

BMJ Open Efficacy and safety of traditional Chinese manual therapy (Tuina) in patients with non-specific chronic low back pain: a study protocol for a randomised controlled trial

Ben Cao ¹, Sitong Fang,¹ Zhiwei Wu,^{2,3} Xin Zhou,^{2,3} Lingjun Kong ¹, Qingguang Zhu,^{2,3} Bowen Zhu ¹, Cheng Tang,¹ Min Fang^{1,3}

To cite: Cao B, Fang S, Wu Z, *et al*. Efficacy and safety of traditional Chinese manual therapy (Tuina) in patients with non-specific chronic low back pain: a study protocol for a randomised controlled trial. *BMJ Open* 2024;**14**:e081022. doi:10.1136/bmjopen-2023-081022

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2023-081022>).

BC and SF are joint first authors.

Received 16 October 2023
Accepted 29 February 2024



© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Professor Min Fang;
fm-tn0510@shutcm.edu.cn

ABSTRACT

Introduction Non-pharmacological interventions play a crucial role in the management of non-specific chronic low back pain (NSCLBP). One prime example is Tuina, a traditional Chinese manual therapy that incorporates pressing, kneading and rubbing techniques to alleviate physical discomfort and enhance overall well-being. It serves as a widely used technique in China and other East Asian countries. However, the effectiveness and safety of Tuina for managing NSCLBP have not been substantiated through rigorous clinical research. We sought to carry out a randomised controlled trial with an open-label design, blinded assessors and parallel arms to assess the effectiveness and safety of Tuina as a treatment for NSCLBP. The trial aims to provide high-quality evidence regarding the efficacy and safety of Tuina in improving outcomes for patients with NSCLBP.

Methods and analysis A total of 150 patients aged 18–60 years with NSCLBP will be recruited. Participants will be randomly assigned to one of the two groups. Both groups will receive standard health education. In addition, the treatment group will receive Tuina therapy, while the control group will participate in core stability exercises. Each group will undergo a total of 18 interventions over 6 weeks, with the interventions administered three times per week. The primary outcome measure is the patient's pain intensity, assessed using the Numerical Rating Scale, at week 6 following randomisation. Secondary outcomes encompass disability (measured by the Roland-Morris Disability Questionnaire), quality of life (assessed using the EuroQoL-5 dimensions questionnaire), adverse emotions (evaluated with the Pain Catastrophizing Scale, Tampa Scale of Kinesiophobia and Depression Anxiety Stress Scale), biomechanical outcomes, socioeconomic indicators (medication use, healthcare utilisation and absenteeism), patient satisfaction, treatment adherence and other relevant factors.

The statistical analysis will follow the intention-to-treat principle. Two-way repeated measures analysis of variance will be used to compare the clinical data across different time points within both groups.

Ethics and dissemination The study protocol has received approval from the Ethics Committee of Shuguang

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study has a sufficient sample size, and the institution supporting the study can ensure an adequate recruitment of participants.
- ⇒ This study will incorporate a 26-week follow-up period, facilitating the observation of Tuina's long-term effectiveness.
- ⇒ Multiple outcome measures covering various aspects will be used to compare the efficacy of the two intervention methods, ensuring a comprehensive evaluation of the results.
- ⇒ It is not possible to blind the intervention providers and patients due to the nature of the intervention.
- ⇒ This study will be conducted at a single centre, potentially impacting the generalisability of the research findings.

Hospital, Shanghai University of Traditional Chinese Medicine (2023-1366-133-01). All study participants will be required to give written informed consent. The findings of the study will be submitted to a peer-reviewed journal for publication and presented at scientific conferences. Additionally, the participants will receive copies of the results.

Trial registration number ChiCTR2300076257.

INTRODUCTION

Non-specific chronic low back pain (NSCLBP) is a prevalent and complex condition that impacts individuals across various age groups and socioeconomic backgrounds.¹ NSCLBP contributes significantly to disability and work absenteeism, placing a substantial burden on healthcare resources and society in general.² Despite the existence of various medications including nonsteroidal anti-inflammatory drugs, muscle relaxants and opioids, over 60% of patients experience inadequate pain relief or functional improvement and continue to experience recurrent or persistent symptoms

even 1 year after the initial onset of low back pain (LBP).³ Consequently, non-pharmacological and complementary therapies like acupuncture, massage and exercise therapy have garnered increasing attention due to their demonstrated safety, cost-effectiveness and potential efficacy in managing NSCLBP.⁴

Tuina, a traditional Chinese manual therapy, uses a range of techniques, including acupressure, kneading, rolling and pressing, to manipulate the soft tissues and joints of the body.⁵ Throughout centuries, Tuina has been used in China for pain relief, improved mobility and the enhancement of overall health and well-being. Numerous studies have indicated the potential benefits of Tuina for conditions such as lumbar disc herniation,⁶ non-specific chronic neck pain⁷ and knee osteoarthritis.⁸ These effects may be attributed to mechanisms such as inflammation reduction, circulation enhancement and nerve function stimulation.^{9–11} However, there is currently a shortage of clinical trials observing the effectiveness of Tuina on NSCLBP. Moreover, previous systematic reviews and meta-analyses have revealed numerous limitations in existing studies, including inadequate safety monitoring, ambiguous outcome measures, absence of follow-up and insufficient sample sizes.^{12–14} As a consequence, the research quality is diminished and, as a result, the findings should be interpreted with caution. Therefore, a randomised controlled trial (RCT) with an adequate sample size, rigorous design and sound methodological quality is necessary to ascertain the clinical efficacy and safety of Tuina therapy for NSCLBP.

The study protocol we have devised incorporates a rigorous methodological design, featuring an ample sample size, precise and comprehensive outcome measures, and meticulous monitoring of the safety and long-term effects of Tuina. The findings from this trial will enhance the existing evidence supporting Tuina as a non-pharmacological approach for managing NSCLBP, potentially influencing clinical practice and policy decisions.

METHODS

Study design

This study is a randomised, controlled trial using a two-arm parallel group design in a 1:1 ratio. It is conducted in an open-label manner but with blinded assessors. The study protocol, under the approval number 2023-1366-133-01, has been approved by the Ethics Committee of Shuguang Hospital, Shanghai University of Traditional Chinese Medicine, and any modifications to the protocol will require a written application to the committee. Additionally, it is registered with the Chinese Clinical Trial Registry and bears the registration number ChiCTR2300076257. The protocol for this study will adhere to rigorous standards as outlined by the Declaration of Helsinki, the Consolidated Standards of Reporting Trials (CONSORT)¹⁵ and the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT)¹⁶

guidelines. This commitment ensures the ethical and transparent conduct of our trial.

We will recruit a total of 150 participants from Shuguang Hospital in Shanghai, China. The participants will be randomly allocated in a 1:1 ratio to either the Tuina group or the core stability exercise (CSE) group. The trial will consist of a 6-week intervention period followed by a 20-week follow-up period. Before randomisation, we will assess the participants' baseline characteristics and evaluate their pain and disability levels, quality of life, adverse events and other indicators at weeks 6, 12 and 26. We will depict the study procedure in a flowchart (figure 1) and present the detailed schedule of patient interventions and outcomes in table 1.

Recruitment

We will post recruitment advertisements for this trial in the community, as well as in the Tuina and Orthopaedic Outpatient Departments of Shuguang Hospital. Furthermore, we will disseminate the advertisements through WeChat, the most widely used social media platform in China, to ensure easy access for interested participants. The first patient enrolment date was 1 October 2023, and the recruitment period will end on 30 June 2024. Potential participants will contact the research team via phone or WeChat. One of the study researchers will verbally explain the study protocol and eligibility criteria to potential participants and assess their eligibility over the phone after obtaining verbal consent. Eligible potential participants will receive the Participant Information and Consent Form via WeChat or email, allowing them at least 24 hours to review the document. If potential participants still express interest in participating and meet the eligibility requirements, they will be invited to attend a baseline session. During the baseline session, one of our researchers will review the study protocol, reconfirm the participant's eligibility and obtain written informed consent. Additionally, a baseline assessment will be conducted during the session, which will include all primary and secondary outcomes as well as demographic information. Afterwards, the patients will be randomised.

Randomisation, allocation concealment and blinding

A statistician, independent from other aspects of the study, will generate a block randomisation schedule using a computer-generated random number table to allocate participants to one of the two treatment groups: 'Tuina' or 'CSE'. The randomisation list and block sizes will be blinded for all researchers. To ensure allocation concealment, sequentially numbered opaque sealed envelopes will be prepared by a staff member not involved in the study. After obtaining informed consent and baseline data, the study physician will assign a unique study identification number to each participant and open the corresponding sealed envelope to reveal the assigned treatment group. Due to the nature of the intervention, Tuina doctors, physical therapists and participants will be aware of their group assignment and will not be blinded.

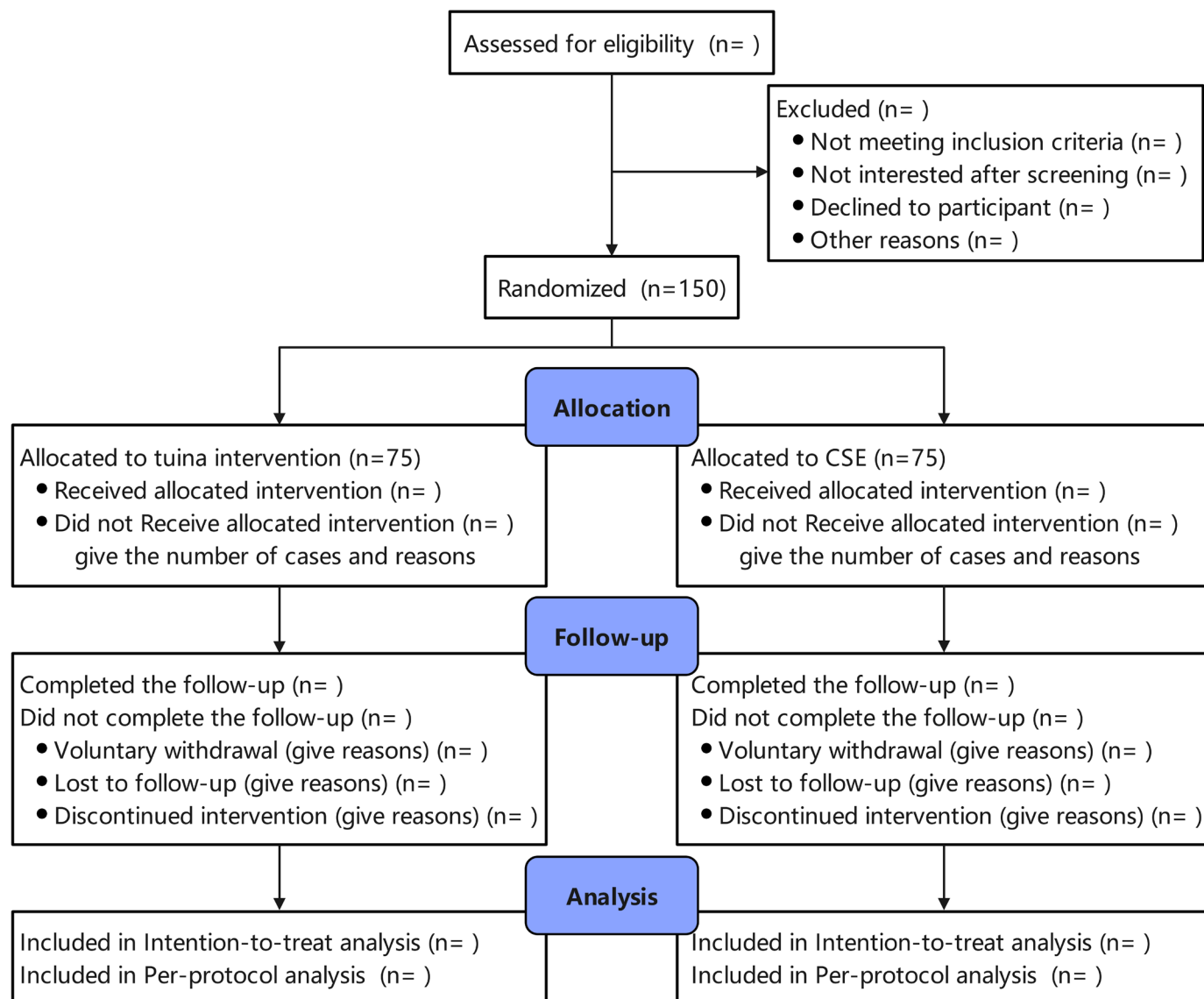


Figure 1 Flowchart of the study procedure. CSE, core stability exercise.

However, evaluators, data collectors and analysts will be blinded to the allocation. In specific circumstances, such as serious adverse events or emergencies, unblinding may be permitted. If unblinding occurs, the participant will be withdrawn from the study, and the researcher will record and report the reasons for withdrawal.

Inclusion criteria

Eligible participants who met the following criteria will be included:

- ▶ Age between 18 and 60 years old.
- ▶ The primary complaint of pain in the region between the 12th rib and the creases of the buttocks, with or without lower limb pain.
- ▶ LBP lasting for at least 12 weeks.
- ▶ The average scores on Numerical Pain Rating Scale (scale range, 0–10) over the past week were ≥ 3 and ≤ 8 .
- ▶ The scores of the Roland-Morris Disability Questionnaire (scale range, 0–24) ≥ 5 .

- ▶ Minimum primary education and adequate Chinese literacy for the study's questionnaires and instructions.
- ▶ Voluntarily participate in the trial and sign an informed consent.

Exclusion criteria

Participants matching any of the following criteria will be excluded:

- ▶ Known severe rheumatic, neurological, cardiovascular and metabolic disorders.
- ▶ Known or suspected serious spinal pathology (eg, malignancy, inflammatory or infective diseases, cauda equina syndrome).
- ▶ Specific LBP (eg, fractures, spinal stenosis, spondylolisthesis).
- ▶ Nerve root compromise (dominant leg pain, straight leg raise tests $\leq 45^\circ$ and/or any two alterations in strength, reflexes or sensation of the same nerve root).

Table 1 Schedule of enrolment, intervention and outcome measures

	Enrolment and allocation		Treatment period			Follow-up period	
	Screening	Allocation	Week 1	Week 2–5	Week 6	Week 12	Week 26
Timepoint	Week –1	Week 0					
Enrolment							
Inclusion/exclusion criteria	×						
Informed consent	×						
Medical history	×						
Physical examination	×						
Baseline characteristics	×						
Allocation		×					
Intervention							
Tuina			×	×	×		
CSE			×	×	×		
Outcomes							
NRS	×				×	×	×
Credibility			×				
RMDQ	×				×	×	×
EQ-5D	×				×	×	×
PCS	×				×	×	×
TSK	×				×	×	×
DASS	×				×	×	×
GBRS					×	×	×
Satisfaction					×	×	×
Biomechanical outcomes	×				×		
Medication use	×				×	×	×
Healthcare utilisation	×				×	×	×
Absenteeism	×				×	×	×
Adverse events					×		
Treatment adherence					×		

CSE, core stability exercise; DASS, Depression Anxiety Stress Scale; EQ-5D, EuroQoL-5 dimensions questionnaire; GBRS, Global Back Recovery Scale; NRS, Numeric Rating Scale; PCS, Pain Catastrophizing Scale; RMDQ, Roland-Morris Disability Questionnaire; TSK, Tampa Scale of Kinesiophobia.

- ▶ Having another musculoskeletal disorder that is more troublesome than their back pain.
- ▶ Women who are pregnant, lactating or planning to conceive within the next 6 months.
- ▶ Previous spinal surgery or scheduled for major surgery within the next 6 months.
- ▶ Uncontrollable cognitive impairment or mental disorder (eg, severe depressive disorder, schizophrenia).
- ▶ Any contraindications to Tuina manipulation (eg, severe osteoporosis, infectious diseases and skin disorders in the lumbar region).
- ▶ Participation in other clinical trials related to LBP within the past 3 months.
- ▶ Patients deemed unsuitable for participation in this trial by the researchers due to other reasons.

Withdrawal, dropout and removal criteria

Participants involved in any of the following conditions will be considered as the withdrawal cases

- ▶ SAE or complications occur during the trial period
- ▶ The occurrence of other serious illnesses, such as stroke, precludes further study
- ▶ Unblinding for emergencies
- ▶ Researchers believe that participants should withdraw from the trial.
- ▶ Participants request to withdraw from the study due to a loss of interest, scheduling conflicts or other personal reasons

We will strive to contact participants who withdraw for any reason to acquire follow-up data and ensure their safety post-trial.

Participants matching any of the following conditions will be removed:

- ▶ Wrongly included due to misdiagnosis.
- ▶ Not meeting the inclusion and exclusion criteria.
- ▶ Participating in other clinical trials at the same time.
- ▶ The data is incomplete, with no assessable records to analyse the results

Participants who do not complete the clinical trial, irrespective of the reasons, will be classified as dropout cases.

Sample size calculations

The sample size for the primary outcome, which is the mean pain intensity in the past week measured on a 0–10 Numeric Rating Scale (NRS) at 6 weeks after randomisation, was calculated to detect a 1-point difference (assuming an SD of 1.65).^{17–19} A statistician used the PASS 15 software and referred to the book ‘Sample Size Calculations in Clinical Research’²⁰ to determine the necessary sample size. Each group was designed to include 75 participants, resulting in a total of 150 participants. This sample size ensured a minimum power of 90% to detect the expected effect, with a two-sided significance level (α) set at 0.05, and assuming a follow-up rate of at least 80%. These calculations conservatively disregarded any increase in statistical power conferred by baseline covariates.

Intervention

Before randomisation, participants will receive detailed explanations of biopsychosocial knowledge related to LBP through graphic media, videos and individual conversations. The educational content aims to enhance the understanding of pain, promote healthy work and lifestyle habits and encourage moderate physical activity. These educational initiatives will continue throughout the intervention period. Subsequently, the two participant groups will be assigned their respective treatment protocols. Each protocol will span 6 weeks, consisting of 3 sessions per week with intervals of 1–2 days, resulting in a total of 18 treatment sessions.

The researchers conducting the intervention will document participants’ attendance frequency in an intervention diary but will not collect any additional data for the experiment. If a participant is absent from an intervention session, we will promptly contact them to determine the reason and encourage them to complete the scheduled session. This study follows a pragmatic approach aimed at reflecting clinical reality. Throughout the study period, participants may seek other conventional treatments for LBP after consulting with the researchers. The researchers will record the types and frequencies of such additional treatments received by the participants.

Tuina group

The Tuina intervention will be administered by three licensed Tuina doctors who are all affiliated with the Tuina Department of Shanghai Shuguang Hospital and possess a minimum of 5 years of clinical experience in

treating LBP. To ensure treatment standardisation, a 12-hour technique training will be provided to the three doctors over 2 weeks, with 3 days of training per week. This training will include lectures, video demonstrations and mutual practice. At the conclusion of the training, an assessment will be conducted and only doctors who pass the assessment successfully will be eligible to participate in subsequent interventions. The training and assessment will be overseen by Professor MF, who is the chief editor of China’s national planning textbook for Tuina Studies and has extensive experience in both practicing and teaching Tuina.

In the previous study,⁵ we provided a detailed description of the Tuina technique applied to the lumbar spine. A similar technique will be used in this trial. A complete Tuina intervention will have a duration of 15–20 min, depending on factors such as the degree of stiffness in the lower back muscles and individual tolerance. The treatment will consist of two steps following the principles of ‘relaxation first, then proceed with joint adjustment techniques’. Specifically, kneading and rolling techniques will be employed to relax the muscles in the patient’s lower back. Subsequently, acupressure will be applied to target specific tender points and acupoints in the lumbosacral region and legs, including Shenshu (BL23), Huantiao (GB30) and Weizhong (BL40). After completing the aforementioned procedures, a technique called lumbar spine oblique pulling, which shares similarities with spine manipulation,²¹ will be employed to correct potential misalignments of the lumbar spine. Typically, the audible joint ‘click’ will be heard, which is considered a sign of successful manipulation. Further details of the interventions can be found in online supplemental file 1.

Core stability exercise group

The CSE is widely recognised globally as an effective treatment modality for NSCLBP.^{22,23} Therefore, we selected the CSE as the intervention for our control group. In this trial, two certified physical therapists from Shanghai Shuguang Hospital will perform the CSE intervention. These therapists have over 5 years of experience in applying CSE programme. To ensure treatment standardisation, they will receive technical training and assessment using the same format and frequency. The training and assessment will be conducted by QZ, who has previous postdoctoral experience in Human Movement Science at the University of Ottawa and Shanghai Sports Academy. QZ also possesses extensive practical experience and teaching expertise in exercise therapy.

This study will reference the previously validated CSE programme used in published research for its effectiveness in treating a specific population with LBP.^{24,25} Each exercise session will begin with five to six cycles of the cat/camel exercise to activate the core muscles. This will be followed by exercises such as abdominal bracing, side planks and quadruped exercises, with each section consisting of three to five progressively challenging movements. Participants will not progress to advanced training

until they can complete the designated number of repetitions for the basic training exercises. Once a participant reaches the final exercise in a progression group, they should continue performing it and increase repetitions if possible. The duration of each CSE session, including rest periods, will be limited to 20–30 min, depending on individual ability and tolerance. Certified and trained physical therapists will provide one-on-one exercise guidance and supervision to participants in separate rooms. Additionally, participants will be encouraged to maintain regular exercise after completing the 6-week intervention. Detailed information about the interventions is presented in online supplemental file 2.

Outcomes

The efficacy evaluation of this study will focus on the primary outcome, which is the mean pain intensity reported over the previous week at 6 weeks after randomisation. In addition, several secondary outcomes will be assessed, including disability level, quality of life, psychological burden, patient satisfaction and socioeconomic indicators. Data collection at each time point will be conducted by independent investigators who are blinded to group assignments and not involved in other aspects of the study. Detailed information about the specific outcomes and observation times can be found in [table 1](#).

Primary outcome

The primary outcome of this study is the patients' one-time self-reported average pain intensity over the past week at the sixth week after randomisation. Pain intensity will be assessed using a self-reported 11-point NRS.²⁶ The NRS is a continuous measurement ranging from 0 (indicating no pain) to 10 (representing the worst imaginable pain). Previous research has demonstrated that the NRS exhibits excellent test–retest reliability, with an intraclass correlation coefficient of 0.92.²⁷ The minimum clinically important difference (MCID) between groups on the 11-point NRS is 1.0 points,¹⁷ while the within-group MCID is defined as a change of 30% from baseline.²⁸

Secondary outcome

► Treatment credibility

To evaluate the treatment credibility of both interventions, we will use the first three questions from the Credibility/Expectancy Questionnaire (CEQ) following the initial treatment session.²⁹ The CEQ is a continuous scale that ranges from 3 (indicating the lowest treatment credibility) to 27 (representing the highest treatment credibility).

► Roland-Morris Disability Questionnaire (RMDQ)

The RMDQ will be used to assess back-specific function.³⁰ It consists of 24 questions that evaluate physical activity and daily life function. Each question offers two response options: 'yes' or 'no'. A score of 1 point is given for each 'yes' response. The RMDQ provides a continuous measure, ranging from 0 (indicating no problems

with back function) to 24 (indicating the most severe problems).

► EuroQoL-5 Dimensions Questionnaire

The 5-Level EuroQoL-5 Dimensions Questionnaire (EQ-5D-5L) will be used to evaluate health-related quality of life.³¹ It encompasses five dimensions: mobility, self-care, usual activities, pain or discomfort, and anxiety or depression. Each dimension consists of five levels, corresponding to different points.³² In addition, the EQ-5D-5L includes a Visual Analogue Scale ranging from 0 (representing the worst imaginable health) to 100 (representing the best imaginable health).

► Pain Catastrophizing Scale (PCS)

The PCS will be employed for the assessment of catastrophising thinking associated with chronic pain. It comprises 13 self-report items, and individual perception determines the total scores, which range from 0 (indicating no catastrophising) to 52 (indicating extremely severe catastrophising).³³ The PCS has demonstrated significant clinical acceptance, good construct validity, excellent internal consistency and test–retest reliability.³⁴

► Tampa Scale of Kinesiophobia (TSK)

We will employ the TSK to evaluate the fear of movement related to pain.³⁵ It comprises 17 items, each scored on a 4-point Likert scale ranging from 1 (indicating strongly disagree) to 4 (indicating strongly agree). The total score on the scale ranges from 17 to 68, with higher scores indicating greater fear of engaging in activities or experiencing (re)injury. The TSK has demonstrated good reliability and validity.³⁶

► Depression Anxiety Stress Scale (DASS)

The depression level of the participants will be assessed using the Depression subscale of the DASS.³⁷ This subscale comprises 7 items (3, 5, 10, 13, 16, 17, 21) scored on a 4-point scale, ranging from 0 (indicating completely disagree) to 3 (indicating completely agree). The total score for this subscale ranges from 0 to 42 (the sum of the scores is multiplied by 2), with higher scores indicating more severe depressive symptoms. The DASS has demonstrated robust psychometric properties, and its cross-cultural validity has been confirmed.³⁸

► Global Back Recovery Scale (GBRS)

The global perceived effect of the intervention will be evaluated using the continuous 11-point GBRS.³⁹ This scale ranges from –5 to 5 and measures the extent of recovery reported by patients in comparison to the start of the intervention plan. A score of –5 indicates 'very much worse', 0 signifies 'no change' and 5 represents 'completely recovered'.

► Patient Satisfaction

Patient satisfaction with the treatment outcomes will be rated using the 11-point NRS.⁴⁰ This is a continuous scale ranging from 0 to 10, with 0 indicating 'totally unsatisfied' and 10 signifying 'totally satisfied'.

► Biomechanical outcomes

To assess the effects of Tuina on NSCLBP, we will use the Vicon (Oxford, UK) motion capture system and Noraxon (Scottsdale, Arizona, USA) surface electromyography.

These technologies will allow us to analyse changes in joint range of motion, as well as activation of the lower back and lower limb muscles during bending, walking, sitting and standing. Objective and comprehensive analysis of biomechanical parameters will provide data support to validate the effectiveness of the Tuina intervention in treating NSCLBP.

► Socioeconomic outcomes

This study will primarily examine three socioeconomic outcomes. First, medication use will be assessed by quantifying the frequency of medication intake per week. Second, healthcare service utilisation will be measured by calculating the proportion of patients in each group seeking additional medical interventions, such as advanced imaging or hospitalisation.⁴¹ Last, the number of workdays missed by participants due to LBP will be recorded.

► Adverse events (AEs)

Before each treatment session, the study's data collection personnel will proactively inquire with each participant to assess any adverse reactions experienced during and after the previous treatment. These inquiries will focus on potential outcomes such as increased pain, muscle soreness or heightened fatigue. If any of these reactions occur, the participants' level of discomfort will be recorded using an 11-point self-report bothersomeness scale.⁴¹ On this scale, a score of 0 indicates 'not at all bothersome', while a score of 10 represents 'extremely bothersome'.

The handling of AEs and their corresponding outcomes will be thoroughly documented in the Case Report Forms (CRFs). AEs will be assessed by MF and QZ to determine their association with the intervention and the necessity for additional treatment. If an AE is classified as serious (defined as requiring hospitalisation or resulting in death and life-threatening injuries), the trial will be terminated and promptly reported to the ethics committee. Participants will be provided with complimentary further treatments, and any associated expenses during this period will be covered by the research sponsor.

► Treatment adherence

Tuina doctors and physical therapists will use an intervention diary to record participant attendance frequency. A comparison will be made between the two groups to determine the mean number of visits and the proportion of patients who complete the treatment according to the specified protocol (the number of treatments ≥ 14). Furthermore, any treatment measures performed outside of the research protocol will be documented.

Data collection and management

The data collectors, blinded to group assignments and uninvolved in other aspects of the study, will accurately document all collected data into the CRF. After trial completion, the CRF will be handed over to two professional data workers who are also blind to the allocation and uninvolved in other parts of the study. The two data workers will independently extract the data from the CRF

into Excel (Microsoft Corp, Washington, USA) and verify the accuracy of the data. All electronic data will be stored on password-protected servers, while all paper-form data will be kept in locked file cabinets. Additionally, de-identified data will be stored separately from files and cabinets containing participant details and trial identification numbers.

The Electronic Data Capture (EDC) system will also be used throughout the study, where any data entry or modification traces will be recorded. The Information Science Department and Clinical Research Center at Shuguang Hospital, affiliated with Shanghai University of Traditional Chinese Medicine, provide the EDC platform and will oversee the entire process of research data collection and management. They will conduct beginning, interim and end monitoring in the 1st, 6th and 26th weeks of the study, respectively, to ensure the quality of the study and the reliability of the data.

Quality control

All researchers involved in the study will receive standardised training covering various aspects such as subject enrolment, allocation, intervention, data collection and adverse event management, along with completing the CRF. The Ethics Committee at Shuguang Hospital, affiliated with Shanghai University of Traditional Chinese Medicine, is responsible for the implementation and safety monitoring of this trial. Furthermore, there are no conflicts of interest between the committee members and this study.

Statistical analysis

The statistical experts will analyse the data using Excel 2019 (Microsoft) and SPSS Statistics V.25.0 (SPSS IBM). The primary and secondary outcomes will be analysed based on the intention-to-treat principle, where each participant is analysed according to the treatment group they were assigned to, regardless of compliance. Missing values for dropout cases will be imputed using either the last observation carried forward method if the dropout rate is below 5% or the multiple imputation method for a dropout rate of 5% or higher. Additionally, a secondary analysis will be conducted using the per-protocol principle, which includes only participants who completed the trial successfully according to the intervention plan and did not receive any other treatment besides Tuina and CSE in the first 6 weeks.

All effects will be estimated with a 95% CI, and all statistical tests will be two-sided with a significance level (α) of 0.05. Baseline variables will be summarised according to the treatment groups. For categorical variables (such as gender, education, smoking and alcohol history), the χ^2 test will be used, while continuous variables (such as age, body mass index and duration of symptoms) will be compared using the t-test and Mann-Whitney test. The results will be presented as counts (percentages), medians (IQRs) or means (SD). To analyse trends over time and the interaction between groups and times, two-way

repeated measures analysis of variance will be used to compare clinical data at multiple observation time points. The χ^2 test will be employed to compare the proportions of participants in each group who achieve MCID in pain improvement level after the intervention. Additionally, the proportions of participants in each group seeking additional medical services, experiencing adverse events and completing the intervention as planned will also be compared using the χ^2 test.

Trial status

The current version of the research protocol is 1.0 and was registered on 28 September 2023. At the time of manuscript submission, recruitment of potential participants had already begun.

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research. On the conclusion of the study, participants will be provided with written feedback regarding their test and assessment results throughout the course of the treatment.

DISCUSSION

Manual therapy has different modalities and names in different countries. In China, Tuina is a well-established and scientifically based form of manual therapy that has been used for centuries to treat NSCLBP, accumulating significant clinical experience. However, few RCTs have evaluated the clinical effectiveness of Tuina intervention for NSCLBP, and most of them are of low quality. To address this gap, we designed a single-centre, open-label, assessor-blinded, parallel-arm RCT. We aim to assess the short-term and long-term clinical efficacy of Tuina by evaluating multiple indicators at pre-treatment, post-treatment and at the 12th and 26th weeks after randomisation.

To accomplish our objectives, we meticulously developed this study protocol, which offers several key strengths. First, the research is supported by a leading institution specialising in Tuina in China, ensuring ample opportunities for participant recruitment with over 120 000 outpatient visits annually. Second, the study has an adequate sample size. Third, it incorporates a 26-week follow-up period, facilitating the observation of Tuina's long-term effectiveness. Fourth, the intervention procedures will be standardised through training and assessment supervised by authoritative experts in the field. Last, the study will encompass various facets of the observed indicators, including patients' emotional distress, adherence and socioeconomic factors.

However, this study does have certain limitations. First, blinding the intervention providers and patients is not feasible. Second, due to the long-standing popularity of Tuina in China over thousands of years, patients may exhibit varying preferences and levels of trust towards

the two intervention methods. Third, the trial duration is relatively short, necessitating enhanced collaboration and division of labour for greater efficiency. Fourth, the study will be conducted at a single centre, potentially impacting the generalisability of the research findings. Last, NSCLBP still lacks precise diagnostic criteria to date, typically requiring detailed history taking and physical examination to rule out specific disorders of spinal and non-spinal origin, with particular attention to red flags. This may pose challenges in recruiting study participants.²³ Despite these limitations, the trial results are anticipated to yield reliable evidence on the clinical efficacy and safety of Tuina in treating NSCLBP, thereby benefiting patients, clinicians and researchers in this field.

Author affiliations

¹Shanghai University of Traditional Chinese Medicine, Shuguang Hospital, Shanghai, China

²Shanghai University of Traditional Chinese Medicine, Yueyang Hospital of Integrated Traditional Chinese Medicine and Western Medicine, Shanghai, China

³Institute of Traditional Chinese Tuina, Shanghai Academy of Traditional Chinese Medicine, Shanghai, China

Contributors MF, BC and SF conceptualised and designed the study. MF obtained research funding and ethical approval. BC and SF prepared the initial manuscript and facilitated revisions in consultation with QZ and LK. MF, XZ, ZW and QZ guided the RCT design. BZ and CT developed the statistical analysis methods and will be responsible for analysing the trial data. All authors have reviewed and authorised the final version of the manuscript.

Funding This project was supported by the National Natural Science Foundation of China (82030121), the Three-Year Action Plan for Enhancing Clinical Skills and Innovation Capabilities of SHDC (SHDC2022CRT018), and the Construction of Research-oriented Wards of SHDC (SHDC2022CRW010).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Ben Cao <http://orcid.org/0009-0001-6694-9484>

Lingjun Kong <http://orcid.org/0000-0002-6854-4202>

Bowen Zhu <http://orcid.org/0000-0001-6931-1139>

REFERENCES

- 1 Maher C, Underwood M, Buchbinder R. Non-specific low back pain. *Lancet* 2017;389:736–47.

- 2 Diseases GBD, Injuries C. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the global burden of disease study 2019. *The Lancet* 2020;396:1204-22.
- 3 Itz CJ, Geurts JW, van Kleef M, et al. Clinical course of non-specific low back pain: a systematic review of prospective cohort studies set in primary care. *Eur J Pain* 2013;17:5-15.
- 4 Chou R, Deyo R, Friedly J, et al. Nonpharmacologic therapies for low back pain: A systematic review for an American college of physicians clinical practice guideline. *Ann Intern Med* 2017;166:493-505.
- 5 Cao B, Zhou X, Zhang S-P, et al. Effect of traditional Chinese manual therapy on alleviating pain and dysfunction of lumbar disc Herniation: a randomized controlled pilot study. *Am J Transl Res* 2022;14:6941-52.
- 6 Huang F, Xiao Z, Zhan X, et al. Tuina combined with adjuvant therapy for lumbar disc Herniation: A network meta-analysis. *Complement Ther Clin Pract* 2022;49.
- 7 Cheng Z-J, Zhang S-P, Gu Y-J, et al. Effectiveness of Tuina therapy combined with Yijinjing exercise in the treatment of nonspecific chronic neck pain: A randomized clinical trial. *JAMA Netw Open* 2022;5:e2246538.
- 8 Wang Z, Xu H, Wang Z, et al. Effects of externally-applied, non-pharmacological interventions on Short- and long-term symptoms and inflammatory cytokine levels in patients with knee osteoarthritis: a systematic review and network meta-analysis. *Front Immunol* 2023;14:1309751.
- 9 Yao C, Ren J, Huang R, et al. Transcriptome profiling of microRNAs reveals potential mechanisms of manual therapy alleviating neuropathic pain through microRNA-547-3p-mediated Map4K4/NF-Kb signaling pathway. *J Neuroinflammation* 2022;19.
- 10 Lei F, Min F, Shichao J, et al. Optimization of parameters of Yi Zhi Chan Tuina manipulation promotes peripheral circulation. *Journal of Traditional Chinese Medicine* 2015;35:558-63.
- 11 Lv T, Mo Y, Yu T, et al. An investigation into the Rehabilitative mechanism of Tuina in the treatment of Sciatic nerve injury. *Evid Based Complement Alternat Med* 2020.
- 12 Yang J, Zhou X, Ma Q, et al. Efficacy and safety of Tuina for chronic nonspecific low back pain: A PRISMA-compliant systematic review and meta-analysis. *Medicine (Baltimore)* 2023;102:e33018.
- 13 Kong LJ, Fang M, Zhan HS, et al. Tuina-focused integrative Chinese medical therapies for Inpatients with low back pain: a systematic review and meta-analysis. *Evid Based Complement Alternat Med* 2012.
- 14 Zhou X, Ma Q, Yang J, et al. Clinical outcome measures reporting in randomized trials evaluating Tuina therapy for chronic nonspecific low back pain: A systematic review. *Medicine (Baltimore)* 2023;102:e33628.
- 15 Schulz KF, Altman DG, Moher D, et al. Statement: updated guidelines for reporting parallel group randomised trials. *J Clin Epidemiol* 2010;63:834-40.
- 16 Chan A-W, Tetzlaff JM, Altman DG, et al. SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Ann Intern Med* 2013;158:200-7.
- 17 Busse JW, Bartlett SJ, Dougados M, et al. Optimal strategies for reporting pain in clinical trials and systematic reviews: recommendations from an OMERACT 12 workshop. *J Rheumatol* 2015;42:1962-70.
- 18 Guohui Z, Xin M, Qingjuan G, et al. Core stability exercises combined with manipulation therapy in 30 patients with lumbar disc Herniation. *Shanghai Journal of Traditional Chinese Medicine* 2019.
- 19 Zhang Y, Tang S, Chen G, et al. Chinese massage combined with core stability exercises for nonspecific low back pain: a randomized controlled trial. *Complementary Therapies in Medicine* 2015;23:1-6.
- 20 Chow SC, Shao J, Wang H. Sample size calculations in clinical research. In: *Biostatistics Series*. second ed: Chapman & Hall/CRC, 2008.
- 21 Thomas JS, Clark BC, Russ DW, et al. Effect of spinal manipulative and mobilization therapies in young adults with mild to moderate chronic low back pain: A randomized clinical trial. *JAMA Netw Open* 2020;3:e2012589.
- 22 Xueqiang W, Peijie C, Wei J, et al. Exercise therapy for back pain: expert consensus. *CHINA SPORT SCIENCE* 2019;39:19-29.
- 23 Chiarotto A, Koes BW. Nonspecific low back pain. *N Engl J Med* 2022;386:1732-40.
- 24 Hicks GE, Fritz JM, Delitto A, et al. Preliminary development of a clinical prediction rule for determining which patients with low back pain will respond to a stabilization exercise program. *Arch Phys Med Rehabil* 2005;86:1753-62.
- 25 Alrwaily M, Schneider M, Sowa G, et al. Stabilization exercises combined with neuromuscular electrical stimulation for patients with chronic low back pain: a randomized controlled trial. *Braz J Phys Ther* 2019;23:506-15.
- 26 Dworkin RH, Turk DC, Farrar JT, et al. Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. *Pain* 2005;113:9-19.
- 27 Chiarotto A, Maxwell LJ, Ostelo RW, et al. Measurement properties of visual analogue scale, Numeric rating scale, and pain severity Subscale of the brief pain inventory in patients with low back pain: A systematic review. *J Pain* 2019;20:245-63.
- 28 Ostelo RWJG, Deyo RA, Stratford P, et al. Interpreting change scores for pain and functional status in low back pain: towards International consensus regarding minimal important change. *Spine (Phila Pa 1976)* 2008;33:90-4.
- 29 Devilly GJ, Borkovec TD. Psychometric properties of the credibility/expectancy questionnaire. *J Behav Ther Exp Psychiatry* 2000;31:73-86.
- 30 Roland M, Morris R. A study of the natural history of back pain. part I: development of a reliable and sensitive measure of disability in low-back pain. *Spine* 1976;141-4.
- 31 Herdman M, Gudex C, Lloyd A, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Qual Life Res* 2011;20:1727-36.
- 32 Luo N, Liu G, Li M, et al. Estimating an EQ-5D-5L value set for China. *Value Health* 2017;20:662-9.
- 33 Sullivan MJL, Bishop SR, Pivik J. The pain Catastrophizing scale: development and validation. *Psychological Assessment* 1995;7:524-32.
- 34 Xu X, Wei X, Wang F, et al. Validation of a simplified Chinese version of the pain Catastrophizing scale and an exploration of the factors predicting Catastrophizing in pain clinic patients. *Pain Physician* 2015;18:E1059-72.
- 35 Aguiar AS, Bataglion C, Visscher CM, et al. Cross-Cultural adaptation, Reliability and construct validity of the Tampa scale for Kinesiophobia for Temporomandibular disorders (TSK/TMD-Br) into Brazilian Portuguese. *J Oral Rehabil* 2017;44:500-10.
- 36 Wei X, Xu X, Zhao Y, et al. The Chinese version of the Tampa scale for Kinesiophobia was cross-culturally adapted and validated in patients with low back pain. *J Clin Epidemiol* 2015;68:1205-12.
- 37 Osman A, Wong JL, Bagge CL, et al. The depression anxiety stress Scales-21 (DASS-21): further examination of dimensions, scale reliability, and correlates. *J Clin Psychol* 2012;68:1322-38.
- 38 Wang K, Shi H-S, Geng F-L, et al. Cross-cultural validation of the depression anxiety stress Scale-21 in China. *Psychol Assess* 2016;28:e88-100.
- 39 Hush JM, Kamper SJ, Stanton TR, et al. Standardized measurement of recovery from nonspecific back pain. *Arch Phys Med Rehabil* 2012;93:849-55.
- 40 Kim B-G, Lee W, Song JH, et al. Effect of intravenous dexamethasone on the duration of postoperative analgesia for Popliteal Sciatic nerve block: a randomized, double-blind, placebo-controlled study. *Korean J Anesthesiol* 2021;74:317-24.
- 41 Evans R, Haas M, Schulz C, et al. Spinal manipulation and exercise for low back pain in adolescents: a randomized trial. *Pain* 2018;159:1297-307.