

INPLASY PROTOCOL

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None declared.

Effect of Traditional Chinese Exercises on Bone Mineral Density in Postmenopausal Women: A Systematic Review and Network Meta-Analysis

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Review question / Objective: Patient population: The sample population includes the participants were diagnosed as postmenopausal women with osteopenia or osteoporosis, or with normal bone mass, and had no serious complications or other diseases. Intervention: the experimental group includes traditional Chinese exercises (e.g., Tai Chi, Baduanjin, Wuqinxi, Yijinjing, and Liuzijue), compared with different types of control groups (e.g., waiting-list, routine care and non-exercise control, etc), the experimental group can take adjuvant drugs and perform daily physical activities. Outcomes: the outcome indicators include test data on BMD in lumbar spine, femoral neck or ward's triangle BMD as one of the outcome indicators. We aimed to integrate the relevant clinical evidence of direct and indirect comparative relationships between different TCE using a network Meta-analysis. The effect of different types of TCE on bone mineral density at different sites was assessed using a network meta-analysis of the physical status of patients with osteoporosis or osteomalacia based on a probability ranking of the superiority of the index efficacy in postmenopausal women.

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INTRODUCTION

Review question / Objective: Patient population: The sample population includes the participants were diagnosed as postmenopausal women with osteopenia or osteoporosis, or with normal bone mass, and had no serious complications or other diseases. Intervention: the experimental

group includes traditional Chinese exercises (e.g., Tai Chi, Baduanjin, Wuqinxi, Yijinjing, and Liuzijue), compared with different types of control groups (e.g., waiting-list, routine care and non-exercise control, etc), the experimental group can take adjuvant drugs and perform daily physical activities. Outcomes: the outcome indicators include test data on BMD in

lumbar spine, femoral neck or ward's triangle BMD as one of the outcome indicators. We aimed to integrate the relevant clinical evidence of direct and indirect comparative relationships between different TCE using a network Meta-analysis. The effect of different types of TCE on bone mineral density at different sites was assessed using a network meta-analysis of the physical status of patients with osteoporosis or osteomalacia based on a probability ranking of the superiority of the index efficacy in postmenopausal women.

Condition being studied: Given the severe prevalence of postmenopausal osteoporosis and the many disadvantages of pharmacological treatment, such as long cycle times, high costs, adverse effects, and poor compliance, exercise therapy is gaining increasing attention as a complementary therapy to pharmacological treatment due to its advantages of being economical and having few side effects. As one of the representative exercise therapies, aerobic exercise has a unique advantage in improving muscle strength produced by muscle contraction and has a soothing, stimulating effect on bone mass. Traditional Chinese exercise (TCE) is famous worldwide for improving the physical and mental health of patients with chronic diseases, including Tai Chi, Baduanjin, Wuqinxi, Yijinjing, and Liuzijue. As a low-cost, easy-to-learn, highly safe, and suitable aerobic exercise, traditional Chinese exercise is suitable for older people. Compared to other exercises, TCE are easy to learn and not restricted by exercise venues while having sound effects on personal health and disease prevention, improving body balance, strengthening lower limb muscles, and preventing postmenopausal osteoporosis.

Despite some differences in the design of these experiments, TCE is a safe option for preventing and treating patients with primary osteoporosis or bone loss. Recent meta-analyses have shown that Tai Chi interventions prevent further osteoporotic BMD decline in elderly female patients with osteopenia or osteoporosis. Another meta-

analysis have shown that of all exercises, Baduanjin was effective in inhibiting or even reversing BMD in older adults with osteoporosis. However, except for Tai Chi, there have been no systematic reviews on the effects of TCE on BMD in postmenopausal older adults. Furthermore, a recent meta-analysis suggests that different types of exercise may affect BMD differently. Overall, the most effective types of TCE workouts to improve BMD in different parts of the body in patients with osteoporosis remain unclear.

Therefore, we aimed to integrate the relevant clinical evidence of direct and indirect comparative relationships between different TCE using a network Meta-analysis. The effect of different types of TCE on bone mineral density at different sites was assessed using a network meta-analysis of the physical status of patients with osteoporosis or osteomalacia based on a probability ranking of the superiority of the index efficacy in postmenopausal women.

METHODS

Participant or population: The participants were diagnosed as postmenopausal women with osteopenia or osteoporosis, or with normal bone mass, and had no serious complications or other diseases.

Intervention: The experimental group includes traditional Chinese exercises (e.g., Tai Chi, Baduanjin, Wuqinxi, Yijinjing, and Liuzijue), compared with different types of control groups (e.g., waiting-list, routine care and non-exercise control, etc), the experimental group can take adjuvant drugs and perform daily physical activities.

Comparator: compared with different types of control groups (e.g., waiting-list, routine care and non-exercise control, etc), the experimental group can take adjuvant drugs and perform daily physical activities.

Study designs to be included: Follow the PICO model in the reporting design, descriptive data extraction features include: first author, country and year of publication, sample size (attrition rate),

mean age or age range, years of menopause, bone mass of participant, intervention design (intervention, time, frequency), and main outcome indicators.

Eligibility criteria: Eligibility criteria for inclusion in the study: (1) randomized controlled trial (RCT); (2) the participants were diagnosed as postmenopausal women with osteopenia or osteoporosis, or with normal bone mass, and had no serious complications or other diseases; (3) type of intervention: the experimental group includes traditional Chinese exercises (e.g., Tai Chi, Baduanjin, Wuqinxi, Yijinjing, and Liuzijue), compared with different types of control groups (e.g., waiting-list, routine care and non-exercise control, etc), the experimental group can take adjuvant drugs and perform daily physical activities; (4) outcome indicators include test data on BMD in lumbar spine, femoral neck or ward's triangle BMD as one of the outcome indicators; (5) before the test subjects in each group of indicators is consistent baseline, and (6) published in Chinese or English.

Information sources: The literature was obtained from English (e.g., Web of Science, EMBASE, Cochrane Library, Springer link, Scopus, EBSCO, and PubMed) and Chinese (e.g., China National Knowledge Infrastructure, Wanfang, CBMdisc, and VIP Database for Chinese Technical Periodicals) databases.

Main outcome(s): Each study consisted of at least one dimension of the outcome indicators—lumbar bone mineral density, femoral neck bone mineral density, ward's triangle Bone Density.

Quality assessment / Risk of bias analysis: The Physiotherapy Evidence Database Scale (PEDro) aims to help the best evidence to enhance the effectiveness of physical therapy services, and it used contains 11 assessment items. Owing to the project was not included in the study's blind assessment because the teacher's blind method was difficult to control during the intervention. Furthermore, we want to further analyze the difference between

independent exercise and drug-exercise combination, so we added a new item of isolated traditional Chinese exercise. The revised PEDro scale includes the following items: eligibility criteria, randomization, concealed allocation, similar baseline, assessor blindness, subject blindness, point estimation, comparison between groups, a retention rate of 85% or above, completeness of measurement results, and isolated traditional Chinese exercise. A higher score indicates better method quality (0–11 points), of which a PEDro score > 6 is divided into the high-quality group, while a PEDro score ≤ 6 is divided into the low-quality group.

Strategy of data synthesis: Traditional meta-analysis and network meta-analysis module in Stata14.0 software (Manufacturer, City, US State abbrev) was used to perform the meta-analysis, and the outcome indicators are all continuous variables, we selected standardized mean difference (SMD as pooled effect size reflects magnitude of effect of exercise intervention), with its 95% confidence interval (CI). The combined effect size (Hedge's $g = 0.2$ small effect; $= 0.5$ medium effect; $= 0.8$ large effect) was used to assess the effectiveness of intervention methods.

Secondly, the “network” package is used for network meta-analysis, and a mesh relationship diagram is drawn (in the diagram, each node represents an intervention measure, the area size of the node represents the number of samples corresponding to the intervention measure, the thickness of the lines between the connecting nodes represents the number of studies included under the intervention measure). If there is a closed loop in the graph, its inconsistency is judged by the loop inconsistency factor (LI). If the lower limit of 95% CI of the inconsistency factors (IF) value is zero (close to zero), it indicates that the direct evidence and indirect evidence are consistent. Finally, the ranking among the interventions was obtained by comparing the surface under the cumulative ranking (SUCRA). The larger the SUCRA value, the better the effect of the intervention.

Subgroup analysis: Subgroup analyses will be conducted which aims to explain the potential causes of heterogeneity when necessitated. The subgroup analyses will be implemented according to age, gender, frequency, time, duration, and event.

Sensitivity analysis: A comparison-correction funnel plot was used to assess whether there was a small sample size effect or publication bias in the included studies. Besides, sensitivity analysis was performed by excluding studies with an intervention duration less than 3 months and a sample size smaller than 30 to evaluate the stability of the results.

Country(ies) involved: China.

Keywords: Traditional Chinese Exercises; Bone mineral density; Femoral neck; lumbar spine.

Contributions of each author:
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