INPLASY PROTOCOL

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Corresponding author:
Sijun Wu

334070@whut.edu.cn

Author Affiliation:
School of Physical Education, Wuhan University of Technology, Wuhan 430070, China.

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None declared.

Effects of different mind-body exercises on glucose and lipid metabolism in patients with type 2 diabetes: a systematic review and network meta-analysis

Wu, SJ[1]; Wang, L[2]; He, YX[3]; Shi, FR[4]; Zhuang, HQ[5].

Review question / Objective: **In this study, we aimed to compare the relative advantages of different physical and mental exercise modalities in improving glycemic and lipid control in patients with T2DM by using a network meta-analysis, and to rank different interventions that could help inform clinical decisions.**
Condition being studied: **According to a recent report released by the International Diabetes Federation (IDF), the number of adults aged 20-79 with diabetes will reach 537 million worldwide in 2021 (1 in 10 people have diabetes); the number is expected to rise to 643 million by 2030 and to 783 million by 2045, with the prevalence still on the rise. More than 90% of patients with diabetes are diagnosed with type 2 diabetes mellitus (T2DM). the main feature of T2DM is a relative insulin deficiency caused by defective insulin secretion from pancreatic β-cells and the inability of insulin-sensitive tissues to respond appropriately to insulin, leaving patients with abnormal blood glucose and lipid levels [*]. Poorly controlled diabetes can lead to microvascular and macrovascular complications that not only cause severe psychological and physical distress to patients and caregivers, but also have a significant economic impact on countries and health systems: the global health expenditure due to diabetes in the year 2021 alone amounts to $966 billion, or 9% of global health expenditure. Clearly, diabetes poses a serious threat to global public health security. A sedentary lifestyle is considered one of the major risk factors for T2DM and its complications, and increasing physical activity is an effective way to prevent and treat type 2 diabetes with all lifestyle-based changes.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 06 June 2023 and was last updated on 06 June 2023 (registration number INPLASY202360023).

INTRODUCTION

Review question / Objective: **In this study, we aimed to compare the relative advantages of different physical and mental exercise modalities in improving glycemic and lipid control in patients with T2DM by using a network meta-analysis, and to rank**

different interventions that could help inform clinical decisions.

Rationale: Numerous existing studies and meta-analyses have demonstrated the effectiveness of physical and mental exercise in improving glycolipid levels in patients with type 2 diabetes. However, it is difficult to determine the superiority of different physical and mental exercises using randomized controlled trials or paired meta-analyses. Network meta-analysis is a novel analytical approach that can help inform clinical decision making by combining direct and indirect evidence to compare the relative effectiveness of all interventions simultaneously in a single analysis and to rank different interventions.

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A sedentary lifestyle is considered one of the major risk factors for T2DM and its complications, and increasing physical activity is an effective way to prevent and treat type 2 diabetes with all lifestyle-based changes.

METHODS

Search strategy: To identify studies on the effects ofTai Chi on diabetes, we conducted a search of Chinese and English electronic databases, such as Web of Science, PubMed, the Cochrane Library, EMBASE, CNKI, Weipu, and Wanfang.The upper limit for the publication date of articles was February 20, 2023.Chinese search terms include "Tai Chi", "Badaanjin", "yoga", "diabetes", "type 2 diabetes", "non-insulin-dependent diabetes", etc, "Type 2 diabetes", "non-insulin-dependent diabetes", etc. The main English search terms are: "Diabetes Mellitus, Type 2", "NIDDM", "T2DM", "non insulin* depend*", and "mind-body exercis*", "Tai Chi", "baduanjin", "Yoga ", "Pilates", "danc*".

Participant or population: The people who met the inclusion criteria were older than 18 years and diagnosed with type 2 diabetes, regardless of nationality, ethnicity, or gender. Patients with chronic diseases such as hypertension, hyperlipidemia, and coronary heart disease are also included. However, diabetic complications (diabetic ketoacidosis, infections, diabetic nephropathy, diabetic retinopathy, diabetic foot), chronic kidney disease, type I diabetes, and pregnant women were excluded.

Intervention: We will focus on the following mind-body exercises: Tai Chi Chuan, Baduanjin, Wuqinxi, Yijinjing, liuzijue, Yoga, Dance and pilates.

Comparator: One of the following nine exercise training modalities:Tai Chi Chuan, Baduanjin, Wuqinxi, Yijinjing, liuzijue, Yoga, Dance and pilates. In addition, standard care for diabetes and no exercise also included.

Study designs to be included: Randomized controlled trials (RCTs).

Eligibility criteria: The inclusion criteria have been detailed in the entry above. Exclusion criteria for this study included:(1) non-randomized controlled studies; (2)

populations or interventions that did not meet our inclusion criteria; (3) no outcome indicators of interest; (4) incomplete experimental data; (5) second publication of the same trial; and (6) conference abstracts.

Information sources: We conducted a search of Chinese and English electronic databases, such as Web of Science, PubMed, the Cochrane Library, EMBASE, CNKI, Weipu, and Wanfang.In addition, references to relevant studies were checked to avoid omission of eligible literature.

Main outcome(s): Changes in at least one of the following primary outcome measures were reported: fasting blood glucose(FBG), Hemoglobin A1C(HbA1C), total cholesterol (TC), triglycerides(TG), high-density lipoprotein cholesterol(HDL-C), and low-density lipoprotein cholesterol(LDL-C).

Data management: Two researchers independently extracted data from each included study, including research characteristics (e.g., name of the lead author, year of publication, title, country), characteristics of participants (e.g., sample size, average age, and sex ratio), details of intervention measures (e.g., type, frequency, intensity, duration), and relevant data of each kind of interesting results (e.g., sample size, mean value and standard deviation of changes before and after intervention, and baseline). Considering that the included literature involves many countries or regions, there is a situation of inconsistent measurement units. Therefore, this study used blood glucose (mmol/L), blood lipids (mmol/L), and blood pressure (mmHg) as the standard to convert the original studies using mg/dl. In addition, when the statistical data related to the results are not fully reported, we use relevant formulas to calculate the values of missing results according to the recommendations of the Cochrane manual. The third researcher checked all the data.

Quality assessment / Risk of bias analysis: Two researchers independently examined the bias risk of each included study using the Cochrane bias risk tool. The six areas of bias are method of adequate sequence generation, allocation concealment, blinding of participants and personnel, incomplete outcome data, selective reporting, and other sources of bias. In every field, there is a risk of low, unclear, or high bias in the experiment. Overall, if all domains are classified as' low risk ', then the study has a' low bias risk '; If at least one domain is classified as' unclear ', there is a' moderate bias risk 'in the study; If at least one domain is classified as' high-risk 'or multiple domains are rated as' unclear', there is a 'high bias risk'. Any differences shall be adjudicated by a third researcher to reach a consensus.

Strategy of data synthesis: We will estimate the changes in baseline mean and its standard deviation (SD) for meta-analysis. MD and its 95% confidence interval (95% ci) will be used to estimate the magnitude of the effect.
Statistical analysis was conducted using STATA (Version14, StataCorp, TX, USA). In addition to HDL results, the decrease in other indicators indicates that the ideal treatment effect has been achieved, indicating that negative estimates indicate that treatment is beneficial. For all outcome indicators, a binary analysis was conducted using the DerSimonian and Laird random effects models to explore the effects of various exercise interventions compared to the control group. I^2 was used to calculate the heterogeneity between studies. If the number of studies compared in pairs is greater than 10, then the publication bias is evaluated using the Egger test . Subsequently, network meta-analysis was conducted based on a frequency-based framework. We considered the heterogeneity between different randomized controlled trials and therefore applied a random effects model in the network meta-analysis. Generate a network graph to evaluate the geometric shape of the network. We detected global design inconsistency by using a per treatment design model. At the same time, we used loop specific methods and node splitting techniques to evaluate local inconsistency. In order to rank the

treatment of each outcome in NMA, we used surface and average rankings under the cumulative ranking curve (SUCRA). The higher the SUCRA value, the better the ranking of interventions in the network.
The CINeMA (Confidence in Network Meta Analysis) web application is an adaptation of the graded recommendation evaluation, development, and evaluation (GRADE) method of NMA, used to evaluate the certainty of the main network meta-analysis results and ultimately classify the reliability of the results into high, medium, low, and very low.

Subgroup analysis: **None.**

Sensitivity analysis: **We plan to perform sensitivity analysis by excluding studies with a high risk of bias.In addition, We conducted a network meta-regression analysis to explore the moderating effects of the frequency and duration of exercise intervention, as well as the age of the intervener compared to the baseline levels of each indicator.**

Country(ies) involved: **China.**

Keywords: **Type 2 diabetes; Network meta-analysis;Glycemic control;mind-body exercise.**

Contributions of each author:
Author 1 - Sijun Wu.
Email: 334070@whut.edu.cn
Author 2 - Lin Wang.
Email: wanglin123@126.com
Author 3 - Yuxuan He.
Email: cdbb924230865@126.com
Author 4 - Fengrui Shi.
Email: 3076997668@qq.com
Author 5 - Huiqi Zhuang.
Email: 1352621006@qq.com