

INPLASY PROTOCOL

To cite: Mao et al. Effects of Tai Chi on Postural Control in People with Peripheral Neuropathy: A Systematic Review and Meta-analysis. Inplasy protocol 202340098. doi: 10.37766/inplasy2023.4.0098

Received: 27 April 2023

Published: 27 April 2023

Corresponding author:
Li Li

lili@georgiasouthern.edu

Author Affiliation:
Sport Science College of
Nanjing Normal University.

Support: None.

Review Stage at time of this submission: Completed but not published.

Conflicts of interest:
None declared.

Effects of Tai Chi on Postural Control in People with Peripheral Neuropathy: A Systematic Review and Meta-analysis

Mao, WH¹; Wang, T²; Sun, MZ³; Zhang, FT⁴; Li, L⁵.

Condition being studied: Peripheral neuropathy (PN) damages the peripheral nervous system from the lower limb to the spinal cord, leading to progressive loss of peripheral sensation, plantar sensitivity, proprioceptive declination, and neuromuscular dysfunction. This dysfunction may result from exposure to hyperglycemia and peripheral nervous system damage in the muscular system. The loss of muscular mass, power, and strength is particularly severe in people with DPN in the lower extremity muscles. These deficits predispose people with DPN to have a limited range of motion in the lower limb joints, slow, stiff, unstable gait, easier fatigue, and impaired postural control.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 April 2023 and was last updated on 27 April 2023 (registration number INPLASY202340098).

INTRODUCTION

Review question / Objective: Participants: Participants were included in the study if they met the following criteria: (1) They have not practiced Tai Chi in the past four months; (2) They had a clinical diagnosis of PN based on symptoms, an increase in vibrating perception threshold (VPT), and a decrease nerve conduction velocity (NCV);

(3) They engaged in moderate intensity exercise at least once a week; and (4) The body mass index (BMI) was between 10 and 35kg/m². Participants were excluded from the study if they: (1) were taking drugs that may affect postural control; (2) Had a history of frequent falls; (3) had visual impairment; (4) had orthopedic/neuromuscular/cardiovascular disorders, or were limited physical exercise; (5) had

engaged in moderate or vigorous exercise three months before the start of the study; (6) were unable to walk independently; (7) had severe diseases; and (8) had cognitive impairment. Intervention: The study duration was a minimum of 8 weeks. The experimental group received Tai Chi alone or with other resistance training. In contrast, the control group received other forms of exercise, such as postural control or routine rehabilitation training. Outcome measures: The following measures were used to assess the effects of Tai Chi on postural control and peripheral neuropathy: (1) One-leg standing test (OLST); (2) double-leg stance balance with both eyes closed (s); (3) Berg balance scale; (4) ABC balance confidence scale; (5) 6-minute walking distance test (6MWD) (m); (6) Timed Up-and-Go Test (TUG) (s); and (7) plantar pressure detection threshold (PPDT) testing. Study design: All RCTs included in the meta-analysis compared Tai Chi combined with conventional rehabilitation training to traditional training of rehabilitation, using relevant Chinese and English literature.

Condition being studied: Peripheral neuropathy (PN) damages the peripheral nervous system from the lower limb to the spinal cord, leading to progressive loss of peripheral sensation, plantar sensitivity, proprioceptive declination, and neuromuscular dysfunction. This dysfunction may result from exposure to hyperglycemia and peripheral nervous system damage in the muscular system. The loss of muscular mass, power, and strength is particularly severe in people with DPN in the lower extremity muscles. These deficits predispose people with DPN to have a limited range of motion in the lower limb joints, slow, stiff, unstable gait, easier fatigue, and impaired postural control.

METHODS

Participant or population: Participants were included in the study if they met the following criteria: (1) They have not practiced Tai Chi in the past four months; (2) They had a clinical diagnosis of PN

based on symptoms, an increase in vibrating perception threshold (VPT), and a decrease nerve conduction velocity (NCV); (3) They engaged in moderate intensity exercise at least once a week; and (4) The body mass index (BMI) was between 10 and 35kg/m². Participants were excluded from the study if they: (1) were taking drugs that may affect postural control; (2) Had a history of frequent falls; (3) had visual impairment; (4) had orthopedic/neuromuscular/cardiovascular disorders, or were limited physical exercise; (5) had engaged in moderate or vigorous exercise three months before the start of the study; (6) were unable to walk independently; (7) had severe diseases; and (8) had cognitive impairment.

Intervention: The study duration was a minimum of 8 weeks. The experimental group received Tai Chi alone or with other resistance training. In contrast, the control group received other forms of exercise, such as postural control or routine rehabilitation training.

Comparator: The intervention of the control group.

Study designs to be included: All RCTs included in the meta-analysis compared Tai Chi combined with conventional rehabilitation training to traditional training of rehabilitation, using relevant Chinese and English literature.

Eligibility criteria: These articles were excluded because they needed to meet the inclusion criteria for this systematic review. The inclusion criteria were only randomized controlled trials (RCTs) related to the effects of Tai Chi on postural control and peripheral neuropathy in people with DPN. Articles that were not RCTs, animal experiments, case reports, literature of methodological experimental design, review, or unavailable data were excluded from the analysis.

Information sources: The literature retrieval process consisted of the following steps: (1) Relevant literature was retrieved from various databases such as Web of Science,

CNKI, and others using keywords determined based on the obtained literature; (2) The databases were searched using all relevant keywords, and the titles and abstracts were read. If the inclusion criteria were met, the entire paper was searched and read; (3) The references of the obtained literature were further searched.

Main outcome(s): The following measures were used to assess the effects of Tai Chi on postural control and peripheral neuropathy: (1) One-leg standing test (OLST); (2) double-leg stance balance with both eyes closed (s); (3) Berg balance scale; (4) ABC balance confidence scale; (5) 6-minute walking distance test (6MWD) (m); (6) Timed Up-and-Go Test (TUG) (s); and (7) plantar pressure detection threshold (PPDT) testing.

Quality assessment / Risk of bias analysis: The Cochrane Collaboration 's tool for assessing risk of bias.

Strategy of data synthesis: The meta-analysis was performed using RevMan 5.3.0, provided by Cochrane Collaboration. The software was used for data processing, merging data, performing sensitivity analysis on the outcome indicator, risk of bias, and drawing forest plots. Continuous variables were analyzed in a meta-analysis using the standard mean difference (SMD) with a 95% confidence interval (CI) calculated as the effect size of the outcome. Heterogeneity was tested based on the Higgins I², with I² values of ≤25% representing none to low heterogeneity, 25% < I² ≤50% representing moderate heterogeneity, 50% < I² ≤75% representing high heterogeneity, and I² >75% representing very high heterogeneity. If the I² value was less than 50%, a fixed-effects model was used for combination, and if the I² was greater than 50% or equal to 50%, a random-effects model was used[51]38]. Sensitivity analysis was performed by eliminating papers stepwise to determine if a single study significantly affected the heterogeneity. The

level of statistical significance was set at $\alpha < 0.05$.

Subgroup analysis: None.

Sensitivity analysis: None.

Country(ies) involved: China.

Keywords: Tai Chi; peripheral neuropathy; postural control; balance.

Contributions of each author:

Author 1 - Mao Wenhui drafted the manuscript.

Email: 12127@njnu.edu.cn

Author 2 - Wang Ting drafted the manuscript.

Email: 191502034@njnu.edu.cn

Author 3 - Sun Mengzi reviewed and edited the manuscript.

Email: 12199@njnu.edu.cn

Author 4 - Zhang Fangtong reviewed and edited the manuscript.

Email: zhangfangtong@bsu.edu.cn

Author 5 - Li Li - Correspondence author, Conceptualized and administrated this project.

Email: lili@georgiasouthern.edu