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THE EFFECTS OF TAI CHI EXERCISE ON PHYSICAL AND PSYCHOLOGICAL FUNCTIONING IN STROKE PATIENTS AT THE REHABILITATION STAGE: A SCOPING REVIEW

Nimas Efa Amanah*, Meira Erawati, Fitria Handayani
Department of Nursing Science, Faculty of Medicine, Universitas Diponegoro, Jl. Prof. Soedarto Gedung F, FK, Tembalang, Semarang, Central Java 50275, Indonesia
*nimaschan5@gmail.com

ABSTRACT
Research on the effects of Tai Chi on physical and psychological functioning in stroke patients has been conducted by previous researchers. However, so far there are limited reviews on this topic. The purpose of this review is to get an overview of the extent of the effects on physical and psychological functions in stroke patients based on the results of studies that have been conducted. Method The keywords used in the article search is "Tai chi" AND "Stroke" AND "Psychological stroke" AND "Stroke rehabilitation" were analyzed using a synthesis matrix. Several databases used in this study such as Scopus (n = 187), Pubmed (n = 17), Sciendirect (n = 3,234) and EBSCO (n = 548) were then eliminated and screened into 10 articles reviewed. The review method uses a scoping review, determining the research questions to be reviewed using the PICO framework (Population, Intervention, Comparison, Outcome). Based on the results of the analysis of 10 articles, it was found that Tai Chi has an influence in helping to reduce symptoms and improve physical and psychological conditions in stroke patients, including on physical function, are increasing motor function (upper and lower extremities), muscle strength, cardiopulmonary, trunk posture, increasing swallowing ability, increasing mobility disorders, sleep disorders and balance control, while on psychological functions are post-stroke depression, reducing symptoms of anxiety and stress, cognitive function in stroke and QOL. The conclusion of the journal review shows that tai chi has an effect on improving physical and psychological conditions and quality of life in stroke patients.

Keywords: physical; psychological; rehabilitation; stroke; tai chi

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INTRODUCTION

Stroke is a neurological disorder caused by a blockage or clot in a blood vessel. The blockage of an artery causes the blood vessel to rupture, leading to bleeding and sudden brain cell death due to lack of oxygen.(Campbell & Khatri, 2020). Stroke has the impact of decreased muscle strength or paralysis, in addition to physical changes, stroke can cause psychological and cognitive disorders. (Bártlová et al., 2022). According to the World Stroke Organization (WSO), stroke is the second leading cause of death and the third leading cause of death and disability (Feigin et al., 2022). In 2020, the global prevalence of all stroke subtypes was 89.13 million cases. The number of deaths caused by stroke was 7.08 million (Capirossi et al., 2023). The national stroke prevalence rate in Indonesia is 2,097.2 (1878.1.2 - 2,351.8 95% UI) per 100,000 people in Indonesia. Data in Indonesia shows that women and men have a stroke prevalence of 12.1% and 12%, respectively, 444 and stroke is more common in men than women. Each year, in a population of one million, approximately 2,400 people will suffer a stroke. Of these, less than 50% return to independent living. Even patients who regain their functional independence continue to suffer from considerable deficits, limitations, and changes in cognitive and behavioral function. (B et al., 2023).

Reduced social contact, low self-esteem, and post-stroke depression are also contributing factors to the decline in quality of life (Martini et al., 2022). Patients who complete the Tai chi exercise intervention regain personal sensory control, which is an important determinant of quality of life, thereby increasing their confidence in disease management and improving quality of life(Wang et al., 2020). Practicing Tai Chi improves the independence and quality of life of stroke patients by relaxing joint tension, increasing joint mobility, and improving motor coordination(Jiang et al., 2022). Tai Chi is a type of mind-body exercise that encompasses behavioral, physical, psychosocial, emotional, and spiritual. Tai Chi has evolved into an attractive and popular physical activity of moderate intensity for rehabilitation or improvement of physical and psychosocial well-being (Lyu et al., 2021). Management of physical and psychological function in stroke patients is very necessary to prevent muscle weakness and post-stroke depression along with complications or recurrent attacks in stroke patients. Tai Chi training as an intervention in stroke patients has been widely practiced and is very effective for stroke patients. Although the review of articles that can be the basis for intervention thinking is still limited, this article aims to summarize all articles related to the effects of Tai Chi on physical and psychological functions in stroke patients at the rehabilitation stage.

METHOD

This study used a scoping review method to map the concepts underlying the effects of Tai chi exercise on physical and psychological functioning in stroke patients. The method was used to collect data or sources related to the chosen theme from various sources. The researcher collected scientific journals from various research databases in research journals (Laksita Barbara, 2020). The stages in making a scoping review are: 1.) identify research questions tailored to the research objectives, 2). Identifying relevant literature sources through various sources, 3). Selection of literature that has been obtained according to the research topic, 4). Mapping and collecting the literature used, 5) compiling and reporting the results of analyzing the selected literature, and 6) consulting with competent parties (Widiasih et al., 2020). In the first step by determining the topic to be reviewed in the scoping review and determining the research question. The topic in this scoping review that will be reviewed is Tai chi and stroke patients, with the research question “What is the effect of Tai chi exercise on stroke patients?”. Furthermore, by searching and selecting articles through electronic media online from several databases such as: 1. Pubmed, 2. Science Direct, 3. Scopus, 4. Ebsco, with the keywords “Tai chi” and “Stroke” AND “Psychological stroke” AND “Stroke rehabilitation”. Identify articles by screening articles using the inclusion criteria, namely: 1. stroke patients 2. Tai chi in stroke 2. Articles published in the last 5 years (2020-2024), 3. Articles that are pure research 4. Articles that are complete and can be accessed for free, 5. Research in related articles conducted abroad and Indonesia 6. Articles in English. Exclusion criteria are any articles or research that does not match the inclusion criteria mentioned by the researcher and the articles searched are the same as other databases. The next step is to select articles, first done by looking at relevant titles, after screening, the article tai chi in stroke is obtained. Next, the abstracts of the articles were reviewed and those that met the inclusion criteria were identified. The full text of the abstracts was read to determine which studies were included in the review. This research uses the PRISMA Flowchart framework which is useful for the selection process of literature sources that have been collected by researchers.

Tabel 1.
Framework PICO

Population	Intervention	Comparison	Outcome
Stroke patients	Tai Chi	-	Physiological and psychological functioning in stroke patients

Next is data mapping by grouping the material according to the main issues and themes. After that, the results of grouping articles based on the suitability of the inclusion criteria are presented in tabular form. The last step is to collect and present the results by summarizing the selected literature and reporting the results in the results and discussion.

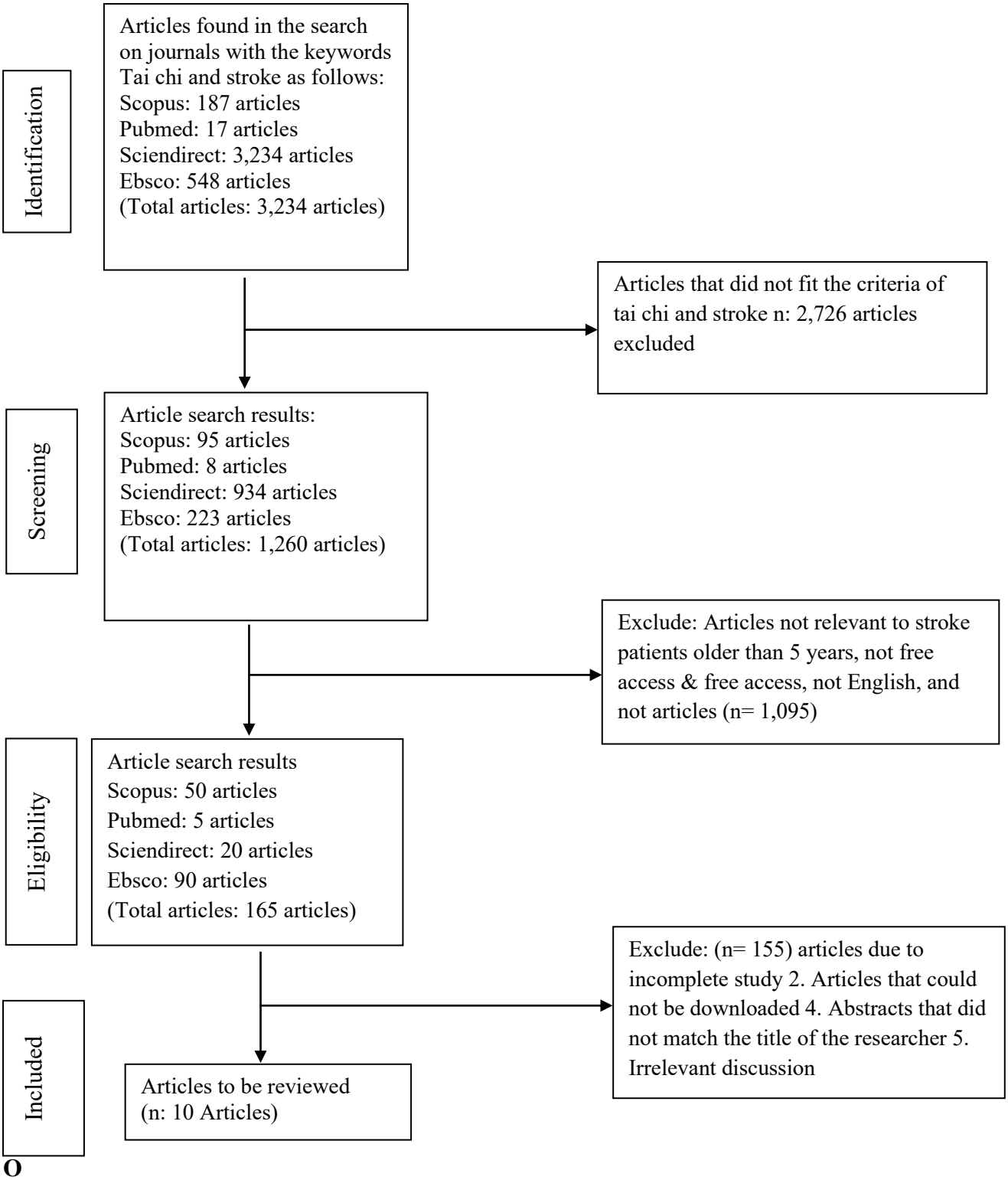

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Figure 1. PRISMA *FlowChart*

RESULT

The following is a summary of article analysis of 10 articles focusing on Tai chi and stroke Article search using the specified keywords resulted in 3,234 articles, Scopus : 187 articles, Pubmed: 17 articles, Sciendirect: 3,234 articles, EBSCO: 548 articles, Selection process based on inclusion criteria, obtained 1,260 articles, then excluded with irrelevant themes as many as 165 articles so that 10 articles were obtained. The results of the identification process of search and selection of research articles are described in detail in Figure 1. PRISMA

flowchart of search and inclusion. The 10 articles show that Tai Chi exercise has an effect on physical and psychological functions, including physical functions are muscle strength (Jing et al., 2021) (Song et al., 2021), increased motor (upper extremity) (Zhao et al., 2022) (Xie et al., 2023) (Yu et al., 2020) (Zhang et al., 2024)(Jiang et al., 2022), ADL, mobility and swallowing (Song et al., 2021), sitting balance control, shoulder ROM (Zhao et al.,2022), balance control and walking (Yu et al., 2020), cardiopulmonary(Tan et al., 2021) and trunk posture (Cui et al., 2023). In psychological functions, namely poststroke depression, increasing 5HT and DA levels (Jing et al., 2021), reducing symptoms of anxiety, stress and sleep disorders in stroke (Taylor-piliae et al., 2021). Cognitive function, QOL (thinking and self-care) (Song et al., 2021) (Zhao et al.,2022) and symptoms of depression (Zhao et al.,2022).

Table 1.
Analysis of article

No	Title	Design And Participants	Results	Author And Year
1	Tai Chi postural training for dyskinesia rehabilitation: a study protocol for a randomised controlled trial in convalescent ischaemic stroke patients	Randomised controlled trial. A total of 120 acute ischemic stroke patients AIS patients who were in the subacute phase (from 2 weeks to less than 3 months after disease onset)	The results showed that in 4 weeks after tai chi intervention there was an increase in muscle strength of 12.86% ± 1.34% compared to patients with routine rehabilitation therapy with a result of 3.18% ± 1.34%. The tai chi sample trial showed significant differences in 5-HT and DA levels before and after tai chi exercise, indicating that tai chi exercise is closely related to changes in blood levels of monoamine neurotransmitters.	(Jing et al., 2021)
2	Effects of a Tai Chi-Based Stroke Rehabilitation Program on Symptom Clusters, Physical and Cognitive Functions, and Quality of Life: A Randomized Feasibility Study	A single-blind randomized controlled trial 34 Stroke survivors enrolled in outpatient rehabilitation centers	The Tai Chi group showed significant improvement in muscle strength especially in flexor muscles (P=0.002), ADL (P=0.46) and mobility (P=3.23). Cognitive function also improved significantly in the Tai Chi group (Interaction effect: F=7.09, P=0.004 for K-MOCA; F=4.33, P=0.017 for K-MMSE). The Tai Chi symptom group showed significant improvement in swallowing-related symptoms compared to the control group (P=(0.001)). After completing the 6-month Tai Chi-based stroke rehabilitation program, the Tai Chi group showed significant improvements in several dimensions of SS-QOL, particularly in thinking (interaction effect: F=3.70, P=0.030) and self-care (interaction effect: F=8.82, P=0.001).	(Song et al., 2021)

No	Title	Design And Participants	Results	Author And Year
3	Tailored Sitting Tai Chi Program for Subacute Stroke Survivors: A Randomized Controlled Trial	An assessor-blind RCT was conducted Four separate inpatient neurology units of 2 tertiary level A traditional Chinese medicine hospitals in Kunming, China	This study showed significant results on upper limb function, depressive symptoms, sitting balance control, shoulder ROM (shoulder extension, external shoulder, and internal rotation), ADL, and quality of life of stroke participants during (8 weeks).	(Zhao et al., 2022)
4	Neurobiomechanical mechanism of Tai Chi to improve upper limb coordination function in post-stroke patients: a study protocol for a randomized controlled trial	A randomized, single-blind, parallel-controlled trial Post stroke	Tai Chi has potential benefits for restoring upper limb motor function in post-stroke patients.	(Xie et al., 2023)
5	Effects of Body Weight Support-Tai Chi Footwork Training on Balance Control and Walking Function in Stroke Survivors with Hemiplegia: A Pilot Randomized Controlled Trial	an assessor-blinded randomized controlled clinical trial involving stroke patients recruited from Shanghai Seventh People's Hospital and Evidence-Based Complementary and Alternative Medicine	Within 12 weeks Tai Chi footwork training with body weight support improves dynamic balance control and walking function in stroke survivors with hemiplegia.	(Yu et al., 2020)
6	The effect of body weight-supported Tai Chi Yunshou on upper limb motor function in stroke survivors based on neurobiomechanical analysis: a four-arm, parallel-group, assessors-blind randomized controlled trial protocol	single-center, four-arm, parallel-group, assessor-blinded randomized controlled trial Presence of documented stroke by CT or MRI, including ischemic and hemorrhagic stroke; Patients in sub-acute phase (2-12 weeks period)	Stroke patients need to receive interventional rehabilitation as soon as possible after their vital signs stabilize. The results showed that BWS-TCY can be used in the early stages of stroke and can improve upper extremity muscular function in stroke patients.	(Zhang et al., 2024)
7	Effectiveness of Tai Chi Yunshou motor imagery training for hemiplegic upper extremity motor function in poststroke patients: study protocol for a randomized clinical trial	This study is an assessor-blinded, parallel, superiority, randomized clinical trial (allocation ratio: 1:1). First event of stroke (infarct or haemorrhage) and in line with the diagnostic criteria of cerebrovascular disease formulated by the 4th National Cerebrovascular Academic Conference, confirmed by CT or MRI; (2) No gender limitation, age 40 to 80 years; (3) Poststroke duration 3 to 6 months;	TCY-MIT combined with CRT to treat upper extremity motor dysfunction in post-stroke patients can be performed safely and can improve upper extremity motor function in stroke patients.	(Jiang et al., 2022)
8	The novel effectiveness of Tai Chi on cardiopulmonary fitness among stroke patients in the recovery phase: a study protocol for a randomized controlled trial	The study will be a 19-week randomized-blind parallel control group trial. Patients will be allocated in a 1:1 ratio into either the control group or the Tai Chi group. 2 weeks to 6 months after the onset of stroke	Regular Tai Chi exercise was shown to improve cardiopulmonary fitness of stroke patients. The primary outcome Vo2max was positively correlated with regional cerebral blood flow.	(Tan et al., 2021)
9	Effects of “Taking the Waist as the Axis” Therapy on trunk postural control disorder after stroke: A randomized controlled trial	a study protocol of randomized controlled trial A total of 43 hemiplegic stroke patients with impaired trunk postural control, who had Trunk	WAT is an effective trunk treatment after stroke, which significantly improves the patient's ability to control trunk posture, motor function, and	(Cui et al., 2023)

No	Title	Design And Participants	Results	Author And Year
		Impairment Scale (TIS) scores between 8 and 18, participated in this study and were randomly allocated into the experimental group (N=23) or control group (N=20). The experimental group received WAT plus conventional therapy, and the control group received Trunk Selective Activity Therapy (TSAT) plus conventional therapy.	forced vital capacity.	
10	The Feasibility of Tai Chi Exercise as a Beneficial Mind-Body Intervention in a Group of Community-Dwelling Stroke Survivors with Symptoms of Depression	feasibility study, a single-group pre-post intervention design interested stroke survivors contacted study staff by distributing flyers placed at various ambulatory rehabilitation centers, senior centers, and neurosurgery/neurology offices).	Changes in depression, anxiety and stress symptoms at the beginning of the study, average mild and moderate depression symptoms after tai chi intervention.	(Taylor-piliae et al., 2021)

DISCUSSION

Based on a review of articles that have been conducted, it shows that tai chi exercise has an effect on physical and psychological function in stroke patients. Tai chi training can have an effect on physical functions including muscle strength (Jing et al., 2021) (Song et al., 2021), increased motor (upper extremity) (Zhao et al., 2022) (Xie et al., 2023) (Yu et al., 2020) (Zhang et al., 2024) (Jiang et al., 2022), ADL, mobility and swallowing (Song et al., 2021), sitting balance control, shoulder ROM (Zhao et al.,2022), balance control and walking (Yu et al., 2020), cardiopulmonary (Tan et al., 2021) and trunk posture (Cui et al., 2023). In psychological functions, namely post-stroke depression, increasing 5HT and DA levels (Jing et al., 2021), reducing symptoms of anxiety, stress and sleep disorders in stroke (Taylor-piliae et al., 2021). Cognitive function, QOL (thinking and self-care) (Song et al., 2021) (Zhao et al.,2022) and symptoms of depression (Zhao et al.,2022).

Tai Chi is a physical and mental exercise derived from ancient Chinese martial arts characterized by the basic principles of slow, smooth, and continuous body movements that involve shifting body weight while maintaining a relaxed upright posture(Song et al., 2021). In addition, Tai Chi focuses solely on releasing tension in the body, incorporating mindfulness and imagination into movements, increasing awareness and breathing efficiency, and promoting overall relaxation of the body and mind (Taylor-piliae et al., 2021). Tai Chi has the advantage of encompassing holistic exercise, which involves body movement, breathing, and meditation to improve physical and mental health. (Lee & Chu, 2023). Restoration of upper limb function after stroke becomes a fundamental goal in rehabilitation determining independence in the performance of necessary activities of daily living and instrumental activities of daily living (IADL) of patients. with Tai chi therapy in post-stroke patients may be an additional remedy to improve upper limb movement patterns. (Lerma Castaño et al., 2020). Tai chi therapy significantly improved motor function and reduced seizure abnormalities in stroke patients. (Chen et al., 2023). Plasticity is a feature of the central motor system that allows changes in the organization of the system. It allows the development of new motor strategies in a changing environment, which can be beneficial when learning new skills, or when recovering from injury by adapting to compensatory strategies. When elements of the motor system are damaged, for example in nervous system disorders, neuroplasticity allows patients to recover motor function (Lustenhouwer et al., 2019).

The fusion of frontal-parietal sensorimotor networks and muscle activation patterns is an important mechanism for upper limb functional recovery. Bilateral coupling between the ascending and descending cortices and muscles in the sensorimotor control circuit is weakened in stroke patients, resulting in abnormal upper limb muscle coordination and movement patterns and compensatory movements. When the elbow of a stroke patient moves, the β and y functional corticomuscular coupling (FCMC) of the anterior deltoid and brachialis muscles changes. Decreased FCMC in the brachial biceps and increased FCMC in the deltoid muscle are associated with decreased elbow flexion and excessive shoulder joint abduction. Therefore abnormal movement patterns in stroke patients, including slow movement, poor fluency and greater movement variability, lead to compensatory torso movements. Tai chi can activate sensorimotor function, frontal- parietal lobe and other brain areas. In stroke patients, Tai chi can activate brain areas related to sensorimotor function and frontal-parietal lobe, increase upper limb muscle activation in stroke patients, and increase sensory input. (Xie et al., 2023).

Tai chi can improve balance control due to maintaining the center of mass within the base of the pedestal while continuously shifting the body weight. Shifting the center of pressure involves explosive changes in back muscle activity. The activity of the trunk muscles voluntarily increases after sitting tai chi. Which may be the basic mechanism of improved balance control (Yu et al., 2020). Stroke patients have difficulty swallowing for up to 5 years. Swallowing difficulty is one of the serious barriers that significantly affects the quality of life of stroke patients. The improvement of swallowing ability with tai chi can be explained by eating with better sensual awareness of food, consequently reducing the risk of aspiration. Head lifting exercises such as shaker exercises can improve swallowing ability by improving upper esophageal spinster muscle function through isotonic and isometric exercises. Warm-up exercises for tai chi exercises include neck flexion and extension exercises, which may strengthen the muscles around the neck and help improve swallowing ability. (Song et al., 2021).

Cardiopulmonary fitness has a close relationship with blood perfusion and stroke rehabilitation. Because stroke causes limited movement, stroke patients showed a 50% reduction in CRF compared to healthy individuals. And VO2 max values are 8-22 ml/kg/min, which is equivalent to 26-87% of Vo2 max values in healthy individuals. Cardiopulmonary fitness decreases markedly and is often accompanied by weakness of the respiratory muscles including the diaphragm, intercostal muscles and abdominal muscles. The respiratory muscles contribute to balance ability. The heart dominates the blood and blood vessels, and the lungs dominate the breath. Tai chi exercise can increase the motor function of the frontal gray matter (which is related to emotions) and the volume of the hippocampus (which affects cognition) fitness Tai chi exercise can facilitate the flow of qi through the body so as to improve cardiopulmonary fitness (Tan et al., 2021).

Tai chi has antioxidant effects. SOD is an important antioxidant enzyme that catalyzes the dismutase of superoxide anion into hydrogen peroxide and molecular oxygen. Performing tai chi can result in a 36% reduction in SOD activity, indicating a decreased oxidative environment after the intervention, which can reduce symptoms of depression, stress, anxiety and sleeplessness (Taylor-piliae et al., 2021). Tai chi exercise is closely related to changes in blood levels of monoamine neurotransmitters. Changes in central excitatory or inhibitory function have important effects on motor function, including the regulation of neurotransmitter monomania. An increase in the ratio of central 5-HT and DA in the brain is closely related to central fatigue (Jing et al., 2021). Tai chi is beneficial for psychological disorders especially in stroke patients, however, it is not a substitute for psychiatric treatment. Tai chi can be an adjunctive or initial treatment where anxiety and depression levels are relatively low, mild to moderate major depressive disorder exercise or meditation can be

recommended as primary or secondary treatment (Cai et al., 2022). The goal of stroke rehabilitation is for individuals who have experienced a stroke to return as closely to normal life as possible by regaining their daily skills. Different therapy options have been used help stroke survivors to improve their quality of life. (Harjpal et al., 2022).

CONCLUSION

Tai chi exercise can have an impact on stroke patients. Tai chi has been shown to improve the physical and psychological functions of stroke patients including muscle strength,increased motor (upper extremity), ADL, mobility and swallowing, sitting balance control, shoulder ROM, balance control and walking, cardiopulmonary and trunk posture. In psychological functions, are post-stroke depression, increasing 5HT and DA levels, reducing symptoms of anxiety, stress and sleep disorders in stroke. Cognitive function, QOL (thinking and self-care) and symptoms of depression. The conclusion of the journal review shows that tai chi has an effect on improving physical and psychological conditions and can help improve ADL (activity daily living) and quality of life in stroke patients.

REFERENCES

B, V. W., Rahman, F. F., & Ningrum, V. (2023). Proceedings of the 3rd International Conference on Cardiovascular Diseases (ICCvD 2021). In *Proceedings of the 3rd International Conference on Cardiovascular Diseases (ICCvD 2021)* (Vol. 1). Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-048-0

Bártlová, S., Šedová, L., Havierniková, L., Hudáčková, A., Dolák, F., & Sadílek, P. (2022). Quality of life of post-stroke patients. *Zdravstveno Varstvo*, *61*(2), 101–108. https://doi.org/10.2478/sjph-2022-0014

Cai, Q., Cai, S. bin, Chen, J. kun, Bai, X. H., Jing, C. X., Zhang, X., & Li, J. Q. (2022). Tai Chi for anxiety and depression symptoms in cancer, stroke, heart failure, and chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Complementary Therapies in Clinical Practice*, *46*. https://doi.org/10.1016/j.ctcp.2021.101510

Campbell, B. C. V., & Khatri, P. (2020). Stroke. *The Lancet*, *396*(10244), 129–142. https://doi.org/10.1016/S0140-6736(20)31179-X

Capirossi, C., Laiso, A., Renieri, L., Capasso, F., & Limbucci, N. (2023). Epidemiology, organization, diagnosis and treatment of acute ischemic stroke. *European Journal of Radiology Open*, *11*(October), 100527. https://doi.org/10.1016/j.ejro.2023.100527

Chen, R., Zhang, Y., Wang, X., Zhao, Y., Fan, S., Xue, Y., Zhao, J., Liu, Y., & Wang, P. (2023). Treatment effects of low-frequency repetitive transcranial magnetic stimulation combined with motor relearning procedure on spasticity and limb motor function in stroke patients. *Frontiers in Neurology*, *14*. https://doi.org/10.3389/fneur.2023.1213624

Cui, R., Liu, H., Li, M., Wang, J., Mao, J., Ni, W., Wang, F., Pan, J., Yu, L., Wang, Y., Wang, Y., Huang, P., Li, G., Zhao, Y., Zhu, N., Chen, C., Pan, Z., Zhang, Y., Fu, W., & Yang, J. (2023). Effects of "Taking the Waist as the Axis" Therapy on trunk postural control disorder after stroke: A randomized controlled trial. *Frontiers in Aging Neuroscience*, *15*(January), 1–12. https://doi.org/10.3389/fnagi.2023.1040277

Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., Fisher, M., Pandian, J., & Lindsay, P. (2022). World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. *International Journal of Stroke*, *17*(1), 18–29. https://doi.org/10.1177/17474930211065917

Harjpal, P., Qureshi, M. I., Kovela, R. K., & Jain, M. (2022). Efficacy of Bilateral Lower-Limb Training Over Unilateral Lower-Limb Training To Reeducate Balance and Walking in Post-Stroke Survivors: A Randomized Clinical Trial. *Cureus*, *14*(10), 1–13.

https://doi.org/10.7759/cureus.30748

Jiang, L. H., Zhao, L. J., Liu, Y., Zhang, H., Zhang, S. C., Cong, W. Q., & Qi, R. (2022). Effectiveness of Tai Chi Yunshou motor imagery training for hemiplegic upper extremity motor function in poststroke patients: study protocol for a randomized clinical trial. *Trials*, *23*(1), 1–9. https://doi.org/10.1186/s13063-022-06283-z

Jing, C., Li, K., Li, Z., Sun, Y., Wu, J., Li, Y., Li, Y., Zhou, L., Zhang, Z., Zhao, M., & Zhang, Y. (2021). Tai Chi postural training for dyskinesia rehabilitation: A study protocol for a randomised controlled trial in convalescent ischaemic stroke patients. *BMJ Open*, *11*(5), 1–10. https://doi.org/10.1136/bmjopen-2020-046003

Lee, L. Y. K., & Chu, E. C. P. (2023). Tai Chi as a Body-Mind Exercise for Promotion of Healthy Aging in Nursing Home Residents: Appropriateness, Feasibility, and Effectiveness. *Clinical Interventions in Aging*, *18*(November), 1949–1959. https://doi.org/10.2147/CIA.S430968

Lerma Castaño, P. R., Rodríguez Laiseca, Y. A., Montealegre Suárez, D. P., Castrillón Papamija, D. B., & Losada Urriago, G. E. (2020). Effects of kinesiotaping combined with the motor relearning method on upper limb motor function in adults with hemiparesis after stroke. *Journal of Bodywork and Movement Therapies*, *24*(4), 546–553. https://doi.org/10.1016/j.jbmt.2020.07.003

Lustenhouwer, R., Van Alfen, N., Cameron, I. G. M., Toni, I., Geurts, A. C. H., Helmich, R. C., Van Engelen, B. G. M., & Groothuis, J. T. (2019). NA-CONTROL: A study protocol for a randomised controlled trial to compare specific outpatient rehabilitation that targets cerebral mechanisms through relearning motor control and uses self-management strategies to improve functional capability of the uppe. *Trials*, *20*(1), 1–17. https://doi.org/10.1186/s13063-019-3556-4

Lyu, D., Wang, J., Yang, F., Zhang, Y., Zhang, W., Liu, H., Lyu, X., & Fang, B. (2021). Effect of Tai Chi on post-stroke non-motor disorders: a systematic review and meta-analysis of randomized controlled trials. *Clinical Rehabilitation*, *35*(1), 26–38. https://doi.org/10.1177/0269215520951020

Martini, S., Setia Ningrum, D. A., Abdul-Mumin, K. H., & Yi-Li, C. (2022). Assessing quality of life and associated factors in post-stroke patients using the world health organization abbreviated generic quality of life questionnaire (WHOQOL-BREF). *Clinical Epidemiology and Global Health*, *13*(December 2021), 100941. https://doi.org/10.1016/j.cegh.2021.100941

Song, R., Park, M., Jang, T., Oh, J., & Sohn, M. K. (2021). Effects of a tai chi-based stroke rehabilitation program on symptom clusters, physical and cognitive functions, and quality of life: A randomized feasibility study. *International Journal of Environmental Research and Public Health*, *18*(10). https://doi.org/10.3390/ijerph18105453

Tan, T., Meng, Y., Li, X., Bai, R., Wang, C., Lyu, J., Yan, K., Liu, M., Zhang, C., & Wei, Y. (2021). The novel effectiveness of Tai Chi on cardiopulmonary fitness among stroke patients in the recovery phase: a study protocol for a randomized controlled trial. *Trials*, *22*(1), 1–11. https://doi.org/10.1186/s13063-021-05565-2

Taylor-piliae, R. E., Morrison, H. W., Hsu, C. P., Whitman, S., & Grandner, M. (2021). *The Feasibility of Tai Chi Exercise as a Beneficial Mind-Body Intervention in a Group of Community-Dwelling Stroke Survivors with Symptoms of Depression*. *2021*.

Wang, D., Wang, P., Lan, K., Zhang, Y., & Pan, Y. (2020). Effectiveness of tai chi exercise on overall quality of life and its physical and psychological components among older adults: A systematic review and meta analysis. *Brazilian Journal of Medical and*

Biological Research, *53*(10), 1–7. https://doi.org/10.1590/1414-431x202010196

Widiasih, R., Susanti, R. D., Mambang Sari, C. W., & Hendrawati, S. (2020). Menyusun Protokol Penelitian dengan Pendekatan SETPRO: Scoping Review. *Journal of Nursing Care*, *3*(3), 171–180. https://doi.org/10.24198/jnc.v3i3.28831

Xie, Q., Wu, J., Zhang, Q., Zhang, Y., Sheng, B., Wang, X., & Huang, J. (2023). Neurobiomechanical mechanism of Tai Chi to improve upper limb coordination function in post-stroke patients: a study protocol for a randomized controlled trial. *Trials*, *24*(1), 1–13. https://doi.org/10.1186/s13063-023-07743-w

Yu, X. M., Jin, X. M., Lu, Y., Gao, Y., Xu, H. C., Xue, X., Fang, L., & Hu, J. (2020). Effects of Body Weight Support-Tai Chi Footwork Training on Balance Control and Walking Function in Stroke Survivors with Hemiplegia: A Pilot Randomized Controlled Trial. *Evidence-Based Complementary and Alternative Medicine*, *2020*. https://doi.org/10.1155/2020/9218078

Zhang, L., Wang, J., Zhou, H., Liao, W., Wang, N., & Yu, X. (2024). The effect of body weight-supported Tai Chi Yunshou on upper limb motor function in stroke survivors based on neurobiomechanical analysis: a four-arm, parallel-group, assessors-blind randomized controlled trial protocol. *Frontiers in Neurology*, *15*(July), 1–11. https://doi.org/10.3389/fneur.2024.1395164

Zhao, J., Chau, J. P. C., Chan, A. W. K., Meng, Q., Choi, K. C., Xiang, X., Zhao, Y., He, R., & Li, Q. (2022). Tailored Sitting Tai Chi Program for Subacute Stroke Survivors: A Randomized Controlled Trial. *Stroke*, *53*(7), 2192–2203. https://doi.org/10.1161/STROKEAHA.121.036578

Zhao, J., Chau, J. P. C., Lo, S. H. S., Choi, K. C., & Liang, S. (2021). The effects of sitting Tai Chi on physical and psychosocial health outcomes among individuals with impaired physical mobility: A systematic review and meta-analysis. *International Journal of Nursing Studies*, *118*, 103911. https://doi.org/10.1016/j.ijnurstu.2021.103911.