

Effectiveness of Tai Chi Exercise Application on Stress and Anxiety among Patients with Parkinson's Disease

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Abstract

Background: Parkinson's disease (PD) is a prevalent degenerative neurological condition that lowers quality of life and results in loss of independence. Studies directly comparing the clinical efficacy of different Tai Chi exercises in treating anxiety and stress symptoms in older adults are still rare, despite the growing body of evidence supporting the beneficial effects of Tai Chi in reducing these symptoms. **Therefore, the current study aimed to evaluate the effectiveness of Tai Chi exercise application on stress and anxiety among patients with Parkinson's disease. Study design:** A quasi-experimental research design was used to fulfill this study using a pre-test and post-test one-group design. **Setting:** The study was conducted in the neurology outpatient setting at Sohag University Hospital. **Subjects:** the study included a convenient sampling technique of 100 patients with Parkinson's disease. **Tools of data collection:** Three tools were used for data collection; **Tool I:** Personal assessment datasheet, **Tool II:** Perceived Stress Scale-10 (PSS-10), and **Tool III:** The State-Trait Anxiety Inventory. **Results:** A statistically significant difference was found between stress mean scores and anxiety at ($P=0.001$) pre and post-Tai Chi exercise application. Also, a substantial reduction in pre- and post-Tai Chi exercise application between the groups was reported regarding stress and anxiety levels. **Conclusion:** The Tai Chi exercise application has a significant decrease in mean post-test stress and anxiety among patients with Parkinson's disease. **Recommendations:** It is strongly advised to apply a training program for patients with Parkinson's disease about the importance of the Tai Chi exercise application to be able to use them as a part of routine care.

Keywords: Anxiety, Patients with Parkinson's disease, Stress, Tai Chi Exercise Application

Introduction:

Bradykinesia, rigidity, resting tremor, and reduced postural reflexes are the four hallmark signs of Parkinson's disease, a prevalent neurodegenerative condition. It is believed that at least 4 million people worldwide have been diagnosed with Parkinson's disease. Parkinson's disease is more common in older adults, particularly those over 50, even though the exact origin of the illness is uncertain (Moonen, 2021).

According to reports, a sluggish, shuffling, and dysrhythmic stride is frequently seen by Parkinson's disease sufferers. Most Parkinson's disease patients will also eventually experience balance problems. Gait disturbance and balance deficiencies develop as the disease progresses, contributing to falls, reduced quality of life, and loss of independence even with breakthroughs in medical therapy. Thus, Parkinson's disease sufferers increasingly put a burden on society, the medical community, and the financial system (Carey, 2021).

Patients suffering from Parkinson's disease find it difficult to manage physical restrictions, disabilities, or other health concerns resulting from the loss of

physiological functions amid an increasingly fast-paced lifestyle and social pressures (Pontone & Mills, 2021). Furthermore, psychological health issues are more prone to arise in this circumstance. As per the World Health Organization's 2017 data, anxiety disorders and depression account for 3.8 and 7% of the total prevalence among individuals aged 60 and over. These conditions have emerged as a major global source of disability (Moonen, 2021).

Stress and anxiety are prevalent psychological issues that are becoming more and more common. Nonetheless, the state of global treatment today is far from optimal. Many of these patients are limited to using medicine and cognitive behavioral treatment because of the intricate mechanisms underlying these illnesses. However, although cognitive behavioral therapy necessitates in-person treatment, which is inconvenient for many patients, pharmaceutical treatment has drawbacks and adverse side effects. This is especially difficult for Parkinson's disease sufferers, who are a vulnerable segment of society with even less promising treatment outcomes. The expense of mental health care is further increased by cognitive behavioral therapy and drug treatment, which places a heavy financial burden

on patients and their families. Thus, the significance of selecting affordable and side-effect-free physical exercise becomes particularly prominent (**Zhang et al., 2020**).

Parkinson's disease is a degenerative neurological ailment that poses both physical and psychological problems to both those with the diagnosis and those who provide care. Anxiety and other emotional problems are more common in Parkinson's patients than in the general population, but it is unclear how much anxiety is a sign of the condition, a response to it, a result of medication side effects, or the result of other causes unrelated to the Parkinson's disease. Few pharmacological or psychological interventions have been amply proven to be successful in clinical trials to date, and little is known about how PWP's experience anxiety (**Pontone and Mills, 2021**).

Increased knowledge of anxiety experiences among patients is crucial since anxiety is one of the best indicators of quality of life among Parkinson's disease patients, can be more difficult to manage than motor symptoms, and has been recognized by PWP as a research priority. Research indicates that in consultations, anxiousness is often overlooked. The identification process is hampered by symptoms that can be confused with one another, such as tremors, weariness, and appetite loss, as well as signs unique to Parkinson's disease, like greater freezing of gait. Although the development of illness-specific screening techniques has increased detection, correct classification remains difficult because the criteria have not been validated for use in Parkinson's disease patients. Uncertainty surrounds the existence of a subsyndromal variant of anxiety unique to the disease (**Zhang, 2022**).

There is uncertainty on the etiology of anxiety in Parkinson's disease patients. Emotional processing may be affected by underlying dopaminergic dysfunction and neuroanatomical changes, according to the conventional dopaminergic model of Parkinson's disease patients. While post-mortem studies have documented the degeneration of the amygdala, a crucial brain region for fear responses that receives mesolimbic dopaminergic input, this is corroborated by retrospective evidence linking anxiety with the course of the disease and the discontinuation of dopaminergic therapy. On the other hand, dopaminergic drugs do not reduce anxiety the same way as motor deficiencies do. Additionally, research from the past reveals that anxiety can occur up to 20 years before motor symptoms, and evidence from the future indicates that anxiety is higher among patients who have not taken medication at the time of diagnosis than in controls. The neuropathology of Parkinson's disease patients is now thought to be likely to affect the

fear circuit in various ways, and anxiety may correlate with large-scale network connectivity changes that implicate cognitive changes before the onset of symptoms (**Carey, 2021**).

Two possible mechanisms for the pathophysiological alterations that occur early in stress responses involve the brainstem structures rich in noradrenaline (locus ceruleus) and serotonin (raphe nucleus). Research indicates that biological sex and a family history of anxiety are linked to anxiety in Parkinson's disease patients. These associations may be due to genetic and gonadal hormones. Parkinson's disease and other neurodegenerative disease pathologies, including many neurotransmitters, are anticipated to interact complexly to produce the neural substrate of anxiety in patients with the disease (**de Micco, 2021**).

Psychosocial factors are likely to influence anxiety in patients with Parkinson's disease. Stressful life events, loneliness, and neuroticism are factors that are significant for anxiety in populations without Parkinson's disease. Psychosocial determinants of anxiety in Parkinson's disease patients included personality, coping strategies, social support, and sickness, according to a recent comprehensive study. While social support and a strong sense of self were found to be protective, avoidant and pessimistic personality types were linked to higher levels of anxiety, probably as a result of less effective coping mechanisms like avoiding unpleasant emotional situations. These findings imply that mental health is influenced by the psychosocial coping strategies used to manage chronic illness. Elderly people may also be more prone to normalize fear or have other sources of anxiety, such as family, finances, or health problems, and have difficulty recognizing anxiety symptoms, which could reduce diagnostic sensitivity. It is thus likely that the development of anxiety in patients with Parkinson's disease is multi-factorial and affected by how anxiety is perceived (**Zimmermann et al., 2021**).

One non-pharmacological intervention that has shown promise in helping treat Parkinson's disease patients is exercise. It has been shown to improve gait disturbance, balance deficiencies, and fall frequency in people with Parkinson's disease. It may enhance brain function by reducing oxidative stress, maintaining calcium homeostasis, and promoting enhanced glucose uptake, synaptogenesis, angiogenesis, and neurogenesis—all changes linked to the central nervous system's plasticity. Additionally, pertinent research shows that patients with Parkinson's disease benefit from

vigorous exercise in terms of improving their gait and balance (Balestrino & Martinez-Martin, 2017).

As a workout for the mind and body, tai chi consists of a series of dance-like motions connected in a continuous sequence that flows smoothly and quietly from one action to the next, emphasizing body movement and weight transfer. This could enhance postural control, which is good for balance, gait, and quality of life. Studies have shown that Tai Chi is good for enhancing gait and balance. According to the results of the most recent systematic review, Tai Chi helped Parkinson's patients improve their mobility and balance (Dlay, 2020).

Tai Chi has its roots in ancient China and developed historically via historical upheaval, guided by the principles of Chinese martial arts and folklore, breathing and meditation techniques, and traditional Chinese medical theory (Tang & Gu, 2022). This type of exercise treatment harmonizes yin-yang and fosters homeostasis between body and mind, much like the academic ideas of traditional Chinese medicine, which include "use exercise to regulate emotions" and "the body and the spirit are jointly regulated" (Pan et al., 2019). Chinese people and even those from other Asian countries adore it. Group instruction is a good way to start tai chi training since it may keep students engaged and inspired to keep practicing. This is especially because of the social benefits yielded by the communications and interactions regarding Tai Chi (Gothe & Kendall, 2020).

Tai Chi is a graceful type of exercise that was formerly a part of ancient Chinese culture. It entails a series of movements carried out slowly, intently, and in tandem with deep breathing. Tai Chi, also known as Tai Chi Chuan, is a self-paced, non-competitive technique of light physical activity and stretching. Your body was in constant motion since each posture led seamlessly into the next. Tai Chi offers a wide range of styles. Every style may gently highlight different tai chi ideas and techniques. Every style has its variations. Some Tai Chi styles could concentrate on maintaining good health, while others might concentrate on the martial arts component. Similar to yoga, Tai-chi is a form of meditative movement (de Micco et al., 2021).

Significant of the study:

Although tai chi was once intended for self-defense, it has since evolved into a graceful form of exercise that is used to relieve stress and several other illnesses. Tai Chi is sometimes compared to meditation in action because of its fluid, flowing movements (Avanzino et al., 2018).

The elderly choose Tai Chi as a moderately intense exercise since it's easy to learn, doesn't require a

lot of room, and is kind. Tai Chi has previously shown promising results in therapeutic settings in lowering symptoms of stress and anxiety. As per Avanzino et al. (2018), research findings have linked Tai Chi practice to significant improvements in anxiety and stress symptoms among the elderly population. Additionally, Dlay, (2020) found that meta-analysis results also support the significant efficacy of Tai Chi in improving anxiety and depression in the elderly population.

Since Tai Chi is a traditional martial art, there are several categories under which it falls. Its founding families—Yang, Chen, Wu, Wu, and Sun—allow for the first classification. Second, it can also be categorized into groups of 8, 16, 24, 32, and 42 based on how challenging they are. Furthermore, there are three postures in Tai Chi: high, middle, and low. Different Tai Chi styles have unique qualities and call for varying degrees of physical stamina and flexibility from their practitioners. It is also essential to select a Tai Chi style that is appropriate for older people with impairments or chronic illnesses and to practice under the supervision of trained instructors. For example, lower positions necessitate greater strength, flexibility, and balance. As a result, beginners are advised to commence their Tai Chi practice with higher postures and gradually progress to lower ones (Carey, 2021).

Still, there is inconsistent practice, and that's precisely because there are many different Tai Chi forms, each with its frequency, duration, and target audience. Nevertheless, the results of various Tai Chi practice techniques will vary as well. As a result, there is still debate on the best therapy for Parkinson's disease patients, and there is no clear solution for selecting an exercise regimen that works for these people (de Micco et al., 2021).

Aim of the study:

The current study aimed to evaluate the effectiveness of the Tai Chi exercise application on stress and anxiety among patients with Parkinson's disease.

Research hypothesis:

H1: Patients with Parkinson's disease who applied the Tai-Chi exercise will experience lower mean scores of stress post-application than pre-application.

H2: Patients with Parkinson's disease who applied the Tai Chi exercise will experience lower mean scores of anxiety post-application than pre-application.

Subjects and Method:

Research design:

A quasi-experimental research design was used to fulfill this study using a pre-test and post-test one-group design.

Setting:

The study was applied in the Neurology outpatient at Sohag University Hospital.

Sample:

The study included a convenient sampling technique of 100 patients with Parkinson's disease.

Tools of data collection:

Tool (I): Personal assessment data sheet: Used to collect data regarding personal data, it included 4 items related to personal data such as (age, educational level, occupation, and residence)

Tool (II): Perceived Stress Scale-10 (PSS-10):

The tool known as the Perceived Stress Scale-10 (PSS10) was adapted from Cohen et al. (1983). It is a ten-item self-report measure designed to assess an individual's degree of stress. The nurses are asked to rank their thoughts and feelings from the previous month. The nurses graded each item on a five-point scale that went from never (0) to very often (4). Consequently, the scores of each patient varied from 0 to 40. Higher reported stress levels were reflected by higher scores.

Scoring system:

Low levels of stress were indicated by PSS-10 scores between 0 and 13, moderate levels by scores between 14 and 26, and severe levels by scores of 27 or higher. Items 4, 5, 7, and 8 were the four that used reverse scoring. The PSS was correlated with measures of anxiety, sadness, helplessness, and disease activity to achieve convergent validity. There was 0.78 internal consistency on the scale.

Tool (III): The State-Trait Anxiety Inventory:

The State-Trait Anxiety Inventory is a 40-item self-assessment questionnaire made up of brief statements that was designed by **Spielberger in 1972** to determine the trait and state anxiety level. The scale has 20 items for assessing trait anxiety and 20 for state anxiety. **State anxiety items** involve: "I am tense; I am worried" and "I feel calm; I feel secure." **Trait anxiety items** involve: "I worry too much over something that really doesn't matter" and "I am content; I am a steady person." All items are rated on a 4-point scale.

Scoring system:

The scale items measure the level of State-Trait Anxiety and are scored as follows: "none" (1), "some" (2), "many" (3), and "entirely" (4). The highest score obtained is 80 and the lowest score is 20. Low scores indicate a mild form of anxiety and high scores indicate a severe form of anxiety.

Tools validity and reliability

The content validity of the tools, their clarity, comprehensiveness, appropriateness, and relevance were reviewed by five experts; three professors in Medical-Surgical nursing field and two professors; in Psychiatric nursing field who reviewed the instruments for clarity, relevance, comprehensiveness, understanding, applicability, and easiness. No modifications were made according to the panel judgment to ensure sentence clarity and content appropriateness. In establishing the reliability and statistically done Alpha Cronbach's way to check the stability of the internal consistency of instrument II was 0.923. State-Trait Anxiety Inventory reliability is considered good with Cronbach's alpha of 0.87 for the total score

Pilot study

After developing the tools, a pilot study was conducted on 10% (10 patients with Parkinson's disease) of cases to test the feasibility and applicability of the tools used in the current study for data collection as well as to determine the time required to be applied and no modifications were done of the questionnaire and the patients with Parkinson's disease who were tested in the pilot study were included in the study sample.

Ethical considerations:

The faculty dean and research ethics committee of the faculty of nursing provided written initial approval. To acquire their agreement and to explain the goal of the study, the researchers visited with the medical and nursing directors of the chosen settings. Patients with Parkinson's disease were informed of the study's purpose and allowed to provide written consent before being allowed to participate. The patients with Parkinson's disease were told by the researchers that the study was optional, they could choose not to join, and they could leave the study at any moment, for any reason. They also received assurances of the confidentiality of their information.

Fieldwork:

Three days a week, from 9 am to 12 pm, the researchers have visited the previously chosen sites. They introduced themselves to patients with Parkinson's disease and explained the purpose of the study. From the start of June 2023 to the end of November 2023, a period of six months was used to gather data. Every interview tool took between thirty to forty minutes to complete.

Implementation phase:

After assessing the level of stress and anxiety among patients with Parkinson's disease, the investigator conducted the pretest by using the Perceived Stress Scale to assess the level of stress and State-Trait Anxiety Inventory to assess the level of anxiety. Non-probability

convenience sampling technique was used to select the samples. The investigator obtained oral consent from the selected samples before the study and their data were also collected. After the pretest, the Tai-chi exercise was performed on the studied sample. The investigator gathered them and taught them about the Tai Chi exercise.

Intervention group (TaiChi):

For two months, the intervention consisted of one-hour group Tai Chi sessions tailored specifically for Parkinson's disease patients, held three times a week. Following a set of conventional warm-up exercises, two qualified and experienced instructors will lead a class of six students in simplified Tai Chi motions. The fifteen minutes of warm-up activities included swinging an arm, shifting weight, gently stretching the neck, shoulders, spine, arms, and legs, as well as visualization exercises and conventional breathing techniques (i.e., whole-body breathing). These exercises helped to alleviate physical tension, improve breathing awareness, integrate mindfulness and imagery into movement, and encourage general body and mind relaxation.

The Yang Short-form style of Master Cheng Man-ching served as the inspiration for the main 45-minute Tai Chi motions, which are repeated. These are the six movements: Step up and push downward;(4) strike to ears with both fists;(5) repel the monkey;(6) grab the tail of a sparrow. (1) Wave hands like clouds. (2) Part of the wild horse's mane on both sides. The chosen actions were chosen due to their ease of comprehension and emphasis on bilateral stepping performed repeatedly while transferring body weight, which can help people with Parkinson's disease maintain postural stability. Patients can relax in the chairs provided, and they are free to move at their comfort and pace. I.e. A 30-minute instructional videotape outlining the exercises taught in class was given to the Tai Chi group after two months of teaching. At least three times a week of at-home practice was mandated for patients. Their speed and level of comfort



III: Evaluation phase:-

This phase aimed to evaluate the effectiveness of the Tai Chi exercise application on stress and anxiety among patients with Parkinson's disease. This was done by giving posttest similar tools to the pretest past two months.

Statistical analysis:

The SPSS version (19) was used for both data entry and analysis. Numbers, percentages, and mean standard deviations were used to display the data. The qualitative variables were compared using a chi-square test. Quantitative data were reported as mean standard deviation (SD) if they were normally distributed. Either the Fisher's exact test or the Chi-Square test was used to assess how comparable the demographic attributes of the two groups were. To look for variations in physiological parameters across the groups, the repeated measurements of analysis of variance (RM-ANOVA) test was used. P-Values less than 0.05 are regarded as statistically significant.

Results:

Table 1 illustrates that the studied patients with Parkinson's disease mean age was 60 ± 4.22 years old. Regarding sex, 52% of them were female, 68% of the studied sample were living in urban areas and 42% of them had secondary education.

Table 2 shows that in the pretest, the majority of studied patients with Parkinson's disease (68%) had high perceived stress, and (32%) had moderate levels of stress. In the post-test, the majority of studied patients with Parkinson's disease (87%) their stress levels and had low stress, and (13%) had moderate levels of stress. A significant decrease and improvement were detected regarding the effectiveness of Tai Chi exercise on stress among studied patients with Parkinson's disease pre and post-application.

Table 3 shows that in the pretest, the mean and standard deviation of the level of stress among studied patients with Parkinson's disease is 30.89 ± 4.44 . In the post-application, the mean and standard deviation of the level of stress among studied patients with Parkinson's disease is 12.02 ± 2.64 with a highly

statistically significant difference found pre and post-Tai Chi exercise **application** among studied patients with Parkinson's disease.

Figure1 predicts that there was a significant reduction in the level of stress among the studied patients with Parkinson's disease after post-Tai Chi exercise application. The assessment of the post-test stress level displays that (72%) had a mild level of stress, (28%) had a moderate stress level, and none had severe stress.

Table 4 shows that anxiety mean scores were lower post-application in comparison to their anxiety mean scores pre-application, with a statistically significant difference among the studied patients with Parkinson's disease ($p < 0.001$).

Table 5 illustrates that there was a statistically positive correlation determined between the stress and anxiety levels among the studied patients with Parkinson's disease **pre and post- Tai Chi exercise application** with ($p < 0.001$).

Table1: Personal data among the studied patients with Parkinson's disease in the (n=100)

| Personal data | the studied patients with Parkinson's disease (n=100) | |
|------------------|---|----|
| | No | % |
| Age | | |
| M±SD | 60 ± 4.22 | |
| Sex | | |
| Male | 48 | 48 |
| Female | 52 | 52 |
| Residence | | |
| Urban | 68 | 68 |
| Rural | 32 | 32 |
| Education | | |
| Illiterate | 21 | 21 |
| Primary | 28 | 28 |
| Secondary | 42 | 42 |
| University | 9 | 9 |

Table 2: Comparison between the stress levels among the studied patients with Parkinson's disease pre and post-Tai Chi exercise application (n=100)

| Level of Stress | Pre-application | | Post application | | P-value |
|-----------------------|-----------------|-----|------------------|-----|---------|
| | No | (%) | No | (%) | |
| Low Stress | 0 | 0 | 87 | 87 | <0.001* |
| Moderate Stress | 32 | 32 | 13 | 13 | |
| High Perceived Stress | 68 | 68 | 0 | 0 | |

Table 3: Differences between mean scores of the stress levels among the studied patients with Parkinson's disease pre and post-Tai Chi exercise application (n=100)

| Items | Pre-application | Post application | P –value |
|--------------------|-------------------------|-------------------------|----------|
| | Mean Standard deviation | Mean Standard deviation | |
| Stress mean scores | 30.89±4.44 | 12.02±2.64 | <0.001* |

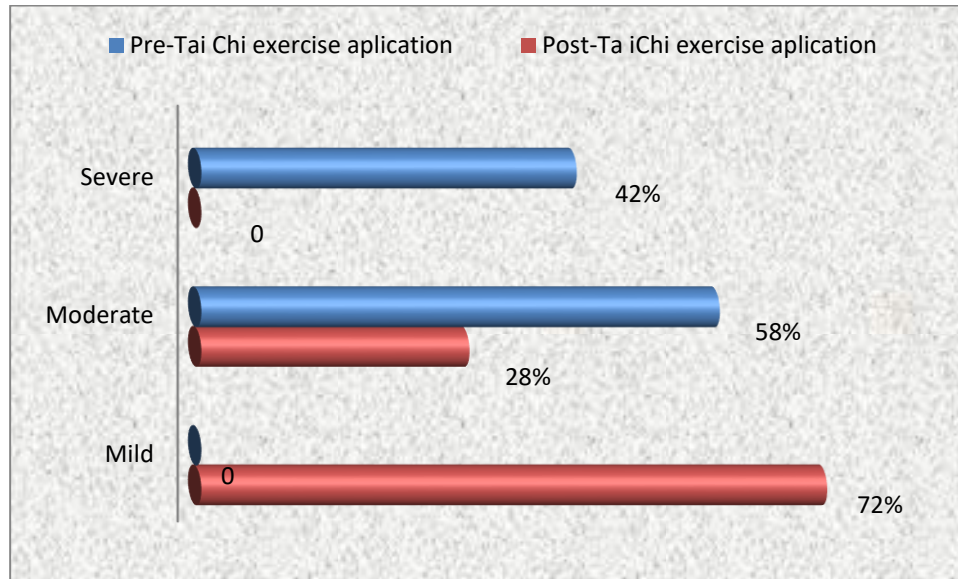


Figure 1: Total stress levels among the studied patients with Parkinson's disease pre and post-Tai Chi exercise application (n=100)

Table 4: Comparison between the studied patients with Parkinson's disease regarding their anxiety means scores pre and post-Tai Chi exercise application (n=100)

| Items | Pre-application | Post- application | t-test | p-value |
|--------------------------------------|-----------------|-------------------|--------|---------|
| State and Trait Anxiety Scale Scores | 38.48 ± 8.97 | 24.33 ± 2.52 | 14.34 | <0.001* |

*= significant at p<0.001 level.

Table 5: Correlation between stress levels and anxiety levels among the studied patients with Parkinson's disease pre and post-Tai Chi exercise application (n=100)

| Stress levels | Anxiety levels | |
|--------------------|----------------|-------|
| Pre-application | r | 0.130 |
| | p | .127 |
| Post – application | r | 0.568 |
| | p | .000 |

*= significant at p<0.05 level

Discussion:

Anxiety and stress disturbances are recognized as common nonmotor, psychiatric comorbidities in idiopathic Parkinson's disease that contribute to reductions in quality of life, higher levels of care dependency, and increased caregiver distress (Hanna& Cronin-Golomb, 2018; Riedel et al. 2019).

Tai Chi is a popular aerobic workout for both young and older persons that range in intensity from low to moderate. According to Lan et al. (2019), it consists of breathing, mental focus, physical balance, relaxed muscles, and thoughtful integration that support the harmony between the body and mind. Tai chi is said to be able to cure headaches, dizziness, sleeplessness, and neurasthenia brought on by cerebral cortex activity. Tai Chi influences blood viscosity, elasticity, and platelet function.

The results of the present study pointed out that the mean stress scores expressed by the patients with Parkinson's disease were lower than in the pretest, more than two-thirds of studied patients with Parkinson's disease had high perceived stress, and nearly one-third had moderate levels of stress. In the post-test, the majority of studied patients with Parkinson's disease their stress levels and low stress. A significant decrease and improvement were detected regarding the effectiveness of Tai Chi exercise on stress among studied patients with Parkinson's disease pre and post-application. From the researchers' point of view, this finding reflected the positive effects of Tai Chi exercise application on stress levels among the studied patients and confirmed the study hypothesis stated in H₁.

This result is in the same line with Zhenget al. (2019) who conducted a study and found that after the applications, the expression of stress by the patients was found to be lower post-intervention than post-application. Also, they found that the sample who participated in five, one-hour Tai Chi exercise sessions weekly for 12 weeks did not significantly improve their self-reported stress levels. This result is supported by The results of our study were matched with previous studies which found that Tai Chi classes significantly improved their perceived stress level and mood (Caldwell et al., 2019; Caldwell et al., 2021; Wang, 2018).

Based on the results of the current study, revealed that in the pretest, the mean and standard deviation of the level of stress among studied patients with Parkinson's disease is 30.89 ± 4.44 . In the post-application, the mean and standard deviation of the level of stress among studied patients with Parkinson's disease is 12.02 ± 2.64 with a highly statistically significant difference found pre and post-Tai Chi exercise application among studied patients with Parkinson's disease. From the researcher's point of view, it reflected the effectiveness of the Tai Chi exercise application which helps in stress reduction among patients with Parkinson's disease. In two

recent Egyptian studies, Shalash et al., (2018) studied non-motor symptoms in 97 PD patients using BDI-score and found depression frequency at 76.7%. Also, Ragab et al., (2019) found the prevalence at 47.5%. Across the literature, several studies by Aarsland et al., (2022; Zheng et al., 2017; Nègre-Pagès et al., 2019) found the prevalence of stress in Parkinson's disease was high.

The current study's findings demonstrated that there was a significant reduction in the level of stress among the studied patients with Parkinson's disease after post-Tai Chi exercise application. This finding was corroborated by a study by Steffen et al. (2020), who investigated the effects of Tai Chi exercises on stress reduction and found that stress decreased following Tai Chi exercise application. This outcome was consistent with research done by Yazhini et al., (2024) which discovered that the Tai Chi exercise was useful in lowering stress levels in the sample under study.

It demonstrated the effectiveness of the Tai Chi exercise application, according to the researchers. Tai Chi has been shown to reduce or treat physical and psychological illnesses in the past. The former includes conditions like cardiovascular disease (Huang et al., 2021) and chronic obstructive pulmonary disease, while the latter includes conditions like cognitive impairment (Lin et al., 2021).

The current study's findings revealed that anxiety mean scores were lower post-application in comparison to their anxiety mean scores pre-application, with a statistically significant difference among the studied patients with Parkinson's disease. From the researcher's point of view, it confirmed the success of the Tai chi exercises application. Furthermore, a study by Lin et al. (2021) examined the impact of Tai Chi exercises on anxiety in participants, and the results showed that Tai Chi exercises reduced anxiety levels among the studied sample.

The current study's findings are also consistent with those of Wang et al. (2019), who found that using Tai Chi exercises can reduce anxiety and treat a few common psychosomatic illnesses. Furthermore, the current study's findings are consistent with those of Zhao et al. (2021), who discovered that Tai Chi training improved the physical and psychosocial impairment of people with limited physical mobility.

Tai Chi exercise may have this impact because it lowers sympathetic nervous system activity. By monitoring salivary cortisol levels, researchers have shown that Tai Chi practice can generate certain cell mediators, including transforming growth factor- β and interleukin-10. These mediators are produced, which enhances life quality and lessens anxiety and psychological stress (Esch et al., 2020). Furthermore, brain alterations brought about by Tai Chi training may improve participants' capacity to manage anxiety and

sadness, therefore enhancing patients' emotional states (Huang et al., 2021).

The result of the current study revealed that there was a statistically positive correlation between the stress and anxiety levels among the studied patients with Parkinson's disease **pre and post-Tai Chi exercise application**. Therefore, a decline in stress after **Tai Chi exercise application** is also associated with a decline in the state of anxiety level. Thus, the **Tai Chi exercise application** is effective for stress management and is associated with lower anxiety levels in the patients. These results were consistent with **Shalash et al., (2018)** as they found anxiety was the primary predictor of QOL impairment in Egyptian patients. The finding is in line with other studies (**Chuquilín-Arista et al., 2020, Yamanishi et al., 2019, Menon et al., 2021**) which found that the impact of Parkinson's disease patients is independently influenced by non-motor disease aspects.

The findings of our study showed the success of the effectiveness of Tai Chi training on anxiety and stress among patients with Parkinson's disease. This result is supported by **Shalash et al. (2018)**, who studied " Non-motor symptoms as predictors of quality of life in Egyptian patients with Parkinson's disease " and it was found the same results. In a recently published clinical trial, **Chuquilín-Arista et al., (2020)** found beneficial effects of Tai Chi exercise on balance, physical function, and falls, suggesting that Tai Chi is an appropriate physical activity for patients with Parkinson's disease and it might be useful as a therapeutic exercise.

Conclusion:

It was determined based on the study's results and hypothesis that the Tai Chi exercise application has a significant reduction in mean post-test stress and anxiety among patients with Parkinson's disease.

Recommendations:

The following suggestions are put forth in light of the findings of the current study:

- It is strongly advised to apply a training program for patients with Parkinson's disease about the importance of the Tai Chi exercise application to be able to use them as a part of routine care.
- To enable generalization, more investigation and replication of this work with a large sample size are needed.

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