TRENDS OF USE OF YOGA AND OTHER FITNESS MEASURES IN PATIENTS WITH PARKINSON'S DISEASE - A PILOT CROSS SECTIONAL STUDY

BY

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Diacritical marks used in Thesis

a	=	अ	ṅa	=	ङ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
e	=	ए	ṭa	=	ट	ra	=	र
ai	=	ऐ	ṭha	=	ठ	la	=	ल
o	=	ओ	ḍa	=	ड	va	=	व
au	=	औ	ḍha	=	ढ	śa	=	श
m	=	अं	ṇa	=	ण	ṣa	=	ष
ḥ	=	अः	ta	=	त	ha	=	ह
ka	=	क	tha	=	थ	kṣa	=	क्ष
kha	=	ख	da	=	द	tra	=	त्र
ga	=	ग	dha	=	ध	jña	=	ज्ञ
gha	=	घ	na	=	न			

TRENDS OF USE OF YOGA AND OTHER FITNESS MEASURES IN PATIENTS WITH PARKINSON'S DISEASE - A PILOT CROSS SECTIONAL STUDY

Abstract

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Parkinson's Disease is a progressive neurodegenerative disorder characterized by bradykinesia, rigidity, and resting tremor impacting the quality of life of individuals as well as the caregivers. This cross-section study was conducted to understand the trend of the fitness measures among people with Parkinson's Disease, the rationale behind the popular choices and its effect. A one-time survey was done on active adults diagnosed with Parkinson's Disease that included researcher's questionnaire and two standard screening measures Parkinson's Anxiety Scale (PAS-12) and the CDC Health Related Quality of Life (CDCHRQOL-14). Result: The result of survey showed Yoga was among one of the popular choices of fitness measures in the sample population. The study showed impact of regular Yoga practice on physical, mental, and emotional component of the individuals and a strong correlation between Yoga with reduced anxiety scores and improved Healthy Days Score which can be further studied for future scope.

Introduction

Parkinson's Disease

Parkinson's Disease or PD is a progressive neurological disorder that affects the movement in the individual. It was first diagnosed by James Parkinson in 1817. In mid-1800 Jean Martin Charcot further clarified and expanded various facts about Parkinson's Disease and was also responsible to distinguish Parkinson's disease from Multiple Sclerosis and other disorders that involved tremors. Even though the official definition of Parkinson's disease as neurological disease was given by James Parkinson in 1817, few descriptions of the disease was found prior to that when Sylvius de la Boe mentioned about resting tremor in 1680 and Sauvages described festination (tendency to speed up when performing repetitive movements) in 1768. It is remarkable that prior to these explanations the traditional ancient Indian text of Ayurveda and ancient Chinese text also mentions health disorders like Parkinson's Disease (Goetz, 2011).

Incidence

The incidence of PD has increased in the last few years with over 1-2 per 1000 getting diagnosed with it (Tysnes & Storstein, 2017). Statistically, nearly one million people are living with PD in the United States and almost 60,000 Americans are diagnosed with PD every year and this number is expected to rise to 1.2 million by 2030. Almost 10 million people worldwide are living with PD. Commonly, onset of PD is seen over age of 50, but some are diagnosed in younger age and are between 20-50 years and are considered as Early Onset PD (Parkinson's Foundation, 1957). PD manifests itself with motor as well as

non-motor symptoms which progresses gradually affecting the quality of life of the individual and often takes a mental and emotional toll on patients and their caregivers.

Etiology or Causes

The most common type of PD is also known as idiopathic which means the cause unknown. However, some risks factors play a major role in etiology of the disease. These are as follows:

1. Genetic causes - A family history can be a risk factor for PD. Recent study has proved a connection of mitochondrial dysfunction in early onset PD (Surmeier et al., 2011). Since genetics play a role, it is seen that some individuals are more susceptible to get PD.
2. Environmental causes - In recent years research has proven that some of the environmental factors may also be responsible for causing Parkinson's disease. Long term exposure to pesticide, herbicides or certain industrial chemicals can lead to Parkinson's disease (Surmeier et al., 2011).
3. Oxidative stress - Oxidative stress is defined as the disturbance in the balance between the production of reactive oxygen proteins (free radicals) and antioxidant defenses (Cheung et al., 2018).
4. Age - Commonly seen in older adults above age of 50 however early onset Parkinson's is seen in some cases when it is diagnosed in 20-40 years of age.
5. Gender - Incidence is higher in men than in women.

Other causes of Parkinson's disease can be listed as follows

1. Vascular Parkinson's disease
2. Drug induced Parkinson's disease
3. Viral Parkinson's disease
4. Other types of Parkinson' disease
    a. Multiple system atrophy
    b. Supranuclear palsy
    c. Normal pressure hydrocephalus

Pathophysiology

The main cause of the Parkinson's disease is the loss of pigmentation of a dark pigmented region called substantia nigra pars compacta in the transverse section of the brainstem. This loss of pigmentation is directly related to the damage of dopaminergic neurons of the substantia nigra (Kouli et al., 2018). In idiopathic PD, the reason for this damage is not completely known. This damage to the neurons producing the neurotransmitter dopamine disturbs the chemical balance of various other neurotransmitters. Dopamine plays an important role in transmitting information from substantia nigra to the different parts in the central nervous system and is responsible for various motor and cognitive functions. It also influences the limbic system which is seat of emotions. The dopaminergic pathways are responsible for initiation of the movements in the body as well as various other non-motor functions. Since the damage is gradual the symptoms appear only when more than half of the neurons are damaged or impaired.

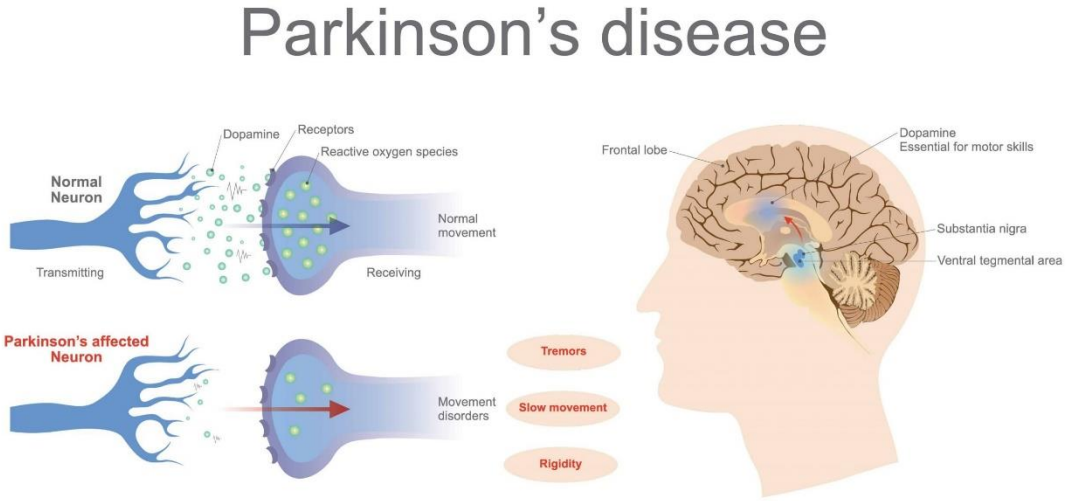

Figure 1 Parkinson's Disease (https://www.parkinsonsinfoclub.com/what-does-parkinsons-disease-affect/)

The pathology also highlights the presence of Lewy Bodies in these and surrounding areas of the brain. Lewy bodies are abnormal cytoplasmic deposits in the neuronal cell bodies which are immunoreactive for protein alpha-synuclein. In addition to these regions of the brain, the Lewy Bodies are also seen to be present in some of the peripheral organs like retina, bladder, skin, parts of the cardiovascular system, stomach, intestines, submandibular gland, uterus, and bladder. This has increased interest among researchers of PD to study the involvement of peripheral nervous system in PD and possible role of gut brain axis in pathophysiology of PD (Kouli et al., 2018). Research in last few years have highlighted the role of oxidative stress on the progressive damage of dopaminergic neurons. Oxidative stress is defined as the disturbance in the balance between the production of reactive oxygen proteins (free radicals) and antioxidant defenses. Postmortem studies revealed increased number of free radicals and decreased

number of antioxidants in the substantia nigra of PD patients emphasizing the role of free radicals in the etiology of PD (Cheung et al., 2018).

Symptoms

Parkinson's disease has both motor as well as non-motor symptoms and sometimes early symptoms can be too subtle to notice and can be considered as normal aging symptoms. As the disease progresses more symptoms arise. The rate of progression of the disease differs from person to person.

Motor Symptoms

There are four main cardinal motor symptoms

1. Bradykinesia (Slowness of movement)- The slowness of the movement is due to inability of make a spontaneous and automatic movement. This affects the quality of life as it makes daily normal tasks like bathing, dressing up, etc. difficult to perform and may take longer time than usual to finish these personal daily tasks
2. Rigidity also refereed as the tightness by the individuals experiencing it is defined as increased resistance during passive mobilization of extremity. (Baradaran et al., 2013) This is mainly caused due to failure of opposing muscles to relax because of disturbance in the communication from the basal ganglia responsible for smooth movement. The muscles always remained tight and produce jerky movements when moved passively giving rise to the characteristic "cog wheel rigidity".
3. Resting tremors - tremors that are present at rest and disappear when movement is initiated. Often tremors can start in a single finger or one foot and spreads

gradually to other parts as the disease progresses. The classical “pin rolling” tremor is seen which involves the thumb and forefinger in a pin rolling action. Stress, emotional excitement or just being aware of the tremors can aggravates the tremors.

4. Postural instability- This is the inability of the person to stand upright and maintain a stable posture. It also includes impaired balance and higher vulnerability to falls. This also causes difficulty in suddenly changing directions while moving or walking resulting in further slowing the movements.

Some other motor symptoms include

1. Freezing gait- is the characteristic gait pattern seen in patients with Parkinson’s disease where they freeze while walking unable to lift their feet to take the next step as though their feet are glued to the ground. This happens when person is beginning to walk or trying to change direction or approaching a furniture or doorway. Even though freezing of gait is temporary and normal gait is resumed this can increase the risk of falling in the patients.
2. Dyskinesia - are the involuntary, jerky muscle movement that may arise in extremities, face, or trunk.
3. Facial Masking also referred to as reduced or no facial expressions due to inability to perform quick fine movements of the facial muscles.
4. Cramping - sustained or repeated tightening or twisting of the muscles.
5. Festination - small rapid steps taken during walking that can result in falling and causing freezing gait.

6. Micrographia - small untidy cramped handwriting due to in coordination of the muscles of the hand.

Non-motor symptoms

1. Drooling- These even though non motor symptoms are caused as result of slowing and incoordination of muscles of the throat and mouth.
2. Urinary symptoms - increased frequency and urgency of urination.
3. Gastrointestinal symptoms - dysphagia (difficulty in swallowing), nausea, constipation.
4. Depression and emotional changes are commonly seen in patients with Parkinson's disease. The disease progression as well as the disturbances in neurotransmitters that control the mood (dopamine, serotonin and non-epinephrin) contribute to the stress and emotional changes.
5. Sleep disturbances include difficulty falling asleep, maintaining good night sleep, excessive daytime sleepiness, waking up for bathroom, restlessness in the physical body.
6. Dementia, cognitive problems, and memory problems are seen in Parkinson's patients because of disturbances in the levels of various neurotransmitters in the brain. Some of common cognitive impairment is seen in form of decreased attention, inability to process complex instructions, slowing of the mental processing and decreased problem-solving abilities.

7. Fatigue can be mental or physical fatigue because of symptoms and the progression of the disease. Mental and emotional stress associated with the lowered quality of life can further lead to fatigue.

Complications

Often Parkinson's disease is associated with some other complication which together with main symptoms affect the quality of the life of the patient.

1. Cognitive problems like dementia or thinking difficulties
2. Depression
3. Swallowing problems
4. Chewing or eating problems
5. Bladder problems
6. Constipation
7. Sleep disorders

Diagnosis

There is no specific test for diagnosis of Parkinson's disease as individuals may show varying symptoms. Since the initial symptoms are subtle or mild are often unnoticed or mis diagnosed as old age symptoms until they affect normal functioning of the individual on daily basis. A trained neurologist can diagnose it on physical examination. Considering your family history and neurological evaluation diagnosis can be made. At least two of the four cardinal symptoms must be present to make the diagnosis. Sometimes response to Parkinson's drugs like levodopa are seen to confirm the diagnosis. Some diagnostic tests

are used to rule out other differential diagnosis. These are MRI, dopamine transporter chemical scan (DaTSCAN), spinal fluid analysis, etc. However, none of these tests confirm the diagnosis. They are used to strengthen the result of physical examination, family history and progression of symptoms to make a diagnosis.

Hoehn and Yahr Scale

The Hoehn and Yahr Scale is a scale used to describe the progression of the Parkinson's disease. The scale is helpful to stage the extent of disability in the progression of the disease and helps to assess the severity of the patient's condition. It was originally published by Margret Hoehn and Melvin Yahr in the journal of Neurobiology in 1967.The original scale explained stages 1 to 5. Later the scale was modified by addition of stage 1.5 and 2.5 to account for the intermediate course of progression of the disease (*Hoehn and Yahr Scale*, n.d.). The New and Modified Hoehn and Yahr scale is as follows

Stage 1: Unilateral involvement only

Stage 1.5: Unilateral and axial involvement

Stage 2: Bilateral involvement without impairment of balance

Stage 2.5: Mild bilateral disease with recovery on pull test

Stage 3: mild to moderate bilateral disease, some postural instability, physical independent

Stage 4: Severe disability, still able to walk or stand unassisted

Stage5: Wheelchair-bound or bedridden unless aided

Treatment

As of today, there is no complete cure for Parkinson's disease. Pharmaceutical drugs, occasional surgery is the main line of treatment which focuses mainly on the symptomatic relief.

Conventional modern medicine

1. Pharmaceutical management

Pharmaceutical drugs are used to manage the symptoms of PD. Some of the commonly used medications are as follows

- Medication that increases the level of dopamine in the body like Carbidopa levodopa which passes the blood brain barrier and gets converted to dopamine. This can also be administered in inhaled form or infusion orally (Mayo Clinic, 1998).
- Dopamine antagonist do not convert into dopamine but have an effect like dopamine.
- The MAO B Inhibitors block an enzyme that breaks down dopamine in the brain.
- Anticholinergic drugs are used to reduce and manage tremors.

Although very good symptomatic relief is gained by this medication, their effect starts to taper over a period and disease gradually progresses, making it important to monitor and adjust the dosages by their neurologist. Often these medications also come with their range of side effects which also decreases the quality of life in these patients.

2. Surgery

Deep brain stimulation (DBS) is a brain surgery where the surgeon implants electrodes in the specific are of the brain which generate impulse that reduces the symptoms of Parkinson's disease. This is often used as an advance treatment in final stages and when the management with medication becomes difficult. The surgery carries its own risk of infection, hemorrhage, and stroke.

Complimentary and Alternate Therapies and Lifestyle Management

Even though there is no definite cure of Parkinson's disease, last few decades of research have brought the role of complimentary and alternate (CAM) therapies into highlight. These therapies have proven to manage and even reversing some of the symptoms and slow down the progression of the disease. They can be given along with existing pharmaceutical drugs and are known to reduce the severity of symptoms, manage side effects of the preexisting medication and most important improve quality of life (QOL). Some of the commonly used therapies are as follows

- Physical therapy
- Massage
- Acupuncture
- Tai Chi
- Yoga Therapy
- Meditation or mind body techniques
- Strength and balance classes
- Aerobic exercise
- Dance and Music Therapy

- Lifestyle and wellness management

Role of Yoga therapy in Parkinson's Disease

Yoga Therapy is treatment modality which uses the Yogic principles to a particular person with an intention to achieve a specific physiological, psychological, and spiritual goal. (International Asosciation of Yoga Therapists, 1989) This includes but is not limited to the use of all components of *Ashtanga Yoga* (eight step practice) as explained in the traditional text of *Patanjali Yoga Sutras*. These eight steps are *Yamas* (restrains), *Niyamas* (observances), *Asana* (posture), *Pranayama* (breath regulation), *Pratyahara* (withdrawal of senses), *Dharna* (concentration) *Dhyana* (meditation) and *Samadhi* (liberation). In addition to this the concept of *Yogic Satvik Diet*, lifestyle changes, psychological counselling, spiritual discourses, chanting and guided imagery also used as a component of Yoga Therapy. The gender, age, occupation, religious beliefs and physical or mental limitation of the patients are respected while administering Yoga Therapy. (International Asosciation of Yoga Therapists, 1989)

Yoga therapy is rooted on the concept of *Pancha Kosha*, or 5 sheaths of existence as explained in traditional *Taittiriya* Upanishad which is a part of *Yajurveda*. According to this concept each living being exist in five sheaths of existence, the physical sheath (*Annamaya Kosha*), the breath or energy sheath (*Pranamaya Kosha*), the mind sheath (*Manomaya Kosha*), the intellect sheath (*Vijnanmaya Kosha*) and the bliss sheath (*Anandmaya Kosha*). According to the *Panchakosha* Theory model of treatment, every illness arises as a disturbance in the mind sheath (*Manomaya Kosha*) known as an Adhi

which causes the disturbances in the energy flow of the body in the breath sheath (*Pranamaya Kosha*). This can lead to either blockage, excess, or diminished flow of energy in the energy channels called as *Nadis*. This disturbed energy manifests itself in the form of physical ailment called as *Vyadhi*. The Yoga Therapy believes the management of an ailment through all these sheaths of existence since the root cause of ailment lies beyond the physical sheath.

Yoga therapy in Parkinson's disease works on all the five layers of existence. The physical Yoga postures work on improving the posture, flexibility, building strength and reducing the rigidity. The standing poses also help to improve balance. The combination of breathing with movement as done in loosening exercises (*Sukshma Vyayama*) improve the range of motion, the functional mobility and coordination of movements. Regular practice of Yoga poses helps the Parkinson's patient better control of their body and reduce their frequency of falling. A study published in 2021 proved the effect of Yoga and Meditation in improving proprioception and balance in individuals diagnosed with Parkinson's disease (Cherup et al., 2021). The pranayama or breathwork has a direct effect on the mind body connection, reduces mental and emotional stress and balances the autonomous nervous system. The meditation and relaxation component gives the patient an opportunity to calm down the mind, relax the body and introspect. This introspection brings the motivation to make healthy choices in their lifestyle. The chanting or Mantra Yoga introduces healing sound vibrations in their treatment plan which has a soothening effect on the nervous system. Yoga Therapy has proven to be one of effective

complementary therapy by working directly on the cardinal symptoms of the disease and improving the quality of life (QOL).

The purpose of this study

A regular physical fitness regime plays an important role in managing the symptoms as well as to maintain a better quality of life in Parkinson's patients. Patients choose variety of fitness classes like Yoga, fit boxing, strength and balance, dancing, tai chi, etc. depending upon their interest, availability, and their individual physical capability. The purpose of this study is to compare the different kinds of fitness classes and Yoga and how each of them influence the physical, mental, psychological levels of the patients. The study will also give the insight whether Yoga being a mind body practice has any additional advantage on the psychophysiological aspect compared to other fitness classes.

Ancient Literature

Patanjali Yoga Sutras

Although Yoga is considered as a physical practice in modern Western societies, the ancient literature from where this practice has originated explains Yoga as deeper practice going beyond the physical postures. The great Sage Patanjali defines Yoga in the second verse of the first chapter of his ancient text of *Patanjali Yoga Sutras* as follows

योगश्चित्तवृत्तिनिरोध PYS 1.2

Yoga chitta vritti Nirodah

Meaning - Yoga is process of gaining controlling over the mind.

Sage Patanjali goes on explaining further that when one can attain that mastery over mind, he can reach his original state which is of complete content and happiness. The Patanjali Yoga Sutras gives a systematic process of gaining control over the fluctuations and disturbances of the mind in eight steps also known as *Ashtanga* Yoga. These 8-stepped practice is explained in verse 29 from the second chapter. It is as follows.

यमनियमासनप्राणायामप्रत्याहारधारणाध्यानसमाधयोऽष्टावङ्गानि PYS 2.29

Yamaniyamasanapranayamapratyaharadharnadhyansamdhayoavaangani

Meaning - The eight components of yoga are external discipline (*yama*), internal discipline (*niyama*), posture *(asana*), breath regulation (*pranayama*), control over senses (p*ratyahara*), concentration (*dharna*), meditative absorption (*dhyana*), and liberation (*samadhi*). The first five steps are also called as *Bahiranga* Yoga also known as external Yoga as these indirectly control the mind through the physical body. The last three steps

are referred as *Antaranga* Yoga also known as internal Yoga as they mainly work by directly controlling the mind.

In the *Patanjali Yoga Sutras*, *Maharishi Patanjali* also explains the obstacles in the path *of Yoga or achieving liberation. The 30th verse in the first chapter lists the obstacles or Chitta Vikshepas.* They are as follows

व्याधिस्त्यानसंशयप्रमादालस्याविरतिभ्रान्तिदर्शनालब्धभूमिकत्वानवस्थितत्वानि

चित्तविक्षेपास्तेऽन्तरायाः PYS 1.30

yaadhistyaanasaMshayapramaadaalasyaaviratibhraantidarshana

aalabdhabhUmikatvaanavasthitatvaani chittavikShepAH teantaraayaaH

Meaning- Disease, languor, doubt, carelessness, laziness, worldly-mindedness, delusion, non-achievement of a stage, instability, these cause the distraction of the mind, and they are obstacles.

The presence of these creates obstacles and hinderance to one's path of achieving peace and gain mastery of mind.

Ayurveda

The ancient text of *Ayurveda* also emphasized the importance of exercise and lifestyle in maintaining overall health. In Charaka Samhita the ancient text of Ayurveda there is a beautiful explanation of how even moderate activity and exercise when incorporated in your lifestyle has tremendous benefits. It goes as follows

लाघवं कर्मसामर्थ्यं स्थैर्यं दुःखसहिष्णुता ।

दोषक्षयोऽग्निवृद्धिश्च व्यायामादुपजायते||३२||

Charaka Samhita Sutra Sthana Chapter 16, Verse 32

Laghavam karmasaamarthyam sthyaram dukhasahishnutaa,

doshakshyoagnivriddhishcha vyayamadupjaayate

Meaning - The right amount of exercise beings lightness in the body and mind, increase in work capacity, increase in body stability, improvement in resistance to discomfort, balance of *Tridosha* and improvement in strength of digestion (Art of Living, n.d.).

According to both the above ancient texts the concept incorporating physical and mental exercise was considered important as a part of daily routine and was known to have a powerful effect on psychosocial, physical, and mental health of an individual.

Scientific Literature

Table 1 Scientific Literature Review

#	Author and Year of Publication	Sample Size and Design	Intervention	Assessment Tool	Results	Conclusion
1	(Cherup et al., 2021)	**Sample**: 33 participants with mild to moderate PD symptoms **Design**: RCT	Participants were randomly assigned to a yoga meditation program (YoMed) or to an established proprioceptive training program (PRO). Both interventions included twice weekly sessions	Joint position sense (JPS_{45}°, JPS_{55}°, JPS_{65}°) and joint kinesthesia (JK_{Flex} and JK_{Ext}), the Tinetti Balance Assessment Tool (TIN), Falls Efficacy Scale (FES), Balance Error Scoring System (BESS), dynamic posturography	Significant between-group differences favoring the YoMed group were observed for TIN ($p = 0.01$, $d = 0.77$) and JKFlex ($p = 0.05$, $d = -0.72$). DMA and TIME scores significantly improved for both groups, and no adverse events were reported	YoMed program is safe and effective for patients with PD

#	Author and Year of Publication	Sample Size and Design	Intervention	Assessment Tool	Results	Conclusion
			(45 minutes each), spanning a 12-week period.	(DMA and TIME) and the Timed Up-and-Go Test (TUG).		
2	(Swink et al., 2020)	**Sample**: 17 participants **Design**: Mixed method study	8 weeks merging Yoga with Occupational therapy for PD. Before, just before and upon completion	Parkinson's Disease Questionnaire—8 (PDQ-8), a measure of HRQoL	There were no significant differences in PDQ-8 scores between time points, $F(2,32) = 1.60$, $p = 0.22$, partial $\eta 2 = 0.09$. Participants did discuss	Results diverged, with quantitative results showing no significant improvement in HRQoL and qualitative results

#	Author and Year of Publication	Sample Size and Design	Intervention	Assessment Tool	Results	Conclusion
					improvements in all 8 HRQoL domains, frequently regarding mobility and activities of daily living.	indicating participant perceived improvements in all domains of the PDQ-8
3	(Elangovan et al., 2020)	**Sample**: 20 Participants (2 groups) **Design**: Pilot randomized controlled	The immediate treatment group received a 60-min Hatha yoga training twice a week for 12 weeks, while the	Baseline Unified Parkinson's Disease Rating Scale (UPDRS) motor scores, and gait and postural kinematics including postural	After Hatha yoga training, UPDRS motor scores improved with an 8-point mean decrease which is considered as a moderate	This study showed that a 12-week Hatha yoga training can improve static balance in PWP. We found

#	Author and Year of Publication	Sample Size and Design	Intervention	Assessment Tool	Results	Conclusion
		trial design	waitlisted control group received no training.	sway path length, cadence, walking speed, and turning time were obtained	clinically important change for mild-moderate PD. Sway path length during stance decreased significantly (mean reduction: -34.4%). No significant between-group differences or improvements in gait kinematics were observed.	no evidence that it systematically improves gait performance in PWP.

#	Author and Year of Publication	Sample Size and Design	Intervention	Assessment Tool	Results	Conclusion
4	(Van Puymbroeck et al., 2018)	**Sample**: 27 (Yoga=15, Waitlist control=12) **Design**: Randomized, wait-list controlled pilot study	8 weeks Yoga intervention with postures, breathwork, meditation and relaxation techniques. No Yoga intervention for the waitlist group	FGA (functional gait assessment), FOGQ (Freezing of Gait questionnaire), Mini-BESTest for balance assessment	Across group changes were statistically significant for the FGA (t=2.27, p=0.03), indicating greater functional gait in the experimental group at the end of the yoga intervention, compared with the WLC.	An 8-week yoga intervention may reduce fall risk and improve postural stability, and functional and freezing gait in individuals with Parkinson's Disease

Aim and Objective

Aim

The aim of the study was to compare the effect of Yoga with other fitness classes taken by People with Parkinson's disease (PWP).

Objective of the study

The objective of the study was to find out if Yoga has an added advantage over other fitness classes since it is a mind body practice and it uses tools other than just physical stretching like breathwork (Pranayama), meditation and relaxation techniques. The study also gave an insight on why those diagnosed with Parkinson's disease choose to practice Yoga as one of their fitness measures and if there is enough awareness about therapeutic benefits of Yoga.

Research question

Does Yoga, a mind body practice have an advantage over other fitness classes among adults with Parkinson's disease?

Hypothesis and Null Hypothesis

Hypothesis: Yoga has an advantage over other fitness classes for adults with Parkinson's disease

Null Hypothesis: Yoga does not have an advantage over other fitness classes for adults with Parkinson's disease.

Methodology

Participants

This cross-sectional study was conducted by collecting a one-time data from the adults that are diagnosed with Parkinson's disease, with mild to moderate symptoms in the Denver Metro area in Colorado State, United States of America.

Inclusion criteria

The sample population selected for this study consists of adults diagnosed with Parkinson's disease also referred to as people with Parkinson's disease (PWP). This study included both genders and all ages. The sample included only those who showed mild to moderate symptoms were physically independent and were actively engaged in any exercise regime that included one or more fitness classes per week. These fitness classes included a variety of fitness classes and not just Yoga. The classes attended by the sample population included and not limited to kick boxing, circuit training, tai chi, strength and balance, dance, Pilates, and Yoga. The style of Yoga classes attended by sample papulation was not specified so it included all styles of Yoga.

Exclusion criteria

Adults who are diagnosed with Parkinson's disease but do not attend any fitness classes regularly (not even one class per week) and those who do not wish to participate in the study will be excluded.

Ethical clearance

Ethical clearance was obtained by VaYU ethical committee. A digital consent form was obtained from each participant before collection of the data. A complete anonymity was maintained while obtaining the data from the participants and no other personal information of the participants were used by the researchers except the age and gender which was used as demographic data of the study.

Design

Cross sectional study design was used as a part of this thesis. This was an observational study where no intervention was used but a survey was administered to collect data from a specific population. A set of questions were put together as a one-time survey which was filled by people with Parkinson's Disease (PWP) who were actively engaged in any kind of physical exercise measures. The survey included set of questions formulated by the researcher as well as questions from standard approved questionnaires. The survey was able to collect information about the trend seen in PWP when they choose a particular type kind of exercise measure and the rationale behind their choice. The data collected also gave insight if there was any preference between virtual and in-person format of the exercise classes as virtual classes were included during the Coronavirus pandemic for this population. The survey also collected information of their emotional and mental health, anxiety levels as well as their health-related quality of life (HRQOL).

Intervention

No specific intervention was used as a part of this study.

Assessment Tool

A specifically designed survey was used to collect one time data from the sample population in the format of digital google form that included questions from the researcher as well as questions from standard approved questionnaires.

In this study the two standard approved tools used were

- **CDC HRQOL-14 (CDC Health Related Quality of Life - 14)** - The CDC HRQOL-14 included 14 questions under three modules, healthy days core module (CDC HRQOL-4), healthy days symptoms module and activity limitation module each module. The standard Healthy Days Core question module (CDC HRQOL-4) has been in use as tool since 1993 in State Based Behavior Risk Factor Surveillance System (BRFSS) and since then been used in National Health and Nutrition Examination Survey (NHANES) from 2002 -2012. Since 2003 it is used in Medicare Health Outcome Survey (HOS), used as a measure in National Commission of Quality Assurance (NCQA), Healthcare Effectiveness Data and Informative Set (HEDIS). The Healthy Days Core Module along with the Healthy Days Symptoms Module and the Activity Limitation Module constitutes the CDC HRQOL-14 measure (Centers for Disease Control and Prevention, n.d.).

- **PAS (Parkinson's Anxiety scale)** – The Parkinson's Anxiety Scale was created by Albert F G Leentjens, Kathy Dujardin, Gregory M Pontone, Sergio E Starkstein, Daniel Weintraub, and Pablo Martinez-Martin based on the Delphi procedure to get a better validity measure of anxiety levels in patients of PD. The PAS includes

12 questions divided under three subscales of anxiety levels, persistent anxiety, episodic anxiety, and behavior avoidance anxiety (Leentjens et al., 2014).

In addition to above standard tools, a few questions were included by the researcher.

Data Collection and Analysis

Data Collection

Data was collected in form of survey administered as Google form on Google drive and shared online with the participants of the study. The digital data collected was saved and electronically transferred in the Microsoft excel which was used for analysis.

Data Analysis

Statistical analysis was carried out on the digital data collected through the survey. The total number of participants in the survey was 14 out of which one declined to take the survey. Out of the 13 participants who participated in the survey, 5 were males and 8 were females and all were in the age range of 55-84 years old.

1. **Trend on the choice of type of Fitness Measure chosen by PWP Sample**

The data collected was from a very active Parkinson's community who attended an average of three or more fitness classes per week. The observation was as follows.

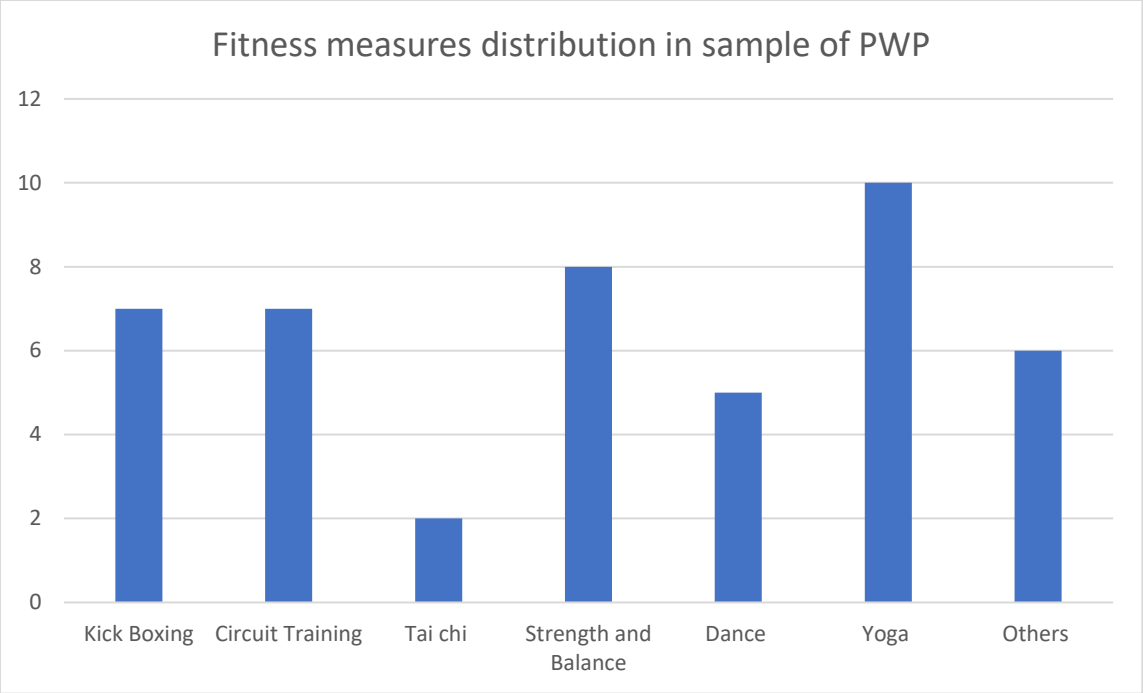

Figure 2 Fitness measures distribution in sample of PWP

There were 10 responses for attending Yoga, 8 responses for attending Strength and Balance class and 7 responses for attending Circuit Training and Kick boxing classes. There was an overlap of responses as the participants were asked to choose all classes they attend in a week and most of the participants attended either 3 or more classes per week. Some other responses included Pilates, plyometrics and biking.

2. Comparison of virtual and in-person fitness classes seen in the sample

The survey also gave an insight what was the preference on the class delivery method. The concept of delivering the classes virtually on Zoom gained popularity during the pandemic. Since this was the high-risk population most of their classes were moved to virtual for their safety during the peak of pandemic. Eventually they were moved back to in-person mode and then also provided in hybrid mode where the participants had option

of choosing either the virtual or in-person classes. One of the questions in the survey was to find out what mode of delivery of these classes was preferred in PWP. The result showed out of 13 responses 3 responded to continue online only mode whereas 4 responded to have attending classes in-person mode and majority of 6 responses continued taking both virtual as well as in-person classes.

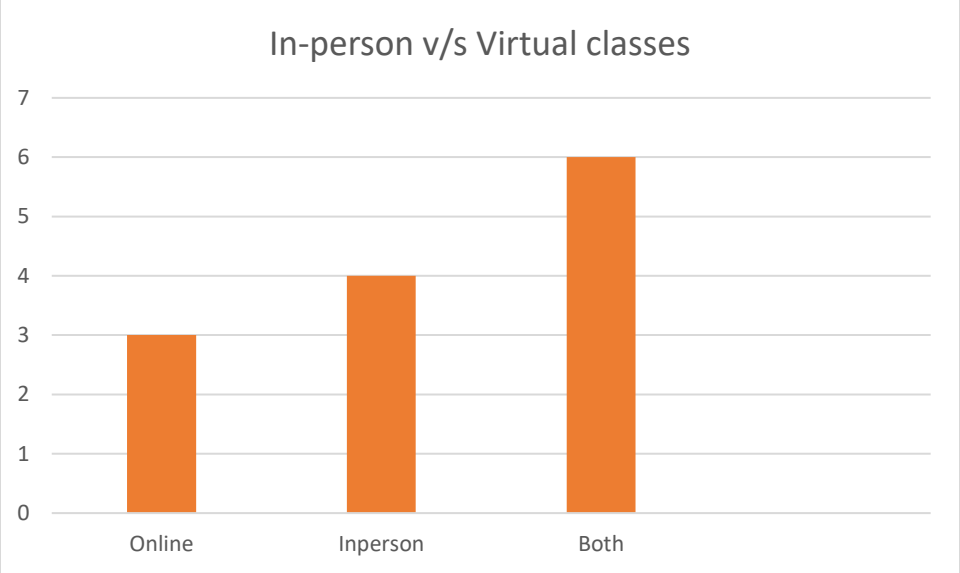

Figure 3 In-person vs Virtual classes

3. Yoga versus Non-Yoga participants

The survey was able to categorize responses in those who did or did not attend Yoga. Out of 13 responses, 9 responded of attending regular Yoga classes in a week and 4 responded of not attending Yoga. The reason for not attending Yoga were collected as a subjective data that included the following

"Tried Yoga and did not like it"

"I am not aware of any benefits of Yoga in Parkinson's Disease"

“I used to attend Yoga, but I was exercising too much, and yoga was an exercise put on my ‘future’ list

“Yoga is a religion or inclined to a particular faith”

4. Reason for attending Yoga sessions

The survey also collected the data on what was the motivation or reason to attend a Yoga class. The result was as follows.

Reason	Responses out of 9
Improve Physical Strength	7
Reduce stiffness	9
Relieve mental stress	8
Feeling active throughout the day	7

Table 2 Reason for attending Yoga sessions

7 out of 9 responded of choosing Yoga for its effect on improvement in physical strength and to make them more active throughout the day. 8 responded Yoga helped them to relive their mental stress whereas all the 9 responded Yoga helped in reducing their stiffness.

5. Style of Yoga

5 out of 9 responded they practiced Gentle Yoga, 3 responded they were unsure of what style they practiced and 1 responded of practicing Vinyasa Yoga.

6. Effect of different fitness classes on physical, mental, and emotional component

The survey made a comparison of different fitness measures and its effect on physical, mental, and emotional components of the respondent. The participants were asked to choose the classes that made them feel physically and mentally strong and emotionally relaxed.

Physical Component - Circuit training scored highest as 8 out of 13 responded that they felt physically strong after the Circuit training class.

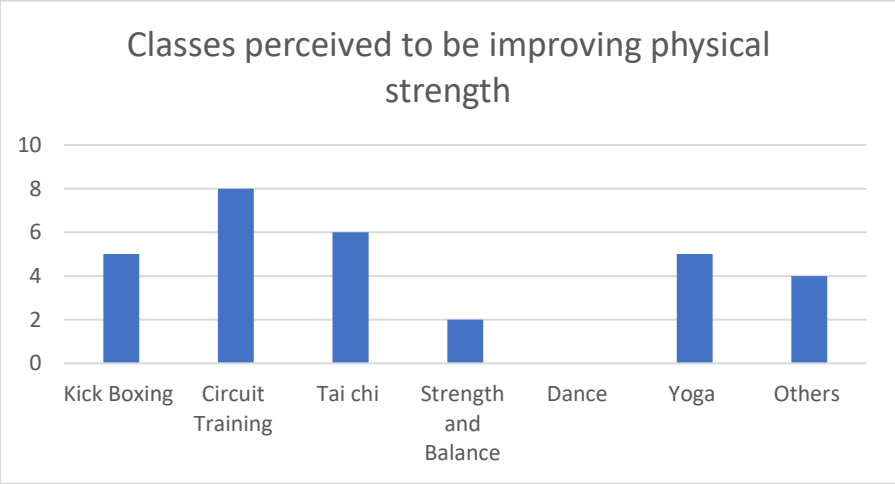

Figure 4 Classes perceived to be improving physical strength

Mental Component - Yoga scored highest in its effect on mental strength with 9 out of 13 responded Yoga made them mentally strong.

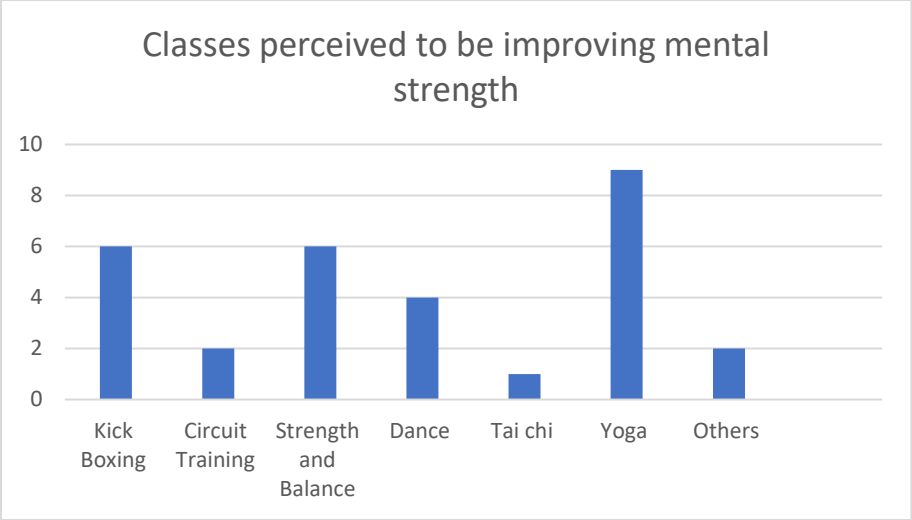

Figure 5 Classes perceived to be improving mental strength

Emotional Component - Yoga also scored high in its effect on emotional component as 10 out of 13 responded Yoga made them emotionally relaxed.

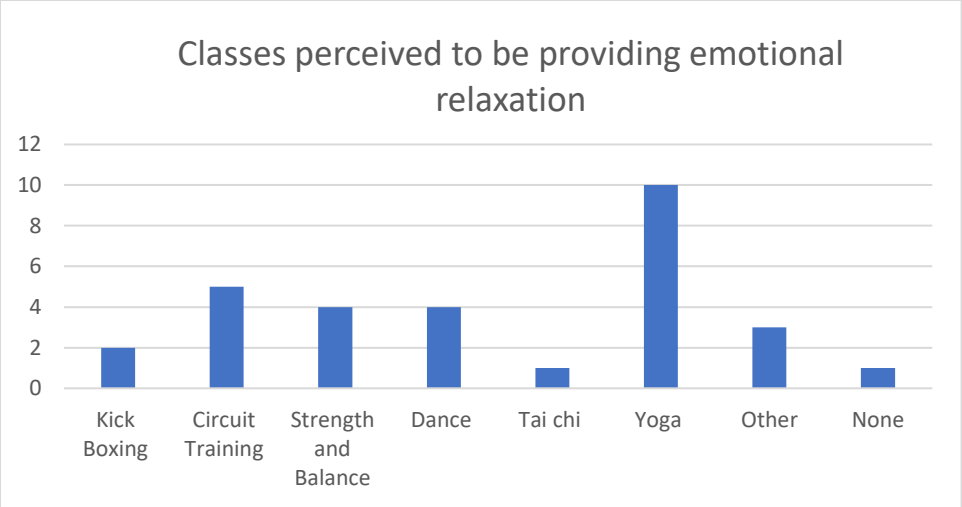

Figure 6 Classes perceived to be providing emotional relaxation

7. Effect of Parkinson's Symptoms with Yoga

The survey collected data whether the practice of Yoga had any impact on symptoms of Parkinson's Disease. The result was as follows

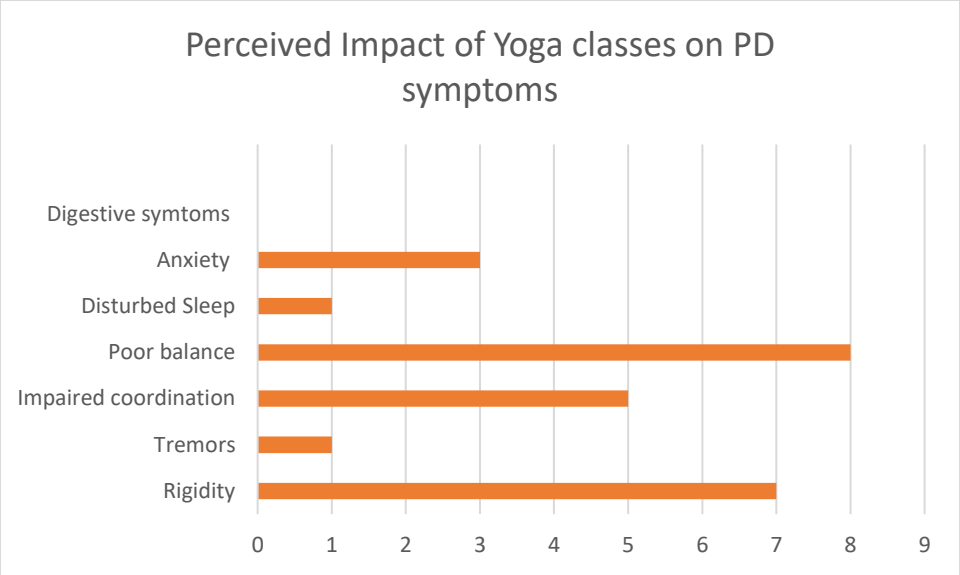

Figure 7 Perceived Impact of Yoga Classes on PD symptoms

Out of 9 those who responded of attending Yoga regularly as their fitness routine, the highest scores were for poor balance, decrease in rigidity and improvement of impaired coordination. 8 responded improvement in their balance with Yoga, 7 responded decrease in rigidity and 5 responded an improvement in impaired coordination. 3 out of 9 responded decrease in anxiety and 1 response was for reduction of tremors. None of the participants responded any change in the digestive symptoms commonly seen associated with PD.

8. Health Related Quality of Life Assessment (CDC-HRQOL14)

The CDC-HRQOL14 item measure was the tool used to assess the health-related quality of life index of the participants in the survey. This tool is mainly divided into three sections mainly, Health days Core Module (4), Activity Limitation Module (5) and Healthy Days Symptom Module(5). (Centers for Disease Control and Prevention, n.d.). Out of these three modules the score from the Healthy Days Core module was used for the analysis

in this survey. The questions in the first module are designed to receive data on estimate of number of days respondent felt physically as well as mentally unhealthy in the last 30 days. These are calculated as unhealthy days. The total Healthy Days were calculated by subtracting the unhealthy days recorded by the respondent from 30. An analysis was made to see if there were any correlations between people who attended Yoga regularly and their Healthy Days Score. The following observation was made from the survey.

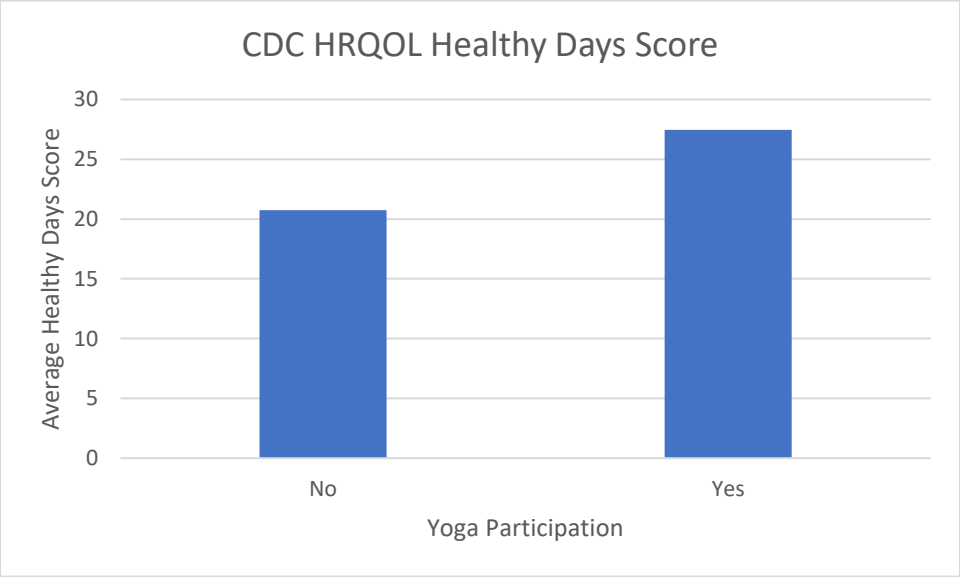

Figure 8 CDC HRQOL Healthy Days Score

The participants who responded “Yes” for attending regular Yoga classes in the survey questionnaire showed an average of higher healthy days score (Avg Score 27.44) than those who did not attend Yoga (Avg Score 20.75). Since the Healthy Dayes Score included the days, respondent felt physically and mentally healthy, this observation showed a clear correlation between having a good HRQOL and having Yoga as a part of regular fitness measure in the lifestyle of PWP. This correlation can be further studied.

9. Parkinson’s Anxiety Scale (PAS-12)

The Parkinson's Anxiety Scale (PAS-12) measure was included as a part of the survey to estimate the level of anxiety in the sample population. The PAS covers the estimate of three types of anxiety under the subscales of persistent anxiety, episodic anxiety, and avoidance behavior anxiety. Each items were scored on a five point Likert Scale ranging from severity of 'not at all' to 'most of the time'. (Leentjens et al., 2014). The average scores in all the subscales of the anxiety were higher in those who responded "No" for attending a Yoga class.

Persistent Anxiety- The average score of Persistent Anxiety was 0.325 in those who did not attending Yoga compared to those who did Yoga as their fitness routine with an average score of 0.288.

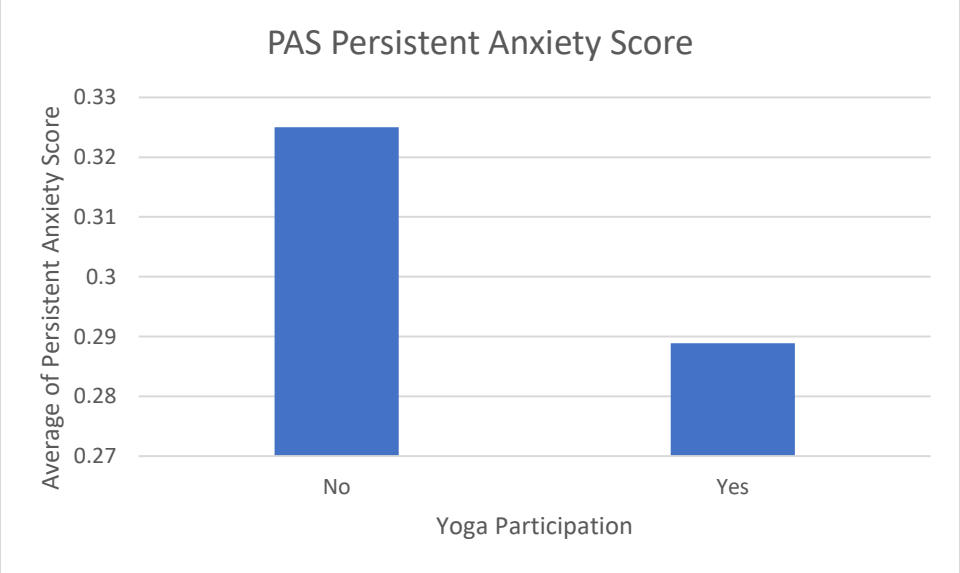

Figure 9 PAS Persistent Anxiety Score

Episodic Anxiety - The average score of Episodic Anxiety was high as 0.109 in non-Yoga practitioners compared to 0.097 who attended Yoga regularly.

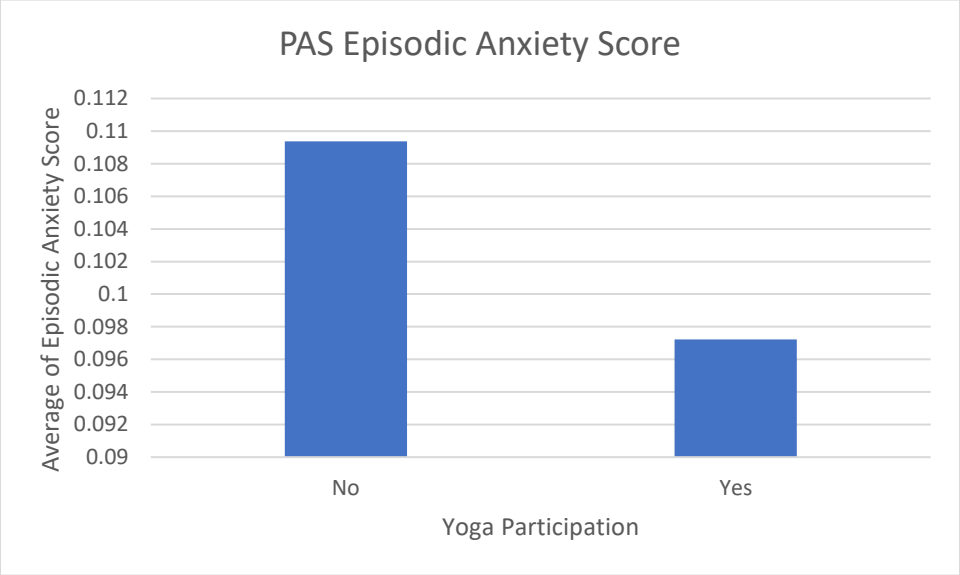

Figure 10 PAS Episodic Anxiety Score

Avoidance Behavior - The Avoidance behavior Anxiety estimated the avoidance of certain situations, places, or social gatherings due to anxiety. This average score was as high as 0.250 among those who did not practice Yoga compared to a lower score of 0.138 among Yoga practitioners.

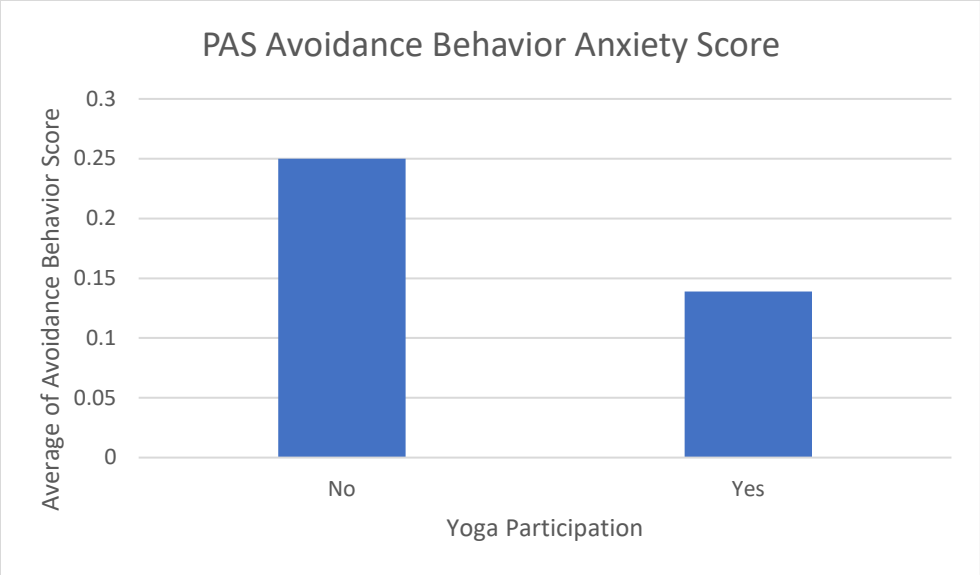

Figure 11 PAS Avoidance Behavior Anxiety Score

Conclusion

The results from the analysis concluded that Yoga was one of the top chosen fitness measures among people diagnosed with Parkinson's disease in this sample population. The survey also highlighted connection between Yoga and a good Healthy Days Score and lower anxiety levels in this sample. Yoga being a physical and mental practice that involves physical postures, breathing and meditation as its core components it may have a positive effect on overall heath. Since this was a descriptive study, with multiple variables it is hard to find direct correlation between practice of Yoga and its effect on physical and mental strength. However, a strong correlation between overall health and activity levels of an individuals who practice Yoga regularly can be made. Further experimental studies will be needed in future to prove the advantage of Yoga compared to other fitness measures.

Scope of Further Study

Similar survey can be repeated with a larger sample size to document more data that can give an inferential finding. Experimental studies can be done to find the correlation between the mental and emotional impact of regular Yoga practice routine on people diagnosed with Parkinson's. Experimental studies can be done on individual component of Yoga practice to find its effect on symptoms of Parkinson's Disease

Appendix

Google Form link to questionnaire:

https://docs.google.com/forms/d/1fAeS1UZc7WSqLYWUxCM_C9mTbPCodamZ2El9VwJTWCo/prefill

Questions were presented to participants using Google Forms in digital format. Below questions were included on the Google Form

1. Demographic
    a. Gender
    b. Age Range
2. Screening 1 (Basic screening questions)
    1. What fitness classes do you attend?
    2. Do you attend these classes online / virtual (Zoom) or in-person?
    3. How many times do you attend a fitness class (any class) in a week? This includes in-person and virtual or zoom.
    4. Which class/ classes make you feel physical strong?
    5. Which class / classes make you feel mentally strong?
    6. Which class /classes make you feel emotionally relaxed?
    7. Do you attend a Yoga class?
    8. What is the reason for not taking a Yoga class after being diagnosed with PD?
    9. What is the main reason to go to a Yoga class?

10. What style of Yoga do you practice?
11. Do you prefer Yoga class online (Zoom) or in-person?
12. What part of the Yoga class do you like the most?
13. Do you feel strong after a Yoga class?
14. Do you think your tightness and rigidity reduces after Yoga?
15. Do you see change in any of your Parkinson's symptoms after Yoga class?
16. Which of the symptoms of PD listed below get better with Yoga?
17. Do you see any change in your tremors after Yoga class? Do you feel emotionally relaxed after a Yoga class?
18. Do you feel mentally calm after a Yog Do you feel less anxious the day you do Yoga? a class?
19. Are you aware of the therapeutic benefits of certain Yoga practices in Parkinson's disease?
20. Would you recommend Yoga for Parkinson's Disease to friends and family?

3. Screening 2 (PAS-12)
    a. Parkinson’s Anxiety Scale questionnaire (PAS-12)
4. Screening 3 (CDC HRQOL-14)
    a. CDC’s Health-Related Quality of Life questionnaire (CDC-HRQOL-14)

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