INTEGRATIVE EXERCISE THERAPIES AND THEIR EFFECT ON MOTOR FUNCTION IN PATIENTS WITH PARKINSON'S DISEASE

By

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Abstract

This thesis examines current research surrounding integrative mind-body exercise therapies and their effect on motor-function in individuals who suffer from Parkinson's disorder. Parkinson's disease is a progressive neuromuscular disorder. There is no cure for Parkinson's disease. Treatment is mainly symptomatic, and medications alone cannot eradicate symptoms (Bhalsing, Abbas & Tan, 2018). Therefore, it is important to explore complementary and integrative therapies to potentially improve motor symptoms and quality of life for people with Parkinson's disease. A literature review comprised of 10 articles was conducted to examine the evidence of mind-body exercise therapies, specifically tai chi, dance and yoga. The goal of the review was to determine if these specific therapies help to improve motor function in those suffering from Parkinson's disease. This thesis will use the evidence obtained from literature review, to identify best practice recommendations. The recommendations will then be used to develop a theoretical implementation and evaluation plan for a best practice project.

Chapter One: Introduction

Statement of Purpose

The purpose of this thesis is to explore effectiveness of physical activities like tai chi, dance, and yoga on improving motor function in individuals suffering from Parkinson's disease. The aim of this thesis is to create evidence based best practices that can be implemented as plan of care for an individual suffering from Parkinson's disease. Chapter one will provide background on Parkinson's disease, the typical course of treatment and the significance to nursing.

Background of Problem

Parkinson's disease is a chronic and progressive neurological disorder that affects dopamine producing neurons in the midbrain, brainstem, thalamus and cortex. The exact pathology is unknown, but it is thought the degeneration of brain cells occurs from mitochondrial dysfunction, abnormal phosphorylation, oxidative stress, and dysfunction of the ubiquitin proteasome system which is responsible for processing intracellular proteins (McCance & Huether, 2019). Lewy bodies, or abnormal clumps of protein, are present in individuals with Parkinson's disease which indicates abnormal brain functioning (Lewis et al., 2017). The depletion of dopamine, which is an inhibitory regulator, and excitatory neurotransmitters that fire in excesses cause the symptoms of Parkinson's disease (McCance & Huether, 2017).

An individual with Parkinson's disease will present with parkinsonism, or abnormal movements. These abnormal movements include tremor, rigidity, akinesia and postural instability (Lewis et al., 2017). It affects the body bilaterally. Tremors are typically the initial sign of the disorder. They are present in the hands and are worse when the patient is not moving (Lewis et al., 2017). Passive range of motion exercises are difficult to perform due to muscle

rigidity. When the patient moves their joints, it appears jerky. Akinesia is defined as a loss of voluntary muscle movements. Parkinson's patients in particular experience bradykinesia, or slow movements (Lewis et al, 2017). Finally, the patient has postural instability which effects their gait and balance. They are unable to adjust their equilibrium to prevent falls. To compensate, they will walk with a shuffled gait (McCance & Huether, 2019). In addition to disordered movement, a patient will Parkinson's will experience symptoms like difficulty sleeping, slurred speech, sensory disturbances, apathy, depression, urge incontinence and dementia (McCance & Huether, 2019).

Parkinson's disease is progressive, and severity is defined by stages. The Hoehn and Yahr stages scale rates motor symptoms on a scale of 1-5 (Barmore, 2019). A score of one indicates early stage Parkinson's disease. A score of four or five indicates advance stage Parkinson's disease. An individual in this stage needs full assistance to walk and complete activities of daily living (Barmore, 2019) The Motor Disorder Society-Unified Parkinson Disease Rating Scale (UPDRS) also divides the progression of Parkinson's in five stages, but it is more comprehensive. It includes measures symptoms like mental functioning, mood and social interactions (Barmore, 2019). There are four parts of the MDS-UPDRS (Goetz et al., 2008). Part one measures non-motor experiences of daily living. Part two measures the motor experiences of daily living like handwriting or getting in and out of a car. Part three consists of a motor examination and part four examines motor complications like involuntary movements (Goetz et al., 2008).

Treatment Options

The typical course of treatment for Parkinson's disease is symptomatic. Dopamine agonists or dopamine precursors are the typical medications given. They stimulate the depleted

receptors and provide better muscular control. However, some of the effective medications come with severe side effects like seizures, heart attack or stroke. Additionally, after 3 to 5 years of using the medication, a patient may experience episodes of severe hypomobility when the medication dose wears off. A patient with hypomobility may not be able to speak or walk during the episodes. If a patient does not respond well to drug therapy, they may have to undergo surgical treatment. A deep brain stimulating electrode can be implanted in the brain to reduce excess activity. Ablation surgery can destroy tissues that cause the abnormal impulses (McCance & Huether, 2019).

Bhalsing, Abbas and Tan (2018) state that due to Parkinson's progressive nature, pharmacologic therapy is unable to alleviate all motor symptoms. In fact, medications like Sinemet, which is used during the initial disease treatment lose their therapeutic effects over time (McCance & Huether, 2019). Furthermore, there has been positive research that shows benefits of physical activity on improving the symptoms of motor function. Physical activity is non-invasive and has been linked to beneficial effects of reducing oxidative stress, improving mitochondrial function and enhancing neural plasticity (Bhalsing et al., 2018). Studies on animals with parkinsonism have shown that there are neuroprotective effects from physical activity, which could correlate with improvement in humans suffering from the disorder (Bhalsing et al., 2018).

Significance to Nursing

It is estimated that by 2030, 9 million individuals over 50 years old will live with Parkinson's disease (Cwiekala-Lewis, Gallek & Taylor-Pilliae, 2016). There will be a higher likelihood that a nurse will take care of an individual with the disorder. It is important to understand and offer holistic care to patients in order to improve their quality of life.

The nursing profession aims for integrative techniques to alleviate symptoms and promote health. Complementary health approaches, or practices that are used adjunctively and not considered standard practice, are becoming more common (Shin, Pohlig & Haberman, 2017). In 2016, one third of older American adults used some type of complementary health approach and reported benefits from them (Shin et al., 2017). Tai Chi, yoga, and dance are considered mind-body therapies and function as a complementary health approach (Shin, Pohlig & Haberman, 2017). Mind-body interventions put emphasis on the mind, body, and behaviors working in synchrony to improve health (Kwok, Chow & Lai, 2016). They increase self-awareness of the body, reduce discomfort and enhance coordination (Kwok et al., 2016). Nurses should be aware of these therapies as they show benefits and are safe to use. An awareness can allow nurses to advocate for their patients to participate in complementary health approaches and mind body therapies safely.

Conclusion

The aim of this thesis is to develop a best practice recommendation of integrative exercise therapies for individuals with Parkinson's disease. It is a disease with severe symptoms that effect all aspects of an individual's life. Though medications and surgery can alleviate some of the symptoms, they cause unpleasant side effects and are invasive. Physical activities can provide a non-invasive way to complement therapies and alleviate the symptoms of the disease. Mind-body therapies like yoga, tai chi and dance are a form of physical activity. The literature review will examine research of tai chi, yoga and dance and determine their benefit for individuals suffering from Parkinson's disease.

Chapter Two: Review of Literature

The PICOT(S) question used to guide this research was, in patients suffering from Parkinson's disease, how does physical activity such as tai chi, yoga and dance compared to medications alone affect motor function? CINAHL and PubMed were used to find articles. Data was limited to articles published between 2014-2019 and full text articles. Searches were conducted using the phrases: "Parkinson's", "physical activity", "yoga", "alternative therapies", "complimentary therapies", "dance", "tai chi". Articles were selected by reading the abstract and were included if they studied the effects of tai chi, yoga and dance. Though research articles were found that focused on psychological benefits of alternative exercise therapies, only articles with an emphasis on motor function were included in the literature review. Ten articles were chosen for the literature reviews; one that explored mind body therapies in general, two that focused on tai chi, five that focused on dance, and two that focused on yoga.

Effects of Mind-Body Exercises on Motor Function

In a systematic review Kwok et al. (2016) sought to examine the current literature of mind-body exercises and if there is evidence that these interventions improve physiological and psychological outcomes for patients with Parkinson's disease. Only randomized controlled trials and clinical trials were selected for the systematic review. To be included in this review, research studies needed to be in English, focus on idiopathic Parkinson disorder and the intervention needed to be mind-body exercises. There were nine articles included in the systematic review. Five examined tai-chi, two examined yoga and two were dance studies. A systematic search was completed to find articles. The articles in the systematic review were independently appraised by two reviewers. The Effected Public Health Practice Project quality assessment tool was used to rate included articles as strong, moderate or weak. A metanalysis of the study was

completed. Heterogeneity between the studies was measured by I2 tests. This determined if variation was caused from heterogenicity or chance (Kwok et al., 2016).

The average sample size of the studies varied between five and 40 participants (Kwok et al., 2016). All of the studies determined the effects of their intervention on motor function using the UPDRS III scale. There was a 70% heterogeneity found when comparing motor symptoms, but all of the studies showed a significant improvement in reducing UPDRS III scores compared to a control group in all three mind-body therapies with a $p<0.05$ (Kwok et al., 2016). The length of the intervention in all studies was 60 minutes per session over 10 to 16 weeks, however there were differences in the doses (Kwok et al., 2016). A subgroup analysis was conducted comparing the amount of sessions per week between the studies. Low dose was once per week, moderate dose was two times per week and high dose was three times per week. Moderate dosing was the only one that had significant improvement on UPDRS III scores with a $p<0.05$ (Kwok et al., 2016).

Seven studies examined the effects of postural instability on individuals with Parkinson's disease with the timed up and go (TUG) score. The meta-analysis found significant improvements to TUG scores after all of the mind-body therapy sessions compared to control groups with a $p<0.01$ (Kwok et al., 2016). The literature review found that studies with a shorter intervention of 12 weeks or less had higher adherence rates between (73.3-92.9%) compared to studies with interventions between 16 weeks to 1 year. No studies reported significant adverse events from the intervention (Kwok et al., 2016).

The researchers note there are differences in results because there were three exercises examined. Regardless, the meta-analysis determined that mind-body therapies had moderate to large significant improvement to motor function and mobility in patients with Parkinson's

disease (Kwok et al., 2016). This systemic review serves to substantiate the findings of the articles throughout chapter two as it summarizes the positive effects of tai chi, yoga and dance.

Tai Chi for Improvement of Motor Function

Yang et al. (2014) aimed to evaluate if tai chi as an adjuvant therapy was effective in improving motor function, balance and gait for people with Parkinson's disease. The systematic review and meta-analysis consisted of seven randomized control trials and one non randomized control trial. Studies were included in the review if they focused on patients with PD, compared tai chi to another variable (no therapy, placebo, other therapies), and assessed motor function, balance and gait (Yang et al., 2014). Sample sizes ranged from 20 to 195 participants and individuals had mild to moderate PD. Yang-style, Sun-style and 24-short form tai chi were used in the studies. Tai chi was compared to interventions like walking, stretching, resistance training, other exercises or no intervention (Yang et al., 2014). Motor function was measured using the UPDRS III scale in all of the included studies. Four studies measured gait velocity and endurance. Four studies measured functional mobility with the TUG. Biases of the articles were examined. Two of the articles had areas where high risk of bias could be observed (Yang et al., 2014).

The meta-analysis showed that there were improvements in UPDRS III scores compared to no intervention with a $p=0.03$ (Yang et al., 2014). However, there was not significant improvement in scores after tai chi was compared to other exercise intervention with a $p=0.11$. There were no significant improvements to gait in any of the studies when tai chi was compared to other active therapies. However, there were significant improvements in TUG scores compared to no intervention with a $p<0.00001$ (Yang et al., 2014). The researchers report that TUG scores improved when compared to individuals that used stretching therapy, however there

was no clear evidence provided by researchers to support this. The researchers determined that tai chi is a safe way to potentially improve mobility and balance for people with Parkinson's disease. They hypothesized this could be from the slow movements and concentration needed to perform tai chi, which improves the strength of legs and stability (Yang et al., 2014).

Cwiekala-Lewis, Gallek and Taylor-Piliae (2016) conducted a systematic review to examine the effects tai chi has on function for individuals with Parkinson's disease. The quality of the articles was assessed independently by two authors using the Quality Index checklists. If there were discrepancies in scores, the articles we rechecked, and a consensus was made from discussion. Out of 196 articles identified, 12 were used in the review, which incorporated 11 studies. Seven were randomized control trials and four were quasi experimental studies. In the 11 studies, there were 229 participants who received a tai chi intervention and 277 who received another, or no intervention. The predominant style used among studies was Yang style, the average length of the intervention was 24 sessions over 12 weeks and there was a 90% adherence rate (Cwiekala-Lewis et al., 2016).

The studies examined variables like balance, gait, mobility, motor disability, aerobic endurance and well-being. Five RCTs and two quasai experimental studies examined found statistically significant evidence of improved balance post intervention in participants who did tai chi; both had p values of $p<0.05$ (Cwiekala-Lewis et al., 2016). Four RCTs assessed gait, but only one found a statistically significant improvement after the tai chi intervention ($p<0.05$). The study was conducted by Li et al. (2012) and the intervention occurred over 48 sessions in 24 weeks. This was the longest intervention of all the studies. Six articles examined mobility in patients with Parkinson's disease and three of them found statistically significant improvements ($p<0.05$) in mobility after the tai chi intervention (Cwiekala-Lewis et al., 2016). Five studies

used the UPDRS to examine motor disability, and two showed statistically significant results ($p<0.05$) post intervention. Five studies examined aerobic endurance using the 6MWT or 50-foot walk test. One RCT, one quasai-experimental and one controlled trial without randomization found statistically significant improvements to endurance after completing the intervention with a $p<0.05$ (Cwiekala-Lewis et al., 2016). Two randomized control trials examined fall rates and there were significantly fewer falls in the tai chi group than the control group ($p<0.05$). The systematic review article cites articles that found statistically significant results from strength testing (Cwiekala-Lewis et al., 2016). However, it does not specify how strength was tested. The reviewers concluded from the studies that tai chi is safe and has indications that it can improve motor function in patients with Parkinson's. This is clinically important because it is a cost-effective program that can be implemented in settings where people with Parkinson's disorder can utilize them (Cwiekala-Lewis et al., 2016).

The review has some limitations. Only one of the studies included had a quality index score of 30, the remaining studies were 21 and below, the lowest being 14 (Cwiekala-Lewis et al., 2016). The p values presented were not specific only $p <.05$ or $p>0.05$. The time and frequency of the interventions drastically varied between the studies and the sample sizes were below 100. Additionally, only 42% of the studies included in the review report adherence rate (Cwiekala-Lewis et al, 2016). This limits generalizability to the general public, as some individuals with Parkinson's may not be able to complete a more intensive program. The review concludes that more research needs to be completed. Future studies need to be more rigorous randomized controlled trials, with an adequate same size and intervention dose (Cwiekala-Lewis et al., 2016).

Dance for Improvement of Motor Function

Rocha, Slade, McClelland and Morris (2017) conducted a qualitative analysis to determine how people with Parkinson's disease experienced therapeutic dance classes and the best way to design a dance class for patients. Participants were recruited via email and consisted of five people with PD, five dance instructors and six allied health professionals. The PD participants must have taken a previous therapeutic dance class. Instructors needed to have experience teaching individuals with PD. The health professionals were included if they had experience working with people with PD (Rocha et al., 2017). The study was quantitative, and data were collected from a three-hour discussion forum. The forum was led by a postdoctoral physical therapist. The meeting was recorded and transcribed verbatim. There were two clinicians assigned to overserving body language and behaviors of the participants. The data were analyzed using grounded theory which determines codes, categories, themes and subthemes in the research (Rocha et al., 2017).

Four themes emerged from the research: "There is a need to consider the stage of disease progression when designing classes", "The recognition that dance is just more than therapy", "The benefits of carefully selecting music to move by", and "Ways to design classes that are both feasible and engaging" (Rocha et al., 2017). Theme one revealed that some individuals with PD might prefer classes separated by stages of the disease so they can dance with people at the same level as them and feel less uncomfortable. The dance instructors felt that there would discrimination if people were separated by their stage (Rocha et al., 2017). Under theme two, participants with PD felt that the most important therapy goal of the dance classes was to improve their motor symptoms. The dance instructors felt that the art of dance itself should be a higher priority, but the health professionals corroborated the views of the individuals with PD

and that their needs are important to consider for a successful program (Rocha et al., 2017). Theme three determined that music with a clear strong purposeful beat can help combat motor symptoms. Theme four discussed the logistics of a dance class. The participants agreed that the class should be at least one hour, two times per week for two months or more. There should also be time for socialization between individuals with PD (Rocha et al., 2017). The class itself should be divided into three phases: a warm-up, dance routines and a cool down. The dance routines should have a variety of repetitive movements and positions. The study participants also discussed that a PD specific dance class can be expensive which may limit the number of qualified instructors and participants (Rocha et al., 2017).

This article has credibility as two researchers independently reviewed the data before discussing their results together. There was a diverse sample of participants from different backgrounds, however only three of the 18 people included in the study were male. The results were audio recorded and transcribed verbatim at a different time. The researchers present actual quotes from participants to support their themes. This article has a level of evidence of VI (Rocha et al., 2017).

Aguiar, Rocha and Morris (2016) utilized a systematic review to determine how different dance genres affect mobility and quality of life of people with Parkinson's disorders. One main reviewer and two independent researchers selected the articles. To be included, articles needed to be only randomized controlled trials, quasi-randomized control trials and case series. Participants in the studies had to be over 18 years old, diagnosed with PD and staged 1-4 on the Modified Hoehn and Yahr scale. Of the 133 articles identified, 18 were included in the review (Aguiar et al., 2016).

The review included tables outlining the results of all the articles. There were nine randomized controlled trials included in the review. Tango was the primary form of dance investigated in the RCTs (Aguiar et al., 2016). The intervention groups were tested for variables like mobility, balance, freezing of gait, walking distance using tools like the 6MWT, TUG, FOG-Q (Freezing of Gait), Mini-BESTest and the MDS-UPDRS III. The results of the RCTs indicate improvements after undergoing a tango intervention compared to the control group. One study conducted by Volpe (2013) tested the effect of a six-month, one day per week, 90-minute Irish dancing class intervention had on balance, freezing of gait and disease severity. The results showed significant improvements in mobility, disease severity and FOG. The non-randomized control trials and case studies substantiate the results of the randomized control trials; that there were improvements in motor function individuals with PD (Aguiar et al., 2016).

This review supports that therapeutic dancing, particularly tango, can help improve motor function. Though not all of the studies showed statistically significant results, the studies presented similar findings. This indicates that there can be clinical significance, however more research needs to be done on partner dancing and classes besides tango (Aguiar et al., 2016). The sample sizes of the studies were small which reduces generalizability. The researchers declared that they did not have any conflicts of interest but did not specify other biases. Additionally, the reviewers did not conduct a meta-analysis of the results found in the studies, therefore there is not statistical evidence to summarize the results (Aguiar et al., 2016).

Delabary et al. (2017) analyzed the results of randomized clinical trials that compared a dance intervention to other interventions or no intervention using a systematic review with meta-analysis. To be eligible for inclusion in the review, studies were randomized clinical trials, had an intervention for at least three weeks and measured gait. Studies were selected by two

reviewers to be included and reviewed for bias. If there was a dispute between the two reviewers, a third would evaluate the article. Two subgroups were created from the RCT's: trials that compared dance to another exercise and trials that compared dance to no intervention (Delabary et al., 2017). Separate meta-analyses were conducted for each. Five RCTs were selected for the systematic review. The five studies had a total of 159 participants, 79 were exposed to a dance intervention and 80 were not (Delabary et al., 2017).

The first subgroup contained three RCTs that compared dance to another intervention (Delabary et al., 2017). Rios Romenets et al. examined the effect of tango classes two times per week for 12 weeks versus self-directed exercises. There were 18 PD participants in the dance group and 15 in the self-directed exercise group. Volpe et al. compared 12 PD patients who took a 90-minute Irish dance classes once a week for 6 months to 12 patients who did physiotherapy during the same time. Finally, Hackney et al. investigated the difference between 9 PD individuals who completed 20, 1-hour tango classes twice per week and 10 participants who performed regular exercise. The meta-analyses for the first subgroup showed there were statistically significant improvements of motor symptoms, using the UPDRS III, ($p=0.02$) and functional mobility, using the TUG test, ($p=0.01$) in individuals who completed the dance intervention (Delabary et al., 2017). All of the studies compared freezing of gait, using the FOG-Q, which showed improvements after taking dance classes, but did not have statistically significant results. The researchers determined that this could be due to random effect (Delabary et al., 2017).

The second subgroup contained two RCTs that compared an intervention to no intervention. Both of the studies consisted of Tango class interventions one hour two times per week. Duncan and Earhart analyzed the effects of classes versus no classes for 12 months.

Hackney and Earhart observed participants over a 10-week period. The UPDRS III scale was used to measure motor symptoms and meta-analysis shows there were significant improvements in the intervention group with a p=0.003 (Delabary et al., 2017). The 6MWT was used to measure endurance of the participants and there were no statistically significant improvements. Freezing of gait was measured using the FOG-Q and though the results favored improvement from the dance classes, there was not statistically significant evidence. Forward and backward walking velocity was also measured by the two studies, but there were not statistically significant results (Delabary et al., 2017).

This systematic review is credible. The researchers identified articles with biases in them and provided specific tables of their results. However, there was not a description of determining study quality. The systematic review found evidence that supports dance classes can improve motor symptoms and functional mobility in patients with Parkinson's disease (Delabary et al., 2017). This holds clinical significance because improvement of the symptoms associated with Parkinson's disease can lead to a better quality of life, prevent fall risks and promote autonomy. The reviewers found that the randomized control trials included in the study lacked specificity of what occurred in the dance classes (Delabary et al., 2017). The studies had different types of dance at different durations and intensities. Additionally, there is a limited number of studies that investigate the relationship between dance and Parkinson's disease. The researchers suggest that future studies contain specific protocols and defined intensity (Delabary et al., 2017).

Duncan and Earhart (2014) created a pilot study to determine if a 2-year community dance class could improve functional mobility for individuals with Parkinson's disease (PD). 10 individuals were included in the study under the criteria that they were diagnosed with idiopathic PD, over 40, taking levodopa medication (Duncan & Earhart, 2014). Participants did not have

any additional neurological or musculoskeletal abnormalities besides Parkinson's disorder or a serious medical condition. The Argentine Tango (AT) group consisted of five participants who underwent biweekly 1-hour tango class. After one year of completing the class, participants were offered an additional year of classes. The other five participants were assigned to a control group and were told to continue their normal physical activity regimen. Normal activity did not include dancing. All participants agreed to be evaluated at the start of the study, at 12 months and 24 months (Duncan & Earhart, 2014). The researchers measured PD motor symptoms using Sections I-III of the MDS-UPDRS. Balance was measured by the Mini-Balance Evaluation Systems Test (Mini-BESTest). The test measures 14 balance tasks on a scale of 0-2, a higher score indicating better balance. Gait velocity was measured by having participants walk forward and backward on a GAITRite walkway, Timed Up and Go Test and a Six Minute Walk Test. Participants were assessed when they were at least 12 hours off their medication (Duncan & Earhart, 2014).

At 12 and 24 months, participants in the AT group had significantly lower MDS-UPDRS II and III scores than the control group. These results were statistically significant with $p= 0.04$ for MDS-UPDRS III and $p=0.05$ for MDS-UPRDRS II (Duncan & Earhart, 2014). The AT group showed better results for the Mini-BESTest scores at 12 months than the control group at 12 and 24 months at a $p<0.001$ (Duncan & Earhart, 2014). The only statistically significant gait measure was the results of the Six Minute Walk Test at $p=0.013$. The AT group was able to walk farther distances in six minutes compared to the control group who's distance continuously declined over 24 months (Duncan & Earhart, 2014). The researchers hypothesize that the increased results of the MSD-UDSRS II are a reflection of the increase in scores from MSD-UPDRS III. Section II is a measurement of ADL's which may become easier if the motor

symptoms and balance are improved. (Duncan & Earhart, 2014). Mini-BESTest scores increased because dancing requires starting and stopping. The 6MWT scores did not decline as significantly for the AT participants because dancing increased cardiovascular endurance and balance (Duncan & Earhart, 2014).

The findings of this study align with previous randomized control trials of a 1 year AT dance therapy (Duncan & Earhart, 2014). When the participants were examined by researchers it was a blind group assignment. Additionally, the measurements were consistent as they were measured in the same order with each visit. However, this study has limitations. The sample consists of people who wanted to continue the program for 2 years, therefore those individuals are motivated to exercise. That bias and a small sample size may make it not generalizable to all PD patients. The classes offered were only Argentine Tango, it is unclear if other dance classes would have the same results. This article has a level II evidence, it is a single randomized control trial (Duncan & Earhart, 2014).

Similarly, McKay, Ting and Hackney (2016) developed a pilot study examining the effects of Adapted Tango Dance therapy. The goal was to determine if Adapted Tango classes held for 90 minutes, five times per week over 3 weeks would be feasible and effective (McKay, Ting & Hackney, 2016). The researchers also wanted to determine if Adapted Tango could be effective in changing center of body mass and electromyographic activity in patients with mild to moderate Parkinson's disorder. McKay et al (2016) chose Adaptive Tango for their study because studies have shown partnered dance can help improve balance. Additionally, high volume lower intensity exercise therapies have increased gait speed. It was an observational study with no control group (McKay et al., 2016).

The study consisted of 22 participants, but only 20 completed all of the assessments. To be included in the study participants needed to be over 35 years old, have a definite diagnosis of idiopathic PD. Participants were observed one week before and one week after the intervention (McKay et al., 2016). Then, there was a 1 month follow up. The Adapted Tango class consisted of warmups, walking to tango rhythms in order to control gait cycle, and dancing with a partner. Study participants were paired with individuals without PD. They were allowed to take breaks during the 90-minute class as needed. The researchers evaluated balance and gait using the UPDRS-III, dyskinesia, The Berg Balance Scale (BBS), Dynamic Gait Index, Fullerton Advanced Balance Scale (FAB), Functional reach (FR), Two Footed Jump test, 6 Minute walk test (6MWT), Single and Dual Timed up and Go test (TUG). Nine participants were selected to undergo perturbation testing in addition to balance and gait (McKay et al., 2016). This testing was used to observe automatic postural response. Patients were strapped to a harness on a perturbation platform and were instructed to maintain their balance with their feet in place while the platform shifted.

The program had a 77% adherence rate, which indicates that the program could be feasible. There were statistically significant results comparing the pretest and posttest scores of the participants on BBS test ($P<0.01$), FAB ($P<0.001$) and DGI ($P=0.01$) and maintained their values during the one month follow up (McKay et al., 2017). Additionally, the UPDRS-III scores decreased significantly ($P<0.01$) from the pretest to the follow up. The researchers found that there was a reduction displacement of the participants center of mass (CoM) during forward perturbations ($P=0.03$). McKay et al. (2016) found a significant correlation between the reduced forward perturbation CoM displacement and the increased BBS ($P=0.04$) and DGI (0.03) scores.. Strengths of this study include a high retention rate and consistency in the measurements. The

exams were administered by the same rehabilitation scientist at each observation. The results from this trial was comparable to longer high intensity dance trials. The study did not have a control group, had a convenience sample and was short in duration (McKay et al., 2016). This article has a Level III of evidence.

Yoga for Improvement of Motor Function

Puymbroeck at al. (2018) used a randomized control trial determine the effect an 8-week hatha yoga intervention had on motor function, balance, postural stability and freezing gait in people with Parkinson's disease. Hatha yoga consists of combining positions, breathing and meditation. It was chosen for this study because research has shown that when used together, breathing and postures produce different effects than regular exercise. Participants were included in the study if they were diagnosed with PD with a rating of 1.5-3 on the Modified Hoehn and Yahr Scale of Parkinson's Disease Progression, can stand and walk 10 meters, speak English, scored above a 4 on the Minimental Status Exam, and can attend two weekly sessions for 8 weeks (Puymbroeck et al., 2018). There were 30 participants selected and randomly assigned to the yoga group or wait list control group. The intervention group received two modified yoga classes per week for 8 weeks. The control group received no intervention but was offered the intervention after the study concluded. Both groups were assessed at baseline and after the conclusion of the program. They were tested on the MDS-UPDRS III, Mini-BESTest, Functional Gait Assessment (FGA) and the FOG (Puymbroeck et al., 2018).

Out of the 30 individuals recruited for the study, only 27 completed it. Of the 27, 15 received the intervention and 12 were in the control group (Puymbroeck et al., 2018). At the end of the intervention there was a statistically significant improvement in the FGA for the intervention group at $p<0.0001$. There was a significant improvement in the yoga group for

Freezing of Gait scores (p=0.018) and the MDS-UPDRS III (P=0.0102) scores. The control group did show improvements in the Mini-BESTest scores with p=0.0012 (Puymbroeck et al., 2018). Additionally, the yoga intervention led to changes in the Modified Hoehn and Yahr Score. At baseline there were zero individuals in stage one, 10 classified as stage 2, and four as stage 3. After the yoga intervention two individuals were classified as stage one, seven were stage 2 and zero were stage three. The results indicate that a yoga intervention can improve motor function, balance and gait in individuals with PD (Puymbroeck et al., 2018).

The assessment tools chosen had high test-retest and interrater reliability. They also were conducted by individuals who were trained for each assessment. Limitations of this study include the possibility of "practice effect" among the control group. The control group might have practiced the movements before testing which could indicate why there were improvements in balance and functional gait in the control group. Additionally, there might be bias that the participants who volunteered for the study may be more willing to have an active lifestyle, which may not apply to the general population of people with PD (Puymbroeck et al., 2018). The level of evidence is II.

Ni, Mooney, and Signorile (2016) were more specific. They conducted a pilot study to determine the efficacy of Vinyasa, a high-speed style yoga practice, improved bradykinesia, rigidity, muscle function and overall quality of life in patients who have mild to moderate Parkinson's disorder (Ni et al., 2016). Patients were included in the study if they were between 60 and 90 years old, were diagnosed with under stage III Parkinson's disease. Additionally, participants had to be able to ambulate, sit and stand up from the ground without assistance. The sample consisted of 27 patients. Fifteen participants were divided into the intervention group, and 12 patients were in control group (Ni et al., 2016). The intervention consisted of a power

yoga program (YOGA). The group style program combined fast transitions between poses and strengthening positions to promote balance. The class occurred two times per week over 12 weeks and increased in difficulty throughout the study. The control group continued with their typical care and were provided non-exercise classes during the 12 weeks. Strength and power, rigidity and bradykinesia were measured via a pre and post-test. Strength and power were determined from five pneumatic resistance machines. Rigidity and bradykinesia were determined from the URDRS motor exam. A Parkinson's disease questionnaire (PDQ-39) was also given to patients before and after the study (Ni et al., 2016).

The YOGA intervention was well tolerated by participants and 13 of the 15 finished the program. There were statistically significant improvements in the YOGA group in all measured categories. After the 12-week program, YOGA participants showed a decrease in their bradykinesia (-4.5 in upper limbs, and -2.5 in lower limbs) and rigidity (2.6 decrease) scores compared to the control group (Ni et al., 2016). There was a statistically significant increase in strength scores among the YOGA participants. The most notable was the seated calf raises with a $p < .001$ (Ni et al., 2016). The PDQ-39 determined that the mobility was improved in the post-test in patients that participated in YOGA. There was mean decrease in the score by 5.6 compared to a 1.1 increase in score from the control group. This result was statistically significant at $p=.025$ (Ni et al., 2016) These results indicate that a 12-week vinyasa style yoga program can improve motor symptoms in patients with Parkinson's. This study is strong because it had a high retention rate and individuals were able to attend on average 22 of the 24 sessions. The small sample size is a limitation. Patients had mild to moderate PD and were examined during when they were not feeling stiff and slow. A limitation is the short duration of the

program and that it is a pilot study. More studies, with larger sample sizes and longer durations need to be conducted (Ni et al., 2016). It is a level two evidence.

Conclusion

Mind body interventions "increase self-consciousness of body, increase the energy, mental clarity, concentration and ability of an individual to tolerate physical discomfort" (Kwok et al, p. 122, 2016). This literature review consisted of ten articles that examined three types of mind-body interventions: tai chi, dance and yoga. The articles varied between systematic reviews with meta-analyses, pilot studies, randomized controlled trials and qualitative appraisals. In most studies participants were over 35 years old and had idiopathic Parkinson's disease between stages 1-4. Participants were taking medication like Levodopa in conjunction with the exercise therapy (Duncan & Earhart, 2014). Many of the reviews had small sample sizes between 20-30 participants and individuals who completed the studies may have been more motivated to do exercise therapies than the general population (Puymbroeck et al., 2018).

Though measurements varied between studies, there is evidence from all studies that each type of integrative exercise therapy showed statistically significant improvements in motor function for individuals with Parkinson's disease. The review indicates that any of the three exercises could be a beneficial addition to typical treatment modalities. However, the findings of chapter two suggest more research needs to be done. Future studies should compare the effects of tai chi, yoga and dance as interventions. This could determine if one exercise therapy is superior to others at improving motor symptoms. Regardless, exercise therapies show improvement compared to none (Yang et al., 2014). This literature review will assist in making evidenced-based practice recommendations that health care providers can use to help improve motor function in patients with Parkinson's disease.

Chapter 3: Best Practice Recommendations

This purpose of this thesis is to formulate best practice recommendations based on current research about integrative mind-body exercise therapies and their effect on motor-function individuals who suffer from Parkinson's disorder**.** Chapter three will outline the proposed best practice recommendations to consider when developing a complementary exercise program. Table one organizes each recommendation with relevant rationale.

Table 1

Best Practice Recommendations for Improving Motor Function Patients with Parkinson's Disease

Recommendations	**Rationale**	**References**	**Study Design & Level of Evidence**
Integrative exercise therapy (tai chi, dance or yoga) is better than doing no exercise at all.	Any integrative therapy, regardless of type is better than doing no exercise at all when improving motor function. Individuals could have a choice of class they enjoy, and it could make the experience more fun.	Kwok, J. Y., Chow, C. K., & Lai, C. H. (2016). Effects of mind-body exercises on the physiological and psychosocial well-being of individuals with Parkinson's disease: A systematic review and meta-analysis. *Complementary Therapies in Medicine*, 29, 121-131. Doi:10.1016/j.ctim.2016.09.016.	Systematic Review with Meta-Analysis Level I
Any exercise intervention should be 60 minutes, 2x per week for 10-12 weeks.	There were statistically significant improvements in UPDRS scores for this time frame across various studies. There will be a higher	Cwiekala-Lewis, K. J., Gallek, M. & Taylor-Pilliae, R. E. (2016). The effects of tai chi on physical function and well-being among persons with Parkinson's disease: A systemic review. *Journal of Bodywork & Movement Therapies*, 21, 414-421. doi:10.1016/j.jbmt.2016.06.007.	Systematic Review Level I

	adherence rate within this time frame. People with the disorder may not feel comfortable committing to a long program if their disease worsens.	Delabary, M., Komeroski, I. G., Monteiro, E. P., Costa, R. R., & Haas, A. N. (2017). Effects of dance practice on functional mobility, motor symptoms and quality of life in people with Parkinson's disease: a systematic review with meta-analysis. *Aging Clinical and Experimental Research,* 30, 727-735. doi: 10.1007/s40520-017-0836-2	Systematic Review with Meta-Analysis Level I
		Kwok, J. Y., Chow, C. K., & Lai, C. H. (2016). Effects of mind-body exercises on the physiological and psychosocial well-being of individuals with Parkinson's disease: A systematic review and meta-analysis. *Complementary Therapies in Medicine*, 29, 121-131. Doi:10.1016/j.ctim.2016.09.016.	Systematic Review with Meta-Analysis Level I
		Ni, M., Mooney, K., & Signorile, J. F. (2016). Controlled pilot study of the effects of power yoga Parkinson's disease. Complementary Therapies in Medicine, 25, 126-131. doi: 10,1016./j,ctim,2016,01.007.	Randomized Control Trial Level II
		Rocha, P. A., Slade, S. C., McClelland, J., & Morris, M. E. (2017). Dance is more than therapy: Qualitative analysis on therapeutic dancing classes for Parkinson's. Complementary Therapies in Medicine, 34, 1-9. doi: 10.1016/j.ctim.2017.07.006	Qualitative Study Level VI
Therapies should aim to partner people with the same level of motor function.	Doing this makes people more willing to participate and more comfortable if they are with individuals of a	Rocha, P. A., Slade, S. C., McClelland, J., & Morris, M. E. (2017). Dance is more than therapy: Qualitative analysis on therapeutic dancing classes for Parkinson's. Complementary Therapies in Medicine, 34, 1-9. doi: 10.1016/j.ctim.2017.07.006	Qualitative Study Level VI

	similar skill level.		
Classes should be designed with warmup, routines to target motor symptoms, a cool down and encouraged breaks.	Study participants voiced they wanted a class that focused on targeting their symptoms. A warmup, breaks, and cool down make participants feel more comfortable.	McKay, J. L., Ting, L. H., & Hackney, M. E. (2016). Balance, body motion and muscle activity after high-volume short-term dance-based rehabilitation in individuals with Parkinson's disease A pilot study. *Journal of Neurologic Physical Therapy*, 40(4), 257-268. doi:10.1097/NPT.0000000000000150 Rocha, P. A., Slade, S. C., McClelland, J., & Morris, M. E. (2017). Dance is more than therapy: Qualitative analysis on therapeutic dancing classes for Parkinson's. *Complementary Therapies in Medicine,* 34, 1-9. doi: 10.1016/j.ctim.2017.07.006	Controlled Trial Level III Qualitative Study Level VI
Adapted Tango is the preferred dance class for individuals with Parkinson's disease.	Across multiple studies, adapted tango classes have been shown to significantly improve UPDRS III scores functional mobility and balance.	Augier, L. P., da Rocha, P. A., & Morris, M. (2016). Therapeutic dancing for Parkinson's Disease. *International Journal of Gerontology,* 10, 64-70. doi: 10.1016/j.ijge.2016.02.002 McKay, J. L., Ting, L. H., & Hackney, M. E. (2016). Balance, body motion and muscle activity after high-volume short-term dance-based rehabilitation in individuals with Parkinson's disease A pilot study. *Journal of Neurologic Physical Therapy*, 40(4), 257-268. doi:10.1097/NPT.0000000000000150	Systematic Review Level I Controlled Trial Level III
When looking at expense, Tai Chi is the most cost-effective program.	Tai Chi is based on slow safe movement. It can be easily implemented in	Cwiekala-Lewis, K. J., Gallek, M. & Taylor-Pilliae, R. E. (2016). The effects of tai chi on	Systematic Review Level I

	settings where people with Parkinson's Disorder can participate.	physical function and well-being among persons with Parkinson's disease: A systemic review. *Journal of Bodywork & Movement Therapies*, 21, 414-421. doi:10.1016/j.jbmt.2016.06.007	

Summary of Best Practice Recommendations

As mentioned at the end of chapter two, the literature review determined that several integrative exercise techniques: tai chi, dance or yoga can be utilized to see improvements in motor function (Kwok et al., 2016). Among all exercises, there was found to be some improvement to UPDRS III scores compared to no exercise at all (Kwok et al., 2016). This means that individuals can choose a modality that best fits their interests, which may increase adherence rate (Kwok et al., 2016). When designing an integrative exercise therapy program, regardless of the type of therapy, the classes should be around 60 minutes at least two times per week over a duration of 10-16 weeks (Kwok et al., 2016). Cwiekala-Lewis et al. (2016) found that 24 sessions over 12 weeks had a 90% adherence rate. There were significant improvements to mobility observed across numerous studies came from interventions that were in this time frame.

Additionally, when designing a class, people of similar skill levels should be placed together. Rocha et al. (2017) used qualitative interviews to gather that individuals felt more comfortable participating in classes with people of similar motor skills. Designing classes for people at different levels in the disease progression, could be more generalizable for individuals with Parkinson's disorders. Some people may not be able to complete a class that is more intense (Cwiekala-Lewis et al., 2016). Furthermore, research indicates that in order for the exercise to be successful it should be designed to target specific motor symptoms (Rocha et al., 2017). For example, Yang et al. (2014) hypothesized that the improvement in motor symptoms,

leg strength and stability from tai chi could be attributed to the slow movements and concentration done in Tai Chi. Finally, expenses must be considered when considering classes to implement. Tai Chi is inexpensive and can be implemented in a variety of settings due to structure of classes (Cwiekala-Lewis et al., 2016). In contrast, yoga and dance classes may be more costly. The classes would need to hire instructors that have worked with individuals with Parkinson's disease in order to create a safe and adapted program (Rocha et al., 2017).

Chapter 4: Implementation and Evaluation

The purpose of chapter four is to develop a proposed theoretical implementation and evaluation plan of online mind-body exercise program specifically tailored for individuals with Parkinson's disease. The online exercise program would feature a variety of classes with live instructors. This would allow participants to partake in exercises from their homes. This could be beneficial in recruiting more individuals who may not have transportation to and from community centers where classes would typically be held. A study conducted by Baez et al. (2017) reviewed the efficacy of an online exercise program for older adults. The researchers found that an online group exercising program is equally effective in motivating older individuals to exercise when compared to traditional home-based exercise (Baez et al., 2017). The proposed online exercise program proctored through a video conferencing service could allow individuals with Parkinson's disease to stay healthy at home while working to improve their motor symptoms.

Evidence from all the research in chapter two supports that any mind-body integrative therapy could be implemented to improve mobility in individuals with Parkinson's disease (Kwok et al., 2016). Therefore, the proposed online program would allow individuals with Parkinson's disease to choose between tai chi, dance, and yoga classes specifically targeted for improving motor symptoms (Rocha et al., 2017). It is important that individuals who participate in this program have a choice of classes they take. Participants should enjoy the integrative exercise they choose. This will increase adherence rate to the program, because they would be motivated to continue exercises they enjoy (Kwok et al., 2016). The best practice project will be theoretically implemented and evaluated using the Plan, Do, Study, Act (PDSA) Cycle

improvement model from the Institute for Healthcare Improvement (Institute for Healthcare Improvement, 2017).

Implementation

Plan. The first step in the planning phase of the PDSA cycle and implementation process is forming a team through organizing community resources (Institute for Healthcare Improvement, 2017). The proposed online classes will begin on a small scale within the Tucson community. The American Parkinson Disease Association has a chapter in Tucson, Arizona that offers various resources for families. This includes support groups, educational resources and an opportunity to contact physicians (American Parkinson Disease Association, 2020). The chapter would be contacted via phone and email to help with the recruitment process for the online program. They would be presented with data collected from the literature review to support the importance of the classes. The American Parkinson Disease Association could also help involve key stakeholders to fund the project (Institute for Healthcare Improvement, 2017).

After forming a team, the next step is determining a clear, measurable objective to guide the program planning (Institute for Healthcare Improvement, 2017). This would allow all team members to be clear on the purpose of the program and the outcome they want to achieve. It is imperative the program is safe for all participants as individuals with Parkinson's disease are at a higher risk for falls (McCance & Huether, 2019). After objectives are determined, the logistics of the program can be formulated. The final step in the planning process is to establish measures of how the program will be evaluated. Participants that are recruited for the study will complete a pre and post program survey. The survey will ask participants various questions to evaluate and rate their experience with the program. The pre and post surveys are included Appendices A and B.

Do. The next step in the PDSA cycle for improvement is to carry out the online program on a small scale in the Tucson community (Institute for Healthcare Improvement, 2017). The plan would be outlined to healthcare providers in Tucson through a short presentation of the proposal. Then, the healthcare providers would be asked to assist in the recruitment process. They would assess their patients to determine individuals that could safely participate in the program. The goal would be to recruit 30 individuals with stages 1-4 of Parkinson's disease to participate in the live online program (Puymbroeck et al., 2018). This number was chosen because the sample size and demographic are similar to those in the literature review.

Tai chi, dance, and yoga classes would all be offered with the online program. All classes would be live through a video conferencing service and led by an instructor that is certified to teach individuals with Parkinson's disease. This ensures the exercises target specific motor symptoms and are safe (Rocha et al., 2017). A schedule would be sent to participants each week outlining the types classes offered and at various times of the day for that week. This would allow people to fit the exercise into their schedule. Each type of modality would have a both a beginner and intermediate class. Evidence shows that people feel more comfortable participating in classes with people of a similar disease stage or skill level as them (Rocha et al., 2017). Per the best practice recommendation, individuals would be asked to participate in at least two classes per week. These could be two different exercises or two of the same modalities.

Participants would log onto the video streaming platform at the time of the class they selected. All of the classes would be 60 minutes long and include a warmup, exercises that target motor symptoms, a cool down, and have encouraged breaks (McKay et al., 2016). Since the program would be live, time should be allotted for participants to socialize with other classmates (Rocha et al., 2017). To start on a small scale, the initial program would go for four weeks.

Throughout the duration of the program, participants would be asked to fill out an exercise log. This exercise log will track when they participated in the classes and their experience with the class on that day. The exercise log is in Appendix C. At the end of four weeks, participants would complete a post-survey with their feedback.

Evaluation

Study. The Institute of Healthcare Improvement stresses the importance of analyzing data and measurements. Measurement allows the team to determine if the program actually led to an improvement (Institute of Healthcare Improvement, 2017). Within a week of the completion of the program, a post program survey (included in the Appendix) would be distributed to participants. Data would be recorded from the surveys and considered when developing future programs. Additionally, the program adherence rate would need to be studied in order to determine if the program was successful at retaining participants. Since the program would be offered via live classes, the instructors would document each person who attended their class. This data would be put into a spreadsheet to track how many classes the participants attend throughout the four-week time period. Participants would also be given a hard copy of an exercise log to fill out as they do the classes.

Act. The final stage of the PDSA cycle is to use the data collected from the program evaluation to determine modifications that can be made to improve the program (Institute for Healthcare Improvement, 2017). Feedback from participants would be imperative to help modify the structure of the class for future implementation. For example, their feedback could determine if the instructor-led live online classes were successful or if participants would prefer pre-recorded video. It also could determine if there is a type of modality participants preferred over another. The pilot program would only be implemented for four weeks, but if it was

successful it could potentially be extended to 10-12 weeks. Based on the data collected from the literature review, this time frame is the best practice recommendation to see improved results and sustained adherence to the program (Kwok et al., 2016). Eventually after repeated PSDA cycles, a successful implementation could lead to a spread of changes (Institute for Healthcare Improvement, 2017). The program could be offered to more individuals across Arizona.

Strengths and Limitations of Thesis Project

A strength of this thesis project is the quality of evidence obtained from the literature review. The research included in chapter two is within the last six years. Many of the articles were systematic reviews and most had statistically significant improvements in at least one area of motor function. This thesis also studies the effect of three different integrative mind-body therapies. This gives individuals with Parkinson's disease a choice in a therapy that best suits their needs and interests. Additionally, if small scale trials of the live online program were successful, it is a program that could be easily implemented on a larger scale.

However, there are several limitations to this thesis project. The best practice project is a theoretical implementation and evaluation plan. There would be more aspects to consider in a real implementation plan. A major consideration would be the safety of older participants. If they are completing the exercise alone in their homes, there is a risk for injury. In a real implementation, there would need to be concrete safety measures in place. This program could be expensive because there are six types of classes offered with live specially trained instructors. This could make it difficult to locate enough funding. Some individuals may not have access to a computer or the internet to partake in an online class. Finally, due to the variety of classes offered, people might not focus on being able to learn one type of integrative exercise well. This

thesis does not explore if doing only one type of exercise modality is more beneficial than doing different ones.

Summary

This thesis explored how physical activity such as tai chi, yoga, and dance compared to medications alone affect motor function in individuals suffering from Parkinson's disease. The current research shows that there are statistically significant benefits to integrative exercise therapies like tai chi, dance, and yoga. The literature review led to the formation of best practice recommendations. These recommendations outlined the ideal frequency and duration of exercises classes. They also emphasized the need for patients to feel comfortable and enjoy the exercises they are completing. A proposed online integrative exercise program was developed using the best practice recommendations and the Institute for Healthcare Improvement's PSDA Cycle. The online program would allow individuals with Parkinson's disease to participate in a variety of integrative exercises from their home. Overall there is still more research that needs to be done regarding integrative exercise modalities, specifically comparing the effects of tai chi, dance, and yoga to each other. More research could lead to programs like the online classes proposed in this thesis.

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Appendix A

PRE-PROGRAM SURVERY

1) What is your:
    a. Age: _____
    b. Gender: _____
    c. Stage of Parkinson's Disease: _____
2) Have you previously taken an integrative exercise class?
    a. Yes.
    b. No.
3) If you answered yes to the previous question, what type of class did you take? What did you like/dislike about the class?

_____

_____

_____

4) What interested you in participating in this program?

_____

_____

_____

5) What do you hope to get out of this program?

_____

_____

Appendix B

POST PROGRAM SURVEY

1) What is your:
    a. Age: _____
    b. Gender: _____
    c. Stage of Parkinson's Disease: _____
2) Put a check next to the classes you participated in.

__ Beginning Tai Chi

__ Intermediate Tai Chi

__ Beginning Dance

__ Intermediate Dance

__ Beginning Yoga

__ Intermediate Yoga

3) Is there one exercise you preferred over others? Please explain.

_____

_____

_____

4) How did you feel about being offered different types of classes? Please explain.

_____

_____

_____

5) On a scale of 1 to 5 (1 being the lowest and 5 being the highest) rate how beneficial you think this program is for improving your motor symptoms. _____

6) On a scale of 1 to 5 (1 being the lowest and 5 being the highest) rate how difficult the program was for you. _____

7) On a scale of 1 to 5 (1 being the lowest and 5 being the highest) rate how well the instructors taught the class. _____

8) Did you like that the classes were live with an instructor and other classmates?
    a. Yes
    b. No
    c. Not Sure
    d. Feedback:_____
    _____

9) Is this a program you would continue to participate in the future?
    a. Yes
    b. No
    c. Not sure
    d. Feedback:_____
    _____

10) Do you have any more feedback/suggestions you would like to give about the program?

_____

_____

_____

_____

_____

_____

Appendix C

DAILY EXERCISE LOG

Date	**Name of class**	**Feedback/experience taking the class (ex. What did you like/dislike? How you feel after taking the class?)**