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**THE EFFECT OF TAI CHI EXERCISE ON BALANCE AND FALLS IN
PERSONS WITH PARKINSON'S DISEASE**

by

BETH A. GLADFELTER

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

DOCTOR OF NURSING PRACTICE

2011

Beth Gladfelter 5/28/11
Student Date

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Advisor Date

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DEDICATION

This project is dedicated to my loving, patient husband and family that were so supportive and understanding during this long arduous process. I thank you and love you all so very much.

ACKNOWLEDGMENTS

This project would not have been possible without the help of my advisor, Dr. Kris Mauk. She was extremely knowledgeable and invaluable during each step of the EBP project. I would also like to thank IU Health Goshen for allowing me to use their facility to implement the project as well as Norma Monik and Kathy Steffen, the Tai Chi instructors that donated much of their time. I am grateful to those that volunteered to participate in the Tai Chi classes and the comparison group so this project could be completed.

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ABSTRACT

Parkinson's disease (PD) is a neurodegenerative disease that progresses to impair one's gait and balance, often causing falls and subsequent disability. Current management of PD is aimed at treating the symptoms but is not effective in treating the underlying cause, nor does typical treatment effectively improve postural stability. Exercise can decrease symptoms of the disease and lessen disability. Providers need to find alternatives to the costly physical therapy that is prescribed to treat progressive and debilitating PD. Tai Chi (TC) has been shown to offer an enjoyable exercise routine that participants want to maintain. There is evidence to support the use of TC as a form of exercise as beneficial in improving balance, reducing falls and promoting quality of life in those with PD (Hackney & Earhart, 2008; Klein & Rivers, 2006; Li et al, 2007). The purpose of this evidence-based practice project was to establish a TC program for persons with PD in a small health system. The Stetler model and the Transtheoretical model of change were used to guide this project. The program developed was 12 weeks in length with two TC sessions of one hour per week. The 20 interested participants that met inclusion criteria were randomized into either the intervention or comparison group. Modified Yang Style TC was taught to 12 persons with PD ages 57 - 89 with Hoehn and Yahr Stages I - IV. All participants also kept an exercise and fall history during the 12 week project. Outcome measures to evaluate balance and quality of life were completed pre and post intervention on both groups and included: a) the Berg Balance Scale, b) the Functional Reach Test, c) the Timed Up and Go, and d) the Parkinson's Disease Quality of Life Questionnaire-39. The data was analyzed using the SPSS 18.0 statistical package. Paired *t*-tests demonstrated a significant difference in the intervention group for all three pre and post intervention balance measures but did not for falls and quality of life. Findings suggested that TC can be a safe, cost effective exercise for persons with PD to improve balance.

Keywords: balance, exercise, falls, Parkinson's disease, Tai Chi, Taiji

CHAPTER 1

INTRODUCTION

The current healthcare crisis demands new approaches, more effective interventions and improved delivery of services to optimize the health and wellbeing, quality of life, and functional capacity of patients (Bryant-Lukosius & DiCenso, 2004). The Institute of Medicine (IOM) calls for patient care to be safe, high quality, cost effective, efficient, timely, equitable and patient centered. The IOM proposes that change occurs based on several recommendations with one being evidence-based practice (IOM, 2001). Evidence-based practice (EBP) is defined as the reliable and well thought-out use of current best research evidence in combination with clinical expertise and patient values to direct decisions made by health care professionals (Sacket, Strauss, & Richardson, 2000).

The transition to the Doctorate in Nursing Practice (DNP) is a response to the healthcare needs in this country and was developed to assist in a resolution to the crisis. The DNP is intended not only to improve the healthcare of the individual, but also a way to affect the health care system as a whole. This requires competence in translating research in practice, evaluating evidence, applying research in decision-making, and implementing viable clinical innovations to change practice (AACN, 2010). The advanced practice nurse (APN) with a DNP focuses on providing leadership for evidence-based practice. This paper is an exemplar of this leadership. The purpose of this paper is to describe an EBP project that develops and then evaluates a program for possible practice change.

Background

Parkinson's disease (PD) is a progressive neurological disease that results in significant functional limitations leading to impaired gait and balance, falls and eventually

to disability (Parkinson's Disease Foundation, 2010). The lack of balance tends to result in greater postural instability and therefore an increased number of falls. Current medications and surgical interventions have little effect on postural stability and falls. The disease's main symptoms are: impaired gait, rigidity, bradykinesia or slowness of movements, tremors, poor balance, diminished expression, and kyphotic or stooped posture. Onset of the disease can range from ages 40 to 70 years. PD affects over one million individuals in the United States (Parkinson's Disease Foundation, 2010).

PD is caused by a decreased amount of the neurotransmitter dopamine (Jankovic, 2008). The imbalance of the dopamine chemical worsens the symptoms of PD and eventually causes the inability to complete easy activities of daily living. PD often leads to the need for the person to be placed in a care facility outside the home (Crizzle & Newhouse, 2006).

At this time no treatment has been discovered to slow or stop the progression of this disease. Instead, therapy is directed at treating the symptoms that are most bothersome to the individual with PD (Jankovic, 2008). For this reason, there is no standard or "best" treatment for PD. The typical treatment approaches are medication and surgical therapy. Other treatment approaches are general lifestyle modifications such as rest and exercise, physical therapy, and speech therapy (Parkinson's Disease Foundation, 2010). Research shows that the improvement from physical therapy lasts six months after the last treatment (Cutson, Laub & Schenkman, 1995). Deterioration in enhanced motor performance begins when the program is completed. A therapy that is successful at decreasing the detrimental effects of PD is necessary, one that would be continued on a regular basis, not for short periods like physical therapy.

Exercise has been demonstrated to be beneficial in slowing the progression of the symptoms of PD and reducing the impairment of the disease (Kluding & McGinnis, 2006). Research also indicates that exercise can increase the dopamine level in the

brain which then increases functional independence in those with PD (Sasco, Paffenbarger, Gendre, & Wing, 1992). Difficulty with balance is the indicator that PD is progressing and is the symptom that distinguishes the levels of the Hoehn and Yahr (1967) PD staging scale.

Tai Chi (TC) is a mind-body exercise that began in China but is rapidly growing in popularity in the West. The Yang style has become the most popular form of TC (Li, Fisher, Harmer & Shirai, 2003). Recent surveys confirm that over 5 million Americans are practicing TC and the number is growing (Wayne & Kaptchuk, 2008b). Several studies show that TC is safe and effective, even for the frail and elderly, and has the potential to be incorporated more often into health care. The Yang style is considered to be the gentlest and most suitable form for the elderly (Li et al., 2003). The extent of the integration and adoption of TC by health care providers will depend on evidence-based findings on its usefulness and safety for various populations and diseases (Wayne & Kaptchuk, 2008a). There is a growing body of clinical research to support the use of TC for many health related issues and many studies are currently ongoing.

There has been an increase in the number of studies completed to appraise TC for prevention and a rehabilitative option for several health problems such as: balance and postural stability, muscle strength and flexibility (Wayne & Kaptchuk, 2008b). Tai Chi is an exercise that is applicable for adults and patients with chronic disease, such as PD (Wong, Lin, Chou, Tang, & Wong, 2001). It is a "series of graceful movements linked together in a continuous sequence so that the body is constantly shifting from foot to foot, with a lower center of gravity" (Wong et al., 2001, p. 608). TC provides training that improves muscle strength through stationary and moving exercises while addressing the need to control balance over a constantly changing base of support (Li et al., 2003). TC also uses deep breathing and mental concentration during the moves to strive for synchronization between the body and brain. It also improves balance because of the

limb to limb coordination and the coordination used between the upper and lower movements. In addition, the training of TC is likely to improve the response of the older adult in near fall situations (Li, et al., 2003).

A positive aspect of using this form of exercise in the elderly and those with chronic disease is that TC movements can be performed while standing, sitting walking or lying down (Wong, et al., 2001). Also, TC is executed without the aerobic and physically demanding aspect of other types of exercise, making it suitable for the population with PD. It is a slow form of exercise that is controlled with continuous weight shifting with several postures (Wayne & Kaptchuk, 2008b).

Tai Chi has also been found to be a low-cost form of exercise because no equipment is needed, just a facility to run the class, a qualified instructor and handout materials to help the participant learn and practice the moves (Li, et al., 2008). Also the length of the class can be adjusted for the needs of the population, allowing for its flexibility (Kromagata & Newton, 2003).

Statement of the Problem

The PD patient has primary deficits that define the disease. At onset, the classic symptoms are bradykinesia, rest tremor and rigidity, and progress to difficulties with balance that contribute to falls (Cutson, Laub, & Schenkman, 1995). In addition to the primary impairments, there are also secondary symptoms that occur from the immobility the disease causes (Kluding & McGinnis, 2006). The immobility contributes to the deficits of poor balance and postural instability the PD patient is already experiencing.

Postural instability is the hallmark of PD and the major cause of falls, often resulting in worsening physical disability and the person's inability to remain in the home living alone (Bloem, Grimbergen, Cramer, Willemsen, & Zwinderman, 2001). Balance is vital in the prevention of falls which can have a significant impact upon PD patients' health.

The disabilities due to PD occur at all stages of the disease and impact the patient's quality of life (Bloem, et al., 2001).

In addition to the clinical needs of the person with PD, there is also a financial reason to develop a more cost-effective intervention to help treat the problem of postural instability and falls. New discussions in healthcare reform are attempting to find ways to reduce U.S. healthcare spending. It has been cited that the financial incentives provided by fee for service (FFS), the predominant payment model in the U.S. healthcare system, are a key reason for spending growth (Bigalke, 2010). Under FFS, which is based on volume or units of service delivered, "doing more" is rewarded whether or not it contributes to quality. An option that is being discussed to decrease costs is the concept of bundling.

Many proponents of bundling of financial resources believe that a single-bundled payment system would provide incentives for providers to better coordinate care which, in turn, would result in higher-quality outcomes, improved efficiency, and reduced costs (Bigalke, 2010). Currently the Center for Medicaid and Medicare (CMS) is conducting pilot projects to find ways to implement this into healthcare by 2015. Because many health plans make coverage decisions based on CMS practices, the CMS may play a key leadership role in developing episode-based payment and its application to all health plan member populations (Bigalke, 2010). Therefore, if this proposal is adopted by the CMS for their beneficiaries, other third party payers will most likely follow this along.

A key feature of the bundling concept is its need for evidence-based best practices, including clinical guidelines and quality measures. The bundling concept has been explained as an effective cost-saving measure and a technique to make hospitals and providers more accountable for the services they provide (Lubell, 2009). Yet, provider sources caution that much still needs to be learned about the bundling concept and all the responsibilities it will bring and are concerned that quality of care will be lost in the

interest of value (Bigalke, 2010). Regardless of a person's view on this debate, providers need to find lower cost, evidence-based options to care for their patients.

Most studies that are designed for physical activity and the elderly conclude that it is very difficult to motivate older adults to exercise (Wooten, 2010). A possible success of TC may depend on motivating older adults to do any type of activity and maintaining it.

Data from the literature supporting the need for the project. In a literature review completed by the American Academy of Neurology (AAN), eight randomized trials were reviewed that compared exercise and physical therapy to other modalities (Suchowersky et al., 2006). The literature review was part of a practice parameter written by the AAN and concludes that exercise may be helpful in improving motor function in PD patients. Additional findings were that the improvement was small and the benefit was not sustained after the exercise program was completed (Suchowersky et al., 2006). Therefore, there is a need to find a program that is cost effective and that the PD patient will enjoy and want to continue.

Because PD is a progressive disease, there is a need for continuous treatment. Pharmacological interventions can treat the worsening symptoms of the disease, but over time become ineffective (Cutson et al., 1995). Therefore, the intervention of exercise is necessary throughout all stages of the disease. With the trend toward managed care, rehabilitation for neurodegenerative diseases has been searching for more ground-breaking ideas (Kromagata & Newton, 2003). The search is now ongoing for formats that decrease the length of therapy visits, fewer visits overall and the use of group sessions. More and more emphasis is being placed on education and home exercise programs. Another format to use TC would be as a group therapy for those that have completed formal rehabilitation with a physical therapist (Wooten, 2010). Tai Chi has the ability to be flexible and used in various approaches.

A literature-based analysis was completed on two previous studies to ascertain the cost versus benefit of a TC program for prevention of fractures in nursing home residents (Wilson & Datta, 2001). It was concluded that TC is a cost-saving intervention for the nursing home population with a total net savings of \$1274.43 per person per year. The economic benefit of TC stems from the decrease in falls.

Data from the clinical agency supporting the need for the project. Healthy Generations, Goshen Health System's community outreach program, offers a number of community services including exercise programs and support groups that are held at The Retreat. The Retreat is a facility that provides all the women's services and the complimentary therapies. The IU Goshen Health System currently has a TC exercise class open to the public that has been in session for two years with only three members. The members have progressed well and according to the instructor; it would be difficult to add new members at this point with limited knowledge and experience of TC. Currently, the TC program is not supporting itself and is in jeopardy of being cancelled due to lack of interest and members.

The vision of the program director and DNP student is to develop a beginner, intermediate and advanced group to progress the TC participants through as they learn the moves and become competent. If there are an adequate number of members with interest and commitment this goal may be feasible.

A need for the Goshen Health System is to find a cost-effective, safe and effective program to refer PD patients for exercise. Starting this year the Center for Medicare and Medicaid (CMS) has put a new tighter limit on outpatient physical therapy at \$1,860 in payments per year with no exceptions for specific diseases or injuries (Romanow & Brown, 2009). That payment translates into approximately 15 visits per year. Congress installed the hard cap after learning that outpatient therapy costs were soaring at twice the growth of other Medicare services. There were reports that some therapy providers

were charging exorbitant fees for treatments, further threatening the financial health of Medicare. Medicare payments for outpatient therapy are still rising significantly. With only 15 visits per year, alternative forms of therapy and evidence-based exercise program must be identified.

Purpose of the EBP Project

The purpose of the project is to develop a TC exercise program for PD patients that need improvement in their balance and a reduction in their falls. Another consideration of this project is cost and sustainability.

Identify the compelling clinical question. Is TC a more effective exercise for improving balance and decreasing falls in persons with PD than a group with PD that is doing their usual routine with or without exercise?

PICOT format. In persons with Parkinson's disease, what is the effect of a 12 week Tai Chi exercise program on balance and falls versus routine exercise?

Significance of the project

PD is the second most common neurodegenerative disorder in the United States, surpassed only by Alzheimer's disease, and has been estimated to reach 9.3 million cases worldwide by the year 2030 (Jankovic, 2008). This disease limits functional and non-motor abilities and causes significant physical, economic, and emotional burdens. New findings suggest that the effects of exercise can be neuroprotective of the brain, and improve brain function in persons with neurological disorders such as PD (King & Horak, 2009; Morris, Martin, & Schenkman, 2010). Therefore, it is necessary to establish exercise programs that will have good fit and feasibility for this population

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

In this chapter, review of the two theoretical frameworks used to guide the EBP project will be discussed. Also, a review of the literature regarding exercise, TC, the elderly population and the person with PD will be appraised and applied to the clinical question.

Stetler theoretical framework

The first theoretical framework that was used to guide this EBP project was the Stetler Model. The Stetler model has experienced revisions since its inception in 1976 and therefore the latest revision from 2001 will be used. The model describes a step approach to analyze and incorporate evidence for the practitioner to use in clinical practice (Melnyk & Fineout-Overholt, 2005). Critical thinking is a focus of this model and importance is placed on the use of evidence by the individual practitioner rather than at the organizational level.

Description of the Stetler theoretical framework. The Stetler model consists of five progressive phases for using evidence-based research: preparation, validation, comparative evaluation/decision making, translation/application, and evaluation (Stetler, 2001). Each phase guides the user in organizing the research literature to answer the question being asked.

Therefore, the first step (the preparation phase) establishes the purpose of the project. This phase also identifies the need and then the practitioner begins the literature search for all the applicable research (Melnyk & Fineout-Overholt, 2005). In this phase, outcomes that may be measured should be determined.

The second step, or the validation phase, has the practitioner entrenched in the literature, critiquing it and then completing a summary that is relevant to the project

(Melnyk & Fineout-Overholt, 2005). The research is rated for the quality and level of evidence to determine its value for use by the practitioner. Only the most applicable, relevant research should be used in the validation phase.

The third step (comparative evaluation/decision making) is the phase that requires each study be assessed on how it fits in a particular setting, including the risk and feasibility of the project (Stetler, 2001). Feasibility is assessed looking at the resources and the willingness of those involved with the project. At this point the practitioner decides if there is adequate evidence to continue with the project. If not, then it is necessary to return to the first phase and start over. If there are adequate research studies to support the project, the practitioner should advance to the next phase.

The fourth step of the Stetler model is called the translation/application phase. This step focuses on how to implement the findings and recommendations into a plan for change and sets up a timeline for the policy, guideline or project (Stetler, 2001).

The fifth and final step is called the evaluation. In this step the practitioner appraises the project that was implemented and decides if the goals were met by significant outcome measures (Stetler, 2001). The final phase is ongoing.

Apply the Stetler theoretical framework to EBP project. Using the Stetler model for this EBP project, the preparation phase defined a need for a more cost-effective exercise for persons with PD that would be sustained. This disease process is progressive and poor balance and falls cause debility to many of those that must live with PD. The DNP student practices in a general neurology office that cares for approximately 170 PD patients that are listed in the data base. The usual practice is to refer them for physical therapy (that is costly). The therapy only lasts for a limited time frame, often is not enjoyable, nor do the patients usually sustain the prescribed home exercise program.

In the *validation phase* the literature was searched and critically appraised to determine if there was evidence to support the project, which there was. All studies were rated for the level of evidence. Studies were discarded if they were not relevant to the population or project.

The next step is the comparative evaluation/decision *making* phase and consists of four parts: substantiating the evidence, fit of setting, feasibility and current practice. There is a TC class offered in the same health care system with a TC instructor and available space but very few members and the director is searching for ideas to increase enrollment. A meeting took place with the Healthy Generations director who is in charge of all the health and wellness classes to ascertain if a program could be developed and incorporated in to the existing community outreach plan. The director was very interested in collaborating to meet the needs discussed. Discussions continued and a project was designed based on evidence from the literature. Current practice is to use basic handouts with instruction on balance exercises for the patient to work on their own or for referral to physical therapy for gait and balance training.

The DNP student had a conversation with her collaborating physician and he agreed to refer PD patients to the program that were in need of exercise or improvement in postural stability if the program was available and easily feasible. The completed project details will be presented at a future provider meeting of the Physician Network to obtain buy in and market the program for the PD population to other providers.

The fourth phrase is translation/application and involves the implementation of the actual program based on the evidence. The project was 12 weeks in length with two TC sessions of one hour per week. It was taught by a qualified TC instructor. Because the population is older with disabilities, an extra instructor was available at all classes for added instruction and safety. Chairs were available for rest periods if needed. Additional information will be in Chapter 3 which discusses the Method.

The fifth phase is evaluation and consisted of pre and post testing of outcome measures and the use of a participant satisfaction survey. The outcomes measures demonstrated within group significance for the intervention group and there are plans to continue the program this spring; feedback from the participant survey will drive the changes necessary.

Strengths and limitations of the Stetler theoretical framework for EBP project.

The Stetler model was easy to use with the step approach and offered alternatives routes if the evidence was not supportive of the clinical question. A positive of the model is the emphasis on critical thinking and the intended use for the clinical practitioner. It was helpful to scrutinize the fit and feasibility components in this model when developing this EBP project. There were no limitations.

Transtheoretical model of change theoretical framework

The goal of the EBP project is for persons with PD to adopt TC as their exercise program and maintain it to improve their symptoms of the disease. The transtheoretical model (TTM) of change has been the basis for developing effective interventions to promote many health behavior changes (Duran, 2003). To adopt TC as an exercise program will require a behavior change which is difficult. Despite research supporting the fact that health promotion intervention can significantly reduce the effects of chronic disease, healthcare providers fail to incorporate wellness and exercise teaching into their care plans (Gunderson & Tomkowiak, 2004). The TTM provides a practical guideline for motivating health behavior change in clinical practice. In TTM, "behavior change is seen as an incremental, continuous, and dynamic process occurring along point of a continuum" (Duran, 2004, p. 210). The TTM will be used as the second theory to guide and motivate the EBP project.

Key posits in this theory are the *stages of change*, *decisional balance*, *self-efficacy*, and *processes of change* (Prochaska & DiClemente, 1983). The stages of change are

in five categories and move along a continuum that reflects the person's readiness to change. *Precontemplation* is the stage in which people are not intending to take action in the foreseeable future; usually measured as the next six months. *Contemplation* is the stage in which people are intending to change in the next six months. *Preparation* is the stage in which people are ready to make change in the next 30 days and may have begun to make changes. *Action* is the stage in which people have made specific obvious modifications in their life-styles within the past six months. And then finally is *maintenance*; in this stage people have made specific overt modifications in their life-styles within the past six months and can last up to five years. *Regression* occurs when individuals revert to an earlier stage of change. Relapse is one form of regression, involving regression from *action* or *maintenance* to an earlier stage.

Decisional balance refers to the perception of positives and negatives of a specific behavior change and is influenced by the stage of change that the person is in (Duran, 2003). *Self-efficacy* is the person's perception of his/her ability to achieve and the *processes of change* are stage-specific methods that assist progress through the stages of change (Prochaska & DiClemente, 1983).

For the purpose of this EBP project, the TTM will be used to help guide the DNP student in counseling the person with PD through the change of *preparation* and *contemplating* TC as an exercise option for them and progress on the continuum to *maintenance*. The DNP student will use the *processes of change* as shown in Table 2.1, as interventions to assist with the purpose and goals. Different interventions are appropriate at different stages (Duran, 2003).

Literature search

The following section will discuss the sources that were searched, key words that were used, inclusion and exclusion criteria and expert opinions that were applicable. Next the levels of evidence are discussed and finally the relevant evidence is appraised.

Table 2.1

Stage-Based Interventions with Motivational Interviewing Techniques

| Stage | Interventions |
|--------------------|---|
| Precontemplation | <ul style="list-style-type: none"> - Encourage client's exploration of pros and cons of change. - Educate about health-related consequences of behavior in a nonjudgmental way. |
| Contemplation | <ul style="list-style-type: none"> - Assess importance of change using scaling questions. - Encourage client to generate reasons for change. - Tip decisional balance by heightening discrepancies between current and target behavior. - Assess confidence with scaling questions and use confidence-building strategies as necessary. |
| Preparation | <ul style="list-style-type: none"> - Support client's identification of a specific goal and date for behavior change. - Assist client in breaking down goal into small, achievable targets. - Assist client in identifying situations where risk of relapse is high and encourage exploration of possible strategies for dealing with these. - Explore successful past changes client has made. |
| Action/Maintenance | <ul style="list-style-type: none"> - Provide regular follow-up and determine client preference for frequency and type of contact. - Use relapses to help client increase awareness of self and of the process of behavior change. - Reinforce successes by identifying effective strategies and encouraging positive steps toward change. |

Adapted from: Prochaska & DiClemente, 1983

Sources examined for relevant evidence. The search engines used for the project included: PubMed, Proquest, MEDLINE, CINAHL, OVID, the Cochrane collection, and the Joanna Briggs Institute through JBI COonNECT. The DNP student met with the Valparaiso University nursing research librarian to assure that the literature search reached saturation. Key words included in the search of the data bases were Tai Chi, Tai Chi Chuan, Taiji, Parkinson' disease, exercise, and falls and balance in different groupings. Only articles in English were retrieved that included research or evidence-based journals, dissertations and EBP articles. Dates from 2001-2010 were included in the searches. Articles were then screened for topic relevance, originality and quality and were excluded if it had poor quality of evidence, duplicates or articles that were not relevant to the EBP project. Because there were a low number of hits on the specific topic of PD and TC, the search was expanded to include both the PD and other types of exercise and the elderly and TC.

The database PubMed was searched using the terms noted and there were 513 results for TC and 54,309 for PD but only nine when searched collectively. Six of those were helpful in answering the clinical question. A search of Proquest yielded 19 documents, four of which were usable and pertinent. The data base MEDLINE was investigated via EBSCO and yielded 1196 TC sources and 38,912 on the subject of PD but only seven when searched in combinations. Of the seven, six were relevant but were duplicates. The CINAHL search found 282 articles regarding TC and 1400 about PD, but only two when the terms were searched together. When the search was made with TC and PD together from the original search, two items were produced. Ovid was searched using EBSO with results of 407 TC sources, and 6,505 on PD. Using the search terms together yielded 40 sources with 8 pertinent to the EBP project and six of the eight were already obtained from other searches. The Cochrane Library was searched using the terms TC and PD and returned no reviews. When the terms were

searched individually 155 responses were retrieved with only one being relevant to elderly in relation to falls. And lastly, JBI was searched with no specific TC/PD sources found but there were 15 results on TC and three of the most relevant due to the discussion of TC and its effects on falls, chronic conditions were chosen for evaluation.

After the databases were searched and the sources were retrieved, and duplicates were excluded, there were 19 sources remaining. Then all reference lists were hand searched for appropriate articles and five additional articles were established bringing the total to 23 best evidence sources to help build the basis for this EBP project

Expert opinions. Bill Douglas is a TC master and expert that has authored several books recommends that TC be used with all PD patients (Douglas, 2010). He has been interviewed and quoted by many national sources regarding TC. He reports anecdotal improvement in disability from his personal experience of teaching persons with PD the exercise forms of TC. Douglas recommends that all PD patients exercise using the TC forms because it rotates the trunk of the body much greater than other types of exercise. The rotation of the trunk improves rigidity, one of the hallmark symptoms of PD. He notes that more healthcare providers and support groups are beginning to prescribe TC for this population, but not as frequently as indicated.

Description of levels of evidence. The levels of evidence used to rate the research studies for this EBP project were based on the guidelines from Melynk & Fineout-Overholt (2005). The levels are as follows: Level I: Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs); Level II: Evidence obtained from at least one well-designed RCT; Level III: Evidence obtained from well-designed controlled trials without randomization; Level IV: Evidence from well-designed case control or cohort studies; Level V: Evidence from systematic reviews of descriptive and qualitative study; Level VI: Evidence from the opinions of authorities

and/or reports of expert committees. The levels of evidence critiqued for this EBP project include Levels I through IV.

Appraisal of relevant evidence. As noted earlier, there were limited studies found that were specific to PD and TC. Therefore, the search was expanded to discover more quality evidence to guide the EBP project. All three categories help provide valuable evidence to answer the clinical question and will be reviewed below, the PD and exercise category and the elderly and TC category will be discussed as a literature review and the more pertinent sources were analyzed in more depth as an integrative review. A summary of the first two categories of studies reviewed is presented in Table 2.2.

Parkinson's disease and various forms of exercise. The PD patient and various forms of exercise were reviewed first as a group. This review provided a basis for the EBP project. Only two sources were used in this category because they were both reviews with a large number of sources.

A review was completed by Crizzle and Newhouse (2006) to evaluate the effectiveness of physical exercise on mortality, strength, balance, mobility and activities of daily living in persons with PD. Seven studies met the authors' criteria and of those, three randomized controlled trials (RCTs), one case control study and three observational studies. All studies used different measures and were difficult to compare but did show an overall improvement in performance and activities of daily living. The authors stated that the findings suggested that any exercise type will benefit the person with PD. A call for more standardized testing and RCTs to aid in finding the best exercise type to recommend for PD patients was made by the reviewers.

A systematic review of PD and exercise interventions was completed with measures that examined postural instability, balance task performance and quality of life (QOL)

Table 2.2

Levels of Evidence from the Appraisal of Literature

| First Author (Date) | Level of evidence | Key evidence related to EBP |
|---------------------------|-------------------|---|
| Crizzle et al. (2006) | Level II | A critical review of 7 studies of PD patients and various exercise types and regimens. All studies demonstrated improved overall performance and activities of daily living in the PD patient. |
| Dibbel et al. (2009) | Level I | A systematic analysis of 21 PD and exercise studies. Reports were examining postural stability, balance task performance and QOL. Analysis determined there was moderated evidence to support the use of exercise in improving postural stability and balance task performance but not QOL. |
| Jayasekara (2009) | Level I | JBI reviewed 2 Cochrane reviews and a clinical guideline. TC was found to be an appropriate exercise for fall reduction in the elderly. |
| Jordan (2006) | Level I | JBI review assessed benefits of TC in general and found them safe, effective and simple enough to be used in any population. |
| Komagata et al. (2003) | Level I | Systematic analysis of 11 studies reviewed on TC and the older adult. Analysis was that TC is effective for improving balance but not falls. |
| Munn (2009) | Level I | JBI systematic review of 23 RCTs and 15 observational studies, overall quality of studies were low. Findings were that TC was safe and effective for the elderly. |
| Li et al. (2008) | Level IV | Program evaluation of TC and the elderly demonstrated significant improvement in all fall and balance measures and QOL. There was also a participant satisfaction and plan to continue with program with all participants. |
| Rogers et al. (2009) | Level II | A literature review of 36 studies, 18 of which were TC and Qigong examining balance and falls in the older adult. Many of the multiple measures demonstrated significant improvement. |

(continued)

Table 2.2

Levels of Evidence from the Appraisal of Literature (continued)

| First Author (Date) | Level of evidence | Key evidence related to EBP |
|-------------------------|-------------------|--|
| Sattin et al. (2005) | Level II | The TC group demonstrated significant decrease in the fear of falling when measured at eight months and at one year when compared to the wellness education group. |
| Tsang et al. (2004) | Level III | TC and the elderly short intensive study of 4 and 8 weeks each, compared to general educations classes. TC group improved significantly in computerized balance scoring and those in the 4 week demonstrated same improvement when tested 4 weeks after intervention when compared to a group of experienced TC practitioners. |
| Wang et al. (2004) | Level I | A systematic review of TC and chronic conditions. Of the 47 studies analyzed, 11 studies purpose were to examined TC and its effect on balance control and falls. All demonstrated a positive effect on balance, flexibility, cardiovascular endurance, postural stability, and strength. |
| Wong et al. (2001) | Level III | Existing experienced elderly TC club was compared to a healthy, active elderly control group. Using computerized testing, the TC group demonstrated improved coordination and postural stability in the more challenging tests but not in the more basic testing. |
| Wooten (2010) | Level I | Integrative review of 22 studies of TC and the older patient. 19 studies demonstrated improved balance, whereas, 3 did not. |

Note: JBI-Joanna Briggs Institute, QOL-quality of life, PD-Parkinson's disease, RCTs-randomized controlled trials, TC-Tai Chi

(Dibble, Addison, Papa, 2009). The exercise interventions were variable and included: whole-body vibration, treadmill training, physical therapy, Qigong, muscle strengthening, balance training, and flexibility training. The sources were given evidence levels and quality ratings using a scale developed by the American Academy of Cerebral Palsy and Developmental Medicine. Meeting the criteria of the researchers were 21 sources with evidence levels of II and III and quality ratings of four to seven with seven being the best score possible. In the postural stability studies, all were RCTs and three of the four demonstrated significant improvements in the variables tested. Researchers suggested that there is moderate evidence that exercise will result in improvements in postural stability. In the balance task performance studies, five of the nine studies had control groups and of the controls, three had a decrease in performance. The researchers still advocated moderate evidence to support exercise to improve balance task performance. The last group of variables measured was examining the effect of exercise on QOL in seven reports. The researchers determined that the evidence to support exercise to improve QOL was limited.

Tai Chi and the elderly. In this category, TC is the intervention, but the population is the elderly, not specifically the person with PD. Of all three categories of literature searched for relevant evidence, the most research with the greater number of subject appears to be in the domain of the elderly practicing TC.

The first article analyzed was a systematic review of 11 studies by Kromagata and Newton (2003). There were a total of 495 subjects, with 250 of those using TC. The majority of the studies support TC as effective in improving balance, but the authors stated that the quality of the studies were moderate and need improvement in areas such as randomization, and confounding. It was concluded that the quality of evidence was strong enough to recommend incorporating TC as an intervention for the elderly to improve balance and fall prevention.

A systematic analysis was completed by Wang, Collet and Joseph (2004) to explore all relevant research of TC in chronic conditions. The analysis consisted of 47 studies and of those, 11 pertained specifically to balance control and falls. Of the 11 studies two were RCTs, five were nonrandomized control trials, three were cross-sectional studies and one was a follow-up study. Balance control, maximal voluntary extension, strength, flexibility, cardiovascular endurance, and postural stability were measured in these 11 studies. Many of the studies multiple outcome measures demonstrated significant improvement and reported that long-term TC exercise had positive effects on balance, flexibility, cardiovascular fitness and decreased falls in the elderly.

Another literature review was completed that examined 36 research reports of 3,799 older adults with the intervention of Tai Chi or Qigong (Rogers, Larkey, Keller, 2009). To be included in the review, the studies had to be randomized and have a control group. The studies were divided into five categories depending on the effect of TC and Qigong that was being researched. The 18 sources in the fall and balance category is the focus for this project and TC was the intervention in 16 of the studies and two were a combination of TC and Qigong. All showed significant responses in the various balance and fall measures. Common measures that are valid and reliable were used such as: Timed Up and Go (TUG), single-leg stance, Berg Balance Scale (BBS), Dynamic Gait Index, and tandem stance.

An integrative review was done by Wooten (2010) that analyzed TC in the improvement of balance and prevention of falls. A total of 22 articles from 1998 to 2009 were reviewed after several were discarded by the author for various reasons. All studies were randomized, controlled with pre and post testing. The most frequent type of TC used was the Yang Style, and of those most were a simplified form so that older adults could practice the moves without difficulty. The majority of studies were for 12 weeks and were one to two sessions per week with the subjects encouraged to practice

outside of class. Most studies demonstrated significant improvement in balance but three of the 22 did not. Recommendations were for more high level studies for support of TC.

A study in Hong Kong looked at short intensive use of TC in the elderly in both four and eight week sessions and compared that to a control group receiving general education for the same time frame (Tsang & Hui-Chan, 2004). This study design scheduled TC six times a week and used computer balance testing for measures on balance control. Both the four and eight week sessions demonstrated significant improvement in the measures and when the four week group was compared to an experienced group of TC practitioners, the balance scores were equal. The authors concluded that even short intensive TC practice leads to good results. Of interest is the high completion rate which was 86.4% of the TC or intervention group with this intensive schedule, when compared to the general education control group with a 66.7% completion rate.

A study was implemented in Taiwan and examined the effect of TC on coordination and postural stability in elderly people (Wong, Lin, Chou, Tang, & Wong, 2001). The researchers used a control group of 14 healthy and active non-practitioners of TC to compare to an existing club with 25 members with 2-35 years TC experience. Measures of coordination and balance were completed with the Smart Balance Master System, a computerized device with force plates the subject stands on that measure postural stability. The results indicated that the experienced TC subjects had better postural stability on the more challenging testing as compared to the control group. There was no difference on the more basic balance testing between the two groups.

A study that examined the fear of falling used a cluster-randomized control trial design and implemented intensive TC training for 48 weeks (Sattin, Easley, Wolf, Chen, & Kutner, 2005). All members in the study had a history of falls. The Activities-Specific

Balance Confidence Scale and the Fall Efficacy Scale were used at baseline and then every four months till completion of the study. The control group was educated on wellness topics. The TC group demonstrated a significant decrease in the fear of falling when measured at eight months and one year compared to the wellness education group.

A larger study with 287 older adults was completed in the United States for an evaluation of a program titled *Tai Chi-Moving for Better Balance* (Li et al., 2008). This was an evidence-based community-based program that was implemented for fall prevention. The design was a single-arm pretest-posttest within-participant study and examined the effect of one-hour classes of TC twice a week for 12 weeks. There was a 25% dropout rate and among those that participated, an 80% attendance rating. Home exercise was encouraged and the group was given VHS or DVDs and a user guide to use for practice. Significant improvements were demonstrated in the testing of FRT, the TUG, the 50-foot walk, and also the Short-Form-12 physical and mental form. In addition, on a post program interview, the TC intervention was well-received and all participants indicated an interest in continuing the program.

An evidence summary written by the Joanna Briggs Institute (JBI) recommends TC for patients with chronic conditions. The summary is based on a systematic review of nine RCTs, 23 nonrandomized controlled trials and 15 observational studies (Munn, 2009). The quality of the studies overall were low. Evidence for TC and effective outcomes for those with chronic conditions was graded as a B. A second recommendation was that TC is safe and effective in older adults and was also given a B grade.

A second evidence summary by JBI reviewed assessment of falls in older adults and effective prevention strategies (Jayasekara, 2009). In this summary, two Cochrane reviews and one clinical guideline were analyzed that advocate exercise as a successful

intervention to decrease falls (Gillespie, et al., 2009; Howe, Rochester, Jackson, Banks, Blair, 2007). TC was specifically indicated as an appropriate exercise of choice for fall reduction. Other findings from the evidence summary were that falls cause negative influence on health, QOL, and costs of healthcare.

A third evidence summary written by the JBI looked at the benefits of TC in general and the review found TC to be safe, effective, and simple enough to be completed by any population (Jordan, 2006). The evidence also demonstrated that TC has many health benefits, one being improved balance, and flexibility.

Parkinson's disease and Tai Chi

The most relevant literature is that which studied the same population and intervention used in this EBP project. This category was analyzed in more detail in an integrative review and placed in a separate table. Ten articles were discovered that were of good quality and are critiqued in this section. Overall, the level of evidence is lower for this category with less randomization and controlled trials completed and published. A few are small case control or case reports, but because this was the most relevant category to this EBP project were included.

A similar electronic search was conducted to identify literature in the following databases: PubMed, Proquest, MEDLINE, CINAHL, OVID, the Cochrane collection, and the Joanna Briggs Institute through JBI COnNECT. Key words used for search terms were: Parkinson's disease, tai chi, tai chi chuan, Taiji, falls, and balance. The inclusion criteria included: a) dates from 2001-2010, b) research articles that were peer-reviewed, c) a diagnosis of idiopathic PD, d) English language, e) all patient ages, and f) all disease stages. The exclusion criteria were studies in which the intervention was Qigong because it is different from TC in that it focuses more on meditation and relaxation and less on movement and balance. A total of six articles were found during

the electronic search that met these criteria. The references were then hand searched bringing the total number of articles to ten. These 10 sources met criteria for analysis.

Appraisal of the literature was conducted using a quantitative review worksheet developed by the Kaiser Permanente Southern California Nursing Research Program. The literature was then scored for quality using the tool entitled "The Kaiser Permanente Grading the Strength of a Body of Evidence". The tool is divided into four sections: study type and number of participants, quality, consistency and relevancy.

Each section contains several questions with supporting hints to explain the significance of the question or to explore a principle. Based on the evidence tool, the literature in this review was graded as good, fair or insufficient. The same levels of evidence, Melynk & Fineout-Overholt (2005) were used for this category of literature as the two previous categories.

Results

The literature on PD and TC will be analyzed and discussed according to two separate outcomes that were the interest of this review. They are balance and quality of life. Balance or postural stability is one of the cardinal symptoms in PD and when affected leads to disability decreasing the persons quality of life. Table 2.3 includes the key results of the critical analysis of the literature that was reviewed.

Balance

A number of studies evaluated balance as their primary outcome. Various tools were used to measure outcomes such as gait, balance, speed of walk, and several others making it difficult to compare the results. There were similarities in the designs of the different TC programs as noted in the Table 2.3 but different forms and numbers of moves were used in the ten studies. Also the class duration, program lengths or frequency of classes were not identical in any two of the studies analyzed. Therefore,

Table 2.3

Summary of Clinical Studies of Tai Chi for Parkinson's Disease

| Author | Level & Quality | Method and Sample Size | Intervention | Control | Outcome Measures | Main Results |
|----------------------------|------------------|--|--|---|---|---|
| Hackney & Earhart (2008) | Level II Good | RCT N=33 | TC Yang Style for 20 sessions for 60 mins over 10-13 weeks | A group without intervention | BBS, UPDRS, TUG, tandem stance, 6 min walk, backward walking, one leg stance, forward walking | BBS, UPDRS, TUG, tandem stance, 6 min walk, backward walking all significant improvement in the TC group |
| Hackney & Earhart (2009) | Level II Good | RCT N=71 | 20 sessions of 60 mins twice per week either TC, tango, waltz and foxtrot | A "no" intervention group | PDQ-39 | Tango was the only group with significant QOL improvements |
| Haas et al (2006) | Level II Good | RCT N= 23 | TC 8 forms for 60 mins twice a week for 16 weeks | Qi Gong for 60 mins twice a week for 16 weeks | gait velocity, stride length, % stance, % double limb support, step duration | No measures showed significance |
| Klein & Rivers (2006) | Level IV Fair | Cohort, nonrandomized, one group N= 8 PD and 7 (partners) | TC Yang Style 12 movement short form for 45 mins times 12 weeks | None | BBS, TUG, SF12, post program evaluation | Ceiling effect with BBS, TUG and SF12 |
| Kluding & McGinnis (2006) | Level IV Fair | Case Report N=2 | 1 st month-group balance exercise, 2 nd month-self directed exercise, 3 rd month-TC | None | BBS, TUG, FR | All measures demonstrated improvement |
| Marjama-Lyons et al (2002) | Level II Good | RCT N=30 | Tai Chi twice weekly for 60 mins for 12 weeks | A "no" intervention group | UPDRS III, Fall Frequency Form, LOS, GAC | UPDRS III-significant- $p=.026$, Fall Frequency significant decreased $p=.009$, LOS and GAC not significant |
| Li et al. (2007) | Level IV Fair | Cohort, blinded N=17 | Yang Style 6 forms for 90 mins times 5 consecutive days | None | TUG, FR, 50 ft walk | All significant TUG- $p.01$ FR- $p=.01$ 50 ft walk- $p=.002$ |
| Puchas & Mac Mahon (2007) | Level I Good | RCT N=20 | TC for 60 mins for 12 weeks. | Crossover group with delayed intervention | TUG, PDQ-39, UPDRS III | TUG and UPDRS did not show significance, PDQ-39 was improved but not significant |

| | | | | | | |
|---------------------|------------------|----------------------------|---|------|-------------------------|---------------------------------|
| Sung, et al. (2007) | Level IV Fair | Cohort N=11 | Tai Chi or 60 mins 3 times per week for 8 weeks | None | Functional Fitness, QOL | Both significant with $p < .05$ |
| Venglar (2005) | Level 5 Fair | Case report N=1 with PD | TC Yang Style once a week for 60 mins times 8 weeks | None | ABC, TUG, FR | Improved in all measures |

Note: ABC-Activities of Balance Scale, BBS-Berg Balance Scale, FR-Functional reach, GAC-Global Assessment of Change, LOS-balance master Limits of Stability, MADRAS-Montgomery-Asperg Depression Rating Scale, PD-Parkinson's disease, PDQ-39- Parkinson's disease questionnaire with 39 questions, TC-Tai chi, TUG-Timed Up and Go, UPDRS-Unified Parkinson Disease Rating Scale

there has been little consistency among existing studies. Of the nine studies reviewed regarding the outcome of balance, four studies demonstrated significant improved outcomes and two had improved outcomes that were not statistically significant. The final three studies had balance measures that were not found to be significant.

Two case reports with a low number of participants reported improved balance measures but not significance (Kluding & McGinnis, 2006; Venglar, 2005). A limitation of the study by Kluding and McGinnis (2006) is that measures were not completed between the crossover interventions so it is difficult to imply that the improvement was from TC alone. With both of the case report studies with two participants each, there was a chance for bias and placebo effect.

A separate study with 17 participants had significance in all the balance outcomes but a limitation was in the TC program design (Li et al, 2007). A constraint of this study was that the TC was taught for 90 minutes for five consecutive days and would be difficult to replicate. Researchers did learn via exit interviews of participants' satisfaction, enjoyment and a desire to continue with TC exercise. Two RCTs with the largest numbers of subjects found in this review also supported use of TC for balance in PD (Hackney & Earhart, 2008; Marjoma-Lyons et al, 2002). In addition, a smaller study without a control group had significant improvement in balance measures as well (Sung et al., 2007).

There were studies that failed to demonstrate significance in balance measures but researchers noted that exit interviews showed high participant satisfaction (see Table 2.3). The post intervention survey in the one study stated that 100% of the subjects enjoyed the TC exercise, 83% would definitely recommend it and 72% thought they had improved their balance (Purchas & MacMahon, 2007). The second study also did not show significance in measures but the TC subjects all reported having benefited from

the exercise and they perceived they had greatly improved (Haas, Waddell, Wolf, Juncos, & Gregor, 2006).

A study completed with volunteers from a community PD support group found that there was a ceiling effect with the Berg Balance Scale (BBS) and Timed Up and Go (TUG) measures when used in persons with mild disease (Klein & Rivers, 2006). It was reported that 15 of the 18 participants perceived a benefit in physical, psychological and social domains as measured with the Short-form 12 questionnaire (SF-12). The most frequent improvement that was noted was balance, though there were no statistical data to confirm the significance. A confidential post program survey was completed in which 93% of the participants would recommend or highly recommend the program to others and 80% detailed their home practice of TC.

Quality of Life

There are conflicting findings when quality of life (QOL) was measured as an outcome in four of the clinical studies. The two tools were used were the SF-12, a questionnaire that is an assessment of global function and QOL. The second tool is the Parkinson's Disease Questionnaire (PDQ- 39) and is specific to PD and assesses eight aspects of QOL. Both tools have been found to be valid and reliable. One study demonstrated significance, two others did not and one the subjects did improve but not sufficient enough to be statistically different.

Of the two studies that used the SF-12 to assess QOL it was proposed that there is a ceiling effect when using this tool with mild to moderate subjects with PD (Klein & Rivers, 2006). The second study demonstrated a significant improvement with the tool when evaluating QOL though the study was small and did not have a control group (Sung et al., 2007). Therefore, one study using the SF-12 was significantly improved when evaluated on QOL and the other was not.

Two additional studies used the PDQ-39 tool also had mixed results in participants practicing TC. A RCT comparing several exercises did not show a significant result when compared with pre and post testing (Hackney & Earhart, 2009), whereas a separate RCT had data that were improved but not significant (Purchas & MacMahon, 2007).

Discussion

The research reviewed that studied the effect of TC exercise in persons with PD is limited in number and weak in design. A key point of this review is that there is a limited amount of quality research. This was a surprising finding for the reason that TC is currently recommended by the National Parkinson's Disease Foundation and the American Parkinson's Disease Association as a treatment for the symptoms of PD as well as by large treatment centers such as the Mayo Clinics and Cleveland Clinic of Neuroscience Center based on this limited evidence. The evidence is beginning to trend toward supporting TC exercise in PD patients with a few of the studies demonstrating improved outcomes and a few more showing significance in balance measures. The positive studies were not all RCTs and had a low number of participants.

The evidence relating to QOL is not sufficient to recommend that TC is effective for this outcome. It is advised that RCTs and stronger study designs be completed. The PDQ-39 was developed specifically for use with PD patients but from the small number of studies reviewed it is difficult to recommend using one tool over the other.

The findings from this integrative review is comparable to a critical review that was completed in 2008 that determined there was insufficient evidence to recommend TC for PD patients and that there are few vigorous trials completed thus far, supporting these review findings (Lee, Lam, Ernst, 2008). That review did not include lower level studies in its literature that were included in this analysis.

When evaluating the quality of the studies they were found to be dissimilar. TC programs had varied designs with duration of class time, number of class times per week and the length of the study. Also, there are so many variations of TC and its forms, and no two studies set up the same program to evaluate. Future studies should replicate the design of the program and the type and forms of the TC that has shown significance in these studies and build on the current evidence.

A recommendation for future research would be to lengthen the time frame for the TC program. A possible constraint of the studies was the length of the programs. Are the time frames long enough to show significant improvement?

Although there is limited evidence to support the use of TC with the PD population, surveys have shown that it is a popular exercise and there is a perceived benefit in those that practice it. Users of TC also highly recommend it to others, so it can be seen as an inexpensive, safe, and enjoyable exercise until there are additional RCTs to add to the evidence on TC exercise. Two large number RCTs are currently examining TC benefits in PD; one is supported by the Parkinson Disease Foundation and the other by the National Institute of Neurological Disorders and Stroke. Both organizations are leaders of biomedical research on disorders of the brain and results of these stronger RCTs will add to the evidence. Providers can refer persons with PD to TC programs knowing that it is safe and enjoyable and the trend of the research is gaining significance for balance improvement.

Construct of the EBP

The preceding appraised literature will serve as foundation for the EBP project. The following paragraphs will discuss the construct in detail.

Synthesis of the critically appraised literature to support the EBP. In summary, PD is a serious progressive disease that causes disability. Most studies demonstrated significant improvement in the elderly in balance and falls with an exercise

program. Tai Chi has been found to be beneficial and safe in the elderly as many of the studies had significant balance and fall outcomes. Data to support the use of TC as an intervention in PD patients is moderate and there is a need for more RCTs to provide stronger evidence. A program and evaluation has been developed to add to the available evidence.

Description of the best practice model recommendation. After reviewing the literature, a program was designed for the elderly PD population. The TC form, moves, and length was chosen based on the best studies with significant results. The EBP project is designed to provide a TC program that is low cost, safe and effective for improving balance and decreasing falls. The program design, videos and handouts will be provided for future classes. Complete details regarding the program are discussed in Chapter 3. The director of Healthy Generations is anxious to have a new program suited for a different population, needs to assist the community in health maintenance, and also increase enrollment. The DNP student's collaborating physician is interested in a program to refer PD patients to that need improved balance, stability, and decreased falls.

Answering the clinical question. The clinical question is: in persons with Parkinson's disease, what is the effect of a 12 week Tai Chi exercise program on balance and falls versus routine exercise? Implementing the planned EBP project will provide more evidence to aid in answering this question.

CHAPTER 3

METHOD OF INTERVENTION

The method for the design and implementation of EBP project will be discussed in this chapter. The outcomes, data management, in addition to the protection of the participants are also included. The purpose of this EBP project was to measure the effect of TC on PD patients' balance and falls. After reviewing the literature it was identified that TC was a technique that is low cost and effective with a high rate of satisfaction among users.

Prior to the EBP project, a nonpharmacological option for balance and fall reduction has been referral to physical therapy. While this can be effective, there are concerns with this plan of care. The Advanced Practice Nurse in Indiana is not legally able to prescribe physical therapy and therefore must have the collaborating physician sign the order. Physical therapy is very costly and the TC program will be a nominal fee or the fee may be waived or reduced if the PD person cannot afford to pay. In addition to the high cost, the CMS this past year decreased the number of visits that are allowed each year (Romanow & Brown, 2009). If the person with PD needs therapy for a knee replacement, that utilizes the available sessions that are needed for balance and gait difficulties. Also from this author's experience, many people do not like to go to therapy and often do not continue the home exercise program that was prescribed for them.

The EBP project gives providers another option for referral when persons with PD worsen and require physical exercise that can improve their debility. An added benefit has been participant satisfaction and continued exercise past the time limit normally spent in physical therapy sessions.

Sample and setting

Working within the investigator's current health system, it was determined that there was an available TC class with two instructors and three members that was not being utilized to its potential. After discussion with the program director of Healthy Generations, the department that organizes health promotion, a PD specific program was organized. There were modifications made for this population for this investigational program to evaluate the possibility of establishing a permanent program in the future.

Institutional Review Board (IRB) approval was obtained from Valparaiso University before the project began or any data was collected. Permission was obtained from the IU Goshen Health System to implement the program and they agreed to accept the Valparaiso University IRB approval.

From a list of 265 available names of PD patients in the IU Goshen Health System in Goshen, IN, letters seeking interested participants were sent to the 165 patients that were in the immediate and surrounding counties within reasonable driving distance (see Appendix A). Those interested in participating were asked to contact the investigator via email or telephone to arrange an interview to answer questions and if still interested, they were assessed according to the qualifications for the program. There were 27 people that either called or emailed and of those 21 were interested in completing the TC program. The six that were not interested either felt the exercise would be too demanding or that they could not commit to the length of the 12 week program. The 20 that came for the preliminary meeting passed the requirements necessary to be included in the EBP project. One person was interested but was unable to participate after having a deep brain stimulator implanted for treatment of PD just prior to the start of the program with post-op complications.

Outcomes

Expected outcomes of the EBP project are improvement in balance and therefore a reduction in falls. A secondary outcome may be improvement in health status and will be assessed using a questionnaire. A post program survey was completed by the TC group to evaluate content such as participant satisfaction and decision to continue the program providing feedback for the health system.

The pre and post testing for the EBP project was completed initially one week prior to the intervention and then repeated one week after the program concluded for the TC group and also for the control group. The measures completed were the Parkinson's Disease Questionnaire-39 (PDQ-39), the Berg Balance Scale, the Timed Up and Go, and the Functional Reach Test. The participants were tested at Goshen NeuroCare Clinic in Goshen. The project coordinator provided the PDQ-39 instructions and answered all questions. The PDQ-39 is a paper and pencil quality of life survey and is self-administered. Also with each use of the PDQ-39, a list of area resources (see Appendix B) was provided in the event that completing this questionnaire caused any untoward emotional distress or other mental health issues.

The pre and posttest balance tests were completed by someone other than the project coordinator to prevent bias. The balance measures were administered by a Physical Therapist Assistant (PTA) with over 13 years experience in physical therapy and works daily with persons with PD. She graduated from Michiana College in 1989 with an Associate of Applied Science in Physical Therapy and is licensed by the state of Indiana. The PTA is very familiar and competent with these measures and has agreed to be available for all testing. Having one person completing the measures provides better inter-rater reliability and accuracy for the measures. She was blinded to the group the participant was assigned to; therefore the project was single-blinded.

Data

Collection. The individuals were considered eligible for participation if they had (a) Mini-Mental Status Exam (MMSE) greater than 24; (b) reliable transportation; (c) the availability for the length of the 12 week program; (d) the ability to walk 10 feet; (e) the ability to stand for 30 minutes and having no major health issues that would prohibit participation in an exercise program such as a severe cardiac or respiratory condition. Also, the person had to be diagnosed with idiopathic PD with an ICD-9 code of 332.0; no atypical forms of PD were accepted into the program such as Lewey Body Dementia or Multi-System Atrophy. All ages were included. Their Hoehn and Yahr staging scores were between I and IV, excluding stage V which would be too debilitated to participate safely. The staging scores were completed by the DNP student that is a nurse practitioner specializing in neurology. See Hoehn and Yahr staging score below (Hoehn & Yahr, 1967).

- 0 - No visible symptoms of Parkinson's disease
- 1 - Symptoms on only one side of the body
- 2 - Symptoms on both sides of the body and no difficulty walking
- 3 - Symptoms on both sides of the body and minimal difficulty walking
- 4 - Symptoms on both sides of the body and moderate difficulty walking
- 5 - Symptoms on both sides of the body and unable to walk

Informed consent (see Appendix C) was obtained from all participants after the risk and benefits were discussed both verbally and in writing. All questions were answered. All participants in the program were adults and have only been included after taking the MMSE with a score greater than 24 and therefore are both cognitively and legally able to provide informed consent. Responses to questionnaires and results from the outcome measures were kept confidential and anonymity will be assured. All data was kept in a locked drawer in the DNP student's office when not in use. Participants were reminded

that withdrawing from the project will not cause any penalty from Goshen NeuroCare Clinic or the IU Health Goshen System.

After the participants met the inclusion criteria the consent forms were signed and times were scheduled to meet to do the pretesting of the measures prior to the start of the investigational program. Fifteen minute appointments were scheduled over two days and participants were assigned numbers and then were assigned randomly by coin-toss to the investigational program or the exercise as usual group prior to pretesting being completed. The demographic sheet (see Appendix D) was completed in addition to the outcome measures being scored that are discussed below. Randomly there were 12 participants assigned to the TC group and eight to the comparison group.

Measures and their reliability and validity. The 39 item Parkinson's disease questionnaire (PDQ-39) is the most widely used PD specific measure of health status. The instrument was developed on the basis of interviews with people diagnosed with the disease. The Cronbach alpha exceeds 0.89 and the questionnaire has been widely validated (Hagell & Nygren, 2007). A systematic review of several quality of life measures found the PDQ-39 to be valid and reliable and the most valuable tool to use with persons with PD (Marinus, Ramaker, Van Hilten, & Stiggelbout, 2002).

The questionnaire contains 39 questions, covering eight aspects of quality of life and categories are as follows: mobility, activities of daily living, emotional well-being, stigma, social support, cognition, communication and bodily discomfort (Hagell & Nygren, 2007). The scale ranges from a 0 (no difficulty) to a 100 (maximum difficulty). The questionnaire can be utilized by both the subscales and a single total index score.

This outcome measure was used to evaluate the impact that PD has on the quality of life of the participants of the project and took 15 minutes to administer. Permission to use the tool was obtained from Linda Naylor, Head of Technology Transfer Group of Isis Innovation Ltd. from the University of Oxford through a licensor-licensee agreement for

the length of the project. A manual with the directions for scoring was also obtained. Coding for all the PDQ-39 questions were coded in the same way and data was entered in to the SPSS with the following values: 0 = Never, 1 = Occasionally, 2 = Sometimes, 3 = Often and 4 = Always or cannot do at all. Instructions were given to complete all questions by checking the boxes that correspond to how the participant was feeling over the last month regarding their PD symptoms.

The Berg Balance Scale (BBS) was one of three measures used to evaluate balance and postural stability. This tool was chosen because it is a well-accepted tool that has excellent reliability and validity with older adults. The BBS was developed to measure changes in functional standing balance over time (Qutubuddin et al., 2005). It is a 14 item scale that rates each function from 0 (worst) to 4 (best) on a dependence-independence continuum. The scores are interpreted as follows: a score of 41-56 indicates a low fall risk; a score of 21-40 indicates a medium fall risk and a 20-0 means a high fall risk (Lusardi, 2004). The tool takes approximately 15 minutes to complete per individual. It is safe and easy to use and has strong internal consistency with a Cronbach alpha of 0.96 and good reliability with many disease populations (Qutubbin et al., 2005). A negative aspect with this tool is a potential ceiling effect with higher functioning persons (Lusardi, 2004).

The Timed Up and Go (TUG) test was the second test that was used to evaluate balance and postural stability. This tool was chosen based on it being objective, reliable, and valid and applicable for a fall prevention program (Jacobs & Fox, 2008). The TUG test measures the time it takes a person to stand up from a chair with back resting on the back of the chair and arms on rests, walk 10 feet, turn, walk back to the chair and return to a seated position measured in seconds (Jacobs & Fox, 2008). A score of 14 seconds or more has been shown to indicate a high fall risk with a score of 10 or less considered normal (Podsiadlo & Richardson, 1991). A practice trial was first completed,

followed by two timed trials that were averaged for the participants' score. Permission was given to use a walking aid but no assistance from another person. Instructions were "on the word GO, you will stand up and, walk at your regular pace to the line on the floor, turn around and walk back to the chair and sit down."

The third test that was used is the Functional Reach Test (FRT). It is a measure of balance and is the difference, in inches, between arm's length and maximal forward reach and has been found to be reliable and valid from several studies (Duncan, Studenski, Chandler, & Prescott, 1992). The participants were instructed to stand with feet shoulder's width apart and lean as far forward as they were able to safely. This test can be used to detect balance impairment and change in balance performance over time. The measurement was completed with three trials using a 36-inch measuring tape with the participant standing using the greatest reach that was obtained. A reach of less than or equal to 6 inches predicts falls (Duncan et al., 1992).

In addition to the tools that were used to measure the outcomes, the participants kept a fall and exercise diary. It was a monthly calendar for each month of the program and the PD patients simply marked in minutes on the days they exercised and what type it was. To clarify for all participants what a fall is, a definition was given with the instructions for the diary. The definition used was 'an unexpected loss of balance resulting in coming to rest on the floor, the ground or an object below knee level' (Lach et al., 1991, p. 198). The fall and exercise diary was kept by both groups and collected when the post measures were completed. Participants also documented when they attended TC classes on the calendar so correlations could be made based on the attendance rate and other variables.

A post program survey with 12 questions was given to assess participant satisfaction in the investigational TC program group (see Appendix E). The survey was designed by

the program investigator and was based on a five-point likert scale and provided feedback for changes that may improve the program for the future.

Analysis. The effect of EBP project was measured by the pre and post tests of the participants and comparison of the two groups. The data were analyzed using the SPSS statistical package and paired and independent *t*-tests of the participants' outcome measures pre and post TC group and comparison group were evaluated. Demographic information was calculated using descriptive statistics.

Implementation of practice change

The TC taught in this program was the Yang Style, short form. It has been studied and used often in the elderly population and in persons with chronic disease. Several studies that were reviewed in preparation for this project have demonstrated positive outcomes and also determined it is safe. The "first third" or the first 12 moves of the Yang Style short form were taught. The PD patients participated in two 60 minute weekly TC classes for 12 consecutive weeks. Also, in addition to the moves, breathing, principles and the walking of TC were also instructed. The usual fee was waived for all participants for the investigational program.

There were two TC instructors for the EBP project. One was the lead instructor and the second was the assistant, who aided with teaching of the moves and also ensured the safety of the participants. The lead instructor had over nine years of experience in leading group TC. She studied under a TC master for three years in South Bend, IN and she has a Master of Education degree. She has taught exercise classes for over five years with the IU Goshen Health System with a good record and performance evaluations. The second TC leader is the Director of the Community Health and Wellness Program that is located in the Women's Retreat Center and was the assistant TC instructor. She is a certified TC practice leader and has been teaching this discipline for over three years. She also has a Master of Business Administration degree from

Purdue University and a degree in Wellness, Nutrition and Fitness. She has been with the IU Goshen Health System for over ten years and has taught TC as well as many exercise and wellness classes. The assistant leader was also available for private instruction external to class hours for participants interested in additional coaching of the TC moves and a few of the participants took advantage of the offer.

To accommodate for persons with PD, an instructional video/DVD was provided for each participant that demonstrated the TC moves for practice in addition to class. This video was purchased by the DNP student and given free of charge to the TC interventional group prior to the start of the program. The video/DVD is entitled *Tai Chi for Health: Yang Short Form* and was one that the TC instructors are very familiar with and recommend (Dunn, 1999). Each week a new move was taught and the personal video/DVD enabled the elderly person with PD to see the moves before class if they were interested. The video/DVD could be viewed between classes for further demonstration for individual practice and reinforcement.

Other special considerations made for this population are as follows. A folder with TC specific handouts was distributed containing general terms, principals and the instructions on the first 12 TC moves to those in the exercise group. In the folder was a letter (see Appendix F) with instructions for participation and the exercise and fall diary, along with the contact information of the DNP student and the Healthy Generations director in case any questions arise. For this disease population, an additional instructor was available during class for added instruction and direction with moves and specific technique. Chairs were provided and the participants could rest during class if needed or hold onto the back of the chair to help with balance. The class was at the same time each Monday and Wednesday to allow for planning of medication for the optimum "on-time" during exercise. The advancement of moves progressed at the pace of the classes learning ability, but proceeded mostly as planned with the "first third" or 12

moves being learned, one per week. The new move was taught on Monday and reinforced on Wednesday and added to the previously learned moves. Again, additional one on one instruction for those that are interested was available and chairs were used less often as the weeks went by for rest and balance checks.

CHAPTER 4

FINDINGS

The purpose of the EBP project was to find an alternative therapy for persons with Parkinson's disease (PD) that would improve balance and decrease falls. Within this chapter, sample characteristics of the participants will be discussed, including, as applicable, the mean, median, standard deviation, frequencies and percentages. The findings from the EBP project that correspond with the clinical question will also be addressed. The clinical question is: In persons with Parkinson's disease, what is the effect of a 12 week Tai Chi exercise program on balance and falls versus routine exercise? Balance measures were completed in addition to a fall and exercise diary. Quality of life was also measured using the PDQ-39 as a secondary outcome.

Sample characteristics

Size. Twenty participants were randomized into the TC (or intervention) group and the comparison group. Of the 12 participants in the intervention group, nine completed the entire 12 weeks and were tested both pre and post intervention. Three participants dropped out, citing various reasons. The first female to withdraw after 2 weeks, stated that she was falling too much and felt she was unable to continue safely. The second person to withdraw was a male and he felt it was too much work for him. He left at 4 weeks into the project. The third person to withdraw completed 6 weeks of the project and reported that the TC exercise worsened her back and knee pain from twisting too much. These three intervention group participants lost through attrition were pretested but their data was not included due to being unavailable for post intervention testing. All comparison participants were available for both the pre testing and post testing. Therefore, there were nine participants in the intervention group and eight in the comparison group available for analysis in addition to demographic data collection,

exercise and fall diaries. The TC intervention group also scored an evaluation survey that provided feedback regarding the program.

Characteristics. All participants were white, with 70.6% males ($n=12$) and 29.4% females ($n=5$) between the ages of 57 to 89, and a mean age of 72.0 ($SD=8.52$). The age at onset of PD ranged from 55 to 84 (see Figure 4.1) with a mean age of 65.53 ($SD=7.67$). Years of duration with PD was from 2 to 15 years with a mean of 5.88 ($SD=3.48$) and the Hoehn and Yahr stage (see Figure 4.2) that labels the disease severity was 2.4 ($SD=0.87$) on a scale of 1 to 5. A breakdown of the stages was: 11.8% in stage 1 ($n=2$), 47.1% in stage 2 ($n=8$), 29.4% in stage 3 ($n=5$) and 11.8% in stage 4 ($n=2$). Of the 17 participants, 29.4% ($n=5$) were experiencing falls and 70.6% ($n=12$) were not. The participants experienced falls between 0 to 10 times per month with a mean of .95 ($SD=2.28$). Characteristics of the participants collected from the demographic form are found in Table 4.1. and Table 4.2.

The two groups were not significantly different with respect to age, onset of PD, years of durations of PD, and Hoehn and Yahr stages as determined by paired t -tests. The groups were different when compared by falls. The comparison group had five persons experiencing falls and the intervention group had three, but all three fallers in the intervention group were lost to attrition.

Changes in outcomes

In persons with Parkinson's disease, what is the effect of a 12 week Tai Chi exercise program on balance and falls versus routine exercise? Statistical analysis of the data was performed using the SPSS statistical software version 18. The alpha level set was at .05 and a two-tailed test of significance was applied for all outcomes that were measured in this EBP project. Two tests were completed to determine if the data was statistically significant for this EBP project. Paired-samples t -tests were use

Figure 4.1 Frequencies of Age

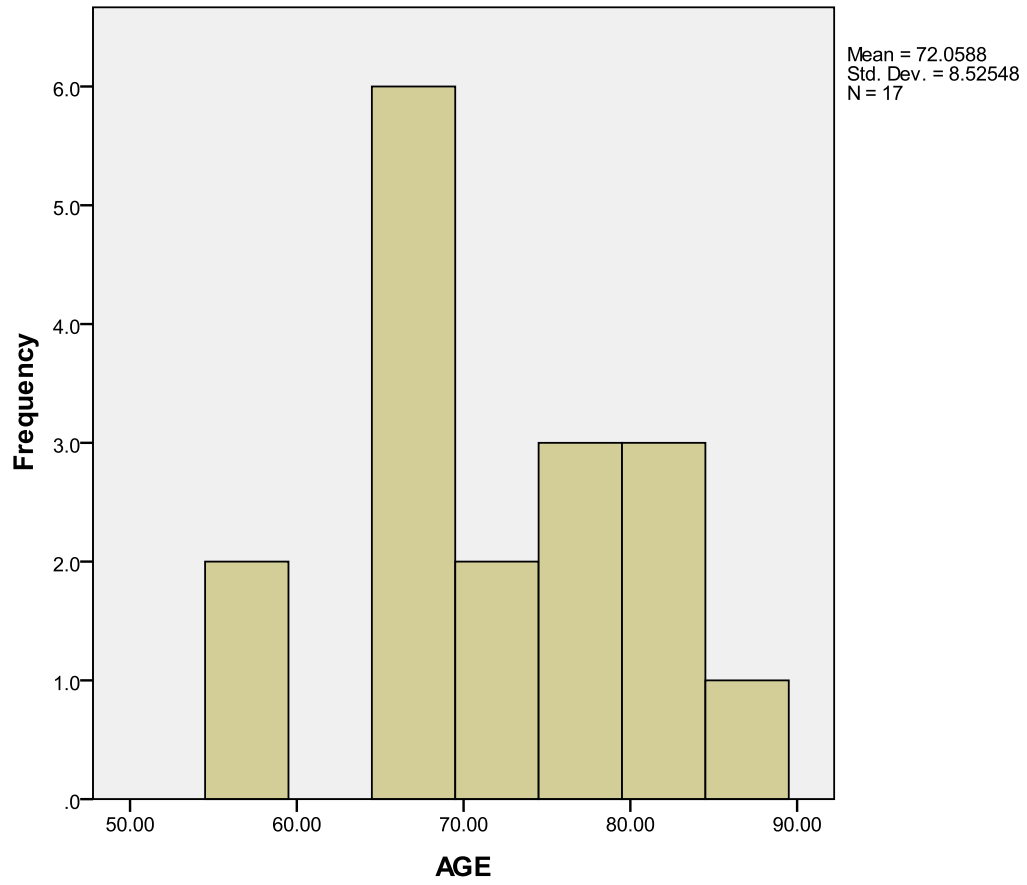


Figure 4.2 Frequencies of Hoehn and Yahr Stages

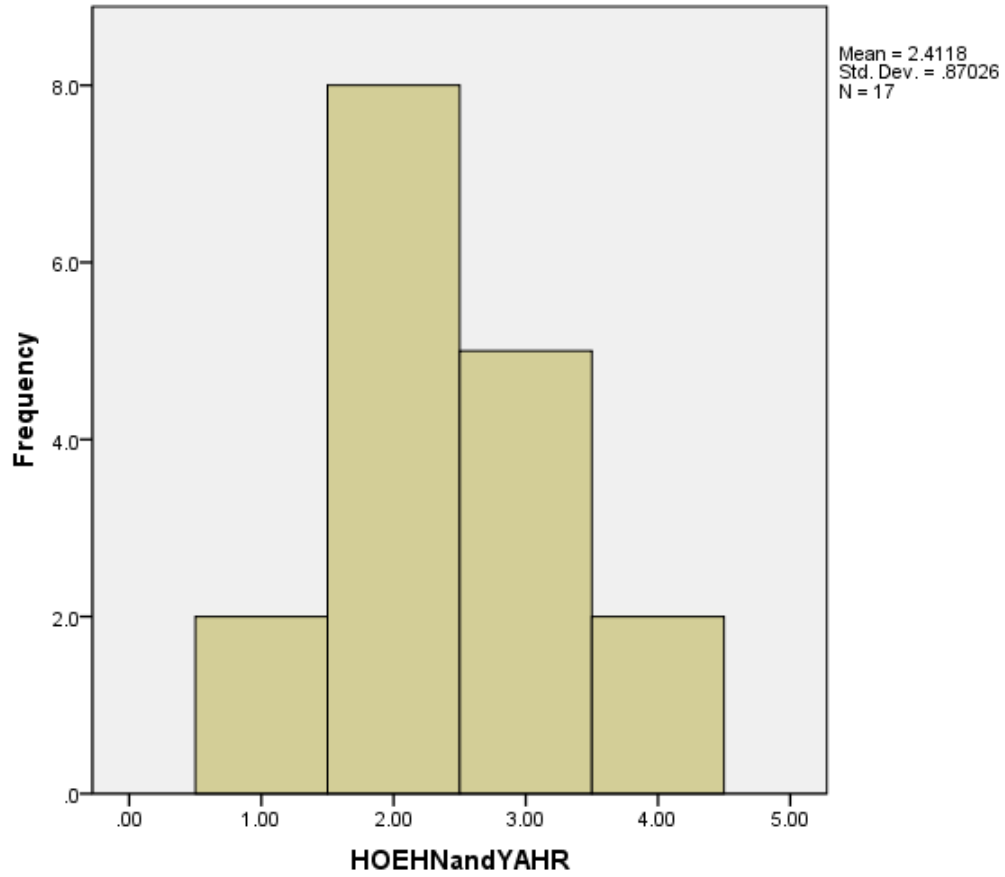


Table 4.1

Sample Characteristics

| Trait | Range | Mean | SD |
|---------------------------|---------|---------|---------|
| Age in years ($n = 17$) | 57 - 89 | 72.0 | 8.52548 |
| Age at onset | 55 - 84 | 65.5294 | 7.67396 |
| Years of duration of PD | 2 - 15 | 5.88 | 3.47998 |
| Hoehn and Yahr stage | 1 - 4 | 2.4118 | .87026 |
| Falls per month | 0 - 10 | .9506 | 2.48325 |

Table 4.2

Sample Characteristics

| Trait Result | Frequency (n) |
|-----------------------------------|--|
| Gender | 70.6% Males (n = 12) 29.4% Females (n = 5) |
| Ethnicity | 100% White (n = 17) |
| Hoehn and Yahr stages | 11.8% Stage 1 (n = 2) 47.1% Stage 2 (n = 8) 29.4% Stage 3 (n = 5) 11.8% Stage 4 (n = 2) |
| Marital status | 82.4% Married (n = 14) 5.9% Divorced (n = 1) 11.6% Widowed (n = 2) |
| Living situation | 82.4% In home (n = 14) 17.6% Nursing home (n = 3) |
| Other residents in home | 94.1% With spouse (n = 16) 5.9% With family (n = 1) |
| Taking L-Dopa | 70.6% Yes (n = 12) 29.4% No (n = 5) |
| Experiencing Falls | 29.4% Yes (n = 5) 70.6% No (n = 12) |
| Previous Exercise | 29.4% Yes (n = 5) 70.6% No (n = 12) |
| Physical Therapy in last 6 months | 5.9% Yes (n = 1) 94.1% No (n = 16) |
| Recent surgeries | 5.9% Yes (n = 1) 94.1% No (n = 16) |
| Recent illnesses | 5.9% Yes (n = 1) 94.1% No (n = 16) |
| Recent hospitalizations | 5.9% Yes (n = 1) 94.1% No (n = 16) |
| Chronic illnesses | 23.5% Yes (n = 4) 76.5% No (n = 13) |

calculated with interval data to compare the means of the two scores from related samples for the data within the groups. Independent-samples *t*-tests were used with interval data to compare the means of the two samples for the data that were randomly assigned between the groups.

Balance

Balance was measured using three tools, the Berg Balance Scale (BBS), Functional Reach Test (FRT) and the Timed Up and GO (TUG). All were completed by a blinded rater pre and post intervention.

Berg Balance Scale. The first balance measure to be discussed is the BBS and the results are listed in Table 4.3. A paired-samples *t*-test was used to compare the mean pre test score to the mean post test score for the *within group* intervention and comparison groups. This BBS measures several scores added together and a higher number is best. At the end of the 12 week program, a statistically significant change was observed with the BBS in the intervention group. The mean on the pre test was 45.55 (*SD* = 7.92), and the mean on the post test was 54.0 (*SD* = 2.34). A significant increase from pre test to post test was found $t(8) = - 8.44, p < .005$. There was no statistically significant difference between pre and post scores in the comparison group. The mean on the pre test was 39.5 (*SD* = 10.96) and the post test was 38.62 (*SD* = 10.82) with no significant increase found $t(7) = 1.02, p < .340$.

Between the groups statistics show that the groups were the same at the start of the intervention but not at completion. An independent-samples *t*-test was calculated comparing the pre intervention means of the groups. No statistical difference was found $t(15) = 1.31, p > .05$. The mean of the intervention group was ($m = 45.55, SD = 7.92$) not significantly different than the mean of the comparison group ($m = 39.5, SD = 10.96$). The post intervention was significantly different between the means of the two

Table 4.3

Berg Balance Scale Results

| Groups | Pre M(SD) | Post M(SD) | <i>t</i> | <i>df</i> | Sig. (2-tailed) <i>p</i> <.05 |
|------------------------------|--------------|---------------|----------|-----------|----------------------------------|
| Within Group Intervention | 45.55(7.92) | 54.0(2.34) | -3.840 | 8 | .005 |
| Within Group Comparison | 39.5(10.96) | 38.62(10.82) | 1.024 | 7 | .340 |
| Between Groups (Pre) | | | 1.31 | 15 | >.05 |
| Between Groups (Post) | | | 4.17 | 15 | < .05 |

groups $t(15) = 4.17, p < .05$. The mean of the intervention group ($m = 54.0, SD = 2.34$) was significantly higher than the mean of the comparison group ($m = 38.62, SD = 10.82$). Therefore the intervention group demonstrated improvement in the BBS and the comparison group did not.

Functional Reach Test. The results for the Functional Reach Test (FRT) test are listed in Table 4.4. The FRT was also measured using the paired-samples t -test for the *within groups* for the intervention and the comparison groups and was calculated to compare the mean pre test score to the mean post test. The mean on the pre test was 10.55 ($SD = 2.06$), and the mean on the post test was 13.22 ($SD = 1.92$). A significant increase from pre test to post test was found $t(8) = -2.67, p < .006$. There was no statistically significant difference for the comparison group. The mean on the pre test was 8.25 ($SD = 1.28$) and the post test was 7.87 ($SD = 1.36$) with no significant improvement found $t(7) = 2.05, p < .080$.

The *between groups* statistics for FRT is confounded with both pre and post testing being significant. The score indicates the reach of the participant in measured in inches and so the higher number the better. An independent-samples t -test was calculated to compare the means of the groups. A significant difference was found between the groups pre intervention $t(15) = 2.718, p < .05$. The mean of the intervention group ($m = 10.55, SD = 2.07$) was significantly higher than the mean of the comparison group ($m = 8.25, SD = 1.28$). A significant difference was found between the mean scores of the groups post intervention $t(15) = 6.54, p < .05$. The mean of the intervention group ($m = 13.22, SD = 1.92$) was significantly higher in the FRT than the comparison group ($m = 7.87, SD = 1.36$). The groups were not equal according to their FRT scores at the beginning of the intervention. The intervention group had a significantly better reach at the start of the program and improved after the intervention while the comparison

Table 4.4

Functional Reach Results

| Groups | Pre <i>M(SD)</i> | Post <i>M(SD)</i> | <i>t</i> | <i>df</i> | Sig. (2-tailed) <i>p</i> < .05 |
|------------------------------|---------------------|----------------------|----------|-----------|-----------------------------------|
| Within Group Intervention | 10.55 (2.06) | 13.22 (1.92) | - 2.67 | 8 | .006 |
| Within Group Comparison | 8.25(1.28) | 7.87(1.36) | 2.05 | 7 | .080 |
| Between Groups (Pre) | | | 2.71 | 15 | <.05 |
| Between Groups (Post) | | | 6.54 | 15 | < .05 |

Table 4.5

Timed Up and Go Results

| Groups | Pre M(SD) | Post M(SD) | <i>t</i> | <i>df</i> | Sig. (2-tailed) <i>p</i> < .05 |
|------------------------------|--------------|---------------|----------|-----------|-----------------------------------|
| Within Group Intervention | 9.81(1.48) | 8.48(1.92) | 1.32 | 8 | .007 |
| Within Group Comparison | 18.01(16.52) | 18.01(16.52) | -.471 | 6 | .655 |
| Between Groups (Pre) | | | 1.49 | 14 | > .05 |
| Between Groups (Post) | | | 1.89 | 14 | > .05 |

group worsened over the 12 weeks. Therefore there was a difference between the groups with the pre and post testing.

Timed Up and Go. The final balance measure to be discussed in the EBP project is the TUG and the results are listed in Table 4.5. This measured walking in seconds; therefore a lower number is best. Again, using the paired-samples *t*-test, the mean pretest was calculated and compared to the mean posttest score. The mean on the pretest was 9.81 (*SD* = 1.48), and the mean on the posttest was 8.48 (*SD* = 1.92). A significant increase from pretest to posttest was found $t(8) = 1.32, p < .007$. There was no statistically significant difference for the comparison group. The mean on the pre test was 18.01 (*SD* = 16.52) and the mean on the post test was 18.22 (*SD* = 15.45) with no significant increase found $t(6) = -.471, p < .655$.

An independent-samples *t*-test was calculated comparing the means *between the groups*. An independent-samples *t*-test was calculated comparing the pre tests means of the groups. No statistical difference was found $t(14) = 1.49, p > .05$. The mean of the intervention group ($m = 9.81, SD = 1.49$) was not significantly different than the mean of the comparison group ($m = 18.01, SD = 16.52$). There also was no statistical difference found $t(14) = 1.89, p > .05$ in the post tests of the groups. The mean of the post intervention group ($m = 8.49, SD = 1.97$) was not significantly different than the mean of the comparison group ($m = 18.23, SD = 15.45$). Therefore, the *between groups* statistics show that there was no significant difference with either group both pre or post intervention in the TUG.

Quality of Life. A secondary measure not concerned with balance and falls but with quality of life was the Parkinson's Disease Questionnaire-39 (PDQ-39). The paper and pencil test was given to the intervention group both pre and post intervention of the TC and the scores were compared in a paired-samples *t*-test. The mean pretest was 14.06 (*SD* = 12.03) and the mean posttest was 13.85 (*SD* = 11.17). No significant

difference from pretest to posttest was found $t(8) = .2111, p < .850$ in the intervention group. There was no statistically significant difference for the comparison group. The mean on the pre test was 39.5 ($SD = 10.97$) and the mean on the post test was 38.62 ($SD = 10.82$) with no significant increase found $t(7) = 1.024, p < .340$.

An independent-samples t -test was calculated comparing the means *between the groups*. An independent-samples t -test was calculated comparing the pre tests means of the groups. No statistical difference was found $t(15) = 1.73, p > .05$. The mean of the intervention group ($m = 14.06, SD = 12.03$) was not significantly different than the mean of the comparison group ($m = 26.72, SD = 17.85$). There also was no statistical difference found $t(15) = -1.52, p > .05$ in the post tests of the groups. The mean of the post intervention group ($m = 13.85, SD = 11.17$) was not significantly different than the mean of the comparison group ($m = 25.17, SD = 18.97$). Therefore, the *between groups* statistics show that there was no significant difference with either group both pre or post intervention with quality of life.

Falls. The participants were asked to estimate the falls they experienced for the six months prior to the start of EBP project and then kept a fall diary for the 12 weeks of the project. The falls were averaged per month. There was no significant difference in falls in the intervention group due to the attrition of the only three persons in the group that were experiencing falls. A paired-samples t -test was calculated to compare the mean falls pre intervention ($m = 4.0, SD = 5.29$) to mean falls post intervention ($m = 6.0, SD = 6.08$) in the comparison group. There were five fallers in the comparison group and there was no significant difference $t(2) = -3.464, p = .080$ in their falls with their exercise as usual over the 12 weeks. The intervention group experienced no falls during the intervention period but neither group showed significant improvements with falls after the intervention.

Correlations

Calculations were completed using the Pearson's r to look for correlations between variables. The correlation between two variables reflects the degree to which the variables are related. Age and Hoehn and Yahr stages have a significant positive correlation $r(15) = .544, p < .024$, indicating a significant linear relationship between the two variables. A calculation was completed for the Hoehn and Yahr stages and the years of duration and a strong positive correlation was found $r(15) = .760, p < .001$ indicating a significant linear relationship between the two variables. The quality of life score also correlates significantly with the years of durations and the Hoehn and Yahr stage $r(15) = .615, p < .009$. Therefore, the more severe the PD was the higher or worse the quality of life score was. There was a significant correlation with the Hoehn and Yahr score and dopamine replacement $r(15) = .621, p < .008$ indicating that the more severe the PD disease, the more likely they were to be on dopamine replacement. These findings are known by providers of PD patients and show that the disease is progressive.

Post Program Survey

A post program survey consisting of 12 questions was completed based on a five-point likert scale (see Appendix E). In addition to the balance changes noted, TC participants reported in a post program survey that they enjoyed participating and would recommend TC to others. The participants were asked to score their responses on the scale as either strongly agree, agree, neutral, disagree or strongly disagree. The findings of the survey can be found in Table 4.6.

A total of 77.8% ($n=7$) respondents either strongly agreed or agreed that TC was an *appropriate* exercise. Whereas, 55.6% ($n = 5$) either strongly agreed or agreed that TC was enjoyable. There were 66.7% ($n = 6$) of the respondents that answered positively by strongly agreeing or agreeing that they were *satisfied* with the TC program. When asked

if TC was *easy to learn*, 11.1% ($n = 1$) strongly agreed, 22.2% ($n = 2$) agreed, 11.1% ($n = 1$) was neutral and 55.6% ($n = 5$) disagreed. Regarding the statement, TC is *easy to perform*, 11.1% ($n = 1$) strongly agreed, 11.1% ($n = 1$) agreed, 44.4% ($n = 4$) were neutral and 33.3% ($n = 3$) disagreed. With the statement TC is *safe to perform*, 33.3% ($n = 3$) strongly agreed and the remaining 66.7% ($n = 6$) agreed. The respondents were asked to answer if TC made them more *confident in their walking*. Of the nine participants, 22.2% ($n = 2$) strongly agreed, 22.2% ($n = 2$) agreed, whereas, 44.4% ($n = 4$) were neutral and 11.1% ($n = 1$) disagreed with the statement. The statement TC *improved my balance* had 11.1% ($n = 1$) strongly agreed, 33.3% ($n = 3$) agreed, 44.4% ($n = 4$) were neutral and 11.1% ($n = 1$) disagreed. The survey statement TC *helped me be more independent* resulted in mostly a neutral response (77.8%, $n = 7$) and 11.1% ($n = 1$) either strongly agreed or disagreed. The respondents were asked if TC *improved their confidence* and 44.4% ($n = 4$) agreed with this statement while 55.6% ($n = 5$) were neutral with their responses. The survey questioned if the respondents wanted to *continue with TC* and this resulted in a mixed response. There were 33.3% ($n = 3$) that agreed, 22.2% ($n = 2$) that were neutral, 33.3% ($n = 3$) disagreed, and 11.1% ($n = 1$) strongly disagreed. The last item of the survey asked if the respondents would *recommend TC to others* and 22.2% ($n = 2$) strongly agree, 44.4% ($n = 4$) while 33.3% ($n = 3$) were neutral with this statement. Some of the respondents made handwritten comments on the survey which will be discussed in Chapter 5.

Table 4.6.

Post Program Survey Results

| Survey Item | Strongly Agree %(n) | Agree %(n) | Neutral %(n) |
|--|------------------------|---------------|-----------------|
| The Tai Chi program was appropriate | 55.6 (5) | 22.2 (2) | 22.2 (2) |
| The Tai Chi program was enjoyable | 22.2 (2) | 33.3 (3) | 33.3 (3) |
| I was satisfied with the Tai Chi program | 11.1 (1) | 55.6 (5) | 33.3 (3) |
| Tai Chi was easy to learn | 5.9 (1) | 11.8 (2) | 5.9 (1) |
| Tai Chi was easy to perform | 11.1 (1) | 22.2 (1) | 11.1 (4) |
| Tai Chi was safe to perform. | 11.1 (3) | 11.1 (6) | 44.4 (4) |
| Tai Chi made me confident in walking | 22.2 (2) | 22.2 (2) | 44.4 (4) |
| My balance has improved | 11.1 (1) | 33.3 (3) | 44.4 (4) |
| Tai Chi helped me be more independent | 11.1 (1) | 0 | 77.8 (7) |
| Tai Chi helped improve my confidence | 0 | 44.4 (4) | 55.6 (5) |
| I would like to continue with Tai Chi | 0 | 33.3 (3) | 22.2 (2) |
| I would recommend Tai Chi to others | 22.2 (2) | 44.4 (4) | 33.3 (3) |

CHAPTER 5

DISCUSSION

Explanation of Findings of Findings using the PARIHS Model

These EBP project findings will be explained using the Promoting Action on Research Implementation in Health Services (PARIHS) framework. The framework was developed to represent the processes involved in implementing evidence into practice. The framework examines the relationship between the nature of the evidence, the context into which the proposed change is implemented and the way in which change is facilitated (Rycroft-Malone, 2004).

Evidence

Research. Twenty-three sources provided the best evidence for this EBP project. The literature was in three separate categories due to a limited number of articles in the unique topic area of TC and persons with PD. Therefore, the search was expanded to include both the elderly and TC and the PD population doing various exercises to improve balance and/or decrease falls. The levels of evidence ranged from I to V as discussed in Chapter 2 with the sources designated as follows: 7- Level I, 8-Level II, 2-Level III, 5-Level IV, 1-Level V. The overall quality of the evidence was good. Not all of the studies demonstrated statistical significance in improving balance; some had small numbers of participants and several were not randomized control trials. The evidence is moderate in support of the use to TC in persons with PD to improve balance and decrease falls. Most of the studies have been completed in the last five years, and two large randomized controlled studies are ongoing. This subject matter is one of current interest in the fields of neurology and physical therapy.

The relevant evidence was reviewed with the project's contact person at the health system, the director of the Healthy Generations and the TC instructor. The evidence

supporting the use of TC in PD was also shared with the participants when the EBP project was explained to them and again to the TC group members during the program to help reinforce their need for participation. The sharing of the literature review aided in obtaining buy-in for the EBP project.

Clinical experience. As mentioned in Chapter One, the common practice of neurologists and also the practice that the DNP student is employed are to order physical therapy when balance issues and falls occur. Poor balance and falls become a concern when they become more frequent and result in injury. There are several problems with this treatment choice. There is evidence that physical therapy does not have a lasting effect for longer than six months after the treatment ends (Patti, 1996). The loss of improvement is seen clinically and it is often necessary to repeat the therapy yearly or so, which is quite expensive and time consuming. Another clinical concern is the decreasing reimbursement by Medicare to cover the cost of the physical therapy. Recently the amount that will be paid per year was decreased, making it more difficult to use this intervention when therapy is needed for another medical condition. Patients often do not want to go to physical therapy and refuse this intervention, limiting the provider's options. As a practicing provider, this DNP student struggles with these issues and realizes a need to have other choices for PD patients' progressing disease state. Problems such as cost and patient preference help drive the need for EBP projects such as this one.

Patient experience. The literature has reported that when surveyed, there is a high satisfaction rate among PD patients with TC exercise. Several studies have included post program surveys in their data collection, and the reviews have been overwhelmingly positive (Hackney & Earhart, 2008; Kluding and McGinnis, 2003; Li et al., 2007). Therefore, the patient experience can be judged as high evidence in this subelement and should be used in the decision making process.

Context

Culture. The IU Goshen Health System has a strong mission and vision, and strives to meet the health care needs of the community. The plan to meet their goals is by focusing on four key areas: best people, high quality, low cost and patient satisfaction (Goshen General Health System, 2009). More than 10 years ago the Uncommon Leader program with the New American Hospital philosophy was adopted; it encourages a culture where the colleagues implement change with the goal of exceeding best practices using the LEAD acronym (French, 2007). LEAD stands for: *lead* by example, *exceed* best practices, *act* to implement change and use *data* to drive the process. The employees are called colleagues in this health system as a display of respect. The changes were made because the administration wanted to value colleagues, and the transformation has resulted in higher employee satisfaction.

The New American hospital supports a flat management style, focuses on value and seeks change (French, 2007). With this new attitude in place, the Goshen Health System has become more evidence-based in their patient care. Many of the changes have been implemented by the colleague due to a bottom-up action that is encouraged from administration. Successful change is rewarded and recognized in a monthly newsletter. This EBP project is an example of such action.

The IU Goshen Health system utilizes FOCUS-PDCA to guide problem solving activities. FOCUS -PDCA is a process improvement model that is used to identify improvement opportunities and to promote a systematic approach to implementing changes (Redick, 1999). The steps are listed below.

F- Find a process to improve

O- Organize a team

C- Clarify the current process

U- Understand the current process

S- Select a strategy for performance improvement

P- Plan

D- Do

C- Check

A- Act

The IU Goshen Health System culture encourages their colleagues to share their concerns and empowers them to improve their work environment. The goal of administration and the colleagues is to improve patient care and outcomes by becoming more evidence-based.

Receptive context. The IU Goshen Health System is eager to find evidence-based, cost-effective interventions to manage chronic illnesses as noted in their mission and vision and their attitude. When the Director of Healthy Generations was approached regarding the EBP project she was enthusiastic to provide an instructor and room to hold the program. She communicated effectively and was helpful in making the necessary changes needed for this population. Currently, discussions are being held regarding the results of the project and if the program will continue.

Leadership. The leadership of the health system is strong and is working towards being transformational by advocating the Uncommon Leader program. The leader or director at the Healthy Generations was not very effective because she was disorganized, and lacked follow through and patience. Customers of the Healthy Generation exercise program complained that class times would change without notice or the entire session would be discontinued without valid reason after it had become a part of their routine. The programs designed and provided there have a history of not being strongly attended or financially solvent. Both the director and the TC instructor were interested in the program and were helpful in donating their time, but the TC class was not always a high priority. A few times there was no instructor, and the class

followed the DVD instead of being led by an instructor. The class's room was moved a few times to make space for changes in scheduling of other paid scheduled classes due to miscommunication or instructors missing their class times. After observing the facility for the 12 weeks, it was apparent that there was a lack of organization and coordination. The organization's weakness affected the EBP project, as comments were made by the TC group members. Some members of the TC group shared that the moving of rooms and changing the time from one class to the next was bothersome to them. Also, the loudness of the other exercise classes was a distraction while they were trying to focus and relax during their TC class.

Evaluation. There was ongoing evaluation of the TC classes, instructors and satisfaction of the participants during the 12 weeks as well as at the completion of the program. Feedback from the participants showed that they preferred certain warm-up exercises over others, reviewing moves longer before learning the next move, and preferred the live instructor over the DVD. Changes were made when possible to improve the program based on comments from the group. There was frequent contact between the project coordinator and the instructors to ensure that the program was running smoothly and attrition was kept as low as possible.

The results of the 12 question survey were also shared with the director of the Healthy Generations and the lead Tai Chi instructor to improve the program for future classes. The survey showed that overall the program was a success and the participants were satisfied. Over half of the group found the exercise enjoyable, but only one-third felt that it was easy to learn. Almost one-half of the group reported improved balance and increased confidence in walking. It was interesting that one-third of the participants wanted to continue with TC but two-thirds of them would recommend it to others. Some of the members wrote in comments such as they enjoyed the support of being with others with the same disease, they felt that the exercise was difficult but

would become easier over time and that they enjoyed the opportunity to be part of the project.

The effectiveness of the program was measured using the pre and post tests for the intervention and the comparison groups. The TC program did improve balance in the intervention group but did not demonstrate any change in falls (either positive or negative) due to the fact that the nine participants that were measured were not experiencing falls. There was no change in QOL in either group. A possible reason for this is that the 12 week EBP project may have been too short for change in QOL to transpire. The participants were very concerned with learning the moves and doing the forms correctly, so that the relaxation/enjoyment phase may have occurred after learning the actual technique required to do the moves and breathing.

Evaluation is periodically completed within the Goshen Health System using Press Ganey surveys to assess for customer satisfaction in all areas of the system in an effort to improve all aspects of care, services, and products. Also, the annual colleague evaluation and salary adjustments are awarded on fee-for-performance. This award is based on improvement of the colleague, goals set and being met on productivity in three separate areas. They are the individual, department and the health system as a whole. This is to motivate the colleague to not only excel individually but work as a team to effect the entire system.

Facilitation

Purpose and Role. The facilitator of this EBP project had a holistic purpose. The aim of the facilitator was to develop a program with both the physical and emotional needs of the PD patient in focus. The goal was to find an appropriate exercise that was effective, safe, enjoyable, inexpensive and sustainable. Discussions took place with all involved to determine preferences in the program and if it was meeting their needs. The facilitator enabled the participants to share their opinions and use the program to meet

new people, be a support group, and share their thoughts on their disease process. Three of the 12 participants plan to sustain the TC and partner with the Healthy Generations team to meet their needs of exercise and maintaining their improved balance status.

The facilitator was an expert in PD and taught the TC instructors about this disease and the symptoms and how they would need to modify the classes for this disease population. Motivation was also used by the facilitator to encourage the TC instructors to be positive and encouraging with the participants. This technique was also implemented with the group members as the facilitator attended classes to be supportive and promote attendance and practice of the TC exercise.

As the facilitator, a plan is to share these results with other providers in the IU Goshen Health System at the monthly provider meeting to allow others to learn from this EBP project and encourage similar projects to take place. A poster has been made that will provide an excellent tool to share this information internally at the health system and then also externally at a national nursing conference this Spring.

Skills and attributes. The skills of the facilitator were flexibility, organization, persistence and also critical thinking and reflection. At times the facilitator was the participant of the TC classes showing interest and comradery and then at the end of class time became the PD expert to both the instructors and the group members. There was a need to be flexible and fill the roles necessary to complete the EBP project. Organization was a key skill in keeping the data controlled with the correct participant number during the pre and post intervention testing. It was imperative to be very accurate with the data collection and keeping. The facilitator also was diligent in communicating with both the participants, Healthy Generation director, TC instructors on a weekly basis. This took persistence and a desire for the project to be a success. Critical thinking was used to develop a TC program for the PD population that was

based on evidence using the Stetler theoretical framework. Critical reflection is taking place after the project has been completed to improve all areas for future TC classes and programs. A suggestion for change is to have the classes for this population during the day when the PD patient has the most energy to participate in exercise versus the evening class time when fatigue becomes a factor. Also, class times should be changed to 45 minutes to help with mental focus and fatigue. A longer warm-up time may be necessary for this disease population in addition to providing time for conversation and support to be shared.

Implications for theory

Two theoretical frameworks were used to guide this EBP project. They were the Stetler model and the Transtheoretical model of change (TTM). Both theories were a good fit for the project and aided in decision making. The Stetler model provided five progressive phases to guide the EBP project. The TTM provided valuable guidance on how to be an effective facilitator with the participants of the project.

For this EBP project, the DNP student progressed through Stetler's five phases. The *preparation phase* was first and identified the purpose of the project and the literature regarding PD was reviewed. The next phase was *validation* and the literature was more deeply analyzed and critiqued and provided the DNP student with the knowledge that the literature was beginning to support TC as an effective exercise choice. During the third phase known as the *decision making*, the DNP student reviewed the resources that were available and determined it would be feasible to build a program for PD persons using TC exercise. There was adequate research to support the program and there was a need for this in the DNP's health system. Therefore, the EBP project moved forward. In the fourth phase known as *application*, the project was fully developed and implemented resulting in the 12 week TC exercise class that was specific for the PD person. In the fifth and final step known as *evaluation*, measures

were completed to determine if the intervention was effective and a survey was given to identify participant satisfaction. This phase is ongoing as improvements are necessary for future programs based on what was learned.

Two constructs of the Stetler model that were especially beneficial were the fit of setting and feasibility of the project. The DNP student was able to find an exercise program that was available in the health system that the EBP project was planned. The TC exercise class was struggling and needed more members for it to be allowed to continue. The director was more than willing to work together to allow a new program to be developed to utilize the space and instructor. The EBP project was a feasible option for both parties.

The TTM works well with behavior change and exercise. There are five stages of change and they were used to identify the participants' readiness for this behavior modification. Understanding at what stage along the change continuum the participant was in, aided the DNP student on how to interact with each person individually. Most of the participants were in the *preparation stage* which indicates they were ready to make the changes and begin life style modifications. Others were more determined and ready and were in the *action phase*. The DNP student was able to utilize constructs of the theory in the talks that were held after classes with the group members. Self-efficacy was discussed to encourage the TC class members when they were discouraged and felt as though they were not doing well. Decisional balance was also implemented as the positives and negative of the exercise was debated.

Both of the theories used were able to guide the EBP project and fit well with the TC intervention and the population. The Stetler model assumes a certain level of knowledge and skill by the provider to judge and make decisions about research findings, making it appropriate for nurse practitioners with experience and expertise in their fields of practice. The steps of the Stetler model allowed for a concise instructional

format to plan and implement the program and the TTM assisted in working directly with the group members.

Implications for research and education

Several needs for further research were identified after completion of this EBP project. Longer studies are needed to establish if quality of life can be significantly improved. It is too early to determine if there is a significant effect after 12 weeks while the participants are focused on learning the exercises. Also, a larger number of participants are needed to increase the strength of the studies and add higher levels of evidence in support of TC in PD. Many of the studies analyzed for the literature review had low numbers of subjects, including this EBP project. Additional randomized controlled trials are needed to provide evidence for generalizability to the PD population. A strength of this EBP project was that it was randomized and had a control group with a blinded rater that completed the balance outcome measures. A weakness as noted above was the low number of participants.

This population may require an even more modified, simpler Tai Chi. The post program survey results indicated that even the modified shorter version of TC used in this program was difficult to learn and perform for this disease population. In this EBP project the PD patients were given chairs to assist with balance or to sit to rest and this was helpful. They used them less often as the 12 weeks progressed and no one needed a chair in the last two weeks. The classes should also be offered earlier in the day when the PD patient is less fatigued and ready to exercise. Programs will need to be designed and then evaluated for safety, effectiveness and patient satisfaction.

The results of this EBP project need to be shared with other providers so that clinical practice can be affected. Health care providers can refer PD patients to a TC program with the knowledge that it is safe, well received and a cost-effective alternative to physical therapy that may help improve balance and reduce falls.

Conclusion

Parkinson's disease is a progressive neurological disease that results in significant functional limitations leading to impaired gait and balance, falls and eventually to disability with over one million individuals in the United States being affected (Parkinson's Disease Foundation, 2010). No treatment has been discovered to date to slow or stop the progression of this disease. Instead, therapy is directed at treating the symptoms that are most bothersome to the individual with PD (Jankovic, 2008). The typical treatment approaches are medication and surgical therapy. Other treatment approaches include general lifestyle modifications such as rest and exercise, physical therapy, and speech therapy (Parkinson's Disease Foundation, 2010). Medication therapy tends to become ineffective after several years and exercise may be needed throughout all the stages of the disease (Cutson, Laub, & Schenkman, 1995).

Tai Chi is applicable for adults and patients with chronic disease, such as PD (Wong, Lin, Chou, Tang, & Wong, 2001). The Yang Style TC is the most popular and the most common style used with the elderly and in persons with chronic disease. TC provides training that improves muscle strength through stationary and moving exercises while addressing the need to control balance over a constantly changing base of support (Li et al., 2003). TC has also been found to be a low-cost form of exercise because no equipment is needed, just a facility to run the class, a qualified instructor and handout materials to help the participant learn and practice the moves (Li, et al., 2008).

As a practicing provider, the DNP student recognized the need for an effective, more enjoyable, less expensive option to physical therapy for PD patients that were experiencing postural instability and falls. The Institute of Medicine report has proposed evidence-based practice (EBP) as one of its key strategies to meet the goal of providing high quality care (IOM, 2001). Clinicians use the EBP process to find, appraise, critique, and apply relevant research to make decisions regarding patient care. After reviewing

the literature and assessing needs and attributes of the health system available, it was determined that TC exercise was a feasible, evidence-based intervention choice. The number of participants in the project was lower than planned but it was randomized and controlled adding to the strength of the project.

It can be concluded that TC is an effective way to reduce balance problems in addition to a safe and helpful form of exercise for persons with PD. The three participants that dropped from the project were the only ones experiencing falls in the intervention group; therefore it was impossible to determine if the TC would demonstrate significance in fall reduction. In this EBP project, the secondary outcome of QOL was not significant and a possible reason for this is the short time frame. The participants commented that the modified short form TC was difficult to learn and perform, so advanced practice nurses and additional EBP projects may need to develop an easier form for this population.

There are plans in the spring to reintroduce the program for persons with PD. A small fee will be charged for the class. Also, the results of the project will be shared with providers in the health system for dissemination of evidence and use in their practices. Verbal feedback has been mostly positive regarding the program but more importantly, an overwhelming appreciation was shared that an interest was taken in the participants' disease process and improving their outcomes.

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BIOGRAPHICAL MATERIAL**Beth A. Gladfelter**

Mrs. Gladfelter graduated from York College of Pennsylvania with a Bachelor of Science in Nursing degree in 1989. She worked in intensive care for ten years before returning for her Master of Science in Nursing degree in 1999 at Valparaiso University in adult health. She also completed the Post masters Family Nurse Practitioner Program while at Valpo and is certified through the AANP. Mrs. Gladfelter also holds a certification in Multiple Sclerosis Nursing and has worked as a nurse practitioner since 2002 in the specialty of neurology in private practice with a collaborating physician. In addition to her practice she has been an adjunct faculty member at Bethel College teaching clinical nursing in med-surg and intensive care and hopes to resume teaching in the future. She has returned to Valparaiso University and is working on her Doctorate of Nursing Practice degree with plans for completion in 2011. Parkinson's disease and migraine are her special interests in the field of neurology. Mrs. Gladfelter is a member of the AANP, International Organization of MS Nurses, Sigma Theta Tau International Honor Society of Nursing, Coalition of Advanced Practice Nurses of Indiana and the Association of Neuroscience Nursing.

ACRONYM LIST

AACN: American Association of Colleges of Nursing

AAN: American Academy of Neurology

APN: advanced practice nurse

BBS: Berg Balance Scale

CMS: Center for Medicare and Medicaid

DNP: Doctorate of Nursing Practice

EBP: evidence-based practice

FFS: fee for service

FRT: Functional Reach Test

ICD-9: International Statistical Classification of Diseases and Related Health Problems

IOM: Institute of Medicine

IRB: Institutional Review Board-

TC: Tai Chi

TTM: transtheoretical model

TUG: Timed Up and Go

PARIHS: Promoting Action on Research Implementation in Health Services framework.

PD: Parkinson's disease

PTA: physical therapist assistant

RCT: randomized controlled trial

QOL: quality of life

SF-12: short form health survey with 12 questions



APPENDIX A

*You Are Invited to Be Part of an
Exciting Project on Tai Chi and
Parkinson's disease*

Dear Person with Parkinson's disease,

Volunteers are needed to participate in an investigational program involving Tai Chi exercise with those with Parkinson's disease. The program will be 12 weeks with classes 1 hour in length, 2 times a week. Classes are scheduled on Monday and Wednesday from 5pm to 6pm in September, October and November and will be led by a qualified Tai Chi instructor.

Tai Chi has been demonstrated to improve balance and help with fall prevention in those with Parkinson's disease. It is a safe, low impact exercise with a high rate of participant satisfaction.

The program will be offered *free* at the Retreat in Goshen for those willing to participate in the classes and take part in pre and post program balance testing and a few simple questionnaires. The usual fee for this class is \$40 for an 8 week session.

Interested participants must be able to stand for 30 minutes and walk 10 feet. If participants are accepted into the study, they will be randomly placed in the Tai Chi program or in an exercise as usual group.

For information please contact Beth Gladfelter by **August 13th** via email at bgladfel@valpo.edu or call at 574-534-6085.

APPENDIX B

Dear Project Participant,

Completing the quality of life questionnaire (PDQ-39) may be distressful to you as you reflect on your disease and the impact it has had on your life. If you feel the need to speak with someone regarding these feelings, please contact someone from the list below.

- Your primary care provider
- Your neurologist at Goshen NeuroCare Clinic at (574) 537-0219
- Oaklawn's Senior Services, call the Access Center at (574) 533-1234, ext. 700
- Goshen Health System's *Nurse On Call* can also provide referral for services
 - **Local:**
574-535-2600
 - **Toll-Free:**
1-877-846-4447

APPENDIX C**CONSENT FORM**

Project Title: The Effect of Tai Chi Exercise on Balance and Falls in Persons' with Parkinson's Disease

Investigator: Beth Gladfelter MSN, RN, NP-C, MSCN, DNP student, Valparaiso University.

Purpose: I, _____, understand that I am being asked to take part in a investigational program of Tai Chi exercise because I have Parkinson's disease. I was selected as a possible participant because I am a patient at Goshen NeuroCare Clinic.

Procedure: If I agree to participate in this project, I will be asked to: Agree to be placed by random assignment into either the Tai Chi exercise group or an exercise as usual group. Prior to being accepted into the study the inclusion and exclusion criteria must be met and will include testing of memory and answering a questionnaire. If assigned to the Tai Chi group, will attend one hour classes two days a week for 12 weeks at the Retreat in Goshen, IN. If assigned to the exercise as usual control group, I will continue my current exercise practice with no changes.

Both groups will keep an exercise/fall journal and will have balance testing completed at the beginning and end of the 12 weeks. Those in the Tai Chi exercise group will be given a DVD/VHS tape and handouts with exercises that should be practiced outside of class for each week. The Tai Chi classes will be taught by a qualified instructor and are of no charge.

Risks: There are no physical or other known risks to participating in the exercise program. Tai Chi is a low impact, safe exercise and the participant may sit when necessary. Those participating in the program will inconvenienced by the time required of the classes, keeping of the exercise and fall log, practice time and testing time. Those participating may be inconvenienced of their time for testing and keeping of the exercise and fall log.

APPENDIX C

Benefits: Possible benefit to participating in the project could include improved health outcomes such as better balance and decreased risk of fall related to Tai Chi exercise.

Voluntary participation/withdrawal: I understand that participating in this project is my choice, and I am free to stop at any time and that this will not affect my current or future relations with Goshen NeuroCare Clinic or Goshen Health System.

Questions: If I have any questions about being in the study now or in the future, Beth Gladfelter, may be contacted at 574-534-6085. If I have any questions about my rights as a research participant, Julie Brandy, Chairman of the Institutional Review Board at Valparaiso University, may be contacted at 219-464-5298.

Confidentiality/anonymity: Although the information and results of the tests I complete will be used and reported by the DNP student, my name and other facts that would identify me will be kept strictly confidential.

Consent to participate in the research study: I have read or had read to me all of the above information about this project, the procedure, possible risks, and potential benefits to me, and I understand them. All of my questions have been answered. I give my consent freely, and offer to participate in this study.

 Participant signature

 Date

 Investigator signature

APPENDIX D

Demographic Information for Investigational Program

Subject number: _____

Age: _____ Gender: M or F

Married _____ Divorced _____ Widowed _____ Single

Living situation: In home _____ Assisted living _____

Nursing home _____

With spouse/significant other _____ With family _____

Alone _____

Age at onset of PD in years: _____ Duration of PD in

years: _____

Medication:

Levodopa: Yes or No Daily dose: _____

Dopamine agonists: Yes or No Daily dose: _____

Other PD medication:

Hoehn and Yahr Stage: I II III IV

Current Exercise Practices:

Do you experience falls? Yes or No If yes, approximately how many per month? _____

Have you had Physical Therapy for gait/balance/falls/strengthening in the last 6 months?

Yes or No

List other chronic illnesses that may affect your ability to exercise:

List any recent surgeries, illnesses or hospitalizations:

APPENDIX E**Post Program Survey**

Participant Number: _____

Number of Classes attended: _____

Circle the response that best describes what you thought about the Tai Chi program. Use the scale below to rate the questions.

1= strongly agree (SA) 2= agree (A) 3= neither agree nor disagree (N) 4= disagree (D) 5= strongly disagree (SD)

| | <u>SA</u> | <u>A</u> | <u>N</u> | <u>D</u> | <u>SD</u> |
|---|-----------|----------|----------|----------|-----------|
| 1. The program was appropriate. | 1 | 2 | 3 | 4 | 5 |
| 2. The program was enjoyable. | 1 | 2 | 3 | 4 | 5 |
| 3. I was satisfied with the program. | 1 | 2 | 3 | 4 | 5 |
| 4. Tai Chi was easy to learn. | 1 | 2 | 3 | 4 | 5 |
| 5. Tai Chi was easy to perform. | 1 | 2 | 3 | 4 | 5 |
| 6. Tai Chi was safe to perform. | 1 | 2 | 3 | 4 | 5 |
| 7. Tai Chi made me confident in walking. | 1 | 2 | 3 | 4 | 5 |
| 8. My balance has improved. | 1 | 2 | 3 | 4 | 5 |
| 9. It helped me be more independent. | 1 | 2 | 3 | 4 | 5 |
| 10. Tai Chi helped improve my confidence. | 1 | 2 | 3 | 4 | 5 |
| 11. I would like to continue Tai Chi. | 1 | 2 | 3 | 4 | 5 |
| 12. I would recommend Tai Chi to others. | 1 | 2 | 3 | 4 | 5 |

Thank you for your time and participation in this program.

Appendix F

Dear Participant,

Thank you for agreeing to be in this investigational program of Parkinson's disease and Tai Chi.

Exercise has been demonstrated to be beneficial in slowing the progression of the symptoms of Parkinson's disease and reducing the impairment of the disease. Research also indicates that exercise can increase the dopamine level in the brain which then increases independence in those with Parkinson's disease.

Tai Chi exercise has been shown through several clinical trials to be safe for the elderly and also for those with chronic disease such as Parkinson's disease. In Tai Chi exercise there is no aerobic or musculoskeletal strain. This modality incorporates slow graceful movements linked together in a continuous sequence so that the body is constantly shifting from foot to foot, with a lower center of gravity. Tai Chi has demonstrated improvement in balance, falls, movement and quality of life. Many people have found it to be very enjoyable.

Please use the provided DVD/VHS for practice outside of class. The handouts in the folder are for your reference as you learn Tai Chi and the moves involved in the exercise. Also included in the folder is the Exercise and Fall Diary with the instruction attached.

If you have any questions regarding the program, please call Beth Gladfelter, Project Coordinator at 574-596-6433.

You may also call Norma Monik, Director of the Fitness and Nutrition for the Goshen Health System at 574-535-2855.