DIFFUSION OF TAI CHI IN OLDER POPULATIONS: FACILITATORS AND BARRIERS TO ADOPTION

By

PETER A. GRYFFIN

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To my wife and children for their sacrifices,
And to my committee, for their support and patience

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LIST OF ABBREVIATIONS AND KEY TERMS

ADOPTION	A term used in diffusion research related to the uptake of an intervention
CTA	Cues to action. Variables that facilitate a “readiness to change.” The more relevant and pertinent the cues to action, the greater the likelihood a person may take action. Cues can be bodily events (chest or other body pains, weight gain), media reminders, and comments from others
DIFFUSION	Process in which an innovation is communicated through certain channels over time among members of a social system
FISHBONE DIAGRAM	A trouble shooting tool originally used in business to visually diagram causes and effects for problem solving.
HBM	Health Belief Model. A psychological model for explaining and predicting health behaviors
KAP	Knowledge, Attitude and Practice. Identifying knowledge and attitudes which affect practice or adoption of a behavior
OLDER ADULTS	The current preferred term as identified by AARP to describe adults aged 50 and older.
QG	Qi Gong. Any of a variety of Chinese breathing exercises, generally aimed at promoting health. Typically involving stationary or slow controlled movements combined with deep breathing, TC is often categorized as a form of QG.
TAILORED MESSAGE	Messages customized to an individual to promote adoption or uptake of a health behavior. Similar to CTA.
TARGETED MESSAGE	Messages customized to a group or societal level to promote adoption or uptake of a health behavior. Similar to CTA.
TC	Tai Chi. A slow moving health exercise which originated as a martial training method, and became popular as a form of Qi Gong (QG)
SE	Self Efficacy. An individual’s confidence that they can successfully engage in a specific behavior

Abstract of Dissertation Presented to the Graduate School
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FACILITATORS AND BARRIERS TO ADOPTION

By

Peter A. Gryffin

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According to the Center for Disease Control (CDC), seven out of ten deaths are due to chronic diseases, most of which are preventable. Prevention has been identified as possibly the only viable strategy for reducing health care costs, death, and disability, with potential Medicare savings of $65.2 billion to $142.8 billion annually. Falls, a specific health threat to older adults (as the leading cause of fatal and non-fatal injuries in older adults), resulted in $28.2 billion of direct care costs. A large body of evidence has demonstrated significant benefits of Tai Chi (TC) for balance and chronic diseases, yet TC is vastly under-utilized. Of critical importance is to develop an understanding of what will facilitate action for TC, as well as barriers to TC adoption. To accomplish this goal two focus groups were conducted, one group consisting of participants who had never considered adoption of TC (*n*=10), the second group consisting of participants who were TC practitioners (*n*=11). A fishbone diagram was utilized to structure responses according to the Health Belief Model (HBM) according to facilitators (perceived threats and benefits), and perceived barriers. Perceived threats, benefits, and barriers listed on the fishbone diagram were rated on a 0-9 scale, and were evaluated according to frequencies, mean group scores, as well as standard deviation.

Additional qualitative data was gathered during the discussion phase. Lack of awareness of benefits of TC, a need for evidence based benefits, as well as issues related to teaching style were identified as the greatest barriers. The largest opportunity for the promotion of TC identified related to perceived threats from falls. Threats identified by the focus groups were compared to statistics from the Center for Disease Control (CDC). A large dissonance existed between health threats identified by the CDC and threats identified by focus group participants, indicating a potential area to target. Implications related to the diffusion of innovations are also presented, related to the five stage innovation-decision making process and the perceived characteristics of an innovation relevant to the adoption of TC, with recommendations for future research.

CHAPTER 1
INTRODUCTION

Purpose of this Study

According to the Center for Disease Control,[1] seven out of ten deaths are due to chronic diseases, most of which are preventable. In 2002, half of Medicare beneficiaries had been treated for at least five chronic conditions, which accounted for more than 75% of Medicare spending.[2] Chronic diseases are primarily lifestyle illnesses, and as such, are the most preventable, through the adoption of a healthy lifestyle. Older adults in particular are beset by a number of additional health problems atypical to most of society, in particular threats from loss of balance and falling, as well as threat of reduced mobility, heart disease, cancer, stroke, and various other conditions.[3,4]

Tai Chi (TC) is characterized by slow gentle movements focused on controlling the central balance of the body, and has been identified as an exercise suitable for all ages, including older adults.[5-7] Benefits have been reported for balance,[5-7] cardiovascular disease,[5,8] cardiopulmonary disease,[9] beneficial effects for type 2 diabetes,[10,11] various psychological and mental benefits[6,12], and potential benefits for cancer.[13-16] Refer to overview of benefits of TC for older adults in chapter 2 for more information.

Yet TC tends to remain under-utilized by society, including in the older adult population. For example, On Top of the World community (OTOW), in Ocala Florida, an active living community of approximately 10,000 residents, has been offering a TC program for over 6 years, yet attendance is constant at around 7 to 9 participants. From discussions with other active living communities in Central Florida, such low attendance rates are typical. TC has the lowest attendance rate, compared to other fitness classes

at OTOW, which tend to number around 18-20 per class (with 17 different class offerings, equaling a total of 37 classes each week, not including TC). As a comparison TC is under-utilized, particularly considering it is a low impact exercise that is particularly beneficial for older adults (refer to the review of literature in chapter 2). Determining facilitators and barriers to the adoption of TC may provide insights which can be used to promote adoption of a variety of health exercises.

The question is, why do people not take advantage of health offerings, particularly when offered at no cost? Knowledge, attitudes and practice (KAP) studies have been established as an effective means to discover key adoption factors.[17] Chodzko-Zajko and others,[18] during an national expert meeting sponsored by the National Blueprint office at the University of Illinois and the National Council on Aging, identified a strong need for studies on the most effective ways to deliver evidence based TC and Qi Gong programs to the public, including elements related to the importance of understanding current knowledge and attitudes towards TC.

Primary issues identified by the authors, aside from the development of more effective ways to teach TC outside the traditional expert or master format, was the need to address the challenges of integrating TC into the aging network and to develop an effective program to meet the needs of a diverse population. These challenges include the need to identify barriers such as misinformation (knowledge), perceptions that the practices are too unusual or esoteric (attitudes), that TC does not mean learning a martial art (knowledge), as well as lack of understanding of the benefits of TC (knowledge).

Other suggestions related to knowledge and attitudes include; the need to develop a clear and concise marketing message regarding the benefits of TC for target populations, particularly older adults; marketing the value of program adoption to community based organizations; gather testimonials from successful programs for media use; develop information for distribution at community health fairs and other venues; and communicate research findings to the media and health care professionals in Western terms.[18] These recommendations form the essence of the current study – to identify KAP, barriers, facilitators, and an effective social marketing platform for the effective diffusion of TC in the older adult community.

The purpose of this dissertation was to identify facilitators and barriers to the adoption of TC through a focus group design, comparing knowledge and attitudes between TC practitioners and those who have never considered TC adoption, relevant to perceptions of health threats and benefits of TC, as well as barriers which may affect the diffusion of TC. The Health Belief Model (HBM) was used as a framework, in conjunction with a fishbone diagram to structure responses. The study will be valuable for health education specialists in fulfilling their responsibilities as laid out by the National Commission for Health Education Credentialing.[19] The current study would address the following areas of responsibility:

1. Assess the needs, assets and capacity for health education: The primary purpose of the KAP assessment.
2. Plan health education: The results of the focus group study, using the fishbone diagram results and follow up studies, would assist with effective health education planning.
3. Conduct evaluation and research related to health education: The function of this dissertation.

4. Administer and Manage Health Education: Focus group results, and follow up studies, can be used by OTOW management for better meeting community needs.

5. Serve as a health education resource person: The KAP assessment will provide information and resources for health educators to better serve the public, by laying a foundation from which to conduct rigorous studies for validation, as well as initial findings from the focus groups.

6. Communicate and advocate for health education: The dissertation will provide baseline data for additional studies which can be used to advocate and communicate the benefits of participatory community research.

To accomplish these goals, a KAP assessment was conducted using a focus group design, using the HBM and fishbone diagram (see chapter 3: Methods, for detailed overview) as a framework. The focus of this study was to identify factors within two focus groups (one consisting of non-adopters who have not considered adoption of TC, and a second focus group of current TC practitioners), to lay a foundation for future research towards the effective diffusion of TC in older adult populations. Findings can be used to structure a case series towards refining facilitators and barriers to the adoption of TC, and the eventual development of a survey to validate findings relevant to a larger population, and to identify variables not uncovered through the current study design.

Background and Overview of the Health Belief Model

The Health Belief Model (HBM) was developed by social psychologists Godfrey Hochbaum, Irwin Rosenstock, and Stephen Kegels, for the U.S. Public Health Services in the 1950's.[20] According to Champion and Skinner,[21] the HBM has been used on a wide basis to explain maintenance of and change in health behavior, and as a framework for developing health interventions.

The model was developed to study and explain why people did not participate in health based programs. The model was later applied to the study of symptom response, response to diagnosis of illness, and most importantly, adherence to health routines and regimens. The model grew from two primary sources, Stimulus Response (S-R) theory and Cognitive Theory[21]. According to Champion and Skinner, S-R theory contributed an understanding of how reinforcements (or the consequences of an action) can affect the frequency of a behavior.

From a TC perspective, internal enjoyment of the form, perceived health benefits and/or approval of friends and parents, would be positively reinforcing, resulting in an increased likelihood of performing TC (the Perceived Benefits construct of the HBM). However, if a consequence of practicing TC resulted in boredom, displeasure, and/or disapproval of friends or family members, then the experience would be negatively reinforcing, resulting in a decrease in TC performance (the Perceived Barriers construct of the HBM).

Social psychologists also incorporated elements of Cognitive Theory into the HBM, particularly the role of the subjective value of an outcome, and the subjective probability (the expectation) that a specific action will result in a specific outcome. Adding the cognitive element changed the nature of health behavior performance from primarily externally motivated (approval or disapproval of friends and family), to also consider the role of internal factors, subjective thoughts, and feelings regarding the experience. Champion and Skinner[21] sum this up as *value-expectancy,* where health behavior can be predicted or influenced by the value of good health, and the

expectation that health behaviors (i.e., TC), will reduce or prevent the likelihood of becoming ill.

The HBM consists of five main constructs: Perceived Threats, Perceived Benefits, Perceived Barriers, Self-Efficacy, and Cues to Action.[21] Below is a description of each factor.

Perceived Susceptibility is the belief that one has a chance of getting ill, or will be affected by certain condition (i.e. injury from falling). When Perceived Susceptibility is low health actions are less likely to be taken. When Perceived Susceptibility is high the person is more likely to take action.[21] In older adults, several occurrences of loss of balance would act to increase the perceived susceptibility of falling.

Perceived Severity is the belief regarding how serious the condition is, and potential consequences. For example, in older adults, the perception that balance is compromised, leading to the threat of limited independence. Or, on the other hand, perception that balance is not compromised, and results of a fall will be minimal.
The higher the Perceived Susceptibility and Perceived Severity, the greater the likelihood one will take action. Collectively Perceived Severity and Perceived Susceptibility are labeled as Perceived Threat.[21] For the purpose of the focus group setting, Perceived Susceptibility and Perceived Severity will be evaluated collectively as Perceived Threat.

Perceived Benefits is the belief that taking action will produce a benefit, and increases the likelihood of taking action. Taking action would be a factor of Perceived Threat and the Perceived Benefit. The higher the Perceived Threat the greater would be the Perceived Benefit of taking action.[21]

Perceived Barriers is the belief that certain variables (psychological and environmental) make action difficult if not impossible. Essentially Barriers are the costs of taking action.[21] For example, for fall prevention efforts, the perceived barrier to TC for enhanced balance might be lack of time, lack of knowledge, and/or negative attitudes. The larger the barrier the lesser the likelihood of taking action. The reverse would also be true – smaller the barrier the greater the likelihood of taking action. Perceived Threats, Benefits and Barriers will be the three main constructs used for structuring the fishbone diagram and focus group discussion.

Other constructs of the HBM not being directly addressed by the focus group design include Cues to Action. Cues to Action are variables that facilitate a "readiness to change"[21]. Examples might be e-mail messages, advice, or visual reminders on the importance of developing balance. A specific example might be a targeted message specific to the older adult population, such as a poster showing a person lying on the ground with the infamous caption "I've fallen and I can't get up," next to an older person in a graceful TC pose with the caption "Tai Chi - master balance, master life." The more relevant and pertinent the Cues to Action, the greater the likelihood a person may take action. Champion and Skinner[21] however, state that little has been done empirically to study the actual effectiveness of cues to action. This would be an area worth pursuing. Focus group results regarding perceived threats, perceived benefits of TC, and perceived barriers to the adoption of TC, can provide initial data from which to develop larger scale and more detailed investigations from which effective cues to action.

For the current study, total group and individual responses scores for each construct were examined, to identify potential variables for testing in a larger population

or through a case series. Individual responses to items can also be used to identify items of potential greatest concern, towards designing effective cues to action or targeted messages for testing in larger populations.

Research Problem

Despite proven benefits to the older adult population, Tai Chi may be under-utilized. For example, according to the director of the community fitness center at On Top of the World (OTOW) Active Living Community, a free TC class has been offered for over 6 years, yet despite active promotion efforts, attendance has remained level at 7-9 participants, out of a total population of 10,000 residents. Other fitness classes, including yoga, average 19 participants in each class. Another example indicating the paucity of TC in society, compared to yoga, can be taken from the yellow pages phone directory. Yoga has its own heading (with 3139 listings in the state of Florida as an example), while TC is included under martial arts in the filter for a total of 2552 listings in Florida, including other martial arts.[22]

Of critical importance is to develop an understanding of what will motivate individuals to become regular practitioners of TC, and what factors might account for lack of participation. The focus of this dissertation is to conduct a Knowledge, Attitude and Practice (KAP) study using a focus group design, to determine possible factors related to potential facilitators and barriers to effective diffusion of TC in older populations, which can be used to develop larger studies. KAP studies have been used in various ways, particularly to identify knowledge deficits and negative attitudes which may act as barriers to adoption of an innovation.[17] Since one focus group is being selected based on minimal exposure to TC, the current assessment focused on knowledge of TC (or lack of it) and factors which may help to facilitate favorable

attitudes towards practice. Results will establish a baseline for larger studies to permit more effective diffusion of TC interventions, ultimately affecting long term impact on health care costs, discretionary spending, and quality of life.

Research Questions

1. What knowledge do older adults have regarding TC (regarding perceived benefits and relationship to perceived threats)?
2. What are the primary barriers affecting adoption of TC in an older adult sample?
3. What are the primary facilitators (perceived threats and benefits) affecting adoption of TC in an older adult sample?
4. What differences exist in the above between the TC and Non TC groups?

Delimitations

A focus group design was chosen due to the early stage of research into diffusion of TC. The strength of a focus group is the inclusion of multiple points of view, compared to a case study,[23] although not as representative of a population as would be a survey. The focus group design was chosen to evaluate commonalities across individual cases in facilitators and barriers in TC adoption, particularly relating to knowledge and attitudes between a TC group and a Non TC group. Subjects consisted of volunteers from the older adult population age 65 and above from a specific site (OTOW), actively recruited from fitness center participants by the center director. The focus group participants were limited to those active at the fitness center, as opposed to the general OTOW population, in an attempt to control for differences due to basic activity and fitness level. This fishbone diagram (see chapter 3: Methods) was used to help establish a common condition, with an ability to more accurately compare group differences using reported items, frequency of responses, and rating of personal relevance of uncovered items on a 0-9 scale.

Limitations

The limitations of a focus group study and the investigations include:

- Findings of study developed from focus groups at OTOW cannot be generalized to a larger sample or population.
- Findings included self-reported data, resulting in possible over or under reporting of data.
- Sample size does not lend itself readily to larger statistical analysis.
- Findings may not be able to be applied to other health interventions.
- Data was collected during the summer of 2012, data collected at other time periods may differ.
- Group format may inhibit responses from individuals (Blinded aspect of fishbone diagram may help to control this limitation).
- Researcher bias may influence responses (also minimized through use of the fishbone diagram – see Methods and Discussion Sections for explanation).

Assumptions

The assumptions for this study include:

- The participants who volunteered for the study adequately represented the larger population of active older adults age 65 and above.
- Recruited participants will be able to complete the study.
- Sample size will be adequate for the research design and analysis.
- The focus group format will yield more data in a synergistic manner than would individual interviews.
- The researcher will be neutral and avoid biasing focus group discussion and the use of fishbone design will help to limit potential researcher bias, through blinded individual responses.

Significance of the Study

Prevention has been identified as the best and possibly only viable strategy to reduce health care costs, Medicare spending, and disability,[2] which would have a direct effect on wealth and retirement income, as well as quality of life. With recent cuts in the

prevention and public health fund by 5 billion dollars over the next five years[24], it is more important than ever to document the potential economic impact to society. Rula and colleagues assert that by 2023, preventive care and modest improvements in unhealthy behavior could reduce the number of chronic disease cases by 40 million, with an associated reduction in costs by $1.1 trillion annually.[2]

Medicare savings based on projected scenarios could range from a $65.2 billion to $142.8 billion in annual savings. Even small reductions in Medicare expenditures through modest interventions would have a large impact in the fiscal crises facing the Hospital Insurance Trust Fund. Rula and colleagues further note that studies on a current fitness program for Medicare Advantage members, SilverSneakers, has resulted in significant reductions in hospitalizations and health care costs (saving $1663 the first year and $1230 the second year per participant, compared to nonparticipants).[2]

Particularly relevant to the current study, aside from chronic diseases, is the threat of falls to older populations. According to the Center for Disease Control, falls among older adults resulted in estimated direct health care costs of over $28.2 billion dollars in 2010.[4] Direct costs do not account for long term effects, including disability, dependence on others, and reduced quality of life. The CDC stated that approximately one third of older adults fall, and falling is the leading cause of fatal and non-fatal injuries in the United States for persons age 65 and older.[4]

Of those who experience non-fatal falls, 20-30% have reduced mobility and ability to live independently. Reducing health care costs through effective low cost interventions will impact not only health care and disability costs, but will also enhance discretionary spending, quality of life, and retirement income. The CDC further

documents that the cost of fall injuries increase rapidly with age, which further indicates the importance of motivating TC uptake early in retirement based on the benefits for balanced as noted in the overview of TC benefits.[4]

The economic impact beyond costs related to fall reduction would be even greater, due to the many additional mental and physical health benefits of Tai Chi noted in the review of literature in Chapter 2. According to Guijing Wang, an economist in the Applied Research and Evaluation Branch of the CDC, direct costs of hypertension (high blood pressure) in the United States is over 108 billion dollars each year.[25] TC has been demonstrated in clinical studies to have a direct beneficial effect on blood pressure.[8]

Still to be determined is the development of an understanding of when and why people, particularly older adults, adopt or reject Tai Chi, and what factors will maximize uptake and diffusion in society, as an additional health activity to conventional forms of exercise with many unique benefits (Chapter 2). Understanding adoption factors of TC is an area identified by Chodzko-Zajko and colleagues as an area in critical need of study towards reducing illness and health care costs in society.[18] Addressing adoption factors through a focus group setting is the focus of the current study.

CHAPTER 2
REVIEW OF THE LITERATURE

In addition to a review of Everett Rogers seminal work Diffusion of Innovation[17] and diffusion research relevant to the current study, a search was conducted using the EBSCOhost online reference system, which accesses multiple databases with one search. A secondary search was also carried out in the EBSCO business searching interface. Search terms included focus group, Ishikawa diagram, fishbone diagram, KAP, knowledge, attitudes, knowledge attitude practice, exercise, health belief model, tai chi, yoga, and CAM.

For the overview of health benefits of TC for older adults, another search was carried on the EBSCOhost online reference system, using the following search terms: Tai chi, older adults, elderly, health benefits, balance, cardiovascular disease, blood pressure, cardiopulmonary disease, diabetes, mental benefits, stress, and cancer. The review of literature is divided into four sections – overview of health benefits of TC for older adults, constructs and elements of diffusion of innovations as developed by Rogers[17] relevant to the current study, KAP studies on TC and other forms of exercise, and review of studies relevant to using the fishbone diagram from a qualitative approach.

Overview of Health Benefits from Tai Chi for Older Adults

Tai Chi is characterized by slow gentle movements focused on controlling the central balance of the body, and has been identified as an exercise suitable for all ages, including older adults.[5,6] The weight of the body is shifted gradually between the right and left legs, with the knees slightly bent and the body held in an upright posture (the tailbone dropped and crown of the head lifted, as if pulled by a string in opposing

directions. Tai Chi originated as a martial art, and has diversified into many styles of TC. The Yang, Wu, Hao, and Sun styles of TC are most representative of the slow circular movements of TC, while the Chen style retains many of the more explosive movements and jumps characteristic of its origins as a martial art.[6]

From the review of literature below, the benefits of TC can be divided into three main areas: physiological benefits, mental benefits, and benefits for balance. Chiang and others[5] conducted an overview of literature to document a wide range of reported physical benefits for older adults. Five studies specific to TC and balance reported significant effects (with a p value ranging from .01 to .05) compared to non TC participants. Tai Chi can be an effective exercise for balance due to the shifting of weight from one leg to the other in a slow controlled manner, with the balance held over one leg (with an option for having the other leg balanced in the air during many movement, or lightly touching the ground). In TC terminology, this is called being “single weighted”. Significant effects of TC for older adults were also reported for knee and ankle strength, mental health and vitality, blood pressure, fitness levels, flexibility, body fat, psychosocial status, and self-efficacy.[5]

Schleicher and colleagues[7] conducted a systematic review of 24 articles relating to the effectiveness of TC for reducing risk of falls in older adults. A limitation addressed by the authors is that not all studies reported the style of TC used. Those that did included Yang, Sun, Ng, and Chen styles and variations, with Yang being the most prevalent. Level of intensity was also not defined consistently (ranging from gentle to low impact). The authors further stated that frequency and duration of TC practice did not seem to impact outcomes, with significant improvements in balance being reported

ranging from7.5 hours per week for 3 weeks, or 1 hour a week for 16 weeks. Significant improvements were shown in reduction of number of falls, fear of falling, and significant improvement in laboratory based balance measures. In studies reporting fall surveillance, five of the six studies reported fewer number of falls with the TC intervention compared to no intervention.

Yeh and colleagues[10] documented the benefits of TC for cardiovascular disease (CVD) and risk factors. The authors reported beneficial effects related to effects on blood pressure effects and hypertension, particularly in patients with CVD risk factors. In the only randomized controlled trial reviewed using patients with CVD (comparing aerobic exercise to TC), both groups experienced significant reduction in systolic blood pressure ($p < 0.05$), while diastolic pressure was improved only in the TC group ($p < 0.01$). Greater compliance was reported with the TC class. The authors suggest that TC may be particularly appropriate for those unable or unwilling to engage in other forms of exercise, or as a bridge to more vigorous forms of exercise. The authors also report excellent compliance with TC interventions in clinical trials, which may offer an attractive alternative to conventional cardiac rehabilitation programs which are cited as being underutilized. In a randomized controlled trial using patients with heart failure, a significant improvement was demonstrated on the 6 minute walk test ($p < 0.01$), improved B-type natriuretic peptide ($p < 0.03$) and improved QOL compared to usual care. Yeh and others[10] also support that TC may be safe for patients with cardiovascular disease, noting that 3 studies with higher risk coronary patients reported no ill effects, with metabolic equivalents of 1.5-4.0, similar to low-moderate intensity aerobic exercise.

Chiang and colleagues[5] also reported benefits for coronary heart disease, stroke, and hypertension. Six studies were reviewed, reporting significant improvements in systolic and diastolic blood pressure, noting that TC has similar benefits to low impact aerobic exercise, and increased peak oxygen uptake during exercise. Effects on blood pressure may be a particular cardiovascular benefit of TC as indicated by Yeh and colleagues[8] in a review of 22 studies on the effects of TC on blood pressure. The authors found 22 studies reporting reductions in blood pressure using tai chi as the intervention (3-32 mm Hg systolic and 2-18 mm Hg diastolic BP reductions, $p < 0.01$ to 0.05). No adverse effects were reported. The authors suggest that TC may reduce blood pressure and serve as a practical method to manage hypertension, in conjunction with conventional hypertension management.

Aside from cardiovascular disease, TC has also demonstrated effectiveness for cardiopulmonary disease (COPD). Chan and colleagues[9] conducted an investigation into the effectiveness of TC for enhancing respiratory functions and activity tolerance in 206 patients with COPD using a single blind randomized design. The exercise group was taught breathing techniques to be used with walking. Participants in the control group maintained normal activities, while the TC group practiced 60 minutes twice a week for 3 months. A significant improvement was noted in improvement of respiratory functions and activity tolerance for the TC group ($p < 0.01$). Only the TC group experienced improvements, with no change in the exercise groups, and a decline in lung function in the control group at the 3 month follow up.

Several studies have been conducted investigating the potential effect of TC on diabetes. Diabetes is the sixth leading cause of death in older adults.[1] Song and

colleagues[11] examined the effects of adherence to 6 months of TC on glucose control, diabetic self-care activities, and QOL among 99 adults diagnosed with type 2 diabetes. Sixty-two participants completed pre-test and post-test measures. Thirty one participants who completed 80% of the TC sessions were compared to 31 who did not. The adherent group had greater decline in fasting glucose (interaction effect $F = 5.13$, $df = 2$, $p < 0.05$) and HbA1c (interaction effect $F = 4.15$, $df = 2$, $p < 0.05$) and experienced better QOL in most mental components compared to the non-adherent group.

Other studies found similar benefits for type 2 diabetes, including a study by Shih-Chueh and colleagues,[11] who investigated the effects of TC on biochemical profiles and oxidative stress indicators in obese patients with type 2 diabetes using a randomized control trial format. Participants were randomized into either a TC group or a conventional exercise group, exercising 3 times a week for 12 weeks. Significant improvements were experienced by the TC group in serum lipids, HDL cholesterol, and body mass (BMI), while the hemoglobin A1C values did not decrease. Oxidative stress profiles also improved in the TC group, compared to the exercise group which experienced no improvement in BMI, lipids and oxidative stress profiles.

Tai Chi also has many psychological benefits as a mindfulness based form of moving meditation.[6,26] Jimenez and colleagues conducted a review of 43 studies investigating the psychological effects of TC.[6] According to the authors, the two primary areas of benefits can be categorized into quality of life (QOL) and cognitive function. TC has been documented in the literature as creating states of great calm and mental tranquility, and has been classified as a form of moving meditation. Yet it is noted that the majority of studies on TC focus on the physical benefits of TC for health.

Jimenez and others conducted an extensive review of the literature for studies which included a psychological component.[6] The authors reported findings for significant effects on emotional well being, in regards to mood, stress reduction, anxiety, depression, general perception of mental health, as well as self-perception related to self-esteem. Nineteen of 22 studies found significant improvements in emotional well being, with 9 of 11 studies finding significant improvement in mood, 9 of 11 significant improvements in depression symptoms, 7 of 8 significant improvements in anger and tension, 60 8 significant improvements in anxiety reduction, 6 of 8 significant improvements in the ability to manage stress more effectively, and 5 of 9 significant improvements in emotional disorders.

Seven of 9 studies also found significant improvements in feelings of self-efficacy, and 5 of 5 enhanced confidence related to fear of falling. Six of 7 studies found significant improvements for sleep disorders. The authors note concern regarding the wide range of styles, new forms that are being developed, and teaching styles as a large limitation in trying to generalize results. Several confounders which can affect study results were identified: Pace (i.e., slow versus fast), duration and frequency of practice, style and form practiced, support patterns of footwork (i.e. single versus double weighted), height of stance, and intensity (the authors state that the slower TC is performed, and the deeper the stance, the greater the magnitude of muscle activation). The authors also note that reported mental benefits of TC averaged 13 weeks of 2-3 sessions each week for 1 hour, although some cases reported effects after 5 weeks. Jimenez also notes that few studies have been carried out on the effects of TC on

cognition, noting only two which confirmed significant improvements in attention, memory, concentration, and speed of information processing.[6]

The mindfulness component of TC may also have benefits for weight management through raising awareness to help establish control over “unconscious” and habitual eating. TC has been demonstrated to be an effective mind/body exercise for establishing awareness and control of addictive behavior, based on effects in a smoking cessation program.[16]

One recent study sought to determine potential effects of TC on brain size and cognition with possible effects on Alzheimer at the University of South Florida.[12] Participants in a TC group were compared to a literature discussion group. Both groups demonstrated a significant increase in brain volume comparable to previous studies documenting the benefit of aerobic exercise on brain volume. A control group demonstrated brain shrinkage over the same period typical for the 60 to 70 year age group. The authors note that gradual cognitive deterioration which precedes dementia and is associated with increasing shrinkage of the brain as nerve cells and connections are gradually lost. It is unknown at this point if such activities could help prevent Alzheimer’s disease, but the authors state that epidemiological studies have shown that those who engage in regular physical exercise or are more socially active have a lower risk of Alzheimer.

Tai Chi has also been demonstrated to have a significant effect on immunity[27,28] Chiang and others documented a significant increase in myeloid dendritic cells in a TC group compared to a sedentary control group.[27] According to the authors, dendritic cells are the most potent antigen-presenting cells linking innate and adoptive immunity. White

blood cell count was also higher in the TC group. Irwin and colleagues investigated the effects of TC on varicella-zoster virus specific immunity in older adults, who are at risk for shingles.[28] The TC group (n=18) demonstrated a significant increase in varicella-zoster virus specific immunity ($p < 0.05$), with a 50% increase from baseline, compared to the control group (n=18).

Although the second leading cause of death among older adults as identified by the CDC,[3] cancer is discussed last due to a lack of convincing evidence on direct benefits of TC on cancer. In a systematic review of 27 potential studies conducted by Lee and others,[13] only four studies were included due to study design limitations. Overall the authors concluded that there was a lack of convincing evidence that TC is any more effective than other forms of exercise. Four common uses of tai chi in cancer care were identified, including relieving symptoms of vomiting, fatigue, nausea, and depression.

Lee and colleagues also conducted another review of 81 potentially relevant studies on the effects of tai chi on breast cancer.[14] Only 7 met inclusion criteria. Significant differences were found in improved mood and depression compared to spiritual growth and standard health care, as well as beneficial effect on mood and psychosocial adaptation compared with an education program. Significant differences on effects of tai chi on physical outcome measures included improved hand grip strength and flexibility and range of motion over an education program control group, and beneficial effects on pain and range of motion compared to no treatment. No adverse effects were reported in any of the included trials. Overall the authors felt that

there was a lack of convincing evidence in support of TC as an effective cancer intervention, possibly related to poor study designs and inconclusive findings.

Yet a number of reported incidences by those with cancer indicate that it may be important to keep an open mind on potential direct effects of TC on cancer treatment and possibly even prevention.[15,16] One possible underlying mechanism of why TC may have a potential beneficial effect on cancer (and possibly many other diseases as well) may be related to enhanced blood oxygen diffusion. An area of cancer research is the role of hypoxia in cancer. Maleki and colleagues developed a mechanical device based on the idea of enhancing tumor oxygenation through water electrolysis, utilizing an ultrasonically-powered implantable micro oxygen generator (IMOG).[29] The IMOG device generates oxygen at the site of the tumor, boosting the cancer fighting power of radiation and chemotherapy. The IMOG device has been used with significant effect in pancreatic tumors implanted in mice, generating oxygen and shrinking the tumors faster than without the device.

It is common when performing TC to feel a pleasant tingling in the hands and arms, due to increased oxygen diffusion. Like the feeling one gets when blood flow returns to a limb that has fallen asleep, except pleasurable rather than painful. By enhancing blood oxygen saturation and diffusion, it may be possible for oxygen to have an increased range of movement across cell walls, enhancing the oxygen gradient.

In a study conducted by Gryffin, blood oxygen saturation was measured in 31 TC practitioners using a pulse oximeter.[16] SpO^2 increased significantly ($p < 0.001$) as did hear rate ($p < 0.001$). The range of SpO^2 increase was from one to three points above resting level, with a mean increase of 1.29, compared to no significant difference

between resting and active SpO^2 levels for walking, and a significant decrease ($p < 0.05$) in SpO^2 during cycling (-2.9%) and running (-4.9%). These findings further support that TC may have a distinctly different effect on the body compared to conventional exercises, a difference which may enhance physiological functions in the body. Further research would need to be conducted to determine exact effects, and possible effects on other health conditions.

Diffusion of Innovations

The Diffusion of Innovations is a comprehensive work on the elements involved with the successful diffusion of an innovation. Rogers[17] defined Diffusion as the process in which an innovation is communicated or spread through certain channels over time among members of a social system, for example, the diffusion of TC in the older adult population in general, or at an active living community in particular. In order to understand and facilitate diffusion, Rogers stated that it is important to understand the process of communication (communication channels) within which information is created and shared. Of particular relevance to the current study is the importance of uncertainty, which Rogers stated is the degree to which a number of alternatives are perceived with respect to the occurrence of an event and the relative probability of these alternatives. In the case of TC, this would relate to possible lack of awareness, combined with the many alternative choices for activity, ranging from gardening, walking, to watching TV. For TC, as a relatively unfamiliar activity, Rogers saw the innovation-decision process as consisting of information seeking and information processing in order to reduce uncertainty regarding the advantages and disadvantages of an activity. Following is an overview of key elements of diffusion of innovation theory

supported with various studies relevant to the current study. See Figure 2-1 for an overview and linkage of foundational concepts of the diffusion of innovations.

Knowledge, Attitudes, and Practice (KAP): Knowledge, Attitudes and Practice (KAP) surveys are an important part of diffusion studies.[17] Unfortunately, according to Rogers, most KAP surveys will find a KAP-Gap, a gap between development of knowledge and favorable attitudes, and the actual practice of the desired intervention. People may now be aware of the intervention, and its benefits, but may not be sufficiently motivated towards practice.

The Taichung Field Experiment was given as an example of one of the largest and most successful KAP studies ever conducted.[17] The researchers used four communication strategies towards the adoption of family planning in Taichung, Taiwan. Neighborhood meetings were held, by themselves as well as in conjunction with the addition of mailed information, personal visits by change agent with the woman, and also personal visits by change agents with both the husband and wife. The area was also blanketed with family planning posters. In this study, the key factor was home visits by change agents, which was the primary motivating independent variable (other independent variables included neighborhood informational meetings and neighborhood meetings plus mailed information). Visitations by change agents accounted for a 40% adoption rate.

Another powerful factor identified was the continuation of interpersonal communication beyond formal programming, acting as informal change agents. Findings from the focus group study can be used to target potential change agents for a follow up case series, towards educating and training change agents to develop

knowledge and favorable attitudes in a target population to encourage TC practice. An overview of KAP studies specific to TC and related exercises is presented below following the overview of foundational concepts of the diffusion of innovations.

Time (the KAP Gap): As mentioned above, the KAP GAP is a critical element relating to the delay between favorable Knowledge and Attitudes, and Practice.[17] That is, the time lag between knowledge of an innovation, the attitudes formed regarding the innovation, and the actual practice of the innovation. An example would be aerobics. Ken Cooper published the book *Aerobics* in 1968. It would be another 20 years before it made significant inroads into society.[30] An effective awareness campaign focused on creating a favorable attitude, as well as addressing lack of knowledge, may help to reduce or eliminate the KAP Gap, but to develop such an effort, it may be important to identify relevant knowledge and attitudes, as well as barriers to adoption.[31] Roberto documented the importance of awareness in closing the KAP Gap, using a focus group approach. The author states provides greater understanding of the quality of awareness in the target population, which the author hypothesized to be the primary factor in the KAP Gap. In this study, four focus groups were conducted, consisting of 8 to 10 married male and female participants, to determine the roles of awareness in condom usage.[31]

Topics included attitudes towards condom use, factors which motivated use or rejection of condom use, and the meanings associated with condom use related to time, manner, and reasons for accepting or rejecting condoms. The author concluded that quality of awareness depends on experience with use and that most negative perceptions were imaginary, but can be overcome with positive statements; buying condoms is embarrassing; and brand awareness is low.[31] The author recommended

developing a consciousness campaign to overcome factors related to the KAP Gap and lack of awareness. The focus group design of this dissertation is targeted at identifying knowledge and attitudes related to TC, which might be used to develop larger studies towards closing the KAP Gap of TC.

Perceived Attributes of Innovations. Rogers stated that the five categories of the perceived attributes of an innovation listed below are the most important characteristics in explaining the rate of adoption of an innovation.[17] This is an important factor and driving force behind conducting a Knowledge, Attitudes, and Practices (KAP) assessment. Identifying KAP will help to identify the perceived attributes of TC (knowledge), and attitudes regarding the perceived benefits. Five general categories of perceived attributes that can be used to increase adoption of an innovation include:

1. Relative Advantage –. What are the perceived benefits compared to other choices. Rogers considers relative advantage, and compatibility (below) as particularly important in explaining rates of adoption. In certain respects, relative advantage may be comparable to decisional balance.

2. Compatibility –is the innovation consistent with the values, experiences, and needs of the potential adopters. Roger notes that re-invention may be critical in the process of adoption. For the successful adoption of TC in among older adults may necessitate adjustments in form, teaching style, and practice specific to desired target populations.

3. Complexity – how difficult to adopt does the target population perceive the innovation?

4. Trialability –an innovation Rogers states that innovations that can be tried before full commitment are adopted more quickly, and reduces the factor of uncertainty.

5. Observability – is the degree to which an innovation is visible to others. Rogers states that although some ideas area easily observable and communicated, other innovations may be less so. According to Rogers, spokespersons and role models may help overcome this limitation.

Pankratz and others suggested that a gap exists between research and practice, and that the perceived attributes of an innovation may be an effective way to close that

gap.[17] The authors developed a scale to determine the perceived attributes of a health education program before it is developed, to allow program modification to enhance diffusion, as well as program follow up, to determine effective diffusion strategies. The author's findings confirmed the association between innovation perception and innovation adoption, and the distinct constructs within the innovations perceptions (although relative advantage and compatibility clustered into one factor).

The authors also found that at the organizational level, complexity can be the greatest barrier to adoption of an innovation. This may be true at the individual level as well, and worth following up with in regards to TC. Also noted that observability may be most closely tied to programs that provide very tangible and immediate outcomes. Trialability was a weak predictor of adoption, which the authors note may be due to difficulty in measuring this construct, which may be less of a problem with more concrete interventions. The authors concluded that it may be important to adapt the perceptions to specific innovations.

Communication Channels: Another key element in the diffusion process. Rogers states that communication channels are critical to understand the nature of the information exchange relationship. Mass media channels are the most rapid and efficient method of creating awareness. To create effective mass media messages, it is important to know the KAP of the target market, which underscores the importance of this element of the current study. And although it may seem important to highlight scientifically proven benefits of an innovation in various media messages, according to Rogers, the majority of people do not evaluate an intervention based on scientific studies, but rather on the subjective evaluation of those who have already adopted the

innovation.[17] This stresses the importance of recruiting stakeholders in the diffusion process from among the population who have adopted an innovation, as spokespersons and salesmen, and the relevance of beginning such a project with a focus group, to understand and train potential stakeholders. Rogers does state that support from scientific studies can be important in recruiting early adopters, but after that point, interpersonal communication is more important. Rogers also addresses the need of "homophilous" representatives, that the greater the similarity of the recruiting individual to the target population, the greater the response rate.

Seth Noar evaluated a set of principles for effective communication campaigns, noting that reviews of campaigns revealed a disconnect between campaign design, evaluation, and practice.[32] Shortcomings identified included no formative research, non theory based, low audience exposure (36-42%), and weak outcome evaluations. The author presents an integrated framework for communication campaigns which address these shortcomings, which he calls the audience-channel-message-evaluation (ACME) framework for health communication campaign design.

The first element is audience(who) and is related to audience segmentation, targeting who the campaign will be directed to, its homogenous or heterogeneous nature, demographic variables, attitudes, behaviors, as well as message and channel preferences. The second element, channel (how), relates to channel selection and strategic implementation. What is known about the audience segment channel preferences, which channels contain the desired properties, communication components, message placement, short versus long campaigns, and campaign evaluation/mid course corrections. The third element, Message (what), relates to

message design. What is a clear message, based on campaign goals, what are the behavioral determinants, what elements of behavioral and message design theory need to be incorporated (the look, feel, and attractiveness of the message), message sources and campaign slogans, audience message preference, and initial reactions to pretesting of messages? The last element is evaluation (did it work). Did the campaign and messages affect the intended attitudes or behaviors? Noar suggests that by following the above elements will increase the intended impact of a campaign.

Social System: As a fairly homogenous system, retirement communities can be affected by social systems, which according to Rogers, are based on norms and accepted patterns of behavior.[17] This may be a major barrier to the adoption of a new innovation (such as TC), if the innovation is seen as unusual and unfamiliar. Rogers states that it is critical to focus on opinion leaders and change agents, also supporting the importance of stakeholder involvement. As more of the social structure becomes involved in an innovation, the greater the level of uncertainty is reduced.

Acceptability: KAP studies are important for identifying factors involved in the acceptability of an innovation.[17] Rogers states that such data can be valuable for predicting an innovation's rate of adoption, if gathered prior to or in conjunction with the individuals decision to adopt the intervention. A focus group study could help gather valuable data on deciding factors related to the acceptability of an innovation, as indicated by Roberto in his study on factors involved in condom use described above under the KAP Gap above.[31] The author concluded that quality of awareness depends on experience with use and that most negative perceptions were imaginary, but can be overcome with positive statements.

Critical Mass: According to Rogers, critical mass is one of the more powerful factors of the diffusion of an innovation is the observation that once a certain percentage of a population adopts a new innovation, further diffusion tends to be self-sustaining.[17] Rogers states that peer influence is the major contributor to critical mass, and although the exact percentage of adopters can vary depending on the innovation, typically once 5 to 20 percent of the population has adopted an innovation, the diffusion process becomes self-sustaining.

This elaborates the importance of social marketing and diffusion efforts to reduce the KAP Gap, which can delay the diffusion of an innovation by decades (as in the case of aerobics mentioned above), until the requisite 5 to 20 percent of the population adopts. Rogers states that typically a small number of highly influential individuals can help facilitate diffusion faster than a similar number on non-influential persons. Identifying factors through the current focus group design which might persuade influential members of a population to adopt TC, may interest such individuals into playing such a role, and or to act as stakeholders in the diffusion of TC. Highly recognized role models can help promote the diffusion of an innovation. Rogers provides four strategies for achieving critical mass:

1. Target highly respected individuals within the social system.
2. Stress the fact of others adoption, that the innovation is already mainstream.
3. Identify sub-groups to target, achieving critical mass initially in the sub-group.
4. Provide incentives for adoption

The focus group design is oriented around identifying what facilitators might motivate adoption in the sub-group of users of the OTOW fitness center, towards becoming stakeholders in communicating the benefits of TC (incentives for adoption) to the larger community, to facilitate achieving critical mass in future studies and diffusion

efforts. Arroyo-Barriguete and colleagues state that the transition of society to an information based economy is important to consider in addressing an economy of networks and critical mass.[33] The economy of networks stresses the importance of network effects, in which adoption of an innovation snowballs to the exclusion of competing products. This may be an important consideration in the diffusion of TC. The growing number of TC offerings “loosely” based on TC, or called TC but are actually stretching or yoga (Appendix A), may better targeting immediate consumer needs with a user friendly format, but at the cost of long term benefits. It is possible that this may result in the extinction of true TC, with a possible impact on TC benefits. Arroyo-Barriguete and others,[33] as well as Rogers[17] give the QWERTY keyboard as an example. Although the QWERTY keyboard is more efficient, the critical mass achieved with the slower DVORAK keyboard eliminated the former from the market. This may be an important consideration in the diffusion of TC, related to a potential battle between user friendly and effective formats. An ideal situation would combine the two formats.

Diffusion of Innovation Bell Curve: The Diffusion of Innovation is characterized by societal changes, or adoption of innovations, by society at large. The Diffusion of Innovation model, popularized by Everett Rogers in 1962, [17] is based on the observation that adoption of new innovations tends to follow the bell curve. It is a useful model for identifying needs to address in each category of adopters. According to Rogers, there are five adopter categories (Figure 2-2) that can influence the rate of adoption, which exhibit a bell curve distribution.

Innovators are characterized by those who are among the first adopters of an innovation. They require the shortest adoption period, tend to like to try new things, and

may be motivated by the idea of being in the forefront, or being different. They can also serve as peer educators for the next group of adopters.

Early Adopters begin the process of introducing a new trend on a larger scale in society. They follow innovators as a trend setter, and can be role models for a larger segment of society. Early adopters are ideal stakeholders for promoting a new innovation, as well as test subjects for innovation trials.

Early majority see the benefits from the innovators and early adopters, and begin adopting on a larger scale. They seek proven benefits and reliable service, and do not want to become experts to understand benefits, so they rely on testimonials from trusted sources. Cost/benefit ratio is more important to this group. The innovation, service, or product needs to be user friendly. It is at this point critical mass is reached (see below), and the innovation will spread of its own accord, as society becomes aware of the benefits on a large scale.

Late Majority are conservative and tend to response slowly, resistant and skeptical of new innovations. Peer pressure from the early majority may bring them into adoption, as will economic necessity, while laggards may influence the late majority to further caution. It is at this point that the saturation point tends to be reached in a new market or innovation in the diffusion process.

Laggards are the skeptics of society, and tend to stay with the status quo, with what they have always done. They see little need to change things in their lives, unless necessity forces them to.

The Innovation-Decision Process Model: According to Rogers, the Innovation-Decision process consists of five stages, which tend to follow an S-shaped curve, due to

the relatively rapid adoption by later stages in the diffusion process, following the initial adoption of about 5-25% of a systems members (critical mass).[17] Of the five stages (Knowledge, Persuasion, Decision, Implementation, and Confirmation), the first two stages are the most relevant to the current KAP study, in order to identify what knowledge current and potential adopters may have about TC and what factors may create positive attitudes towards persuading adoption.

Following is a description of Rogers Innovation-Decision Process:

1. Knowledge Stage – when exposure and understanding of innovation's existence and benefits occurs.
2. Persuasion Stage – the formation of a favorable or unfavorable attitude towards the innovation.
3. Decision Stage – activities that lead to choosing or rejecting the innovation.
4. Implementation Stage – putting the innovation into use.
5. Confirmation Stage – seeking reinforcement of an innovation-decision already made. Adopter may reverse decision if exposed to conflicting messages.

Figure 2-2 presents an overview of the innovation-decision making process.

Research from Knowledge, Attitudes, and Practice (KAP) and Related Studies

Knowledge, Attitudes, and Practice (KAP) studies were primarily developed in the 1960's as a way to develop an effective understanding of health issues in developing countries, in order to implement effective diffusion strategies for health interventions, particularly in the area of family planning. [17]

A KAP study relating directly to TC was a study conducted by Sherry Beaudreau.[34] Beaudreau conducted a focus group consisting of 12 individuals self-selected from an invited population of 100 randomized individuals from an older adult volunteer research pool. Fourteen had volunteered for the TC focus group, but two were

excluded due to significant self-reported problems with balance and lack of physician approval, and that the focus group was full. This is notable, in that out of 100 individuals, Only 14% expressed interest in the free class, despite the promotion of the benefits of TC for increasing balance, flexibility, and strength in the recruitment flyer. Of these 12 participants, 4 dropped out, consisting of individuals who had little previous experience nor motivation for exercise, compared to the 8 who completed the study, 7 of whom had been regular exercisers in other forms of exercise. Another aspect of the study worth noting is that 10 of the original 12 participants were women. The author did not state if the 4 who did not complete the study were male or female.

The class consisted of 30 minutes of learning TC movements, twice a week for a 5 week period. As in other studies, this is a limitation that needs to be addressed, since what is being measured is learning TC as opposed to practicing TC, which may have significant impact on results, and explain the wide variation of significant and non significant findings for the same health concern. For the study conducted by Beaudreau (2006) this may be less of a limitation, in that the researcher was evaluating variables related to motivation, class participation, and home practice. Thematic analysis was used to evaluate the results of transcribed notes.

Key findings from the TC focus group included:

- Motivation to take TC being tied to exposure from TV, a friend, or seeing it in a park (n = 5).
- Desire to improve balance, strength, coordination, or to decrease pain (n = 4).
- Difficulty practicing TC outside of class (n = 8), with desire for written or visual cues to follow.
- Important to teach at a level appropriate to older adults.
- Recommendation for small class size (15 people or less).

- Important to have a patient, interested, and participant appropriate teacher (n= 7).
- Physical benefits after 5 weeks: improved posture, balance, body awareness (n = 3).
- Mental benefits after 5 weeks: improved mood, relaxation, feels good (n = 3).

It is worth noting that 3 participants experienced pain or difficulty from holding movements. This supports that it is important to consider teaching style and ability, since TC is typified by flowing movements, rather than holding postures, indicating a focus on “correct” movements in the class. It is likely that the instructor had participants hold various positions for extended lengths of time while walking around to correct movements.

Kuei-Min Chen and colleagues conducted 7 focus groups in Taiwan to explore the knowledge and attitudes frail elders have related to TC.[35] Focus groups consisting of 40 frail elders living in long term care facilities were recruited for the study, 22 who had never practiced TC (divided into 4 groups), and 18 from a previous quasi-experimental study evaluating the effects of a six month Yang style TC intervention (divided into 3 groups). The authors used a cross-sectional descriptive study utilizing a focus group. Questions related to perceptions of TC in the non-TC group included:

1. How many times per week of TC practice do you suggest?
2. What is your suggestion for the length of a TC session?
3. When would be the best time to practice TC when we design a program?
4. How many people per group do you suggest for learning TC?
5. Where is the best location to practice TC?
6. What type of TC instructor do you prefer for learning TC?

As can be seen from the questions, the perceptions evaluated pertained to the organization of a TC class, and not perceptions of what TC is or how it might be of

benefit. The above study highlights the nature of KAP studies as being useful for evaluating novel interventions in a new culture, since the questions did not pertain to knowledge and attitudes about TC, but rather the practice of TC. The study took place in Kaohsiung, Taiwan.

Content analysis was utilized to evaluate the data, conducted independently by two co-leaders with expertise in qualitative research, and then cross checked for consistency. The primary leader then validated the content analysis, and presented the data using descriptive statistics, by describing the most frequently occurring themes as well as presenting frequencies and percentages. The primary findings of interest were the comparisons between the two groups in regards to time of practice and practice location. The majority of the TC group (*n* = 18) preferred early morning (*n* = 10; 55.56%), while the majority of the non-TC group (*n* = 22) preferred afternoons after napping (*n* = 12; 54.55%). As for location, the TC group preferred indoors (*n* = 11; 61.11%) while the non-TC group state they would prefer outdoors (*n* = 19; 86.36%). The majority of participants reported preference for practice twice each week (TC *n* = 10, 55.56%; NTC *n* = 9, 40.91%), with a duration of 31-60 minutes per class (TC *n* = 13, 72.22%; NTC *n* = 10, 45.45%). As for group size, the majority preference was for 10-20 students (TC *n* = 14, 77.78%; NTC *n* = 15, 68.18%). For characteristics of a TC teacher, 55.56% (*n* = 10) of the TC group expressed preference for a gentle instructor, while 50% (*n* = 11) expressed preferences for an experienced instructor.

In a study on the facilitators and barriers to elders' practice of TC, Chen, Snyder and Krichbaum identified a strong need to understand reasons for TC adoption and barriers to adoption.[35] The authors conducted a cross-sectional descriptive study in

Taichung Taiwan. Face to face interviews were conducted in community settings such as parks, athletic grounds, or participants homes. Participants consisted of 80 community dwelling elders aged 65 and older, 40 who practiced TC and 40 who did not, using a convenience snowball sampling strategy. It is worth noting that the TC group consisted of very serious practitioners – the average practice was 74 minutes per practice seven times per week, which contrasts to most studies in which TC is practiced two to three times per week for 30 to 60 minutes.

The following questions were asked of the TC group:

1. What led you to practice TC?
2. What are the reasons you continue TC?

The non-TC group were asked the following questions:

1. Have you ever considered practicing TC?
2. If yes, what has kept you from practicing Tai Chi?
3. If no, why not?

Data were analyzed using descriptive statistics. Perceived benefits to health (*n* = 21; 52%), encouragement from others (*n* = 14; 35%), increased leisure time in retirement (*n* = 9; 22%), and admire graceful movements of TC (*n* = 8; 20%) where the primary motivating reasons for beginning TC in the TC group. Being close to home was listed by 4 participants. Primary reasons for continuing practice included positive health outcomes (*n* = 28; 70%), habit (*n* = 11; 27.5%), and social rewards (*n*= 7; 17.5%). Among those who have never considered TC, 17 (48.6%) felt they were too weak to practice TC, 8 (22.9%) felt the movements were too complicated and would be difficult to remember, 5 (14.3%)felt they were too old to practice TC, and 4 (11.4%) stated that they had no time.

The above results indicate the importance of social support, health expectations, knowledge of what TC consists of, and perceived benefits in developing a TC program. Being a convenience sample of a small group none of the percentages in either group are necessarily representative of the general older adult population, either in Taiwan nor the United States, but they do highlight the importance of discovering the knowledge and attitudes towards TC that may act as barriers and facilitators.

The following studies relate to KAP and complementary and alternative medicine (CAM), yoga, and exercise. Avino conducted a KAP assessment regarding complementary and alternative medicine (CAM) of nursing faculty and students, to investigate knowledge due to growing demand among consumers.[36] The survey tool *Complementary and Alternative Medicine Survey of Knowledge and Attitudes of Health Professions Students* from the University of Minnesota's Academic Health Center was used for the survey, for which the face validity was established by the developers. The survey measured 11 general attitudes and 8 barriers to the use of CAM on a 7-point semantic differential scale, ranging from very strongly agree to very strongly disagree. Effectiveness of CAM was measured using a 6-point semantic differential scale (highly effective to harmful, and no opinion). Previous education on CAM and training needs were evaluated with a 4-point semantic differential scale (none, some but not enough to advise, sufficient to advise patients about use, and sufficient to personally provide). A descriptive study design was used to evaluate frequencies and differences in attitudes and perceived barriers, in addition to specific provider questions.

Findings of particular interest to the current study include sources of information on CAM among faculty (peers 90%; professional journals 75%; and mass media 58%)

and students (peers 73%; mass media 55%; and professional journals 52%). Mass media was also reported as a primary source of knowledge regarding the benefits of exercise during pregnancy cited above, while peers as a source of information is in keeping with the importance of interpersonal networks from diffusion theory. Lack of evidence regarding the effectiveness of CAM was also cited as a barrier (82% students; 96% faculty), as well as lack of access (81% students; 92% faculty) and cost (77% students; 90% faculty).

Benefits, barriers, and cues to action were evaluated in the promotion of yoga using a focus group approach by Atkinson and Permuth-Levine.[37] The authors also identify a lack of research on factors that encourage and deter yoga practice. The HBM was used as the theoretical framework for the study, due to its focus on behavior perceptions and effects on actual behavior. The authors used a focus group approach to understand the nature of the perceptions of people who might attend or have attended a yoga class. Fifty participants were split into two groups of three levels of yoga experience: (1) never practiced yoga, (2) practiced less than one year, and (3) practiced more than one year. Questions were developed and coded using select HBM constructs and attitudes.

Internal cues to action among yoga practitioners consisted primarily of physical ailments, injury prevention or rehabilitation, and mental health problems or emotional concerns. External cues to action consisted of hearing about yoga from friends or colleagues, as well as print and television media. Perceived benefits, reported by all groups including non-practitioners, were health promotion effects, disease prevention effects, and social/psychological benefits. Variation between practitioners and non-

practitioners was observed in perceived barriers, primarily in time constraints. Although time constraints were mentioned by all groups, non-practitioners had the additional burden of not already having time allocated for yoga, and having to make a decision of what to give up to have time for yoga.

Both groups mentioned cost constraints, but again the burden was higher in non-practitioners, who not knowing yoga did not have the choice of practicing on their own at home. Negative preconceptions included a belief by all groups that yoga is dominated by women, and that women are better at yoga due to their inherent flexibility. As such many male practitioners stated they felt self-conscious when starting yoga. Other negative perceptions noted by all groups included perceptions of yoga practitioners as having alternative lifestyles. Among non-practitioners, additional barriers were identified as perceptions that yoga is not challenging aerobically, requires flexibility, and not wanting to start as a novice. Non-practitioners did not want to waste time on an activity that would not benefit them aerobically, or be difficult to learn. Negative teacher traits (judgmental or unfriendly) were also identified as a barrier.

Negative health effects were noted as a minor barrier across groups, mainly the possibility of joint and other injuries. Other negative perceptions included the thought that yoga might undo the benefits of running or strength training. The authors state that initial positive experiences with yoga may help non-practitioners to overcome most of the identified barriers, as well as shorter classes, and increased accessibility. Non-critical and adaptable instructors were also noted as advisable.

An informal survey by the Yoga Alliance identified misperceptions about Yoga as a barrier to practice.[38] The following attitudes towards yoga were reported as barriers:

4. Yoga is religious
5. Only those who are flexible can practice yoga.
6. Yoga is not really exercise
7. Yoga is “New Age”
8. Uncertain benefits

Zhang and others conducted a survey on fall prevention KAP of community stakeholders and older adults.[39] Of particular note is the involvement of key stakeholders in the form of senior serving organizations. The questionnaire consisted of 24 open and closed ended questions for service professionals, and 52 closed ended questions for older adults age 65 and older, conducted via a telephone survey. Descriptive statistics were used to evaluate data. Employees identified falls to be an urgent (62% very urgent, 38% somewhat urgent) issue in the older population. Insufficient resources were identified as the main barrier to regular fall preventions services (80%), followed by lack of trained personnel (28%), lower organizational priority (24%), and low awareness of the importance of fall prevention (22%). Results from the older adult survey also yielded some notable results. Thirty four percent reported falls to be their least important health concern. The primary barrier to fall prevention activities was the perception of not feeling at risk for falling

The authors concluded that a disparity exists between proven prevention strategies and older adult awareness and understanding of these practices. Essentially a KAP Gap. Lack of knowledge and opportunity of services was also identified as a major barrier. When practices for fall prevention were perceived as important, ready availability of the preventive measure seemed to promote adoption (59% of community dwelling older adults with access to strength and balance training perceived strength and balance training as important, and 54% actually participated in the activity). This

study is relevant in stressing the importance of understanding older adults health views, motivations, and adoption factors.

Buttery and Martin conducted a knowledge, attitudes and intentions assessment regarding participation in physical activity of older post-acute hospital inpatients.[40] The authors sought to determine knowledge of benefits of physical activity, attitudes and barriers to participation, and intentions towards future physical activity. The survey was developed from questions from surveys on older people and physical activity, with the inclusion of questions regarding knowledge, attitudes, barriers and intentions. Pilot testing was utilized to establish face validity. Forty-six participants consented to participate, with two withdrawing due to fatigue. Results of the knowledge portion of the assessment found that while the majority of respondents acknowledged benefits of exercise for preventing heart disease (n = 31; 70%), keeping supple (n = 40; 91%), improving health (n= 39; 89%), and lengthening life (n = 29; 66%), a fair number were unsure or disagreed (ranging from 9-27% depending on the item). Reasons for not exercising were primarily linked to difficulties walking and breathing. Social factors and lack of interest were other identified factors in exercise adherence (no statistics were given for these variables). Identified barriers included injury and disability, poor health, prefer other uses for time (rest and relaxation), do not enjoy exercise, and lack of energy.

A large well designed study by Crombie and others randomly selected 409 older persons aged 65 to 84 years of age to investigate why older people are reluctant to participate in physical activity, as well as strategies for promoting activity.[41] The questionnaire was developed from a variety of resources, including findings from focus

groups and four in-depth interviews. Questions on beliefs, attitudes and intentions to be physically active were on placed on a Likert scale. 97% of subjects (n = 395) believed physical activity helps to keep one supple, and 96% (n = 392) believe physical activity can improve health.

However, despite high level of knowledge of benefits of physical activity, levels of actual activity were low (31% reported walking for health less than two hours per week). 53% did less than two hours of all forms of leisure activity (gardening, bingo, church, lunch/coffee with friends, etc.) per week, with 36% doing none at all. It is interesting to note that although significant barriers identified to physical activity included lack of transport, shortness of breath, lack of energy, lack of interest, and embarrassment in joining a group ($p < .0001$), lack of time was not identified as a barrier. Being an assessment of a retired population this is not surprising, and may not be a major barrier among older adults.

Ribeiro and Milanez investigated the KAP of women in Brazil with respect to physical exercise during pregnancy.[42] This descriptive study sought to determine the KAP of exercise in pregnant women and why some women do not exercise during pregnancy. 161 women between 18 to 45 years, in their third trimester of pregnancy were interviewed. Despite 65.6% (n = 103) of the women being informed about the benefits of exercise during pregnancy, with 93.8% (n = 151) being in favor of exercise, only 22.9% (n = 37) got adequate exercise. Lack of time (n = 63; 55.8%) and feeling tired and uncomfortable (n = 37; 32.8%) were given as the primary reasons for not exercising. It is also worth noting that the majority stated they learned of the benefits of

exercise for pregnancy through television (*n* = 89; 55.3%), followed by books and magazines (*n* = 39; 24.2%).

In summary, the primary barriers to TC, yoga, and exercise identified by the above KAP studies included: Lack of fitness/poor health, particularly shortness of breath;[35,40,41] cost and lack of access;[34-37] Lack of adequate/patient teacher;[34] difficulty remembering;[35]Too old;[35] Lack of knowledge/perception new age/perception not an exercise;[37,38] and Lack of time.[35,37,42] The primary facilitators to TC, yoga, and exercise identified included: Exposure to TC;[34,37,42] Perceived health benefits including enhanced suppleness;[34,35,37,40,41] Social aspects;[34,35,40] Appropriate/Patient teacher;[34] and Evidence based programs.[36]

Studies using the Fishbone Diagram in a Focus Group Design

The fishbone diagram, also known as the Ishikawa Diagram after the originator, is a method used in the manufacturing industry to identify cause and effect relationships, and to identify weaknesses in the manufacturing process.[43] Hermens documented an adaption of the Ishikawa diagram by Metrobank to uncover weakness and values in customer service in focus groups consisting of key administrators (no *n* was given). The method was used to find hidden customer values and match services with needs. The author reported more open communication as a result of the fishbone diagram. According to Hermens, the Ishikawa diagram, or fishbone diagram, presents a data-ready tool from which to capture participant needs and wants by efficiently categorizing responses and permitting quantifiable responses.

Fluker et al.[44] utilized a focus group design with the fishbone diagram, to gather more specific data following a survey to evaluate physicians' health counseling knowledge, attitudes, and practice (to identify barriers to counseling). Internal medicine

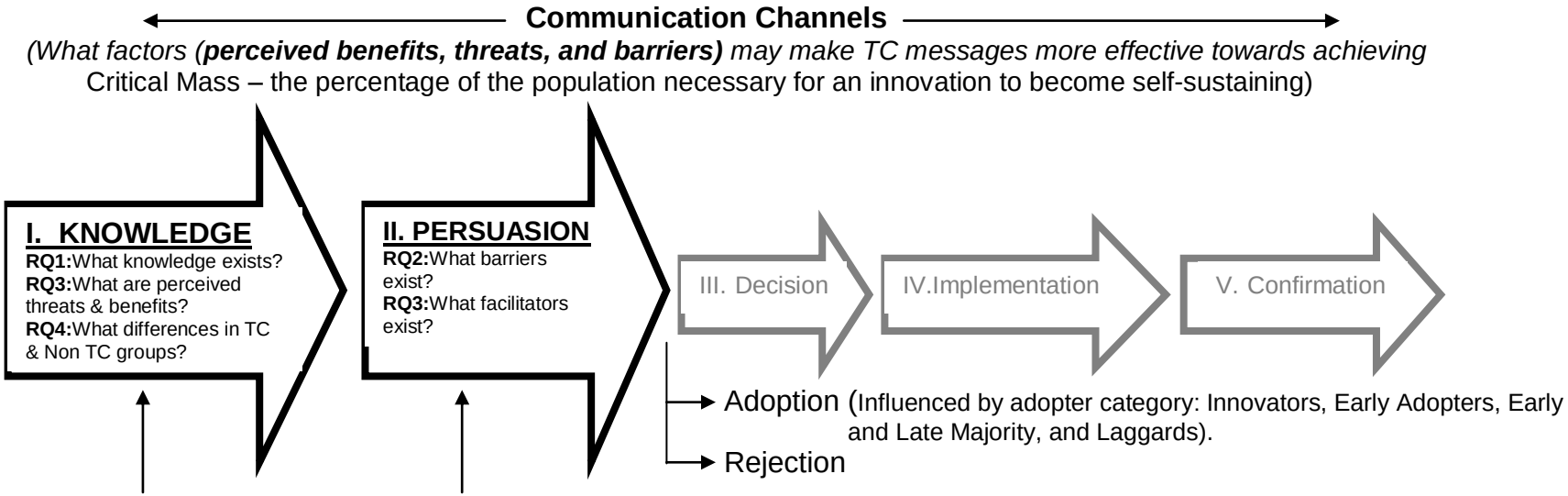
residents (*n* = 158) completed a KAP questionnaire, which was analyzed using descriptive statistics. The KAP questionnaire exposed a clinical knowledge deficit, lack of familiarity with national guidelines, and low self-efficacy. Lack of time was the largest barrier to counseling (*n* = 25; 15.9%). A fishbone diagram was used to uncover additional barriers not identified by the KAP questionnaire.

The fishbone diagram was created by conducting a focus group session and asking residents to silently write down as many barriers as possible on adhesive notepads (one barrier per note) during a 5-10 minute period.[44] Notes are not shared until collated on the fishbone diagram. No identifying information is given on the adhesive notepads. The participants then worked together for 10 minutes organizing related barriers into categories of their choice. A fishbone diagram was then drawn on a 25 by 30 inch sheet of paper, with “Barriers to Exercise (Nutrition) Counseling in Patients with Hypertension in Clinic” on the head of the fish. The adhesive notes were then grouped into categories onto the bones of the fish (including duplicates, to count how often each barrier was mentioned (Figure 2-2). The authors state that the fishbone technique allows a structured approach allowing everyone input, provides a visual display, and stimulates a more thorough exploration of the problem.

Duckett and Nijssen-Jordan used a fishbone diagram to map and identify causes of long waits in emergency departments.[45] The authors first created a fishbone diagram as a framework of current initiatives related to emergency department long stays. Brainstorming sessions were then held of operational leads to review the initiatives and propose new strategies. The data was then entered into spreadsheets, which were then updated pending new strategies identified at weekly meetings. Group

sizes and number of meetings were not given. A final report was made incorporating the fishbone diagram with approved strategies. The authors stated that the fishbone diagram helped to promote greater involvement of participants in a coherent manner.

Diffusion as the process in which an innovation is communicated or spread through certain channels over time among members of a social system (Rogers, 2003). Diffusion of an innovation involves the process diagramed below (from initial knowledge and relevance to the social system, to adoption and confirmation of the innovation). The chart is based on the innovation-decision process model developed by Rogers (2003), and provides an overview of the factors addressed in the theory section in the review of literature. The current study focuses on the first two stages of the model (in bold), and where the research questions fit into to the process affecting the diffusion of an innovation.



Characteristics of the Decision-Making Unit
SOCIAL SYSTEM
(Factors which can affect Time – the KAP Gap, the delay between Knowledge, Attitudes and the Practice or adoption of an innovation (TC in this case).

Perceived Characteristics of the Innovation (*Factors which may affect attitudes towards adoption of an innovation (Rogers, 2003).*
1. Relative Advantage – What are benefits of TC compared to other choices?
2. Compatibility – Acceptability, how consistent is TC with existing values & needs?
3. Complexity – How difficult do older adults perceive TC?
4. Trialability – What is the current ability to try TC? What factors of trialability might affect adoption?
5. Observability – How observable is TC? What options exist to increase observability?
***** The above questions are addressed in Chapter 5, under Recommendations, related to how findings might be applied to promoting diffusion of TC among older adults, and recommendations for future research.

Figure 2-1. Overview and linkage of foundational concepts of diffusion of innovations based on Rogers model of five stages in the innovation-diffusion process.[17]

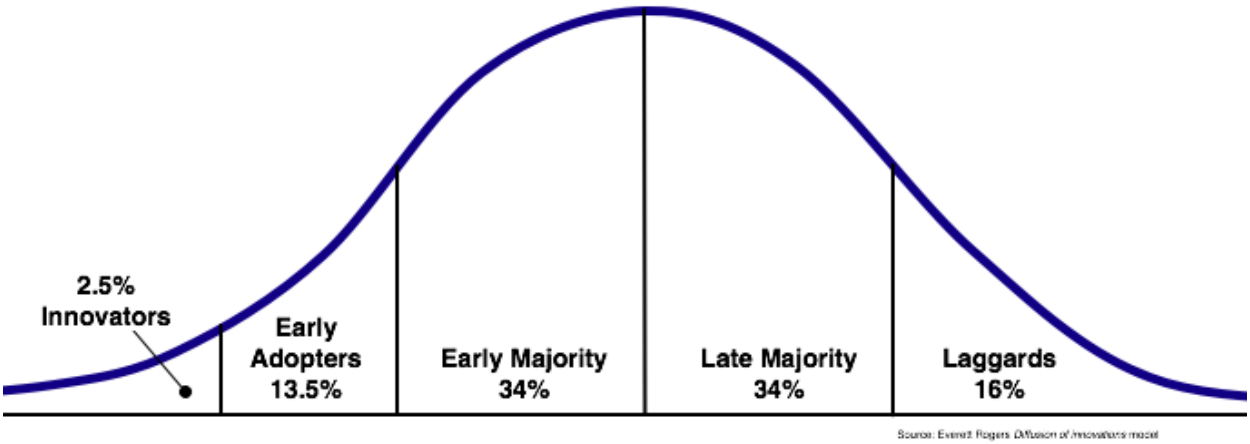


Figure 2-2. Adopter categorization on the basis of innovativeness. From Rogers. [17]

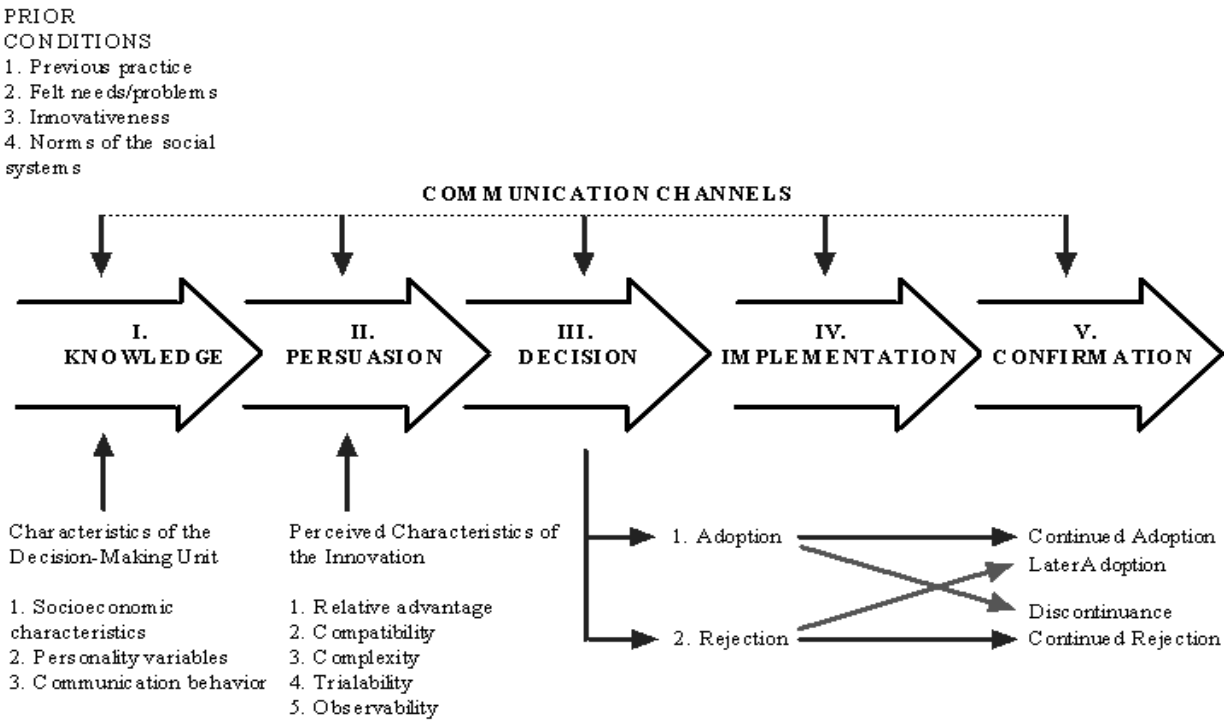


Figure 2-3. The innovation-decision making process.[17] The first two stages are pertinent to a KAP study: Identifying current knowledge among a specific group of potential or current adopters (with shared characteristics), and identifying which characteristics of an innovation may create favorable attitudes towards adoption.

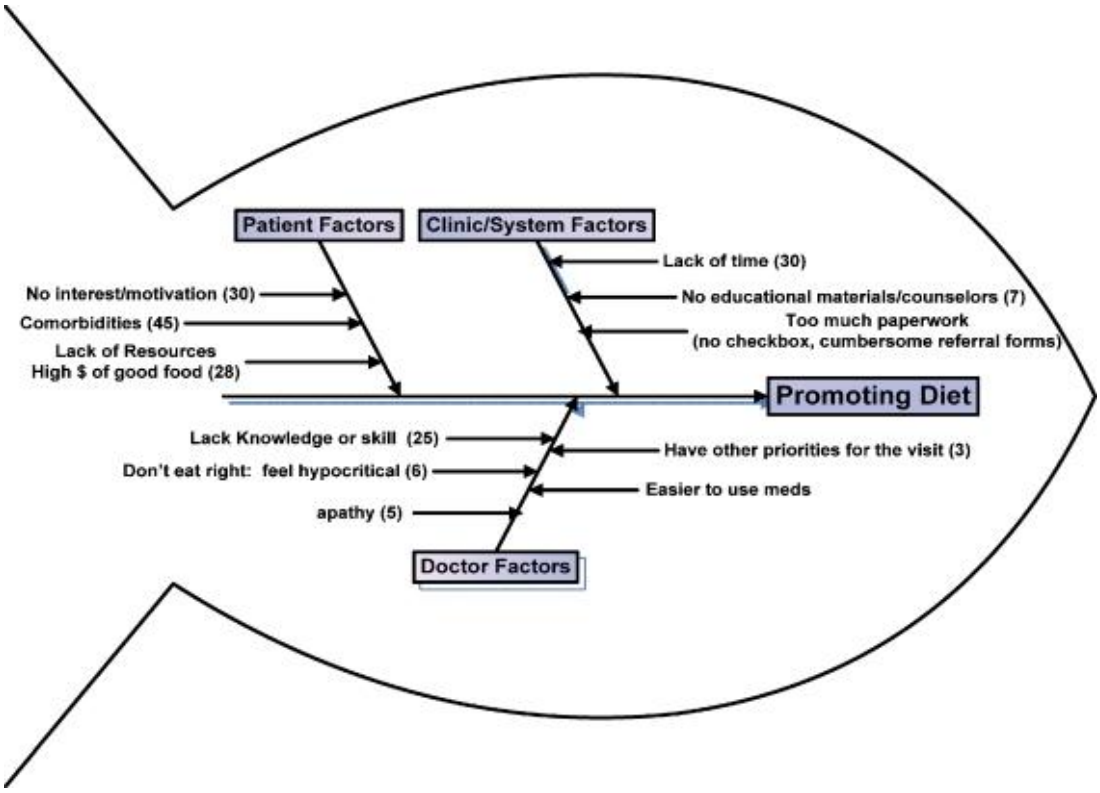


Figure 2-4. Aggregate fishbone for IM residents' perceived barriers to nutrition counseling in hypertensive patients.[44]

Table 2-1. Facilitators and barriers to TC in older adults. Originally stated as "like, dislikes, and obstacles."[34]

Facilitators	Barriers
Small class size (*n*=8)	Lack of visual/written cues (*n*=8)
Repetition, clear instruction (*n*=8)	Get confused when try on own (*n*=5)
Interested, patient instructor (*n*=7)	Holding positions hurt (*n*=3)
Saw on TV, park, or friend suggested (*n*=5)	
Wanted to improve balance (*n*=4)	
Age appropriate classes (*n*=4)	
Needed exercise (*n*=4)	
Convenient time/location (*n*=2)	

* Group size: *n* = 8

Table 2-2. Comparison of facilitators and barriers from a survey of older adult TC (*n* = 40) and Non TC practitioners (*n* = 40) in Taiwan. Facilitators and barriers originally stated as "reasons for practice" and "reasons kept from practicing."[35]

Facilitators (TC group reasons for practice)
Perceived benefits to health/ relieve pain/treat illness (*n*=21; 52.5%)
Encouragement from others (*n*=14; 35%)
More leisure time in retirement (*n*=9; 22.5%)
Admire graceful movements of TC (*n*=8; 20%)
Interested in TC (*n*=7; 17.5%)
Keep active in old age (*n*=6; 15%)
Close to home (*n*=4; 10%)
TC group reasons for continued practice
Positive health outcomes (*n*=28; 70%)
Fell into the habit (*n*=11; 27.5%)
Social rewards (*n*=7; 17.5%)
Relaxed and less moody (*n*=5; 12.5%)
Clear-headed and think better (*n*=5; 12.5%)
Barriers (Non TC group reasons for non-practice)
Too weak to practice (*n*=18; 45%)
Memory/movements too complicated (*n*=8; 20%)
No time (*n*=7; 17.5%)
Too old (*n*=5; 12.5%)
Not interested (*n*=4; 10%)
No patience to learn the movements (*n*=2; 5%)
Too fat (*n*=2; 5%)
Do not know where to go to learn (*n*=1; 2.5%)

NOTE: These categories are not mutually exclusive. Participants may appear in more than one category.

CHAPTER 3
METHODS

Study Design

Two focus groups were conducted consisting of TC practitioners and Non TC practitioners to determine barriers and facilitators to adoption of tai chi in older adults, at "On Top of the World" (OTOW) active living community. Focus groups have been defined in the literature as an interview with a small group of people on a specific topic. Flick addresses the benefit of the focus group design in permitting more efficient sharing of individual and group views.[23] Focus groups have been identified as being particularly valuable for revealing important areas of knowledge and deficits for understanding of human behavior (which can lead to an explanation of patterns of adoption or non-adoption) which may be missed through a broad based survey or quantitative design. Flick states that in many ways a small group of people brought together as a discussion or resource group is more revealing than a representative sample in a quantitative study.[23]

Groups typically are composed of six to eight people who participate in the interview for one half to two hours[23], however, although Fern indicated that optimal group size for creative tasks is less than 8, group design and purpose can greatly affect this.[46] Fern reported group sizes ranging from 5-12 to 20 or more for greater synergistic effects. The main drawback reported for larger groups involving greater degrees of group discussion is frustration with participants opportunities for participation, and the amount of time available for discussion. An important consideration is the nature of the group participation. Fern reported that nominal groups (groups in which individuals submit and then rank views before discussion) out-performed real groups (groups

oriented around “real” discussions) regarding the number of ideas produced, and in creativity of ideas (stating that group pressure can inhibit interaction and expression of ideas, particularly in brainstorming sessions).

In the study conducted by Fluker and others, using the fishbone diagram for gathering and ranking participant ideas, focus group size included 10-12 participants.[44] The focus groups in this study included 10 participants in the Non TC group, and 11 in the TC group, due to the efficacy of the fishbone diagram in organizing efficient use of time in a focus group setting as described above. The fishbone diagram also permits blinded responses to minimize bias from focus group interaction and potential researcher bias. The discussion phase is limited to clarifying responses on the post-it notes, and noting additional unprompted observations made by the focus groups on the margins of the fishbone diagram (with the exception of asking participants in the Non TC focus group about their perspective regarding a class specifically for beginners, and perspectives on any possible influence of views regarding TC related to previous military experiences at the end of the discussion phase, based on suggestions from dissertation committee members).

The fishbone diagram was utilized to organize topics and permit anonymous response to topics. Group discussion followed the development of the completed fishbone chart. During the focus group process the fishbone charts efficiently categorized responses according to the constructs of the Health Belief Model and permitted quantifiable responses. Responses between the Tai Chi group and Non-Tai Chi group are also compared with threats to health in older adults according to death rates as recorded by the CDC (Table 5-2) to identify potential lack of knowledge related

to perceived versus real health threats. The protocol of the focus groups followed the process as elaborated on in an I-Cubed program workshop on qualitative inquiry on use of the fishbone diagram in a focus group setting at the University of Florida, as well as the Ishikawa diagram process outlined by Hermens[43] and Fluker and colleagues.[44] These processes include a brainstorming session, linking health concerns (perceived threats), opportunities (arising from perceived benefits), and problems or causes (perceived barriers).

The HBM was utilized to structure the fishbone diagram for theory driven thematic analysis,[47] described below, to organize discussion and responses according to the constructs of the HBM. The primary measures for the focus group design at OTOW is theory driven thematic analysis (from the fishbone diagram and discussion phase) as well as frequencies of responses (number of post-it notes) related to knowledge and attitudes oriented around facilitators (perceived threats and benefits) and perceived barriers to TC adoption. Participants also rated personal relevance of each item identified on a 0-9 scale. Following the focus group sessions, descriptive data were analyzed using theory driven thematic analysis (see data analysis below), as well as frequencies of responses and item scores (0-9), including means and standard deviation using statistical software package SPSS 17. The following sections detail participant recruitment, focus group process and data analysis.

Institutional Review Board

The study was submitted to the Institutional Review Board (IRB-02) at the University of Florida. The institutional review board reviews research studies involving human subjects. A description of the study as well as participants rights are included on the first page of the informed consent form. Identifying information will be kept on the

hard-drive of the investigators office, locked and accessible only with a password. Hard files will be kept in a locked file in the researcher's office.

Study Sample

The "On Top of the World" (OTOW) is a large community, designed for those who are age 55 and older, with approximately 10,000 residents located in Ocala, Florida. According to the OTOW website,[48] it is a retirement community known for an advanced approach to the older adult lifestyle. OTOW emphasizes a wide variety of programming and opportunities, including "Master the Possibilities," a comprehensive lifelong learning program with its own education center and a faculty of over 100 educators.

The sample frame for the focus groups consisted of two groups – 10 participants in the Non TC group (5 men and 5 women), and 11 in the TC group (all women), recruited from active users of the OTOW fitness center, in an attempt to control for lack of adoption of TC due to a sedentary lifestyle. Selection criteria for the Non TC group also included being in the precontemplation stage, having never contemplated adoption of TC. Selection criteria for the TC group included being active TC practitioners. All TC group members were active in the TC classes at OTOW. Residents of OTOW were recruited by the community fitness director, from the current TC classes and those active in the other activity classes. The director made an announcement in each activity class, asking for volunteers for a focus group study on health concerns and class offerings at the fitness center, and their views on TC. It was also announced that each participant would receive a gift certificate or coupon donated by local area restaurants (ranging in value from $10 to $25). Interested residents signed up on one of two signup

sheets provided by the director (one for those practicing TC, and one for those who have not considered TC.

The threat of self-selection bias is minimized through the homogenous nature of the population and the purposeful nature of the sample.[49] Higgens and Straub note that groups that are similar in nature can help minimize bias due to differences that may result from a randomized sample from a larger and more diverse population base. The more similar group members are to each other, the less self-selection will affect the study. Since the sample was purposely taken from active members who regularly engage in exercise at the fitness center, with a shared location as residents at OTOW, focus group members are more homogenous and representative of the OTOW population than if participants were randomly selected from a larger area (or even from OTOW, if exercise habits were not similar). Flick also recommends a certain level of homogeneity on characteristics which may affect group discussion.[23] Flick states that for some studies, a more homogenous group with shared characteristics have more points for common discussion.

Ten residents signed up for the Non TC group, consisting of 5 men and 5 women currently active at the fitness center at OTOW. These participants had never taken the TC class at OTOW, nor had ever considered taking the class, according to self-report. Eleven residents (all women) signed up for the TC group, consisting of active members in the TC class at OTOW, which consisted at that time (Summer 2012) entirely of women, which may be a limitation of the study.

Participant two, although had never contemplated taking the TC class at OTOW (nor anywhere else according to his statement), had tried it on a cruise ship, not out of

serious consideration, but as something to do. Due to participant two's stated non-intention to practice TC outside of the cruise ship class (and to gain his perspective as a non-interested participant in a TC class), he was included in the Non TC focus group. To control for possible biasing effect during the discussion phase, remarks and input from participant two regarding his experiences were discussed last during the discussion phase. The fishbone diagram eliminates possibility of bias and influence from his experiences during the development of the diagram, since individual responses are noted silently on post-it notes.

See Tables 3-1 and 3-2 for an overview of participant characteristics.

Characteristics of Tai Chi class and Instructors at OTOW

OTOW was in the process of changing teachers for the TC class during the summer of 2012. The first teacher (teacher 1) had minimal experience (three years, and learned from Dr. Paul Lam's Tai Chi for health DVD's,[50] but later was certified to teach Dr. Lam's TC for Arthritis program during a 2 day workshop. Teacher 1 stated that she did not feel comfortable teaching the hour long class due to her lack of experience, and stopped teaching to pursue further TC training. Teacher 1 used Dr. Lam's warm up and cool down exercises, and his TC for Arthritis form (typically taking approximately 20 minutes to follow this section), some instruction, and incorporated various additional qi gong exercises learned from various DVD's for any time remaining. Another reason given for leaving the TC program was that teacher 1 was a resident of OTOW, and class participants expressed frustration when the instructor was away travelling.

The second teacher (teacher 2) was not a resident at OTOW, but was a professional dancer and exercise class group leader. She had learned TC as part of her dance training 25 years ago, and had incorporated a variety of stretching, warm ups,

and exercises from a variety of sources, including Dr. Lam's program.[50] Instructor 2 emphasized a more dynamic class, repeating individual movements in a style similar to low impact aerobics. The instructor stated she based the faster movements on Chen style TC, an early and more martial form of TC. The class also stressed balance during a variety of faster pace dynamic movements. Instructor 2 stated that it was important to get participants hearts moving, increase VO2, and work on range of movement and balance. Instructor 2 also stated that she has found that participants seem to enjoy faster paced TC similar to Chen style.

Focus Group Protocol

As discussed above, by using a group process facilitated by the fishbone diagram to streamline the group discussion and input, the focus groups for the purpose of this study included 10 participants in the Non TC group, and 11 participants in the TC group. To allow discussion on factors of TC adoption following development of the fishbone diagram, a two-hour format was conducted. Flick[23] addresses the benefit of the focus group design as permitting more efficient sharing of individual and group views. A limitation of focus groups is difficulties in note taking, which is addressed through the fishbone diagram process described below.

Focus group proceedings were not audio recorded, in part to address potential bias identified in the literature which can result from focus group recording, due to self-monitoring of remarks by focus group participants.[23] Flick recommends restricting the use of audio recording unless absolutely necessary for the collection of data relevant to the research question. Audio recording to capture all responses was less of a concern due to the strength of the fishbone diagram in capturing the majority of participant views and comments in a written format.[44]

Focus groups were conducted in the morning, in a conference room at the fitness center at OTOW. Each session lasted approximately two hours in length, the maximum time limit for a focus group, as recommended by Flick.[23] A 15 minute break was conducted half way through the session for each group, following collection of the post-it notes, to permit bathroom breaks and snacks, which were provided by the researcher. Bottled water, chips, a vegetable platter and dip were provided. During the break, the post-it notes were collated and results written on the fishbone diagram for group discussion following the break. The diagram was then hung on the wall for group discussion. Before a general discussion of the completed fishbone diagram, a brief discussion was held to confirm that grouping of similar terms matched participant views of their response. The collation of post it notes formed items for group discussion, as well as for items to be rated on a 0-9 scale for personal relevance following the group discussion. Rating the items uncovered by the fishbone diagram process followed group discussion to clarify understanding of items listed, and to address the added item of perceptions related to lack of a beginners class at OTOW.

Additional comments made during the discussion phase not already noted on the fishbone diagram were noted on the margins of the chart. Following completion of rating individual perceptions of items on a 0-9 scale, participants filled out a follow up questionnaire on current physical activities to gather additional demographic data (see Appendix C). Gift certificates were then raffled off to participants. A detailed overview of the focus group process is given below.

The procedures for running the focus group incorporated the method laid out by Flick[23] and Boyatzis,[47] and were modified based on the use of the fishbone diagram as

discussed above, as well as training in the fishbone diagram process at an I-Cubed program workshop on qualitative inquiry at the University of Florida. Each focus group was moderated by the researcher, utilizing methods and training gained during a qualitative research methods class at the University of Florida, in addition to training at the I-Cubed workshop on qualitative methods mentioned above. Following is a detailed overview of the focus groups conducted at OTOW:

Focus Group Process

Set up: Prior to arrival of focus group members, bottled water was placed on the three tables in front of each seat, along with pens, markers, and post-it notes.

Introduction and instructions for focus group: Introduction of moderator (the investigator) and explanation of focus group protocol. Participants were informed that they would be noting concerns or thoughts related health threats, knowledge of benefits of TC, and barriers to TC practice on post it notes (one thought or comment to each note), which would be stuck to a plain piece of paper with the appropriate construct on it, and gathered by the moderator, collated by commonalities, and posted on the chart in the appropriate areas. Participants were informed that no names were to be written on the notes, so that responses would be anonymous.

Participants were then informed that the observations and comments would be transferred to the fishbone diagram during a brief break, during which snacks would be available. Focus group members were then informed that following the break, the group would discuss the finished diagram, following which they would rate identified items created on the fishbone diagram on a 0-9 scale, and would also complete a brief questionnaire related to their current physical activities. Participants were also informed

that there would be a raffle of the gift coupons provided by local area restaurants at the conclusion of the meeting. Expectations for level of participation were given, which in this case was primarily oriented around the fishbone diagram. Time frame: 15 minutes.

Completion of Informed Consent: Following the introduction of the moderator and explanation of the focus group protocol, participants were given the option of withdrawing. All participants chose to stay, and then completed the informed consent, following an overview of the informed consent form by the moderator. Time frame: 10 minutes.

Introduction of focus group members: A short introduction of the members to each other, emphasizing the common ground of the members to enhance community and personal health. Time frame: 5 minutes.

Construction of Fishbone Diagram: Beginning the discussion with a "discussion stimulus," in this case the questions of threats to health, knowledge of benefits of TC, and barriers which may affect TC practice. Also presentation of HBM constructs in the form of the fishbone chart, and reminder of instructions for using the chart as presented in the introduction. Participants were reminded of the "blinded" aspect of their replies via the post-it notes. Participants were asked to write their participant number down on the back of each post-it note for later analysis, but that numbers would not be revealed to the group, nor identifying information used in later analysis. Participants were each given a blank sheet of paper titled with one of the three main constructs of the HBM (threats, benefits, barriers), upon which they were asked to stick the notes to.

Each construct was addressed in turn, the paper with the post-it notes affixed handed in to the moderator before going on to the next construct. Participants were then instructed to address the next construct (participants were asked: “Please reflect on any benefits of Tai Chi practice you can think of, and note each benefit on a separate post-it note;” “Please reflect on any threats to your health that you can think of, and note each health threat on a separate post-it note;” “Please reflect on any barriers to Tai Chi practice you can think of, and note each barrier on a separate post-it note;”). As participants worked on the next construct, the moderator removed the post-it notes from the papers, and collated them by commonalities (for example balance/falls, memory loss, breathing/lung problems), and then grouped them on the fishbone diagram.TC Time frame: 30 minutes (10 minutes for each construct).

Snack Break and collation of post-it notes onto fishbone diagram: A snack break followed, with snacks (vegetables, chips, and dip) arranged on each table by the facility director. During the break, the moderator transcribed the collated post-it notes onto the fishbone diagram, using a large marker for easy visibility. Time frame: 15 minutes

Clarification of items and discussion phase: Following the snack break, the moderator went over each transcribed item, and clarified any post-it notes for grouping into common themes and items. For example, clarifying the notations “poor stamina” and “poor health” in the Non TC group. Since the fishbone diagram is intended to enhance anonymity, the group was asked to clarify potential meanings of the terms. This provides the author of the note an opportunity to clarify their meaning, while getting additional group member input. For these items, it was agreed that “poor stamina” and

“poor health” should be grouped together as a barrier. Another example from the TC group, is a post-it note stating “need a kick in the behind to go,” as a barrier to TC. The group consensus was to list this as “motivation” for addressing on the fishbone diagram. Following consensus on grouping of post-it notes into common themes and categories, a final list of items for each construct was listed with a large marker on the fishbone diagram for group discussion and rating of personal relevancy on a 0-9 scale (see below).

Group discussion: A group discussion followed, addressing factors uncovered by the fishbone diagram, to explore possible other considerations. Members were asked to openly discuss the results of the fishbone diagram, and any other thoughts regarding what might promote or inhibit TC adoption. The moderator guided discussion through each area of the fishbone diagram, noting which items were considered the most important with asterisks next to those items, and then asking participants to rate the starred items from most to least important. The moderator also made notes on the margins of the chart using a large marker, for areas brought up that were not already on the chart. When the last item was discussed, the moderator asked if there were any other thoughts or comments, before moving on to the next step. Time frame: 20 minutes

Rating of personal relevance of items: Members were then asked to rate on a piece of paper each item uncovered on the fishbone chart, using a 0-9 scale (zero being not applicable to the participant, 9 being directly relevant) developed from the fishbone chart results. A blank paper was provided, upon which participants were asked to list each item created on the fishbone diagram, divided by the three main constructs of the HBM (threats, benefits, and barriers), and their rating of perceived relevance. Following

completion of personal ratings, participants completed a follow-up questionnaire regarding their current activities. Time frame: 20 minutes

Conclusion and raffle: Conducted raffle for restaurant coupons, by handing out raffle tickets. As each number was called, participants came up to the table and chose one of the coupons. Thanked members for participation and concluded focus group session. Time frame: 5 minutes

The Fishbone Diagram

Figures 3-1 and 3-2 are an example of the fishbone chart, developed by the TC group in the post-it note stage and after collation of post-it notes into specific items agreed upon by the group:

Data Analysis

Data analysis consisted of theory driven thematic analysis as described by Boyatzis[47] using the HBM for clustering based on constructs of the HBM. Perceived benefits, threats and barriers identified by each member of the focus groups were noted on the diagram, including frequencies of responses (number of post-it notes). According to Boyatzis[47] and Flick,[23] the basic format of thematic analysis includes reviewing data and looking for common themes from which to create categories. Codes are created from words or phrases that create labels to be used as data (in this case literally, the participants labeling items with post-it notes, which were used as the basic unit of data). Theory driven thematic analysis uses themes and codes which are based on an existing theory, either the researcher's, or from an existing theory, to drive and structure a focus group discussion.[47] In the case of the current study, the Health Belief Model was used to categorize codes and determine themes (perceived benefits, threats and barriers) for group discussion apriori.

Boyatzis stated that a theory driven code using framework not developed by the researcher (such as the HBM in this case) has a higher degree of validity than a theoretical framework developed by the researcher (due to potential conceptual rigidity). Inter-rater reliability can also be affected by the source of the theory driven code. Boyatzis noted that researcher developed theories are more prone to differences in interpretation between raters, as well as projection on the part of the researcher. This is not a limitation in the current study, in that the data ready format of the fishbone diagram precluded the need for rating, other than participant agreement on collating post-it note responses into relevant categories and items. In a sense, it could be said that the participants of the focus groups acted as raters, cross-checking to verify accuracy of responses grouped on the chart. Boyatzis discussed this as synchronic reliability, the consistency and judgment among multiple viewers.[47] Participant input during the discussion phase was also directly tied to identified items and theoretical constructs, and any additional data was listed on the margins of the diagram following group consensus.

Reliability issues are critical to consider when using thematic analysis, which relates to consistency of observation, labeling, or interpretation.[47] These reliability issues can affect the potential for replication, extension and generalizability of the research, and are related to the validity of the judgments. Boyatzis further stated that reliability is a factor of consistency of judgments towards the interpretive social scientists social construction of meaning. This reliability issue may be controlled for in the current study through the data ready format of the fishbone diagram and discussion input, which eliminates the need for judgment on the part of the researcher for

translation and building of conceptual bridges discussed by Boyatzis. Boyatzis also stated that reliability and validity of information obtained is directly affected by the way information is obtained.

An example is given of video and audio recordings to reduce variation in observations through repeated viewings by multiple observers to discuss coding of moments during the tape. Variation of observations was controlled for in the current study through use of the fishbone diagram to clearly identify items, as compared to having to evaluate “moments” and interactions. The main points the author stresses regarding reliability relates to consistency and confidence of judgment, which is addressed through the fishbone diagram and clear labeling of identified items and notations. The author also states that validity can be enhanced through confirmation, related to confidence of observations, which was addressed in the current study by having focus group participants confirm the grouping and final meaning of responses and items on the fishbone diagram.

Boyatzis further noted that thematic analysis can allow translation of qualitative codes into numeric expression for quantitative analysis, although the author notes that quantitative analysis is considered by many to violate the methodologies and values embedded in qualitative research.[47] However, the author states this primarily relates to the lack of a need to generalize to others, due to the uniqueness of the people, organization, or event being studied. However, if the group being studied is fairly representative of a larger population, then quantitative translation can be useful. The author states that frequency of responses can be scored as an ordinal scale, and intensity of responses as an interval scale. In the case of the dissertation study,

frequency of responses (post-it notes) for each item were recorded as an ordinal scale, with individual ratings of level of personal concern for each item (intensity, on a 0-9 scale), as an interval scale, for quantitative analyses. Descriptive data were analyzed using frequencies of responses, as well as HBM scores (items rated on a 0-9 scale, with 0 being not relevant and 9 being very relevant) calculating item means and standard deviation, using statistical software package SPSS 17.

Summary of Focus Group Process Related to Minimizing Bias

The following research questions were addressed by the focus groups, using the fishbone diagram organized according to the constructs of the HBM.

1. What knowledge do older adults have regarding TC (regarding perceived benefits)?
2. What are the primary barriers affecting adoption of TC in an older adult sample?
3. What are the primary facilitators (perceived threats) affecting adoption of TC in an older adult sample?
4. What differences exist in the above between the TC and Non TC groups?

Table 3-1. Demographics of Tai Chi Group (TCG). *LSVT BIG is a Parkinson Exercise. For Race W = White

PARTIC. NUMBER	AGE	GENDER	RACE	OTHER EXERCISES	HEALTH MOTIVATION	LENGTH OF ACTIVITY(yrs)
TCG1	70	F	W	Various exercises	Increase Health-had lung removed	3
TCG2	75	F	W	Aerobics/Weights/ Badmiton/Golf/Walk	Increase Health/Slow Aging	9
TCG3	70	F	W	Stretching/Walking	Increase Health-need structure	4.5
TCG4	74	F	W	Just Tai Chi	Feel Better-balance,flex,focus	10
TCG5	70	F	W	Aerobics/Weights/ Stretching	It's Fun/Feel Better – life habit	2
TCG6	71	F	W	Tennis/Kickbox/ Weights/Swim/Yoga	Good Teacher/ Walking Distance-life habit	9
TCG7	77	F	W	Balance Classes/ Web Qi Gong	Prevent Falls/Care for Sedentary Husband-availability of classes	10
TCG8	62	F	W	Walking/Biking	Increase Health-weight,stress, lifehabit	30
TCG9	64	F	W	Gym/Walking/Zumba/ Water Walking	Increase Health-retiring,having time	2.5
TCG10	69	F	W	Aerobics/LineDancing/Golf	Feel Better-live long life	9
TCG11	70	F	W	LSVT BIG*/Walking	Improved Mental State-mental decline	9

Table 3-2. Demographics of No Tai Chi Group (NTC). For Race A = Asian, W = White.

PARTIC. NUMBER	AGE	GENDER	RACE	OTHER EXERCISES	HEALTH MOTIVATION	LENGTH OF ACTIVITY(yrs)
NTC1	70	F	A	Balance/Strength/ Aerobics/Stretching	Increase Health, strength -accessability	1month
NTC2	80	F	W	Walk/Gardening/ Balance/Birding	Routine,partners-knowledge, presence of cancer, seeing others condition	Life-time, Balance-OTOW
NTC3	70	F	W	Water Aerobic/Walking	Weight loss/cardio-flexibility, wellbeing	1
NTC4	78	F	W	Swim/Core/Balance/Gym	DiabetesII/Fitness-Weight	10
NTC5	80	M	W	Swimming/Posture/ Stretch/Gym (occasional)	My Belly-my wife	5
NTC6	75	M	W	Balance/Strength/Walk/ Jog/Gardening	Increase Health-weight	4
NTC7	76	M	W	Walking	Don't Drive	Lifetime
NTC8	69	M	W	Walk/Bike/Aerobics/ Dance/Kickbox/Clog/Str.	Fun, fast-music, good teachers	8
NTC9	71	M	W	Treadmill/Elliptical/ Weights/Kickbox/Golf	Feel good, live longer for kids -limited by bad hip, miss competition	55 (running)
NTC10	67	F	W	WaterAerobics/Bike,step/D ance/Balance/Weights	Lose weight, increase health, Feel better- more strength and stamina	4

Figure 3-1. Post-It Note Phase of the Fishbone diagram created by the TC group, identifying variables related to Perceived Threats, Benefits, and Barriers for TC adoption. Focus group participants brainstormed and listed results on individual post-it notes, which were posted in appropriate areas of the diagram. Frequencies were noted for each item. Photo courtesy of Peter Gryffin.

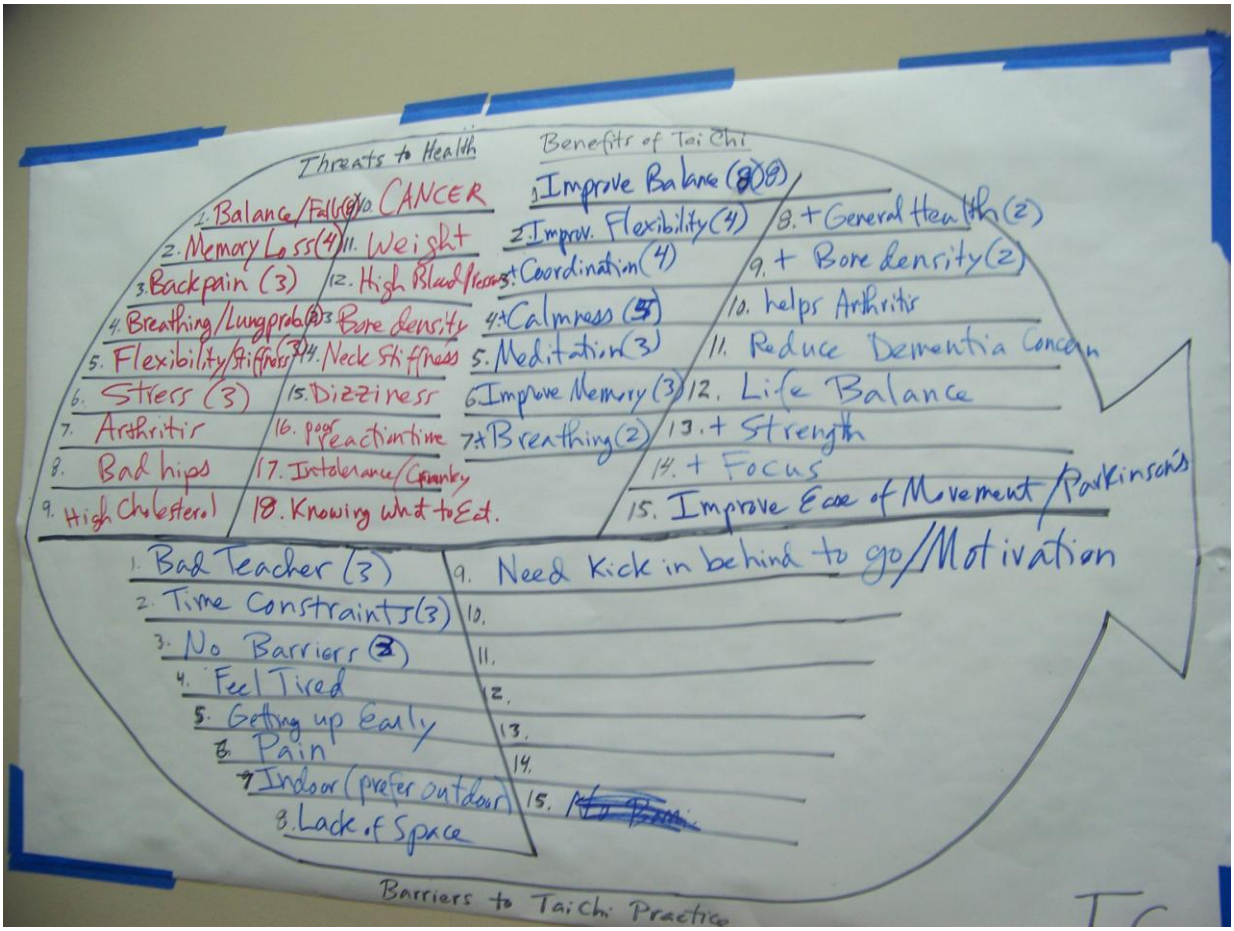


Figure 3-2. Perceived Threats, Benefits, and Barriers Identified by the TC focus group and listed on the Fishbone diagram. Numbers in parenthesis indicate multiple identification of an item.

CHAPTER 4
FINDINGS

Organization of Findings

Following is an overview of the fishbone chart results, categorized into tables according to the constructs of the Health Belief Model (perceived threats, benefits, and barriers) as rated on a 0-9 scale, as well as discussion of additional focus group comments. An overview and chart of primary findings is presented at the end of this chapter. The following section presents the findings from the focus group sessions as related to each of the four research questions. The following format is used for each relevant research question: Responses are groups according to theme or construct (for example threats to health). Individual responses to each of the three main constructs of the HBM are reported as the number or frequency of post-it notes created by each participant. Following individual responses via the post it notes, personal evaluation of all noted threats, benefits, and barriers (as recorded on a 0-9 scale) are presented, including individual and group mean scores for each item as well as standard deviation. Group observations and comments from the discussion phase are also presented.

Research Question One: What knowledge and attitudes does an older adult sample have regarding TC?

Knowledge of TC was based on the results of the fishbone diagram for the perceived benefits of TC, as well results from the discussion phase. Attitudes towards TC were addressed during the discussion phase. The Non TC group, consisted of 10 participants who had not previously considered uptake of TC, and had little in the way of exposure to TC outside of commercials (i.e. a Claritin commercial featuring a tai chi group in a grass field, which all but one participant (participant number 8) recalled seeing at some time). It should be noted that participant 2, although having never

considered taking up TC as a regular practice, did participate in a TC class on a cruise ship, but he stated it was not out of any particular interest, and he did not particularly enjoy the class. He took the class as something to do, similar to other activities available on the ship. To ensure undue bias did not result from the experience of participant 2, his responses were considered carefully in relation to the other participants during the discussion phase, which was a minor part of the focus group process (20 minutes). The majority of the focus group session was spent on developing the fishbone diagram, which is done silently by each individual without participant interaction or discussion.

The responses on his post-it notes were evaluated during placement on the fishbone diagram to ensure his experience would not bias the discussion phase. The only response participant 2 made related to his cruise ship experience was as a barrier related to efficacy of teaching, which was eliminated from the responses. Barriers were the last section of the discussion section, and the post-it note related to teaching style from participant 2 was left as the last item for discussion. Since participant 2 still met the inclusion criteria of not having considered uptake of TC, and due to the format of the fishbone diagram and discussion phase which controlled for his input regarding this area, participant 2 was not exclude from the group. Another factor for the inclusion of participant 2 was to obtain the perspective of an individual who had never considered TC, yet had experienced a class. Other than his observations that he was off-put by the teaching style, participant 2 stated that he could not remember anything from the cruise ship class.

Despite limited exposure to TC, the Non TC group identified six perceived benefits (although four of these benefits had only one response, or post it note (Table 4-1)). The primary perceived benefit of TC was benefits for balance and reduction of falls (*n* = 4), followed by general health benefits (*n* = 3). As individual responses, via the post it notes, 4 participants did not identify any benefits, while three only reported one benefit (balance, agility, and general health). Participant 5 identified 2 benefits (balance and fluidity, stating that it looks like slow motion kung fu). Participant 2 (who had taken the cruise ship TC class) also reported 2 benefits (balance and health). Participant 3 reported 4 perceived benefits (balance/agility, flexibility, clears mind, and relaxation). This contrasts with the greater number of perceived health threats and benefits identified by the TC group. Although the TC group only identified 3 more threats than the Non TC group, they also identified 9 more benefits than the Non TC group.

During the discussion phase of the focus group meeting, the Non TC group identified enhanced balance and fluidity as being the most important perceived benefit of TC, while the TC group identified enhanced balance, flexibility, memory, and breathing as the most important. The TC group observed that they liked how TC stopped the brain from going all the time, and felt that TC may enhance memory by improving brain connections. Overall the TC group had a positive attitude towards TC, noting the many health benefits they felt TC provided.

Other benefits brought up by two participants in the Non TC group was the perception of TC as a calm exercise that could be performed anywhere, and may be good for stress reduction (noting in reference to seeing Chinese people doing TC in a park on TV, and how calm and peaceful they looked). The Non TC group did not

express any negative attitudes towards TC, the consensus was that they really did not know anything about it, and not seeing how it would benefit them, had never considered TC. Overall the attitude towards TC could be described as neutral. To address possible influence of experiences in the military, participants were asked if any experiences in the military might influence their views of TC. One participant had military experience, but he expressed surprise (based on facial expressions consisting of a pause and raised eyebrows) and negation that such experience might influence his views. The group consensus was that no previous experience related to the various Asian wars (or other experiences) affected their attitudes towards TC, which as stated above appeared to be neutral or ambivalent. See chapter 5 for a discussion on attitudes towards TC related to observations of perceived benefits.

Following the development of the fishbone chart using the post-it notes, participants rated their perceptions for each benefit listed on the fishbone diagram on a scale of 0 (no perceived benefit) to 9 (high perceived benefit) to permit expression of the importance and personal relevance each participant felt each item had to their own situation. In the Non-TC group perceived benefits of TC for balance exhibited a mean score of 7, with all but one participant (number 8) noting possible benefits for balance on the 0-9 scale when they were asked to reflect on that item. Only 4 participants initially noted benefits for balance using the post it notes. See Table 4-2 for individual responses across identified benefits. The TC group contrasted from the Non-TC group, in that they identified 15 perceived benefits of TC as opposed to 6 by the Non TC group (Tables 4-1 and 4-3).

The TC group exhibited a wider range of psychological and physiological benefits, including increased bone density and benefits for arthritis. Balance was also the number one benefit in the TC group, identified by 8 of the 11 participants, with a mean score on the 0-9 scale of 6.58, and a standard deviation of 1.3. The standard deviation for flexibility was also 1.3, which compared to other items (Table 4-4) indicates greater uniformity related to perception of benefit for balance and flexibility compared to other items for the TC group. Of the 15 perceived benefits identified by the TC group, only 6 had a single post-it note (benefits for arthritis, strength, dementia, life balance, focus, and increased movement). Calmness (*n* = 5) was the second most identified benefit, followed by enhanced coordination (*n* = 4), flexibility (*n* = 4), meditation (*n* = 3), and improved memory (*n* = 3). Two participants identified benefits to health, breathing, and bone density. That improved health was only listed by two participants may be due to health benefits being listed individually.

Research Question Two: What are the primary barriers which may affect adoption of TC in an older adult sample?

The TC and Non TC group each identified a similar number of perceived barriers, 8 for the TC group and 11 for the non TC group (Tables 4-5 to 4-7). The perceived barriers unique to the Non TC group include (*n* listed if more than one post it note): Balance problems (*n* = 2), perception that the form is too slow (*n* = 2), lack of time (*n* = 2), stamina/health problems (*n* = 2), don't know TC, arthritis, poor flexibility, and belief that they could not remember the form. Participant 2 noted "need instructor who is a master." When asked about this, participant 2 stated that the cruise ship teacher told the group that only TC masters could accurately teach TC. Participants 5 and 7 did not

identify any barriers with the post it notes, stating they did not know enough about TC to know the barriers.

Both groups shared perceptions related to efficacy of the teacher. One member listed barriers related to teaching on a post-it note (the participant who happened to try TC on a cruise ship. A group mean score is not included for this barrier, since this experience was unique to participant 2). Three members of the TC group listed teacher efficacy as a potential barrier with a group mean score of 5.4. Time constraints were also listed as a barrier (Non TC, *n* = 2; TC, *n* = 3), as well as being too tired (TC, *n* = 1) and poor stamina/poor health (Non TC, *n* = 2). Other perceived barriers unique to the TC group included the class being too early, being indoors rather than outdoors, poor motivation (or as put by the respondent – too lazy), pain restrictions, and lack of space (all of these had one response). It is also worth noting that except for teacher efficacy, (TC M = 5.4; SD = 4.3), most barriers identified by the focus groups were rated below 4 on the 0-9 scale. The larger standard deviation also indicates less uniformity regarding participant perceptions regarding this barrier.

As individual responses on the post-it notes, 5 participants in the TC group did not identify any barriers, while 3 only reported one barrier; time (reported by 2 participants, and “need a kick in behind to go” reported by the third, recorded on Table 4-5 as “Motivation”). One participant reported 4 barriers (bad teacher, pain, too early, and feeling tired), another participant reported 3 barriers (Bad teacher, space, indoor classes), and a third participant 2 barriers (time and bad teachers). As individual responses by the Non TC group, two participants identified 2 barriers (partner, and can’t remember; the second identifying time and too slow). Three participants identified 2

barriers (one reporting balance problems, lack of flexibility; another listing time, don't know how; and the third noting balance, arthritis) Three identified one barrier each; poor health, too slow, and lack of stamina.

During the discussion phase of the focus groups, several participants in the TC group mentioned that those instructors who use visualizations during class can be disturbing. Examples were given of a teacher stating to visualize anger leaving your body as orange streams of energy. The TC group also stated that they find it off-putting the number of health claims made for TC, as a panacea to cure all ills, without evidence to back it up. Related to this, it was also suggested that it would be important to educate society on why and how TC works. Several participants also stated that people do not see TC as exercise. It was commented that people who view TC just see people waving their hands around in the air, and do not understand what it is that they are doing. Also that it is important to explain why breathing is so important in TC. The last consideration brought up by the TC group was the suggestion that for effective promotion, it should be stressed that TC can be performed in 5 minutes or so and does not need to be in the hour format typical of most classes.

No participants in the Non TC group brought up negative connotations for TC related to being "new age," and when asked if any experiences related to the various Asian wars or other experiences might impact their interest, the individual and group consensus was that this did not relate to their views of TC. The primary barrier identified was related to lack of awareness of benefits. Participants in the Non TC group also agreed on participant number 2's observation that having an effective teacher would be a primary factor in their adoption of TC. Participant 2 noted that the TC class members

on the cruise ship had been told that inadequate instructors do not know or get into the hidden reasons for TC, and that it was important to learn from a master (to avoid biasing earlier discussion, this observation was left for last during the discussion phase). The Non TC group was also asked to rate their perception of a beginners class compared to an ongoing integrated class. Group members agreed that having a class specifically for beginners who did not know TC would be preferred to an ongoing class of mixed levels. The group score for this barrier following the development of the fishbone diagram was 5.4 (no post-it notes identified a barrier related to a beginner's class, this item was added to get participant views at the end of the group discussion as well as rating on the 0-9 scale).

Research Question Three: What are the primary facilitators (perceived threats and benefits) affecting adoption of TC in an older adult sample?

Research question three takes a closer look at perceived threats, and potential influence of benefits of TC, which may facilitate adoption (from the HBM perspective, perceived threats are a primary facilitator towards action). The perceived benefits of TC, as viewed by the TC group (detailed in research question number one) included: balance, relaxation, grace (fluidity), increased bone density, benefits for arthritis, calmness, enhanced coordination, strength, flexibility, meditation, clear mind, improved memory, breathing, life balance, decreased dementia risk, and overall enhanced health.

As facilitators to adoption of TC, perceived threats and benefits were considered together – the various perceived health threats of the individuals in the TC group as possible motivating factors in their adoption of TC, due to benefits of TC addressing identified threats. Some perceived benefits and threats hold relationships which may account for not being listed in both categories. For instance, under perceived threats,

back pain, bad hips, and stiff neck might be categorized as the benefit of TC as enhanced ease of movement. The focus of this section is on perceived threats, and on the discussion phase for threats and benefits. Individual responses on the 0-9 scale of health threats may be more revealing for the groups (see below).

Looking specifically at perceived threats identified, the TC group identified 18 perceived threats to health compared to 15 in the Non TC group. The health threats unique to the TC group included memory loss (n = 4), back-pain (n = 3), flexibility issues (n = 3), stress (n=3), bad hips, high cholesterol, stiff neck, dizziness, poor reaction time, intolerance (also defined as “crankiness”), and poor nutrition. Health threats unique to the Non TC group included shoulder problems (n = 3), diabetes (n=3), general age related decline, heart disease, feet problems, digestion problems, and safety issues (self defense). Threats shared in common included: balance concerns (TC, n = 8; NTC, n = 5), high blood pressure (TC, n = 1; NTC, n = 3), weight concerns (TC, n = 1; NTC, n = 3), cancer (TC, n = 1; NTC, n = 2), arthritis (TC, n = 1; NTC, n = 2), breathing problems (TC, n = 2; NTC, n = 1), and bone loss. See Tables 4-9 to 4-12 for more details on findings related to perceived threats.

The mean balance perceived threat total is 7 versus 4 in the Non TC group. For the Non TC group, the highest mean perceived threat total is 5 for weight concerns, which rated as a higher perceived threat than balance, which only 4 of the 10 participants listed as a concern on their responses). For perceived threats to health, 35 threats were recorded on post it notes, with a mean of 3.19 post it notes per participant. Three participants recorded only 2 threats, with the most listed by one person being 6 post it notes. Participant 4 in this group recorded 1 concern (foot problems), while

participant 5 recorded 2 problems (balance and breathing). All other participants in the Non TC group recorded 3 or more threats, with 5 health concerns being reported by participants 6, 9, and 10. See Tables 4-10 and 4-11 for individual and group mean ratings for perceived threats to health which may act as facilitators or motivators in the adoption of TC (or other health activities).

During the post-fishbone diagram phase, all participants in the TC group identified as important motivating factors in their adoption of TC as being related to health concerns. One participant began TC and other activity classes when they had a lung removed. Another began at the recommendation of a personal trainer, then continued upon seeing benefits. Another started TC after trying yoga, due to a neck injury which prevented them from doing many of the yoga postures. Four participants mentioned looking to reduce stress as a primary motivator in trying TC, and 3 stated concerns for balance and falls were a motivating factor (although one of these stated they started TC out of general curiosity, and then continued when they saw improvement in balance).

The Non-TC group stated that health concerns were also a primary motivating factor in their uptake of their current forms of exercise. Other factors included interested partners, observing others who have not maintained health, weight loss (mentioned by 5 participants during the post fishbone diagram phase), and two stating that seeing the benefits of exercise motivated them. One participant stressed that fun and fast activities with music are more motivating, and another mentioned that they are trying to keep healthy, but that a bad hip was limiting their activities. This participant further stated that if they saw benefits of TC, and it would not cause further injury, that they would be

interested. Knowing proven benefits of an exercise was the primary theme for motivation for exercise.

Research Question Four: What differences exist between the TC and Non TC Groups.

There were a number of notable differences between the TC and Non TC group, beginning with the number of categories identified for each construct of the HBM, particularly in perceived benefits of TC. The TC group identified 15 benefits of TC, compared to 6 benefits from the Non TC group. Four participants in the Non TC group were not able to identify any benefits, with 3 identifying 1 perceived benefit. The discussion phase of the TC group added one important factor, that of teaching methodology. The TC group expressed great dissatisfaction with variation of teacher knowledge, ability, and class structure (for example, if time is spent on new participants, regular students are ignored, and if time is spent on regular students, the new students get frustrated). One surprising difference which existed between the two groups was gender differences between the two groups. The TC group consisted of all women, whereas the Non TC group was evenly split, with half men and half women attending the focus group session.

Both groups identified balance as a primary concern (by 8 out of 11 in the TC group, but only 5 out of 10 in the Non TC group). Overall, despite being active in a variety of exercises (the Non TC group listed a total of 43 forms of exercise they regularly engage in, compared to just over 30 forms of exercise by the TC group (Tables 3-1 and 3-2), the Non TC group still identified a larger number of personal health threats, including high blood pressure (n = 3), diabetes (n=3), cancer (n = 2), and arthritis (n = 2). This contrasts with the TC group, in which diabetes was not even

mentioned, and high blood pressure, cancer, and arthritis were only listed once. Figures 4-1 to 4-3 present a summary of principle findings from the fishbone diagram and group discussion.

Table 4-1. Comparison of Benefits Identified by the Non TC and TC Group

Non TC Group		TC Group	
Balance (*n*=4)	Balance (*n*=8)	Memory (*n*=3)	Life Balance (*n*=1)
Health (*n*=3)	Health (*n*=2)	Breathing (*n*=2)	Focus (*n*=1)
Fluidity (*n*=1)	Coordination (*n*=4)	Bone Density (*n*=2)	+ Movement (*n*=1)
Relaxation (*n*=1)	Calmness (*n*=5)	Arthritis (*n*=1)	
Flexibility (*n*=1)	Flexibility (*n*=4)	Strength (*n*=1)	
Clear Mind (*n*=1)	Meditation (*n*=3)	Dementia (*n*=1)	

Table 4-2. Non Tai Chi (NTC) Group Perceived Benefits. Benefits in bold are unique to the NTC group. (Numbers in parenthesis are the number of people who responded with each area, if more than one post it note. Starred numbers where considered the most beneficial, during the discussion phase).

PARTIC. NUMBER	BENEFIT AVERAGE	BALANCE(4)*	HEALTH(3)	FLEXIBILITY	FLUIDITY*	RELAXATION	CLEAR MIND
NTC1	8.17	9	8	7	8	8	9
NTC2	8.33	9	9	8	8	8	8
NTC3	9.0	9	9	9	9	9	9
NTC4	8.5	7	8	9	9	9	9
NTC5	8.83	9	8	9	9	9	9
NTC6	6.5	5	7	7	6	7	7
NTC7	7.0	8	5	8	8	8	5
NTC8	0.0	0	0	0	0	0	0
NTC9	5.17	8	4	5	3	4	7
NTC10	7.67	9	9	6	9	6	7
Mean	6.92	7.3	6.7	6.8	6.9	6.8	7
SD	2.7	2.9	2.9	2.7	3.0	2.9	2.8

Table 4-3. Tai Chi Group (TCG) Perceived Benefits. Benefits in bold are unique to the TCG. (Numbers in parenthesis are the number of people who responded with each area, if more than one post it note. Starred numbers where considered the most beneficial, during the discussion phase).

PART. NUMBER	BENEFIT AVERAGE	BALANCE(8)*	CALMNESS(5)	COORDINATION(4)	FLEXBILITY(4)*	MEDITATION(3)	MEMORY(3)*	BREATHING(2)*	BONEDENSITY(2)	HEALTH(2)	ARTHRITIS	STRENGTH	DEMENTIA	LIFEBALNCE	FOCUS	+MOVEMMENT
TCG1	3.6	9	9	9	9	9	0	9	0	0	0	0	0	0	0	0
TCG2	7.07	9	7	6	7	6	8	9	8	9	4	4	3	9	9	8
TCG3	7.2	9	9	9	9	9	9	9	9	9	5	4	0	4	9	5
TCG4	8.6	9	9	9	9	9	9	9	9	9	9	3	9	9	9	9
TCG5	8.0	9	9	9	9	9	9	9	5	7	9	8	2	8	9	9
TCG6	4.73	5	3	5	5	3	5	3	8	3	8	8	0	5	5	5
TCG7	7.73	9	9	9	9	8	7	7	7	6	8	8	8	8	7	6
TCG8	7.53	7	9	8	8	9	7	8	7	8	8	7	5	7	8	7
TCG9	5.93	9	3	9	9	0	5	9	6	6	6	3	3	6	6	9
TCG10	5.33	8	6	7	7	4	2	8	7	8	7	3	5	0	4	4
TCG11	6.6	9	9	9	9	8	7	8	0	8	7	3	2	3	8	9
Mean	6.58	8.4	7.5	8	8.2	6.7	6.2	8	6	6.6	6.5	4.6	3.4	5.4	6.7	6.5
SD	1.52	1.3	2.4	1.5	1.3	3.1	3	1.8	3.2	2.8	2.7	2.7	3.1	3.3	2.8	2.8

Table 4-4. Comparison of mean scores and standard deviation between groups for comparable benefits.

	BALANCE	HEALTH	FLEXIBILITY	RELAX/CALM	CLEAR MIND/MEDT.
NTC Mean	7.3	6.7	6.8	6.8	7.0
TC Mean	8.4	6.6	8.2	7.5	6.7
NTC SD	2.9	2.9	2.7	2.9	2.8
TC SD	1.3	2.8	1.3	2.4	3.1

Table 4-5. Comparison of Barriers Identified by the Non TC and TC Group

Non TC Group		TC Group	
Balance (*n*=2)	Don't Know TC (*n*=1)	Teacher (*n*=3)	Pain (*n*=1)
Health (*n*=2)	Arthritis (*n*=1)	Time (*n*=3)	No Space (*n*=1)
Too Slow (*n*=2)	Flexibility (*n*=1)	Too Tired (*n*=1)	
Time (*n*=2)	Can't Remember (*n*=1)	Too Early(*n*=1)	
Teacher (*n*=1)		Indoor (*n*=1)	
Partner (*n*=1)		Motivation (*n*=1)	

Table 4-6. Non Tai Chi (NTC) Group Perceived Barriers. Barriers in bold are unique to the NTC group. (Numbers in parenthesis are the number of people who responded with each area, if more than response. Starred numbers where considered the greatest barrier during the discussion phase).

PARTIC. NUMBER	BARRIER AVERAGE	BALANCE(2)*	STAMINA/HEALTH(2)	TOO SLOW(2)	TIME(2)	PARTNER	DONT KNOW TC	ARTHRITIS	FLEXIBILITY	CAN'T REMEMBER	*NO BEGIN. CLASS***
NTC1	6.30	5	7	1	8	1	9	8	8	8	8
NTC2	4.00	6	3	1	2	8	6	3	2	7	2
NTC3	2.90	4	8	0	0	0	0	0	8	0	9
NTC4	5.00	5	6	5	0	5	9	0	4	7	9
NTC5	6.20	9	9	0	3	9	9	5	9	0	9
NTC6	3.00	1	0	0	3	1	8	1	7	0	9
NTC7	1.80	0	0	0	0	0	5	5	0	0	8
NTC8	0.0	0	0	0	0	0	0	0	0	0	0
NTC9	2.1	0	0	6	8	7	0	0	0	0	0
NTC10	1.10	0	4	3	0	4	0	0	0	0	0
AVG.	3.24	1.6	2.4	3.7	3.0	5.4	3.5	4.6	2.2	3.8	2.2
SD	2.17	3.2	3.6	2.3	3.2	3.6	4.7	2.9	3.9	3.6	4.3

** *No Beginner Class* was added by moderator to have participants rate lack of a beginners class at the facility, and was discussed last during the discussion phase.

Table 4-7. Tai Chi Group (TCG) Perceived barriers. Barriers in bold are unique to the TCG. (Numbers in parenthesis are the number of people who responded with each area, if more than one response. Starred numbers where considered the greatest barrier during the discussion phase).

PARTIC. NUMBER	BARRIER AVERAGE	TEACHER(3)*	TIME(3)	TOO TIRED	TOO EARLY	INDDOOR	MOTIIVATION	PAIN	NO SPACE
TCG1	1.13	9	0	0	0	0	0	0	0
TCG2	2.38	9	5	0	0	0	0	0	5
TCG3	2.38	7	8	4	0	0	0	0	0
TCG4	7.62	7	9	5	5	9	8	9	9
TCG5	2.25	9	9	0	0	0	0	0	0
TCG6	1.13	0	1	0	0	0	8	0	0
TCG7	5.0	0	9	9	0	5	9	8	0
TCG8	0.0	0	0	0	0	0	0	0	0
TCG9	0.0	0	0	0	0	0	0	0	0
TCG10	3.25	9	1	0	0	8	0	0	8
TCG11	3.38	9	8	5	5	0	0	0	0
Mean	2.59	5.4	4.6	2.1	.91	2	2.3	1.6	2
SD	2.2	4.3	4.1	3.2	2.0	3.6	3.9	3.5	3.6

Table 4-8. Comparison of mean scores and standard deviation between groups for comparable barriers.

	STAMINA/TIRED	TIME
NTC AVG	3.7	2.4
TC AVG	2.1	4.6
NTC SD	3.6	2.4
TC SD	3.2	4.1

Table 4-9. Comparison of Threats Identified by the Non TC and TC Group

Non TC Group		TC Group	
Balance (*n*=5)	Heart Prob. (n=1)	Balance (*n*=8)	Arthritis (*n*=1)
High B.P. (*n*=3)	Mental Prob. (n=1_	Memory (*n*=4)	Bad Hips (*n*=1)
Shoulder Prob (*n*=3)	Breathing Prob. (*n*=1)	Back Pain (*n*=3)	Cholesterol (*n*=1)
Diabetes (*n*=3)	Feet Prob. (*n*=1)	Flexibility(*n*=3)	Bone Loss (*n*=1)
Weight (*n*=3)	Digestion Prob.(n=1)	Stress(*n*=3)	Stiff Neck (*n*=1)
Cancer (*n*=2)	Safety Issues (n=1)	Breath Prob.(*n*=2)	Dizziness (*n*=1)
Arthritis (*n*=2)		High B.P. (*n*=1)	ReactionTime(n=1)
Age Decline (*n*=1)		Cancer (*n*=1)	Intolerance (*n*=1)
Bone Loss (n=1)		Weight (*n*=1)	Nutrition (*n*=1)

Table 4-10. Non Tai Chi (NTC) Group Perceived Threats. Threats in bold are unique to the NTC group. (Numbers in parenthesis are the number of people who responded with each area, if more than one post it note. Stared numbers where considered the most threatening, during the discussion phase).

PARTICPANT NUMBER	THREAT AVERAGE	BALANCE (5)*	HIGH B.P. (3)	SHOULDER PROB.(3)	DIABETES(3)	WEIGHT(3)*	CANCER (2)	ARTHRITIS (2)*	AGE DECLNE	BREATHIG PROB.*	FEET PROBLEMS	DIGESTIN PROB.	BONELOSS	HEART	MENTAL PROB.	SAFETY ISSUES
NTC1	5.0	9	3	6	7	4	1	8	1	9	7	2	9	7	1	1
NTC2	5.0	8	3	2	0	4	8	6	9	4	4	6	6	6	7	2
NTC3	1.67	2	0	9	0	5	0	0	4	0	0	0	0	0	5	0
NTC4	4.4	5	0	3	9	9	9	2	9	2	7	3	4	0	0	4
NTC5	4.67	9	0	9	0	5	0	9	0	9	4	4	4	9	4	4
NTC6	3.57	3	3	5	1	6	5	2	7	2	3	5	1	2	5	0
NTC7	1.33	0	5	0	5	5	0	5	0	0	0	0	0	0	0	0
NTC8	1.33	3	0	0	0	5	5	2	5	0	0	0	0	0	0	0
NTC9	3.67	3	8	0	0	4	7	6	9	2	0	0	0	8	2	6
NTC10	0.8	0	0	5	0	4	0	3	0	0	0	0	0	0	0	0
Mean	3.14	4.2	2.2	3.9	2.2	5.1	3.5	4.3	4.4	2.8	2.5	2	2.4	3.2	2.4	1.7
SD	1.68	3.4	2.7	3.5	3.5	1.5	3.7	3.0	4.0	3.5	2.9	2.4	3.2	3.8	2.6	2.2

Table 4-11. Tai Chi (TCG) Group Perceived Threats. Threats in bold are unique to the TCG. (Numbers in parenthesis are the number of people who responded with each area, if more than one post it note. Starred numbers where considered the most threatening, during the discussion phase).

PART. NUMBER	THREAT AVERAGE	BALANCE(8)*	MEMORY(4)*	BACK PAIN(3)	FLEXBILITY(3)*	STRESS(3)	BREATHIG(2)*	HIGH B.P.	WEIGHT	CANCER	ARTHRITIS	BAD HIPS	CHOLEST	BONELOSS	STIFFNECK	DIZZINESS	REACION TIME	INTOLERANCE	NUTRITION
TCG1	1.0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	0	0	0
TCG2	3.61	8	2	2	7	8	8	0	5	8	0	0	0	6	4	3	4	0	0
TCG3	4.67	8	5	6	8	8	8	8	0	4	8	0	0	7	7	0	4	3	0
TCG4	4.89	9	5	9	5	5	0	2	5	0	9	1	8	9	9	9	0	3	0
TCG5	5.94	9	9	5	9	9	9	0	5	5	5	5	9	9	0	0	8	0	5
TCG6	2.22	5	5	5	5	0	0	0	0	0	3	3	0	0	3	0	3	8	0
TCG7	3.22	9	8	9	4	0	0	0	0	0	3	9	0	8	0	6	1	1	0
TCG8	5.44	5	9	9	9	7	4	0	9	9	6	5	4	5	9	7	0	1	0
TCG9	2.17	3	3	0	3	0	0	0	0	3	3	0	9	9	6	0	0	0	0
TCG10	4.72	7	8	6	5	5	2	6	5	5	9	9	8	9	0	0	0	1	0
TCG11	5.61	9	9	2	9	9	5	9	0	9	3	2	8	0	9	6	6	6	0
Mean	3.95	6.6	5.7	4.8	5.8	4.6	4.0	2.3	2.6	4.7	4.5	3.1	4.2	5.6	4.3	2.8	2.4	2.1	.5
SD	1.62	3.0	3.1	3.4	2.9	3.9	3.9	3.6	3.2	3.7	3.2	3.5	4.2	3.9	3.9	3.5	2.8	2.7	1.5

Table 4-12. Comparison of mean scores and standard deviation between groups for comparable threats.

	BALANCE	HIGH BP	WEIGHT	CANCER	ARTHRITIS	BREATHING PROB	BONELOSS
NTC M	4.2	2.2	5.1	3.5	4.3	2.8	2.4
TC M	6.6	2.3	2.6	4.7	4.5	4.0	5.6
NTC SD	3.4	2.7	1.5	3.7	3.0	3.5	3.2
TC SD	3.0	3.6	3.2	3.7	3.2	3.9	3.9

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NTC Group reported 6 benefits. Benefits listed by more than 1 person listed below:

Balance (n = 4; M = 7.3; SD =2.9)
General Health (n = 3; M = 6.7; SD =2.9)
(4 reported no benefits)

TC Group reported 15 benefits. Benefits listed by more than 2 persons listed below:

Balance (n=8; M = 8.4; SD =1.3)
Calmness (n = 5; M =7.5; SD =2.4)
Coordination (n=4; M = 8.0; SD =1.5)
Flexibility (n=4; M = 8.2; SD =1.3)
Meditation (n=3; M = 6.7; SD =3.1)
Memory (n=3; M = 6.2; SD =3)

* n = number of participants listing each benefit; M = mean group score when rated on 0-9 scale (for comparison, low *n* and focus group design precludes statistical significance).

It is worth noting that TC SD for balance and flexibility is 1.3, and 1.5 for coordination, indicating greater uniformity relating to the perception of these benefits.

Knowledge of TC (from discussion phase):

Non TC Group:

- Perceived as potential benefit for balance and fluidity.
- Two members identified possible benefits for calmness and stress reduction, after commenting on how calm and peaceful a Chinese TC group looked (viewed on TV).

TC Group:

- Perceived balance, flexibility, enhanced memory, and breathing as most important.

Attitudes to TC (from discussion phase):

Non-TC Group:

- Indifferent
- Need to know benefits compared to current activities.
- If proven benefits, would consider TC (depends on how compares to benefits of current activities).

TC Group:

- Positive attitude towards TC

Figure 4-1. Primary Knowledge of TC Benefits (from fishbone diagram)

NTC Group reported 15 threats to health. Threats listed by more than 1 person listed below:	TC Group reported 18 threats to health. Threats listed by more than 2 persons listed below:
Balance Concerns (n = 5; M = 4.2; SD = 3.4)	Balance Concerns (n = 8; M = 6.6; SD = 3.0)
High Blood Pressure (n = 3; M = 2.2; SD =2.7)	Memory Concerns (n = 4; M = 5.7; SD =3.1)
Shoulder Problems (n = 3; M = 3.9; SD =3.5)	Back Pain (n = 3; M = 4.8; SD =3.4)
Diabetes (n = 3; M = 2.2; SD =3.5)	Flexibility (n = 3; M = 5.8; SD =2.9)
Weight (n = 3; M =5.1; SD =1.5)	Stress (n = 3; M = 4.5; SD =3.9)
Cancer (n = 2; M =3.5; SD =3.7)	Breathing Problems (n = 2; M = 4.0; SD =3.9)
Arthritis (n = 2; M =4.3; SD =3.0)	

* n = number of participants listing each threat; M = mean group score when rated on 0-9 scale. (for comparison, low *n* and focus group design precludes statistical significance).

It is worth noting that NTC SD for weight is 1.5, indicating greater uniformity relating to the perception of weight as a threat.

Facilitators to TC (as threats to health, from discussion phase):

Non TC Group:

- Concerns for weight, balance, arthritis, and breathing problems considered greatest threats to health.
- During the discussion phase, participants also noted sleep problems, and elaborated concerns for breathing problems in regards to lung problems.

TC Group:

- Concerns for balance, memory, flexibility, and breathing problems considered greatest threats to health.
- Also noted that for shoulder problems, main concern was functionality.

Figure 4-2. Primary Perceived Facilitators to TC Adoption (as threats to health from fishbone diagram).

NTC Group reported 9 barriers. Barriers listed by more than 1 person listed below:

Poor Stamina/Health (n = 2; M = 3.7; SD =3.6)
Poor Balance (n = 2; M = 3.0; SD =3.2)
Lack of Time (n = 2; M = 2.4; SD =3.2)
Too Slow (n = 2; M = 1.6; SD =2.3)
(1 reported no barrier)

TC Group reported 8 barriers. Barriers listed by more than 1 person listed below:

Poor Teacher (n = 3; M = 5.4; SD = 4.3)
Lack of Time (n = 3; M = 4.6; SD =4.1)
(5 reported no barriers)

* n = number of participants listing each barrier; M = mean group score when rated on 0-9 scale. (for comparison, low *n* and focus group design precludes statistical significance).

Barriers to TC (from discussion phase):

Non TC Group:

- Lack of awareness of benefits
- Bad teachers
- No beginners class

TC Group:

- Bad teachers and mix of beginners and advanced students in one class were identified as the largest barrier.
- Participants also noted that visualizations can be disturbing.
- Embarrassment to do TC in public.
- Claims that TC is a panacea are off-putting.
- Misperceptions in the public that TC is not an exercise – that people think they are “just waiving hands around.” The group also noted that it is important to describe why breathing is important.
- Suggested that 5 minute formats may address barrier of time.

Figure 4-3. Primary Perceived Barriers to TC (from fishbone diagram)

CHAPTER 5
DISCUSSION

Organization of Discussion Section

Chapter 5 presents primary findings from the focus groups. The first section highlights findings from the focus groups, followed by a comparison to health threats among older adults as identified by the CDC,[3] which were either not identified or minimally identified by focus group participants. Elements of diffusion of innovation presented in the review of literature are revisited in relation to findings from the focus group study. The last section discusses limitations of the findings, recommendations for future research, as well as a summary of key points from the focus group study.

Facilitators related to Perceived Benefits and Threats

See table 5-1 for eight primary areas related to perceived benefits and threats identified by focus group participants, which may be potential areas to consider in larger studies. Findings specific to the focus group results related to benefits of TC were closely linked to perceived health threats. This is particularly notable in that results of number of perceived threats for the NTC group were similar to the TC group. The NTC group idenditifed15 threats, and a total of 29 post-it notes, compared to 18 identified threats by the TC group, with a total of 33 post-it notes (Table 5-2), possibly indicating that as older adults, both groups face similar burdens related to health threats (although despite some similarities (i.e. balance), many listed perceived threats varied. Also, worth noting is that the TC group identified 15 perceived benefits of TC with a total of 39 post-it notes, compared to 6 perceived benefits and 12 post-it notes in the Non TC group.

It should be noted that for the most part, according to self-report, the TC group members did not begin TC due to concerns for health threats and perceived benefits of

TC. But it may be valuable to determine if knowledge of evidence-based benefits of discovered through trying TC is a factor, and if perception of personal health benefits is a factor in the maintenance of TC practice. Tracking this type of information may motivate adoption and maintenance of TC among non adopters. Other factors such as convenience of location and access or affordability may also affect adoption.

One particular health threat, problems with balance, may be a particular opportunity for motivating TC adoption. It was identified by 8 of the 11 participants in the TC group as a concern. That only 4 participants in the Non TC group identified balance as a health threat, and 3 participants in the TC group did not identify benefits for balance, indicates that may be important not only to educate older adults into the benefits of TC for balance, but also that they are at high risk for falls. Indeed, 2 participants in the Non TC group identified poor balance as a barrier to adoption of TC, and 6 rated balance as a concern preventing TC adoption on the 0-9 scale. This again supports that targeting evidence based benefits of TC and actual health threats may overcome many of the barriers to the adoption of TC related to lack of knowledge. It is also worth noting that the SD for benefit for balance for the TC group was 1.3, compared to 2.9 in the Non TC group, possibly indicating greater uniformity of belief related to their experience with TC.

It is also interesting to note that the perceived benefit mean score for balance and perceived threat for falls in the TC group were both high (8.4 and 6.6 respectively), compared to the Non-TC group, in which as a group, perceptions of TC as benefiting balance was also high (M = 7.3) but mean perception of threats from falls was 4.2. This may be due to the TC group having a more accurate perception of the limitations of their

balance, due to the nature of TC in working with balance. It is also worth noting that 2 participants in the Non TC group noted poor balance as a barrier to TC, with 5 participants rating it as a potential barrier (Table 4-6).

Targeted messages aimed at the older adult population to increase perceived susceptibility for falls and severity of resulting injuries (including death) may be a prime opportunity for reducing incidences of falls in this population, as well as promoting adoption of TC (while being sensitive to avoid creating a state of paranoia). Another suggestion might be to target older adults who have recently experienced a fall with individually tailored messages, by working with local area doctors. Having experienced a fall may result in stronger motivations for trying TC, as a very physical cue to action.

The TC group also identified psychological benefits as a primary benefit of TC. Calmness (*n* = 5, SD = 2.4) was the second most identified benefit in the TC group, with 3 participants also identifying meditation and improved memory. Individual perceived benefit scores were also high for these items, with a mean score of 7.5, 6.7, and 6.2 respectively. Evidence based mental benefits may address concerns related to memory, pending sufficient research. For the Non TC group only two participants listed any mental benefits. One participant listed “clear mind” as a perceived benefit, and another participant listed “relaxation.” However, the group score for perception of benefits for clear mind was 7, and the group mean score for relaxation was 6.8.

A potential facilitator which may tie into the mindfulness or meditative aspect of TC may be potential effects of TC on weight management related to the development of mindfulness and awareness of eating habits. Weight concerns were rated as the largest health threat by the Non TC group (n=3; group mean score = 5.1; SD = 1.5), despite

being of similar weight range as the TC group (neither group contained members who would be categorized as obese). For comparison, only one member of the TC group identified weight as a concern on the post-it notes, and the group score for weight was 2.6. Since TC may not be perceived as a major “fat burning” exercise, this may be a barrier to the general older adult population. It should be noted that Yeh and others (2009) report that TC has metabolic equivalents of 1.5-4.0, similar to low to moderate intensity aerobic exercise.

During the discussion phase the TC group talked about the effects of meditative practices on the brain. The TC group observed that they liked how TC stopped the brain from going all the time, and felt that TC may enhance memory by improving brain connections. The risk comes in that this extends the benefits of TC to include not only a wide variety of physical ills, but also mental health and functioning as well. Strong support from of evidence based promotional material may need to be accumulated and promoted to overcome potential bias against a “cure all,” as identified by the TC group.

Related to this is the need to educate the public on the mechanisms of benefits for various threats to health. There are several organizations which certify TC instructors, but potential limitations related to style, methodology and teaching methods (see Appendix A for more details) may indicated a need to educate the public for personal evaluation of appropriateness of various programs to participant needs. As addressed in chapter 2 of this dissertation, being single weighted is a critical element of TC practice for developing balance, yet many teachers do not follow this principle (Appendix A). Targeting the public as well as TC teachers on the benefits of single-weighted practice may be important to maximize TC benefits for balance, and minimize

the barrier of not getting expected results. Related to the focus group findings, knowledge of benefits may help participants to maximize the benefits of TC as well as find personally relevant classes, which may address some of the barriers related to teaching. Essentially, creating an educated consumer, to put pressure on those who teach TC for health to create consumer appropriate classes.

Other potential facilitators or opportunities for promoting adoption of TC identified by the focus groups include perceived benefits for flexibility. Four members of the TC group identified benefits for flexibility with the post-it notes (group mean score = 8.2), and although only one person in the Non TC group identified potential benefits for flexibility, it received a group score of 6.8. But that lack of flexibility was also identified by one person in the Non TC group as a potential barrier to TC (barrier group mean score = 3.8), may indicate an opportunity for facilitating TC adoption by educating the public on the benefits of TC for flexibility.

Two final areas which may facilitate interest in TC and potential adoption, is perceived threats related to shoulder and back pain, as well as for breathing problems. Three members of the Non TC group listed shoulder problems as a health threat (group mean score = 3.9), and 3 members of the TC group listed back pain (group mean score = 4.8). Breathing problems were listed by 2 participants in the TC group as a health threat (group score = 4.0), and by 2 participants as a benefit of TC (group score = 8.0). These results may indicate an opportunity to facilitate TC adoption by focusing on evidence-based benefits for back problems, movement, and pain, as well as breathing problems such as COPD, as listed in chapter 1.

Facilitators Related to Health Threats Identified by the CDC

To address actual health threats (as identified by the CDC) to perceived threats identified by focus group participants, a comparison table was made for the top 7 causes of death among older adults (age 65 and above) compiled by the CDC.[3] The Non TC group identified as barriers to TC practice many of the very benefits provided by TC according to the literature (see chapter 1). The Non TC group identified poor balance, poor flexibility, poor stamina and health, as well as limitations due to arthritis as barriers to TC. The absence of knowledge relating to TC, and its benefits, may be a primary barrier to the adoption of TC. Conversely, knowledge of TC and its benefits may be a primary facilitator in the adoption of TC.

These findings indicate the importance of targeting older adults regarding potential health threats, and also indicate opportunity for promoting TC. Heart disease, the number one cause of early death in older adults, was not identified as a threat at all by the TC group, and by only one person in the Non TC group. Table 5-2 presents findings from the focus groups compared to the seven leading causes of early death in adults age 65 and older.[3] Deaths due to falls is also included due to the concern and incidence of falls among older adults. CDC causes of death are labeled CDC 1-7 and CDC-f for falls. Deaths from falls is not among the top 10 causes of early death in older adults, except as a subcategory of death by accidents, which is the 9th leading cause of death following nephritis. It is worth noting that as a subcategory of accidental deaths, falls accounted for 19,700 deaths of the 38,292 deaths due to unintentional injury reported[4].

The statistics from the CDC are provided as potential areas to address as related to facilitators for motivating adoption of TC, and use in the overview related to elements

of the diffusion of innovations (Figure 5-1) presented at the end of this chapter. Heart disease, the leading cause of death, was not identified as a concern in the TC group, and received a mean group score of 3.2 by the Non TC group. Cancer had slightly higher mean group scores, 4.7 and 3.5 respectively (all scores are on a 0-9 scale), while the mean risk of stroke was only rated as 2.3 and 2.2 by both groups (indirectly, through their concern for high blood pressure, a major risk factor for stroke).

All leading causes of death received low group scores, except for risk for falls in the TC group, with a mean group score of 6.6. The low rating of mean group scores for the various threats indicates a strong need for targeting older adults on threats to their health, along with opportunities for minimizing threats, such as TC, along with evidence based support and programming. An opportunity for increasing awareness and motivation may be by raising perceived threat levels during doctor visits, during which personal relevance and susceptibility of threats can be addressed, along with opportunities such as TC for addressing these threats and the severity of potential consequences. Such an effort would necessitate cooperation and support of the medical community, which may be a limitation

Overall, the key areas as identified by the CDC[3] which may be relevant to facilitating the adoption of TC, include addressing evidence-base benefits of TC for heart disease, cancer, stroke, chronic lower respiratory disease, and falls, as well as possible benefits for Alzheimer and diabetes. Benefits of TC on the immune system, relevant to deaths by influenza, may also be a factor among older adults lacking access or not availing themselves of flu shots.

Perceived Barriers to the Adoption of TC

Table 5-4 presents an overview of potential barriers to the diffusion and adoption of TC. Reported perceived barriers are noted as potential areas to address related to adoption of TC relevant to focus group findings. Seven primary barriers (B1-B7) were identified by the focus groups. As mentioned above, the Non TC group identified as barriers to TC practice many of the very benefits provided by TC according to the literature (see chapter 2). The Non TC group identified poor balance, poor flexibility, poor stamina and health, as well as limitations due to arthritis.

In the survey of 40 Non TC practitioners conducted by Chen and others,[35] as mentioned in the review of literature, 45% (n = 18) indicated that they felt they were too weak to practice TC, and was the primary reason stated for not trying TC. The absence of knowledge relating to TC, and its benefits, may be a primary barrier to the adoption of TC. The TC group addressed that they find it off-putting the number of health claims made for TC, as a panacea to cure all ills, without evidence to back it up. One of the greatest opportunities for the promotion of TC may be evidence-based programs based on rigorous research and proven physiological mechanisms, balanced with benefits compared to aerobic and other exercises, to create an informed consumer.

Teacher efficacy was identified by both groups as a major barrier during the discussion phase and on group scores (to minimize bias and influence related to the experience of TC on a cruise ship of participant 2, barriers related to teaching were addressed last in the Non TC group, at the end of the discussion phase). Poor teacher was the largest barrier reported by the TC group (n = 3, mean group score = 5.4), and although only reported as a barrier by participant 2, it was rated as the largest potential barrier as well by the Non TC group (mean group score = 5.7). It should be noted that

the new teacher at OTOW has adapted the TC class to follow a format similar to an aerobics class, using repetition of faster paced movements, which the members of the focus group found displeasing, while the former teacher stopped teaching in part due to being uncomfortable teaching TC, having learned primarily from DVD's.

Also related to teaching as a barrier among older adults, is that TC, having originated as a martial art, is still often taught from a martial perspective (Appendix A). A martial perspective may be more attractive to some individuals, but a barrier for others. An important consideration for TC programs may be to match teaching style and style of TC to participant needs and objectives. Social aspects, following a fun exercise, learning TC for home practice, and learning TC as a martial art, may be areas for future development and research. During the discussion phase of the TC focus group, the social and health aspect seemed most important to participants, particularly the perceived health benefits participants observed following adoption of TC. The difficulties of learning TC were minimally addressed, but a format allowing participants to follow along may be worth investigating.

As noted in the review of literature, Beaudreau[34] also noted that clear instruction was identified as important by all 8 focus group participants and that an in interested and patient instructor was considered important by 7 of the 8 participants. During the discussion phase the TC group expressed frustration when classes contain a large number of beginners, stating that the teacher then spends too much time going over the basics rather than practicing TC. A solution to this may be a separate beginner's class, to bring participants "up to speed." This solution was effective for the Taoist Tai Chi group in Appendix A.

Related to the barrier of lack of written or visual cues identified by participant 2 from his cruise ship experience, Beaudreau,[34] also noted that lack of written or visual cues were identified as a barrier to learning TC by all 8 focus group members in that study group, and that 5 noted that they get confused when they try TC on their own. Chen and colleagues[35] also identified the barrier to trying TC related to the perception that TC is too complicated, by 8 of the 40 Non TC practitioners surveyed.

Other barriers relate to observations by the TC group regarding an instructor who had them visualize anger leaving their body as orange streams of energy, and found this disturbing. Unless instructors make a link to visualization as a useful mental tool rather than a reality, the “new age” (as identified by participants) aspect may be a distinct barrier to the diffusion of TC. A proposed solution to this barrier would be to stress to teachers and the TC community to focus on evidence based benefits, at least with beginning students and the general population.

Recommendations Related to Diffusion of Innovations Theory

Figure 5-1 presents an overview of potential facilitators and barriers identified from the focus group results, applied to elements of Diffusion of Innovation theory presented in chapter 2. The most important element related to the diffusion of innovations may be targeting evidence based TC (barrier B1) to address lack of awareness related to uncertainty of benefits. Rogers[17] stated that uncertainty is possibly the greatest barrier to the diffusion of an innovation, which also relates to the number of alternative choices available. Why try TC, when there are so many proven health exercises available?

Related to this are the communication channels used to obtain information about new innovations, which would be a good follow up to the current study, to determine

which communications channels are most effective for TC in persuading potential adopters. As mentioned in chapter 2, the review of literature, Rogers[17] identified home visits by change agents as a critical communication channel, which can account for up to a 40% adoption rate. For OTOW, it may be possible to set up a program in which TC advocates can volunteer for home visits or small group discussions. Alternatively (rather than visiting potential adopters with home visits), as older adults visit doctors, physicians may be used as important change agents, making recommendations for TC practice as appropriate, as mentioned above.

Stakeholders, via interpersonal channels, have been demonstrated to be more effective in overcoming barriers (B1, B7) for the later adopter categories.[17] This may be an important area to target for future research for motivating evidence based TC adoption. Another potential communication channels that OTOW or other active living community might utilize could include local mass media (either in newsletters or working with local media) to deliver targeted messages (using facilitators CDC1-8 and F1-8).

According to Rogers,[17] as highlighted in the literature review, stage one of the innovation-decision process (knowledge) is particularly dependent on the characteristics of the decision making unit (the social system). Future recommendations include in-depth investigation of the characteristics of a targeted community (for example OTOW), to determine micro-variable which might affect the quality and nature of knowledge (CDC1-8, F1-8, and B1), possibly through a case series (see final recommendations below). Rogers[17] identified 7 generalizations relating to knowledge of an innovation, which can be affected by educational level, social status, mass media use, interpersonal networks, accessibility to change agents (for example the staff at OTOW fitness center),

social networks, and linkage to outside the social system (for example local news and media channels). Future research may wish to address each of these variables in designing and testing effective targeted messages to enhance knowledge in the targeted community.

Relative to the persuasion stage of the innovation-decision process model are the five characteristics that Rogers[17] considers the most important in explaining the rate of adoption of an innovation, as mentioned in the review of literature. Applying these characteristics to the observations from the TC and Non TC group, several areas to target for future research emerge. Relative advantage and compatibility are considered by Rogers to be the two most important of the five characteristics of an innovation. The first, relative advantage, again stresses the importance of education and evidence based TC (CDC1-8, F1-8, B1). In order for potential consumers to be able to make accurate judgments, a comparison study might be advised, to evaluate TC in relation to current activities in regard to benefits, economic costs, convenience, and satisfaction.

Further study related to evidenced and dosage based user friendly formats was also identified by Jimenez and others[6] as well as Schleicher and others.[7] Schleicher and colleagues found significant effects reported for balance with a wide range of time formats, ranging from 1 hour a week to 7.5 hours per week during a review of 24 studies. It would be worth comparing benefits from a 60 minute class twice a week (120 total minutes) to a 30 minute class 4 times a week (120 total minutes), as well as 5 minutes of daily practice 7 days a week. Providing a baseline for dosage may also help in creating consistent and evidence based messages

Although the literature on the benefits of TC do include some comparison to other activities, little is presented in the way of detailed description of the format of TC used in various interventions, including time spent in each class learning versus practicing TC, and amount (if any) of time spent practicing at home.[13,14] This situation can be confusing to researchers and those seeking to develop a TC intervention or program, and ability to create an educated consumer, as well as ability to make comparisons to other health activities for determining relative advantage.

As mentioned by Fry and colleagues,[51] in a study on the effects of TC on the physical functioning and psychological well-being, the majority of each class was spent in lecture, so that it was difficult to determine if it was the expectation of benefits or the few minutes spent doing TC which delivered significant effects. A 12 week study using a format that takes 1.5 years to learn, would be measuring the effects of learning TC, verses the effects of practicing TC. It may be difficult to determine relative advantage from studies of this nature. To reduce the barrier of mixed or uncertain results, it is recommended that detailed instructions on method of instruction and style of TC be presented in studies, and if possible, detail a format that does not include a learning phase (or at least differentiate that any significant or non-significant effects where derived while learning TC, as opposed to ongoing practice).

In regards to compatibility, Roger noted that re-invention may be critical in the process of adoption (B4-7). For the successful adoption of TC in older adults, it may necessitate adjustments in form, teaching style, and practice specific to desired target populations. Dr. Paul Lam has made efforts in this direction by applying a step-wise progressive teaching method from the field of education to teaching TC.[52]

The TC group suggested offering or teaching 5 minute formats of TC to address barriers of time. It would be important however to first document the effectiveness of shorter formats of TC to address evidence based benefits, as well as various consumer friendly classes, in comparison to traditional formats of TC instruction to address compatibility issues (Appendix A) This also relates to the third characteristic, complexity. TC, as taught traditionally, can be a very complex exercise. Lack of a teacher capable of teaching TC effectively (B2) and lack of a beginners class (B3) are two barriers related to complexity identified by both focus groups. Participant 2 noted that the movements taught in the cruise ship class were difficult to remember. Simplifying TC to its essential elements for health may be critical. Even the basic way of moving, the coordination of upper and lower body, may be more complex and challenging than many Western forms of exercise, requiring careful adaptation of teaching methods. In a method developed at Fullerton College,[53] this is addressed by using the first 5-10 minutes with a new group in learning how the lower body moves, then the upper body, and finally coordinating the two, and as mentioned earlier, by Dr. Lam using a step-wise progressive teaching method.[52]

Trialability, the opportunities to try TC without a large commitment or investment of time, is the fourth important characteristic. Rogers stated that innovations that can be tried before full commitment are adopted more quickly, and reduces the factor of uncertainty. This relates to the identification by both focus groups of the desirability of a class just for beginners (B2), where new people can try TC without the threat of trying to match or keep up with more experienced students, as well as the possibility of being neglected when the teacher focuses on more experienced students. Written or visual

cues (in the form of a DVD or notes), enhancing ability for home practice may address the barrier related to difficulty remembering the form (B8), as well as allowing potential adopters to try TC at home, or practice what was done in class. Recommendations in this area include developing and evaluating effective methods for home practice.

Observability (the final characteristic), related to the visibility to non-adopters regarding the benefits of TC among the adopting population, may be a limitation in TC promotion, in that most of the benefits of TC are not visible. It may be important to educate potential adopters regarding how long it might be before benefits are observed, and evaluate targeted messages based on expected benefit time frames. For example, if a significant effect on balance (or at least in regards to TC challenging balance) was observed in one class, this may be applicable to creating effective messages. For some benefits, results may occur fairly quickly – participant 9 noted that they started TC out of curiosity, and observing benefits for balance, continued practice. This is also an area addressed by Schleicher and others[7] as noted in Chapter 2, Review of Literature.

Spokespersons and role models may help overcome the limitation of observability, as well as education into the benefits to longer term practitioners. As noted by the TC group, “most people just think we are waving our arms around for no reason.” Embarrassment when doing TC in the public was noted by the TC group, which would inhibit observability through public performance. Observability might be achieved through posters and targeted messages through various communication channels, which is another area recommended for further research. This may also help reduce the embarrassment factor by creating familiarity and acceptance in society. It is likely that people jogging in the park are less susceptible to embarrassment while

exercising (although the first joggers who began this trend may have been self-conscious). Recommendations in this area include evaluating impact of various messages in mass media channels. As noted above, what few perceptions the Non-TC group had regarding benefits of TC were primarily related to a TV commercial featuring a group of TC practitioners in a green field. Five of the 8 participants in the study group conducted by Beaudreau,[34] mentioned in the review of literature, exposure to TC may have been linked to seeing TC on the TV (or park, or friend suggested – the author did not differentiate).

Weinreich Communications,[54] a company which works with the media industry coordinating social media strategy, may be worth following up with to put positive images and evidence-based messages related to TC into the public media. “Larry Crowne,” a recent movie directed by (and starring) Tom Hanks[55] related the misadventures of an older adult returning to college, and featured a scene in which the guidance counselor suddenly interjects “you should take tai chi – tai chi cured my diabetes.” The scene then continued with no reference to tai chi until the end of the movie, when the camera panned across the campus, and in the background could be seen the guidance counselor leading a group of students in tai chi. Such scenes would enhance familiarity and observability of TC, as well as informally educate the public on relevant benefits. One caution regarding this scene is that if benefits are not evidence-based and conclusive, such messages may be counterproductive, creating more doubt than interest in TC. Diabetes is one health concern for which there is minimal evidence regarding the benefits of TC beyond type 2 diabetes, particularly in relationship to acting as a cure. Inclusion of groups performing TC in the background of random scenes of

various movies, just as you would have joggers running in the background, or kids playing, would also act to increase observability of TC.

Limitations and Bias

Various strategies related to the fishbone diagram were utilized to minimize bias during the course of the study. Researcher bias was minimized through the use of the fishbone diagram, which permits identification of threats, benefits and barriers with minimal researcher interaction. Researcher interaction is limited to handing out sheets of paper, post-it notes, and pens. Verbal interaction was limited to giving instructions to note as many threats, benefits and barriers as possible during each section of the fishbone diagram. This format of moderation is identified by Flick as formal direction, in which researcher interaction is limited to control of the agenda, in the form of fixing the beginning, course, and end of the discussion, which reduces the potential for bias which may result from topical steering or steering the dynamics.[23]

Following this process, the researcher asked focus group participants to verify grouping of identified items. In this sense, the focus group members acted as a second rater, confirming their own perceptions, as opposed to evaluation by an outside rater who may misinterpret meaning. Following recommendations by Boyatzis,[47] no opinions were given by the researcher, who restricted interaction to asking questions directly related to responses, such as “would you group ‘need a quick in the behind to go’ with ‘motivation.’” This format of the focus group design helps control for consistency of judgment on the part of the researcher, since the participants themselves acted as a second rater to verify meanings of items.[23]

Question bias, related to leading questions or putting words in respondent’s mouths[56] was controlled for by using direct questions related to HBM constructs,

regarding focus group participants perceived threats, benefits of TC, and potential barriers, as outlined in the “construction of the fishbone diagram” section above, described in the focus group process. During discussion phase, researcher input was limited to asking the group to identify the largest perceived threats, benefits and barriers, and noting on the margins of the fishbone diagram any additional observations made by focus group members. For example, during the discussion phase, participants were asked “What do you feel is the largest health threat to older adults listed on the chart?” As opposed to “Do you think loss of balance is the biggest health threat?” The focus group also acted as a second rater during the discussion phase, by being asked to verify the accuracy of the comments made by focus group participants, which were written down by the researcher on the margins of the chart. Since the research design was based on a theory driven code based on the HBM, as opposed to a researcher developed theory, projection on the part of the researcher is minimized.[56]

Question order bias may be a factor to address in future studies, in that respondents may be influenced on later constructs by their answers on earlier constructs.[56] It may be worth noting if respondents identified more or less (or different) threats and benefits, if perceived benefits of TC were addressed before perceived threats to health. That the questions were very general in relation to perceived threats, benefits and barriers may help address question order bias.[56] Writing down responses and creating the fishbone diagram before the group discussion also helped control for reference bias, preventing respondents from influencing each other’s response.[56]

Dominant respondent bias, which can result from a dominant respondent monopolizing time, was controlled for through the fishbone diagram, as was shyness

bias.[56] Each respondent had an equal amount of time to note threats, benefits, and barriers in an anonymous manner. During the discussion phase, each participant was acknowledged in turn, to permit an opportunity to provide additional input, changing table order to reduce respondent order effects. No person dominated discussion during this phase, and the anonymous format of the fishbone diagram helped to minimize bias from shyness and sensitivity, since participants did not need to personally identify with each item.

Error bias, related to errors in memory and judgment was a minimal concern, in that the goal was to identify general perceptions most important to the focus group in regards to threats, benefits and barriers, as opposed to all actual threats, benefits, and barriers.[56] What was not reported can be as significant as what was reported. The completed fishbone chart was referred to in the discussion phase to identify any areas not considered in the fishbone phase (such as benefits for sleep, which was identified during the discussion phase, but not the fishbone phase). The discussion phase helped to control for error bias, by cross checking findings, and permitting additional input that may have been overlooked.[56]

Another advantage of the fishbone diagram is that it addresses sensitivity bias, which may result from discussion of sensitive subjects, which can be compounded if proceedings are audio recorded.[23,56] The blinded aspect of the fishbone diagram permits anonymous identification of responses, and discussion as an objective exercise independent of respondent identification.[44] Biased reporting of data was controlled for by reporting direct findings, independent of researcher observations and comments. Findings were reported in tables listing participant identified threats, benefits, and

barriers, ratings on a 0-9 scale, and direct comments noted on margins of fishbone diagram.

The threat of self-selection bias is minimized through the homogenous nature of the population and the purposeful nature of the sample, which can minimize bias due to differences which may result from a randomized sample from a larger and more diverse population base.[49] Since the sample was purposely taken from active members who regularly engage in exercise at the fitness center, with a shared location as residents at OTOW, focus group members are more homogenous and representative of the OTOW population than if participants were randomly selected from a larger area (or even from OTOW, if exercise habits were not similar). The fishbone diagram also helped maintain common conditions between groups, which uncontrolled for can be another source of bias.[44]

Despite efforts to control bias, several limitations must be kept in mind. A limitation which applies to the focus group study conducted at OTOW, is that the large majority of behavior change research and interventions is oriented around those most prepared for action.[57] This is also the case with the OTOW groups – the Non TC group were all very active in various activities at the health center, which in many ways may already prime them for TC adoption. Targeting already active older adults may be a key prospect for achieving critical mass, which may then carry over to more sedentary individuals, but ultimately it may be important to address studies related to TC specific to non-users of the OTOW fitness center. It may be worth considering if TC may be perceived as a more attractive form of exercise to sedentary individuals than more active forms of exercise.

Although a possible limitation of this study, it is worth noting that as a whole, the participants in the focus groups had not been particularly active until moving to OTOW. So access and time may be a particular key in the motivation towards adoption of health activities, and stresses the importance of considering the environment and accessibility in promoting health activities. This may be a limitation in the current study, in that findings may not apply to populations without access or free time. Ethically, it may be important to consider if marketing and motivating adoption if TC is appropriate if not supported in the community or society at large (Appendix A). On the other hand, educating the public (whether at OTOW or society at large), may be what is needed to create a demand and base for user friendly programs.

As a focus group study, the findings cannot be generalized to the entire population of OTOW, nor to the general older adult population, particularly since the groups consisted of currently very active individuals. The TC group also consisted of all women, compared to the equal mix of male and female participants in the Non TC group, which is a further limitation. Economic status and diversity issues may also be a limitation (all members of the focus groups were Caucasian, with the exception of one person of Asian descent in the Non TC group) towards generalizability to other groups. But the findings may prove useful in developing larger scale studies, by pointing potential directions to go.

Another limitation is developing interest in TC without a true understanding of how to maximize the benefits. Is five minutes of practice enough? Is the evidence strong enough? How long and how many times a week does one need to practice TC to get desired benefits, and how does this affect promotion of TC if these factors are not

known? It should be considered if it is ethical to promote TC on a larger scale for conditions (such as diabetes and cancer) which may have limited evidence of benefits, pending further conclusive evidence. Also to be considered is a limitation of promoting diffusion research with the current potential lack of accessibility to health and consumer friendly formats (Appendix A).

As discussed in Chapter 3: Methods, a final limitation is potential bias on the part of the researcher. From suggestions in the literature[44] this bias may be minimized through the application of the fishbone diagram, which limits researcher input to asking one general question related to the three main constructs of the HBM (threats, benefits, and barriers, i.e. “Please reflect on any threats to your health that you can think of, and note each health threat on a separate post-it note”). During the discussion phase, input from the researcher is limited to clarifying responses via the post-it notes, and noting any additional comments on the margins of the chart, with the exception of asking participants in the Non TC focus group about their perspective regarding a class specifically for beginners, and perspectives on any possible influence of views regarding TC related to previous military experiences (as noted in Chapter 3: Methods.

Conclusion & Recommendations

The key elements derived from the focus groups at OTOW, as indicated by the fishbone diagram results and group discussion, include observations that the major barrier to adoption of TC in the general older adult population (at least among active older adults) may be related to lack of knowledge of what TC is, and its benefits. As mentioned in the review of literature, perceived benefits for health were also the primary reason for adoption of TC in a study on TC practice in Taiwan.[35]

The attitude towards TC in the Non-TC group could be described as neutral - the general consensus was that before adopting a new activity (particularly if it meant replacing a current form of exercise), they wanted to know exactly how it would benefit them, and what the advantages were over current forms of exercise. The benefits and mechanisms of aerobics and strength training are well established, but to most people, TC is a complete unknown. As the TC group noted; “people see TC and think we are waving our hands around for no reason.”

An important area to target may be education into actual versus perceived risks, as evidenced by Table 5-2. Many of the specific benefits of TC, for example balance, were identified as a barrier to adoption of TC by the Non TC group. That weight was of more concern in the Non TC group (who were non-obese active users of the OTOW fitness center), than specific health threats, further indicates a strong need to educate older adults in actual versus perceived threats to health. Primary perceptions of benefits in the Non-TC group were linked to images in commercials, identified during the discussion phase. Only participant 8 stated that they could not recall seeing an advertisement featuring TC, and rated 0 perceived benefits (on the post-it notes as well as ratings on the 0-9 scale). This is worth noting in that the majority of literature on TC (which is located in the martial art section of libraries and book stores), as well as a large number of classes in the United States (Appendix A) focus on fighting aspects of TC, metaphysical aspects, as well as physical health benefits. Those who see images of TC in the media as a peaceful and relaxing exercise may be dissuaded from actual adoption of TC if a class or other resources do not meet expectations.

Lack of a separate beginner's class was discussed as a major barrier, which may be addressed through regular monthly classes specifically to orient beginners, and/or by splitting classes into learning and practice phases, which can be attended separately depending on interest level and need. The Taoist TC Society (Appendix A) uses such a format, with a separate beginner's class cycling every three months. A large barrier related to this may be convincing current TC teachers to adapt current teaching methodology to accommodate a wider range of skill levels.

Gender differences are also an area in need of future research. All participants in the TC focus group were women. Aside from investigating gender differences in TC adoption, future studies targeting sedentary individuals would be important. Motivation for TC among sedentary individuals may be a critical area for future research, as indicated by Prochaska above,[57] and in Beaudreau,[34] by the drop out of the 4 sedentary participants from the focus group, and the continuance of the 8 previously active participants. To address this issue, a future study could follow up with participants who try and then drop out of TC, to identify variables related to motivation, as well as to address important issues related to effects of self-efficacy. Self-Efficacy has been addressed in the literature as possibly the greatest deciding factor in the adoption of health interventions.[21,58]

Overall, the findings from the focus groups point to a possible need to provide evidence based classes and messages to reduce uncertainty, with targeted messages specific to actual versus perceived health threats. Related to knowledge and attitudes towards TC, it may also be important to address that many of the benefits of TC were actually identified as a barrier. That one teacher at OTOW quit their position due to not

being comfortable with teaching large groups, and another adapted TC towards being more like an aerobics class, suggests a need for further research into how teachers might better meet the needs of the older adult population.

Summary of Key Findings Related to Facilitators and Barriers Identified by OTOW Focus Groups (Anywhere the word "may" is used indicates potential areas for future study).

1. Only 5 participants in Non TC group identified balance as a health threat (compared to 8 in TC group). Two participants in the Non TC group identified poor balance as a barrier to TC, with 6 rating it as a barrier.

2. Barriers for Non TC group, aside from uncertain benefits, were related to the benefits of TC: Health concerns of poor stamina/health, flexibility, balance, and arthritis were seen as barriers to TC adoption. Also no beginner's class/teacher accessibility.

3. Mental benefits of TC for calmness, meditation (clear mind), and memory are among the highest rated benefits after balance for the TC group. Mental aspects and benefits may be a valuable opportunity for the promotion of TC, and may help overcome the boredom element perception identified by the Non TC group, as well as facilitate using only a few repeated movements for practice of TC for health.

4. Non TC groups perceptions of benefits are linked to images in the media, and general concept it is supposed to be for health, but are uncertain of real benefits.

5. TC group also identified ignorance of what TC is, and its benefits, as major barrier, indicating a need for evidenced-based programming and marketing.

6. TC group noted that focusing on metaphysical or esoteric aspects of TC may alienate the general population.

7. Major health threats identified by the CDC, but not considered a priority by the focus groups included: Non TC group - blood pressure, diabetes, osteoporosis, and mental concerns (mean group scores ranging from 2.2 – 2.4, using a 0-9 scale). Cancer scored 3.5, Arthritis 4.3, while breathing and heart problems were rated as a 2.8 and 3.2. TC group - no mention made of diabetes or heart disease.

8. Weight was rated as the number one perceived threat in the Non TC group (M = 5.1, SD = 1.5).

9. Aside from balance, the TC group identified memory concerns, cancer, arthritis, and osteoporosis as a major health threat (mean group score 4.5 – 5.7 using a 0-9 scale).

10. Gender differences were noted between the Non TC and TC group. Half of the Non TC group consisted of men, but the TC group was composed of all women. According to the OTOW director, the majority of TC class participants are women.

11. Teacher capabilities were identified as the largest barrier by the TC group, and perceived as potentially the largest barrier by the Non TC group. This relates to instructional methodology and class format, which may be the greatest barrier to the diffusion of TC in society (Appendix A).

Final Recommendations and Application of Focus Group Study

Future research would benefit from a multi-pronged approach. Before targeting non-adopters and pre-contemplators, it is recommended to establish or use an existing program that includes the user-friendly characteristics identified by the focus group participants. An evidence based user friendly class is recommended in order to avoid frustration which may result from creating a demand for a class which cannot meet consumer expectations. Focus group participants identified the importance of TC for balance, and a need for understanding how and why TC benefits balance (which also indicates that a class needs to address TC for balance in a user friendly and non-threatening format). Focus group participants also stressed the importance of developing separate beginners and ongoing classes to create a more user friendly format for all levels of experience.

Studies following the development of a user friendly class can elaborate and extend focus group findings related to class preferences, as class offerings become more popular and feasible. A primary area to target for future research relates specifically to motivations of non-adopters. Following the focus group study, a lecture on evidence based TC was presented, to thank OTOW for recruiting and hosting the focus groups. The message advertising the talk targeted elements identified by focus group

participants as being particularly important related to health threats and perceived benefits of TC. Following is the excerpt from the advertisement for the lecture:

> Tai Chi – Evidence Based Practice for Health & Well-being
> Recent research on the health benefits of Tai Chi will be presented, including scientific findings of how Tai Chi affects the body, and why it benefits health in so many ways. Studies related to the use of Tai Chi for balance, cancer, back problems, mobility issues, breathing problems, high blood pressure, stress, and smoking cessation (with implications for weight management) will also be presented**.**

Over 100 residents from OTOW attended the talk, one of the largest presentations according to the director. Following the lecture, over 20 new people signed up for the TC class at OTOW, which previously had averaged 7-9 participants. The class went from being one of the smallest to being one of the largest activity classes at OTOW. The question is, what are the differences between the 80 who did not decide to try TC and the 20 who did? It is recommended that a similar presentation be given at a targeted active living community, to track adoption and maintenance of participants who begin TC, as well as to conduct a study in order to identify differences between the adopters and non-adopters.

A series of presentations can be formatted building on findings from each level of adopters and non adopters. Initial efforts would target contemplators, identified as those who have contemplated TC to the degree that they attend the presentation. Following these contemplators through the decision making and preparation/action/rejection process may identify factors which can be used as leverage for achieving critical mass in the target population. In addition to factors in the decision making process related to TC, primary research questions may address what differences exist between adopters and non-adopters in socio-economic characteristics (including distance from classes

and transportation availability), exercise patterns, motivation, self-efficacy, personality traits, and fitness level. Findings can also be compared to the current focus group findings.

Following the presentation on evidence based TC, it is recommended to recruit 10-20 participants from those in attendance who do not try the TC class, based on suggestions by Richie[58] for a case series, to track the decision making process. It is also recommended to recruit a similar number from new adopters for comparison. Aside from having a group for comparison and statistical analysis, tracking adopters would permit documentation of efforts towards adoption and maintenance. This would allow identification of potential barriers and opportunities for new adopters not identified by the focus groups, as well as to permit potential validation of focus group findings in a larger population. To facilitate recruitment, key stakeholders and spokes persons would be utilized, as well as incentives identified by stakeholders as being particularly attractive.

The case series approach permits identification of micro-variables for better understanding of motivations and factors related to adoption or non-adoption of TC. Case-series are a type of case study in which commonalities are evaluated across individuals.[59] Case series have been identified as being particularly valuable for revealing important relationships and implications through evaluating a series of cases that can lead to an explanation of patterns that can arise across examples. Case series have an advantage over case studies, in that statistical analysis can be made between subjects, and of pre-test and post-test results.[59] The National Health and Medical Research Council in Australia has recognized case series as an important addition to

clinical research, to the point of including case series as an important scientific method for obtaining evidence, as level four in the Four Levels of Evidence in a handbook series on preparing clinical practice guidelines.[58]

Following the adoption or rejection process in a case series may identify important details, by monitoring participant perception and responses to targeted messages, identifying potential self-efficacy issues, as well as documenting factors related to their adoption or rejection of TC (including any attempts at trying TC). Such micro-variables may also help identify factors related to gender differences. All of the TC focus group were women, compared to half men and half women in the general exercise group. The majority of TC practitioners surveyed in appendix A were women, which has also been identified as a trend in other studies.

Following identification of primary variables related to the adoption or rejection of TC, it is recommended that findings be compared to the current focus group study, towards developing a survey for testing within a targeted population Consistent findings may identify important areas to target, to maximize messages and communication channels, as well as areas to address towards developing an organized social marketing effort within various communities. The following scales are suggested for identifying motivational and self-efficacy issues:

Amotivation Towards Exercise Scale (ATES). Developed by Viachopoulos and Gigoudi to be a short, reliable, valid scale for older adults.[60] The scale measures outcome beliefs (perceived benefit of the exercise), capacity beliefs (perceptions related to capacity to perform the exercise), effort beliefs (perception of ability to maintain the exercise behavior) and value beliefs (value placed on the exercise).

Exercise Self-Efficacy (ESE) Scale. Since Self-Efficacy is considered possibly the largest factor in the adoption of health behaviors, the exercise self-efficacy scale will be included as a subscale. The Exercise Self-Efficacy (ESE) Scale is designed to be self-administered as part of a larger questionnaire, and was developed from the General Self-Efficacy Scale (GSE) to assess SE for exercise by Everett and colleagues.[61]

The above scales may also be administered as repeated measures for the case series groups, to assess effects of programming and various tailored and targeted messages. In addition, a personality inventory such as the Big Five traits subscale may also be administered to the case series groups. The Big Five traits subscale measures personality traits related to Extroversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience, which have been associated with many health related behaviors, incorporating elements of Self-Determination Theory.[62] Self Determination Theory (STD) is a theory of human motivation which has been used to improve exercise adoption, adherence, and feelings of well-being.[62,63] Aside from quantifiable measures which can be subjected to statistical tests, the case series approach also permits documentation of subjective experiences and adoption efforts, including progress through the stages of change. In addition to the above scales, current exercise habits, access and centrality to the TC class location, and perceptions of TC which may act as barriers will also be assessed with a short open-ended questionnaire

The overall goal is motivation for health behavior. The Innovation-Diffusion Framework and findings from the proposed study may be adopted as necessary to meet participant and community needs, since TC is but one activity which may meet health

needs of an older adult population. TC is the focus of the current study, to develop a framework which can also be applied for motivation for other health behaviors, as well as due to the identification of TC as being a particularly suitable exercise for older adults.[5,7,18]

Areas to focus on in the targeted community from a theory driven approach related to the perceived characteristics of an innovation are listed below. The following constructs might be evaluated with a community level survey, which can target precontemplators as well as contemplators.

Education and targeted communications focusing on Relative Advantage. To tip decisional balance and address uncertainty, using various communication channels target Pre-contemplators, focusing on Threats to health and Benefits of TC. Since balance was identified as a major perceived benefit by the TC group, and a primary threat by both groups, it may be advantageous to target benefits for balance compared to other forms of exercise.

Train teachers and develop formats focused on Compatibility with the older adult population. Initial focus may be on singular benefits of critical need, identifying Sub-Groups such as TC for balance, TC for Arthritis, and TC for blood pressure, to address Complexity and Self-Efficacy issues, as well as to minimize Barriers to learning and maximize understanding of health Threats and Benefits of TC for specific health concerns. Findings from the focus group study indicate that it may be important to target perceived mental benefits as well as benefits of TC for balance.

Develop and promote beginners classes to allow Trial-ability to reduce barrier of uncertainty. As separate beginners classes (as suggested by the focus

groups) or other format (such as a 5 minute format suggested by the TC focus group), to support Preparation (but stressing regular practice (Action) to see desired benefits). It may also be important to determine evidence based effective dosage and expected time frame to see benefits (for example, for pain management, TC practice has been demonstrated to be effective within two weeks of daily practice[16] and within 5-15 weeks of one hour of practice two times each week.[64]

Promotional efforts to create Observability and reduce uncertainty. (public performance). Work towards making TC mainstream and acceptable, which was identified as a major barrier by the TC focus group. It is recommended to target the Contemplation stage, combined with evidence based benefits to develop understanding of mechanisms behind health benefits (reducing barrier of uncertainty, and returning again to increasing awareness of Relative Advantage and support of Maintenance stage). Also highlight Current Adopters and recruit notable Spokespersons from those highly respected within the social system. Develop tailored messages which can be provided by local area medical providers. Also encourage and promote observability by encouraging a TC class or group meeting in a public place, such as a local area park.

The multi-faceted approach suggested may target diffusion of TC from a variety of areas sufficient to generate an understanding of how to promote, structure, and target TC in a community towards achieving critical mass. Other areas to target which may also affect TC adoption is the perceived versus actual health threats discrepancy, identified from the focus group findings of perceived threats compared to threats identified by the CDC. The recommendations for future research is an initial suggested plan, which may be adjusted dependent on the experience, expertise, needs, and

suggestions of stakeholders involved with the project. The proposed research primarily targets contemplators, the 80% who contemplated TC sufficiently to attend the talk on TC but were not sufficiently motivated to try TC. It would also be worth targeting those who did not come to the talk, the precontemplators, to determine variables related to non-attendance of the lecture. It may be a simple matter of time conflicts or accessibility, or it may be due to disinterest in TC. Targeting this segment of the community would be important to identify variables related to pre-contemplators. Community level surveys, and possible a case series recruiting non-attendees, may uncover new layers for understanding effective diffusion of TC related to the various adopter categories, as well as the stages of change.

Overall, the primary areas stressed by the focus group participants is a need for evidence based benefits – they want to know what works, and why (with the primary identified need and interest related to balance). Another area to target is accessibility – user friendly classes with teachers able to address their needs with an actual TC format. Also stressed was a need for promoting greater exposure for TC, so that people are more familiar with the exercise and its benefits – as opposed to “just waving our hands around for no reason.” It is suggested that the research recommended above be developed to confirm or modify findings from the focus group study, towards identifying an effective path for diffusion which may be more valid and reliable for motivating effective diffusion and adoption of TC in a larger population. As indicated in the introduction, targeting health benefits of TC, particularly for balance, may offer valuable contributions to reduce the health burden in society, medical cost savings, and may enhance quality of life among the older adult population.

Table 5-1. Possible facilitators to adoption of TC related to OTOW focus groups. n = number of response via the post-it notes, M = mean group score (for comparison, low n and focus group design precludes statistical significance).

FACILITATOR	NTC n	NTC M	TC n	TC M
F1: BALANCE				
Perceived benefit falls	4	7.3	8	8.4
Perceived threat falls	5	4.2	8	6.6
F2: WEIGHT CONCERNS				
Perceived threat weight	3	5.1	1	2.6
F3: MENTAL BENEFITS				
Perceived benefit calm/relax	1	6.8	5	7.5
Perceived benefit memory	-	-	3	6.2
Perceived threat stress	-	-	3	4.6
Perceived threat memory loss	-	-	4	5.7
F4: FLEXIBILITY				
Perceived benefit flexibility	1	6.8	4	8.2
Perceived threat flexibility	-	-	3	5.8
F5:PAIN/ARTHRITIS/BACK/SHOULDER				
Perceived benefit arthritis	-	-	1	6.6
Perceived threat arthritis	2	4.3	1	4.5
Perceived threat back pain.	-	-	3	4.8
Perceived threat shoulder problem	3	3.9	-	-
F6: COPD/BREATHING PROBLEMS				
Perceived benefit breathing	-	-	2	8
Perceived threat breathing	1	2.8	2	4.7
F7: CANCER				
Perceived threat cancer	2	3.5	1	4.7
F8: DIABETES				
Perceived threat diabetes	3	2.2	-	-

Table 5-2: Comparison of Perceived Benefits, Threats and Barriers as frequency of responses via post-it notes. PNotes = total number of post-it notes (responses) for each construct for each group. Total # is the number of benefits, threats, or barriers identified for each construct for each group.

	Benefits	Threats	Barriers
PNotes - NTC	12	29	15
PNotes- TC	39	33	12
Total # NTC	6	15	11
Total # TC	15	18	8

Table 5-3. Top seven causes of death in 2007 among persons 65 years of age and over (CDC, 2010). Deaths from falls in 2008 included, due to status as primary perceived health threat among persons age 65 and older. In 2009, 2.2 million non-fatal injuries among persons 65 and over due to falls were treated in emergency rooms. Columns to the right (No TC Group Perceived Threats, and TC Group Perceived Threats) are the number of participants in each group which expressed each category as a concern, followed by mean scores for each threat.

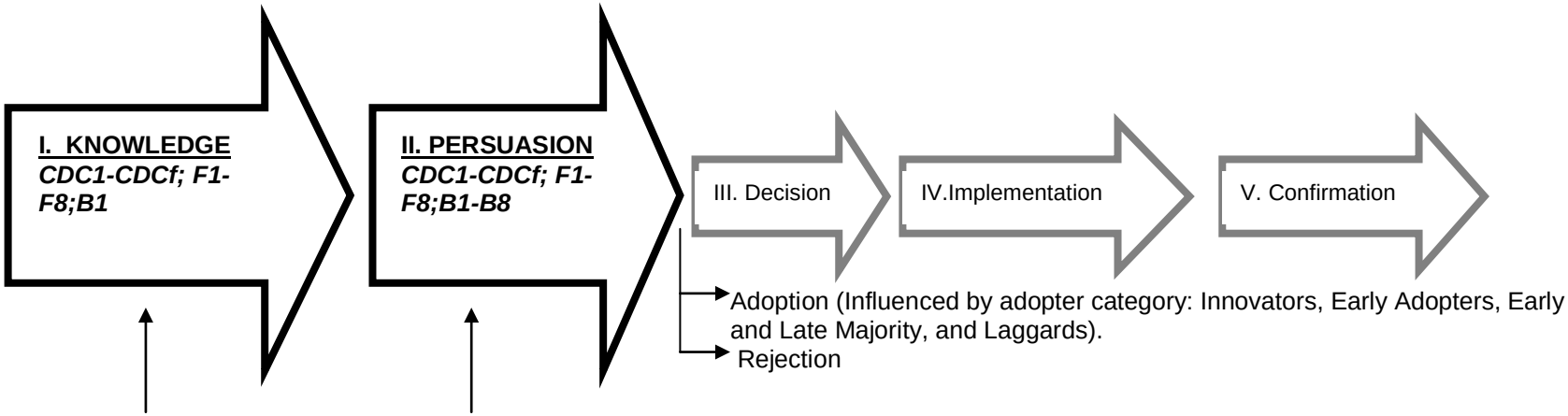
[1]Concern expressed as high blood pressure.
[2]Concern expressed as breathing problems.
[3]Concern expressed as memory loss

Causes of Death	%	Number Deaths	Non TC Threat(*n*)	Non TC Threat(M)	Non TC SD	TC Group Threat(*n*)	TC Group Threat (M)	TCGroup SD
CDC1: Heart Disease	28%	491,559	1	3.2	3.8	—	—	–
CDC2: Cancer	22%	386,225	2	3.5	3.7	1	4.7	3.7
CDC3: Stroke	7%	122,890	3[1]	2.2	2.7	1[1]	2.3	3.6
CDC4: CLRD	6%	105,334	1[2]	2.8	3.5	2[2]	4.0	3.9
CDC5: Alzheimer	4%	70,223	1	2.4	2.6	4[3]	5.7	3.1
CDC6: Diabetes	3%	52,667	3	2.2	3.5	—	—	–
CDC7: Influenza	3%	52,667	—	—	–	—	—	–
CDCF: Falls	.01%	19,700	5	4.2	3.4	8	6.6	3.0

Table 5-4. Perceived Barriers to the adoption of TC identified by the focus groups. n = number of responses via the post-it notes, M = mean group score (for comparison, low *n* and focus group design precludes statistical significance).

BARRIERS	NTC n	NTC M	TC n	TC M
B1: Lack of Awareness of Benefits				
Poor health seen as a barrier	2	3.7	-	-
Perception TC not exercise			(from	discussion)
Unsupported cure all needs evidence			(from	discussion)
B2: Lack of Adequate Teacher	-	-	3	5.4
B3: Lack of Beginner Class**	-	5.4	-	-
B4: Lack of Time	2	2.4	3	4.6
B5: TC Too Slow	2	1.6	-	-
B6: Visualizations can be disturbing	-	-	(from	discussion)
B7: Embarrassment doing in public	-	-	(from	discussion)
B8: Lack of Written/Visual Cues (Can't remember moves)	1*	2.2	-	-

Communication Channels
(What factors may make TC messages more effective towards achieving Critical Mass, *factors to address for* Targeted Messages)
CDC1-CDCf; F1-F8;B1; B8)



Characteristics of the Decision-Making Unit
SOCIAL SYSTEM
(Factors which can affect Time – the KAP Gap)
,

Perceived Characteristics of the Innovation (*Factors which may affect attitudes towards adoption of an innovation (Rogers, 2003).*
1. **Relative Advantage** – *What are benefits of TC compared to other choices?* ***CDC1-CDCf, F1-F8, B1***
2. **Compatibility –** *Acceptability, how consistent is TC with existing values & needs?* **B4-B7**
3. **Complexity** – *How difficult do older adults perceive TC?* ***B2, B3, B8***
4. **Trialability –** *What is the current ability to try TC? What factors of trialability might affect adoption?* ***B3, B8***
5. **Observability –** *How observable is TC? What options exist to increase observability?* ***B7***

Figure 5-1. Overview of potential facilitators and barriers identified from the focus group results, applied to elements of diffusion of innovation, based on Rogers five stage innovation-diffusion process model.[17] See Appendix B for key to codes.

APPENDIX A
REVIEW OF SELECTED TAI CHI PROGRAMS IN THE UNITED STATES

Results from the Tai Chi (TC) group from the dissertation study indicated a large dissatisfaction related to teaching style and opportunities for TC. The classes at the On Top of the World Community (OTOW) in Ocala Florida had gone through a variety of teachers. The first took a traditional long term approach, in which participants would learn TC over the course of a year or more. The second taught a format she learned from DVD's, and through a two day workshop. This format was based on educational principles and formats developed by Health2 (see below) in which most of the class at OTOW was spent learning a shortened version of TC over a 3 to 4 month period. Participants in the TC group expressed dissatisfaction with these classes, in that more time was spent learning versus practicing TC. Since user friendly formats may be an important facilitator to the adoption of TC, and lack of access to such classes may be a major barrier, a visitation was made to 8 major TC programs in the United States (based on program size, publications, and public exposure), as well as a class at a large retirement community which used one of the major program formats, for a comparison.

The following research questions were addressed:

RQ1: What style of TC was taught?
RQ2: Is the format single or double weighted?
RQ3: How long does it take to learn the form?
RQ4: What was the class format?
RQ:5 What were the perceived benefits identified by the students?
RQ6: What were the primary facilitators identified by the students?
RQ7: What are the primary barriers identified by the students?
RQ8: What teacher attributes are perceived by the students as most important?

Methods

Major programs were identified as based on influence on TC development in the United States, as well as accessibility to the public (based on number of schools, publications, or public exposure). Refer to table A-1 and A-2 for an overview of programs. A visitation was made to representative schools for each program, during which a class was observed and class participants were asked to complete a short 9 question open ended questionnaire developed from findings from the focus group study (Appendix D). Both groups completed an informed consent form as part of the IRB approved study. Thematic analysis was used to identify recurring themes, oriented around perceived benefits of TC, facilitators to TC adoption, barriers to TC adoption, and teacher qualifications.

A second rater, also with a background in holistic health, independently evaluated student's responses, and then met with the researcher to discuss conflicting ratings, to determine a common understanding for each factor to resolve any discrepancies, and combine like items (for example combining individual responses for back, knee, and shoulder pain into a single category). Responses were evaluated by the raters for themes which were compiled into 15 perceived factors for benefits, 14 for facilitators, 8 for barriers and 6 teacher qualifications.

Program Overview

All programs acknowledged the benefits of TC for health to one degree or another. Student responses at all programs indicate a perception of TC being beneficial for health, regardless of program orientation (Table A-3). The programs visited were divided up based on the focus of the instructional methodology. Health1-4 used an

adapted form of TC, shortening, or in the case of Health1eliminating, the learning curve. Health1 used a format similar to a group aerobics class, including a warm up period, push-ups, and various strength and relaxation exercises more similar to qi gong and yoga than TC. When asked about this, the instructor stated that they called several of their qi gong yoga classes TC, since there was a public demand for TC, but that they taught the same material in all classes (qi gong and TC classes), focusing on individual user friendly movements. Health2-4 used a shortened format of TC (developed by Health2), with a shorter learning curve (stated as being approximately 3-4 months). Health 4 also incorporated various other styles of TC, including the 24 short form, a style of TC based on a Hawaiian form of Karate, and had separate classes for the Health 2 format, a beginners class for the other forms, and an ongoing class for advanced practitioners in the mixed styles.

Two programs (TC1-2) used a more traditional format of TC (the 108 yang long form), with a more traditional teaching style, which took students 1-2 years to learn, but with minimal focus on the martial aspects of TC. MA1 and MA2 taught traditional forms and formats as well, but also taught other Chinese martial arts, and included TC weapon training in the TC class as well as two person martial exercises (push hands). MA1 taught Chen style TC, while MA2 taught the 108 Yang long form. Below is a brief overview of each school:

Health1 Is an extensive chain of schools with over 10,000 branches throughout the United States according to their website. The focus of the program is on forms of qi gong, marketed as a form of yoga. Most locations also offer a TC class. The hour long TC class is run like a fitness class, with moves more consistent with strength based

forms of qi gong and Western exercise (push-ups were included). The school visited was the programs flagship program.

Health2 Is one of the largest TC for health and certification program in the world, with over 2 million students trained or certified and over 14 instructional DVD's. The focus is on teaching a short 2-3 minute form, targeting various health issues. The class format begins with a series of stretching exercises (10-15 minutes), followed by learning individual movements. At the end of the class the form is performed as a group. Health 2 was a visitation to one of the founder's workshops.

Health3 is a low cost public program aimed at seniors, from a certified instructor using **Health 2**'s program. The class meets each Friday morning, and has been ongoing for over eight years. The class follows a 3-4 month format, teaching the TC for arthritis form in recurring cycles. This next year the instructor plans to alternate with **Health 2**'s TC for energy form. The class spends 10-15 minutes doing stretching exercises, followed by 20-30 minutes of instruction on various movements. The remaining class time is spent practicing the form.

Health4 is a retirement community program, consisting of two groups of TC. It was included for comparison to more general public programs, and due to its use by both instructors of **Health2**'s programming. The first, offering classes at the community fitness center, is primarily based on **Health2**'s DVD's, particularly the TC for arthritis form. The class follows the same format at **Health3.** The other instructor teaches in more of a club format, using a combination of **Health2**' DVD's, the 24 style short form, and a Hawaiian style of TC based on a karate form. The second instructor has an

ongoing class for experienced students, and a separate beginner's class that meets one day a week.

TC1 is the largest non-profit TC organization in the world. TC1 has locations in 28 states, and offers classes almost daily at many locations. The site visited was one of their larger programs, with 43 classes offered throughout the week. The program teaches a traditional format (i.e. the 108 long form), with a focus on health and Taoist religious practice. The class begins with a series of qi gong (breathing exercises) for 10-15 mintuesA beginner's class cycles every 3 months, with it typically taking a year or more to learn the form.

TC2 was the first official school of a national organization aimed at promoting traditional TC and qi gong for health. The organization is the official source of TC information for HealthFinder.gov. The organization has changed its webpage since the visitation, and no longer lists TC2 (nor any school) as an official school, and may be in the process of restructuring. The organization offers certification for instructors, but the current focus may be more on promoting TC than on certification. The one hour class at TC2, offered 2 times per week, focuses on qi gong warm ups, instruction, and time practicing the form.

MA1 is the United States headquarters of the oldest and largest Chinese Zen Buddhism and Chinese martial arts organization in the world. Although the focus is on kung fu, a TC class is offered (the more martial style of Chen TC), and due to the teacher and program prominence, attracts those looking for TC for health. According to **Health 1**, located in the same city, **Health 1** regularly gets students who were looking

for TC for health who tried **MA1** first due to their prominence, but became discouraged by the difficulty of the martial oriented movements.

MA2 is the headquarters school of founded by a TC teacher and writer, publisher, and producer of over 85 books, videos and DVD's on TC, kung fu, and qi gong over the past 30 years, published in over 13 languages. His publications are primarily martial oriented. The focus of the class is on the traditional 108 Yang long form, weapons, and two man training (although enhanced health is an acknowledge benefit).

Facilitators and Barriers Identified by TC Students

A total of 58 students consented to complete the questionnaire. See table A-1 for an overview of students for each TC school or program. It is worth noting that the majority of students were women (n=43), as well as for each class observed, with the exception of MA1 and MA2, which had a more martial orientation to classes, as well as Health2, which was focused on certifying teachers. Although the majority of students were women, all but one instructor for all classes observed were men (Health1 had a female instructor).

Perceived Benefits

As can be seen in table A-3, the primary perceived benefit identified related to balance (n = 26). This is consistent with the focus group findings, and further indicates that benefits for balance may be a primary area to target. Twenty two mentioned either benefits for general health, or specific chronic conditions (stated as Parkinson (n=1), stroke (n=1), scoliosis (n=1), and physical disability due to injury (n=1). The responses also support focus group findings related to perceived mental benefits of TC, with 20

students reporting benefits for clear mind, calm state, or meditative aspect of TC. Relaxation was also a typical response. Specific benefits for back, knee and shoulder pain were also mentioned, as were improved focus, happier/less stress, improved breathing and flexibility, increased walk speed and mobility, enhanced memory, improved strength, more energy, and improved sleep. Seven students specifically mentioned challenge as a benefit of TC.

Individually, specific benefits noted by individual students include:

"Feeling light and agile when I actually have a heavy stiff (arthritic) body."

“I don't have back pain which used to walk me up during the night."

"I have scoliosis - sideways curvature of the spine. I am in constant pain. Doing TC reduces the pain, and standing correctly allows me to stand and walk. I also have titanium legs, hip replacement, and arm. TC is what allows me to love life. It did change my life.”

"I had a lumpectomy 4 yrs ago. Surgery on Friday, went to class on Wed. Surgeon said my recovery was advanced because of the tai chi. I had no swelling of my arm and my scars have almost disappeared. Complete flexibility in my arm."

Perceived Facilitators to Adoption of TC

See Table A-4 for an overview of facilitators identified. The greatest facilitator mentioned by students were recommendations that TC be promoted more in the media (n=31). Thirteen felt that public exposure, such as practicing in the park, would generate more interest and awareness of TC. One student noted that while visiting China seeing people practicing in the morning in the parks got them interested in TC. Another was first introduced to TC through a hospital program (they did not say why), and one by their chiropractor. One student noted:

"(I) watched tai chi'ers in California on the beach and was amazed."

Twenty two were attracted by the flowing graceful movements of TC. Seventeen were fairly frank that people need to realize that they need to practice at home to get the benefits of TC. This may be an important area to consider in educating potential consumers. As stated by one student:

> "Frankly I do not do enough practicing at home. You get out of it what you put into it. The most impressive aspect of TC to me is that people in their eighties can practice it and still benefit from doing so."

However, another noted that there is also value in a user friendly format that does not require practice:

> "Decide whether to teach exercise or form. Form more difficult and requires steady attendance. Residents are often travelling so can't attend regularly."

Personal recommendations brought 11 students to TC, indicating the importance of interpersonal communication channels. Greater availability of TC (as more classes) was mentioned by 10 participants as something that would facilitate more practice of TC, while 9 felt that it would be important to teach TC at a young age, which may increase familiarity with TC or encourage practice from a younger age. Nine began TC just to try something new, while 7 were attracted to the social aspect, and 7 were attracted to the spiritual or mystical aspect. One student liked how TC allowed them to “feel the earth,” while another stated they liked the peace they felt from the exercise. This indicates that at least for a few people, the metaphysical side is an attraction. See Perceived Barriers below for the comments of one student regarding their negative perceptions of a religious context to TC. One student stated that they felt men need to

be targeted more, while another suggested targeting the martial aspect of TC to attract more men.

Four students felt that more classes specifically oriented for beginners would help facilitate the adoption of TC. One of these students made a specific comment that highlights not only the need for separate beginner's classes, but how integrated class (beginners, intermediate, and advanced) can be frustrating to those who already know the TC form:

> "I feel too advanced for this class, I feel I have to wait while the slow learners catch up."

Perceived Barriers

See Table A-5 for an overview of facilitators identified. Difficulty memorizing movements were cited as the largest barrier, mentioned by almost half of the students surveyed (n=26). Difficulty coordinated movements were mentioned by 12 students, while 7 cited difficulties with balance as a barrier, and 8 noted difficulties concentrating or focusing on movements. The different styles of TC, lack of patience, difficulty relaxing and time were each listed twice. One individual (not listed on B-5) since this barrier was listed by only one student, indicates another potential barrier related to those who incorporate religious or spiritual aspects to their classes:

> "The shrine is insulting to anyone who practices one of the three major religions. I'm considering leaving to avoid worshiping false idols."

Facilitators and Barriers Related to Teacher Characteristics

See Table A-6 for an overview of positive teacher characteristics identified. Perceptions related to what qualifications a teacher should have included teaching

ability, even more so than experience with TC or knowledge of the form. One student stated:

"If you truly love TC you can teach the little you know."

This indicates that those programs that focus on teaching effectiveness over form knowledge (such as Health2 and Heath3) recognize this and are trying to meet that need. Patience was mentioned by 23 students. That 4 students in each of Health2,3 and TC1 note the importance of patience, indicates that older adults in particular may value a patient instructor (The mean age of participants in these locations was over 50, compared to other programs). It should be noted that 4 of the 7 students who mentioned instructor certification as important were from Health 2, which stressed certification of instructors (the workshop, aside from learning the short TC form, was also focused on certifying those interested in becoming instructors).

Conclusion and Recommendations

Most of the schools followed the traditional format of TC (Table A-2). Students spend 3-12 months or more learning the form, targeted for individual home practice. Health 2 and 3 (different locations, but same organization) focused on effective teaching methods of select movements, shorting the learning curve to about 3 months, while all the other schools stated they had a 12 to 18 month learning period (except Health 1 – see below).

Little class time was spent in any of the schools for performance of TC, with the exception of Health1, which was oriented more like a yoga or fitness class, holding individual movements for extended periods of time, usually double weighted (weight distributed over both feet). The class began with 20 push-ups which is atypical of TC

schools, and may not be a user friendly format for older adults. As noted above, all the schools programs are run the same, with some of the classes called TC to target those looking for TC. This is rather surprising, and indicates a large potential barrier and a strong need to educate potential consumers on what to look for in a TC class. One school observed, separate from the study on major TC programs in the United States, spent the class doing a fast set of calisthenics loosely based on TC. The class also included explosive deep knee bends (squatting and then springing up) which may be particularly unsuited for many adults, particularly in the older adult population. Another had a more traditional format for TC instruction, but did the Yang 108 long form in approximately 13 minutes, which is a very fast pace for this form.

MA1 used the Chen style of TC, which is a faster paced form of TC. They also used a more double weighted style of movement, as did MA2. When asked about this, the instructors replied that being single weighted makes it too easy to be pushed over in push hands competition (push hands was originally a method of practicing with a partner to develop sensitivity and ability to control another's balance. It has since become more of a form of competition). Although MA2 used the long 108 form, this martial emphasis reduces the benefits of TC for balance, further indicating the importance of creating an educated consumer. Another major program observed (it was a training workshop for association teachers) also focused on the martial aspect and double weighting for push hands competition. In this workshop, one exercise consisted of smashing your shoulder as hard as you could against another person.

The martial orientation of many programs may be a major limitation towards the diffusion of TC, if potential students attend a program thinking all TC is the same, and

all TC is for health. TC originated as a martial art, but the majority of people, as indicated in the survey, may be more interested in TC for health. A person walking into a martial oriented class, not knowing the difference, may become discouraged from further [practice if they do not experience the benefits expected (for example for balance, due to the focus on being double weighted). Even more alarming is those schools who are not teaching TC (such as Health1), yet are calling their classes TC. Health1 was specifically targeting health, and as a Yoga or strength based class may have many benefits, but not what would be expected from TC. Yet this program has over 10,000 branch schools according to their website. It is also worth noting that Health1 regularly got students who had first tried MA1 (they are located in the same major metropolitan area) due to MA1's notoriety, but could not keep up with the faster pace and harder training of Chen style TC.

Another potentially large barrier is that all of the programs (except Health1) were oriented on learning TC. Considering 26 students expressed difficulty memorizing the movements, this may be a limitation, particularly if students are not disciplined enough for home practice. It is recommended that a model similar to that followed by many teachers in the public parks of China and large Chinese communities in the United States (such as Monterey Park, CA) may be particularly effective in creating a user friendly format of TC. The format used includes the use of loud speakers to broadcast verbal instructions that permit people to follow TC without having to learn it. A park in Monterey Park CA often had 300 people or more every weekend following TC. Programs may also benefit from having a DVD students can use for home practice, which "talks" students through the form. A limitation to the follow along method would be

the need to determine if the same benefits for health can be derived from following TC as compared to independent practice of TC.

Focusing on increasing public exposure of TC, in the media and through promoting public practice in parks may be an important consideration. For media exposure it may be important to consider promoting accurate evidence-based benefits. “Larry Crowne,” a recent movie directed by (and starring) Tom Hanks (Hanks, 2011) related the misadventures of an older adult returning to college, and featured a scene in which the guidance counselor suddenly interjects “you should take tai chi – tai chi cured my diabetes.” The scene then continued with no reference to tai chi until the end of the movie, when the camera panned across the campus, and in the background could be seen the guidance counselor leading a group of students in tai chi. One caution regarding this scene is that if benefits are not evidence-based and conclusive, such messages may be counterproductive, creating more doubt than interest in TC. Diabetes is one health concern for which there is minimal evidence regarding the benefits of TC beyond type 2 diabetes, particularly in relationship to acting as a cure. Inclusion of groups performing TC in the background of random scenes of various movies, just as you would have joggers running in the background, or kids playing, may also act to increase observability of TC.

Increased public exposure might also be achieved by tapping into World Tai Chi Day, an organization and event (worldtaichiday.org, 2013) created to promote TC, with an annual public practice of TC on a specified day each year in communities throughout the world. Such an organization has the resources to promote and encourage regular weekly public practice by local instructors throughout the year. Such a format would

increase exposure of local instructors enhancing recruitment of new students, as well as enhance familiarity with TC in the general public. Another large opportunity to facilitate adoption of TC in the older adult community, as indicated by the majority of respondents, is to focus on the benefits of TC for balance. Overall, the above findings and tables indicate multiple opportunities to facilitate adoption of TC, and areas to address related to barriers to TC.

Table A-1. Student characteristics.

	Total	Health1	Health2	Health3	Health4	TC1	TC2	MA1	MA2
Total Students	-	12	*	34	**	7	18	2	7
Compl. Survey	58	5	7	11	13	7	7	2	6
Mean age	-	<50 yrs	<50yrs*	>50 yrs	>50 yrs	<50yrs	>50yrs	<50yrs	<50yrs
Women	43	4	3	10	13	7	4	1	2
Men	15	1	4	1	-	-	3	1	5
Experience									
< 1 year* **	20	3	1	3	-	4	4	2	3
1-3 years	19	1	1	7	6	3	1	-	-
4 - 9 years	12	-	3	1	5	-	2	-	1
10+ years	7	1	2	-	2	-	-	-	2

*Total students were not recorded for Health 2 due to workshop nature of class with founding instructor, and predominant number of instructors at workshop.

**Total students were not recorded for Health 4 due to students meeting separately from two classes, one of which was not meeting at the time of the study. Based on participant report, class size typically ranged from 7-9 participants for each group.

*** 17 of the 20 had been doing TC 3-4 months, one less than one month, and two for 7-9 months.

Table A-2. Overview of Schools.

	Health 1	Health2	Health3	Health4	TC1	TC2	MA1	MA2
Style	Qi gong, strength	Sun	Sun	Sun,Po, Yang	Yang	Yang	Chen	Yang
Weight	DW	SW	SW	SW	SW	SW	DW	DW
Format	follow	learn	learn	learn	learn	learn	learn	learn
Time	N/A	3 mo	3 mo	3-12+mo	12+mo	12+mo	12+mo	12+mo

DW = Double weighted, the weight of the body primarily balanced equally between both legs.
SW = Single weighted, the weight of the body alternating balanced between the left and right leg.
Time = Typical time necessary to be able to do the complete TC form.

Table A-3. Perceived Benefits

Perceived Benefit	Total n = 58	Health1 n = 5	Health2 n = 7	Health3 n = 11	Health4 n = 13	TC1 n = 7	TC2 n = 7	MA1 n = 2	MA2 n = 6
Balance	26	2	1	8	6	2	4	1	2
Health/chronic cond.	22	4	3	2	6	3	1	-	3
Clearmind/calm/Med	20	4	2	1	6	1	2	1	3
Relaxation	20	2	-	6	7	1	2	1	1
Back/knee/shldr pain	13	1	-	1	-	6	2	-	3
Focus	12	1	-	2	1	2	3	1	2
Happier/less stress	12	2	2	1	2	2	2	-	1
Improved breathing	10	1	1	3	2	1	-	-	2
Flexibility	8	-	1	1	2	2	1	-	1
Walk speed/mobility	8	-	1	1	2	3	-	1	-
Challenge	7	-	-	1	1	-	3	-	2
Enhanced memory	5	-	1	1	2	-	1	-	-
Improved strength	5	1	-	-	-	2	-	1	1
More energy	5	1	-	1	-	2	-	-	1
Improved sleep	3	1	1	-	-	1	-	-	-

Table A-4. Facilitators

Facilitators	Total n = 58	Health1 n = 5	Health2 n = 7	Health3 n = 11	Health4 n = 13	TC1 n = 7	TC2 n = 7	MA1 n = 2	MA2 n = 6
Media Promotion	31	2	6	6	6	5	3	1	2
Flow/grace	22	1	5	6	3	2	2	1	2
Practice	17	-	2	1	8	3	1	1	1
Public Exp/outdoors	13	-	3	2	2	3	1	-	2
Personal recomm.	11	1	1	2	3	2	2	-	-
More classes	10	-	1	5	2	1	-	-	1
Teach young	9	-	1	1	1	2	1	1	2
Try something new	9	-	1	2	3	-	2	1	-
Social Aspect	7	-	2	-	-	2	1	1	1
Spiritual	7	3	1	-	-	1	1	1	-
Low impact/easy	6	-	1	1	2	1	-	1	-
DVD of form	4	-	1	-	-	2	-	-	1
Beginr class/simplify	4	1	-	1	2	-	-	-	-
Martial applications	4	-	-	-	1	-	1	-	2

Table A-5. Perceived Barriers

Barriers	Total n = 58	Health1 n = 5	Health2 n = 7	Health3 n = 11	Health4 n = 13	TC1 n = 7	TC2 n = 7	MA1 n = 2	MA2 n = 6
Memorizing moves	26	2	4	3	8	4	2	-	3
Coordination	12	1	2	4	2	2	1	-	-
Balance	7	1	-	3	-	1	1	-	1
Focusing/concentratng	8	3	-	2	2	-	-	1	-
Different styles	2	-	-	-	-	-	1	-	1
Lack of patience	2	-	-	1	-	-	-	-	1
Relaxing	2	-	-	1	-	1	-	-	-
Time	2	-	-	1	-	-	-	-	1

Table A-6. Teacher Qualifications.

Teacher Qualifications	Total n = 58	Health1 n = 5	Health2 n = 7	Health3 n = 11	Health4 n = 13	TC1 n = 7	TC2 n = 7	MA1 n = 2	MA2 n = 6
Teaching ability	27	1	3	8	6	3	-	2	4
TC Knowledge	25	1	2	4	6	4	4	1	3
Patience	23	2	3	4	4	4	4	-	2
Passion	8	1	3	-	1	1	-	2	-
Certification	7	-	4	-	2	-	-	-	1
Humor	4	-	-	-	-	-	-	-	4

APPENDIX B
KEY TO CODES FOR FIGURE 5-1

F1: Evidence-Based Benefits for Balance
F2: Evidence-Based Benefits for Weight Management (i.e. Mindfulness)
F3: Evidence-Based Mental Benefits – Calmness, Memory, Stress Reduction
F4: Evidence-Based Benefits for Flexibility
F5: Evidence-Based Benefits for Pain-Arthritis/Back/Shoulder Pain
F6: Evidence-Based Benefits for COPD/Breathing Issues
F7*: Evidence-Based Benefits for Cancer
F8*: Evidence-Based Benefits for Diabetes

CDC1: Heart Disease
CDC2: Cancer
CDC3: Stroke
CDC4: CLRD
CDC5: Alzheimer
CDC6: Diabetes
CDC7: Influenza
CDC-f Falls

B1: Lack of Awareness of Evidence-Based Benefits – Claims of being a panacea off-putting, misperceptions TC not an exercise, see benefits of TC as a barrier (poor stamina/health, poor balance).
B2: Lack of Adequate Teachers/Classes – Do not meet needs of participants (focus martial or learning vs practicing TC, also need for greater patience with older adults and ability to break down movements).
B3: Need for Beginner Class – most classes mix beginners to advanced, resulting in frustration.
B4: Lack of Time – knowledge of how to integrate into daily life (possible 5 minute formats).
B5: TC Too Slow – lack of patience for slow movements of TC.
B6: Visualizations can be disturbing (i.e. visualizing anger leaving your body as orange streams of energy)
B7: Embarrassment doing TC in public.
B8: Lack of Written or Visual Cues – Get confused when try on own.

FACILITATOR/BARRIER CODES (F = Group identified facilitators; B = Group identified barriers; CDC = Health concerns according to the CDC)

APPENDIX C
INSTITUTIONAL REVIEW BOARD SUMMER 2012 DOCUMENTS

UFIRB 02 – Social & Behavioral Research

Protocol Submission Form

This form must be typed. Send this form and the supporting documents to IRB02, PO Box 112250, Gainesville, FL 32611. Should you have questions about completing this form, call 352-392-0433.

Title of Protocol:	DIFFUSION OF TAI CHI IN OLDER POPULATIONS: FACILITATORS AND BARRIERS TO ADOPTION		
Principal Investigator:	**Peter Gryffin**		**UFID #:**
Degree / Title:	**Doctoral Student in Health Education and Behavior**	**Mailing Address:** (If on campus include PO Box address):	**Email:**
Department:	**Health Education and Behavior**		**Telephone #:**
Co-Investigator(s):		**UFID#:**	**Email:**
Supervisor *(If PI is student)***:**	**Dr. William Chen**	**UFID#:**	
Degree / Title:	PhD, Professor	**Mailing Address:** (If on campus include PO Box address):	**Email :**
Department:	**Health Education and Behavior**		**Telephone #:**
Date of Proposed Research:	**06/01/2012-06/01/2013**		
Source of Funding *(A copy of the grant proposal must be submitted with this protocol if funding is involved):*	None.		

Scientific Purpose of the Study:

To lay a foundation related to an understanding of reasons for practice, adoption, or rejection of Tai Chi, and what factors may enhance the maximum diffusion of Tai Chi in older populations.

Describe the Research Methodology in Non-Technical Language: ***(****Explain what will be done with or to the research participant.****)***

Two focus group sessions will be conducted, one group with interest in Tai Chi, and a second group who has never considered Tai Chi (or who have tried Tai Chi and rejected it). Focus groups will last up to two hours. The first hour will be used to build a fishbone chart (a chart dividing the discussion into the benefits and barriers of Tai Chi, which uses post it notes to allow anonymous thoughts and considerations to be posted for each category). The following hour will be used for group discussion of the completed fishbone chart, as well as self-assessment of risks, benefits, and barriers using a self-created survey. Each participant will be assigned an identifying number. Data or findings will not be linked to identifiers. Informed consent will be obtained prior to focus group sessions.

Describe Potential Benefits:

This study will add to the understanding of underlying factors behind non-adoption of Tai Chi. The findings from this study can promote discussions about possible support systems and structures that might be needed to help promote Tai Chi in the older adult population.

Describe Potential Risks: (*If risk of physical, psychological or economic harm may be involved, describe the steps taken to protect participant.)*

No more than minimum risks are anticipated.

Describe How Participant(s) Will Be Recruited:

Participants will be recruited by e-mail, through an in-house e-mail system at Oak Hammock Independent Living Community, as well as through flyers posted at the facility.

Maximum Number of Participants (to be approached with consent)	**30**	**Age Range of Participants:**	**55-100**	**Amount of Compensation/ course credit:**	**None.**

Describe the Informed Consent Process. (Attach a Copy of the Informed Consent Document. See http://irb.ufl.edu/irb02/samples.html for examples of consent.)

An informed consent form will be provided to participants prior the interviews. Participation is completely voluntary.

(SIGNATURE SECTION)		
Principal Investigator(s) Signature:		**Date:**
Co-Investigator(s) Signature(s):		**Date:**
Supervisor's Signature (if PI is a student):		**Date:**
Department Chair Signature:		**Date:**

Protocol Revision Form For Already Approved Studies

Institutional Review Board Office 02 (Social and Behavioral Research)

UFIRB Number:	2012-U-584				
PROTOCOL TITLE:	Diffusion of Tai Chi in Older Populations: Facilitators and Barriers to Adoption				
PI'S NAME:	Peter Gryffin	**PHONE:**		**EMAIL:**	

Revision / Amendment to Protocol

***State the revision(s) you are making to the study*:**
Addition of questions for a backgrounder related to the instruction and promotion efforts of Tai Chi. Change to recruitment and methodology to include instructors and directors of Tai Chi programs.
Methodology addition: Interviews will be conducted with teachers and directors of Tai Chi programs, using 10 open-ended questions, to identify factors affecting the diffusion of Tai Chi in older populations. Classes will be observed to document differences between programs on teaching methodology that might affect the diffusion of Tai Chi in older populations. There will be no interaction with students, other than asking permission to observe the class.
Recruitment addition: Instructors and directors of Tai Chi programs will be recruited by phone, asking if they would complete a brief interview, and permit observation of relevant classes.

Justification for Revision

Protocol Revision Form For Already Approved Studies

Institutional Review Board Office 02 (Social and Behavioral Research)

***Provide reason / justification for this change*:**
Initial findings from focus groups indicate a major barrier is instructional methodology. Tai Chi has diversified considerably since its introduction into the United States for a variety of reasons. The backgrounder questions are to document modifications, and obtain perspective of instructors and directors of Tai Chi programs on the barriers and facilitators to the adoption of Tai Chi.

Does this change affect the following? Please attach Revised Copy.

Informed Consent	**Questionnaire**	**Flyer**	**Number of Participants**
Yes	Yes	Yes	Yes #_1000_of participants
No	No	No	No

SIGNATURE SECTION

Principal Investigator:		(Date)
Supervisor's Signature (If PI is student):		(Date)

*********This section is for irb02 use only*********

Reviewer Comments:

Signature: IRB Chair		**Approval Date:**	

Informed Consent

Protocol Title: DIFFUSION OF TAI CHI IN OLDER POPULATIONS

Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study: To describe barriers and facilitators to practicing Tai Chi.

What you will be asked to do in the study: To help develop a chart of facilitators and barriers to Tai Chi through anonymous post it notes, followed by discussion regarding the finished chart, and participation in a self-created survey.

Time required: Up to 120 minutes

Risks and Benefits: No more than minimal risk. There is no direct benefit to the participant in this research. However, this research can add to the understanding of reasons for practice or non-practice of Tai Chi.

Compensation: A free raffle will be held at the end of each focus group meeting for local area gift cards.

Confidentiality: Your identity will be kept confidential to the extent provided by law. The names of the participants will not be used in any research reports or presentations. Your name will not be connected to your responses once the focus group meeting is over. The final results will be presented in a dissertation, and might be sent to education journals and magazines for possible publication.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at anytime without consequence. You do not have to answer any questions you do not want to answer.

Whom to contact if you have questions about the study:

Peter Gryffin, MS., Department of Health Education and Behavior, University of Florida

Whom to contact about your rights as a research participant in the study:

UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; ph 392-0433.

I have read the procedure outlined above. I voluntarily agree to participate in this study and have received a copy of this description.

Participant's signature and date

_____

Principle investigator's signature and date

_____

Participant #:_____

Follow Up Questions:

1) What health activities do you currently engage in?

2) What do you find to be the largest motivating factor in your current health activities?

3) What were the largest factors in motivating you to begin your current health activities?

4) When did you begin your current health activities?

5) What do you find to be the biggest barrier to engaging in a health activity?

6) What would most motivate you to begin a new health activity?

Participant Number:_____

Tai Chi Student Backgrounder

1. How long have you been practicing Tai Chi?

2. What made you want to learn Tai Chi?

3. What do you find the most challenging in learning Tai Chi?

4. What parts of Tai Chi do you like the best, and why?

5. What do you think would make Tai Chi easier to learn?

6. What do you think would make Tai Chi more popular?

7. Do you have any particular observations you would be willing to share regarding benefits you feel you have received due to Tai Chi?

8. What qualifications do you feel a Tai Chi teacher should have?

9. Do you have any other thoughts or observations you would like to add?

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BIOGRAPHICAL SKETCH

Originally from Pasadena, California, Peter A. Gryffin earned his Master of Science in kinesiology and health promotion in 1997 from California State Polytechnic University, Pomona. Following this, he began teaching at Fullerton College, where developed eight new courses based on holistic health practices and experiential education, using the development of mindfulness as a core component for creating awareness of self-destructive behavior, as well as motivating positive psychological and physiological health through alternative fitness. Peter returned for his PhD at the University of Florida to lay a foundation for researching, developing, and promoting innovative and evidence based programs for health and wellness. A large part of his study included social marketing and effective diffusion of health behavior (currently tai chi), as well as the development of a Health Belief Model Tool (HBMT) for prediction and motivation of health behavior and effective development of tailored messaging. His research interests also include motivation and awareness as it relates to health and behavior change across the lifespan (including application to hypokinetic diseases, as well as addiction). Peter has published over 10 articles in mainstream magazines, and is enjoying using his writing talents for journal publication and active dissemination of health interventions. Peter was also the assistant editor for the International Electronic Journal of Health Education (IEJHE), a publication for the American Association for Health Education (AAHE). His previous works and interests include research into physiological mechanisms behind the benefits of tai chi for a variety of chronic conditions, and the use of experiential fiction as a teaching aid for motivating greater behavioral control over life incidences.