

Title: Tai Chi via DVD instruction as an introduction to physical activity for women with morbidly obese: a feasibility study

Document date: September 23, 2016

Primary investigator and Corresponding author:

Cathy L. Stucker, PT, DSc<sup>1</sup>

[stuckerc@husson.edu](mailto:stuckerc@husson.edu)

Co-investigator:

Sondra G. Siegel, PT, PhD<sup>1</sup>

[siegels@husson.edu](mailto:siegels@husson.edu)

<sup>1</sup> Husson University

Department of Physical Therapy

1 College Circle

Bangor, ME 04401

Clinical Trial Registration Number: NCT04106661

**TITLE**

Tai Chi via DVD instruction as an introduction to physical activity for women with morbidly obese: a feasibility study

**Purpose:**

The purpose of this study is to investigate alternative approaches to physical activity in people who are morbidly obese to improve their overall health, functional mobility, and quality of life. Although physical activity is recommended in most weight management programs, the type of physical activity that results in the most successful outcomes has not been determined. Walking programs are among the most common forms recommended, however few parameters or guidelines are provided, and well-controlled comparisons to other types of exercise are lacking. Compliance with exercise programs is also a factor that impacts success, therefore offering solutions that improve compliance would be beneficial as well. Our study will investigate the use of home-based exercise enhanced with DVDs along with weekly, supervised group sessions to compare Tai Chi and resistance exercise in participants who are morbidly obese.

**History**

Obesity is a significant health problem in the United States, with approximately 35% of adults having a body mass index (BMI) of over 30 (Ogden, Carroll, Kit, & Elegal, 2014). Body mass index is a commonly used measure that indicates the relationship between body weight and height. A BMI of 30 or over is considered indicative of obesity, while a BMI of over 40 characterizes morbid obesity. Obesity is associated with a poorer quality of life as well as additional health-related conditions including osteoarthritis, poor mobility, pain, lower levels of physical activity (Garver, et al., 2014), decreased independence with ADLs (Pajecki, Kanagi, Riccioppo, de Cleva, & Cecconello, 2014) and greater risk for falls (Jeon, 2013). In a longitudinal study involving over 36,000 participants, Rillamas-Sun and colleagues found that obese women are at a greater risk

for chronic disease, mobility disability and mortality compared to others who were not obese, with the risk of disability increasing with the degree of obesity. The implications of these measures can be translated into increased financial burden (Rillamas-Sun, et al., 2014). A study conducted by Wang and colleagues identified higher direct health care costs associated with increased adiposity and physical inactivity (Wang, McDonald, Reffitt, & Edington, 2005). This study found that active obese individuals had lower direct healthcare costs than their inactive obese counterparts. This further endorses the need to identify effective and long-term alternatives for physical activity in people who struggle with obesity.

Several types of exercise are known to enhance mobility and function in people who are overweight. Aerobic and walking programs have resulted in improvements in BMI, weight reduction, gait tolerance, strength (Lee, Seo, & Chung, 2013) and self-reported quality of life (Baillot, W, Comeau, Meziat-Burdin, & Langlois, 2013) in this population. Other benefits of aerobic exercise programs include improvement in mood, and improvement in VO2 max (Sarsan, Ardic, Ozgen, Topuz, & Sermez, 2006). These studies support the use of exercise for women with obesity, but do not provide sufficient information to determine which type of exercise is optimal.

Comparisons between aerobic exercise programs and strengthening or resistance exercise programs in the obese population show that these two forms of exercise have different effects on a variety of parameters, though both are beneficial. For example, Geliebter et al found that in obese participants who are restricting caloric intake, resistance exercise limits the loss of fat free mass more than aerobic exercise, but does not protect against the decrease in metabolic rate observed with dieting (Geliebter,

54 Maher, Gerace, Gutin, Heymsfield, & A, 1997). Both exercise protocols were more  
55 effective than diet alone in promoting positive mood changes. Similarly, Sanal  
56 compared aerobic exercise to the combination of aerobic and resistance exercise, and  
57 found differential effects on fat free mass (Sanal, Ardic, & Kirac, 2013), and Sarsan's  
58 results supported the hypothesis that aerobic exercise is more beneficial than resistance  
59 exercise in enhancing depression scores (Sarsan, Ardic, Ozgen, Topuz, & Sermez,  
60 2006).

61  
62 Tai Chi is typically considered a form of aerobic exercise, but is performed slowly and  
63 deliberately, with attention to quality of movement. In the general population, it  
64 improves mobility, attitudes toward exercise, and may lead to improvements in immune  
65 function (Yeh, H, L-W, C-Y, & L, 2006) . It helps augment physiological measures of  
66 function and strength in elderly people (Audette, Jin, Newcome, Stein, Duncan, &  
67 Frontera, 2006) and people with arthritis (Song, Lee, Lam, & Bae, 2003) and has  
68 positive effects on people who are overweight as well. Liu demonstrated that performing  
69 Tai Chi exercise in a group improves several indicators of mental health, such as  
70 depression, anxiety and stress however these results may have simply been due to  
71 performing an exercise program, not specifically a Tai Chi program, as the control group  
72 did not participate in an exercise program (Liu, et al., 2015).

73  
74 The unique characteristics of Tai Chi may make it a desirable form of exercise for people  
75 with morbid obesity. Xu studied the influence of a 16-week, twice per week Tai Chi  
76 intervention in a group of obese women over 60 years old, who had not previously been  
77 involved in an exercise program, and compared their results to a no-exercise control  
78 group (Xu, et al., 2015). The intervention group improved in weight loss, blood pressure,

79 sit to stand measures, and flexibility. Dechamps' results were similar using a protocol  
80 that involved only one session per week of Tai Chi compared to one session of resisted  
81 exercise (Deschamps, Gatta, Bourdel-Marchasson, Tabarin, & Roger, 2009). On the  
82 other hand, Maris et al. studied a group of older obese women who participated in a combined  
83 program of tai chi and resistance exercises and found that the only difference in outcomes  
84 measures between the two groups was in Timed Up and Go scores; no differences were noted in  
85 gait speed, chair stand, flexibility, and strength (Maris, et al., 2014). Together, these studies  
86 suggest that Tai Chi produces desirable functional outcomes in obese people, but they  
87 do not specifically target people who are morbidly obese, with BMIs of greater than 40.  
88 Furthermore, many of the studies cited have included only women in their samples,  
89 resulting in questionable applicability to men. The morbidly obese population is  
90 desperately in need of strategies to promote physical activity and its benefits, but has  
91 largely been ignored by the literature. Due to the magnitude of the problem of obesity,  
92 and the potential benefits of exercise with this population, it is important to determine the  
93 elements of a feasible and effective physical activity program.

#### 95 **SPECIFIC AIMS AND SCOPE OF THE PROPOSED RESEARCH**

96 The proposed research is a collaborative study involving the Eastern Maine Medical  
97 Center Weight Management Program. This program currently has no formal physical  
98 activity recommendation for its non-surgical participants. The Weight Management  
99 Program managers are seeking guidance as to successful physical activity  
100 recommendations for their patients. It is anticipated that a wide demographic will be  
101 represented allowing the results to be applied across the spectrum of age and gender.

#### 102 **Objectives:**

- 103 1. Identify any difference in the functional outcome measures resulting from  
104 participation in the different forms of physical activity

2. Identify differences in compliance among the various types of physical activity with the supervised group and individual sessions.

3. Determine the impact of the type of physical activity on the health measures collected including blood pressure, and weight.

4. Identify differences in self-reported quality of life measures resulting from participation in the different physical activities.

Clearly, an intervention that would reduce mobility deficits in this population and improve overall health could have a tremendous impact on quality of life for a large portion of the population. The overarching aim of the proposed study is thus to help identify a beneficial and feasible program to impact activity level and therefore health and well-being of people with morbid obesity.

**PARTICIPANT RECRUITMENT AND SELECTION:** Participants will be recruited from the Eastern Maine Medical Center Weight Management practice in Bangor, Maine. The anticipated number of participants will be 45 with 15 participants in each of 3 groups. Adult clients will be included if they are at least 21 years old with no restriction on upper age range. Male and female clients will both be included. Inclusion criteria are as follows: Body mass index (BMI) greater than 40, as determined by the physician's office, and successful performance on the Four Square Step Test balance assessment at pre-screening to determine falls risk (described below), and the ability to walk independently (with or without an assistive device) for at least 50 feet. Participants must also be able to attend at least one supervised session at Husson University per week for 8 weeks. Data will be included in our analysis if a person has attended at least half of the supervised sessions. Exclusion criteria include: history of bariatric surgery; history of neurological condition (stroke, brain injury, etc.); high fall risk (as indicated by pre-screening); absence of medical clearance received from the physician's office; inability to consistently attend exercise sessions; and pregnancy.

**LOCATION:** Participants will continue to attend routine physician appointments while enrolled in the Weight Management Program at Eastern Maine Medical Center during the study for medical monitoring and diet consultation. The proposed study does not modify any interaction with the patient's current medical management. The Tai Chi and General Exercise groups will meet once a week for 8 weeks at the Kenduskeag Laboratory on the campus of Husson University in Bangor, Maine, along with 2 additional sessions for pre and post testing. Participants will perform the exercises or Tai Chi forms at their homes or at another location of their choice 2 additional times per week. Participants in the control group will also attend 2 sessions at the Kenduskeag Laboratory for pre- and post-testing; the remainder of their participation will occur at a location of their choice. Functional outcome data, anthropometric measures, height, weight, and vital signs will also be collected at the Kenduskeag Laboratory.

**DURATION:** The supervised exercise sessions will take place for 8 consecutive weeks. Following the 8-week intervention, the participants will return for reassessment of the outcome measures; thus each participant's time involvement in this study will be approximately 10 weeks (including pre and post testing). We anticipate that this study will be done in two consecutive phases, each spanning approximately one academic year, with the entire study taking place between August of 2016 and May of 2018. The first phase of the study will include participants who are in the Tai Chi group and a control group, and the other phase will include those who are doing resistance training along with another control group. After each intervention phase (Tai chi or resistance training), a shorter, 4-week intervention program will be offered to those people who have participated in the control group. This will serve as a reward for participation, and will also encourage people to return for measurements. Thus it should take approximately 21 months to complete the entire study. We understand that we will need to apply for an extension of the protocol after the first year of progress on this study.

**RESEARCH DESIGN:** This pilot study will compare three different approaches to provision of physical activity with morbidly obese participants in a Weight Management Program. The participants will be recruited through Eastern Maine Weight Management Program using flyers and pamphlets (See page 28 for an example of the flyer). If they meet the pre-screening minimum requirement for safe dynamic standing balance, they will be eligible to complete the initial outcome measures at that time, and to participate in the rest of the program.

In order to allow the researchers to feasibly carry out this study, it will be completed over two academic years. During the first year, data will be collected for the control group and for one of the intervention groups (Tai Chi). The following year, data will be collected for the other intervention group (resistance exercise) and an additional control group. This is a repeated measures study with measures being taken just prior to the initiation of the exercise program and then again after the conclusion of 8 weeks of interventions. The use of control groups for both phases will allow researchers to be blinded to group assignment as they take the pre-and post-test measurements.

After providing informed consent, each potential participant will first be asked to perform the Four Square Step Test (FSST) to determine eligibility for admission to the study. This test will identify those at risk for falls, and they will be excluded from the rest of the study. For this test, participants begin by standing in one quadrant of a square formed by one-inch PVC pipes secured together with a cross connector placed on the floor forming a grid (Figures 1 and 2). They are asked to step in a specific sequence through each of the quadrants of the square. A time of greater than 15 seconds or an incidence of imbalance during the test would result in exclusion from the study. The FSST score of greater than 15 seconds has been found to be associated with a high fall risk in older adults (Dite & Temple, 2002) though no specific parameters have been determined for the morbidly obese population.

If a person is eligible based on the FSST results, he or she will fill out a basic demographic form (see pages 29-30). The researchers will then collect data on the following medical parameters: Body-mass index (requires measurement of weight and height), blood pressure, neck circumference, and weight. Participants will complete a quality of life self-assessment using the SF-36 Questionnaire (Appendix 1). The SF-36 is a valid and reliable tool for self-assessment of the overall health of obese individuals (Wadden & Phelan, 2002). They will also complete the Rapid Assessment of Physical Activity (Appendix 2), to provide us with an idea of their general level of activity. (<http://depts.washington.edu/hprc/rapa>)

The general mobility status of each participant will be assessed by the following measures:: Short Physical Performance Battery (SPPB) (Guralnik, et al.), Timed Up and Go Test (TUG) (Podsiadlo & Richardson, 1991), 6 Minute Walk Test (6MWT) (Larsson & Reynisdottir, 2008), 30 second sit to stand (Jones, Rikli, & Beam, 1999), and the FSST (Dite & Temple, 2002). The SPPB assesses how well people perform some simple balance activities, how fast they walk, and how quickly they rise from a chair (Appendix 3). It is typically completed in 10-15 minutes. The TUG is a test that requires the participant to stand from a chair, walk approximately 10 feet, turn around and come back to the chair (Appendix 4). It is timed, and the time to complete the test is used to identify changes in balance over time. To perform the 6MWT, participants will walk back and forth between two cones or other markers, placed 100 feet apart, as many times as they can comfortably, within 6 minutes. Chairs will be placed at both markers so that participants may sit as needed during the 6 minutes. Total distance walked in 6 minutes is recorded. The 30 second Sit to Stand test simply requires participants to rise to a stand from a chair, and sit back down as many times as possible within 30 seconds. The number of completed rises is recorded. Lastly, the researchers will ask the participants to walk down a Zeno walkway, which is an instrumented 20-foot pad that records gait parameters electronically. The

researchers performing the outcome measures data collection will be blinded to the group assignment of the participants.

The groups of participants will include two intervention groups and two corresponding control groups. The control groups will receive the instruction in participation in physical activity currently provided by the Weight Management Program, but will receive no formal interaction with an exercise instructor or physical therapist during the study period. This is the current standard protocol, so no treatment is being withheld from this group of participants. One intervention group will be instructed in Tai Chi exercises during weekly supervised exercise sessions. A commercially available DVD will be utilized to lead the exercise session with close supervision of technique and safety by the assigned researchers. Participants in this group will be provided with an identical Tai Chi DVD to use during their home sessions. The DVD was created by Dr. Paul Lam, a Tai Chi master who is also a medical doctor, and is specifically geared towards people with arthritis who want to enjoy Tai Chi. We chose this because we could not find a DVD that had been developed for people with obesity, and since many obese people would also benefit from joint protection techniques, we felt that the modifications the master has made for this population would be appropriate for our targeted research participants. Following completion of the 8-week study period, the people who were assigned to the corresponding control group will be offered a 4-week supervised Tai Chi program along with the accompanying DVD. We hope that this will help provide an incentive for them to return for the second measurement session, and will also reward them for participating as part of the control group.

In the second phase of the study, a group will be instructed in an exercise program of resisted exercises for trunk, upper and lower extremities and stretching exercises. These participants will attend one supervised session per week and will have a DVD to use at home to remind them

of the exercises. This DVD will be created and produced by the researchers specifically for this population, based on their knowledge of exercise. Resistance to the exercise will be achieved by the use of elastic bands with varying amounts of resistance. Resistance will be increased during the supervised exercise sessions, as appropriate, on an individual basis. The exercises will become progressively harder over the 8-week period. An additional control group will be recruited as a comparison for this resistance exercise group. The addition of a control group for this phase of the study will allow the researchers to be blinded as they take measurements, and will allow each phase of the study to stand on its own as a complete project with a valid comparison group. After the 8-week study period is completed and post-study measurements have been completed, the control group participants will be offered a 4-week supervised exercise session of resistance training. As described above, this should provide incentive to return for the second measurement session, and will serve as a reward for their participation.

All of the group exercise sessions will be supervised and led by student physical therapists, with a licensed physical therapist (one of the co-investigators) present at all times. The students and physical therapists are well trained in identifying and guarding patients who may be at risk for falls, though the initial screening should have identified these people and allowed us to exclude them from the study. Prior to starting the exercise sessions with the participants, the researchers will attend instructional sessions with a local experienced Tai Chi teacher (Shih Wah Noh) to learn the correct positions and movements in order to provide effective supervision. During the exercise sessions, the researchers will be observing the participants closely and suggesting modifications in Tai Chi forms or resistance exercises when appropriate, according to the participant's individual abilities. In this sense, the Tai Chi and the resistance exercises will be tailored to the appropriate level for the individual.

Participants in both intervention groups will be instructed to carry out a home program twice a week that is similar to what they have done in the supervised session. In addition to the group and individual exercises in which two groups will participate, all study participants will be instructed to walk daily for exercise, as per the current protocol. All participants will maintain an exercise log to track their compliance with the home program and any additional activity they perform, including walking. They will be instructed to stop exercising if they experience significant shortness of breath, chest pain, dizziness, leg pain, or joint pain. They will be instructed in the use of the BORG Rating of Perceived Exertion (RPE) Scale (Figure 3) with a target range of 12-16. The Borg RPE Scale is a simple scale that allows an individual to quantify his or her response to exercise. A rating of 12-16 encompasses a level of exercise that is rated subjectively as “somewhat hard.” To increase safety in the home exercises, our participants will be instructed to perform the exercises or Tai Chi forms near a support such as a chair, counter, or railing that could be used for assistance in the event of a loss of balance. Participants may be encouraged to discontinue the exercise and exit the study if they experience any discomfort or injury as a result of participation.

**POTENTIAL RISKS:** There is always a risk related to falls and/or musculoskeletal injuries as a result of participation in daily activity. There is an increased risk of falls associated with the Tai Chi group due to the type of exercise and movement that is required with that activity. The FSST was selected as a fall risk screening tool because of the similarity in activity between the FSST and the Tai Chi positions. Thus people who can perform adequately on the FSST should be able to safely perform the Tai Chi positions. These positions, while providing a challenge to balance, should not be so difficult for participants that they will provoke a fall. Tai Chi is performed with slow, controlled movements as well which will allow the participants to attend to their balance as they perform the movement patterns. Additionally, all exercises (Tai Chi and resistance

exercises) will be performed at a supervised exercise session before a participant will be performing them at home, which will allow the researchers to ensure that they are being performed correctly and safely. During these exercise sessions, researchers will be present for guarding to prevent falls. The exercises will be modified on an individual basis as necessary for safe performance at home. Participants will be instructed to perform the exercises near a support during their home session in the event that they would need a balance assist.

Participants in all groups will be instructed in safe levels of exercise and when to stop activity. They will be instructed to stop exercising if they experience shortness of breath, dizziness, leg pain, chest pain, or joint pain. Since walking is the common activity that is being encouraged, safety with walking will be emphasized. Walking is presently a part of the program at Eastern Maine Medical Center Weight Management, and thus will not increase the patient's risk level above the current protocol.

Any time an individual begins an exercise program, or increases the intensity of an exercise program, there is a risk of mild to moderate muscle soreness. This is expected and does not cause alarm. This should resolve within 2-3 days of initiating the activity, but may return again when new exercises are added to the program.

There have been some reports of the exercise bands breaking while patients are using them, which may lead to injury. The Theraband company, which fabricates the elastic bands we will be using, recommends that users inspect them for tears before use, and inspect them for color fading, which could indicate weakness. Recommendations also include use of a stabilizing component that they manufacture, so that the band cannot slip out of a doorway. Participants will be provided with new elastic bands on a regular basis to prevent breakage from wear and

297 tear. In addition, they will be educated on how to inspect their bands for age or wear and tear,  
298 in order to avoid injury.

299 **POTENTIAL BENEFITS:** Physical activity has been shown to be an important element for weight  
300 loss and improved physical condition. The participants in all groups stand to benefit from the  
301 increased activity from the walking program. The experimental groups may see benefits in  
302 strength, balance, and overall fitness level. Although the duration of the study is brief, the  
303 participants may also benefit from weight loss and improvement in the results from their  
304 medical exam. Participants may benefit psychologically from exercising, and those involved in  
305 the two intervention groups may benefit psychologically from the group activity. The results of  
306 this study may provide guidance towards improving mobility and health in people who are  
307 morbidly obese.

308 **DATA COLLECTION:** Measurements will be taken on one session prior to, and on one session  
309 following completion of the 8 weeks of exercise sessions. A sample data collection form is found  
310 on page 31. The participant identification numbers will be the only identifying information  
311 utilized during data collection and analysis. Records of the identification codes for the  
312 participants will be kept by the primary investigators only, and will be stored in hard copy in  
313 their locked offices, and on their password-protected computers. These codes will be stored in  
314 a separate file from the research data, so that if there were a breach of the computer, the  
315 identity codes would not be obvious. Any data created and collected on paper by this study will  
316 be kept in the locked offices of the primary investigators. The paper data will be transferred to  
317 spreadsheets on the computers of the primary investigators, which are password  
318 protected. When the data are transferred to the electronic spreadsheets, only the numerical  
319 codes will be used, so even if there were a breach of the computer, individual identities would  
320 not be revealed. The researchers who are assigned to collect pre-test and post-test outcome

measures will be excluded from participation in the exercise class instruction for all groups in order to maintain blinding of the researchers. The data will be analyzed using SPSS software. Analysis of the test results among the test groups will include repeated measures ANOVA to compare performance on the outcome measures from initiation of the exercise program to the conclusion.

**FUNDING:** A small internal grant from Husson University will cover the cost of the DVDs and the resistance equipment required for the resistance training group. No additional funding will be necessary. The exercise sessions will be monitored by students who are receiving course credit and therefore do not receive reimbursement for their time, and the faculty members who will be present are required to carry out this research as part of their teaching loads.

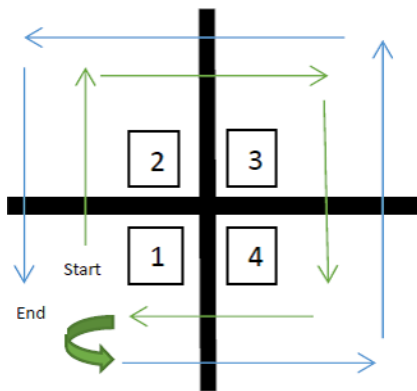
**CONSENT FORM:** See attached Informed Consent Form. This form has a Fleish-Kincaid readability level of 9.0. All researchers will be instructed as to how to properly administer an informed consent form to a study participant.

Figure 1: Equipment shown for the Four Step Square Test. This figure demonstrates a person with bilateral amputations completing the FSST.



[http://www.oandp.org/jpo/library/popup.asp?xmlpage=2013\\_04S\\_056&type=image&id=f2](http://www.oandp.org/jpo/library/popup.asp?xmlpage=2013_04S_056&type=image&id=f2)

Figure 2: Pictorial representation of the sequence of squares a person will walk through in completion of the FSST.



<http://www.monrotherapyservices.com/articles/finding-your-balance-part-4-four-square-step-test-fsst>

Figure 3: BORG Rate of Perceived Exertion Scale.

Rating of Perceived Exertion (RPE)	
6	No exertion at all
7	Extremely light
8	
9	Very light
10	Light
11	
12	Somewhat hard
13	
14	Hard (heavy)
15	
16	Very hard
17	
18	Extremely hard
19	
20	Maximal exertion

<http://www.runningthroughpregnancy.com/heart-rate-monitoring-try-the-borg-rating-scale-instead/>

# Works Cited

- Audette, J. F., Jin, Y. S., Newcome, R., Stein, L., Duncan, G., & Frontera, W. R. (2006). Tai Chi versus brisk walking in elderly women. *Age and Ageing* , 35, 388-393.
- Baillet, A., W, M., Comeau, E., Meziat-Burdin, A., & Langlois, M. (2013). Feasibility and impacts of supervised exercise training in subjects withobesity awaiting bariatric surgery: A pilot study. *Obesity Surgery* , 23, 882-891.
- Deschamps, A., Gatta, B., Bourdel-Marchasson, I., Tabarin, A., & Roger, P. (2009). Pilot study of a 10-week multidisciplinary Tai Chi intervention in sedentary obese women. *Clinical Journal of Sports Medicine* , 19, 49-53.
- Dite, W., & Temple, V. A. (2002). A clinical test of stepping and change of direction to identify multiple falling . *Archives of Physical Medicine and Rehabilitation* , 83 (11), 1566-71.
- Garver, M. J., Focht, B. C., Dials, J., Rose, M., Lucas, A. T., Devor, S. T., et al. (2014, May). *Weight status and differences in mobility performance, pain symptoms, and physical activity in older, knee osteoarthritis patients*. Retrieved April 27, 2016, from <http://www.ncbi.nlm.gov/pmc/articles/PMC4055557>
- Geliebter, A., Maher, M. M., Gerace, L., Gutin, B., Heymsfield, S. B., & A, H. S. (1997). Effects of strength or aerobic training on body composition, resting metabolic rate, and peak oxygen consumption in obese dieting subjects. *America Journal of Clinical Nutrition* , 66 (3), 557-63.
- Guralnik, J., Simonsick, E., Ferruci, L., Glynn, R., Berkman, L., Blazer, D., et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *Journal of Gerontology* , 49 (2), M85-94.
- Jeon, B.-J. (2013). The effects of obesity of fall efficacy in elderly people. *Journal of Physical Therapy Science* , 25 (11), 1485-89.
- Jones, C., Rikli, R., & Beam, W. (1999). A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. *Research Quarterly for Exercise and Sport* , 70 (2), 113-19.
- Kolotkin, R. M., & GR, W. (2001). Quality of life and obesity. *Obesity Review* , 2, 219-229.
- Larsson, U. E., & Reynisdottir, S. (2008). The six-minute walk test in outpatients with obesity: reproducibility and known group validity. *Physiotherapy Research International* , 13 (2), 84-93.
- Lee, E.-O., Lee, K.-H., & Kozyreva, O. (2013). The effect of complex exercise rehabilitation program on body composition, blood pressure, blood sugar, and vessel elasticity in elderly women with obesity. *Journal of Exercise Rehabilitatoin* , 9 (6), 514-19.

- Lee, S.-H., Seo, B.-D., & Chung, S.-M. (2013). The effect of walking exercise on physical fitness and serum lipids in obese middle-aged women: Pilot study. *Journal of Physical Therapy Science*, 25, 1533-1536.
- Liu, X., Viteta, L., Kostner, K., Crompton, D., Williams, G., Brown, W. J., et al. (2015). *The effects of Tai Chi in centrally obese adults with depression symptoms*. Retrieved April 27, 2016, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4320798/>
- Manini, T., Newman, A., Fielding, R., Blair, S., Goodpaster, B., Katula, J., et al. (2010). Effects of exercise on mobility in obese and non-obese older adults. *Obesity*, 18 (6), 1168-1175.
- Maris, S., Quintanilla, D., Taetzsh, A., Picard, A., J. L., Mahler, L. L., et al. (2014). *The combined effects of Tai Chi, resistance training, and diet on physical function and body composition in obese older women*. Retrieved Apr 26, 2016, from <http://dx.doi.org/10.1155/2014/657851>
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Elegal, K. M. (2014). Pervallence of childhood and adult obesity in the United States. *JAMA*, 311(8), 806-814.
- Pajecski, D. S., Kanagi, A. L., Riccioppo, D., de Cleva, R., & Cecconello, I. (2014). *Arq Gastroenterol*. 51 (1), 25-28.
- Podsiadlo, D., & Richardson, S. (1991). The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatric Society*, 39 (2), 142-8.
- Rillamas-Sun, E., LaCroix, A. Z., Waring, M. E., Kroenke, C. H., LaMonte, M. J., Vitolins, M. Z., et al. (2014). Obesity and survival to 85 years without major disease or disability in older women. *JAMA Internal Medicine*, 174 (1), 98-106.
- Sanal, E., Ardic, F., & Kirac, S. (2013). Effects of aerobic or combined aerobic resistance exercise on body composition in overweight and obese adults: gender differences. A randomized intervention study. *European Journal of Physical Rehabilitation Medicine*, 49, 1-11.
- Sarsan, A., Ardic, F., Ozgen, M., Topuz, O., & Sermez, Y. (2006). The effects of aerobic and resistance exercises in obese women. *Clinical Rehabilitation*, 20, 773-82.
- Song, R., Lee, E.-O., Lam, P., & Bae, S.-C. (2003). Effects of Tai Chi exercise on pain, balance, strength, and perceived difficulties in physical functioning in older women with osetoarthritis: A randomized clinical trial. *Journal of Rheumatology*, 30, 2039-44.
- Topolski, T., LoGerfo, J., Patrick, D., Williams, B., Walsick, J., & Patrick, M. (2006). *The Rapid Assessment of Physical Activity (RAPA) among older adults*. Retrieved April 28, 2016, from Preventing Chronic Disease: [http://www.cdc.gov/pcd/issues/2006/oct/06\\_0001.htm](http://www.cdc.gov/pcd/issues/2006/oct/06_0001.htm)
- Wadden, T., & Phelan, S. (2002). Assesmentof quality of life in obese individuals. *Obesity: A Research Journal*, 10 (S11), 50S-57S.
- Wang, F., McDonald, T., Reffitt, B., & Edington, D. W. (2005). BMI, physical activity, and health care utilization/costs among Medicare retirees. *Obesity Research*, 13 (8), 1450-57.

Xu, F., J, L., Bekke, J., Beebe, N., Mahler, L., Lofgren, I., et al. (2015). Impact of a program of Tai Chi plus behaviorally based dietary weight loss on physical functioning and coronary heart disease risk factors: a community based study in obese older women. *Journal of Nutrition in Gerontology and Geriatrics*, 34 (1), 50-65.

Yeh, S.-H., H, C., L-W, L., C-Y, H., & L, E. H. (2006). Regular tai chi chuan exercise enhances functional mobility and CD4CD25 regulatory T cells. *British Journal of Sports Medicine*, 40, 239-43.

466

467

#### RESEARCH PARTICIPANTS' RIGHTS

468

The rights below are the right of every person who is asked to be in a research study. As a research subject you have the following rights:

469

470

471

1. To be told what the study is trying to find out.

472

473

2. To be told what will happen to you and whether any of the procedures, drugs or devices are experimental.

474

475

476

3. To be told about the reasonably anticipated risks or discomforts that may happen to you related to the research.

477

478

479

4. To be told if you can reasonably expect any benefit from taking part, and if so, what that benefit might be.

480

481

482

5. To be told what other appropriate treatment might be worthwhile.

483

484

6. To be allowed to ask questions concerning the study both before agreeing to take part and during the course of the study.

485

486

487

7. To be told what sort of medical treatment is available if any injury arises.

488

489

8. To refuse to take part at all or to change your mind about taking part after the study is started.

490

491

492

9. To receive a copy of the signed and dated consent form.

493

494

10. To be free of pressure or undue influence concerning whether you wish to agree to be in the study.

495

496

### Demographic Survey

Identification number:

Age:

Gender: M / F

1. How would you rate your average pain over the last 3 days, during periods while you were resting or sitting? To answer this question, consider “0” as meaning that you have had no pain, and “10” as indicating horrible pain.

(No pain) 0 1 2 3 4 5 6 7 8 9 10 (Horrible pain)

2. How would you rate your average pain over the last 3 days during times in which you were active (walking, doing housework, exercising, etc).

(No pain) 0 1 2 3 4 5 6 7 8 9 10 (Horrible pain)

3. Do you have any orthopedic conditions that would cause pain? Examples of these might be: arthritis, back pain, foot pain, etc. Yes / No

If yes, please specify \_\_\_\_\_

4. Have you had any orthopedic surgeries? Yes / No

If yes, please describe

\_\_\_\_\_

5. What prescription medications are you taking?

6. Do you use an assistive device such as a walker or a cane to help you while walking?

543 7. How many falls have you had in the past year, approximately? \_\_\_\_\_

544

545

546 When did those falls occur? \_\_\_\_\_

547

548

549 8. How long does it take you to get from you home to Husson? \_\_\_\_\_

550

551

552

553 9. What is your primary reason for participating in this study? \_\_\_\_\_

554

555

556

557

558 10. What is your occupation? \_\_\_\_\_

559

560

561

562 11. How many hours per week do you work? \_\_\_\_\_

563

564

565

566

567

**Data Collection Form:**

	Pretest
<b>Participant ID number:</b>	
<b>Anthropometric Data:</b>	
Height	
Weight	
BMI	
Neck Circumference	
<b>Physical Outcome Measures:</b>	
FSST (Time)	
6 Minute Walk test	
Blood Pressure	
Heart Rate	
Distance	
30 Sec Sit to Stand (#)	
TUG Score (time)	
Gait Measures	
Gait speed	
Step length	
Step width	
Double limb support time	
Cadence	
<b>Paper and pencil surveys</b>	
SF-36 Score	
Rapid Assessment of Phys Activ	
Number of sessions attended at Husson	
Number of times exercised independently	

**Data Collection Form:**

	Post test
<b>Participant ID number:</b>	
<b>Anthropometric Data:</b>	
Height	
Weight	
BMI	
Neck Circumference	
<b>Physical Outcome Measures:</b>	
FSST (Time)	
6 Minute Walk test	
Blood Pressure	
Heart Rate	
Distance	
30 Sec Sit to Stand (#)	
TUG Score (time)	
Gait Measures	
Gait speed	
Step length	
Step width	
Double limb support time	
Cadence	
<b>Paper and pencil surveys</b>	
SF-36 Score	
Rapid Assessment of Phys Activ	
Number of sessions attended at Husson	
Number of times exercised independently	