

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, DSc¹

stuckerc@husson.edu

Co-investigator:

Sondra G. Siegel, PT, PhD¹

siegels@husson.edu

1 Husson University

Department of Physical Therapy

1 College Circle

Bangor, ME 04401

Clinical Trial Registration Number: NCT04106661

1 **TITLE**

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

3 **Purpose:**

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

16

17 **History**

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

28 for chronic disease, mobility disability and mortality compared to others who were not
29 obese, with the risk of disability increasing with the degree of obesity. The implications of
30 these measures can be translated into increased financial burden (Rillamas-Sun, et al.,
31 2014). A study conducted by Wang and colleagues identified higher direct health care
32 costs associated with increased adiposity and physical inactivity (Wang, McDonald,
33 Reffitt, & Edington, 2005). This study found that active obese individuals had lower
34 direct healthcare costs than their inactive obese counterparts. This further endorses the
35 need to identify effective and long-term alternatives for physical activity in people who
36 struggle with obesity.

37
38
39 Several types of exercise are known to enhance mobility and function in people who are
40 overweight. Aerobic and walking programs have resulted in improvements in BMI,
41 weight reduction, gait tolerance, strength (Lee, Seo, & Chung, 2013) and self-reported
42 quality of life (Baillot, W, Comeau, Meziat-Burdin, & Langlois, 2013) in this population.
43 Other benefits of aerobic exercise programs include improvement in mood, and
44 improvement in VO₂ max (Sarsan, Ardic, Ozgen, Topuz, & Sermez, 2006). These
45 studies support the use of exercise for women with obesity, but do not provide sufficient
46 information to determine which type of exercise is optimal.

47
48 Comparisons between aerobic exercise programs and strengthening or resistance
49 exercise programs in the obese population show that these two forms of exercise have
50 different effects on a variety of parameters, though both are beneficial. For example,
51 Geliebter et al found that in obese participants who are restricting caloric intake,
52 resistance exercise limits the loss of fat free mass more than aerobic exercise, but does
53 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.

94

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

105 2. Identify differences in compliance among the various types of physical activity with
106 the supervised group and individual sessions.
107 3. Determine the impact of the type of physical activity on the health measures
108 collected including blood pressure, and weight.
109 4. Identify differences in self-reported quality of life measures resulting from
110 participation in the different physical activities.

111

112

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

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

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

143 **DURATION:** The supervised exercise sessions will take place for 8 consecutive weeks.
144 Following the 8-week intervention, the participants will return for reassessment of the outcome
145 measures; thus each participant's time involvement in this study will be approximately 10 weeks
146 (including pre and post testing). We anticipate that this study will be done in two consecutive
147 phases, each spanning approximately one academic year, with the entire study taking place
148 between August of 2016 and May of 2018. The first phase of the study will include participants
149 who are in the Tai Chi group and a control group, and the other phase will include those who are
150 doing resistance training along with another control group. After each intervention phase (Tai
151 chi or resistance training), a shorter, 4-week intervention program will be offered to those
152 people who have participated in the control group. This will serve as a reward for participation,
153 and will also encourage people to return for measurements. Thus it should take approximately
154 21 months to complete the entire study. We understand that we will need to apply for an
155 extension of the protocol after the first year of progress on this study.

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

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

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

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

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

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

206 The groups of participants will include two intervention groups and two corresponding control
207 groups. The control groups will receive the instruction in participation in physical activity
208 currently provided by the Weight Management Program, but will receive no formal interaction
209 with an exercise instructor or physical therapist during the study period. This is the current
210 standard protocol, so no treatment is being withheld from this group of participants. One
211 intervention group will be instructed in Tai Chi exercises during weekly supervised exercise
212 sessions. A commercially available DVD will be utilized to lead the exercise session with close
213 supervision of technique and safety by the assigned researchers. Participants in this group will
214 be provided with an identical Tai Chi DVD to use during their home sessions. The DVD was
215 created by Dr. Paul Lam, a Tai Chi master who is also a medical doctor, and is specifically geared
216 towards people with arthritis who want to enjoy Tai Chi. We chose this because we could not
217 find a DVD that had been developed for people with obesity, and since many obese people
218 would also benefit from joint protection techniques, we felt that the modifications the master
219 has made for this population would be appropriate for our targeted research participants.

220 Following completion of the 8-week study period, the people who were assigned to the
221 corresponding control group will be offered a 4-week supervised Tai Chi program along with the
222 accompanying DVD. We hope that this will help provide an incentive for them to return for the
223 second measurement session, and will also reward them for participating as part of the control
224 group.

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

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

240 All of the group exercise sessions will be supervised and led by student physical therapists, with
241 a licensed physical therapist (one of the co-investigators) present at all times. The students and
242 physical therapists are well trained in identifying and guarding patients who may be at risk for
243 falls, though the initial screening should have identified these people and allowed us to exclude
244 them from the study. Prior to starting the exercise sessions with the participants, the
245 researchers will attend instructional sessions with a local experienced Tai Chi teacher (Shih Wah
246 Noh) to learn the correct positions and movements in order to provide effective supervision.

247 During the exercise sessions, the researchers will be observing the participants closely and
248 suggesting modifications in Tai Chi forms or resistance exercises when appropriate, according to
249 the participant's individual abilities. In this sense, the Tai Chi and the resistance exercises will be
250 tailored to the appropriate level for the individual.

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

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

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

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

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

291 There have been some reports of the exercise bands breaking while patients are using them,
292 which may lead to injury. The Theraband company, which fabricates the elastic bands we will
293 be using, recommends that users inspect them for tears before use, and inspect them for color
294 fading, which could indicate weakness. Recommendations also include use of a stabilizing
295 component that they manufacture, so that the band cannot slip out of a doorway. Participants
296 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

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

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

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

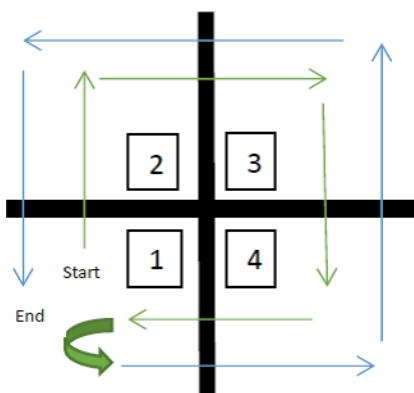
334

335 Figure 1: Equipment shown for the Four Step Square Test. This figure demonstrates a
336 person with bilateral amputations completing the FSST.
337



338
339
340 http://www.oandp.org/jpo/library/popup.asp?xmlpage=2013_04S_056&type=image&id=f2
341
342
343
344
345

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



346
347
348
349 <http://www.monterotherapyservices.com/articles/finding-your-balance-part-4-four-square-step-test-fsst>
350
351
352

353 Figure 3: BORG Rate of Perceived Exertion Scale.

354

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

355 [http://www.runningthroughpregnancy.com/heart-rate-monitoring-try-the-borg-](http://www.runningthroughpregnancy.com/heart-rate-monitoring-try-the-borg-rating-scale-instead/)

356 rating-scale-instead/

357

358

359

Works Cited

360

361 Audette, J. F., Jin, Y. S., Newcome, R., Stein, L., Duncan, G., & Frontera, W. R. (2006). Tai Chi
362 versus brisk walking in elderly women. *Age and Ageing*, 35, 388-393.

363

364 Baillot, A., W, M., Comeau, E., Meziat-Burdin, A., & Langlois, M. (2013). Feasibility and
365 impacts of supervised exercise training in subjects with obesity awaiting bariatric surgery: A
366 pilot study. *Obesity Surgery*, 23, 882-891.

367

368 Deschamps, A., Gatta, B., Bourdel-Marchasson, I., Tabarin, A., & Roger, P. (2009). Pilot study
369 of a 10-week multidisciplinary Tai Chi intervention in sedentary obese women. *Clinical
370 Journal of Sports Medicine*, 19, 49-53.

371

372 Dite, W., & Temple, V. A. (2002). A clinical test of stepping and change of direction to identify
373 multiple falling. *Archives of Physical Medicine and Rehabilitation*, 83 (11), 1566-71.

374

375 Garver, M. J., Focht, B. C., Dials, J., Rose, M., Lucas, A. T., Devor, S. T., et al. (2014, May). *Weight
376 status and differences in mobility performance, pain symptoms, and physical activity in older,
377 knee osteoarthritis patients*. Retrieved April 27, 2016, from
378 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4055557>

379

380 Geliebter, A., Maher, M. M., Gerace, L., Gutin, B., Heymsfield, S. B., & A, H. S. (1997). Effects of
381 strength or aerobic training on body composition, resting metabolic rate, and peak oxygen
382 consumption in obese dieting subjects. *American Journal of Clinical Nutrition*, 66 (3), 557-63.

383

384 Guralnik, J., Simonsick, E., Ferruci, L., Glynn, R., Berkman, L., Blazer, D., et al. A short physical
385 performance battery assessing lower extremity function: association with self-reported
386 disability and prediction of mortality and nursing home admission. *Journal of Gerontology*,
387 49 (2), M85-94.

388

389 Jeon, B.-J. (2013). The effects of obesity of fall efficacy in elderly people. *Journal of Physical
390 Therapy Science*, 25 (11), 1485-89.

391

392 Jones, C., Rikli, R., & Beam, W. (1999). A 30-s chair-stand test as a measure of lower body
393 strength in community-residing older adults. *Research Quarterly for Exercise and Sport*, 70
394 (2), 113-19.

395

396 Kolotkin, R. M., & GR, W. (2001). Quality of life and obesity. *Obesity Review*, 2, 219-229.

397

398 Larsson, U. E., & Reynisdottir, S. (2008). The six-minute walk test in outpatients with
399 obesity: reproducibility and known group validity. *Physiotherapy Research International*, 13
400 (2), 84-93.

401

402 Lee, E.-O., Lee, K.-H., & Kozyreva, O. (2013). The effect of complex exercise rehabilitation
403 program on body composition, blood pressure, blood sugar, and vessel elasticity in elderly
404 women with obesity. *Journal of Exercise Rehabilitation*, 9 (6), 514-19.

405

406 Lee, S.-H., Seo, B.-D., & Chung, S.-M. (2013). The effect of walking exercise on physical fitness
407 and serum lipids in obese middle-aged women: Pilot study. *Journal of Physical Therapy
408 Science*, 25, 1533-1536.

409

410 Liu, X., Viteta, L., Kostner, K., Cromptom, D., Williams, G., Brown, W. J., et al. (2015). *The
411 effects of Tai Chi in centrally obese adults with depression symptoms*. Retrieved April 27,
412 2016, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4320798/>

413

414 Manini, T., Newman, A., Fielding, R., Blair, S., Goodpaster, B., Katula, J., et al. (2010). Effects of
415 exercise on mobility in obese and non-obese older adults. *Obesity*, 18 (6), 1168-1175.

416

417 Maris, S., Quintanilla, D., Taetzsh, A., Picard, A., J. L., Mahler, L. L., et al. (2014). *The combined
418 effects of Tai Chi, resistance training, and diet on physical function and body composition in
419 obese older women*. Retrieved Apr 26, 2016, from <http://dx.doi.org/10.1155/2014/657851>

420

421 Ogden, C. L., Carroll, M. D., Kit, B. K., & Elegal, K. M. (2014). Pervalence of childhood and
422 adult obesity in the United States. *JAMA*, 311(8), 806-814.

423

424 Pajecki, D. S., Kanagi, A. L., Riccioppo, D., de Cleva, R., & Cecconello, I. (2014). *Arq
425 Gastroenterol*. 51 (1), 25-28.

426

427 Podsiadlo, D., & Richardson, S. (1991). The timed "Up & Go": a test of basic functional
428 mobility for frail elderly persons. *Journal of the American Geriatric Society*, 39 (2), 142-8.

429

430 Rillamas-Sun, E., LaCroix, A. Z., Waring, M. E., Kroenke, C. H., LaMonte, M. J., Vitolins, M. Z., et
431 al. (2014). Obesity and survival to 85 years without major disease or disability in older
432 women. *JAMA Internal Medicine*, 174 (1), 98-106.

433

434 Sanal, E., Ardic, F., & Kirac, S. (2013). Effects of aerobic or combined aerobic resistance
435 exercise on body composition in overweight and obese adults: gender differences. A
436 randomized intervention study. *European Journal of Physical Rehabilitation Medicine*, 49, 1-
437 11.

438

439 Sarsan, A., Ardic, F., Ozgen, M., Topuz, O., & Sermez, Y. (2006). The effects of aerobic and
440 resistance exercises in obese women. *Clinical Rehabilitation*, 20, 773-82.

441

442 Song, R., Lee, E.-O., Lam, P., & Bae, S.-C. (2003). Effects of Tai Chi exercise on pain, balance,
443 strength, and perceived difficulties in physical functioning in older women with
444 osteoarthritis: A randomized clinical trial. *Journal of Rheumatology*, 30, 2039-44.

445

446 Topolski, T., LoGerfo, J., Patrick, D., Williams, B., Walsick, J., & Patrick, M. (2006). *The Rapid
447 Assessment of Physical Activity (RAPA) among older adults*. Retrieved April 28, 2016, from
448 Preventing Chronic Disease: http://www.cdc.gov/pcd/issues/2006/oct/06_0001.htm

449

450 Wadden, T., & Phelan, S. (2002). Assesmentof quality of life in obese individuals. *Obesity: A
451 Research Journal*, 10 (S11), 50S-57S.

452

453 Wang, F., McDonald, T., Reffitt, B., & Edington, D. W. (2005). BMI, physical activity, and
454 health care utilization/costs among Medicare retirees. *Obesity Research*, 13 (8), 1450-57.

455

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

460

461 Yeh, S.-H., H. C., L-W, L., C-Y, H., & L, E. H. (2006). Regular tai chi chuan exercise enhances
462 functional mobility and CD4CD25 regulatory T cells. *British Journal of Sports Medicine*, 40,
463 239-43.

464

465

466

467 RESEARCH PARTCIPANTS' RIGHTS

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

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
474 devices are experimental.

475

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

478

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

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
485 take part and during the course of the study.

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
490 study is started.

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
495 to be in the study.

496

Demographic Survey

497 Demographic Survey
498
499 Identification number:
500
501 Age:
502
503
504 Gender: M / F
505
506
507 1. How would you rate your average pain over the last 3 days, during periods while
508 you were resting or sitting? To answer this question, consider "0" as meaning that
509 you have had no pain, and "10" as indicating horrible pain.
510
511 (No pain) 0 1 2 3 4 5 6 7 8 9 10 (Horrible pain)
512
513
514 2. How would you rate your average pain over the last 3 days during times in which
515 you were active (walking, doing housework, exercising, etc).
516
517 (No pain) 0 1 2 3 4 5 6 7 8 9 10 (Horrible pain)
518
519
520 3. Do you have any orthopedic conditions that would cause pain? Examples of these
521 might be: arthritis, back pain, foot pain, etc. Yes / No
522
523 If yes, please specify _____
524
525 4. Have you had any orthopedic surgeries? Yes / No
526
527 If yes, please describe
528 _____
529 _____
530
531
532 5. What prescription medications are you taking?
533
534
535
536 6. Do you use an assistive device such as a walker or a cane to help you while
537 walking?
538
539
540
541
542

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

568
569**Data Collection Form:**

| | Pretest |
|---|---------|
| Participant ID number: | |
| Anthropometric Data: | |
| Height | |
| Weight | |
| BMI | |
| Neck Circumference | |
| Physical Outcome Measures: | |
| 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 | |
| Paper and pencil surveys | |
| SF-36 Score | |
| Rapid Assessment of Phys Activ | |
| Number of sessions attended at Husson | |
| Number of times exercised independently | |

570
571

572

Data Collection Form:

573

| | Post test |
|---|-----------|
| Participant ID number: | |
| Anthropometric Data: | |
| Height | |
| Weight | |
| BMI | |
| Neck Circumference | |
| Physical Outcome Measures: | |
| 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 | |
| Paper and pencil surveys | |
| SF-36 Score | |
| Rapid Assessment of Phys Activ | |
| Number of sessions attended at Husson | |
| Number of times exercised independently | |

574

575