Tai Chi Chuan, health-related quality of life and self-esteem: A randomized trial with breast cancer survivors[1]

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Abstract:
Goals Health-related quality of life (HRQL) and self-esteem are often diminished among women diagnosed and treated for breast cancer. Tai Chi is a moderate form of exercise that may be an effective therapy for improving HRQL and self-esteem among these women. We sought to compare the efficacy of Tai Chi Chuan (TCC) and psychosocial support (PST) for improving HRQL and self-esteem among breast cancer survivors.
Patients and methods A group of 21 women diagnosed with breast cancer, who had completed treatment within the last 30 months were randomized to receive 12 weeks of TCC or PST. Participants in both groups met three times a week for 60 minutes. HRQL and self-esteem were assessed at baseline, 6 weeks, and 12 weeks.
Results The TCC group demonstrated significant improvements in HRQL, while the PST group reported declines in HRQL, with the differences between the two groups approaching significance at week 12. Additionally, the TCC group exhibited improvements in self-esteem, while the PST group reported declines in self-esteem, with the differences between groups reaching statistical significance at week 12. These findings, coupled with a visual inspection of the raw change scores, support the plausibility of a dose-response relationship concerning Tai Chi.
Conclusions In this pilot investigation, the TCC group exhibited improvements in HRQL and self-esteem from baseline to 6 and 12 weeks, while the support group exhibited declines. Randomized, controlled clinical trials with larger sample sizes are needed.
Keywords Breast cancer - Exercise - Quality of life - Self-esteem - Tai Chi

Article:

Introduction

According to the American Cancer Society (ACS), approximately 217,440 new cases of invasive breast cancer and 59,390 in situ (localized) cases will be diagnosed in 2004, resulting in nearly 40,580 deaths [1]. Despite the increased survival rates experienced by women diagnosed with breast cancer, treatments for the disease result in negative side effects, such as decreases in functional capacity, fatigue, nausea, vomiting, alopecia, depression, poor body image and decreases in self-esteem that persist long after treatments have ended [11, 28, 29]. These persistent side effects ultimately lead to impairments in HRQL [11, 28, 32].

HRQL is a biopsychosocial concept that is composed of psychological functioning, social adjustment, functional ability, and disease- and treatment-related symptoms [3, 8]. Evidence suggests that self-esteem is a primary indicant of health, illness coping and HRQL [7]. Self-esteem represents the evaluative and affective components of self-concept (how an individual views the self) and can be described as the negative and positive views individuals hold regarding themselves [5, 6, 13, 14, 16, 17, 26, 32]. Research has demonstrated that self-esteem is positively correlated with, and is the psychological factor explaining most of the variance in HRQL and well-being among breast cancer survivors [6]. This suggests that self-esteem plays a critical role in the ability of breast cancer survivors to thrive and go on to live "normal" lives [14, 20, 32], and may be an

appropriate target for interventions designed to aid breast cancer survivors in maintaining and improving HRQL [6, 7, 13, 14].

Currently, the most widely researched and accepted intervention to enhance self-esteem and HRQL in breast cancer survivors is psychosocial support therapy (PST) [37, 38, 39], which is based on the premise that shared experiences of emotional and social support are associated with enhanced self-esteem and coping. Although PST groups are shown to be moderately effective at enhancing HRQL for some survivors [15, 37, 38, 39], results have been inconsistent and many patients prefer not to attend support groups. Therefore, alternative interventions are needed and should be examined for their efficacy.

Exercise has been found to be a safe method for enhancing HRQL among cancer patients [11] and increasing self-esteem in healthy populations [12, 16, 17, 26, 33, 34, 36]. In breast cancer survivors, four studies have demonstrated positive relationships between physical activity and self-esteem [4, 27, 30, 31]. These studies investigated traditional modes of exercise, to which patients often have difficulty adhering/complying. A form of exercise that may be particularly appropriate for breast cancer survivors is the practice of Tai Chi Chuan (TCC), which is rapidly gaining popularity in the United States [10]. It is an easily modifiable, low-to-moderate intensity form of physical exercise with psychological, physiological, and sociological benefits [18, 19]. For example, TCC has been reported to have positive effects on HRQL, self-esteem, mood, anxiety, blood pressure, osteoporosis, rheumatoid arthritis, natural killer cells, and components of health-related fitness, such as cardiorespiratory function, flexibility, balance and strength [18, 19, 21, 24, 25, 42]. Despite research indicating that TCC is an effective form of therapy for enhancing HRQL and self-esteem [19, 21, 22, 23], TCC has not been tested as an intervention for improving HRQL and self-esteem among breast cancer survivors.

In summary, women diagnosed with breast cancer face a number of biopsychosocial challenges resulting from treatment and diagnosis that may impair HRQL. Additionally, evidence suggests that self-esteem may play a pivotal role in HRQL and in successful coping among these women. TCC may prove to be an effective intervention to help survivors enhance HRQL and self-esteem, but intervention studies are lacking. Therefore, a pilot study was conducted to compare the impact of a 12-week TCC program and a 12-week PST program on HRQL and self-esteem in breast cancer survivors.

Methods
Participants
Breast cancer survivors were recruited collaboratively by the Behavioral Health and Fitness Laboratory at the University of North Carolina Greensboro, Moses Cone Regional Cancer Center and the American Cancer Society via mass mailings, posted flyers in the community and physician referrals. After expressing an interest in participating in this investigation, each participant was contacted by the principal investigator, screened for inclusion, and received an explanation of the details of the study. Inclusion criteria consisted of (1) being female, (2) having a histological diagnosis of primary breast cancer stage 0–IIIb, (3) being between 1 week and 30 months after treatment, (4) having no drainage tubes or catheters, (5) not engaging in moderate to vigorous physical activity more than once a week, (6) obtaining a physician's clearance for fitness testing and exercise, (7) having no physical limitations prohibiting exercise, and (8) having no clinical diagnosis of mental disorder, as defined by the use of psychotropic drugs and self-report. The Institutional Review Board, prior to consenting and enrolling any patients, approved the study.

Design and procedures
Participants reported to the Behavioral Health and Fitness Laboratory at the University of North Carolina Greensboro and were randomly assigned to a 12-week TCC exercise group or PST group, both of which met three times a week for 60 minutes in a classroom in the same building, and at the same time of day for 12 weeks. The PST sessions were lead by a graduate exercise psychology student, under the direct supervision of a Master's-trained counselor. The PST sessions were theoretically guided following Spiegel's Supportive-Expressive Group Therapy model [37] and conducted in an open-ended format that placed strong emphasis on

teaching behavioral coping strategies, peer support, and group cohesion. Participants in the PST group were instructed not to begin any physical exercise programs or change their normal daily physical activity in any way for the duration of the study. According to self-report data, 80% (*n*=8) of the women completing the PST intervention adhered to this requirement, while 20% (*n*=2) did not, and actually began or increased a fitness walking regimen.

The TCC group was led by an American College of Sports Medicine certified health and fitness instructor, who was also an experienced TCC instructor. Participants performed 10 minutes of warm-up stretching and basic Chi Kung (stationary TCC fundamentals). The participants then performed TCC for approximately 40 minutes, and learned a 15-move short form of Yang style TCC. During the last 10 minutes of each session, participants were instructed in regulatory breathing, imagery, and meditation in order to enhance their TCC skills and provide an exercise cool-down. As in the PST group, participants in the TCC group were instructed not to begin any other physical exercise programs and not to change their normal daily physical activity during the course of the study. According to self-report data, 100% (*n*=11) of the women completing the TCC intervention adhered to this requirement, with the only changes in physical activity occurring as a result of participation in the TCC group.

All participants completed a battery of self-report questionnaires (demographics, HRQL, and self-esteem) at baseline, 6 weeks, and 12 weeks. In addition, participants were instructed to keep a daily log for each class they attended in order to monitor attendance and compliance to TCC and PST sessions, as well as intensity and duration of physical activity during the sessions. Participants were not given any formal assignments to do at home outside of the structured sessions; however, they were encouraged to practice the TCC and behavioral coping strategies they learned during the sessions.

Measures
Questionnaire packets were ordered the same for all participants and each packet contained evaluation instruments for demographics and related medical information, HRQL, and self-esteem.

Demographics and related medical information Demographics assessed included age, height, weight, partnered status, race, employment history, household income and educational background. Study participants provided demographic information based on current status. Additionally, body mass index (BMI) was calculated [weight (kg)/height (m^2)] [*2*]. Medical information consisted of stage of disease, surgical treatment and adjuvant therapy.

Functional assessment of chronic illness therapy–fatigue (FACIT–F) HRQL was assessed using the FACIT–F, a 28-item HRQL scale developed specifically for use in cancer clinical trials [*9*]. Cella and colleagues, through extensive interviews with patients experiencing symptoms of cancer and oncology professionals, developed the questionnaire, and it has been validated in a series of studies of 542 cancer patients. The basic measure has shown very good test/retest reliability, as well as validity [*40, 41*]. Along with a total score representing HRQL, there are psychometrically validated subscales of physical, functional, social, cognitive-emotional, and fatigue status. The FACIT–F has become one of the most commonly used measures in oncology. Reliability was calculated in the current investigation for the total score and subscales, with Cronbach's alpha demonstrating good internal consistency at or above *r*=0.75.

Self-esteem Self-esteem was assessed via the Rosenberg Self-Esteem Scale (RSE) [*35*]. The RSE is designed to measure how individuals generally feel about themselves using a unidimensional approach. The RSE is a ten-item survey on which participants respond using a Likert scale ranging from 1 to 5 (strongly agree, agree, neutral, disagree, and strongly disagree, respectively), and scores are computed by summing responses. Rosenberg reported an original reproducibility of 0.93 and a scalability of 0.73. Cronbach's alpha coefficients for internal consistency range from 0.76 to 0.87, and test-retest reliabilities range from 0.63 and 0.85 for cancer patients [*13*]. Reliability was calculated for the current investigation, with Cronbach's alpha demonstrating an internal consistency of *r*=0.76.

Statistical analyses

Data analyses were conducted using SPSS version 12.0 software. Descriptive statistics were calculated to determine the nature and variability of participants' demographics, as well as reported HRQL and self-esteem. The general analytic plan included calculating simple change scores, correlations and analyzing within- and between-group differences on HRQL and self-esteem using analysis of variance (ANOVA) techniques with appropriate post hoc analyses. Additionally, because this was a pilot study, post hoc analyses were conducted to examine the effect of the intervention conditions on HRQL and self-esteem at 6 and 12 weeks despite the absence of significant interaction effects, which would not have been statistically appropriate in a confirmatory study, in order to provide knowledge to aid in the design of future randomized controlled clinical trials.

Results

Participants

Of 31 breast cancer survivors who agreed to participate in the experiment, 68% (n=21) completed the study. Among the TCC participants, 11 completed all study requirements, with a 72% exercise attendance/compliance rate, while 10 PST group participants completed all study requirements, with a 67% PST attendance/compliance rate. The reasons expressed by participants for discontinuing (TCC n=6, PST n=4) included not liking their group assignment, work, family, joining a fitness center, and severe side effects from treatment (e.g., cognitive deficits). Interestingly, all of the patients who dropped out because of not liking the group they were assigned to were assigned to the PST group and desired the TCC group.

Participants ranged in age from 33 to 78 years old (mean 52 years, SD 9). The average body mass index was 26.3 (SD 4.9), and the average body fat percentage was 41.5% (SD 5.7) as assessed by bioelectrical impedance. Almost half of the women were married (48%) and the majority were Caucasian (90%), had at least some college (90%), were employed outside of the home (65%), and had household incomes above $40,000 (62%). All of the participants were diagnosed with stage 0–IIIb breast cancer and received surgical treatment (61% lumpectomy, 33% mastectomy, 6% bilateral mastectomy), with the majority also receiving at least one form of chemotherapy (84%), radiation therapy (61%), and hormonal therapy (56%). Participants in the two groups were found to be significantly different in terms of baseline self-esteem, but not in terms of any other characteristics. Additionally, HRQL and self-esteem were significantly correlated at all three assessment times (Table 1).

Table 1 Correlations between HRQL and self-esteem

|	Pearson r	P value
Baseline	0.728	<0.001
6 weeks	0.813	<0.001
12 weeks	0.469	<0.05

HRQL

A 2×3 (condition by time) repeated-measures ANCOVA, with HRQL as the dependent variable and baseline self-esteem as the covariate (due to significant baseline differences between groups), revealed a significant time main effect ($F_{1,19}$=8.04; P=0.00). Follow-up repeated measures ANCOVAs, with the data split based on intervention assignment, showed significant improvements in HRQL across the 12-week period among the TCC participants ($F_{2,9}$=4.34; P=0.03), but not among the PST participants ($F_{2,8}$=2.66; P=0.14). Additionally, a one-way ANOVA demonstrated a trend toward significant differences between participants in the TCC and PST conditions on changes in HRQL at 12 weeks ($F_{1,19}$=3.66; P=0.07), but not at 6 weeks ($F_{1,19}$=2.07; P=0.17). Furthermore, it is important to note that the TCC participants reported improvements in HRQL at 6 and 12 weeks, while the PST participants reported decreases in HRQL at both assessment times (Fig. 1).
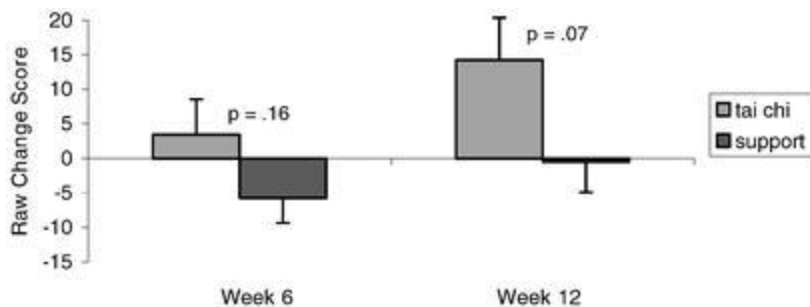
Fig. 1 Comparison of changes in HRQL: Tai Chi Chuan vs psychosocial support

Self-esteem

A 2×2 (condition by time) repeated-measures ANCOVA, with self-esteem as the dependent variable and baseline self-esteem as the covariate, demonstrated a significant time main effect ($F_{1,19}$=4.87; P=0.04). Follow-up repeated measures ANCOVAs, with the data split based on condition, showed a trend toward significant improvements in self-esteem among the TCC participants ($F_{2,9}$=3.36; P=0.10), but not among the PST participants ($F_{2,8}$=1.40; P=0.27). Additionally, a one-way ANOVA revealed a significant difference between the TCC and PST participants on changes in self-esteem at 12 weeks ($F_{1,19}$=7.54; P=0.01), with the TCC group exhibiting improvements in self-esteem and the PST group exhibiting decreases in self-esteem. Lastly, although the changes in self-esteem at 6 weeks were not significantly different ($F_{1,19}$=0.73; P=0.40), the TCC group exhibited improvements in self-esteem, while the PST group showed reductions (see Fig. 2).
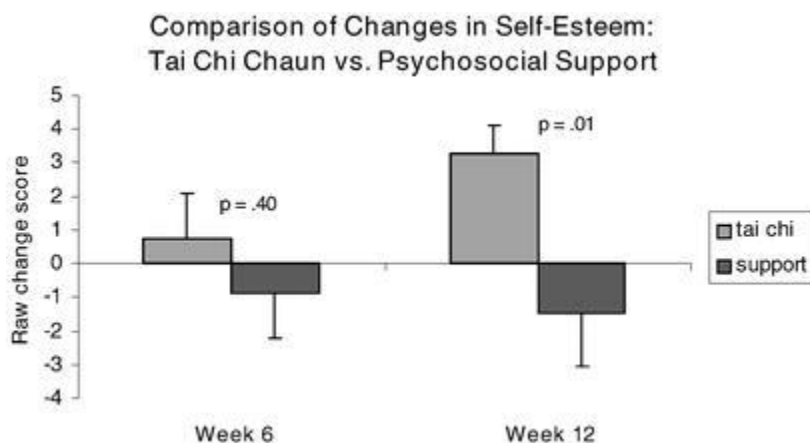
Fig. 2 Comparison of changes in self-esteem: Tai Chi Chuan vs psychosocial support

In summary, the TCC group exhibited improvements in HRQL and self-esteem from baseline to 6 and 12 weeks, while the support group exhibited declines in both. These differences reached statistical significance at 12 weeks.

Discussion

The purpose of this pilot study was to gather preliminary efficacy and feasibility data in preparation for a larger study comparing the efficacy of TCC and psychosocial support therapy for improving HRQL and self-esteem in women diagnosed with breast cancer after the completion of treatment (surgery, chemotherapy, radiation therapy). The results from this preliminary investigation suggest that TCC has a significant positive influence on HRQL and self-esteem in women diagnosed with breast cancer after treatment, but support therapy does not.

Interestingly, the TCC group reported improvements in HRQL and self-esteem at 6 and 12 weeks, while the PST group reported declines in HRQL and self-esteem at both times. A possible explanation for this finding is that the physical aspects of self-esteem may have been particularly salient for this group of women and the physical nature of the TCC intervention may have been a better match for these patients ' needs than the sedentary PST intervention. Prior research has shown that participating in physical activity has a positive

influence on self-esteem and is especially helpful for women who have been diagnosed with breast cancer [4, 27, 30, 31]. It is also possible that the patients' feelings of being in control were enhanced more by the relatively active TCC intervention than by the relatively inactive PST intervention, and this, in turn, contributed to the greater benefits in HRQL and self-esteem observed in the former group.

Moreover, several of the women in both groups celebrated the 1-year anniversary of their diagnosis with breast cancer while participating in the investigation, which is typically a time of significant emotional stress. Despite this, the women in the TCC group reported feeling better about themselves and the quality of their life, while, as previously noted, the women receiving support therapy did not experience improvements, but rather declines in how they felt about themselves and the quality of their lives. As such, these data suggest that TCC may have strong potential as a post-treatment and rehabilitative therapeutic modality for improving HRQL and self-esteem among women diagnosed with breast cancer.

Further examination of the data demonstrated that there was a statistically significant difference between the two treatment groups in terms of improvement in self-esteem, along with a trend toward significant differences in terms of improvements in HRQL at the week-12 assessment. Although not statistically significant, the improvement in HRQL (9%) and self-esteem (9%) observed during week 6 in women in the TCC group compared to the women in the support group (HRQL=–4%, CRF=–7%) may be clinically meaningful to the participants, as suggested by anecdotal evidence from participants in the current study. Furthermore, these findings, coupled with a visual inspection of the raw change scores, support the plausibility of a dose-response relationship concerning TCC, with significant improvements in HRQL and self-esteem occurring after 6 weeks of participation in TCC, but prior to 12 weeks. Concomitantly, it is noteworthy that the TCC group, as a whole, did not report declines in HRQL or self-esteem at either assessment point, whereas the women in the support group, as a whole, reported declines in both outcomes at all time points.

Although these results are positive and hopeful, this study has several limitations. The small, homogeneous sample of participants provided statistically analyzable data, but did not provide results generalizable to the larger cancer patient population (e.g., men, children, individuals with disease at other sites, or individuals undergoing treatment). Additionally, participants may have been particularly receptive to exercise, and the results may not be generalizable to those less amenable to this mode of exercise. Furthermore, since this study was not blinded or placebo controlled, it is possible that the benefits reported from the intervention were due to experimenter bias, participant expectancy effects, or non-specific treatment effects (e.g., differences in patient attention or social interaction).

Despite these limitations, the results of this pilot study are positive and provide preliminary evidence that TCC may be effective in improving HRQL and self-esteem among women diagnosed with breast cancer. Future large-scale and randomized clinical trials are needed to confirm and expand the findings of this pilot study. Additionally, intent-to-treat, dose-response, and cost-benefit analyses might provide useful information. In conclusion, TCC is a safe, well-accepted, and moderate form of exercise, with potential efficacy as a therapeutic intervention for improving HRQL and self-esteem, and, thus, optimizing recovery from breast cancer diagnosis and treatment.

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