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Tai Chi Chuan for Breast Cancer Survivors

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Abstract

Background/Aims—Treatment for breast cancer produces side effects that diminish functional capacity and quality of life (QOL) among survivors. Tai Chi Chuan (TCC) is a moderate form of exercise that may improve functional capacity and QOL in these individuals. Women who completed treatment for breast cancer were randomized to receive TCC or psychosocial support therapy for 12 weeks (60 min; three times weekly).

Results—The TCC group demonstrated significant improvements in functional capacity, including aerobic capacity, muscular strength, and flexibility, as well as QOL; the psychosocial support therapy group showed significant improvements only in flexibility, with declines in aerobic capacity, muscular strength, and QOL.

Conclusions—The TCC group exhibited significant improvements in functional capacity and QOL. These data suggest that TCC may enhance functional capacity and QOL among breast cancer survivors.

According to the American Cancer Society, survival rates for patients with breast cancer have been increasing dramatically; the 5-plus-year survival of women diagnosed with localized disease is 97% [1]. Unfortunately, however, these women experience side effects from their cancer treatments that persist for years. Exercise may be a safe method for improving quality of life (QOL) among breast cancer survivors [2–6].

Although few studies have examined physical exercise patterns during and after treatments for cancer, it appears that patients decrease the amount of physical exercise in which they engage after diagnosis and during treatment. Studies found that exercise increases following treatment but it does not return to the prediagnosis level [2, 3, 5, 6]. Several groups have studied the impact of exercise interventions on functional capacity among breast cancer survivors [2, 3, 6]. These exercise studies utilized traditional modes of exercise (e.g. walking, cycling), and their long-term adherence rates were typically quite low [2, 3, 6]. Novel, alternative modes of physical exercise may better address the unique needs of breast cancer survivors and facilitate increased exercise (re)adoption and adherence.

Tai Chi Chuan (TCC), a practice that is rapidly gaining popularity in the United States [7–11], is a form of exercise that may benefit breast cancer survivors. TCC has shown positive effects on QOL and components of health-related fitness, such as cardiorespiratory function, strength, and flexibility in individuals without cancer [8, 10, 12, 13]. The purpose of this study was to conduct an initial test of the efficacy and appropriateness of a TCC intervention by comparing the benefits of a 12-week TCC program against a 12-week psychosocial

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support therapy (PST) program (exercise control group) on functional capacity (e.g. aerobic capacity, muscular strength, flexibility) and QOL in breast cancer survivors.

Methods

Subjects

Women who completed treatments for breast cancer were recruited for this study. To participate in the study, individuals were required to meet the following inclusion criteria: (1) be female; (2) have a diagnosis of primary breast cancer stage 0–IIIb; (3) be between 1 week and 30 months after treatment; (4) have no drainage tubes or catheters; (5) engage in moderate to vigorous physical activity no more than once a week; (6) have a physician's clearance for fitness testing and exercise; (7) have no physical limitations prohibiting exercise, and (8) have no clinical diagnoses of mental disorders, as defined by the use of psychotropic drugs and self-report.

Design and Procedures

Participants were randomly assigned to a 12-week TCC exercise group or PST typical care control group. Each group met three times a week for 60 min. The PST sessions were facilitated by a trained counselor and an Exercise Psychology graduate student 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.

The TCC group was led by an American College of Sports Medicine Certified Health and Fitness Instructor with extensive training in Yang-style TCC. Participants performed 10 min of warm-up stretching and basic Chi Kung (stationary TCC fundamentals). The participants then performed TCC for approximately 40 min and learned a 15-move short-form sequence of Yang-style TCC. The 15 moves used in the current study intervention consisted of the first 15 moves of the traditional 104-move Yang-style long form. During the final 10 min 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. 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 [12, 13].

Measures

All of the testing protocols adhered to procedures and guidelines set forth by the American College of Sports Medicine (ACSM). All tests were conducted by ACSM-certified personnel. Functional capacity was assessed by evaluating three domains of health-related physical fitness: aerobic capacity, muscular strength, and flexibility. Aerobic capacity was estimated using a 6-min walk test protocol that has been used extensively in clinical exercise trials [14, 15]. Muscular strength was evaluated using a handgrip dynamometer to assess the maximal voluntary grip strength [15]. Although not a direct measure, handgrip dynamometry is correlated with overall body strength [15]. Flexibility was assessed using goniometer measurements of shoulder flexion, extension, abduction, and adduction [15]. QOL was measured using the Functional Assessment of Chronic Illness Therapy-Fatigue survey, a 28-item scale developed specifically for use in cancer clinical trials [16]. Adherence and compliance were monitored using attendance rosters, facilitators' process notes and participants' home journals.

Results

Participants

Twenty-one women completed the study. Eleven TCC participants had a 72% exercise attendance rate with 100% compliance and ten PST group participants had a 67% PST attendance rate with 100% compliance during the sessions attended. The reasons expressed by participants for discontinuing included not liking their group assignment, work-family issues, joining a fitness center, severe side effects from treatment (e.g. cognitive deficits), and scheduling conflicts.

Participants ranged in age from 33 to 78 years old (mean = 52 years; SD = 9). The average height and weight were 164 cm (SD = 6) and 70 kg (SD = 12.8), respectively. The average body mass index was 26.3 (SD = 4.9), and average body fat percentage was 41.5 (SD = 5.7) as assessed by bioelectrical impedance at baseline. Almost half the women were married, (48%). Most were Caucasian (90%), had at least some college education (90%), were employed outside the home (65%), and had household incomes above USD 40,000 (62%). All of the participants were diagnosed with stage 0–IIIb breast cancer and had received surgical treatment (61% lumpectomy, 33% mastectomy, 6% bilateral mastectomy). The majority also had received at least one additional treatment modality: chemotherapy (84%), radiation therapy (61%), or hormonal therapy (56%). Statistical comparisons, using independent t tests, showed no differences ($p > 0.05$) between participants in the two randomized groups on these baseline characteristics. An additional thorough review of participant records yielded no noticeable differences among the participants who withdrew from the study and participants who did not withdraw.

Functional Capacity

Aerobic Capacity—A 2×2 (condition by time) repeated-measures ANOVA, with total distance walked (meters) during the 6-min walk test as the dependent variable, revealed a time by condition interaction effect that approached conventional levels for statistical significance ($F_{1, 19} = 3.507$; $p = 0.077$), suggesting a trend. Follow-up repeated-measures ANOVAs, with the data split based on intervention assignment, showed significant improvements in distance walked across the 12-week period among the TCC participants ($F_{1, 10} = 5.733$; $p = 0.038$; mean change = 26.93; SD = 37.30; ES = 0.46), with decreases in distance walked among the PST group participants ($p > 0.05$; mean change = -1.35; SD = 31.23; ES = -0.02; fig. 1).

Baseline and postintervention means and confidence intervals for all functional capacity domains and QOL are provided in table 1.

Muscular Strength—A 2×2 (condition by time) repeated-measures ANOVA, with handgrip strength (kilograms) as the dependent variable, revealed a significant time by condition interaction ($F_{1, 19} = 9.144$; $p = 0.007$), as well as a significant time main effect ($F_{1, 19} = 4.256$; $p = 0.050$). Decomposition of interaction and main effects using follow-up repeated-measures ANOVAs, with the data split based on intervention assignment, indicated significant improvements in handgrip strength across the 12-week period in the TCC group ($F_{1, 10} = 10.034$; $p = 0.010$; mean change = 4.50; SD = 4.71; ES = 1.08), but not in the PST group which actually showed declines in handgrip strength ($p > 0.05$; mean change = -0.85; SD = 3.15; ES = -0.13).

Flexibility—A $2 \times 2 \times 5$ (condition by time by outcome) repeated-measures MANOVA, with flexion, extension, abduction, horizontal adduction, and horizontal abduction as the dependent variables, revealed a multivariate time by condition interaction that approached

statistical significance ($F_{1, 19} = 2.719$; Wilks' $\lambda = 0.061$), suggesting a trend, as well as a significant multivariate time main effect ($F_{1, 19} = 14.524$; Wilks' $\lambda = 0.000$). Further univariate analyses indicated significant time by condition interactions for extension ($F_{1, 10} = 8.530$; $p = 0.009$) and horizontal abduction ($F_{1, 10} = 6.832$; $p = 0.017$), along with significant time main effects for flexion ($F_{1, 10} = 14.831$; $p = 0.001$), extension ($F_{1, 10} = 26.270$; $p = 0.000$), abduction ($F_{1, 10} = 32.658$; $p = 0.000$), horizontal adduction ($F_{1, 10} = 7.527$; $p = 0.013$), and horizontal abduction ($F_{1, 10} = 16.425$; $p = 0.001$).

Follow-up repeated-measures ANOVAs, with the data split based on intervention assignment, were also conducted. These measures showed significant improvements across the 12-week period among the TCC participants in flexion ($F_{1, 10} = 12.965$; $p = 0.005$; mean change = 16.18; SD = 14.91; ES = 1.4), extension ($F_{1, 10} = 34.665$; $p = 0.000$; mean change = 25.55; SD = 14.39; ES = 2.3), abduction ($F_{1, 10} = 17.185$; $p = 0.002$; mean change = 15.81; SD = 12.66; ES = 1.2), horizontal adduction ($F_{1, 10} = 6.612$; $p = 0.028$; mean change = 5.64; SD = 7.27; ES = 0.9), and horizontal abduction ($F_{1, 10} = 18.706$; $p = 0.002$; mean change = 12.05; SD = 9.24; ES = 1.2). The PST participants showed significant improvement in abduction only ($F_{1, 9} = 18.826$; $p = 0.002$; mean change = 10.80; SD = 7.87; ES = 0.17), with additional, but not statistically significant, improvements in flexion ($p > 0.05$; mean change = 6.30; SD = 11.40; ES = 0.64), extension ($p > 0.05$; mean change = 7.00; SD = 14.69; ES = 0.44), horizontal abduction ($p > 0.05$; mean change = 2.6; SD = 7.04; ES = 0.17), and horizontal adduction ($p > 0.05$; mean change = 2.60; SD = 6.39; ES = 0.09).

Quality of Life—A 2×3 (condition by time) repeated-measures ANCOVA, with QOL 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 QOL across the 12-week period among the TCC participants ($F_{2, 9} = 4.34$; $p = 0.03$), but not in 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 QOL 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, the TCC participants reported improvements in QOL at 6 and 12 weeks, while the PST participants reported decreases in QOL at both assessment times.

Discussion

The results of this preliminary investigation suggest that TCC has a positive influence on functional capacity and QOL in women of all ages (33–78) following treatment for breast cancer. The TCC group demonstrated significant improvements at 6 and 12 weeks in aerobic capacity, muscular strength, flexibility, and QOL even in a relatively small sample size of breast cancer survivors. The TCC group had excellent adherence and attendance rates compared to other exercise programs reported in the literature. This suggests that the novel integrative exercise modes have a potential to meet the unique needs of breast cancer survivors and lead to improvements in both physical and emotional well-being domains. More research is warranted given these positive findings in a small group of survivors on the efficacy of TCC for improving other common side effects associated with cancer and its treatments (i.e. depression, anxiety, distress and sleep disturbance).

In contrast, the PST group showed declines at 12 weeks in aerobic capacity and muscular fitness, with significant improvement in abduction and nonsignificant improvements in all other areas of flexibility. The PST group also showed declines in QOL. These findings support and expand previous research showing benefits from exercise following cancer

treatments [2–6, 12, 13, 17–26] and suggest that groups that provide social supportive environment for breast cancer survivors might not be as sufficient to address the multiple and complex physical and emotional needs of cancer survivors.

In conclusion, these results provide preliminary evidence that TCC may improve aerobic capacity, muscular strength, and flexibility among cancer survivors as well as QOL. These data suggest that TCC has strong potential as a post-treatment rehabilitative modality for improving functional capacity and facilitating the resumption of an optimal QOL among breast cancer survivors. It is unclear from this pilot intervention which part of the group provided the most benefit (e.g. social interaction, mindfulness components, physical activity). Additional research with a larger sample is needed to further delineate the positive effects of TCC among cancer survivors. Future research should examine the possibility of developing a TCC exercise program for breast cancer patients undergoing treatment given the low intensity of the intervention, the high adherence rates, lack of side effects and positive impact on domains of functional capacity and QOL.

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Fig. 1.
Comparison between TCC and PST in mean change from baseline to week 12 in total distance walked.

Table 1

Means and 95% confidence intervals at baseline and 12 weeks for aerobic capacity, strength, flexibility, and QOL

	Mean at baseline			Mean at 12 weeks		
	TCC (n = 11)		PST (n = 10)		TCC (n = 11)	
	mean	CI	mean	CI	mean	CI
Aerobic capacity (total distance walked), m	609.1	564.0–654.3	611.6	555.1–668.3	636.12	602.7–669.5
Strength, kg	24.5	21.7–28.7	27.5	22.7–32.3	29.6	27.4–32.0
Flexibility, degrees						
Flexion	128.1	116.3–140.1	125.8	116.9–134.7	144.3	135.1–153.6
Extension	43.3	35.7–50.9	44.4	36.3–52.4	68.9	60.2–77.6
Abduction	158.4	144.9–172.1	154.2	140.5–167.8	174.2	165.9–182.8
Horizontal adduction	26.8	21.3–32.5	23.7	19.9–27.4	38.9	32.6–45.2
Horizontal abduction	97.8	88.9–106.7	96.2	87.6–104.7	103.4	97.1–109.9
QOL	107.5	92.7–122.3	124.7	112.7–136.8	121.7	107.7–135.8
					124.3	108.2–140.3