

Effects of Kyusho Jitsu on Physical Activity-levels and Quality of Life in Breast Cancer Patients

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Abstract. *Background/Aim: Breast cancer survivors often report a decrease in physical activity levels and quality of life. The aim of this study was to explore whether a “Kyusho Jitsu” martial arts intervention is feasible and can improve general well-being and physical activity levels in breast cancer survivors. Materials and Methods: Breast cancer survivors (N=51) were randomly assigned to the intervention or control group. The intervention group participated in a 24-week Kyusho Jitsu intervention. Both groups were assessed at baseline, 3, and 6 months. Results: Analysis of original data showed several significant improvements in favor of the intervention group, but also some of the control group. Sensitivity analysis supports these findings. No adverse events were observed. Conclusion: To our knowledge this is the first study showing that a holistic Kyusho Jitsu martial arts intervention can be feasible and effective for breast cancer survivors.*

Currently, breast cancer affects approximately 12% of all women (1) and is by far the most common female cancer (23% of all cancers) (2). With a 5-year survival rate of almost 90% (3) there is an increased focus on enhancing survivorship care. Over the past few years, medical treatments have improved rapidly with a wide range of different therapy options available. However, there are numerous acute as well as chronic treatment-related side

effects. Patients experience physical (4), psychological (5) and psychosocial impairments. Impaired upper extremity range of motion, low physical activity level, lymphedema, fatigue, pain, depression and chemotherapy-induced peripheral neuropathy (CIPN) are well-documented (6-10), which negatively affect quality of life (11). In the past few years numerous studies have shown that exercise programs can significantly improve treatment-related side effects such as lymphedema and fatigue (12, 13). Different training protocols have been evaluated, however only few studies have investigated the influence of martial arts interventions in the prevention of mental disorders (14) or the rehabilitation of cancer (15), in particular breast cancer (16, 17). These studies found, that martial arts interventions are not only feasible and acceptable (15) but may also reduce stress, anxiety, and depression, and improve general psychosocial well-being (14). One study even found a significant reduction in one of the most common side-effects of breast cancer treatment: fatigue (16). To further explore the effects of martial arts interventions in breast cancer patients, this study was designed and conducted to assess the feasibility of a “Kyusho Jitsu”-based intervention.

Materials and Methods

This feasibility study was a prospective, randomized-controlled two-armed intervention trial. A total of 51 female breast cancer patients were randomly assigned to the intervention or the control group. The exercise intervention consisted of a 24-week holistic training program which was based on “Kyusho Jitsu” martial arts, “the art of vital points”. The study was conducted under consideration of the “Declaration of Helsinki” (18). It was approved by the human research ethical committee of the German University of Sports Cologne and was registered in the German Clinical Trials Register (DRKS-ID: DRKS00011245).

The sample size for this pilot study was estimated based on infrastructural capacity and human resources. A maximum of 60 patients could have been included in the study. Participants were recruited *via* local newspaper advertisement between 16th of June

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Table I. Baseline characteristics of the intervention and control group.

	Intervention (n=30)	Control (n=21)	p-Value
Age (years)	54.2±7.8 (n=30)	51.5±8.4 (n=21)	0.244
Time since diagnosis (months)	48.3±44.4 (n=29)	39.8±34.5 (n=21)	0.466
Chemotherapy (%)	14 (48%. n=29)	15 (71%. n=21)	0.102
Radiotherapy (%)	23 (77%. n=30)	17 (81%. n=21)	0.714
Surgery (%)	29 (100%. n=29)	21 (100%. n=21)	NA
Hormone treatment (%)	21 (71%. n=29)	15 (72%. n=21)	0.939
Antibodies	4 (15%. n=26)	2 (11%. n=18)	0.685

2014 and 9th of September 2014. In order to take part in the study, participants had to be female breast cancer patients, aged 18 years or older, and within six months of completing medical treatment (excluding hormone treatment). All patients had to provide written consent before they were enrolled into the study. Patients were excluded from the study if they had a metastatic disease, underwent surgery or chemotherapy in the past 6 months, had a severe medical condition that could place the participant at unreasonable risk of injury or illness caused by the exercise program.

Patients in both groups were asked to complete a demographic and health history questionnaire. Additionally, we defined adverse events as any physical injury or harm that was caused by the intervention. Finally, feasibility was determined based on the dropout rate (<30%) or reporting of adverse events (none). The primary aim of the study was to determine the feasibility of the “Kyusho Jitsu” martial arts intervention. The secondary outcomes included health-related quality of life and physical activity behaviour. All outcomes were assessed at baseline, after 12 weeks (T1) and after 24 weeks (T2).

Health-related quality of life was assessed using the EORTC (European Organization for Research and Treatment of Cancer) Quality-of-Life Questionnaire “QLQ-C30” and its breast cancer specific module “QLQ-BR 23” (19). Physical activity levels were assessed using the 16-item GPAQ (Global Physical Activity Questionnaire) (20), which collects information on physical activity behavior in three different settings (activity at work, travel to and from places, recreational activities) as well as sedentary behavior. The reported activity levels were converted into metabolic equivalents (MET).

The exercise intervention involved a 24-week holistic training program which was based on “Kyusho Jitsu” martial arts, “the art of vital points”. Participants were asked to attend two exercise sessions per week for 90 minutes each. The training included several aspects of martial arts as well as self-defence, body related cognition, breathing exercise, meditation, stretching and physical strengthening. In addition, Kyusho Jitsu uses different techniques of Tai Chi and Qi Gong. The training was split up into two main parts, a warm-up phase and a martial arts phase. The intention of the 45-minute warm-up session was not only to improve physical fitness but also to ensure correct techniques and improve patients overall exercise expertise. The warm-up included coordination, mobilisation (upper body focus), strengthening and aerobic exercises. It also incorporated trust building exercises to promote psychological well-being and anxiety management. The second section was split up into three subparts: Kyusho Jitsu Training (20

minutes), Katha (continuous fight sequence for about 5 minutes) and meditation (15 minutes). The duration of the exercises varied between individuals. The third and last subpart of the second section involved a mediation ritual during which patients were able to relax and strengthen their vital points (based on the body “meridians” from the Chinese medicine). The training sessions took place at the German Sport University Cologne and were supervised by professional instructors. Patients in the control group received no Kyusho Jitsu intervention.

Ethics approval and consent to participate. Ethics Approval/ Approval of the Ethics Committee: Approved (leading) Ethics Committee, German University of Sports Cologne (Prof. Meinberg).

Statistical analysis. Patient characteristics were described using mean±standard deviation (SD) or median (interquartile range (IQR)) and count (percentage), as appropriate. Potential baseline differences between groups in age and time since diagnosis were investigated using separate independent *t*-tests. Differences in cancer treatments (surgery, chemotherapy, radiation, hormone treatment, antibody therapy) were analyzed using Chi-square test. Normal distribution of dependent variables was tested with the Kolmogorov-Smirnov test. The original data was analyzed using the Wilcoxon-Test (between Baseline and 3 months, between 3 months and 6 months, between 3 months and 6 months) with a significance level of $\alpha=5%$, two-sided. We used the Mann-Whitney *U*-test (deviation of 3 months and baseline, 6 months and baseline). Results are presented as mean±SD, median (IQR) or mean difference and 95% confidence interval (CI), respectively, and absolute and relative frequencies. The analysis was done using SPSS Statistics 24 (IBM Corp., Armonk, NY, USA).

Results

A total of 60 patients were enrolled in the study. Nine women did not attend the first assessment session, leaving 51 patients in total: 30 patients in the intervention group and 21 patients in the control group. Both groups were comparable with regard to the most relevant clinical data at baseline (Table I). However, patients in the control group were slightly younger.

Overall, 19 women dropped-out of the study between baseline and the first follow-up assessment (3 months). Another two patients dropped out between the first and

Table II. Original Data from the EORTC QLQ-C30 (mean±s.d.) in the intervention and the control group and the results of the INTRA group comparison (Wilcoxon-test).

EORTC-QLQ-C30 parameters	Group	Baseline	3 months	6 months	p-Value (intragroup) from baseline to 3 months	p-Value (intragroup) from 3 months to 6 months	p-Value (intragroup) from baseline to 6 months
Global quality of life (Q:29.30)	Intervention	58.33±14.60	68.75±13.44	70.83±15.52	0.06	0.43	0.01
	Control	64.29±14.94	67.42±16.01	61.54±21.93	0.86	0.52	0.82
Physical functioning (Q:1-5)	Intervention	81.61±10.79	82.50±10.29	84.58±12.35	0.53	0.20	0.72
	Control	89.12±11.16	89.09±13.42	87.78±11.31	0.07	0.10	0.20
Role functioning (Q:6-7)	Intervention	62.07±25.93	68.75±19.12	71.88±21.70	0.25	0.89	0.10
	Control	73.81±29.14	69.70±34.82	70.51±28.18	0.92	0.85	1.00
Emotional functioning (Q:21-24)	Intervention	50.00±21.36	52.78±19.07	69.27±20.35	0.65	0.01	<0.01
	Control	53.97±23.22	54.55±29.90	58.33±24.30	0.13	0.37	0.08
Cognitive functioning (Q:20.25)	Intervention	67.24±20.16	68.89±21.70	71.11±22.24	0.48	0.43	0.61
	Control	66.67±28.38	66.67±31.62	71.79±24.89	0.80	0.08	0.18
Social functioning (Q:26-27)	Intervention	60.92±22.39	71.88±20.83	77.78±19.59	0.23	0.55	0.05
	Control	61.11±33.47	74.24±23.99	73.08±32.30	0.01	0.77	0.03
Fatigue (Q:10.12.18)	Intervention	50.96±20.68	42.36±24.42	36.30±17.55	0.04	0.08	0.01
	Control	38.62±26.67	36.36±22.82	38.46±27.07	0.67	0.76	0.78
Nausea and vomiting (Q:14-15)	Intervention	8.62±20.23	6.25±10.32	3.13±9.07	1.00	0.56	0.71
	Control	5.56±10.97	4.55±7.78	7.69±11.00	0.08	0.18	0.74
Pain (Q:9.19)	Intervention	45.83±26.30	29.17±27.55	26.04±21.05	0.01	0.93	<0.01
	Control	35.71±29.00	25.76±21.56	30.77±31.07	0.26	0.67	0.28
Dyspnea (Q:8)	Intervention	25.29±24.65	22.92±20.07	25.00±25.82	0.32	1.00	0.26
	Control	28.57±30.34	12.12±22.47	25.64±27.74	0.21	0.26	0.41
Insomnia (Q:11)	Intervention	47.13±36.21	47.92±34.36	50.00±34.43	0.53	1.00	1.00
	Control	46.03±32.45	33.33±33.33	46.15±34.80	0.08	0.48	0.37
Appetite loss (Q:13)	Intervention	8.05±19.22	8.33±19.25	2.08±8.33	0.41	0.32	0.56
	Control	9.52±21.46	3.03±10.05	15.38±25.88	0.41	0.19	0.89
Constipation (Q:16)	Intervention	10.71±22.32	6.25±13.44	4.17±11.39	0.41	1.00	0.33
	Control	3.17±10.03	0.00±0.00	8.33±15.08	0.32	0.16	0.56
Diarrhoea (Q:17)	Intervention	8.05±26.21	14.58±24.25	12.50±29.50	0.45	1.00	0.18
	Control	11.11±19.25	9.09±15.57	15.38±25.88	1.00	0.41	0.46
Financial problems (Q:28)	Intervention	19.54±31.52	6.25±18.13	8.89±19.79	0.05	0.32	0.56
	Control	34.92±41.47	24.24±33.63	25.64±33.76	0.04	0.71	0.03

second follow-up assessment (6 months). In total 14 patients in the intervention group and 7 patients in the control group discontinued their participation in the study due to personal or medical reasons. No adverse events were observed. On average patients in the intervention group attended 67% of the training sessions.

Quality of life. Quality of life (EORTC QLQ-C30) analysis of original data showed significant improvements in quality of life ($p=0.01$), emotional functioning ($p<0.01$), social functioning ($p=0.05$), fatigue ($p=0.01$) and pain ($p<0.01$) from baseline to 6 months all in favor of the intervention group. Furthermore, significant improvements could be observed in social functioning ($p=0.03$) and financial problems ($p=0.03$) from baseline to 6 months in favor of the control group (Table II). Results of the breast cancer-specific EORTC QLQ-BR23 questionnaire showed a significant

difference in breast symptoms ($p=0.01$) and arm symptoms ($p=0.01$) from baseline to 6 months in favor of the intervention group (Table III).

Level of physical activity. The analysis of the original data showed significant improvements in vigorous recreational activity ($p=0.03$) from baseline to 6 months in favor of the intervention group. However, we observed a significant reduction in sedentary behavior ($p=0.03$) from baseline to 3 months in favor of the control group (Table IV).

Discussion

When designing this randomized controlled two-armed intervention study we hypothesized that a holistic training program which is based on “Kyusho Jitsu” martial arts and lasts for 24 weeks is feasible and will have a positive effect

Table III. Original Data from the EORTC BR 23 (mean±s.d.) in the intervention and the control group and the results of the INTRA group comparison (Wilcoxon-test).

EORTC-BR-23 parameters	Group	Baseline	3 months	6 months	p-Value (intragroup) from baseline to 3 months	p-Value (intragroup) from 3 months to 6 months	p-Value (intragroup) from baseline to 6 months
Body image (Q:9-12)	Intervention	60.63±27.27	63.02±24.90	71.35±27.72	0.23	0.04	0.16
	Control	61.11±31.22	69.17±23.59	76.39±25.58	0.02	0.39	0.01
Sexual functioning (Q:14.15)	Intervention	66.67±27.59	65.63±23.94	71.11±27.79	1.00	0.12	0.32
	Control	60.83±30.72	68.18±27.34	65.38±26.75	0.17	0.79	0.25
Sexual enjoyment (Q:16)	Intervention	29.17±16.67	33.33±27.22	33.33±37.27	0.71	0.48	0.65
	Control	28.89±24.77	22.22±17.21	33.33±35.63	0.32	1.00	0.65
Future perspective (Q:13)	Intervention	47.13±32.75	50.00±29.81	60.42±32.70	1.00	0.18	0.25
	Control	41.27±27.70	45.45±30.81	46.15±28.99	0.21	0.65	0.16
Systematic therapy side-effects (Q: 1-4.6.7.8)	Intervention	30.71±13.02	27.84±11.14	28.57±9.86	0.20	0.67	0.30
	Control	37.34±23.98	32.86±17.31	32.94±18.66	0.18	0.67	0.48
Breast symptoms (Q:20-23)	Intervention	30.75±23.16	25.00±16.67	20.31±16.66	0.04	0.16	0.01
	Control	24.58±20.67	21.97±18.36	25.64±20.26	0.72	0.55	0.89
Arm symptoms (Q:17.18.19)	Intervention	38.89±29.08	28.47±24.67	23.61±25.94	0.10	0.39	0.01
	Control	33.86±27.32	33.33±25.34	34.19±24.62	0.64	0.77	0.57
Hair loss (Q:5)	Intervention	52.63±33.91	58.33±34.50	30.00±29.19	0.26	0.05	0.27
	Control	40.00±40.98	41.67±50.00	50.00±43.03	0.32	1.00	0.32

Table IV. Original Data from the QPAQ (mean±s.d.) in the intervention and the control group and the results of the INTRA group comparison (Wilcoxon-test).

GPAQ-parameters	Group	Baseline	3 months	6 months	p-Value (intragroup) from baseline to 3 months	p-Value (intragroup) from 3 months to 6 months	p-Value (intragroup) from baseline to 6 months
Total Physical Activity MET-minutes/week	Intervention	4766.37±4527.56	5406.67±4100.85	6458.75±5407.88	0.14	0.35	0.09
	Control	5081.90±4606.44	6324.44±4867.30	4675.71±4836.74	0.64	0.31	0.97
MET value of vigorous work activity per week	Intervention	1166.90±3073.31	53.33±206.56	405.00±1496.80	0.14	0.65	0.25
	Control	342.86±1571.17	2240.00±3779.52	960.00±3082.14	0.11	0.59	0.65
MET value of moderate work activity per week	Intervention	1065.00±1661.46	1587.50±2516.62	2032.50±2466.08	0.54	0.29	0.24
	Control	1365.71±1868.14	960.00±1428.96	857.14±1508.27	0.75	0.07	0.44
MET value of transport activity per week	Intervention	950.76±1102.39	1743.75±1622.92	1453.75±1634.28	0.65	0.42	1.00
	Control	1519.05±1970.91	901.82±1040.98	900.00±885.92	0.23	0.68	0.35
MET value of vigorous recreational activity per week	Intervention	638.57±643.37	1302.50±2396.89	1432.50±1080.86	0.88	0.43	0.03
	Control	1388.57±1644.34	981.82±1009.45	1397.14±2496.64	0.63	0.94	0.59
MET value of moderate recreational activity per week	Intervention	782.76±774.89	1367.50±1323.06	1135.00±841.86	0.01	0.67	0.06
	Control	465.71±418.15	649.09±475.43	561.43±658.79	0.72	0.77	0.88
Minutes spent in sedentary activities on average per day	Intervention	310.34±171.27	320.63±161.26	29.38±170.14	0.38	0.53	0.84
	Control	393.00±144.66	318.18±195.90	325.71±222.60	0.03	0.30	0.13

on physical activity levels and health-related quality of life in breast cancer survivors. To our knowledge this is the first study showing that a targeted Kyusho Jitsu martial arts intervention is safe, feasible and can be effective for breast cancer survivors. However, this may only be applicable for women who are willing to commit their time and can identify with the intervention. A significant effect was detected in favor

of the intervention over six months, that support the findings of Sprod and colleagues who suggest that martial arts, in their case tai chi chuan, may improve health-related quality of life (21). Irwin and colleagues suggest that tai chi can counteract treatment-related side effects, such as insomnia (22). The findings of Larkey and colleagues, that martial arts interventions may decrease fatigue, the most commonly

experienced side effect, were also supported (16, 23). Further, it may lead to improvements in overall quality of life (24) and psychological well-being (14). The current literature suggests that breast cancer patients reduce their physical activity levels during medical treatment and they often remain low thereafter (25), which increases the risk of cardiovascular diseases and impaired QoL (26). A significant improvement in physical activity level was observed in our study, suggesting that a martial arts intervention has the capability to motivate breast cancer patients to change their physical activity behavior. Hence the overall time being active per week was not only increased through the intervention itself, but also through the recreational time spent active. The perceived improvements in quality of life and fatigue may have encouraged patients to exercise outside of the supervised training program to further improve their wellbeing. During recreation, individuals tend to select activities that they enjoy doing. This individual training has been found to have a more sustainable impact on physical activity levels in breast cancer patients (27).

The strength of this study is that it is the first randomized, controlled, supervised Kyusho Jitsu-based martial arts study in breast cancer survivors. The groups were comparable at baseline with regard to all clinical data, however the control group was significantly younger. In addition, we observed a significant difference at baseline between both groups in physical functioning and fatigue which could have modified the observed improvement in the intervention group. The high drop-out rate of 42% is certainly a limitation of this study because the time commitment was not feasible for nine out of 21 drop-outs. Since no adverse events occurred, we propose that the intervention is feasible despite the drop-out rate. This study was intentionally designed as a cross-over study, however due to the high drop-out rate before and after the cross-over, the study was discontinued. Previous martial arts studies have also reported relatively high drop-out rates, suggesting that these type of interventions are not suitable for everyone (17, 16). This applies to our study as well. The high drop-out rate may also be due to the fact that Kyusho Jitsu is a very unique sort of martial arts and not everyone can identify with the training regime. On the other hand, eleven patients joined a Kyusho Jitsu club after the study. A further limitation of this study is the small sample size, which increases the source of error (small variations and early drop outs had a huge impact on the scores). In addition, the exercise intervention was hard to standardize because the training tailored to each individual.

To summarize, our prospective, randomized-controlled two-armed intervention study suggests that a targeted martial arts intervention can support the well-being of breast cancer survivors by improving quality of life and emotional functioning and reducing fatigue. It can also enhance physical recovery by improving and stabilizing physical activity levels in breast cancer patients.

Conflicts of Interest

The Authors declare that they have no competing interests.

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