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Research

The Impact of Dragon Boating on Fatigue for Breast Cancer Survivors

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Received date: February 11, 2021; Accepted Date: March 20 2021; Published Date: March 31, 2021

Citation: Suzanne Denieffe, Margaret Denny, Constantino Fiuza-Castineira**.** The Impact of Dragon Boating on Fatigue for Breast Cancer Survivors, *J. Psychology and Mental Health Care*. 5(1). DOI: 10.31579/2637-8892/103

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Abstract

Background: Fatigue following treatment for breast cancer has a profound impact on quality of life. Dragon boating is known to be beneficial because of its networking and social function.

Objective: The objective of this study was to explore the effects of dragon boating on fatigue and health related quality of life.

Intervention/Methods: Individual and Family Self-Management Theory guided the study. The methodology was a multiple point cohort panel design. Data were collected from breast cancer survivors (n=26) to measure fatigue, quality of life and upper arm functioning at the beginning of the racing season timepoint 1 (T_1), midway through the programme, timepoint 2 (T_2), and at the end of the dragon boat season, timepoint 3 (T_3).

Results: Fatigue levels fell significantly between $T_1$and T_2 ($p<.033$) and from T_2 to T_3 ($p<.048$). Similarly, upper limb functioning improved from T_1 to T_2 ($p<.002$), but showed no significant change between T_2 andT_3 ($p<.58$). Fatigue was significantly related to quality of life at each time point.

Conclusion: While this was a small scale study, the findings suggest that dragon boating appears to have beneficial effects on well-being including reduction of fatigue, which impacts on health related quality of life for women post breast cancer.

Implications for Practice: This study confirms the benefits of dragon boating in upper limb functioning and reduction of fatigue. Health care professionals could advise cancer survivors on the benefits of dragon boating exercise, post cancer treatment.

Keywords: dragon boating; fatigue; breast cancer survivors

Background

Breast cancer is recognised as the second most common cancer, with over 1.7 million new cases diagnosed each year[1.] The estimated survival rate for breast cancer is five years (over 87%) from time of diagnosis.[2] However, cancer survivors may be left with debilitating side effects. One of the most common of these side effects is cancer related fatigue (CrF), with estimates of prevalence of fatigue ranging from 30% of survivors experiencing moderate=severe fatigue in survivorship[3] to 70-90% experiencing fatigue.[4] CrF can be defined as a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning.[5] CrF has been described in the literature as a multidimensional construct having physical, cognitive and emotional factors[6] and impacts on quality of life, as CrF may also predict shorter overall cancer survival.[7-8]

Hence, there is a need to use evidence based interventions to help with the management and treatment of this fatigue. Exercise, which includes personalised physical activity, is now generally accepted as a primary intervention for the management of CrF[5,9,10-11]. A recent meta-analysis of 42 studies,[12] carried out on 3816 cancer survivors reported moderate intensity aerobic exercise was safe and effective for reducing CrF (SMD, 0.32, 95% CI 0.22 to 0.40). Similar results were reported by Tian,Lu, Lin et al,[13] who reported exercise to be more effective than conventional care in improving fatigue in cancer survivors (SMD, -0.22, 95% CI -0.39 to -0.04). The benefits of exercise are therefore verified by a number of randomised controlled studies (RCTs) and systematic reviews,[8-9, 14-15] which showed a positive effect on fatigue reduction.

Nonetheless, it seems that breast cancer survivors are remaining physically inactive.[16] The Clinical Oncology Society of Australia released a position statement calling for exercise to be prescribed as part of routine cancer care. In addition, cancer patients should be referred to exercise

specialists with experience in cancer care[17]. Leclerc et al[18] and Swartz et al[19] highlight the benefits of multi-disciplinary interventions for breast cancer survivors that have a community based focus. They suggest that such rehabilitation programmes create a public health impact and enhance accessibility to more cancer survivors.

While exercise to reduce fatigue can be undertaken on an individual and/or group basis, it has been shown that group exercise in breast cancer survivors is successful, in part because of the networking and social function of such exercise groups.[20] Dragon boating is one such community and group based exercise form that has been shown to be popular in women post breast cancer.[21] Dragon boating is thought to have originated as a Chinese ritual during the 4th Century BC. As described by the International Dragon Boat Federation[21] it involves strenuous, repetitive upper body exercise as 18-22 team-mates propel a 12 metre long boat through the water and may be led by a drummer to keep the paddling rhythm regular. Dragon boat racing has been used with breast cancer survivors since 1996, with over 210 breast cancer dragon boat teams now in existence over 23 different countries.[21]

Initial literature on dragon boating had concerned itself with the possible harm that boating could do to women who had surgery for breast cancer and concluded that it did no harm.[22-25] Further studies on women who participated in dragon boat racing showed that it led to feelings of camaraderie, team spirit, a sense of renewed fitness, health, enhanced self-confidence and control of one's life.[26-31] Hence, while studies have shown that dragon boat racing has many beneficial effects on quality of life,[32-35] there is limited quantitative research that studied the impact of dragon boat racing for cancer survivors on fatigue and quality of life.[26,35]

Theoretical Framework

The theoretical framework informing the study was the Individual and Family Self-Management Theory[36]. This theory proposes that self-management involves individuals or families assuming responsibility for the management of chronic conditions, by purposefully performing a cluster of behaviours. Self-management in this theory is seen as a complex dynamic phenomenon consisting of three dimensions: context, process, and outcomes. Outcomes can be proximal or distal [36]. Table 1 details the application of the theory elements to the study and identification of the variables to be measured.

Theory Elements	Elements Application
Context	Condition: Post Cancer Survivors: Physical Social Environment: Dragon Boating Individual: Adults post cancer
Process	Knowledge and Beliefs : Exercise and Cancer Outcome expectancy- Self Regulation: Participation in Dragon Boating Social Facilitation: Dragon Boat Peer Group
Outcomes Proximal	Self-Management Behaviour: Ongoing participation in Dragon Boating
Outcomes Distal Study Objectives	Quality of Life: measured by EORTC - Health Status : Fatigue measured by FACT-F Upper Limb functioning- Measured by Quick-DASH

Table 1: Application of the Individual and Family Self -Management Theory to the Study

The aim of the study was to explore the effects of dragon boating on fatigue, limb functioning and quality of life in survivors of breast cancer.

The research objectives were to:

1. Assess the impact of dragon boating on participants' fatigue levels over a boating season using the FACT-F;
2. Examine participants' perceptions of upper limb functioning over a boating season using the Quick Dash;
3. Examine the changes in the participants' health related quality of life over a boating season using the EORTC.

A prospective observational design was employed to meet the study aim and objectives. This design involves the sampling of a group of participants and measures variables of interest at more than one point in time[37].

Study Sample

The population of interest were women who had been treated for breast cancer and who were taking part in Dragon Boat Racing. The sampling method was purposive, with inclusion criteria being that the person had a previous diagnosis of cancer. There were no exclusion criteria. Ethical approval was obtained from the relevant research ethics boards. Following Ethical Review Board approval, women taking part in the dragon boating activity across three Dragon Boating Groups in the South of Ireland, were approached by the researchers and invited to a brief presentation about the study. The participants received a research information sheet and were invited to participate.

Data Collection

Date were collected through the use of validated self-report instruments to measure fatigue and HRQOL over the course of a Dragon boating season- March to October, with time-point 1; T_1, at the beginning of season, time-point 2; T_2, midway and time-point 3; T_3, on season completion. The T1, T2 and T3 assessments were collected from all study participants at the same time.

Fatigue

Fatigue was assessed using the Functional Assessment of Cancer Fatigue-Therapy Questionnaire.[38] This is a 13 item scale. Scoring Responses to the items are on a 5- point scale ranging from '0' (not at all) to '4' (very much). Scores on items are summed to give a single total fatigue score. Downie et al[39] suggested a cut-off score of 9-22 for mild fatigue, 23-36 for the presence of moderate fatigue and above 37 for severe fatigue. Cella et al (2002) identified 3.0 as a clinical important difference change for this scale.

Health Related Quality of Life

HRQOL was assessed using the EORTC-QLC Core 30. The European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire C30 Version 3 (EORTC QLQ-C30), was specifically designed for use in cancer patients and clinical research. [40] It consists of 30 items that make up both multi-item scales and single item measures.[40] Scales used in this study included the global quality of life scale and the five functional scales (physical, role, emotional, cognitive and social).

A high score on the global QOL scale represents a high level of functioning and quality of life. According to Fayers and Machin[41] the global health status / QOL scale should be used as the overall summary measure for HRQOL status. In accordance with this recommendation, the global HR QOL score was used to interpret overall level of health related QoL in the study.

Limb Functioning

Perceived upper limb functioning was assessed using the Quick Disabilities of the Arm, Shoulder and Hand (Quick DASH), Questionnaire.[42] This is an 11 item questionnaire that asks about arm symptoms as well as assessing ability to perform certain activities (Scored 0-4). The assigned values for all completed responses are summed and averaged. A higher score indicates greater disability. The minimal clinically important difference (MCID) has been identified as 8.0 points.

Reliability of the Tools

The reliability of the tools was assessed using Cronbach's Alpha (Table 2).

Scale	Number of items	Cronbach's α
FACT-F	13	0.91
QuickDASH	11	0.80
EORTC subscales		
Global health status	2	0.90
Physical Functioning	5	0.70
Role Functioning	2	0.90
Emotional Functioning	4	0.80
Cognitive Functioning	2	0.60
Social Functioning	2	0.80

Table2: Reliability of the Tools

Socio-Demographic Information

Socio-demographic information was also obtained including age, marital status and duration of time since completion of treatment.

Dragon Boating Procedure

The dragon boating exercise was conducted in boats which held 10 rows of two per seat with a steer person in the back and a drummer / caller in the front.

Study findings

Recruitment took place over an 8 month period (1/3/16 – 15/10/2016). Thirty-eight women completed questionnaires at T1, 40 completed at T2 and 39 at T3. Only 26 women completed questionnaires at all three time points and there were 23 women with only two data time points. This group were referred to as the incomplete data group. Statistical differences between those women who provided completed data (questionnaires for T_1,T_2, and T_3 points were compared with those women who provided data at only T_1 or T_2, using independent two tailed t tests for the continuous variables of age and fatigue. Using Chi square analysis, the retained (n=26) and the incomplete data group (n= 23) were not statistically different with respect to age (t (47) = 0.7, p=.48), fatigue (t (47) = 0.67, p=.5. Three dragon boating groups were involved in the study with 5 participants from group one, 11 from group 2 and 10 from group three.

The socio-demographic and clinical characteristics of the study participants who were retained at all time-points are summarized in Table 3. The total number of participants retained was 26 women, with ages ranging from 34-70 years (mean 54, SD 8.3). Most participants were in a relationship (61%, n=21), with 46% (n=12) in paid employment. Regarding cancer diagnosis, 38.6% reported being stage 1 on diagnosis, with the remainder having a stage 2 cancer on diagnosis. All women had surgery (100%), with 80.6% received radiotherapy, 67.8% received chemotherapy while 82% received hormone therapies, for example, aromatase inhibitors or tamoxifen. None of the women in the study reported a recurrence, metastasis or other change during the season. Of the sample, it was the first season of racing for 60%, 19.4% had attended the previous season while 20.4% had participated in three or more seasons. Most women (90.0%) participated in one on-water training session per week.

Variable		
Age (years)	Range 34-70	Mean 54.5 (SD 8.3)
Marital Status Married Widowed Separated Never Married	n (%) 16 (61.5) 2 (7.7) 2 (7.7) 5 (19.2)	
Employment Full-time	n (%) 5 (19.2)	

Part-time Unemployed Retired Housewife	7 (26.9) 4 (15.4) 9 (34.6) 1 (3.8)	
Time since treatment 4-12 months 13-24 months 25- 60 months <61 months	n (%) 7 (26.9) 7 (26.9) 9 (34.6) 3 (11.5)	
Cancer Stage at Diagnosis	Stage 1 - 38.6% Stage 2- 61.4%	
Treatments Received	Surgery- 100% Radiation Therapy- 80.6% Chemotherapy- 67.8% Hormonal Therapy-78% Non-specified Treatments- 4%	

Table 3: Socio-demographic Characteristics

Fatigue

The presence of fatigue, at the 3 time points, early in the racing season T_1, midway through season T_2 and at end of racing season T_3 was examined using the FACT- F, with a cut-off score of 9 indicating the presence of fatigue. As can be seen in Table 4 fatigue lessened over the timeframe of the study. When examined, using a Repeated Measures (RM)- ANOVA, mean fatigue scores differed significantly between time points ($F(2, 24) = 4.5$, $p= .005$). Post-hoc tests using a Bonferroni correction revealed that fatigue improved between $T_1$and T_2 (13.5+/- 11.4 vs 11.5 +/-9.8 respectively), which was statistically significant ($p= .033$). Fatigue scores at T_3 (10.1 +/- 9.3) were also significantly different to the scores at T_1 ($p= .015$) and T_2 ($p= .048$).

Spearman's correlation co-efficient was used to examine the relationships between fatigue level, age, and time since completion of treatment. No significant relationships were identified between age and fatigue and fatigue (T_1- .074, T2 -0.66, T3 -.066) or time since completion of treatment and fatigue (-.074). Likewise no relationship was found between stage of cancer on diagnosis or treatment type and fatigue levels.

Fatigue	**Time 1**	**Time 2**	**Time 3**	**RM -Anova**
Fatigue Scores * Mean (SD)	13.5(11.4)	11.5 (9.8)	10.1(9.3)	F(2, 24) = 4.5*
Meeting Cut-off* **n (%)**	14(53.8)	12(46.2)	8(30.8)	N/A
Graded n (%)* None Mild Moderate	 12 (46.2) 7 (26.9) 7 (26.9)	 14 (53.8) 7 (26.9) 5 (19.2)	 17 (65.4) 6 (23.1) 3 (11.5)	N/A
N/A- Test not applicable. * p= .005				

Table 4: Fatigue Measured using FACT-F

Health Related Quality of Life

Global HRQOL at the 3 time points, early in racing season T_1, midway through season T_2 and at end of racing season T_3 was examined using the Global Quality of Life Scale from the EORTC QoL C30 questionnaire. When examined, using a RM- ANOVA, Global HRQOL mean scores did not differ significantly between time points (T_1 73.0 (SD16.6), T_2 74.3(SD 15.3), T_3 74.65(SD15.8), $F(2, 24) = 1.74$, $p= .19$).

Likewise functional levels (physical, role, emotional , social and cognitive) showed no differences in levels between the time points when examined using a RM- ANOVA (Table 5).

QLQ-C30 Sub-scales	**T_1** **Mean (SD)**	**Time 2** **Mean (SD)**	**Time 3** **Mean (SD)**
Global Quality of Life*	73.0(16.6)	74.3 (15.3)	74.65 (15.8)
Functional Scales			
Physical	81.6 (12.7)	83.7 (15.8)	85.8 (12.6)
Role	82.1 (5.8)	86.0 (6.0)	88.2 (26.5)
Emotional	78.8 (22.1)	76.1 (22.3)	78.4 (20.3)
Social	84.9 (19.4)	84.9 (21.2)	82.2 (23.1)
Cognitive	80.7(9.9)	80.5 (4.4)	81.2 (2.1)
* $F(2, 24)=1.74$			

Table 5: EORTC Sub-scales

Pearson's correlation co-efficient was used to examine the relationships between fatigue level and global HRQOL at each time point and identified significant negative correlations T_1-0.855 (0.000), T_2 -0.807(0.000) and T_3 -0.651(0.000).

Upper Limb Functioning

Upper limb functioning at the 3 time points, was examined using the Quick DASH questionnaire. As can be seen in Table 6 limb functioning improved over the time-frame of the study, whereby lower scores indicate better functioning. When examined using a RM-ANOVA mean scores differed significantly between time points ($F(2, 24) = 8.1$, $p= 0.002$). Post-hoc tests using a Bonferroni correction revealed that upper limb functioning improved between T_1 and T_2 (5.92+/-6.0 vs 4.5 +/-5.5 respectively) which was statistically significant ($p= 0.002$). Upper limb functioning scores at T_3 (4.12 +/-4.9) were also significantly different to the scores at T_1 ($p= .002$) but not to the scores at T_2 ($p= .58$). However these change did not reflect a clinically important difference.

Upper Limb Functioning	**Time 1**	**Time 2**	**Time 3**	**ANOVA**
Quick DASH Scores Mean (SD)	5.9 (6.0)	4.5 (5.5)	4.12(4.9)	F(2, 24) = 8.1*
*p= 0.002				

Table 6: Upper Limb Functioning Measured using Quick DASH

Discussion on Findings

In line with the literature that suggests the beneficial effects of exercise for cancer survivors in terms of reducing fatigue,[3-4, 9,12-13,14-15] the findings of this study suggest that dragon boating, as an exercise mode, also appears to have beneficial effects. Dragon boating is becoming increasingly popular worldwide and as a community based group exercise option offers potential as an intervention for cancer survivors. Hence, in line with the self-management theory [36] dragon boating provides a condition specific physical and social environmental intervention that can have a risk reductive effect on cancer recurrence and therefore a protective effect on health.

Given that cancer-related fatigue is a common long term side effect for cancer survivors [3-4] the clinically important difference change is an important finding. It was seen in the results of this study that fatigue levels fell significantly between T_1 (early in boating season) and T_2 (mid-way through season) and again a significant fall in fatigue scores between T_2 and T_3 (end of season). Therefore, having an impact on a distal health status wellbeing outcome[36].

This study confirms the finding of Ray et al[26] who also found a decrease in fatigue over a dragon boating season. What is important to consider is that in this study over 50% of the women were fatigued at the commencement of the dragon boating season, with 25% experiencing moderate fatigue. Even on completion of the season over 30% were still experiencing fatigue.

Unfortunately, assessment and management of CrF is not always been incorporated into routine care ; this deficiency needs to be addressed particularly as CrF may also predict shorter overall cancer survival.[7] Despite the prevalence of CrF, it is still often undertreated and health care professionals often do not understand the extent of the distress and functional impairment such a disabling side effect can have on patients.[32,8] As CrF is often seen as an inevitable part of cancer and its treatment, clinicians and patients may not see the need to manage it.[32] Health professionals therefore need to be fully cognisant of the fatigue levels that their patients may be experiencing and explore this with them and discuss possible interventions. Nurses and other health professionals have a responsibility to explore exercise and other interventions to reduce fatigue and to identify those who may not be engaging in appropriate interventions for their fatigue. It is highly recommended [10,11,43-44] that health professionals ensure that personalised physical activity programmes are integrated in rehabilitation interventions for cancer survivors .

Global health related quality of life scores did not change significantly over the time periods but were generally quite high. This finding is in line with that of Ray et al[26,36] where the changes in health related quality of life did not represent a clinically significant change. It could be that the women participating in dragon boating are relatively well in survivorship, and hence evidence good levels of health related quality of life. However, quality of life was still negatively correlated with fatigue levels, in that as fatigue levels were higher and quality of life scores were lower.

This study examined upper arm functioning from the perspective of whether dragon boating could have beneficial effects as perceived by the participants. Findings showed that there was a significant difference between scores for limb functioning at T_1 when compared to time- T_2 but was not a clinically important difference (Mintken et al 2009). This could suggest that dragon boating brings about an improvement but only to a certain extent and thus the need for further study, perhaps using objective measurements rather than a reliance on subjective report measures. It could also suggest that limb functioning was not a clinical problem for this group and hence was not going to achieve a clinically significant change.

Limitations

The current study was a descriptive exploratory study with a small sample size. Cofounders, such as degree of participation in the dragon boating or other exercise taken were not controlled for. Hence, generalisations cannot be made.

Not having a control group was also a limitation of the study. Further research, under more controlled conditions and perhaps using a control group may be helpful. The inclusion of process elements of the Self-Management theory could be included in future research in this area, which was beyond the scope of this study. Ideally, a research study should include randomisation and controlling for the characteristics of the sample. In addition, a longitudinal study including collection of data outside of the non-dragon boating season could be undertaken.

Conclusion

This study set out to examine the impact of dragon boating on fatigue levels and quality of life in women breast cancer survivors over a dragon boating season using the Individual and Self-Management Theory to inform the study. While this was a small scale study, the findings suggest that dragon boating, as a rehabilitation intervention, appears to have beneficial outcomes, in helping to reduce reported fatigue and improve limb functioning in breast cancer survivors life.

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