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# BREAST CANCER SURVIVORS INVOLVED IN VIGOROUS TEAM PHYSICAL ACTIVITY: PSYCHOSOCIAL CORRELATES OF MAINTENANCE PARTICIPATION

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SUMMARY
Physical activity is increasingly being promoted as a means to achieve both physical and psychological benefits for cancer survivors. For women with breast cancer, one sport growing in popularity is dragon boating. The purpose of the present investigation was to examine the psychosocial correlates of dragon boat participation over the course of a season. Six crews completed the baseline (early-season) assessment (n=109) and late-season assessments (n=56). The self-report questionnaire completed at both time points included an assessment of the theory of planned behaviour variables, quality of life, cohesion, and physical activity levels. A prospective examination of the TPB variables revealed attitude at early season as the only significant predictor of behavioural intentions 12 weeks later at late season (R2 adjusted=0.27, p50.001). Overall, the group environment was cohesive at a level similar to that for female sport teams among the asymptomatic population. As well, participants' health-related quality of life was similar to normal, healthy women of similar age for both mental and physical health. Copyright # 2004 John Wiley & Sons, Ltd.

## INTRODUCTION

Based upon the evidence from a number of reviews, physical activity is being increasingly recommended as a potential therapy option in the rehabilitation of many cancers (Courneya, 2001; Courneya and Friedenreich, 1999a; Friedenreich and Courneya, 1996). These reviews indicate that exercise rehabilitation for cancer patients (on or off active treatment) results in improvements in both physical and psychosocial variables. While these findings are promising, Courneya

and Friedenreich (1997a, b) documented that the physical exercise levels of individuals with breast and colorectal cancers following treatment had decreased significantly from their pre-diagnosis levels. Further, pre-diagnosis levels of activity were not regained 1–4 years after treatment completion. For example, women with breast

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cancer were found to significantly decrease their levels of physical activity during the course of chemotherapy treatment (Demark-Wahnefried et al., 1997). Also, cancer patients who received usual care, were treated, and recovered were less active than they were before being diagnosed with cancer (Mock et al., 1997).

Whereas these observations are distressing given the known problems associated with physical inactivity for both asymptomatic and symptomatic individuals (U.S. Department of Health and Human Services (USDHHS), 1996), cancer investigators continue to advocate the use of physical activity as an ameliorative treatment and rehabilitative behaviour that has benefits throughout the cancer experience (Courneya and Friedenreich, 2001). A majority of this rapidly accumulating research evidence concerns the physical and psychological benefits that physical activity may afford for women with breast cancer (Pinto et al., 2003). For example, Segal and colleagues found that exercise improved physical functioning in breast cancer patients (Segal et al., 2001). Also, Schwartz (2000) and Schwartz et al. (2001) found

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that exercise reduced levels of daily fatigue as well as aided weight control in breast cancer patients on chemotherapy.

Much of this physical activity research has tended to focus on breast cancer patients closer to their diagnosis and treatment. Less is known about how breast cancer survivors manage to

include physical activity in their post-treatment lifestyles. Indeed, survivors may face similar difficulties in initiating and maintaining physical activity as asymptomatic adults (Brawley et al., 2002). Although independent participation in lifestyle activity is often examined among individuals recovering from disease (e.g. Brawley et al., 2003; Rejeski et al., 2003; King et al., 1997), another less frequently considered alternative is participation in a team sport.

A mode of physical activity that is unique in its growing popularity among individuals with cancer and particularly among breast cancer survivors is the team water sport of dragon boat racing. The sport combines aspects of teamwork with vigorous upper body physical activity. Twenty paddlers in the 18 m-long boat paddle in unison while racing the straight course in an assigned lane that can range from 250 to 1000 m. Obviously, such racing requires preparatory training. Beyond the fitness training, this participation has also been considered a form of support group for breast cancer survivors. There are currently 36 breast cancer teams in Canada. Participation has not only been found to promote fitness gains (Harris et al., 2000), but also psychosocial benefits.

However, the only theoretically based examination of the psychosocial effects of breast cancer survivors' participation in this type of physical activity has been Courneya and colleagues' (2001) use of the theory of planned behaviour (TPB: Ajzen, 1991) in a preliminary study of members of a single team. In this case study, Courneya et al. remedied some of the limitations of earlier physical activity and cancer studies based upon the TPB by utilizing a prospective design and improving measurement behaviour. They found that breast cancer survivors' participation in this team sport resulted in enhanced attitudes and confidence regarding personal physical abilities. Furthermore, variables in the TPB model accounted for 49% of the variance in participants' future intentions to train. As well, these intentions accounted for 35% of the variance in participants' attendance at the team physical activity training sessions. The beliefs in the social support of individuals such as

physicians, spouse and friends (i.e. subjective norm) reflected a key predictor of team members' future intentions to train. Courneya and his collaborators (2001) suggested the need for future investigation of larger, more representative samples, with the goal of examining the generalizability of their results.

In the present study, it was our objective to meet this research need and like our predecessors, extend the research on cancer survivors participating in vigorous physical activity. We utilized a larger sample of participating teams and a prospective design. We also sought to document participants' levels of physical activity and to add to the literature by reporting on two other relevant correlates related to survivors' participation. First, we assessed participants' health-related quality of life (HRQL) as a correlate of participation in the specific physical activity of dragon boating. The literature on the relationship between physical activity and HRQL for a number of diseases, including cancer, indicates that as physical activity involvement increases, so does HRQL (e.g. multiple diseases: reviews by Rejeski et al., 1996; Rejeski and Mihalko, 2001; Cancer: Courneya, 2001). The importance of the HRQL physical activity relationship is clear given that cancer patients and survivors may struggle with regaining their mental and physical health status in their rehabilitation and recovery from breast cancer.

Second, we also explored the cohesiveness of the teams we studied because they are part of the social-support environment that is experienced by the participating cancer survivor. This social influence was not examined in the Courneya et al. case study of a single team. Cohesiveness is a potential correlate of social support and has been related to retention in sport groups (e.g. Carron et al., 1988) and to exercise adherence in both asymptomatic and symptomatic populations (Brawley et al., 2003; Spink and Carron, 1992, 1994). We felt that the nature of group cohesion was important to assess and document given that survivors' depend on their dragonboat team to ensure their participation in vigorous physical

activity over several months. Because cohesion is a complex variable that manifests itself in multiple dimensions (i.e. cf. Carron and Brawley, 2000: individual and group perspective and a task and social perspective), we considered which dimensions were most strongly expressed by the participating teams.



As well, a previous study of exercising groups by Courneya and McAuley (1995) suggested that a relationship between cohesion and support was possible. Consistent with the notion of support and its importance to cancer survivors, we were interested in examining the relationship between various indices of team cohesion and the subjective norm indicant of support included in the TPB. This study provided an initial opportunity to examine their suggestion and whether a clear conceptual distinction exists.

Finally, this study focused on cancer survivors who maintain their activity. Recently, there has been a call for greater research attention directed towards the understanding of health behaviour maintenance (Health Psychology: Rothman, 2000; Wing, 2000). Indeed, Wing (2000) noted that observational studies of the natural history of maintenance health behaviour could provide useful information about successful individuals and the circumstances that encouraged their adherence. Therefore, the first purpose of the present investigation was to extend the work of Courneya et al. (2001) utilized a prospective observational design to study the relationships between TPBrelated determinants of breast cancer survivors' intentions and behaviour during the five months of their competitive dragon boat racing season. This approach allowed us to build upon the interesting findings of Courneya et al., and consider the nature of the TPB relationships (i.e. their nature and stability) over time.

The second purpose of our study was to examine additional independent relationships of dragon boat participation to HRQL and to cohesion. Finally, because of the relationship

previously observed between physical activity and HRQL for individuals with cancer, we also wished to examine this relationship for the most active and the more moderately active individuals of this active survivor sample.

## METHOD

### Participants and design

The study design was prospective, observational where participating teams were followed for approximately 12–14 weeks ( 3–3.5 months) during the course of 1 competitive season (i.e. 5 months: April–August). The period of observation began at early season (approximately 3–4 weeks after the beginning of regular training), and concluded at late season (approximately 2 weeks prior to end of regular training). To obtain volunteer teams at a time of their convenience, we remained flexible in assessing up to a 2 week 'window' that allowed us to capture 12 weeks of participation. As well, we specifically waited for regular team interaction to take place and stabilize prior to the first assessment. As recommended by Carron et al. (2002), we conducted our second assessment before the very end of the season where the team focus is on final competitions in order to avoid competition-specific responses (cf. Carron et al., 2002).

One hundred and nine participants from six volunteer breast cancer dragon boat teams across Canada comprised the initial early season sample. Approximately half of this group were retained as study participants (n=56) for the late-season assessment (i.e. study participant retention of 51%, with all six teams still represented). This attrition was not associated with the cancer survivors participating on their team. While team membership continued at strength, some of the original volunteers from each team declined to volunteer for our second assessment at late season. Participants ranged in age from 23–74 years (M=52.89; S.D.=7.61) and were an average of 5.6 years post-treatment.

### Measures

Background information. The demographics consisted of age, sex, marital status, education, family income, and employment status. Participants were asked to answer the demographic items

in relation to their current status. Medical information reported included self-reported time since diagnosis/treatment and stage of breast cancer at time of diagnosis.

TPB variables. The theory of planned behaviour variables of attitude, subjective norm, perceived behavioural control, and intentions were assessed. In accordance with TPB measurement guidelines, all of the items were consistent with respect to time and activity references. Specifically, each item referred to being active in dragon boat workouts/practices at least 2 times per week over the next 12 weeks. This specificity in measurement is consistent with recommendations for the

 



prediction of intentions and behaviour over time (cf. Courneya and McAuley, 1995).

Attitude. Attitude was measured using 14 bipolar adjective items that tapped both affective and factual components of attitude. Each item was preceded by 'For me to engage in my dragon boat workouts 2 times per week over the next 12 weeks will be...', and was rated on a 1–7 scale. The Cronbach's alpha for the total scale was 0.87, acceptable as per recommendations by Tabachnick and Fidell (2001).

Subjective norm. Subjective norm was assessed with 3 items that ascertain the individual's level of support for engaging in her dragon boat workouts twice per week over the next 12 weeks. Each item was rated on a 1–7 point scale (strongly disagree to strongly agree), with higher scores reflective of greater perceived support. The three items were, 'Most people who are important to me think I should attend my dragon boat workouts twice per week over the next 12 weeks', 'Most people who are important to me approve of me attending my dragon boat workouts twice per week over the next 12 weeks', 'Most people who are important to me would support my attending my dragon boat workouts twice per week over the next 12 weeks'. The Cronbach's alpha for the scale was acceptable at 0.90 (Tabachnick and Fidell, 2001).

Perceived behavioural control. Self-regulatory

efficacy was used as an indicant of perceived behavioural control (Ajzen and Madden, 1986; Bandura, 1997; Connor and Armitage, 1998; McAuley et al., 2001; Rhodes and Courneya, 2003). This measure concerned one's confidence to manage behaviours required to be regularly active in the dragon boat training sessions. Responses to the 5 confidence items were expressed on 1–10 point Likert-type scales with higher scores reflecting greater confidence in the participants' ability to engage in specific behaviours over the next 12week period. Items concerned the self-regulatory skills of regular attendance; planning for attendance; recovering from relapse; and organizing responsibilities around attendance. The Cronba-ch's alpha was acceptable at 0.89 (Tabachnick and Fidell, 2001).

Behavioural intentions. Behavioural intention was assessed with the item, 'I intend to attend my dragon boat workouts twice a week over the next 12 weeks' and was rated from 1 (strongly disagree) to 7 (strongly agree). Using a 1-item assessment of behavioural intention is commonly utilized in the TPB literature (Ajzen, 1991; Culos-Reed et al., 2001).

Physical activity levels. The Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin and Shephard, 1985) leisure score index was used to assess physical activity levels. This index uses three questions covering the frequency of mild, moderate, and strenuous exercise done during free time for at least 15 min duration in a typical week. This measure is easily administered and has been found to be reliable and valid (Jacobs et al., 1993). We utilized it to examine both training levels of physical activity and lifestyle activity outside training.

First, the GLTEQ was used to assess levels of physical activity specific to the dragon boat workouts. These three items assessed the indivi-dual's frequency of mild, moderate and strenuous exercise done during dragon boat workouts for at least 15 min duration in a typical week. Participants were asked to recall their dragon boat workouts during the previous month. This measure of physical activity has been used previously

within the cancer exercise literature, and specifically for the breast cancer dragon boat population (Courneya et al., 2001). Second, consistent with the more generic use of the GLTEQ for asymptomatic individuals and for individuals at various stages within the cancer experience, participants were asked to recall their lifestyle physical activity outside dragon boat training during the previous month.

Health-related quality of life. Participants completed the SF-12 (Short Form of the Rand-SF-36: Ware et al., 1995), a health inventory designed to assess how one's health impacts on the physical, mental and social aspects of one's life. As such, it measures one's perceptions of HRQL. Items consist of both Likert-scale and dichotomous (yes/no) responses. The SF-12 is composed of physical and mental health subscales. The SF-12 is used extensively as an HRQL measure, and has demonstrated both validity and reliability (Ware et al., 1995). Compilation of data using the SF-12 has also produced norms for average and special populations (e.g. diabetes, heart disease). The use of the SF-12 subscales therefore

 



allowed for a comparison to 'normal' and other 'diseased' populations (Ware et al., 1995).

Cohesion. The Group Environment Questionnaire (GEQ: Carron et al., 1985, 1998, 2002) assesses the individuals' perceptions about four dimensions of their team's cohesion. The 18-items, scored on 1–9 scales (strongly agree to strongly disagree) comprise four subscales: (1) attraction to the group}task (ATG-T), (2) attraction to the group}social (ATG-S), (3) group integration} task (GI-T), and (4) group integration}social (GI-S). The higher the score on each subscale, the greater the belief about that aspect of cohesion. Internal consistency of each scale was as follows: ATG-T, $\alpha$=0.83; GI-T, $\alpha$=0.83; GI-S, $\alpha$=0.76; and ATG-S, $\alpha$=0.55. Only the ATG-S scale fell below acceptable levels of reliability. All other GEQ scales had acceptable internal consistency (cf. Tabachnick and Fidell, 2001). The ATG-S

scale was not used in further analyses given its low reliability for this sample.

## Procedure

A questionnaire was sent to 245 potential volunteer participants of Canadian breast canceronly dragon boat teams. We obtained 109 volunteers from six teams. Sixty nine percent of the participants came from western-province teams and the remainder from central provinces. These individuals completed questionnaires at early season (approximately 3–4 weeks after the beginning of regular training to be certain of some degree of mastery of regular exercise). At late season (approximately 2 weeks prior to end of regular training), the questionnaire was mailed again to these participants and 51% responded (n=56). All of the participants were experienced dragonboat team members (minimum of 1 year of experience). The early season and late season questionnaires were identical, except for the exclusion of the demographic and medical information at the time 2 assessment.

# RESULTS

## Descriptive statistics

Seventy-three percent of the respondents were currently married. They represented a range of levels of education (17% graduate school; 31% university degree; 25% some university; 20% high school graduates; 6% some high school), and family income ( 13% less than $40 000; 28% from incomes of $40 000–$60 000; 18% from $60 000 to $80 000; 24% from family incomes greater than $80 000). The self-reported stage of cancer at diagnosis for these survivors was Stage 1=32%; Stage 2=36%; Stage 3=6%; Stage 4=2% (20% did not recall). At the time of this study, only 14% were undergoing treatment and 13% had experienced reoccurrence.

## Prediction of behavioural intentions to train and of training activity

Both concurrent and prospective hierarchical multiple regressions were conducted to examine the TPB’s effectiveness in predicting exercisetraining intentions of breast cancer survivors. In all cases, the TPB variables were entered on the first step and any additional predictors were

entered on the second step to consider their unique contribution to prediction.

For the concurrent tests at both Time 1 (early season) and Time 2 (late season), the TPB predictors accounted for a significant amount of the variance in behavioural intentions for future dragon boat training (R2 adjusted model=0.63 and 0.65, respectively). At both times, the selfefficacy indicant of perceived behavioural control emerged as the significant contributing variable for future intentions to train for the next 12 weeks. When we considered the additional variance that might be accounted for when we added previous dragon boat training to the TPB and conducted the multiple regression procedure, we observed a significant additional but modest 3% of the variance to the prediction (see Tables 1 and 2).

The results of the prospective multiple regressions indicated that the early season assessments of attitude, subjective norm (social support), and perceived behavioural control (self-efficacy) were predictive of 12 week, end of season behavioural intentions-to-train (R2 adjusted=0.27, p50.001), with attitude being the significant contributing predictor (see Table 3).

We also examined the prospective relationship between the TPB and participation in dragon boat training. However, the TPB model was not significant in predicting end of season training activity as measured by the GLTEQ.





Table 1. TPB variables concurrently predicting behavioural intention for exercise: Time 1

| Variable | B | SE B | b | p |
|---|---|---|---|---|
| TPB Model | | | | |
| Confidence (PBC) | | | | |
| Subj. norm | | | | |
| Attitudes | | | | |
| TPB Model+past behaviour | | | | |
| Confidence (PBC) | | | | |
| Subj. norm | | | | |
| Attitudes | | | | |
| Past DB activity | | | | |
| 0.571 | | | | |

0.067
0.003
0.562
0.062
−0.028
0.048
0.052
0.073
0.106
0.051
0.071
0.104
0.018
0.753
0.064
0.002
0.741
0.059
−0.019
0.163
0.0009
0.355
0.972
0.0009
0.383
0.794
0.010

Note. Early season Model R2 adjusted=0.60 for Step 1; DModel R2=0.03 with the addition of past behaviour. N=103.

Table 2. TPB variables concurrently predicting behavioural intention for exercise: Time 2

Variable B SE B b p

TPB Model

Confidence (PBC)

Subj. norm

Attitudes

TPB Model+past behaviour

Confidence (PBC)

Subj. norm

Attitudes

Past DB activity

0.606

0.207

−0.015

0.621

0.199

−0.006
−0.034
0.111
0.129
0.198
0.113
0.130
0.199
0.039
0.698
0.176
−0.010
0.715
0.170
−0.004
−0.074
0.0009
0.115
0.939
0.0009
0.130
0.976
0.386
Note. Late season Model R2 adjusted=0.65 for Step 1; D in Model R2 was not significant with the addition of past behaviour.
N=56.
Table 3. TPB variables at early season predicting behavioural intention for exercise at late season
Variable B SE B b p
Confidence (PBC) −0.010 0.185 0.007 0.954
Subj. norm 0.291 0.236 0.156 0.224
Attitudes 0.863 0.235 0.460 0.001
Note. Model R2 adjusted=0.27 (p50.001). The analysis was conducted using those participants completing questionnaires at both
time points (N=56).
Physical activity levels
Analysis of the dragonboat training activity for the 56 study participants completing surveys at early and late season indicated no difference in their training physical activity (p>0.05). Not surprisingly, cancer survivors were active at similar levels at early season and late season, averaging one hour of vigorous training per week. To remain competitive, participants had to consistently train across the season.
However, this was not their sole physical

activity. Unlike, for example, other cancer survivors whose physical activity has been reported as not returning to pre-diagnosis levels (cf. Courneya and Friedenreich, 1997b), survivors engaged in this competitive sport were not only participating in formal training but also in lifestyle physical activity outside of training. During the course of a normal week, study participants also engaged in one hour, 15 continuous minutes of moderate level activity and 1 h, 15 min to one and one-half hours of mild level activity. Again, there were no differences at early season or late season for the 56 participants participating in both of these assessments. The mean total physical activity
 


(i.e. training plus outside lifestyle) was approximately 3 h and 15 min (i.e. average of 12–13 15 min bouts of continuous activity per week, S.D.=8–8.5).

Relationship between HRQL and total physical activity

In order to examine the relationship of physical activity to HRQL, we cumulated their total physical activity and subsequently considered those dragon boat participants highest and lowest in their total physical activity early in the season (n=109) and again later in the season (n=56). This examination of extreme groups was based on the rationale that if a relationship between activity and HRQL did exist for these breast cancer survivors, it should be detected among the most and least active participants. A tertile split of the total number of mild, moderate and vigorous dragonboat and outside physical activity sessions was used to form the high and lower total physical activity groups (n=34 for each). To verify that the two groups were truly different in their physical activity, a t-test was utilized. The two groups differed significantly on level of total activity, t (70)=7.45, p5 0.001. The highly active group had significantly more minimum 15 min bouts of combined training plus outside activity (M=23.13 activity sessions) than the low active group (M= 5.31 activity sessions).

The HRQL physical and mental health composites

were then used as predictor variables to determine their viability to discriminate survivors who belonged to either the higher or the lower physical activity groups. A discriminant function procedure was performed and was significant, Wilk's lambda (2, 65)=0.890, p50.023. The groups were discriminated by the HRQL function, with the mental health composite being the major variable contributing to the function. The values for both the mental and physical composite scores fall within or slightly above the normative range reported for the general US sample of healthy females of similar age (Ware et al., 1995).

Perceived cohesion

The average levels of individual task cohesion reported on the 9 point scale (i.e. ATG-T: individual attractions to the group-task, M early season=8.08 (1.39); M late season=7.99 (1.20)) were higher than the measure for group task cohesion (GI-T: group integration-task, M early season=7.09 (1.58); M late season=6.49 (1.59)) and the measures for group social cohesion (i.e. GI-S: group integration-social, M early season=6.60 (1.64); M late season=6.77 (1.70)). Teams still had approximately equal representation of their overall membership when late season assessments were taken. Note that attrition was not from the team but from study participation. None of the cohesion measures were low and in general they were comparable to normative values reported for other younger, healthy females competing in team sports (i.e. ATG-T at the 75th percentile; ATG-S at the 70th percentile; GI-T at the 65th percentile; GI-S at the 65th percentile: Carron et al., 2002).

We also correlated the various indices of cohesion with the subjective norm component of the TPB to address a suggestion in the literature previously offered by Courneya and McAuley (1995). As the latter measure concerns significant others as sources of support for desired behaviour, it is possible that the dragon boat team could be viewed as one source of support. Correlations with all measures of cohesion were low and nonsignificant (r's ranging from –0.09 to 0.25, p> 0.05) indicating that these constructs are not

similar and are measuring different beliefs.

## DISCUSSION

### Theory of planned behaviour

The first purpose of our investigation was to extend the work of Courneya and colleagues (2001) by examining the TPB relative to its relationship to participation among cancer survivor members of multiple dragon boat racing teams. We examined the TPB relative to the ability of its various components to predict both concurrent and three month prospective relationships in the midst of a five month season of dragon boat training and racing by breast cancer survivors. The significant relationships observed for the concurrent and prospective TPB model predictions indicated support for the use of the theory in the prediction of behavioural intentions to train. The major contributing variable in the concurrent predictions was self-efficacy, an aspect of perceived behavioural control. For the prospective

 



relationship, attitudes toward training at season onset was the primary variable contributing to the variance explained three months later in late season intentions-to-train. The effect sizes for the use of the TPB model in predicting this dependent variable were large (i.e. R2 of greater than 0.25, Cohen, 1992).

The contribution to concurrent and prospective prediction may be considered from two perspectives; conceptual and methodological. From the conceptual perspective, participants at both time points were required to manage their time weekly and monthly to attend training. Their perceived behavioural control over these self-regulatory actions would vary according to how well they felt they attended and conducted their actual training (cf. Ajzen, 1985). In turn, such beliefs would be most likely related to the concurrently assessed variability for future training intentions at both early season and again at late season. Methodologically, the concurrent tests examined participants' beliefs for the select sample of individuals participating in the study at that time

in the season. The attitudes and subjective norms of those individuals were almost at a ceiling (i.e. more than 6 on a 7 point scale) and very highly positive.

In contrast to these concurrent tests, we could only examine the 56 continuing participants in the study for the prospective test. Thus, these select individuals may have had variability in their attitudes at season onset which more closely predicted variability in their late season training intentions than the prospective relationships of other TPB variables. Also, these individuals were highly motivated and the sample scores on each TPB variable are consistent with this view in that they are very high with a small variability.

Like the findings of Courneya et al. (2001), we found support for the use of the TPB in both concurrent and prospective examinations of the theory's prediction of future intentions to be active. Also, our findings are like many others in the physical activity literature in that we found the strongest TPB predictors of intention were perceived behavioural control and attitudes (Courneya and Friedenreich, 1997c, 1999b; Culos-Reed et al., 2001). Unlike Courneya and colleagues (2001), we did not find that the subjective norm aspect of the TPB contributed much to the prediction of dragon boat training intentions. However, as we followed the recommendations of those investigators to enlarge the sample beyond their single team case study and examine participants from multiple teams, the specific between-study differences observed in the strongest TPB predictors is not necessarily surprising.

In contrast to Courneya et al. (2001), we did not find support in using the TPB to predict training activity. In hindsight, we believe this difference in findings may have been due to methodological differences in the measures of physical activity and in the measurement of perceived behavioural control. Whereas our measure of training activity took into account both the relative intensity and frequency of weekly bouts of physical activity, Courneya et al., focussed upon the frequency of actual attendance at training. A closer inspection of correspondence between TPB predictors and

actual behaviour suggests greater correspondence in the Courneya et al. measures than ours. In our attempt to obtain a more accurate view of activity through the measurement of intensity and frequency (i.e. consistent with previous exercise and cancer research), we may have lowered the important aspect of correspondence between predictors (i.e. beliefs relative to attendance twice per week for the next 12 weeks) and behaviour (i.e. frequency of exercise training bouts at mild, moderate and vigorous intensity). From a TPB methodological perspective, future studies of survivors' physical activity in this team sport would require altering either the action aspects of the TPB belief items to be more correspondent with the assessed multiple dimensions of physical activity or limiting the predicted dimensions of activity to the corresponding single dimension (e.g. weekly attendance frequency) assessed in the TPB belief statements (cf. Courneya and McAuley, 1995).

How active were the cancer survivors?

Whereas Courneya and Friedenreich (1997b, 2001) have reported that the physical activity of many cancer survivors does not return to their prediagnosis activity level, breast cancer survivors who are members of dragon boat racing teams were highly active. These individuals were not only active in training but also with respect to weekly activity outside training. Cumulatively, survivors were regularly engaged in 3–4 h of total activity per week. Clearly, the level of activity not only serves the purposes of preparing the survivors for their sport. When total activity (i.e. training plus

 



lifestyle) was considered, the average intensity would be estimated as moderate (e.g. equal amounts of mild+moderate+vigorous=moderate average). This average intensity of total physical activity, if maintained, would approximate the US Department of Health and Human Services (USDHHS, 1996) recommended level of weekly activity necessary to obtain health benefits (i.e. 30 min of moderate physical activity per day,

most days of the week).

While it is not possible to directly compare the reports in our study with those of Courneya et al., a rough comparison indicates that the survivors on the multiple teams we measured were at least as active in training, and much more active in their lifestyle exercise than the survivors in the former study. In the present study, it may also be speculated that involvement in training does not deter daily lifestyle activity of cancer survivors. An interesting question to be answered in future work is whether participation in training actually encourages regular lifestyle physical activity on the non-training days of the week.

## Physical activity and health-related quality of life

One of the secondary purposes of our investigation was to document any relationship between level of physical activity and health-related quality of life. The literature on the relationship between physical activity and HRQL for cancer indicates that as physical activity involvement increases, so does HRQL (e.g. Courneya, 2001; Courneya and Friedenreich, 1997b, 1999a, 2001). As well, the relationship is more reliable for those individuals who are regularly active and maintain at least moderate levels of physical activity over a period of several months (e.g. multiple diseases, Rejeski and Mihalko, 2001).

Our breast cancer survivor sample of dragon boat participants were well beyond their initial cancer diagnosis and were clearly capable in their physical function. They were physically active with respect to both training and lifestyle activity. Not surprisingly, then, the values for both the mental and physical composite scores of the SF-12 were parallel to or slightly above the normative range reported for the general US sample of healthy females of similar age (Ware et al., 1995). For cancer survivors engaged in this team-related mode of physical activity, this is encouraging when considered from the perspective of a longterm view of their recovery from disease and return to a healthy quality of life.

## Cohesion of dragon boat teams

The participation of multiple breast cancer survivor dragonboat teams in this study provided

the opportunity to consider one aspect of the nature of the social environment in which training occurred. In the Courneya et al. (2001) study of breast cancer survivors participating in this sport, it was noted that physicians, spouses, and friends were the three most important sources of perceived support. However, a single team was the focus of that study, and differential type and level of cohesiveness of the team was not examined. To the best of our knowledge, ours is the only investigation concerning breast cancer survivors that has assessed the cohesiveness of breast cancer groups engaged in physical activity. All task and social aspects of cohesion that participants reported were strong to high and all ranged between the 65th and 75th percentile on normative scales for asymptomatic females competing in a variety of team sports (cf. Carron et al., 2002). Individual attractions of their team for the cancer survivor appeared to be the strongest binding cohesion factor for team members. Thus, the group environment supporting participation in this vigorous training and racing activity was clearly one where survivors felt they belonged, had friends, had opportunities to participate, and had a common bond with other survivors. Although we were only able to capture approximately half of the volunteer sample representing the teams to participate in the study at the later point in the season, the values for the perceptions of cohesion were virtually unchanged over the three month period we observed.

Although a relationship between the subjective norm component of the TPB and measures of cohesion has been previously suggested among exercise participants (Courneya and McAuley, 1995), the correlations we detected in the present sample suggest that the constructs are not well related and thus are different variables. Thus, we would argue for a conceptual distinction being important for future investigations. If the TPB is used to examine breast cancer survivor groups engaged in physical activity in future, it may be instructive to measure both constructs if there is interest in what group variables moderate TPB

 

relationships observed among participating survivor groups. Although the subjective norm component of the TPB captures potential influence from important others and some of these supportive people may be in the group, it reflects individual influence and does not measure the influence of the group as a social unit. Many dimensions of social support are not well understood (Cohen et al., 2000). Thus, understanding the moderating effects of group influence in altering the nature of TPB relationships would be important from theoretical as well as intervention perspectives. However, such a research question would require a future investigation which considered groups as the unit of analysis and require a larger sample of teams (cf. Carron et al., 2003).

Finally, this study focused on cancer survivors who maintain their activity. Wing (2000) noted that observational studies of the natural history of maintenance health behaviour could provide useful information about successful individuals and the circumstances that encouraged their adherence. It seems clear that at least for the select sample of breast cancer survivors in the present observational study, a strong group environment is characteristic of their teams and all teams were engaged in vigorous physical activity. Also, physical activity associated with dragon boat race training plus lifestyle activity appear to be at levels that would be related to achieving health outcomes if sustained. This level of activity is in direct contrast to post-treatment breast cancer survivors whose levels of physical activity do not return to their levels reported pre-diagnosis.

We would be remiss if we did not mention the limitations of this preliminary study. These concern sample, retention of participants to the study, and measurement. First, our results are based upon a selective sample of middle-aged breast cancer survivors participating in team physical activity for dragon boat racing. Inasmuch as these women were a maintenance sample (i.e. at least 1 year of experience with their respective team) that regularly trained at moderate to vigorous levels of

physical activity, they are only characteristic of highly motivated breast cancer survivors. Generalization to other breast cancer survivors (e.g. younger, older, less motivated to be physically active) would be premature.

Second, we retained 56 study volunteers who completed measures at both time points in the prospective design. This represented approximately 49% study attrition. Although those women retained in the study were representative of their teams and were representative of those team members who declined late-season assessment but were still actively training, the smaller sample available for prospective analyses obviously reduced statistical power.

These limitations notwithstanding, our study has a number of strengths that improved upon the initial dragon boat investigation by Courneya and colleagues. Our use of multiple dragon boat racing teams and a greater number of survivors extended the sampling compared to their examination of a single team. We utilized a prospective observational design to study the relationships between TPB-related determinants of breast cancer survivors' intentions and behaviour at two points, allowing us to consider the nature of the TPB relationships (i.e. their nature and stability) over time. We also extended what was examined in the Courneya et al. study investigation by measuring the HRQL of participants and the perceived cohesion that survivors reported for their teams. Finally, we examined these relationships within a five month season, in which we observed three months of mainly on-the-water dragon boat training in contrast to the three months of indoor pool training in the Courneya et al. study. There is clearly more to learn about breast cancer survivors' participation in physical activity. While the initial Courneya et al. investigation and our study used the TPB to explore survivors' motivation to participate, there is still much to learn in using this model when studying successful individuals and the social conditions related to their maintenance of activity. Consideration of health outcomes such as HRQL in addition to fitness improvements and the influence of social context

on maintenance await future study (cf. Rothman, 2000; Wing, 2000).

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