Psychology and Health
Vol. 24, No. 4, April 2009, 423–438

Measuring multiple dimensions of perceived control in women with newly diagnosed breast cancer

Ellen Burke Beckjord[a]*, Judith Glinder[b], Adela Langrock[c] and Bruce E. Compas[d]

[a]RAND Corporation, 4570 Fifth Avenue, Pittsburgh, PA 15213, USA; [b]467 Hamilton Ave., Suite 4, Palo Alto, CA 94301, USA; [c]Middlebury College, McCardell Bicentennial Hall 409-006, Middlebury, VT 05753, USA; [d]Vanderbilt University, Peabody College 512, 230 Appleton Place, Nashville, TN 37212, USA

(*Received 13 November 2006; final version received 27 November 2007*)

A multidimensional approach to the study of focus of perceived control (FPC) can provide a more specific understanding of associations between FPC and adjustment to cancer. We developed and tested a measure to capture multiple dimensions of FPC and examined FPC dimensions in relation to positive expectancies and three indices of psychosocial adjustment in 219 women with breast cancer. Confirmatory factor analysis supported a 6-factor model of FPC ($\chi^2_{284\ \mathrm{df}} = 433.67$, $p < 0.001$; CFI = 0.94; RMSEA = 0.049, 90% C.I. = 0.040, 0.058) that included PC over physical symptoms, emotions, relationships, medical care, cancer outcomes and life in general. Specific associations between FPC and adjustment were observed: more emotional PC was associated with less emotional distress, more physical PC was associated with better physical quality of life (QOL), and more medical PC was associated with better medical QOL. Positive expectancies were also associated with better outcomes. These results indicate dimensions of FPC as differentially associated with indices of adjustment, suggesting multiple targets of interventions aimed at benefiting breast cancer survivors.

Keywords: perceived control; cancer; quality of life

Introduction

Perceived control (PC) is a central psychological construct related to physical and emotional outcomes in cancer. From a theoretical perspective, PC decreases negative reactions to aversive life events, and research has shown this as well: high levels of PC are strongly associated with, and in some instances predictive of, better mental and physical health (see Miller, 1978; Thompson & Collins, 1995, for early reviews of this literature). For example, PC has been associated with decreased pain-related distress (Hazard Vallerand, Hasenau, Templin, & Collins-Bohler, 2005), less functional impairment, and lower psychological distress among cancer patients (Norton et al., 2005). However, associations between PC and adjustment to cancer are more complex than equating high PC with better adjustment and low PC with poorer adjustment. Broadly speaking, there are two categories of PC that are relevant to understanding adjustment to

---

*Corresponding author. Email: ebeckjor@rand.org

ISSN 0887–0446 print/ISSN 1476–8321 online

DOI: 10.1080/08870440701832634
http://www.informaworld.com

breast cancer: locus of PC (LPC; i.e. source of PC over changes in or outcomes of a medical condition) and focus of PC (FPC; i.e. personal PC over physical or psychosocial consequences of the disease). In the context of psychosocial oncology, studies of LPC examine *who* an individual believes is in control of disease-related events and outcomes (e.g. Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2004), while studies of FPC examine *what* individuals feel they have under their control and to what degree (e.g. Newsom, Knapp, & Schulz, 1996).

Most women diagnosed with breast cancer can expect to survive for many years post-diagnosis (ACS, 2005), and as is the case after a negative health event, they will likely have to adjust to changes in several life domains affected by their disease and its treatment (Stanton, Revenson, & Tennen, 2007). Control – FPC specifically – plays a central role in these multiple areas of adjustment (Stanton et al., 2007). Several unidimensional measures of FPC have been used in the study of adjustment cancer (e.g. PC over pain, Hazard Vallerand et al., 2005; PC over emotions, Watson & Greer, 1983), but these investigations cannot capture the role of FPC in adjustment to cancer across multiple domains including, but not limited to, managing emotional reactions, achieving physical recovery and navigating the health-care system. Therefore, multidimensional measures of FPC can offer a more specific and comprehensive understanding of how PC relates to adjustment and in turn can inform targets of psychosocial interventions for cancer survivors.

Previous studies have used multidimensional measures of FPC and have demonstrated the utility of this approach by revealing specific associations between dimensions of FPC and psychosocial adjustment in cancer survivors. For example, Thompson, Sobolew-Shubin, Galbraith, Schwankovsky, and Cruzen (1993) showed PC over emotions and physical symptoms to be the only focus of PC significantly associated with decreased emotional distress in a multivariate model that included three other dimensions of FPC (PC over medical care, PC over relationships and PC over disease outcomes). Newsom et al. (1996) demonstrated dimension-specific associations between FPC in cross-sectional and prospective analyses of patients with recurrent cancer. In their analyses, PC over physical symptoms and life in general predicted decreased symptoms of depression, while PC over cancer outcomes was associated with lower depression scores at baseline only. But in contrast to the Multidimensional Health Locus of Control scales (Wallston, 2005; Wallston, Stein, & Smith, 1994; Wallston, Wallston, & DeVellis, 1978), which are well-established measures of LPC, have extensive psychometric data published (e.g. Luszczynska & Schwarzer, 2005), and have been used in multiple studies of cancer survivors (e.g. Naus, Price, & Peter, 2005; Rowe, Montgomery, Duberstein, & Bovbjerg, 2005; Williams-Piehota et al., 2004), the multidimensional measurement tools of FPC used in previous studies are either not readily available (e.g. Newsom et al., 1996) or lack associated psychometric data (i.e. CFA) to provide evidence for a multidimensional conceptualisation of FPC (Manne & Glassman, 2000; Norton et al., 2005; Thompson et al., 1993). To support continued research on how specific dimensions of FPC relate to specific dimensions of psychosocial adjustment, a validated, multidimensional measure of FPC is needed for use with cancer survivors.

Finally, an improved measurement strategy would address an issue of conceptual relevance as well. Recently, Carver et al. (2000) challenged the conceptual relevance of PC to the process of adjustment to cancer. In their study, reports by early-stage breast cancer patients on a single-item, dichotomous (high, low) measure of LPC over remaining cancer-free were examined, as were positive expectancies about cancer recurrence and an interaction between LPC and positive expectancies. Only positive expectancies that one would remain cancer-free were associated with decreased levels of distress. The authors concluded that compared to PC, positive expectancies about disease outcomes are of greater relevance to adjustment to cancer. However, the use of a single-item measure of LPC was suggested as one reason for the null results regarding PC in the Carver et al. study (Tennen & Affleck, 2000). Further, it is unknown how the results of Carver et al. would have differed in analyses that examined FPC rather than LPC: positive expectancies may be more closely associated with adjustment compared to *who* a woman perceives has control over her cancer outcomes, but may not outweigh the influence of a woman's sense of personal control over *what* aspects of her life have been affected by cancer. A re-examination of the Carver et al. approach using a multidimensional measure of FPC would provide a further comparison of the conceptual relevance of FPC and positive expectancies to adjustment to cancer.

Though theoretical and empirical evidence exists that FPC plays a role in adjustment to cancer, issues related to measurement and conceptual relevance of FPC require further study. We aim to address these issues. First, to determine whether FPC is best conceptualised as a multidimensional construct, we developed a 6-factor model based on previous research (Newsom et al., 1996; Thompson et al., 1993) that addresses personal PC over disease consequences and outcomes. We examine this model using CFA, compare its fit against competing 1- and 2-factor models, and report on the psychometric properties of the scale. Second, to determine whether increased specificity can be achieved in investigating associations between PC and adjustment using a multidimensional measure of FPC, we examined 6 dimensions of FPC in relation to 3 indices of psychosocial adjustment: emotional distress, physical quality of life (QOL), and medical interaction QOL. In multivariate analyses, we expect that dimensions of FPC will be differentially associated with outcomes: compared to other dimensions of FPC, we expect that PC over emotions will be most strongly associated with emotional distress, that PC over physical symptoms will be most strongly associated with physical QOL and that PC over medical decisions will be most strongly associated with medical interaction QOL. Third, we address the conceptual relevance of FPC by examining FPC, positive expectancies and their interaction in relation to psychosocial adjustment to breast cancer. In multivariate models, we expect the hypothesised dimensions of FPC to remain significantly associated with study outcomes even after adjustment for and at all levels of positive expectancies.

Methods

Participants

Participants were 293 women with newly diagnosed Stage 0–III breast cancer, who were part of an ongoing longitudinal study examining the effectiveness of cognitive-behavioural and supportive-expressive group therapy and adjustment to breast cancer. All data presented were collected prior to participation in a support group. A total of 74 women were missing data on one or more of the variables of interest; these women were older than those without missing data ($t = 5.26$, $p < 0.01$) and had fewer years of education ($t = 2.71$, $p < 0.01$) but did not differ from the rest of the sample with respect to stage of disease. The final cross-sectional sample included 219 women.

Participants had a mean age of 51.92 ($SD = 9.55$) and an average of 14.82 years of education ($SD = 2.39$). Seventy-five percent were either married or living with a partner. Representative of the region of northern New York state and northern New England from which the sample was drawn, 98% of the sample was Caucasian. With respect to stage, 15% of the sample was Stage 0, 46% of the sample was Stage I, 33% was Stage II and 6%

was Stage III. With respect to type of cancer, 17% of the sample was diagnosed with either ductal or lobular carcinoma *in situ*, 78% was diagnosed with invasive ductal or lobular carcinoma and the remaining 5% was diagnosed with tublar, mucinous or non-specified carcinomas. At the time of the study, 73% of women had undergone a partial mastectomy, 22% had undergone a total mastectomy and 5% had not received breast surgery. Regarding treatment, 47% of the sample was prescribed chemotherapy, 79% was prescribed radiation therapy and 75% of the sample was prescribed hormonal therapy.

Procedure

Participants were recruited from the Breast Care Center of Fletcher Allen Health Care (affiliated with the Vermont Cancer Center) in Burlington, Vermont and the Glens Falls Cancer Center in Glens Falls, New York. A member of the medical staff approached patients about participation near their time of diagnosis and a research assistant obtained informed consent from participants. Self-report data collection occurred, on average, 15.34 weeks after diagnosis ($\mathrm{SD} = 6.58$ weeks).

Measures

Perceived control

Perceptions of control were assessed using a multidimensional measure constructed for this study (Appendix). Six factors were included to represent dimensions of FPC that have been measured in previous studies with cancer patients: PC over physical symptoms, emotions, medical decisions and care, cancer outcomes, relationships with others and control over life-in-general (e.g. Newsom et al., 1996; Taylor, Helgeson, Reed, & Skokan, 1991; Thompson et al., 1993). Subscales were comprised of two to six items each (see the Appendix for a copy of the measure). Participants rated PC on a Likert scale from 1 (no control at all) to 4 (a great deal of control). Items rated as 'does not apply' were counted as missing; participants who rated the majority of any subscale items as 'does not apply' were excluded from the study sample. For the CFA, missing item data were estimated using mean responses for completed items on the same subscale. Mean scores of subscale responses were used in analyses with higher scores indicating higher ratings of PC.

We conducted three confirmatory factor analyses using AMOS 5.0 (Arbuckle, 2003) to validate the model of PC: (1) our 6-factor hypothesised model, (2) a 2-factor model defined by subscales with a medical focus (physical symptoms, medical decisions and care, cancer outcomes), and subscales with a psychosocial focus (emotions, relationships, life in general), and (3) a 1-factor model in which all items loaded on to the latent variable 'control'. We used χ^2 difference tests to evaluate the relative fit of the three models (Kline, 2005). Additionally, goodness-of-fit indices were selected to evaluate the degree of congruence between the data and the proposed theoretical model (Cole, 1987, Marsh, et al., 1988). Chi-square indices are reported based on convention, although they have been widely criticised for having excess power to reject adequate models tested with larger samples (Hu & Bentler, 1999). Bentler's CFI (Bentler, 1990) was also used to gauge goodness-of-fit, along with Steiger's root mean square error of approximation (RMSEA; Steiger, 2000; Steiger & Lind, 1980). For Bentler's CFI, models with an adequate fit will yield values greater than 0.90, and models with a good fit will yield values of 0.95 or greater. For RMSEA, values less than 0.10 indicate an adequate fit, and values of 0.06 or less indicate a good fit (Steiger; Steiger & Lind).

Table 1 summarises the fit statistics of the three models and their fit comparisons. Based on the fit indices summarised in Table 1, we conclude that the 6-factor model of PC is an acceptable fit to the data, and superior to competing models tested ($\chi^2_{284\ \mathrm{df}} = 433.67$, $p < 0.001$; CFI = 0.94; RMSEA = 0.049, 90% C.I. = 0.040, 0.058). Subscale co-variances and factor loadings for the 6-factor model are displayed in Table 1. Means and standard deviations for the multiple dimensions of FPC are displayed in Table 2. For the outcome and physical PC subscales, participants reported between 'a little bit' and 'a moderate amount' of PC. For the medical, emotional, relational and life-in-general PC subscales, participants reported between 'a moderate amount' and 'a great deal' of PC.

Table 1. Model fit statistics and fit comparisons.

	χ^2	d.f.	p	CFI	RMSEA (90% CI)
6-Factor model	433.67	284	<0.001	0.94	0.049 (0.040, 0.058)
2-Factor model	1166.35	298	<0.001	0.65	0.116 (0.109, 0.123)
1-Factor model	1290.31	299	<0.001	0.60	0.123 (0.116, 0.130)

Fit comparisons using χ^2 difference tests

6-factor *vs.* 2-factor	$\Delta\chi^2 = 732.68$, Δd.f. = 14, $p < 0.001$
6-factor *vs.* 1-factor	$\Delta\chi^2 = 856.64$, Δd.f. = 1, $p < 0.001$

Subscale covariances for the 6-factor model

	Physical	Emotional	Relationship	Medical	Life
Physical					
Emotional	0.49**				
Relationship	0.23**	0.46**			
Medical	0.46**	0.52**	0.34**		
Life	0.41**	0.67**	0.54**	0.53**	
Outcomes	0.43**	0.51**	0.32**	0.54**	0.48**

Understandardized regression weights of scale items onto subscale factors (all coefficients are significant at $p < 0.001$)

Item	Physical	Emotional	Relationship	Medical	Life	Outcomes
1	0.55	0.74	0.39	0.29	0.51	0.66
2	0.38	0.58	0.62	0.61	0.63	0.77
3	0.48	0.55	0.78	0.37	0.54	
4	0.53	0.62	0.70	0.30		
5	0.52	0.64	0.59			
6	0.37	0.65				

Bivariate correlations with responses to stress

PC subscale	Primary control engagement coping	Disengagement coping
Physical	0.27**	−0.15*
Emotional	0.33**	−0.21**
Relationship	0.21**	−0.15*
Medical	0.22**	−0.27**
Life	0.30**	−0.24**
Outcomes	0.21**	−0.16*

Note: 'Item' number refers to corresponding subscale item (see Appendix).
*$p < 0.05$; **$p < 0.01$.

Table 2. Means, standard deviations and internal consistencies for the six subscales of PC, positive expectancies and indices of adjustment.

	Mean (SD)	Range	α
Control over physical symptoms	2.71 (0.66)	1–4	0.76
Control over emotional reactions	3.11 (0.72)	1–4	0.92
Control over relationships	3.15 (0.72)	1–4	0.90
Control over medical decisions and care	3.58 (0.47)	2–4	0.68
Control over life in general	3.36 (0.60)	1.67–4	0.87
Control over cancer outcomes	2.73 (0.85)	1–4	0.72
Positive expectancies (LOT-R)	17.09 (5.84)	0–24	0.86
Symptoms of depression (BDI-II)	10.42 (7.28)	0–33	0.89
Symptoms of anxiety (BAI)	9.01 (7.05)	0–39	0.86
Physical quality of life	0.73 (0.55)	0–2.56	0.76
Medical interaction quality of life	0.28 (0.47)	0–2.67	0.65

Responses to stress

In the responses to stress questionnaire, Cancer Version (RSQ-CV; Compas et al., 2007) was used to evaluate construct validity for the measure of FPC. The RSQ-CV is theoretically derived from a control-based model of coping (e.g. Weisz, McCabe, & Denning, 1994) and reflects a 5-factor model of responses to stress. Two factors were evaluated in relation to FPC to demonstrate construct validity: primary control engagement coping and disengagement coping. Primary control engagement coping consists of action-oriented strategies aimed at problem solving, emotional expression, and emotional modulation ($\alpha = 0.74$). In contrast, disengagement coping involves avoidance, denial and wishful thinking ($\alpha = 0.73$). Both scales are comprised of nine items each, and scores for the two types of responses to stress are calculated as proportion scores reflecting the relative amount that participants reported to use these responses compared to their total reported responses to stress. Higher scores on the RSQ-CV factors indicate more reported use of the coping response. Given the action-oriented nature of primary control engagement coping, we expect positive correlations between this response to stress and the 6 FPC subscales. Similarly, we expect negative correlations between disengagement coping and the 6 FPC subscales.

Emotional distress

The Beck Anxiety Inventory (BAI; Beck & Steer, 1990) and the Beck Depression Inventory, Second Edition (BDI-II; Beck, Steer, & Brown, 1996) measured symptoms of anxiety and depression. Both self-report inventories included 21 items. To avoid problems with multicollinearity, we created a composite distress variable by averaging z scores for the BAI and BDI-II. The resulting variable was highly correlated with its concurrent BDI-II and BAI measure (r's for both $= 0.91$, $p < 0.01$), and the mean of the composite distress score was used in analyses. Symptoms of depression were in the 'minimal' range (Beck et al., 1996), while symptoms of anxiety were in the 'mild' range (Beck & Steer, 1990; Table 2).

Positive expectancies

The Life Orientation Scale-Revised (LOT-R; Scheier, Carver, & Bridges, 1994) was used to evaluate associations between positive expectancies and psychosocial adjustment.

The LOT-R assesses dispositional optimism, defined as the generalised expectation of positive outcomes. Total LOT-R scores were used in analyses, where higher scores indicate more reported positive expectancies.

Quality of life

The Cancer Rehabilitation Evaluation System, Short Form (CARES-SF; Schag, Ganz, & Heinrich, 1991) was used to measure 2 dimensions QOL for cancer patients: physical and medical interaction QOL. Higher scores on this measure indicate poorer QOL; mean scores were used in analyses. The physical subscale has 10 items that focus on functional impairment (e.g. difficulty with household chores, pain, reduction in energy). The medical interaction subscale has 4 items that focus on the patient-provider relationship (e.g. difficulty with asking the doctor questions). One item asked specifically about PC over medical decisions and was removed so as not to artificially inflate the association between medical interaction QOL and medical PC. Both physical and medical interaction QOL were rated, on average, between ‘not at all’ and ‘a little’ disrupted (Table 2).

Medical variables

Trained research assistants collected medical data through chart review. Data collected included diagnosis type, disease stage and treatment regimen (type and date of surgery, and whether chemotherapy, radiation and hormonal therapy were prescribed).

Data analyses

Data analyses were conducted using SPSS Version 15.0 (2006). For the measure of FPC, model reliability was tested by examining the internal consistencies of the six subscales and construct validity was tested using CFA and by examining bivariate correlations between the six PC subscales and the two categories of responses to stress (primary control engagement coping and disengagement coping). Hierarchical multivariate models were constructed to examine three indicators of psychosocial adjustment: emotional distress, physical QOL and medical interaction QOL. Study variables were entered in five steps: first, the dimension of FPC hypothesised to be specifically associated with the indicator of psychosocial adjustment was entered, followed by the remaining five FPC subscales in Step 2. Positive expectancies (LOT-R) scores were entered in Step 3, followed by the interaction between positive expectancies and the dimension of FPC entered in Step 1. Finally, Step 5 adjusted the models for sociodemographic and medical variables associated with the dependent variable in bivariate analyses at $p < 0.10$. Variables considered for inclusion in Step 5 of multivariate models were age, years of education, stage of disease, surgery status at the time of the study, whether chemotherapy or radiation treatments had been prescribed (yes/no), and time since diagnosis. Additionally, emotional distress was included in Step 5 for the models of QOL. Variables in the regression equations that comprised the interaction terms were centred to avoid problems with multicollinearity.

Results

FPC measure reliability and validity

Bivariate correlations between the six FPC subscales and the RSQ-CV supported the construct validity of the measure of PC (Table 1). The six FPC subscales were all significantly positively correlated with primary control engagement coping, suggesting that women who reported more FPC also reported more action-oriented responses to stress (r's ranged from 0.21 to 0.33, all $p < 0.01$). Further, women who reported more FPC reported less disengagement coping responses (r's ranged from -0.15 to -0.27, all $p < 0.05$). Finally, we examined model reliability by testing the internal consistencies of the 6 FPC subscales (Table 2). Reliabilities ranged from adequate ($\alpha = 0.66$) to very good ($\alpha = 0.92$). The internal consistencies of the FPC subscales suggest that each is appropriate for independent use.

Bivariate analyses

Correlations among the six subscales of FPC, positive expectancies and psychosocial adjustment are presented in Table 3. Higher levels of emotional distress were associated with lower ratings of FPC for all subscales (r's ranged from -0.24 to -0.55, all $p < 0.01$). Poorer physical QOL was associated with decreased perceptions of physical, emotional, medical and life PC (all $p < 0.01$). Poorer medical interaction QOL was associated with decreased perceptions of emotional, relationship, medical and life PC (all $p < 0.01$). Finally, the six FPC subscales were positively correlated (mean $r = 0.39$), suggesting that higher levels of PC for one subscale were associated with higher levels of PC on the others.

Multivariate regression analyses

Results of multivariate linear regressions for emotional distress, physical QOL and medical interaction QOL are presented in Table 4. Study variables were entered into the regression models in five steps, where Step 5 included sociodemographic or medical variables associated with the dependent variable in bivariate analyses at $p < 0.01$ (data not shown).

For the model of emotional distress, age, stage of disease, time since diagnosis and chemotherapy status were entered at Step 5. Results supported the study hypotheses: of all the FPC subscales, only higher emotional PC was significantly associated with decreased emotional distress ($b = -0.37$, $p < 0.01$), as were higher positive expectancies ($p < 0.01$). Additionally, longer times since diagnosis were associated with lower reported emotional distress ($p < 0.05$).

Table 3. Correlations between six subscales of PC, age, education, stage of disease and psychosocial variables.

	1	2	3	4	5	6	7	8	9
1. Distress									
2. Physical QOL	0.43**								
3. Medical QOL	0.36**	0.24**							
4. LOT-R	−0.47**	−0.09	−0.35**						
5. PC: Physical	−0.30**	−0.30**	−0.13	0.29**					
6. PC: Emotional	−0.55**	−0.23**	−0.20**	0.46**	0.37**				
7. PC: Relationship	−0.27**	−0.12	−0.21**	0.19**	0.22**	0.44**			
8. PC: Medical	−0.34**	−0.24**	−0.42**	0.26**	0.32**	0.42**	0.33**		
9. PC: Life	−0.41**	−0.25**	−0.22**	0.33**	0.34**	0.59**	0.56**	0.41**	
10. PC: Outcomes	−0.24**	−0.12	−0.21	0.15*	0.34**	0.41**	0.31**	0.38**	0.37**

Note: *Correlation is significant at the $p < 0.05$ level; ** correlation is significant at the $p < 0.01$ level.

For the models of QOL, higher scores on the QOL measure indicate worse QOL. For physical QOL, stage of disease, chemotherapy status and surgery received were entered at Step 5, as was emotional distress. Again, the study hypotheses were supported: of all the FPC subscales, only higher physical PC was significantly associated with better physical QOL ($b = -0.22$, $p < 0.01$). Additionally, lower levels of emotional distress were associated

Table 4. Multivariate linear regressions of emotional distress and QOL.[a]

Step		Standard β	p	sr_i^2
	Adjusted model $R^2 = 0.39$		**Emotional distress**	
1	Control: emotional	−0.37	<0.01	0.06
2	Control: physical	−0.05	0.44	0.00
	Control: relationship	−0.01	0.89	0.00
	Control: medical	−0.08	0.18	0.01
	Control: life	−0.03	0.68	0.00
	Control: outcome	0.01	0.83	0.00
3	LOT-R	−0.26	<0.01	0.05
4	Control: emotional*LOT-R	−0.05	0.45	0.00
5	Age	−0.04	0.46	0.00
	Stage of disease	0.03	0.63	0.00
	Weeks since diagnosis	−0.11	<0.05	0.01
	Did not receive chemotherapy	Reference		
	Received chemotherapy	0.13	0.06	0.01
	Adjusted model $R^2 = 0.27$		**Physical QOL**	
1	Control: physical	−0.22	<0.01	0.04
2	Control: emotional	−0.01	0.95	0.00
	Control: relationship	0.03	0.66	0.00
	Control: medical	−0.08	0.23	0.00
	Control: life	−0.05	0.53	0.00
	Control: outcome	0.08	0.24	0.00
3	LOT-R	0.19	<0.01	0.02
4	Control: Physical*LOT-R	0.01	0.92	0.00
5	Emotional distress	0.38	<0.01	0.08
	Stage of disease	0.16	0.03	0.01
	Did not receive chemotherapy	Reference		
	Received chemotherapy	0.11	0.14	0.01
	Received partial mastectomy	Reference		
	Received total mastectomy	0.16	<0.01	0.02
	Had not received surgery	0.04	0.47	0.00
	Adjusted model $R^2 = 0.31$		**Medical interaction QOL**	
1	Control: Medical	−0.33	<0.01	0.07
2	Control: Physical	0.07	0.29	0.00
	Control: Emotional	0.18	0.03	0.02
	Control: Relationship	−0.13	0.07	0.01
	Control: Life	0.05	0.54	0.00
	Control: Outcome	0.03	0.65	0.00
3	LOT-R score	−0.36	<0.01	0.04
4	Control: Medical*LOT-R	0.16	0.11	0.01
5	Emotional distress	0.24	<0.01	0.04
	Stage	0.06	0.34	0.00
	Years of education	−0.09	0.15	0.01

Note: sr_i^2 = squared semipartial correlation.
[a]Statistics shown for final model.

with better physical QOL ($p < 0.01$), earlier stage of disease was associated with better physical QOL ($p < 0.05$), and compared to participants who had received a partial mastectomy, those who had received a total mastectomy at the time of the study reported worse physical QOL (both $p < 0.01$). Additionally, results of the final model suggested that higher reported positive expectancies were associated with worse reported physical QOL ($p < 0.01$).

Finally, for the model of medical interaction QOL, stage of disease and years of education were entered at Step 5, as was emotional distress. Our study hypotheses were again supported: of all the FPC subscales, higher medical PC was most strongly associated with better medical interaction QOL ($b = -0.33$, $p < 0.01$). Further, higher positive expectancies and lower emotional distress were associated with better medical interaction QOL (both $p < 0.01$), though higher emotional PC was associated with worse medical interaction QOL ($b = 0.18$, $p < 0.05$).

Discussion

The present study advances research on unresolved issues related to measurement and conceptual relevance in the study of perceived control and cancer. First, we provide a tool with which to measure multiple dimensions of FPC for women with breast cancer and data on its psychometric properties. Second, we present evidence that in addition to positive expectancies, multiple dimensions of FPC show specific associations with indices of adjustment to breast cancer.

The results of the CFA supported a 6-factor model of FPC; competing models that characterised FPC as unidimensional or 2-factor construct were not supported. Though previous research has examined multiple dimensions of FPC in relation to psychosocial adjustment (Newsom et al., 1996; Taylor, Lichtman, & Wood, 1984; Thompson et al., 1993), confirmation of the measure using CFA is an important step in supporting, at the conceptual level, that FPC is a complex, multidimensional construct.

Consistent with previous studies (e.g. Newsom et al., 1996; Thompson et al., 1993), multiple dimensions of FPC were associated with adjustment to cancer, and differentially associated with psychosocial outcomes in hypothesised ways. Relative to other dimensions of FPC, emotional PC was most strongly associated with emotional distress, PC over physical symptoms was most strongly associated with physical QOL, and PC over medical decisions and care was most strongly associated with medical interaction QOL. These findings further support the characterisation of FPC as a multidimensional construct, and highlight the utility of a multidimensional measure of FPC – understanding specific associations between FPC and indices of psychosocial adjustment may be of use in tailoring psychosocial interventions for breast cancer survivors.

For example, enhancing perceptions of control over emotional arousal may be most effective for women experiencing emotional distress (e.g., Mackenzie, Carlson, Munoz, & Speca, 2007). Enhancing perceptions of physical control through physiological strategies such as progressive muscle relaxation (e.g., Cohen & Fried, 2007) or physical activity (Mitchell, Yakiwchuk, Griffin, Gra, & Fitch, 2007) may be most helpful for women experiencing poor physical QOL, while enhancing perceptions of control over medical care through interpersonal strategies addressing patient-provider communication may be most helpful for women experiencing poor medical interaction QOL. We cannot draw these conclusions from the current study, and continued research will be necessary to determine whether interventions tailored to promote specific dimensions of FPC differentially impact indices of adjustment. Nonetheless, the patterns of association observed in these results suggest that there may be added value to interventions that aim to impact specific dimensions of FPC. Finally, though PC over relationships, cancer outcomes and life in general were not significantly associated with psychosocial adjustment in the multivariate models, the null results do not suggest that these areas of PC are unimportant to adjustment. Correlational analyses (Table 3) showed these dimensions of PC to be associated with better adjustment on some or all of the psychosocial measures. These dimensions of PC may be significant in multivariate models of outcomes more specific to their domains (e.g. PC over cancer outcomes may account for significant variance in a multivariate model of fears of cancer recurrence).

Our findings regarding positive expectancies were consistent with previous research (e.g. Carver et al., 2000; Carver, Smith, Antoni, Petronis, & Derhagopian, 2005; Schou, Ekeberg, Sandvik, Hjermstad, & Ruland, 2005) in that positive expectancies were significantly associated with adjustment to breast cancer. Though Carver et al. (2000) found positive expectancies to be more strongly associated with adjustment than LPC for women with breast cancer, our analyses supported the conceptual relevance of FPC, and suggested that both FPC and positive expectancies play important roles in adjustment to cancer. Consistent with Carver et al., we did not observe any interactions between FPC and positive expectancies. It should be noted that Carver et al. assessed positive expectancies *specific* to remaining cancer free, whereas our analyses assessed generalised positive expectancies (Scheier & Carver, 1985). Though this difference in measurement may have resulted in the discrepancy of our results, our findings add to existing evidence that PC and positive expectancies are both important to adjustment to illness (e.g. Tennen, Affleck, Urrows, Higgins, & Mendola, 1992).

We did observe two unexpected results in our multivariate models: higher positive expectancies were associated with worse physical QOL, and higher emotional PC was associated with worse medical interaction QOL. Given that previous research has shown optimism to be associated with better adjustment to breast cancer (e.g. Carver et al., 2005; Schou et al., 2005) and emotional PC to be adaptive (e.g. Thompson et al., 1993), it is possible that there is a statistical explanation for these unexpected results. In bivariate analyses, positive expectancies were unrelated to physical QOL and emotional PC was positively related to better medical interaction QOL; in the multivariate models, the associations between positive expectancies and physical QOL and emotional PC and medical QOL were non-significant until emotional distress was added to the models in Step 5. Therefore, it is possible that the unexpected negative associations were the result of emotional distress acting as a negative suppressor in the multivariate models of QOL (Tabachnick & Fidell, 2001). However, there may be conceptual explanations for the unexpected results as well. Partialing out the effects of emotional distress, women experiencing poorer physical QOL after a breast cancer diagnosis may adopt a more optimistic outlook as an adaptive response; alternatively, women with a more optimistic outlook on life may be initially more impacted by physical changes and limitations associated with breast cancer and its treatment. Similarly, women experiencing poorer medical interaction QOL may exert stronger control over their emotional reactions to breast cancer if they feel they are not being emotionally supported during the clinical encounter while, alternatively, women who perceive greater control over their emotional reactions to breast cancer may be more hesitant to disclose questions and needs to their physician. However, these hypotheses are only speculation, and continued research will be necessary to fully explain these unexpected results.

It is worth noting that while our results are consistent with studies that have shown emotional PC to be adaptive (e.g. Thompson et al., 1993), others have shown the opposite. For example, in two studies (Ho, Chan, & Ho, 2004; Watson et al., 1991) that used the Courtauld Emotional Control Scale (Watson & Greer, 1983), emotional PC was found to be positively associated with emotional distress. However, emotional PC in the Ho et al. and Watson et al. studies was defined as the purposeful suppression of negative affect. In this study, the emotional PC subscale aims to asses an individual's ability to control their expression of emotions. Previous work has shown the controlled expression of emotion to be adaptive in adjustment to cancer (e.g. Compas et al., 2007); thus, the distinction between PC over emotional reactions and the purposeful suppression of negative affect is critical, and should be carefully considered in future studies of PC over emotions and adjustment to illness.

Taken in context with previous research, which has used different measures of PC in various illness populations to examine multiple time windows in the illness-adjustment trajectory, perhaps the safest conclusion continues to be that associations between FPC, positive expectancies, and adjustment to illness are highly complex (Tennen & Affleck, 2000). In our presentation of a 6-factor assessment tool for FPC, we do not aim to further complicate the issue. Rather, we hope to help facilitate research for those with the goal of investigating specific relationships between FPC and adjustment. This domain-specific approach may help to simplify, and ultimately to illuminate, the complex results of the effects of FPC on adjustment in the context of illness.

There are a number of limitations to the present study. The first concerns external validity. This sample is largely Caucasian, well-educated and diagnosed with early-stage breast cancer. We cannot assume that associations between FPC and adjustment would remain consistent within more sociodemographically diverse samples, for patients with later-stage disease or for individuals with illnesses other than breast cancer. Control-related research in the study of AIDS (Griffin & Rabkin, 1998), pain (Pellino & Ward, 1997), and recurrent cancer (Newsom et al., 1996) has used self-report questionnaires similar in structure to the measure presented here, suggesting that a version of this scale could be used successfully in the study of FPC in other illnesses; however, research will be needed to determine whether it is useful in the study of other health concerns. The data are cross-sectional and cannot be used to infer causal associations between FPC, positive expectancies and psychosocial adjustment. We were limited in our assessment of treatment received for breast cancer – for chemotherapy and radiation, data were available on whether participants had been prescribed these treatments or not, but the start date of treatment was largely unavailable. It is unknown, therefore, what cumulative dose participants had received in the multivariate models of distress and physical QOL. Finally, our measure does not address LPC, which has been shown to relate to adjustment in the context of cancer, and among breast cancer survivors specifically (Taylor et al., 1984). If it is of interest to a researcher to understand how specific sources of PC are related to adjustment, the Multidimensional Health Locus of Control family of measures (see Wallston, 2005, for a review) would suit their needs.

In conclusion, this study provides evidence that dimensions of FPC are associated with adjustment to breast cancer in significant and specific ways, and provides a tool with which multiple dimensions of FPC can be assessed. A multidimensional approach to investigating FPC in relation to indices of adjustment yields specific associations that suggest meaningful strategies for tailoring control-focused psychosocial interventions. Future research that investigates whether enhancing a specific dimension of PC (e.g. PC over emotions) causes changes in a complimentary index of adjustment (e.g. emotional distress) will strengthen the argument for specific dimensions of FPC as relevant targets of psychosocial interventions for cancer survivors.

References

American Cancer Society. (2005). *Cancer Facts & Figures*. Retrieved 4 January, 2006 from http://www.cancer.org

Arbuckle, J.L. (2003). *Amos 5.0 Update to the Amos User's Guide*. Chicago, IL: Smallwaters Corporation.

Beck, A.T., & Steer, R.A. (1990). *The Beck Anxiety Inventory; Manual*. San Antonio, TX: The Psychological Corporation.

Beck, A.T., Steer, R.A., & Brown, G.K. (1996). *Beck Depression Inventory – Second Edition; Manual*. San Antonio, TX: The Psychological Corporation.

Bentler, P.M. (1990). Comparative fit indices in structural models. *Psychological Bulletin, 107*, 238–246.

Burker, E.J., Evon, D.M., Galanko, J., & Egan, T. (2005). Health locus of control predicts survival after lung transplant. *Journal of Health Psychology, 10*(5), 695–704.

Carver, C.S., Harris, S.D., Lehman, J.M., Durel, L.A., Antoni, M.H., Spencer, S.M., et al. (2000). How important is the perception of personal control? Studies of early stage breast cancer patients. *Personality and Social Psychology Bulletin, 26*(2), 139–149.

Carver, C.S., Smith, R.G., Antoni, M.H., Petronis, V.M., & Derhagopian, R.P. (2005). Optimistic personality and psychosocial well-being during treatment predict psychosocial well-being among long-term survivors of breast cancer. *Health Psychology, 24*(5), 508–516.

Cohen, M., & Fried, G. (2007). Comparing relaxation training and cognitive-behavioral group therapy for women with breast cancer. *Research on Social Work Practice, 17*, 313–323.

Cole, D.A. (1987). Utility of confirmatory factor analysis in test validation research. *Journal of Consulting and Clinical Psychology, 55*, 584–594.

Compas, B.E., Beckjord, E., Agocha, B., Sherman, M.L., Langrock, A., Grossman, C.I., et al. (2007). Measurement of coping and stress responses in women with breast cancer. *Psycho-Oncology, 15*(12), 1038–1054.

Griffin, K.W., & Rabkin, J.G. (1998). Perceived control over illness, realistic acceptance, and psychological adjustment in people with AIDS. *Journal of Social and Clinical Psychology, 17*(4), 407–424.

Hazard Vallerand, A., Hasenau, S., Templin, T., & Collins-Bohler, D. (2005). Disparities between black and white patients with cancer pain: the effect of perception of control over pain. *Pain Medicine, 6*(3), 242–250.

Helgeson, V.S. (1992). Moderators of the relation between perceived control and adjustment to chronic illness. *Journal of Personality and Social Psychology, 63*(4), 656–666.

Ho, R.T.H., Chan, C.L.W., & Ho, S.M.Y. (2004). Emotional control in chinese female cancer survivors. *Psycho-Oncology, 13*, 808–817.

Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indices in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.

Kline, R.B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: Guilford.

Luszczynska, A., & Schwarzer, R. (2005). Multidimensional health locus of control: comments on the construct and its measurement. *Journal of Health Psychology, 10*(5), 633–642.

Mackenzie, M.J., Carlson, L.E., Munoz, M., & Speca, M. (2007). A qualitative study of self-perceived effects of mindfulness-based Stress Reduction (MBSR) in a psychosocial oncology setting. *Stress and Health, 23*, 59–69.

Manne, S., & Glassman, M. (2000). Perceived control, coping efficacy, and avoidance coping as mediators between spouses' unsupportive behaviors and cancer patients' psychological distress. *Health Psychology, 19*(2), 155–164.

Marsh, H.W., Balla, J.R., & McDonald, R.P. (1988). Goodness-of-fit indexes in confirmatory factor analysis: the effect of sample size. *Psychological Bulletin, 103*, 391–410.

Miller, S.M. (1978). Controllability and human stress: method, evidence and theory. *Behavior Research and Thearpy, 13*, 287–304.

Mitchell, T.L., Yakiwchuk, C.V., Griffin, K.L., Gra, R.E., & Fitch, M.I. (2007). Survivor dragon boating: a vehicle to reclaim and enhance life after treatment for breast cancer. *Health Care for Women International, 28*(2), 122–140.

Naus, M.J., Price, E.C., & Peter, M.P. (2005). The moderating effects of anxiety and breast cancer locus of control on depression. *Journal of Health Psychology, 10*(5), 687–694.

Newsom, J.T., Knapp, J.E., & Schulz, R. (1996). Longitudinal analysis of specific domains of internal and external control and depressive symptoms in patients with recurrent cancer. *Health Psychology, 15*, 323–331.

Norton, T.R., Manne, S.L., Rubin, S., Hernandez, E., Carlson, J., Bergman, C., et al. (2005). Ovarian cancer patients' psychological distress: the role of physical impairment, perceived unsupportive family and friend behaviors, perceived control, and self-esteem. *Health Psychology, 24*(2), 143–152.

Pellino, T.A., & Ward, S.E. (1997). Perceived control mediates the relationship between pain severity and patient satisfaction. *Journal of Pain and Symptom Management, 15*, 110–116.

Rowe, J.L., Montgomery, G.H., Duberstein, P.R., & Bovbjerg, D.H. (2005). Health locus of control and perceived risk for breast cancer in healthy women. *Behavioral Medicine, 31*(1), 33–40.

Schag, C.C., Ganz, P.A., & Heinrich, R.L. (1991). Cancer rehabilitation evaluation system-short form (CARES-SF). *Cancer, 68*, 1406–1413.

Scheier, M.F., Carver, C.S., & Bridges, M.W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the life orientation test. *Journal of Personality and Social Psychology, 67*(6), 1063–1078.

Schou, I., Ekeberg, Ø., Sandvik, L., Hjermstad, M.J., & Ruland, C.M. (2005). Multiple predictors of health-related quality of life in early stage breast cancer. data from a year follow-up study compared with the general population. *Quality of Life Research, 14*, 1813–1823.

SPSS Version 15.0. (2006). SPSS Inc., Chicago, IL.

Stanton, A.L., Revenson, T.A., & Tennen, H. (2007). Health psychology: psychological adjustment to chronic disease. *Annual Reviews in Psychology, 58*, 565–592.

Steiger, J.H. (2000). Point estimation, hypothesis testing, and interval estimation using the RMSEA: Some comments and a reply to Hayduck and Glaser. *Structural Equation Modeling, 7*, 149–162.

Steiger, J.H., & Lind, J.C. (1980). *Statistically based tests for the number of common factors*. Paper presented at the Annual Meeting of the Psychometric Society. Iowa: Iowa City.

Tabachnick, B.G., & Fidell, L.S. (2001). *Using Multivariate Statistics* (4th ed.). Boston: Allyn & Bacon.

Taylor, S.E., Helgeson, V.S., Reed, G.M., & Skokan, L.A. (1991). Self-generated feelings of control and adjustment to physical illness. *Journal of Social Issues, 47*, 91–109.

Taylor, S.E., Lichtman, R.R., & Wood, J.V. (1984). Attributions, beliefs about control, and adjustment to breast cancer. *Journal of Personality and Social Psychology, 46*, 489–502.

Tennen, H., & Affleck, G. (2000). The perception of personal control: sufficiently important to warrant careful scrutiny. *Personality and Social Psychology Bulletin, 26*(2), 152–156.

Tennen, H., Affleck, G., Urrows, S., Higgins, P., & Mendola, R. (1992). Perceiving control, construing benefits, and daily processes in rheumatoid arthritis. *Canadian Journal of Behavioural Science, 24*(2), 186–203.

Thompson, S.C., & Collins, M.A. (1995). Applications of perceived control to cancer: an overview of theory and measurement. *Journal of Psychosocial Oncology, 13*, 11–26.

Thompson, S.C., Sobolew-Shubin, A., Galbraith, M.E., Schwankovsky, L., & Cruzen, D. (1993). Maintaining perceptions of control: finding perceived control in low-control circumstances. *Journal of Personality and Social Psychology, 64*, 293–304.

Wallston, K.A. (2005). The validity of the multidimensional health locus of control scales. *Journal of Health Psychology, 10*(4), 623–631.

Wallston, K.A., Stein, M.J., & Smith, C.A. (1994). Form C of the MHLC scales: a condition-specific measure of locus of control. *Journal of Personality Assessment, 63*, 534–553.

Wallston, K.A., Wallston, B.D., & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education Monographs, 6*(2), 160–170.

Watson, M., & Greer, S. (1983). Development of a questionnaire measure of emotional control. *Journal of Psychosomatic Research, 27*(4), 299–305.

Watson, M., Greer, S., Rowden, L., Gorman, C., Robertson, B., Bliss, J.M., et al. (1991). Relationships between emotional control, adjustment to cancer and depression and anxiety in breast cancer patients. *Psychological Medicine, 21*, 51–57.

Weisz, J.R., McCabe, M.A., & Denning, M.D. (1994). Primary and secondary control among children undergoing medical procedures: adjustment as a function of coping style. *Journal of Consulting and Clinical Psychology, 62*(2), 324–332.

Williams-Piehota, P., Schneider, T.R., Pizarro, J., Mowad, L., & Salovey, P. (2004). Matching health messages to locus of control beliefs for promoting mammography utilization. *Psychology and Health, 19*(4), 407–423.

Appendix

Perceived Control Questionnaire

The following questions are about control over different parts of your life that *may* be affected by the experience of breast cancer. The questions ask about how much control you *personally* have over certain aspects of your life. Please read each question carefully and use the following rating scale to select the response that best reflects your current control beliefs. ***Space is provided to fill in a response to each item***.

1	2	3	4	5
No control	A little bit of control	A moderate amount of control	A great deal of control	This item does not apply to you

(1) How much *personal* control do you think you have over your **physical symptoms**, including . . .

- . . . fatigue or weakness? __________
- . . . nausea or vomiting? __________
- . . . trouble sleeping? __________
- . . . mobility/flexibility? __________
- . . . pain or discomfort? __________
- . . . arm swelling? __________

(2) How much *personal* control do you think you have over your **medical decisions and care**, including . . .

- . . . gathering important information and getting your questions answered? __________
- . . . receiving the treatments you want? __________
- . . .choosing a doctor you are comfortable with? __________
- . . . scheduling your treatments at convenient times? __________

(3) How much *personal* control do you think you have over the **outcomes** of your breast cancer, including . . .

- . . . recovering from your current cancer ? __________
- . . . preventing breast cancer from coming back? __________

(4) How much *personal* control do you think you have over your **emotions**, including …

- … feeling sad? ________________
- … feeling out of control? ________________
- … feeling guilty? ________________
- … outbursts of crying? ________________
- … feeling angry? ________________
- … worrying about the future? ________________

(5) How much *personal* control do you think you have over your **relationships** with other people in your life, including your …

- … partner/spouse? ________________
- … other family members? ________________
- … friends? ________________
- … co-workers? ________________
- … medical care providers (doctors and nurses)? ________________

(6) In general, how much *personal* control do you think you have over your **life**, including …

- … the events/things that are most important to you? ________________
- … your personal problems? ________________
- … overcoming challenges that come your way? ________________