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The role of specific and core dysfunctional beliefs in breast cancer radiotherapy patients' fatigue

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Abstract

The goal of the study was to examine the relationships among fatigue catastrophizing, core dysfunctional beliefs, and fatigue in breast cancer radiotherapy patients. Seventy-eight patients participated (mean age=56.3, $SD=10.5$). Patients completed questionnaires on: fatigue catastrophizing, core dysfunctional beliefs and fatigue in their last week of radiotherapy. Using bootstrapping procedures to obtain estimates and confidence intervals for indirect effects, results showed that core beliefs (Need for Comfort and Demandingness for Fairness) had significant indirect effects on fatigue through fatigue catastrophizing, as indicated by the 95% CI (02 to .19 for Need for Comfort, .01 to .16 for Demandingness for Fairness).

Keywords

Fatigue catastrophizing; fatigue; core beliefs; breast cancer

Introduction

Cancer-related fatigue is a highly prevalent and disabling symptom that can greatly impair patients' well-being and daily functioning (Cheville, 2009; Gibson et al., 2005; Mitchell, 2010; Wu and McSweeney, 2007). Patients describe cancer-related fatigue as having a devastating impact on many areas of their lives, including their professional, family, and

social activities (Curt, 2000;Safaei et al., 2009). Patients also rate cancer-related fatigue as more distressing and as having a greater impact on their daily functioning than other cancer-related side effects, including pain, nausea, and depression (Curt et al., 2000;Hofman et al., 2007; Morrow et al., 2005).

During breast cancer treatment, fatigue is reported by a substantial majority of patients (Bardwell and Ancoli-Israel, 2008). Studies examining the prevalence of fatigue among breast cancer patients have found that up to 99% of patients experience some level of fatigue during the course of therapy, and more than 60% of patients rate their level of fatigue as moderate to severe (Bower et al., 2000). Fatigue is particularly prevalent during breast cancer radiotherapy, and it typically increases over the course of the treatment, with up to 93% of patients reporting fatigue by the end of radiotherapy(Dhruva et al., 2010; Knobf and Sun, 2005).

Psychological factors have been shown to influence fatigue in women with breast cancer (Broeckel et al., 1998; Safaei et al., 2009; Servaes et al. 2002). Specifically, there is evidence that cognitive factors play a role in breast cancer patients' experience of fatigue.

Cognitive factors in breast cancer patients' experience of fatigue

One cognitive factor associated with fatigue in breast cancer patients is fatigue catastrophizing. In cognitive behavioral theory, catastrophizing(i.e., awfulizing) is a negative, dysfunctional belief which involves exaggerating the negative consequences of a situation to a great extent (Beck, 1995; Ellis, 1994). Fatigue catastrophizing refers to exaggerating the negative consequences of fatigue (e.g., 'I tend to think that my fatigue is awful', Jacobsen et al., 1999). Research indicates that breast cancer patients who engage in more catastrophizing about fatigue experience greater fatigue (Broeckel et al., 1998; Donovan et al. 2005; Jacobsen et al., 1999; Jacobsen et al. 2004). For example,Jacobsen et al. (2004), in a study investigating the impact of fatigue catastrophizing in a sample of 80 breast cancer patients, indicated that breast cancer patients undergoing radiotherapy who had high levels of fatigue catastrophizing reported more severe fatigue than those with low levels of catastrophizing.

Fatigue catastrophizing is a situation-specific dysfunctional belief and, according to cognitive behavioral theory, situation-specific beliefs stem from broader, more general, and deeper beliefs (Beck, 1995; Ellis, 1994). As Ellis(1994) wrote, "underlying what we think in *specific* situations are what is known as 'core beliefs,' which guide how people react to the events and circumstances in their lives *in general*." Core beliefs are strongly-held, rigid and inflexible beliefs, which form the basis for situation-specific beliefs, which in turn, are theorized to lead to emotional, behavioral or psycho physiological outcomes (Beck, 1995; Ellis, 1994; Froggatt, 2005). For example, holding a broad, general, core belief such as "I shouldn't have to feel discomfort," could give rise to situation-specific dysfunctional beliefs (e.g., "It is awful to feel fatigued"), which could lead to an outcome such as fatigue. However, to date, no study has investigated the relationship between core beliefs and fatigue catastrophizing.

Overview of the present study

The goal of this study is to explore the relationships among fatigue catastrophizing, core dysfunctional beliefs and fatigue. Cognitive behavioral theory (Beck, 1995; Ellis, 1994) states that: 1) emotional, behavioral and psychophysiological reactions stem from situation-specific beliefs; 2) core beliefs influence situation-specific beliefs; and 3) core beliefs have an indirect (i.e., mediated) effect on emotional, behavioral and psychophysiological reactions through situation-specific beliefs. The goal of the present study was to test these theorized relationships in the context of breast cancer radiotherapy. Consistent with theory, we hypothesized that: 1) fatigue would be associated with fatigue catastrophizing; 2) fatigue catastrophizing would be associated with patients' core beliefs; and 3) core beliefs would have an indirect effect on radiotherapy-related fatigue through fatigue catastrophizing.

Methods

Participants and procedures

Seventy-eight female breast cancer radiotherapy patients participated in the study. The descriptive characteristics of the sample are presented in Table 1.

Data were collected from questionnaires administered as part of a larger study on a behavioral medicine intervention for breast cancer radiotherapy patients. Patients scheduled for breast cancer radiotherapy were referred by a physician in the radiation oncology clinic at a major urban hospital. All patients received radiotherapy on a daily basis (5 days a week, for a traditional six-week course of external beam radiotherapy). All questionnaires were administered in patients' last week of radiotherapy, as research has shown that fatigue is at its worst then (Knobf and Sun, 2005). The questionnaires were given to the patients to take home and complete at home the night before their last radiation treatment. The questionnaires were self-report, paper and pencil, and were given to the patients and collected by Research assistants who coordinated the study procedures.

Eligibility criteria included: undergoing breast cancer radiotherapy, having the ability to speak and read English (as the study forms were in English), being at least 18 years of age, and having stage 0-III disease. Patients were ineligible if they had undergone previous radiotherapy or if they had any uncontrolled major comorbid mental illness (determined by medical chart reviews). All patients provided written informed consent, and data was collected in accordance with the institution's human subjects protection guidelines.

Measures

Demographic and clinical measures—The Demographics Questionnaire is a face-valid self-report questionnaire which was used to assess age, ethnicity, education, and marital status.

In addition, we abstracted information about patients' surgery type (i.e., mastectomy or surgery), medication, comorbidities, stage and chemotherapy history from their medical charts.

Fatigue measures—The fatigue-inertia subscale of the Short Version-Profile of Mood States (POMS-SV, DiLorenzo et al., 1999) was used to assess fatigue as expressed by participants' report of weariness, inertia, and low energy level (McNair et al., 1992).

Patients rated their fatigue over the past week on a scale of 0–4, ranging from “0-Not at all” to “4-Extremely.” The 5 subscale items were summed to comprise a fatigue score. A study with cancer patients has shown the fatigue items in the subscale to have high internal consistency ($\alpha = .87$) (Shacham, 1983). The internal consistency (α) for our sample was .92.

The Functional Assessment of Chronic Illness Therapy - Fatigue Subscale (FACIT-F, Yellen et al., 1997) was used to assess cancer-related fatigue during participants' usual daily activities over the past week. Patients indicated how true each fatigue-related statement was to them on a scale of 0–4, ranging from “0-Not at all” to “4-Very much.” The 13 subscale items were summed to comprise a fatigue score. The Fatigue subscale has strong internal consistency ($\alpha = .93$) and test-retest reliability ($r = .90$) (Yellen et al., 1997). The internal consistency (α) for our sample was .93.

A Visual Analogue Scale (Montgomery and Bovbjerg, 2004) was used to assess patients' fatigue intensity by asking patients to rate how fatigued they felt on a 100mm Visual Analogue Scale (VAS) item. VAS scores can range from 0–100, “0-Not at all fatigued to “100-As fatigued as I could be”.

Cognition measures—The Fatigue Catastrophizing Scale (Jacobsen et al., 1999) was used to assess tendencies to engage in catastrophizing about one's fatigue symptoms. Patients indicated how often each item is true on a scale of 0–5, ranging from “0-Never true” to “5-All of the time true”. The 10 items were summed up to comprise a fatigue catastrophizing score. The scale has high internal consistency ($\alpha = .92$) (Jacobsen, 1999). The internal consistency (α) for our sample was .93.

The General Attitudes and Beliefs Scale- Short Form (Lindner et al., 1999) was used to assess core dysfunctional beliefs. Patients were asked to indicate the extent of their agreement on a 5-point scale, ranging from “1-Strongly Disagree” to “5-Strongly Agree.” The scale has 26 items that measure the following dysfunctional core beliefs: (1) Need for Achievement (subscale's $\alpha = .79$); (2) Need for Approval (subscale's $\alpha = .79$); (3) Need for Comfort (subscale's $\alpha = .80$); (4) Demandingness for Fairness (subscale's $\alpha = .80$); (5) Self-Downing (subscale's $\alpha = .84$); and (6) Other-Downing (subscale's $\alpha = .83$) (Lindner et al., 1999). The internal consistency for our sample was: (1) Need for Achievement ($\alpha = .86$); (2) Need for Approval ($\alpha = .48$); (3) Need for Comfort ($\alpha = .79$); (4) Demandingness for Fairness ($\alpha = .78$); (5) Self-Downing ($\alpha = .67$); and (6) Other-Downing ($\alpha = .75$).

Data analysis—Prior to conducting the formal analyses described below, the descriptive statistics for the variables were analyzed (see Table 2). Bivariate correlation analyses (Pearson's r) and Chi Square tests of association were then performed to test for relationships among the demographic, clinical and psychological variables (SPSS 19.0)

We used bootstrapping procedures (Preacher and Hayes, 2008) to obtain estimates and confidence intervals for indirect (mediated) effects. Bootstrapping is a non-parametric approach to effect-size estimation and hypothesis testing that makes no assumption about the shape of the distribution (Efron and Tibshirani, 1993; Mooney and Duval, 1993; Preacher and Hayes, 2004). We used an SPSS macro that accompanies the article by Preacher and Hayes (2008) on testing indirect effects. Unlike the assumptions for mediation models described by Baron and Kenny (1986), the bootstrapping procedure does not operate on the assumption that the dependent variables should be statistically correlated with the independent variables, nor with the potential mediator variables (Hayes, 2009). Bootstrapping also produces a test that is not based on large-sample theory, and it can be used for smaller samples (Preacher and Hayes, 2004). Calculation of the total indirect effects involved four steps (see Preacher and Hayes, 2008): 1) From our original data set of 78 cases, 5,000 bootstrap samples were randomly generated using random sampling with replacement; 2) regression coefficients (Effect of Independent Variable on Mediator: (a path); and Effect of Mediator on Dependent variable: (b path), and the indirect effect estimates ($a \times b$) were calculated based on this bootstrap sample; 3) this process was repeated 5,000 times, yielding 5,000 estimates of the indirect effect of interest; and, 4) the mean of the 5,000 indirect effect estimates was calculated. If zero was not included in the 95% confidence interval of the estimate, we concluded that the indirect effect was statistically significant (Preacher and Hayes, 2008).

Results

Because the three measures of fatigue (POMS-SV, FACIT-F, VAS) were highly correlated (POMS-SV fatigue with Fatigue VAS: $r(76) = .67, p < .05$; POMS-SV Fatigue with FACIT-F Fatigue: $r(76) = .77, p < .05$; and FACIT-F with Fatigue VAS: $r(76) = .62, p < .05$), the raw scores were converted to z-scores, which were then summed to create a fatigue composite score. The subsequent analyses were performed using the fatigue composite score ($\alpha = .75$).

Demographic variables and clinical variables were not significantly associated with the fatigue composite score (all $ps > .05$), with the exception of age, which was negatively correlated with fatigue, $r(76) = -.22, p < .05$. However, when included in a regression model with the cognitive variables (fatigue catastrophizing and core beliefs), age made no statistically significant contribution to fatigue, $p > .05$.

The correlations among fatigue, fatigue catastrophizing and core beliefs are presented in Table 3.

Radiotherapy-related fatigue and fatigue catastrophizing

As hypothesized, fatigue was significantly correlated to fatigue catastrophizing, $r(76) = .43, p < .05$.

Fatigue catastrophizing and core beliefs

As hypothesized, fatigue catastrophizing was significantly correlated to the following core beliefs: Need for Comfort, $r(76) = .25, p < .05$; and Demandingness for Fairness, $r(76) = .22,$

$p < .05$. None of the other core beliefs were significantly correlated to fatigue catastrophizing, all p 's $> .05$.

Core beliefs' indirect effect on radiotherapy-related fatigue through fatigue catastrophizing

The indirect effects of core beliefs (Need for Comfort and Demandingness for Fairness) on fatigue through fatigue catastrophizing were tested. Need for Comfort and Demandingness for Fairness have significant indirect effects on fatigue through fatigue catastrophizing (see Table 4).

Discussion

Consistent with cognitive behavioral theory (Beck, 1995; Ellis, 1994), we hypothesized that: 1) fatigue would be associated with fatigue catastrophizing; 2) fatigue catastrophizing would be associated with patients' core beliefs; and 3) core beliefs would have an indirect effect on radiotherapy-related fatigue through fatigue catastrophizing. Study results supported our hypotheses.

First, results revealed that higher levels of radiotherapy-related fatigue were associated with higher levels of fatigue catastrophizing. This result is consistent with empirical literature which has demonstrated a positive relationship between fatigue catastrophizing and fatigue in breast cancer settings (Broeckel et al., 1998; Donovan et al., 2007; Jacobsen et al., 1999; Jacobsen et al., 2004).

Second, results revealed that fatigue catastrophizing was positively associated with Need for Comfort and Demandingness for Fairness. Need for Comfort is defined as the core belief that one absolutely must be comfortable at all times. Demandingness for Fairness is defined as the core belief that things in one's life must be fair at all times (Ellis, 1994). Results indicated that the more patients believe that they should be comfortable at all times or that things should be fair at all times, the more they consider fatigue as being awful and catastrophic.

Third, results indicate that Need for Comfort and Demandingness for Fairness have a significant indirect (mediated) effect on fatigue through fatigue catastrophizing. More specifically, holding the core belief that one absolutely must be comfortable at all times, is associated with catastrophic, fatigue-specific thoughts like "It is awful to experience fatigue," which in turn lead to greater levels of fatigue. Also, holding the core belief that things in one's life should be fair at all times enhances fatigue catastrophizing, which, in the same manner, leads to a greater level of fatigue. Core beliefs are, in a sense, the very essence of how we interpret the events that happen to us. However, they have a general, abstract form, applicable to all life events and they have an impact on specific outcomes (such as fatigue in this case) only when mediated by situation-specific beliefs (applicable to the life event at hand, such as fatigue catastrophizing).

To summarize, the results indicate that when faced with a difficult situation (e.g., breast cancer radiotherapy), having dysfunctional core beliefs (e.g., Need for Comfort, Demandingness for Fairness) might generate specific dysfunctional beliefs (e.g., fatigue

catastrophizing). In turn, specific dysfunctional beliefs (e.g., fatigue catastrophizing) may influence the experience of aversive psychophysiological reactions (e.g., increased fatigue) in that context. However, future prospective studies are needed to clarify the causal nature of the relationships between dysfunctional core beliefs, dysfunctional specific beliefs and psychophysiological outcomes.

From a clinical point of view, the results suggest that breast cancer patients with higher levels of fatigue catastrophizing may be at greater risk for experiencing higher levels of fatigue, and may be most in need of behavioral medicine to control to manage their fatigue. For example, in our previous work (Montgomery et al., 2009), we demonstrated that a brief cognitive behavioral intervention appeared to be successful in preventing the development of fatigue in breast cancer radiotherapy patients. The results also suggest that for patients and clinicians interested in achieving the treatment goal of reducing radiotherapy-related fatigue, a key treatment objective should be the reduction of fatigue catastrophizing. However, clinical interventions should not stop at the specific-beliefs level since results indicate that core beliefs indirectly affect fatigue level through fatigue catastrophizing.

As cognitive behavioral theory states (Ellis, 1994; Beck, 1995), changing situation-specific dysfunctional beliefs might help the patients *feel better in that particular* situation or life event. However, if patients are left with the same core beliefs, these beliefs can make them vulnerable to developing distress when they encounter other life events. Therefore, as Ellis suggested, changing both core beliefs and specific beliefs helps patients to not only to feel better in a particular situation, but also to remove the general vulnerability derived from their core beliefs, and thus to make them more resilient to a broader area of future life events (Ellis, 1994; David et al., 2010).

There was also a relationship between age and radiotherapy-related fatigue, with older patients reporting less fatigue. This result, although counterintuitive, is consistent with other studies indicating an influence of age on fatigue during breast cancer treatment, with authors suggesting that younger women may have more responsibilities, from professional to family life ones, which may explain their higher levels of fatigue (de Jong et al., 2005; Woo et al., 1998).

As with all research studies, this one is not without limitations. First, the cross-sectional design does not allow for a determination of causality. Future prospective research is needed to build on this foundation, and to determine the nature of the relationships between Need for Comfort, Demandingness for Fairness, fatigue catastrophizing, and fatigue. Second, future studies should also investigate the impact of baseline variables (e.g., fatigue parameters, cognitive and emotional variables) on subsequent fatigue in order to get a deeper understanding of the cancer-related fatigue in breast cancer patients undergoing radiotherapy phenomenon. Third, future research should include additional psychological variables (e.g., expectancies for fatigue, depression, anxiety) when investigating sources of fatigue in breast cancer patients undergoing radiotherapy. Fourth, this study was restricted to breast cancer patients undergoing a traditional six-week course of external beam radiotherapy. It is not clear how the results will generalize to other cancer radiotherapy

populations (e.g., prostate), other types of breast cancer radiotherapy (e.g., hypofractionated), or other types of treatments (e.g., chemotherapy).

This study is one of the few to place fatigue catastrophizing in the context of the cognitive behavioral theory, thus offering a theory-based perspective on the cognitive factors that impact the experience of fatigue in breast cancer patients.

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Table 1

Descriptive statistics of demographic variables

Age	M = 56.3, SD = 10.5
Marital status	47.4% married
Education	69.2% college graduates
Race	71% white
Ethnicity	9% Latina
History of chemotherapy	35.9%
Type of surgery	66.7% lumpectomy 33.3% mastectomy
Stage	Stage 0: 28.20% Stage I: 46.16% Stage II: 16.66% Stage III: 8.98%

Table 2

Descriptive statistics of psychological variables

Variables	Mean (SD)
Fatigue (composite score)	.15 (2.4)
Fatigue catastrophizing	3.05 (4.0)
Need for achievement	7.15 (3.03)
Need for approval	5.47 (1.93)
Need for comfort	8.53 (3.09)
Demandingness for fairness	9.65 (3.55)
Self-Downing	4.96 (1.89)
Other-Downing	6.41 (2.63)

Table 3

Correlations among the psychological variables

	1	2	3	4	5	6	7	8
1. Fatigue	1							
2. Fatigue catastrophizing	.43*	1						
3. Need for achievement	.15	.21	1					
4. Need for approval	.04	.21	.64*	1				
5. Need for comfort	.02	.25*	.67*	.54*	1			
6. Demandiness for fairness	.01	.22*	.68*	.60*	.75*	1		
7. Self-Downing	.04	.06	.40*	.73*	.42*	.47*	1	
8. Other-Downing	.02	.02	.56*	.43*	.34*	.36*	.36*	1

* Note: $p < .05$

Table 4

Bootstrapped Estimates, Confidence Intervals, and Explained Variance for Tests of the Indirect Effects

Independent Variable (Core beliefs)	Mediator Variable	Dependent Variable	Effect of IV on Mediator (a path)	Effect of Mediator on DV (b path)	Indirect effect of core beliefs on fatigue through fatigue catastrophizing (a x b)	Confidence intervals
Need for Comfort	Fatigue catastrophizing	Fatigue	.32 (.14)*	.28 (.06)*	.09 (.04)	.02 to .19
Demandingness for Fairness	Fatigue catastrophizing	Fatigue	.26 (.12)*	.28 (.06)*	.07 (.03)	.01 to .16

Note: Values within parentheses indicate standard errors for the unstandardized regression coefficients;

* $p < .05$