

The Relationship Between Learned Resourcefulness and Cancer-Related Fatigue in Patients With Non-Hodgkin Lymphoma

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Non-Hodgkin lymphoma (NHL) is the sixth most prevalent cancer in men and fifth in women. In the United States, the incidence rate of NHL per 100,000 Caucasian people older than age 65 was reported to be 110 in men and 77 in women (Alexander et al., 2007). In Canada and Israel, the rates reported for all age groups per 100,000 were 14 and 16 for men and 10 and 12 for women, respectively (Alexander et al., 2007). The main treatment for NHL is the CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) chemotherapy regimen (Zelenetz et al., 2010). That regimen can lead to numerous side effects, the most common being fatigue (Byar, Berger, Bakken, & Cetak, 2006). Other common symptoms include neutropenia, pain, sleep disturbances, nausea, issues with concentration, anxiety, and depression (Kimby, Brandt, Nygren, & Glimelius, 2001).

The National Comprehensive Cancer Network defined cancer-related fatigue as “an unusual persistent subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning” (Mock et al., 2000, p. 152). Cancer-related fatigue differs from acute fatigue in that it cannot be fully relieved by resting (Siefert, 2010). Fatigue has been found to increase significantly after the first cycle of chemotherapy and remains elevated during the following cycles (Byar et al., 2006). One study reported fatigue persisted in patients with breast cancer for 1.5 years after adjuvant chemotherapy (Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998). Fatigue negatively impacts patient quality of life by impairing mood and the ability to perform usual daily activities. As a result, fatigue can affect all dimensions of a person’s life (Fortner, Tauer, Okon, Houts, & Schwartzberg, 2005; Siefert, 2010).

Fatigue associated with cancer can be caused by physiologic factors including anemia and impaired nutrition resulting from nausea or vomiting (Glaspy, 2001;

Purpose/Objectives: To investigate the effect of learned resourcefulness on fatigue symptoms in patients with non-Hodgkin lymphoma (NHL) receiving chemotherapy.

Design: Quasi-experimental with repeated measures.

Setting: Two large hospitals in Israel.

Sample: 46 patients with NHL.

Methods: On the first day of a cycle of chemotherapy treatment, participants completed questionnaires assessing fatigue and learned resourcefulness. Fatigue was assessed again after 10 and 21 days.

Main Research Variables: Cancer-related fatigue, learned resourcefulness.

Findings: Fatigue increased 10 days following chemotherapy treatment and returned to pretreatment levels at day 21. Learned resourcefulness correlated negatively with each of the three measurements of fatigue. In addition, a calculated partial correlation showed the specific effect of learned resourcefulness on chemotherapy-related fatigue.

Conclusions: The findings showed a negative correlation between a physiologic variable (fatigue) and a psychological variable (learned resourcefulness), which is related to individual coping ability.

Implications for Nursing: Nurses should receive education about learned resourcefulness to potentially help patients with cancer cope with chemotherapy-related fatigue.

Knowledge Translation: As learned resourcefulness was negatively correlated with chemotherapy-related fatigue in patients with NHL, having this personality trait may help those patients manage fatigue.

Vadhan-Raji et al., 2003). However, fatigue cannot be explained by physiologic mechanisms alone; it is multidimensional with physical, psychological, social, and spiritual aspects (Kirshbaum, 2010; Piper et al., 1998). Cognitive coping styles have been effective in patients with cancer for managing fatigue (Lee, Tsai, Lai, & Tsai, 2008); therefore, personality characteristics related to coping may explain differences in levels of fatigue experienced by patients receiving the same treatment.

Learned Resourcefulness

A personality characteristic that may explain the variance in response to chemotherapy treatment among patients with cancer is learned resourcefulness. Rosenbaum (1990) defined learned resourcefulness as “an acquired repertoire of behavioral and cognitive skills with which the person is able to regulate internal events such as emotions and cognitions that might otherwise interfere with the smooth execution of a target behavior” (p. 14). Learned resourcefulness entails the ability to engage in positive thinking, solve problems, and believe in one’s ability to manage and control stressful situations (Rosenbaum, 1980a, 1980b). When people with high learned resourcefulness use their self-control skills, they may minimize the negative effects of stress that might impair their performance (Rosenbaum, 1990).

Research on learned resourcefulness has demonstrated its positive effect in various health conditions; for example, learned resourcefulness empowers disabled people and helps them engage in meaningful activities to cope with pain (Kennett, O’Hagan, & Cezer, 2008). Another study found patients with epilepsy who had high learned resourcefulness were significantly less depressed and anxious and coped better with their disability than did those with low learned resourcefulness (Rosenbaum & Palmon, 1984). Rosenbaum’s (1980b) research indicated people with high learned resourcefulness use adaptive coping methods more often and more effectively when faced with stressful events and have more trust in their ability to control their emotions during difficult and problematic situations. Another study (Huang et al., 2007) reported patients with diabetes mellitus who had greater learned resourcefulness had fewer depressive symptoms. Learned resourcefulness also was found to have a mediating effect on the relationship between metabolic control and quality of life in patients with type 2 diabetes (Huang, Perng, Chen, & Lai, 2008). The previous examples show how learned resourcefulness helps patients cope with diseases and stressful situations. Therefore, the current authors posited that learned resourcefulness may help patients with cancer cope with fatigue.

Among the cognitive and psychological interventions reported to reduce cancer-related fatigue, task-oriented activities for coping with stress were associated with less fatigue in one study (Tanaka, Fukuda, Mizuno, Kurasune, & Watanabe, 2009). Another study (Ream, Richardson, & Alexander-Dann, 2002) concluded supportive interventions might reduce cancer-related fatigue. In addition, a meta-analysis by Kangas, Bovbjerg, and Montgomery (2008) described nonpharmacologic (psychosocial and exercise) interventions that helped to improve symptoms of cancer-related fatigue.

Coping styles and psychological characteristics have been reported to affect the well-being of patients. For example, high learned resourcefulness predicted well-being among cancer survivors (Ruff-Dirksen, 2000). Huang et al. (2010) found learned resourcefulness predicted less depressive symptoms and a higher health-related quality of life in patients with breast cancer. A study of women with breast cancer and fibromyalgia demonstrated the protective role of resilience and that a sense of coherence correlated negatively with cancer-related pain (Schrier et al., 2012). Another study of patients with chronic widespread pain and chronic fatigue found lower self-efficacy was associated with fatigue (Smith, Strachan, & Buchwald, 2009). Increasing evidence suggests healthy lifestyle practices promote independence and postpone illness and disability. For example, highly resourceful people have more adaptive functioning and enhanced self-help actions. In the context of the current study, use of those skills may help patients with cancer manage their fatigue more effectively.

However, no study was found that showed learned resourcefulness helps patients cope not merely with the illness, but also with chemotherapy’s side effects. As a result, the current study examined the effect of learned resourcefulness on fatigue among patients with NHL treated with CHOP who were experiencing fatigue. The working hypothesis was that higher learned resourcefulness would be associated with a lower level of chemotherapy-related fatigue.

Methods

Hospitalized patients with NHL were recruited from two large medical centers, one in Israel’s central region and the other in the northern region. Inclusion criteria for the current study were fluency in Hebrew and having been prepared for one of the first three chemotherapy cycles of CHOP. Exclusion criterion was having more than one comorbidity, which could affect fatigue. All 48 patients who met inclusion criteria were invited by the department head nurse to participate in the study. On the first day of the chemotherapy cycle, prior to treatment (time 1), participants completed questionnaires on learned resourcefulness and fatigue. They received two more fatigue questionnaires 10 (time 2) and 21 days (time 3) after chemotherapy to complete at home and return at their next chemotherapy course. With the participants’ agreement, the researchers called them at home to remind them to complete the questionnaires. Each questionnaire was coded to keep the three parts together while preserving participant anonymity. The compliance rate was 96%.

The institutional review boards (IRBs) of the two hospitals where the research was conducted and the

ethical committee of Tel Aviv University approved the study (the hospitals are not identified as a condition of the IRBs). Before completing the questionnaire, participants were provided with a short explanation of the aim of the research. They were assured that refusal to take part in the study would not affect their treatment, and anonymity was guaranteed. All participants signed an informed consent form.

Instruments

Learned resourcefulness: The **Self-Control Schedule** (Rosenbaum, 1980b) consists of 36 items that assess four categories of self-control skills: use of cognitive strategies, use of problem-solving strategies, ability to delay gratification, and a general belief in one's ability to regulate internal events. Participants were asked to indicate the extent to which each item characterized them on a six-point Likert-type scale ranging from 1 (very uncharacteristic of me) to 6 (very characteristic of me). Eleven items were reverse scored. An overall score was obtained from averaging all items, with higher scores indicating a higher level of learned resourcefulness. Cronbach alpha reliability was 0.92.

Fatigue: The **Revised Piper Fatigue Scale** (Piper et al., 1998) was used to measure fatigue. The scale is composed of 22 items that comprise four subscales: behavioral/severity, affective meaning, sensory, and cognitive/mood. The participants were not employed and, therefore, five items were not relevant to them. As a result, only 17 of the 22 items were used, which did not affect reliability. Each item is scored on a Likert-type scale ranging from 0 (none) to 10 (a great deal). An overall fatigue score is obtained by summing all items. The index was translated into Hebrew using the Brislin (1980) method by Natanzon (2003). Cronbach alpha reliability was 0.97, 0.97, and 0.96 for fatigue at time 1, 2, and 3, respectively.

Data Analysis

Within-subject one-way analysis of variance (ANOVA) was performed to examine differences in levels of fatigue at the three time points. Partial correlations were calculated to determine whether the effect of learned resourcefulness on fatigue resulted from chemotherapy. The relationship between sample characteristics and fatigue was examined with regression analysis.

Results

The sample consisted of 46 patients with NHL. Demographic characteristics are shown in Table 1. The results of the ANOVA showed significant differences in levels of fatigue at the three measurement points, $F(2, 78) = 24.87$, $p < 0.01$, $\eta^2 = 0.39$. Bonferroni a posteriori testing showed that the mean levels of fatigue

Table 1. Sample Characteristics (N = 46)

Characteristic	\bar{X}	SD	Range
Age (years)	63.31	13.44	36–70
Education (years)	13.93	4.99	12–20
Time since diagnosis (months)	5.53	2.6	2–12
Characteristic	n		
Gender			
Female			27
Male			19
Marital status			
Married			37
Widowed			5
Divorced			4
Chemotherapy cycle at enrollment^a			
First			26
Second			13
Third			7
^a All participants were receiving CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) chemotherapy.			

reported at time 1 ($\bar{X} = 3.75$, $SD = 2.43$) and time 3 ($\bar{X} = 3.37$, $SD = 2.33$) differed significantly from time 2 ($\bar{X} = 5.62$, $SD = 2.51$).

Measurement of fatigue at time 1 correlated more strongly with fatigue at time 3 than at time 2. High negative correlations between fatigue and learned resourcefulness at all three time points were found (see Table 2). From those results, one can infer that learned resourcefulness influenced the level of fatigue in the sample. However, because of the high correlation among the three measurements of fatigue, the correlation between learned resourcefulness and fatigue after treatment could merely reflect the effect of learned resourcefulness on fatigue in patients with cancer, and not specifically the effect of learned resourcefulness on fatigue following chemotherapy. To determine whether learned resourcefulness specifically affected chemotherapy-related fatigue, a partial correlation was calculated between resourcefulness and time 2, controlling for time 1. By doing so, the authors controlled for the effect of learned resourcefulness on cancer-related fatigue, measured before the beginning of the chemotherapy. A significant negative correlation would demonstrate that, in addition to the effect of learned resourcefulness on cancer-related fatigue, learned resourcefulness affected fatigue related to chemotherapy. The results indeed showed a significant negative correlation ($r = -0.41$, $p = 0.005$).

Finally, to ensure that the results could not be attributed to other personal characteristics, the authors performed a regression analysis. At step 1, the demographic variables of gender (as a dummy variable), age, level of schooling, and length of illness were introduced. At step 2, fatigue at time 1 was included.

Table 2. Correlation Matrix of Learned Resourcefulness (LR) and Fatigue at Time Points

Variable	LR	Day 1	Day 10	Day 21
LR	1			
Day 1	−0.67*	1		
Day 10	−0.6*	0.5*	1	
Day 21	−0.72*	0.71*	0.71*	1

* $p < 0.001$

Finally, at step 2, the authors examined the effect of learned resourcefulness. The dependent measure was fatigue at time 2. The results showed higher learned resourcefulness predicted lower treatment-related fatigue ($b = -1.78$, standard error = 0.46, $\beta = -0.6$, $\Delta R^2 = 0.18$, $t = 3.86$).

Discussion

The main finding of the current study was the demonstration of a strong negative correlation between learned resourcefulness and chemotherapy-related fatigue. Of note, a negative correlation was found between a physiologic variable (fatigue) and a psychological variable (learned resourcefulness), the latter being related to individual coping ability. The sample size of 46 participants did not restrict the study's statistical power. The strong effect of chemotherapy on fatigue demonstrated in the ANOVA and the strong and significant correlation coefficients indicate the effects were robust.

Other studies have shown associations between fatigue and physiologic variables such as anemia, low white blood cell count, fever, and immune system function (Hilarius et al., 2011; Iop, Mandfredi, & Bonura, 2004). Negative correlations also have been reported between learned resourcefulness and physiologic function. For example, negative correlations were found between learned resourcefulness and physical impairment in Caucasian and African American patients with osteoarthritis (Summers, Haley, Reveille, & Alarcón, 1988), and better physical performance was associated with less learned helplessness among Asian patients with osteoarthritis (Thumboo, Chew, & Lewin-Koh, 2002). In addition, a negative association was found between learned resourcefulness and depression in hemodialysis recipients (Baydogan & Dag, 2008) and patients with breast cancer (Huang et al., 2010).

Importantly, the current study shows an association between cancer-related fatigue and a personality characteristic related to coping. The negative correlations between fatigue at the three time points strengthened the assumption that learned resourcefulness helps patients cope with fatigue. In addition, of all variables

entered into the regression analysis, learned resourcefulness was the only predictor of fatigue.

Learned resourcefulness has been taught successfully to older adults (Zauszniewski, 1997; Zauszniewski, Eggenchwiler, Preechawong, Roberts, & Morris, 2006), making it a possible intervention. Zauszniewski et al. (2006) found that teaching learned resourcefulness can improve health perception and functioning, suggesting that it may help patients cope with their disease and lead to a more positive perception of personal health status; however, the study was conducted with healthy older adults and its findings may not apply to patients with cancer. Other studies have demonstrated effects of specific learned coping interventions on fatigue. For example, interventions aimed at facilitating coping have decreased fatigue (Kangas et al., 2008; Ream et al., 2002). The current study suggests that individuals with low levels of learned resourcefulness are at particular risk for fatigue and should be treated accordingly.

The importance of learned resourcefulness is even greater when considering the direct relationship observed in the current study between fatigue and the time elapsed since the start of a chemotherapy cycle. Some studies have documented fatigue among patients with cancer in general, and others specifically among those treated with chemotherapy. The current study demonstrated patients with NHL treated with CHOP experienced fatigue that may be mitigated by learned resourcefulness. A meta-analysis of 57 randomized, controlled studies indicated that psychological interventions can help reduce cancer-related fatigue (Kangas et al., 2008). Therefore, teaching learned resourcefulness may be a possible intervention for future research.

Limitations

Learned resourcefulness is known to change over time, but was measured only at baseline in the current study. Although data were collected for only three weeks, learned resourcefulness may have changed over that period. No prior research has showed change in learned resourcefulness in such a short time span without a specific intervention; therefore, this could be a question for future research.

Many other physiologic and psychological variables such as anemia that can be associated with fatigue were not examined in the current study. Fatigue increased 10 days after the start of the chemotherapy course and returned to pretreatment levels 11 days later. During the first 10 days of CHOP, patients usually develop neutropenia, which subsequently resolves as the neutrophil level increases. Being multidimensional (Whitehead, 2009), the fatigue felt on day 10 also was likely to be associated with neutropenia (physiologic effect). In addition, fatigue at day 21 was measured before a subsequent

chemotherapy course. The decrease in the level of fatigue between days 10 and 21 may have resulted from the reduced influence of the chemotherapy treatment during that period. Therefore, fatigue may have been associated with neutropenia, as well as learned resourcefulness. In addition, the participants were in their first three chemotherapy cycles and fatigue is known to worsen with subsequent chemotherapy cycles; therefore, the results of this study may not apply to the later stages of chemotherapy. Those limitations also warrant examination in future studies.

Conclusions

The current study contributes to the understanding of fatigue among patients with cancer. Although learned resourcefulness was not taught as an intervention in the current study, its association with decreased cancer-related fatigue warrants future research and possible inclusion in psychosocial educational interventions for patients receiving chemotherapy.

Implications for Nursing Research

Other studies have suggested that learned resourcefulness can be taught in a short course and used as an intervention to provide a range of skills to assist adults with coping in domains such as problem solving, positive thinking, and priority setting. Therefore, future nursing research should explore teaching learned resourcefulness to patients with cancer who experience fatigue. Patients' fatigue can be measured prior to and after the intervention (taking into consideration the number and day of the chemotherapy cycle) to evaluate its effectiveness.

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