MEANING IN LIFE MEDIATES THE RELATIONSHIPS BETWEEN
PHYSICAL AND SOCIAL FUNCTIONING AND DISTRESS
IN CANCER SURVIVORS

DISSERTATION

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ABSTRACT

A cancer diagnosis may cause individuals to question previously-held beliefs about meaning in life. Individuals who are able to resolve these questions and find meaning tend to adjust better to cancer diagnosis. However, long-term effects of diagnosis and treatment, such as impairments in physical and social functioning, may impede the process of finding meaning and engender distress. Meaning in life was theorized to mediate the relationship between 1) physical functioning and distress, and 2) social functioning and distress. Mediation models were tested longitudinally in a sample of women with an initial diagnosis of regional breast cancer. Both models were found to be significant and indicated partial mediation. To examine the robustness of the findings, the models were tested cross-sectionally in a heterogeneous sample of cancer survivors. Impaired physical and social functioning following cancer appears to be related to greater distress in part through a decreased sense of meaning in life. Moreover, the mediation models were significant regardless of disease and survivor characteristics (e.g., disease site, time since diagnosis, cancer recurrence, age, years of education, and gender).
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INTRODUCTION

Theorists have broadly conceptualized meaning in life as belief in the coherence of the world and the purpose of one’s own existence. The search for meaning in life has been characterized as a fundamental part of being human, its process unique to each individual (Frankl, 1963/1959). Successful development of meaning in life can contribute to feelings of wonder and joy in living (Schwarzberg & Janoff-Bulman, 1991). It has also been tied to feelings of fulfillment, satisfaction, and well-being (Reker & Wong, 1988).

Meaning in life is thought to be resistant to change by all but major life events (Catlin & Epstein, 1992; Park & Folkman, 1997). Over a decade of research has suggested that negative life events, such as cancer diagnosis, can cause individuals to question previous beliefs about a just, purposeful world and an invulnerable self (e.g., Halstead & Hull, 2001; Janoff-Bulman, 1989; Janoff-Bulman, 1990; Schwartzberg & Janoff-Bulman, 1991; Tomich & Helgeson, 2002). For example, cancer patients may struggle with questions about why the diagnosis happened to them, the significance of the diagnosis in their lives, and the changes they must make in response to a diagnosis. Previous beliefs about meaning in life may not provide satisfying answers to these questions, resulting in a crisis in meaning. Patients who are able to resolve this crisis and establish greater meaning in life seem to adjust better, reporting increased psychological well-being and decreased distress (Davis, Nolen-Hoeksema, & Larson, 1998; Vickberg et al., 2000). Thus, meaning in life may play an important role in adjustment to cancer diagnosis.

The creation of meaning is theorized to be a gradual process, occurring over months or years (Davis, Nolen-Hoeksema, & Larson, 1998; Silver, Boon, & Stones, 1983). This process may occur at a time when survivors are coping with physical changes resulting from diagnosis and treatment. Physical changes can be distressing (e.g., Given et al., 1993) and can cause a reduction in daily activities (Portenoy,
While cancer diagnosis and treatment may threaten schemas of meaning in life, reduced activity due to cancer represents a secondary threat that may also impact meaning.

This research examines meaning in life in the context of long-term consequences of the disease, namely physical and social functioning. Physical functioning is defined as the ability to perform daily physical activities, such as walking, climbing stairs, and carrying groceries. Social functioning is the ability to engage in social activities, such as visiting friends and relatives. Meaning in life is hypothesized to mediate the relationship between physical functioning and distress (see Figure 1) and also between social functioning and distress (see Figure 2) in cancer survivors. Survivors with decreased physical and social functioning are hypothesized to experience less meaning in life, and in turn greater distress. After defining meaning in life, we present the theoretical and empirical rationale for examining each path in the mediation model: a) the relationships between physical and social functioning and distress, b) the relationships between physical and social functioning and meaning in life, and c) the relationship between meaning in life and distress.

Defining Meaning in Life

Meaning in life is a multidimensional construct. Many dimensions have been proposed, such as a life scheme (Thompson & Janigian, 1988), purpose in life (Hutzell, 1986), life satisfaction (Battista & Almond, 1973), a sense of coherence (Antonovsky, 1979; Vickberg et al., 2000), an awareness of the value, fragility, and preciousness of life (Bower, Kemeny, Taylor, and Fahey, 2003) and the orderliness and justice of the world (Janoff-Bulman, 1989). From this diverse literature theoretical commonalities arise. Most theorists and researchers would agree that meaning in life can be broadly conceptualized as a set of beliefs that bring coherence to the world and purpose to one’s own life.

In order to address the difficulties that have historically been involved in measuring meaning in life, we developed a measure that incorporates the multidimensional nature of meaning (Jim et al., 2004a). The measure resulted from empirical evaluation of existing conceptualizations of meaning. Data from two samples of cancer survivors provided the basis for psychometric analyses. Items were first generated from a review of literature and existing measures relevant to meaning in life. Factor analyses were then performed to determine latent structure, eliminate unnecessary items, and confirm the final solution.
Finally, analyses were conducted to determine test-retest reliability, convergent and discriminant validity, and group differences. Based on this process, we have concluded that meaning in life can be conceptualized as having four dimensions (Jim, et al., 2004a). Dimensions are correlated and each uniquely contributes to a more detailed understanding of meaning in life. One dimension, named inner peace, is positive emotions and thoughts connoting a sense of harmony, serenity, and contentment. These emotions prompt individuals to “savor current life circumstances and recent successes, experience ‘oneness’ with the world around them, and integrate recent events and achievements into their overall self-concept and world view” (Fredrickson, 1998, p. 306). Harmony and contentment can result from commitment, pursuit, and fulfillment of goals (Battista & Almond, 1973; Csikszentmihalyi 1990).

A second dimension, satisfaction with life and future, is satisfaction with “the network of people or things that comprise the immediate world” (Weisman & Worden, 1976, p. 3). For example, Frankl (1963/1959) has suggested that meaning in life comes from interactions with the immediate world, such as the encounters and experiences that one takes from the world and the attitude with which one faces suffering. To have meaning in life an individual must feel as if he or she is advancing towards some positively-valued future (Baumeister, 1991; Kenyon, 2000). This dimension of meaning has to do with concrete plans and goals as well as interactions with others and the environment.

A third dimension, spirituality and faith, is belief in the orderly, coherent structure of the universe (Antonovsky, 1979; Baumeister, 1991; Paloutzian & Ellison, 1982; Reker, 2000; Reker & Wong, 1988; Yalom, 1980). This dimension of meaning implies that life in general and human life in particular fit into an overall pattern, a design existing outside of and superior to the individual (Paloutzian & Ellison, 1982; Yalom, 1980). Religious and spiritual beliefs are often grounded in the idea that a purposeful structure to the universe exists. This dimension of meaning offers an existential understanding of life in a broad context (Reker and Wong, 1988).

The last dimension, loss of meaning and confusion, is negative or confused beliefs about meaning in life. This dimension reflects a decreased sense of value in life and a belief that life is a negative experience. Individuals lacking meaning react to life events rather than responding in a purposeful way. This dimension reflects both a lack of motivation for important goals and a lack of overall purpose in life.
Lack of meaning is thought to underlie psychological disorders (Yalom, 1980). According to Maslow (1962, pg. 206), “The state of being without a system of values is psychopathogenic.” Lack of meaning, or confusion about meaning in life, is associated with both distress and social isolation (Maddi, 1967). In light of the link between meaning in life and mental health, loss of meaning after a cancer diagnosis creates cause for concern.

Meaning in life, as a set of beliefs about the world and self, must be differentiated from sources of meaning or activities and experiences that give rise to it. Meaning in life may arise from a number of different sources (Baumeister, 1991; Frankl, 1963/1959). These sources vary as widely as individuals themselves. For example, relationships, activities, personal growth, creativity, financial security, cultural values and traditions, and service to others have been cited as common sources of meaning (Debats, 2000; O’Connor & Chamberlain, 2000; Reker, 2000). These sources of meaning may change in importance across time. For example, a study by Dittmann-Kohli and Westerhof (2000) found that older adults were more likely to cite family, such as spouse, children, and grandchildren, as a more important source of meaning than did younger adults. Although empirical research has yet to be conducted, sources of meaning may differ across culture. Individuals from cultures with a strong sense of community, such as African-American, Latino, and Native American cultures, may derive greater meaning from social interaction (Cervantes & Lechuga, 2004; Daniels, 2001; Garrett & Wilbur, 1999). Conversely, individuals from cultures with a strong orientation towards the future, such as Asian and European cultures, may derive greater meaning from plans and goals (Ebersole & Quiring, 1991). For example, Diener, Lucas, and Oishi (2002) note cultural differences in what makes people happy, with self esteem and extraversion less strongly correlated with positive affect in collectivist cultures than individualist cultures. Although sources of meaning are varied and unique to each individual, the belief that life is meaningful is common across individuals and present to a greater or lesser degree. A cancer diagnosis that threatens an individual’s sources of meaning over long periods of time may cause greater difficulty with adjustment.

Path a: The Relationships between Physical and Social Functioning and Distress

Numerous studies have documented potential deleterious effects of cancer on long-term quality of life, including emotional, physical, and social changes. Emotional changes may encompass fear of
recurrence, changes in body image, concerns about fertility, and family distress (Andersen, Woods, & Copeland, 1997; Cimprich, Ronis, & Martinez-Ramos, 2002; Mor, Malin, & Allen, 1994; Shapiro et al., 2001). Physical changes are varied and may encompass sleep difficulties, fatigue, and pain, which may lead to activity restriction (Cimprich, Ronis, & Martinez-Ramos, 2002; Collins, Taylor, & Skokan, 1990; Holzer et al., 2001). These physical changes may persist after treatment or emerge as late treatment toxicities (Gotay & Muraoka, 1998). Social changes may encompass less social activity and fewer ties to friends, family, and the community (Michael, Berkman, Colditz, Holmes, & Kawachi, 2002; Williamson, 2000). Social changes may also include difficulty meeting social obligations and responsibilities (Bloom et al., 1991). Further, these long term changes appear relatively common. In a study of breast cancer survivors, 69% reported difficulty performing physical activities, 71% reported reduced energy, 40% reported difficulty performing household activities, and 53% reported limited engagement in recreational activities three years after diagnosis (Ganz et al., 1996). Another study of breast cancer survivors found that reductions in occupational and recreational activities often persist five or more years after diagnosis (Holzner et al., 2001).

Decreased physical functioning – reduced ability to engage in physical activity – has been associated with increased distress in cancer patients. Clinical trials of interventions that improve physical functioning, such as exercise, often reduce distress as well (e.g., Kolden et al., 2002; Mock et al., 2001). The impact of cancer on physical functioning appears to be a more important predictor of distress than the medical staging of the disease (Bukberg, Penman, & Holland, 1984). In fact, impaired physical functioning is the single greatest risk factor for depression among lung cancer patients (Hopwood & Stephens, 1995). Studies of pain, often a cause of decreased physical functioning, suggest that interpretation play an important role in distress. For example, Barkwell (1991) found that cancer patients who reported greater pain also reported perceptions of cancer pain as an enemy or punishment, rather than a challenge. These patients also reported greater distress.

Decreased social functioning – reduced ability to engage in social activity – has also been associated with increased distress in cancer patients (Allen, 1994; Bloom & Spiegel, 1984; Thoits, 1983). There is a large body of literature suggesting that the presence of social interaction, particularly emotional
encouragement and understanding, during times of stress is important in adjustment (e.g. Bloom & Kessler, 1994; Dunkel-Schetter, 1984; Hoskins et al., 1996). Social resources, such as the size of one’s network of friends and family, is related to the amount of support that is received during the cancer experience, such as assistance with daily tasks, information, and emotional support (Bloom et al., 1991). A decreased ability to engage in social activities may isolate cancer survivors from social resources, and may also exhaust existing resources over time (Bolger, Foster, Vinokur, and Ng, 1996). Thus, the loss of social activity due to health may be especially difficult when patients are coping with multiple stressors, and may intensify distress.

Path b: The Relationship between Physical and Social Functioning and Meaning in Life

Cancer as a threat to meaning. A diagnosis of cancer causes sudden confrontation with the threat of physical harm and death. As such, the American Psychiatric Association (1994), has categorized cancer as a potentially traumatic event. Shock, fear, dread, and disbelief may result from diagnosis (Frank-Stromborg, Wright, Segalla, & Diekmann, 1984; Halstead & Hull, 2001). Weisman and Worden (1976) noted that the traumatic effects of cancer can occur in both acute and chronic phases. They characterized the period following a cancer diagnosis as “existential plight,” or anxiety caused by possible physical endangerment, annihilation, and alienation from loved ones. The acute stage, early impact distress, occurs as the patient confronts anxiety for the first time as a result of diagnosis. The chronic stage, protracted plight, may linger for months as the patient struggles to adjust to life changes wrought by diagnosis and treatment. Indeed, existential plight appears to continue long after diagnosis. A study by Moadel and colleagues (1999) found that 51% of cancer patients surveyed an average of three years after treatment indicated difficulty overcoming existential fears.

According to Janoff-Bulman (1989), a traumatic event such as a cancer diagnosis may shatter one’s long-standing beliefs about the world and oneself. A cancer diagnosis may stand in stark contrast to beliefs about the benevolence and justice of the world, as well as one’s own vulnerability to harm. These fundamental beliefs help to create a predictable, coherent world, which allows individuals to avoid stress, maintain self-esteem, invest in future goals, and trust others (Dalbert, 2001; Hafer, 2000). Because these beliefs are resources during times of stress, their loss may be felt acutely during the diagnosis period.
Belief in the benevolence of the world can be defined as the belief that positive events occur with high frequency (Janoff-Bulman, 1989). This belief may be questioned during a traumatic event such as cancer diagnosis. Comparing victims of traumatic events to non-victims, several studies have found group differences in perceptions of the benevolence of the world. For example, Prager and Solomon (1995) found that Israeli survivors of the Holocaust perceive the world more negatively than age-matched controls. College students who have suffered a traumatic event, such as the death of a parent, also view the world as less benevolent than students who have not suffered a traumatic event (Janoff-Bulman, 1990). Finally, among cancer patients, a commonly reported negative change in beliefs is that the world now seems more threatening (Collins, Taylor, & Skokan, 1990).

Belief in the justice of the world, or the extent to which individuals deserve and control the events that befall them, may also be questioned. Individuals who believe in a just world commonly think that good, decent, caring people engaging in the correct preventative behaviors should not fall victim to traumatic events (Janoff-Bulman & Berger, 2000; Lerner, 1980). Anger and frustration may result when this belief is contradicted. For example, following his wife’s diagnosis of cancer, C.S. Lewis described God as “A door slammed in your face, and a sound of bolting and double bolting on the inside,” (Lewis, 1961, p. 4). Tomich and Helgeson (2002) found that breast cancer survivors five years post-diagnosis perceive the world as random and less controllable than age-matched, healthy controls. Belief in a just world may influence psychological and physical processes. For example, belief in a just world is related to a less threatening appraisal of stressful events and less stress-related autonomic reactivity (Tomaka & Blascovich, 1994).

A final set of beliefs that may be affected by a cancer diagnosis relates to the one’s own vulnerability to negative life events through one’s positive behaviors and personal control. In general, individuals tend to believe they have more positive attributes and personal control than other people (Taylor & Brown, 1988) and that the world is more benevolent and just for them than for others (Calhoun & Cann, 1994). Thus, it is not surprising that across many types of traumatic events, survivors often report that they assumed the event would never happen to them (Janoff-Bulman & Berger, 2000). A traumatic event such as a cancer diagnosis may prompt individuals to wonder “why me?” and “what did I do to
deserve this?” (Doka, 2000; Ersek & Ferrell, 1994; O’Connor, Wicker, & Germino, 1990). A study by Janoff-Bulman (1990) found that the experience of a traumatic event was associated with decreased perceptions of self-worth in individuals who had experienced either the death of a parent, incest, rape, a fire that destroyed the home, or an accident causing serious disability. In addition, a study of cancer patients found that nearly half reported negative changes in views of the self, most commonly feelings of increased vulnerability and decreased personal control (Collins, Taylor, & Skokan, 1990).

**Developing meaning after cancer.** Because a cancer diagnosis can cause survivors to question fundamental beliefs about the world and themselves, the world may seem less meaningful and manageable (Tedeschi & Calhoun, 1995). It becomes a task of the survivor to incorporate this experience into previous beliefs (Janoff-Bulman and Frieze, 1983; O’Connor, Wicker, & Germino, 1990; Thompson & Pitts, 1993). Survivors must either reinterpret the diagnosis to be less threatening or rework beliefs to accommodate the diagnosis. As Thompson and Janigian (1988) point out, however, reworking beliefs does not necessarily result in enhanced meaning. To result in enhanced meaning, reworked beliefs must contribute to a greater sense of coherence and purpose in life.

**Physical and social functioning and meaning.** Impairments in physical and social functioning may cause distress by impeding the development of meaning in life. First, impaired physical and social functioning may cause survivors to reappraise the diagnosis as more negative, thus making creation of meaning more difficult. Second, impaired physical and social functioning may prevent survivors from engaging in activities that previously provided sources of meaning, such as work, leisure activities, and relationships with others.

Cancer may be reappraised as more threatening if survivors perceive long-term, negative consequences of the illness. Thompson and Janigian (1988) have suggested that a “life scheme,” or a cognitive representation of one’s life, forms the basis of meaning by providing order, coherence, and purpose to life. They theorize that a life scheme incorporates a view of oneself, a set of assumptions about the world, a series of goals to attain, and events relevant to goal achievement. Events are interpreted as more negative if they significantly impair the ability to achieve important goals. According to this point of view, impaired physical and social functioning that persist long after treatment may challenge previous
beliefs about order, coherence, and purpose by preventing survivors from achieving pre-diagnosis goals. As a result, survivors may perceive more negative consequences of the diagnosis, and thus experience more difficulty integrating the diagnosis with previous meaning in life.

Kenyon (2000) has pointed out that an important prerequisite for meaning is interaction with the world. Reduced physical functioning limit the types of activities cancer survivors pursue, and thus may reduce interaction with the world. Activities that survivors previously found meaningful, including work, leisure, and volunteer activities, may no longer be feasible (Debats, 2000; O’Connor & Chamberlain, 2000; Reker, 2000; Settersten, 2002). Survivors may mourn the loss of these activities. For example, in a study of cancer patients undergoing bone marrow transplantation, Steeves (1992) noted the importance of returning to work as a symbol of returning to normal life. In addition, patients who required assistance with daily living reported lower purpose in life, perhaps due to inability to engage in other activities as well (Taylor, 1993).

Impairments in social functioning by definition reduce interaction with the world. This may affect meaning, as lower levels of social activity have been associated with decreased life satisfaction and fulfillment among cancer patients (Bloom & Spiegel, 1984). Social interaction is associated with greater meaning. For example, Taylor (1993) found that among patients with recurrent cancer, married individuals reported higher levels of purpose in life. Quality of family relationships has also been associated with increased levels of purpose in life and religious and existential well-being (Schnoll, Harlow, & Brower, 2000). Both relationships with clergy and with friends are reported to reinforce the development of meaning after the death of a partner from AIDS (Richards & Folkman, 1997).

Data suggests that that a reduction in potentially meaningful physical and social activity may occur for many long-term cancer survivors. For example, a recent meta-analysis of quality of life research found that 38% of cancer survivors did not return to work after treatment (Spelten, Sprangers, & Verbeek, 2002). In addition, four years after a breast cancer diagnosis, 23% of survivors studied reported smaller social networks (Michael et al., 2002), which may lead to feelings of social isolation (Thoits, 1983). Yalom (1980) suggested that social isolation may reinforce feelings of existential isolation, thus giving rise to meaninglessness.
While it could be argued that meaning in life is an important outcome in itself, meaning has also been associated with a number of psychological outcomes. For example, increased meaning has been associated with decreased concurrent and prospective distress. Vickberg and colleagues (2000) found that meaning in life was negatively associated with concurrent distress in a sample of women with breast cancer, controlling for sociodemographic factors and physical functioning. Similarly, Davis, Nolan-Hoeksema, and Larson (1998) examined subjects’ ability to make sense of a loss of a family member. They found that the ability to do so one month after the loss was associated with lower levels of distress five months later, controlling for prior distress. Further, across samples of both new mothers and older adults, meaning in life showed significant relationships with both concurrent distress and well-being (Zika & Chamberlain, 1992). These findings support the theory that changes in meaning in life have a broad influence on well-being. In fact, Zika and Chamberlain (1992) have suggested that “people who lack meaning are likely to show detrimental effects in all aspects of their psychological functioning” (p. 142). Therefore, creating meaning may be an important part of reducing distress after a cancer diagnosis. However, the ability to create meaning may be affected by impaired physical and social functioning resulting from the disease.

Research Aims and Design

The primary aim of the study was to examine meaning in life as a mediator of the relationship between functioning and distress. Two models were tested: 1) meaning in life as a mediator of the relationship between physical functioning and distress, and 2) meaning in life as a mediator of the relationship between social functioning and distress. Because many sources of meaning are social in nature, it is predicted that the relationships in the social functioning model will be stronger than those in the physical functioning model. The models were first examined longitudinally in a sample of breast cancer patients. A longitudinal design was used to test the mediation model, providing the basis for directional, inference in analyses. In addition, breast cancer is a relevant research context for the long-term consequences of the disease. Breast cancer diagnosis has the potential to affect meaning in life for a large
number of women. Breast cancer is widespread; one out of every eight women will receive a breast cancer diagnosis in her lifetime (Jemal et al., 2004). Advances in breast cancer treatment have resulted in a growing number of survivors; 88% of patients will live at least five years after diagnosis (Jemal et al., 2004).

The secondary aim of the study was to examine the external validity of the breast cancer findings. External validity has become an important issue in cancer survivorship research. The National Cancer Institute (2004) notes that, “most survivorship research to date has been conducted among breast cancer survivors. While prostate cancer survivors are just now being studied, efforts to describe or address outcomes for the significant number of colorectal, gynecologic, hematologic, and other cancer survivors are rare.” Prognosis, treatment options, and the long-term physical and social effects of treatment vary widely depending on disease site and may affect meaning in life. Survivor characteristics, such as gender, age, and years of education, may affect meaning in life as well. For example, Miller (1984) theorized that women may derive more meaning from social relationships than men, while older and less educated individuals are more likely to derive meaning from religion than younger and more highly educated individuals (Meraviglia, 2002; Thoresen, 1999).

This second study was conducted with two aims: 1) to test the mediation models across a diverse sample of cancer survivors, and 2) to examine the effects of disease and survivor characteristics (disease site, time since diagnosis, cancer recurrence, age, level of education, and gender) on the models. A cross-sectional design was used. Data were collected via the Internet from a sample of male and female survivors of prostate, breast, gynecological, lung, colorectal, hematological, and other cancers. Together these diagnoses comprise more than half of all new cancer cases (Jemal et al., 2004). Participants were also heterogeneous in terms of age, time since diagnosis, recurrence status, state of residence, and education. Thus, the second study examines the robustness of findings from the breast cancer sample to a more diverse sample of cancer patients. In summary, the study aims offer a broad examination of the long-term effects of cancer treatment on meaning and mood.
METHOD

Participants and Procedures

Study I: Survivors with Breast Cancer

Eligibility. Eligible women had received a recent diagnosis and surgical treatment for regional (Stage II or Stage III) breast cancer. Other breast cancer patients were excluded if they had a previous cancer diagnoses, had refused cancer treatment, or had begun or completed adjuvant treatment (e.g., radiation, chemotherapy) prior to accrual. Women with mental retardation, severe or untreated psychopathology (e.g., schizophrenia, bipolar disorder), a current neurological disorder, dementia, and chronic fatigue syndrome or other immunologic conditions/diseases (e.g., rheumatoid arthritis) were also excluded.

Accrual and procedures. Women were consecutive patients awaiting the start of adjuvant treatment from a university-affiliated, National Cancer Institute-designated Comprehensive Cancer Center in Ohio. Patients were approached in the outpatient breast clinic during a post-surgical visit and informed consent was obtained. Accrual was also open to self- or physician-referred women receiving treatment in the community and meeting all eligibility criteria.

Accrual rate for the cancer center was 52% and accrual from the community was essentially 100% as all non-participants fell into excluded categories (e.g., Stage I disease). In combination, accrual was 57%. Analyses contrasting participants with non-participants and analyses contrasting cancer center and community accruals found no significant differences ($p$’s > .10) on demographics, disease/prognostic characteristics, or cancer treatments received.

The study sample was one of convenience as patients were accrued to a randomized clinical trial testing the efficacy of a psychological intervention. The intervention was completed during the twelve months following a patient’s accrual. Periodic assessments of the study participants were conducted in-
person with a female research assistant and nurse either at the university’s General Clinical Research Center or the outpatient breast cancer clinic. Women were paid $25 for an assessment. All patients were followed and the data reported here are from 109 women completing the 30-month assessment and remaining disease free (of 227 subjects recruited for the randomized clinical trial, 51 recurred or dropped the study, 7 passed away, 18 were non-compliant, 35 completed meaning of life data at later timepoints, and 7 did not have complete data). Finally, the intervention was effective for several biobehavioral outcomes (Andersen et al., 2004), but it produced no change in patients’ reports of physical or social functioning when assessed at 18 months or total meaning when assessed at 24 months (Jim, et al., 2004b).

Study II: Survivors with Heterogeneous Sites of Disease

Eligibility, accrual, and procedures. Cancer survivors with access to the Internet and between the above the age of 20 were eligible. Information about the study, labeled “Meaning of Life Survey,” was provided on the study web site (www.meaningoflifestudy.org) and was distributed using the following methods: print materials with the web address were distributed locally; a press release appeared on local television and in print media across the country; and links to the study’s website were posted on cancer web sites, including cancer-related internet discussion groups. Finally, participants were asked to tell other cancer survivors about the study. Upon entering the study’s website (see Appendix), individuals viewed eligibility information, investigator contact information, and informed consent pages. Following consent, participants completed the survey. All responses were anonymous and sent encoded to a secure server/database. The sample is comprised of 420 survivors.

Measures

Physical and Social Functioning

The Medical Outcomes Study – Short Form is a 36-item questionnaire used to assess health-related psychological and physical functioning (SF-36; Ware & Sherbourne, 1992). The SF-36 has 8 primary subscales: Vitality, Social Functioning, Mental Health, Role Functioning Related to Emotional Health, Role Functioning Related to Physical Health, Physical Functioning, Bodily Pain, and General Health. Patients rate their functioning during the previous month, with higher scores indicating better functioning. Each score is standardized with a mean of 50 and a standard deviation of 10. With its
extensive reliability, validity, and normative data, (Ware, Kosinski, & Keller, 1994; Ware, Snow, & Kosinski, 2000), the SF-36 is frequently used for cancer clinical trials and studies of other chronic illnesses (e.g. Dexter, Stump, Tierney, & Wolinsky, 1996). The Physical Functioning (PF) and Social Functioning (SF) subscales were used in the current research. Cronbach’s alphas were .91 for PF and .80 for SF in both samples combined. These values are consistent with previous studies (e.g., Ware et al., 2000).

Meaning in Life

The Meaning in Life Scale is a 25 item, multidimensional measure of meaning (MLS; Jim, et al., 2004a). Factor analysis reveals that it is comprised of four dimensions: Inner Peace (4 items; e.g., “I feel peaceful,” “I can reach into myself for comfort”), Satisfaction with Life and Future (8 items; e.g., “I feel more fulfilled and satisfied with life,” “I am settled about the future”), Spirituality and Faith (3 items: e.g., “I find comfort in my faith and spiritual beliefs,” “I have strength in my spiritual beliefs”), and Loss of Meaning and Confusion (10 items; “I get confused when I try to understand life,” “Life has less meaning”).

A scale score is obtained by reverse scoring any negatively worded items, recoding the items on a 1 to 4 point scale, and calculating the mean response for the items. A scale score ranges from 1 to 4, with higher scores indicating greater meaning. Scale scores can also be summed for a Total Meaning Score, which ranges from 4 to 16. Coefficient alpha reliability was .90 and two-week test retest reliability was .86 for the Total score.

Distress

The Profile of Mood States-Short Form (POMS-SF; Shacham, 1983, DiLorenzo, Bovbjerg, Montgomery, Valdimarsdottir, & Jacobsen, 1999) was used to assess patient mood. The POMS-SF is a 37-item self-report inventory asking the participant how he or she has felt during the past week, yielding one Total Mood Disturbance score and six mood subscale scores: Tension, Depression, Anger, Vigor, Fatigue, and Confusion. The Total Mood Disturbance score is the sum of the Tension, Depression, Anger, Fatigue, and Confusion subscales minus the Vigor subscale. The Total Mood Disturbance score can range from −32 to 200 with higher scores indicating greater mood disturbance. Across both samples, Cronbach’s alpha for the Total Mood Disturbance scores was .93; alphas for the subscales ranged from .84 to .94.
Sociodemographic Information

Single items assessed age, race, marital status, years of education, and occupation in Study I. Study II incorporated these items in addition to items assessing gender, disease site, time since diagnosis, recurrence status, time since recurrence, and state of residence.

Analytic Strategy

Two mediation models were tested in each of the study samples: 1) meaning in life as a mediator of the relationship between physical functioning and distress (see Figure 1), and 2) meaning in life as a mediator of the relationship between social functioning and distress (see Figure 2). In addition, Study II tested the effects of disease and survivor characteristics on the above mediation models through mediated moderation (see Figures 3 and 4). Mediated moderation occurs when there is a significant interaction between an independent variable and a moderating variable, transmitted to the dependent variable through the mediator. In the current research, mediated moderation would occur when there is a significant interaction between disease and survivor characteristics and functioning in the models, predicting variance in distress through meaning in life.

Hierarchical Multiple Regression (HMR) was used to test for both mediation and mediated moderation. A formalized statistical test of mediation is offered by MacKinnon and Dwyer (1993). They propose two criteria: 1) the independent variable must directly predict significant variance in the dependent variable, and 2) the indirect effect of the independent variable on the dependent variable through the mediating variable must be significant. The Goodman test statistic is used to formally test for the significance of indirect effects and is calculated using unstandardized beta weights and standard errors from HMR analyses (Goodman, 1960). Once mediation is established, partial versus complete mediation can be determined through additional regression analyses. Complete mediation is indicated when the previously significant effect of the independent variable on the dependent variable is reduced to zero after the mediating variable is added to analyses. If the effect is reduced but non-zero, partial mediation has occurred. Three separate HMR analyses were required to show mediation in the current research. In the first analysis, functioning must be entered alone as a predictor of distress. In the second analysis,
functioning must be entered alone as a predictor of meaning in life. In the last analysis, functioning must be entered in the first step and meaning in life entered in the second step as predictors of distress.

MacKinnon and Dwyer (1993) also detail the use of HMR to test for mediated moderation. A mediated moderation effect occurs when four conditions are met. Condition one: the interaction of two independent variables must predict significant variance in the dependent variable, over and above each independent variable alone. Condition two: the interaction of two independent variables must predict significant variance in the mediating variable, over and above each independent variable alone. Condition three: the mediating variable must predict significant variance in the dependent variable when controlling for the effects of each independent variable and the interaction between them. Condition four: when the mediating variable is included, the interaction term must predict less variance in the dependent variable than the interaction term does without the mediating variable.

Mediated moderation analyses in the current research required three separate HMR analyses. In the first analysis, functioning and the disease/survivor characteristic must be entered together in the first step and their interaction term entered in the second step predicting distress. In the second analysis, functioning and the disease/survivor characteristic must be entered together in the first step and their interaction term entered in the second step predicting meaning in life. In the last analysis, functioning and the disease/survivor characteristic must be entered together in the first step; their interaction term and meaning in life must be entered in the second step predicting distress.
RESULTS

Descriptive Analyses

Summary characteristics are reported in Table 1 for the 109 participants comprising Sample I and the 420 participants comprising Sample II. The characteristics of Sample I are similar to those for breast patients in the Ohio Cancer Incidence Surveillance System (Community Health Assessments and the Center for Public Health Data and Statistics, 2002) and SEER (Surveillance, Epidemiology, and End Results Program, 2000) databases. Sample II characteristics are reported in Table 1. Comparison of Samples I \( (n = 109) \) and II \( (n = 420) \) indicates no significant differences \( (p's > .05) \) in age \( (M = 51\) years), race (predominance of Caucasian participants, 93%), marital status (65-66% married), and education levels. However, there is greater diversity in Sample II regarding gender (21% male) and place of residence (76% living in regions other than the Midwest). Most importantly, 67% of the Sample II survivors had cancers other than breast, 20% had recurred, and the survivors were five (rather than two) years post diagnosis (range of 0-50 years). Sample differences are statistically significant \( (p's < .05) \).

Sample means were compared for physical and social functioning, meaning in life, and distress (see Table 2). Survivors in Sample I reported significantly greater physical and social functioning. They also reported greater total meaning, inner peace, and spirituality and faith \( (p's < .05) \). No sample differences were found on distress, satisfaction with life and future, or loss of meaning and confusion \( (p's > .10) \).

Regression Analyses

Study I: Survivors with Breast Cancer

Results of mediation analyses can be seen in Table 3. Total meaning in life was examined as a mediator of physical functioning and distress. The mediation model met MacKinnon and Dwyer’s (1993) first condition, as physical functioning directly predicted significant variance in distress. The model also
met condition two. The Goodman I test indicated that the indirect effect of physical functioning on distress was significant. To determine complete versus partial mediation, squared semipartial correlations were used to calculate variance in distress predicted by functioning alone as compared to variance predicted by functioning when controlling for meaning in life. Thus, all percentages of variance reported in the text were calculated by squaring semipartial correlations. Physical functioning alone predicted 15.3% of the variance in distress, and 6.2% of the variance when meaning in life was taken into account (see Figure 5). These results are consistent with partial mediation; meaning in life accounts for part of the relationship between physical functioning and distress.

The mediation model for social functioning, total meaning in life, and distress was tested. The model met the first condition; social functioning directly predicted significant variance in distress. The model also met the second condition; the Goodman I test indicated that the indirect effect of social functioning on distress was significant. Social functioning alone predicted 31.4% of the variance in distress, and 17.6% of the variance when meaning in life was taken into account (see Figure 6). These results are consistent with partial mediation; meaning in life accounts for part of the relationship between social functioning and distress. Therefore, results from Study I suggest that breast cancer survivors with decreased physical and social functioning tend to have less meaning in life, and in turn greater distress, over time.

Study II: Survivors with Heterogeneous Sites of Disease

Mediation Models. Mediation results can be seen in Table 3. Analysis of total meaning in life as a mediator of physical functioning and distress indicated that both conditions for mediation were again met. Physical functioning predicted significant variance in distress both directly and indirectly, through meaning in life. Physical functioning alone predicted 11.8% of the variance in distress, and 6.4% of the variance when meaning in life was taken into account (see Figure 7). These results are consistent with partial mediation.

Examination of the mediation model for social functioning, total meaning in life, and distress indicated that both conditions for mediation were again met. Social functioning predicted significant variance in distress both directly and indirectly, through meaning in life. Social functioning alone predicted
39.6% of the variance in distress, and 15.7% of the variance when meaning in life was taken into account (see Figure 8). These results are indicate partial mediation. Thus, results of the breast cancer sample were replicated in the heterogeneous cancer sample; cancer patients who experienced decreased physical and social functioning reported decreased meaning in life and in turn, greater distress.

Mediated Moderation Models. Mediated moderation models were then tested to examine the effects of survivor and disease characteristics on the relationship between physical and social functioning, meaning in life, and distress. Disease characteristics examined were cancer recurrence (recurrence vs. disease free), disease site (colorectal vs. lung cancer and breast vs. gynecological cancer), and time since diagnosis. Survivor characteristics examined were age, gender, and education level. MacKinnon and Dwyer’s (1993) first condition for mediated moderation: the interaction of two independent variables must predict significant variance in the dependent variable, over and above each independent variable alone. Distress was regressed on the interaction between physical functioning and each survivor and disease characteristic, controlling for each alone. Results indicated that no interaction terms were significant (p’s > .20). Mediated moderation had not occurred; thus, no further mediated moderation analyses were conducted. Meaning in life mediated the relationship between physical functioning and distress across all groups. Analyses were then repeated for social functioning; distress was regressed on the interaction between social functioning and each survivor and disease characteristic, controlling for each alone. Again, no interaction terms were significant (p’s > .12), indicating that mediated moderation had not occurred. Meaning in life mediated the relationship between social functioning and distress regardless of specific disease or survivor characteristics.

Ancillary analyses

Since meaning in life is a construct composed of distinct dimensions, ancillary analyses were conducted to determine which dimensions of meaning in life were most important in mediation. Results of all ancillary analyses can be seen in Table 4 for both samples. Inner peace mediated the relationship between physical functioning and distress in both samples. In the breast cancer sample, physical functioning alone predicted 15.3% of the variance in distress and 7.6% when inner peace was taken into account. The percentages were 11.8% and 4.5%, respectively, for the sample of survivors of heterogeneous
cancers. Inner peace also mediated the relationship between social functioning and distress in both samples. Social functioning alone predicted 31.4% variance in distress, and 18.1% when inner peace was entered into the model for the breast cancer sample. Among survivors of heterogeneous cancers, 39.6% of variance was reduced to 9.9% with the inclusion of inner peace. Satisfaction with life and future was not a mediator of physical functioning or social functioning in the breast cancer sample, but mediated between both types of functioning and distress in the heterogeneous cancer sample. Physical functioning alone predicted 11.8% of variance in distress in this sample, and 8.6% when satisfaction with life and future was taken into account. For social functioning, the percentages were 39.6% and 26.1%, respectively. Spirituality and faith was not a mediator of physical functioning or social functioning in the breast cancer sample, nor did it mediate physical functioning and distress in the heterogeneous cancer sample. However, spirituality and faith did mediate the relationship between social functioning and distress among survivors of heterogeneous cancers. In this sample, social functioning predicted 39.6% of the variance in distress alone, and 34.1% of the variance when spirituality and faith was taken into account. Finally, loss of meaning and confusion mediated both types of functioning in both samples. For the breast cancer sample, physical functioning alone predicted 15.3% of variance in distress and 4.8% when loss of meaning and confusion was included in the model. These percentages were 11.8% and 6.3%, respectively, for the heterogeneous cancer sample. Social functioning alone predicted 31.4% variance in distress, and 15.3% when loss of meaning and confusion was entered into the model for the breast cancer sample. Among survivors of heterogeneous cancers, 39.6% of variance was reduced to 13.1% with the inclusion of loss of meaning and confusion. In sum, it appears that multiple dimensions of meaning in life mediate the relationships between physical and social functioning and distress, with robust effects for inner peace and loss of meaning and confusion.
DISCUSSION

The data provide evidence for significant predictive relationships between physical and social functioning, meaning of life, and distress among cancer survivors. Survivors with impaired physical functioning reported higher levels of distress, due in part to a decreased sense of meaning in life. The same was true for survivors with impaired social functioning. These relationships were found to occur longitudinally in a sample of breast cancer survivors approximately one and a half to two and a half years after diagnosis. The effects were replicated cross-sectionally in a heterogeneous sample of cancer survivors. Moreover, the relationships were found to be significant regardless of site of disease, time since diagnosis, cancer recurrence, age, years of education, and gender. Thus, the relationships between both aspects of functioning, meaning in life, and distress are robust.

The effect of physical functioning on distress was characterized as moderate to large in both samples (Cohen, 1977). The effect was reduced by more than half by the addition of meaning in life to the regression model. While partial mediation suggests the presence of direct effects and/or other, unidentified mediating factors, Baron and Kenny (1986) note that “a significant reduction demonstrates that a given mediator is indeed potent” (p. 1176). The potent, mediating relationship examined here offers insight into long-term quality of life for cancer survivors. Although meaning in life has previously been conceptualized as relevant to quality of life, it has not to our knowledge been examined as a mechanism between important aspects of quality of life, such as physical and social functioning and distress.

The finding that poor physical functioning predicts distress is consistent with several studies linking physical health with mental health (e.g. Given et al., 1993; Hays, Marshall, Wang, & Sherbourne, 1994). A contributor to the strength of this relationship may be the value and meaning individuals attribute to their lives. Perceptions of poor physical functioning may affect the cognitive foundations upon which individuals interpret life events as meaningful. For example, survivors with poor physical functioning may
perceive the world as less benevolent and just, and themselves are more vulnerable to negative life events. The effects of physical functioning on meaning do not appear to be unique to cancer survivors. Evidence suggests that stem cell transplant patients with poor physical functioning report a decreased sense of coherence in life (Edman, Larsen, Hägglund, & Gardulf, 2001).

Meaning in life was also a partial mediator of the relationship between social functioning and distress. Variance in distress predicted by social functioning was reduced by 50% with the addition of meaning to the model. The relationship between social functioning and distress is consistent with a large body of literature documenting the benefits of social support on mental health (e.g., Hann, Oxman, Ahles, Furstenberg, & Stuke, 1995; Hobfall & Stokes, 1988). The current study suggests that meaning in life may be one mechanism by which this relationship occurs. Individuals who must curtail social activities due to illness may lose important sources of meaning and identity, and consequently perceive greater losses resulting from the disease. Social functioning was a stronger predictor of both meaning in life and distress than physical functioning. For example, in the Internet sample social functioning predicted 16% of variance in meaning in life and 40% in distress, while physical functioning predicted 2% and 12%, respectively. Thus, it appears that impairment in social functioning following cancer may be particularly disruptive to both emotional well-being and the schemas of meaning with which individuals interpret their lives.

The stability of the relationships between physical and social functioning, meaning in life, and distress across individuals with varied disease characteristics is noteworthy. Mediation models were significant regardless of survivors’ recurrence status, disease site, time since diagnosis, age, level of education, and gender. These findings suggest that the mediating role of meaning in life appears to be a robust phenomenon. In light of the study’s aim to examine long-term quality of life in cancer survivors, the effects of time since diagnosis on the model is particularly relevant. Survivors with poor physical and/or social functioning may not merely take longer to develop meaning than survivors with high functioning. Instead, survivors reporting impaired physical and/or social functioning appear to be at a disadvantage regarding meaning as compared to survivors reporting high functioning, and this disadvantage may not diminish over time.
The Multidimensional Nature of Meaning in Life

Theorists have noted that meaning in life is a multidimensional construct (e.g., Reker & Wong, 1988; Yalom, 1980). It is defined as feelings of harmony and peace arising from satisfaction with one’s current life, future goals, and belief in an overarching structure of the universe. Meaning is experienced in contrast to meaninglessness, a state of discord and confusion in which the value of life is diminished or questioned. While the current research examined the cumulative sense of life as meaningful, an interesting secondary question is which dimensions of meaning are most important in mediating the relationships between physical and social functioning and distress.

Ancillary analyses were conducted in both samples examining mediation models with subscales of meaning in life. Results indicated that inner peace and loss of meaning and confusion were mediators of physical and social functioning in both samples, while spirituality and faith and satisfaction with life and future showed mediation only in the heterogeneous cancer sample. These results suggest a pattern similar to Weisman and Worden’s (1976) conceptualization of protracted existential plight, in which survivors struggle with feelings of vulnerability characterized by possible physical endangerment, death, and alienation from loved ones. While Weisman and Worden suggested that protracted existential plight tends to resolve in the months following diagnosis, data from the current research indicates otherwise. In the current samples, which were surveyed a mean of two and five years post-diagnosis, individuals who report impairment in physical and social functioning often struggle with existential issues. This struggle is reflected in endorsement of items that indicate confusion about meaning, such as “I get confused when I try to understand my life,” a lack of meaning in life, such as “My life lacks meaning,” and negative beliefs about meaning in life, such as “I am being punished for past sins.” Individuals with impaired physical functioning also experience fewer positive emotional states. According to the “broaden and build” theory of positive emotion (Fredrickson, 1998), positive emotional states are important in the maintenance of physical and emotional health. Fredrickson suggests that emotions such as joy and contentment broaden individuals’ ability to solve problems creatively, increase physical activity, and build social resources. Thus, individuals who experience few positive emotions and simultaneously are struggling with anxiety...
about the value and meaning in their lives may be at particular risk for negative emotional and physical consequences. Indeed, in addition to predicting distress, decreased meaning in life has also been found to predict poorer immune functioning (Bower et al., 2003).

Interestingly, physical and social functioning did not appear to have robust effects on survivors’ spirituality and faith or their satisfaction with life and future. The findings regarding spirituality and faith should not be interpreted to mean that cancer survivors are not concerned with spirituality – clearly they are (e.g., Gall & Cornblatt, 2002; Moadel et al., 1999). However, impaired physical functioning does not appear to be enough to cause breast cancer survivors to abandon previous faith or, conversely, to embrace spirituality where none existed before. Impairment in physical and social functioning also did not affect breast cancer survivors’ satisfaction with goals, future direction, and a sense of self, although significant relationships were found for survivors of heterogeneous cancers. Impairments in physical and social functioning may not be great enough to interfere with breast cancer survivors’ goals, or breast cancer survivors may adapt their goals to accommodate functioning. In fact, breast cancer survivors frequently cite a shift in goals towards those that are attainable despite impaired physical and social functioning, such as a self-knowledge and a greater appreciation for life (Cella & Tross, 1986; Janoff-Bulman & Berger, 2000; Schaefer & Moos, 1992). Differences in the experience of cancer may account for differences in the subscale mediation models between samples. For example, breast cancer survivors are numerous and support for the newly diagnosed is often readily available. These circumstances may help the disease seem less devastating. Survivors of other types of cancer (e.g., lung, head/neck) may feel more isolated by their illness and thus spiritual faith and satisfaction with life and future may be compromised by physical and social functioning. Further research is needed to clarify how physical and social functioning affect spiritual faith and satisfaction with life and future in cancer survivors.

The findings suggest that dimensions of meaning in life are distinct but related to one another. Survivors with impaired physical and/or social functioning appear to feel less positive emotion and question the meaning in their lives relative to survivors without these impairments, yet some maintain similar levels of spiritual faith and satisfaction with life and future. Spiritual faith and satisfaction with life and future may not prevent greater existential concerns in the face of impairments in physical and social
functioning. These findings are similar to those of Folkman and Moskowitz (2000), who noted that
caregiving partners of AIDS patients often experience periods of meaningfulness and yet also periods of
confusion about meaning in life.

Methodology Comments

While a large body of research exists on quality of life following breast cancer, fewer studies exist
for survivors of other types of cancer. In an effort to help redress this issue, the current research sampled
cancer survivors who are not frequently studied, for example survivors of hemotologic, gastrointestinal,
and lung cancers. Sample diversity was also sought and achieved by sampling survivors at various stages
of the disease process. Some participants were newly diagnosed, others were experiencing a cancer
recurrence, and still others had been disease free for many years. A culturally diverse sample was sought
as well, but proved to be more difficult to attain. Despite efforts to recruit non-Caucasian participants (e.g.,
recruiting from minority health web sites), participants were 93% Caucasian. This percentage is similar to
that of lab-based cancer studies (e.g., Butler, Koopman, Classen, & Spiegel, 1999; Sears, Stanton, &
Danoff-Burg, 2003) and points to the multiple challenges inherent in recruiting culturally diverse samples
(Quintana, Troyano, & Taylor, 2001). As the cultural diversity of Internet users has increased dramatically
in recent years (U.S. Department of Commerce, 2002), the Internet may become an important tool in
overcoming these challenges. Culturally diverse samples will also be essential to continuing research on
meaning in life. Most definitions of meaning in life have been suggested by Caucasian Americans and
Europeans, and to date there have been few attempts to verify these definitions across cultures. Thus,
empirical study of meaning in life across cultures is an important next step in research on meaning in life
generally and meaning following cancer specifically.

The use of the Internet for data collection is relatively new, yet its advantages made it a logical
choice for this study. The Internet has become a popular source of health information for Americans (U.S.
Census, 2001), drawing large numbers of cancer survivors to learn about their disease and join online
support groups. This widespread use of the Internet provided the opportunity to recruit a heterogeneous
sample of survivors. Because the study could be accessed and completed from home, individuals with low
physical or social functioning may have found participation easier than lab-based research. Indeed,
members of the Internet sample reported poorer physical and social functioning than members of the breast cancer sample (\(p's < .05\)). In addition, reliable health information has been obtained from study participants over the Internet. In an examination of the accuracy of Internet participants’ self-reported diagnoses, Lenert and Skoczen (2002) compared participants’ reports of migraine headaches to their physicians’ diagnoses. Of physicians contacted, 97% confirmed the patients’ self-reported diagnoses. Further, 97% of participants reported symptoms classified by a neurologist to be consistent with migraine headache. Finally, Krantz & Dalal (2000) compared lab-based and web-based methods of data collection. Internal consistency, inter-item correlations, item means and standard deviations, and factor structures were very similar across both methods of data collection. The authors concluded that the two methods demonstrate “remarkable congruence,” suggesting that the Internet is a valid method of data collection (Krantz and Dalal, 2000, p. 40). To examine this issue in our data, we calculated internal consistency estimates for the convergent and discriminate measures for both samples. Across the three measures (MLS, POMS, & SF-36), the mean difference between internal consistency scores was .04, with a range of .02 to .07. These small differences in internal consistency support Krantz and Dalal’s assertion.

Nevertheless, limitations exist in Internet data collection. For example, Internet participants may submit invalid information by participating more than once or by falsely identifying themselves as cancer patients. Consequently, data analysis procedures were developed to check for invalid information. To check for multiple submissions, data were examined to ensure that no two participants gave similar sociodemographic and/or disease information, and none were found. To identify “random responders,” or participants falsely identifying themselves as cancer patients, specific item pairs were examined. For example, the SF-36 includes the item “Please indicate how much your health limits walking one block” and the item “Please indicate how much your health limits walking more than a mile.” If a responder indicated impairment in walking one block but no impairment when walking one mile, he or she could possibly be responding randomly and the data could be purposefully invalid. Five pairs of items were included and examined. A priori, conflicting responses to three or more pairs was cause for dropping the respondent’s data from analysis. No one met this criterion.
The current study examined data from two samples, a sample of survivors with a regional diagnosis of breast cancer and a sample of survivors of heterogeneous cancers. The breast cancer sample was one of convenience; participants were accrued to a randomized clinical trial testing the efficacy of a psychological intervention. It is noted that accepters to the trial were not significantly different on sociodemographic and disease related variables (Andersen et al., 2004), so from that perspective the sample is not biased. The participants were, however, receiving treatment at an NCI University-affiliated Comprehensive Cancer Center and thus differ from patients treated in the community. Regarding any possible effect of the intervention, there was sufficient power to test for study arm effects in physical and social functioning at 18 months, total meaning at 24 months, and distress at 30 months. No effects were found ($p$’s > .30). Mediated moderation analyses were also conducted in the breast cancer sample to examine whether study arm affected mediation models. Mediated moderation analyses were found to be non-significant ($p$’s > .48); study arm did not affect mediation models. Still, some may hypothesize that there was some, as yet undetected effect. In response, it is noted that the relationships between physical and social functioning, total meaning, and distress were replicated in the independent sample of survivors of heterogeneous cancers, including survivors of breast cancer. This replication reduces further the plausibility of a contribution of the intervention to the findings.

While longitudinal studies provide a distinct advantage for mediation analyses, studies of mediation frequently use cross-sectional data (e.g., Morgan-Lopez, Castro, Chassin, & MacKinnon, 2003; Williamson, 2000). Longitudinal data establishes the direction of relationships and provides a more rigorous test of mediation. Such data was collected in the breast cancer sample and both mediator models were significant. While mediation models imply causality (Baron & Kenny, 1986), causal relationships between physical and social functioning, meaning in life, and distress cannot be concluded from the current research. A randomized, controlled intervention aimed at manipulating perceptions of physical and social functioning would be needed to determine the causal relationships between variables. One possibility would be to conduct such a study in conjunction with an intervention designed to increase physical and social functioning, such as the clinical trial of a psychosocial intervention, drug, or surgical procedure.
The negative physical and psychological sequelae of cancer diagnosis and treatment are well-documented and far-ranging. Fatigue, cognitive impairment, decreased sexual functioning, and body image disturbances occur (Rosenthal, 2001; Yurek, Farrar, & Andersen, 2000), as do distress and anxiety (Anderson, Andersen, & deProsse, 1989). However, a sole focus on negative sequelae risks an incomplete understanding of the cancer experience. Emerging research suggests that these negative sequelae may co-exist with positive outcomes, such as enhanced spirituality, greater appreciation for life, and the ability to make meaning of the cancer experience (Thornton, 2002). To date, research has tended to focus on either negative or positive sequelae; little attention has been devoted to the integrated study of both. The current research examined both negative and positive sequelae (meaning and distress) to gain a more complete understanding of adjustment in cancer survivors.

These data suggest that perceived impairments in physical and social functioning predict less overall meaning in life and in turn, greater distress. These relationships were significant regardless of disease and survivor characteristics. Among dimensions of meaning, inner peace and loss of meaning and confusion are robust mediators while spirituality and faith and satisfaction with life and future are not. These findings suggest that meaning may be an important mechanism in adjustment to decreased physical and social functioning caused by cancer.
LIST OF REFERENCES


 Surveillance, Epidemiology, and End Results Program (SEER): 2000 [Data file]. Rockville, MD: Division of Cancer Control and Population Sciences, National Cancer Institute.


<table>
<thead>
<tr>
<th></th>
<th>Breast n (%)</th>
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<td>27 (25)</td>
<td>59 (14)</td>
</tr>
<tr>
<td>13 to 16</td>
<td>46 (42)</td>
<td>233 (56)</td>
</tr>
<tr>
<td>17 or more</td>
<td>36 (33)</td>
<td>125 (30)</td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0)</td>
<td>3 (1)</td>
</tr>
<tr>
<td><strong>Area of residence</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
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<td></td>
</tr>
<tr>
<td>East</td>
<td>0 (0)</td>
<td>92 (22)</td>
</tr>
<tr>
<td>Midwest</td>
<td>109 (100)</td>
<td>102 (24)</td>
</tr>
<tr>
<td>South</td>
<td>0 (0)</td>
<td>55 (13)</td>
</tr>
<tr>
<td>West</td>
<td>0 (0)</td>
<td>59 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0)</td>
<td>33 (8)</td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0)</td>
<td>79 (19)</td>
</tr>
<tr>
<td><strong>Cancer site</strong></td>
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<tr>
<td>Breast</td>
<td>109 (100)</td>
<td>137 (33)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>0 (0)</td>
<td>51 (12)</td>
</tr>
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<td>Lung</td>
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<td>28 (7)</td>
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<td>Prostate</td>
<td>0 (0)</td>
<td>27 (6)</td>
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<tr>
<td>Gynecologic</td>
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<td>Other</td>
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<tr>
<td>Missing</td>
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<td>0 (0)</td>
</tr>
<tr>
<td><strong>Recurrence status</strong></td>
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<td></td>
</tr>
<tr>
<td>No recurrence</td>
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<td>318 (76)</td>
</tr>
<tr>
<td>Recurrence</td>
<td>0 (0)</td>
<td>85 (20)</td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0)</td>
<td>17 (4)</td>
</tr>
<tr>
<td><strong>Years since diagnosis M(SD)</strong></td>
<td>2 (0)</td>
<td>5 (5)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Item included later in the sample of heterogeneous cancer survivors.

Table 1. Sample characteristics for breast (n = 109) and heterogeneous (n = 420) cancer survivors.
Table 2. Comparison of means and standard deviations between samples for physical and social functioning, distress, and meaning in life.

<table>
<thead>
<tr>
<th>Scale and subscale</th>
<th>Breast $M(SD)$</th>
<th>Heterogeneous $M(SD)$</th>
<th>$p$</th>
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</thead>
<tbody>
<tr>
<td><strong>SF-36</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Physical Functioning Subscale</td>
<td>81.00(21.49)</td>
<td>75.88(24.47)</td>
<td>.05</td>
</tr>
<tr>
<td>Social Functioning Subscale</td>
<td>85.94(19.85)</td>
<td>76.18(25.50)</td>
<td>.00</td>
</tr>
<tr>
<td><strong>MLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner Peace</td>
<td>3.12(.66)</td>
<td>2.95(.70)</td>
<td>.02</td>
</tr>
<tr>
<td>Satisfaction With Life and Future</td>
<td>2.93(.51)</td>
<td>2.81(.68)</td>
<td>.10</td>
</tr>
<tr>
<td>Spirituality and Faith</td>
<td>3.3(.71)</td>
<td>2.9(.99)</td>
<td>.00</td>
</tr>
<tr>
<td>Loss of meaning and confusion</td>
<td>3.48(.44)</td>
<td>3.40(.51)</td>
<td>.14</td>
</tr>
<tr>
<td>Total Meaning</td>
<td>12.81(1.73)</td>
<td>12.05(2.29)</td>
<td>.00</td>
</tr>
<tr>
<td><strong>POMS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Mood Disturbance</td>
<td>14.72(22.68)</td>
<td>17.31(26.80)</td>
<td>.36</td>
</tr>
</tbody>
</table>
### Table 3. HMR analyses examining total meaning in life as a mediator of physical and social functioning and distress

<table>
<thead>
<tr>
<th>Step, predictor, model</th>
<th>Breast</th>
<th></th>
<th>Heterogeneous</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
<td>Goodman</td>
<td>B</td>
</tr>
<tr>
<td>Outcome: Distress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Physical functioning</td>
<td>-.41</td>
<td>.09</td>
<td>-.39**</td>
<td>-.38</td>
<td>.05</td>
</tr>
<tr>
<td>2. Physical functioning</td>
<td>.02</td>
<td>.01</td>
<td>.30**</td>
<td>.01</td>
<td>.01</td>
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<tr>
<td>Full mediation model</td>
<td>-5.72</td>
<td>1.09</td>
<td>-.44**</td>
<td>-7.44</td>
<td>.40</td>
</tr>
<tr>
<td>Outcome: Meaning in life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1. Physical functioning</td>
<td>-.28</td>
<td>.09</td>
<td>-.26**</td>
<td>-.28</td>
<td>.04</td>
</tr>
<tr>
<td>2. Meaning in life</td>
<td>-5.72</td>
<td>1.09</td>
<td>-.44**</td>
<td>-7.44</td>
<td>.40</td>
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<tr>
<td>Full mediation model</td>
<td>-2.83**</td>
<td></td>
<td></td>
<td>-2.57**</td>
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</tr>
<tr>
<td>Outcome: Distress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Social functioning</td>
<td>-.64</td>
<td>.09</td>
<td>-.56**</td>
<td>-.66</td>
<td>.04</td>
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<tr>
<td>2. Social functioning</td>
<td>.03</td>
<td>.01</td>
<td>.31**</td>
<td>.04</td>
<td>.00</td>
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<tr>
<td>Full mediation model</td>
<td>-4.92</td>
<td>1.00</td>
<td>-.38**</td>
<td>-5.85</td>
<td>.39</td>
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Note: B, SE B, and β from final model. Goodman = Goodman I test statistic. **p < .01.
### Table 4. Ancillary analyses examining dimensions of meaning in life as mediators of physical and social functioning and distress.

<table>
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<th>Heterogeneous</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
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<tr>
<td>Outcome: Inner peace</td>
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<td></td>
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<tr>
<td>1. Physical functioning</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Outcome: Distress</td>
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</tr>
<tr>
<td>1. Physical functioning</td>
<td>-.30</td>
<td>.08</td>
</tr>
<tr>
<td>2. Inner peace</td>
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<td>2.72</td>
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<tr>
<td>Full mediation model</td>
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<tr>
<td>Outcome: Inner peace</td>
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<tr>
<td>1. Social functioning</td>
<td>.01</td>
<td>.00</td>
</tr>
<tr>
<td>Outcome: Distress</td>
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<tr>
<td>1. Social functioning</td>
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<td>.08</td>
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<td>2. Inner peace</td>
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<td>Full mediation model</td>
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<tr>
<td>Outcome: Satisfaction with life and future</td>
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<tr>
<td>1. Physical functioning</td>
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<td>.00</td>
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<td>2. Satisfaction with life and future</td>
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<td>Outcome: Satisfaction with life and future</td>
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<td>1. Social functioning</td>
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<td>.00</td>
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<td>Outcome: Distress</td>
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<td>1. Social functioning</td>
<td>-.61</td>
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<td>2. Satisfaction with life and future</td>
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<td>3.58</td>
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<td>Full mediation model</td>
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Continued
<table>
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<tr>
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<th>Outcome: Spirituality and faith</th>
<th>Outcome: Distress</th>
<th>Outcome: Loss of meaning and confusion</th>
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<td>-.42 .03 -.40**</td>
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<td>Full mediation model -1.32</td>
<td>Full mediation model -3.05**</td>
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<td>-2.97**</td>
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<td>2. Spirituality and faith -7.76 2.75 -.24**</td>
<td>2. Spirituality and faith -6.29 2.51 -.20*</td>
<td>2. Spirituality and faith -21.75 4.47 -.42**</td>
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<td>-8.09 1.18 -.30</td>
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<td>-36.19 1.68 -.69**</td>
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<td>1. Social functioning -17.58 4.16 -.34**</td>
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<td>-7.26**</td>
<td>-7.26**</td>
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* p < .05. **p < .01.
Figure 1. Hypothesized model of meaning in life as a mediator of the relationship between physical functioning and distress.
Figure 2. Hypothesized model of meaning in life as a mediator of the relationship between social functioning and distress.
Figure 3. Hypothesized mediated moderation model indicating meaning in life as a mediator of the relationship between physical functioning and distress, moderated by survivor and disease characteristics.
Figure 4. Hypothesized mediated moderation model indicating meaning in life as a mediator of the relationship between social functioning and distress, moderated by survivor and disease characteristics.
Standardized beta weights for variables entered into the model individually are outside parentheses, and standardized beta weights entered simultaneously are in parentheses.

*p < .05.  **p < .01.

Figure 5. Model of meaning in life as a mediator of the relationship between physical functioning and distress in Study I: Survivors of breast cancer (n = 109). Model shows significant predictive relationships between all three variables.
Meaning in Life  
24 months post-diagnosis 

β = .31**

SF-36 Social Functioning Subscale  
18 months post-diagnosis

β = .56** (-.38**)

POMS Total Mood Disturbance  
30 months post-diagnosis

β = -.52** (-.44**)

Standardized beta weights for variables entered into the model individually are outside parentheses, and standardized beta weights entered simultaneously are in parentheses.  
*p < .05.  **p < .01.

Figure 6. Model of meaning in life as a mediator of the relationship between social functioning and distress in Study I: Survivors of breast cancer (n = 109). Model shows significant predictive relationships between all three variables.
Standardized beta weights for variables entered into the model individually are outside parentheses, and standardized beta weights entered simultaneously are in parentheses. *p < .05.  **p < .01.

Figure 7. Model of meaning in life as a mediator of the relationship between physical functioning and distress in Study II: Survivors of heterogeneous cancer (n = 420). Model shows significant predictive relationships between all three variables.
Standardized beta weights for variables entered into the model individually are outside parentheses, and standardized beta weights entered simultaneously are in parentheses. *p < .05. **p < .01.

Figure 8. Model of meaning in life as a mediator of the relationship between social functioning and distress in Study II: Survivors of heterogeneous cancer (n = 420). Model shows significant predictive relationships between all three variables.