PURDUE UNIVERSITY
GRADUATE SCHOOL
Thesis/Dissertation Acceptance

This is to certify that the thesis/dissertation prepared

By Joseph G. Winger

Entitled

ASSOCIATIONS BETWEEN COPING SKILLS PRACTICE AND SYMPTOM CHANGE IN A PSYCHOSOCIAL SYMPTOM MANAGEMENT INTERVENTION FOR LUNG CANCER PATIENTS AND THEIR FAMILY CAREGIVERS

For the degree of Doctor of Philosophy

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ASSOCIATIONS BETWEEN COPING SKILLS PRACTICE AND SYMPTOM CHANGE IN A PSYCHOSOCIAL SYMPTOM MANAGEMENT INTERVENTION FOR LUNG CANCER PATIENTS AND THEIR FAMILY CAREGIVERS

A Dissertation
Submitted to the Faculty
of
Purdue University
by
Joseph G. Winger

In Partial Fulfillment of the
Requirements for the Degree
of
Doctor of Philosophy

August 2017
Purdue University
Indianapolis, Indiana

For JMW, PJW, and BMW

ACKNOWLEDGEMENTS

I would like to thank all of the individuals who made this project possible. First, Dr. Catherine E. Mosher, my advisor and committee chair, provided outstanding mentorship throughout my graduate training. Her dedication to mentorship and the field of psycho-oncology are truly unparalleled. Second, I wish to thank my committee members who offered essential guidance and feedback, including Drs. Kevin Rand, John McGrew, and Richard Frankel. Third, I wish to thank Dr. Victoria Champion and the Behavioral Cooperative Oncology Group (BCOG) pre-doctoral fellowship program. I am grateful for the wealth of opportunities that the BCOG fellowship afforded me. I also wish to thank all of the participants who enrolled in our symptom management trial. Finally, I wish to thank my family, friends, and College Park Church for their support and love throughout this process.

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ABSTRACT

Winger, Joseph G. Ph.D., Purdue University, August 2017. Associations Between Coping Skills Practice and Symptom Change in a Psychosocial Symptom Management Intervention for Lung Cancer Patients and Their Family Caregivers. Major Professor: Catherine E. Mosher.

Little research has explored the degree to which specific intervention components predict improved health outcomes for cancer patients and their family caregivers. The present study examined relations of intervention components (i.e., coping skills) to symptoms in a telephone symptom management (TSM) intervention delivered concurrently to symptomatic lung cancer patients and their family caregivers. Guided by Social Cognitive Theory (SCT) and cognitive behavioral therapy (CBT) frameworks, patient-caregiver dyads were taught coping skills including: a mindfulness exercise (i.e., noticing sounds and thoughts), pursed lips breathing, guided imagery, cognitive restructuring, and assertive communication. Symptom measures were administered at baseline and 2 and 6 weeks post-intervention. The measures assessed patient and caregiver depressive and anxiety symptoms as well as patient pain severity, distress related to breathlessness, and fatigue interference. Data were examined from patient-caregiver dyads enrolled in TSM (N = 51 dyads). Patients and caregivers were predominantly female (55% and 73%, respectively) and Caucasian (87%). The average patient was 63 years of age (SD = 8) and the average caregiver was 56 years of age (SD = 14). Seven autoregressive panel models tested relations of coping skills to symptoms. All models had at least adequate fit to the data (χ^2 *p*s > 0.05, RMSEA values < 0.06). For patients, more assertive communication practice during the intervention was related to less pain severity, fatigue interference, and depressive and anxiety symptoms at 6 weeks post-intervention. Additionally, more guided imagery practice during the intervention was related to less fatigue interference and anxiety at 6 weeks post-intervention. In contrast, more cognitive restructuring practice during the intervention was related to more distress related to breathlessness and depressive and anxiety symptoms at 6 weeks post-intervention. Similarly, more practice of a mindfulness exercise during the intervention was related to more fatigue interference and anxiety at 6 weeks post-intervention. For caregivers, more guided imagery practice was related to more anxiety at 2 weeks post-intervention. All other pathways from coping skills to symptoms at 2 and 6 weeks post-intervention were non-significant for both patients and caregivers. Findings suggest intervention effectiveness may have been reduced by competing effects of certain coping skills. For lung cancer patients, future studies should consider focusing on assertive communication and guided imagery, as these two coping skills were most consistently associated with reduced symptoms. However, more studies are needed to better understand these findings and particular caution should be used when applying CBT-based interventions that have not been validated in lung cancer populations.

BACKGROUND

Introduction

For many individuals, cancer can be conceptualized as a “dyadic disease” that profoundly impacts both the patient and his or her caregiver (Badr & Krebs, 2013; Hagedoorn, Sanderman, Bolks, Tuinstra, & Coyne, 2008; Manne & Badr, 2008). Thus, over the past two decades, numerous psychosocial interventions have focused on improving outcomes for cancer patients and their caregivers (Badr & Krebs, 2013; Baik & Adams, 2011; Martire, Schulz, Helgeson, Small, & Saghafi, 2010; McLean & Jones, 2007; Regan et al., 2012). Dyadic interventions (i.e., psychosocial interventions with patients and caregivers jointly participating) have shown small to moderate effects on a range of patient and caregiver outcomes (Badr & Krebs, 2013; Regan et al., 2012). Little is known, however, about the effective components of these interventions.

Identifying effective intervention components is an essential step in developing cost-effective and efficacious interventions (Czaja, Schulz, Lee, & Belle, 2003; Kazdin, 2007). One method for testing intervention components is to explore associations between intervention components and outcomes (Andersen, Shelby, & Golden-Kreutz, 2007; Chan, Richardson, & Richardson, 2012; Kazantzis, Whittington, & Dattilio, 2010).

Currently, component-outcome associations remain understudied in both cancer (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007; Matthews, Schmiege, Cook, Berger, & Aloia, 2012; Tremblay, Savard, & Ivers, 2009) and non-cancer populations (e.g., patients with chronic pain) (Curran, Williams, & Potts, 2009; Heapy et al., 2005; Jensen, Turner, & Romano, 2001); moreover, no studies have examined these associations in dyadic interventions for cancer patients and their caregivers. The current study addresses this gap in the literature by examining associations between intervention components and symptom change in a telephone-delivered symptom management intervention for lung cancer patients and their family caregivers.

In the following sections I discuss the symptom burden of lung cancer and present the current empirical support for dyadic interventions for patient and caregiver symptoms. Following, I describe previous studies that have examined component-outcome associations in psychosocial interventions for cancer patients. Next, I provide theoretical explanations for the associations between intervention components and symptom change. Lastly, I present my aims and hypotheses.

Symptom Burden of Lung Cancer

In 2016, it is estimated that 224,390 new cases of lung cancer will be diagnosed in the United States (American Cancer Society, 2016). Accounting for around 25% of all cancer deaths, lung cancer causes more deaths per year than breast, prostate, and colon cancers combined (American Cancer Society, 2016). Approximately 85% of lung cancer patients are diagnosed at advanced stages (i.e., stage III or IV non-small cell lung cancer and extensive small cell lung cancer) (American Cancer Society, 2016), which contributes to high rates of debilitating symptoms (Dudgeon, Kristjanson, Sloan, Lertzman, & Clement, 2001; Hopwood & Stephens, 1995; Hopwood & Stephens, 2000).

The symptom burden of lung cancer and its treatment is well documented (Dudgeon et al., 2001; Hopwood & Stephens, 1995; Kurtz, Kurtz, Stommel, Given, & Given, 2002; Rolke, Bakke, & Gallefoss, 2008; Zabora, Brintzenhofeszoc, Curbow, Hooker, & Piantadosi, 2001). Lung cancer patients report high rates of frequent and severe symptoms such as depressive and anxiety symptoms, pain, breathlessness, and fatigue (Dudgeon et al., 2001; Mercadante & Vitrano, 2010; Potter & Higginson, 2004; Tanaka, Akechi, Okuyama, Nishiwaki, & Uchitomi, 2002b; Zabora et al., 2001). In the following sections each of these symptoms are discussed separately; however, it is important to note that most lung cancer patients experience multiple symptoms that often interact to increase functional impairment (D. J. Brown, McMillan, & Milroy, 2005; Hopwood & Stephens, 1995; Rolke et al., 2008; Tanaka et al., 2002b).

Lung cancer patients report greater depressive and anxiety symptoms compared to patients with other common cancers (Linden, Vodermaier, MacKenzie, & Greig, 2012; Zabora et al., 2001). Based on validated self-report measures, rates of clinically significant psychological distress range from 18% to 55% for depressive symptoms and 24% to 56% for anxiety symptoms (Linden et al., 2012; Rolke et al., 2008; Zabora et al., 2001). Longitudinal studies suggest that depressive and anxiety symptoms typically persist throughout the disease trajectory, with levels of distress at diagnosis strongly predicting future distress (Akechi et al., 2006; Cooley, Short, & Moriarty, 2003; Hopwood & Stephens, 2000). Increased depressive and anxiety symptoms have been associated with decreased social functioning and reduced health-related quality of life (Cooley et al., 2003; Hopwood & Stephens, 2000; Rolke et al., 2008).

One of the most consistent predictors of increased depressive and anxiety symptoms in lung cancer patients is female gender (Hagedoorn et al., 2008; Hopwood & Stephens, 1995; Hopwood & Stephens, 2000). Some argue that this gender difference reflects the higher prevalence of depressive and anxiety symptoms for women in the general population (Davis, Matthews, & Twamley, 1999; Mirowsky & Ross, 1995; Nolen-Hoeksema, 2001). Additionally, this gender difference may reflect the dynamic and reciprocal nature of physical and psychological symptoms (Hagedoorn et al., 2008; Hirsh, Waxenberg, Atchison, Gremillion, & Robinson, 2006; Riley, Robinson, Wade, Myers, & Price, 2001). For example, women often experience a heightened response to physical symptoms (e.g., fatigue and pain) relative to men, which in turn may increase their psychological distress (Hirsh et al., 2006; Riley et al., 2001).

Increased depressive and anxiety symptoms in lung cancer patients have also been consistently associated with worse performance status (Hopwood & Stephens, 1995; Hopwood & Stephens, 2000). Performance status refers to a global assessment of patients’ functional ability and self-care and is the primary variable that oncologists use to make lung cancer treatment decisions and monitor treatment tolerability (Buccheri, Ferrigno, & Tamburini, 1996; Oken et al., 1982; Pfister et al., 2004; J. W. Yates, Chalmer, & McKegney, 1980). The gold standard for quantifying patient performance status is the Eastern Cooperative Oncology Group (ECOG) score (Oken et al., 1982). Higher ECOG scores equate to worse functioning, with scores ranging from 0 (able to function at a pre-disease level) to 5 (death) (Oken et al., 1982). Therefore, in general, patients with frequent and severe physical symptoms have worse performance statuses (Buccheri et al., 1996; Oken et al., 1982). Regarding the strong, negative association between performance status and psychological symptoms, patients with diminished ability to care for themselves may feel more depressed and anxious, which in turn may decrease their motivation for self-care and exacerbate their physical symptoms (Hopwood & Stephens, 2000).

Lung cancer patients report high rates of pain (Mercadante & Vitrano, 2010; Potter & Higginson, 2004; van den Beuken-van Everdingen et al., 2007; Wildgaard et al., 2011). A systematic review of 32 studies with lung cancer patients noted that the weighted mean prevalence of pain was 47% (range = 6% to 100%) (Potter & Higginson, 2004). Across studies, pain was attributed to the cancer tumor and/or metastases (weighted mean = 73%, range 44% to 87%) as well as cancer treatment (weighted mean = 11%, range 5% to 17%) (Potter & Higginson, 2004). Increased pain in cancer patients has been associated with decreased engagement in social activities, lower levels of social support, increased psychological distress, and reduced health-related quality of life (Herndon et al., 1999; Mercadante & Vitrano, 2010; Potter & Higginson, 2004; Zaza & Baine, 2002). Additionally, a longitudinal study with lung cancer patients found that increased pain predicted mortality above and beyond performance status, tumor histology, weight loss, breathlessness, and fatigue (Herndon et al., 1999).

One of the most frequent and distressing symptoms experienced by lung cancer patients is breathlessness (Dudgeon et al., 2001; Hopwood & Stephens, 1995; Quast & Williams, 2009; Tanaka, Akechi, Okuyama, Nishiwaki, & Uchitomi, 2002a). A systematic review of ten studies with lung cancer patients found the average prevalence of breathlessness to be 71% (range 50% to 87%) (Quast & Williams, 2009). Moreover, the authors noted that the average patient reported a moderate level of distress (mean distress level = 2.1 out 5) related to his or her breathlessness (Quast & Williams, 2009). Qualitative studies have highlighted the particularly frightening nature of breathlessness, with lung cancer patients describing the symptom as “suffocating” or a “feeling of impending death” (Lai, Chan, & Lopez, 2007; O'Driscoll, Corner, & Bailey, 1999). Increased breathlessness in lung cancer patients has been consistently related to increased psychological distress and pain as well as worse performance status (Bruera, Schmitz, Pither, Neumann, & Hanson, 2000; Dudgeon et al., 2001; Hopwood & Stephens, 1995; Tanaka et al., 2002a).

The majority of cancer patients experience at least some fatigue, regardless of cancer type or time since diagnosis (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007; Oh & Seo, 2011). In contrast to the other symptoms discussed, there has been debate in the cancer literature regarding conceptualizations of fatigue (Bower et al., 2014; L. F. Brown & Kroenke, 2009; Hofman et al., 2007; Visser & Smets, 1998). The most recent American Cancer Society (ACS) guidelines define cancer-related fatigue as “a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer and/or cancer treatment that is not proportional to recent activity and interferes with usual functioning” (Bower et al., 2014, p. 1843). One of the controversies surrounding cancer-related fatigue is that it is often highly correlated with psychological distress (Bower et al., 2014; L. F. Brown & Kroenke, 2009; L. F. Brown et al., 2013; Visser & Smets, 1998). A systematic review of 59 studies with cancer patients reported that the average sample-size weighted correlations were moderate between fatigue and depression (*r* = 0.56, 95% CI: 0.54 to 0.58, *k* = 59) as well as fatigue and anxiety (*r* = 0.46, 95% CI: 0.44 to 0.49, *k* = 35) (L. F. Brown & Kroenke, 2009). As with any correlation, three possibilities exist: (1) psychological distress causes cancer-related fatigue; (2) cancer-related fatigue causes psychological distress; or (3) a third factor (e.g., a common etiology) causes both cancer-related fatigue and psychological distress (L. F. Brown & Kroenke, 2009; Jacobsen, 2004; Visser & Smets, 1998). Longitudinal studies provide the most support for the third possibility; that is, cancer-related fatigue and psychological distress are likely separate constructs with a common etiology (L. F. Brown et al., 2013; Morrow et al., 2003; Pirl, Greer, Goode, & Smith, 2008; Visser & Smets, 1998).

Prevalence estimates of clinical levels of fatigue in lung cancer patients have varied from 37% to 78%, with higher rates in patients with advanced disease (Hickok, Morrow, McDonald, & Bellg, 1996; Hopwood & Stephens, 1995; Hürny et al., 1993; Okuyama et al., 2001; Tanaka et al., 2002b). Fatigue in lung cancer patients is often: (1) prevalent at diagnosis (Hopwood & Stephens, 1995); (2) exacerbated by treatment (e.g., chemotherapy and radiation) (Hickok et al., 1996; Hürny et al., 1993); and (3) worse as patients approach death (Hürny et al., 1993; Okuyama et al., 2001). Increased fatigue in lung cancer patients has been associated with increased psychological distress, pain, and breathlessness as well as worse performance status and reduced health-related quality of life (Hickok et al., 1996; Hürny et al., 1993; Okuyama et al., 2001; Tanaka et al., 2002b).

Compared to lung cancer patients, family caregivers of lung cancer patients tend to report comparable or increased levels of depressive and anxiety symptoms (Carmack Taylor et al., 2008; Kim, Duberstein, Sörensen, & Larson, 2005; Mellon, Northouse, &

Weiss, 2006; Mosher, Champion, et al., 2013). It is estimated that between 30% and 50% of family caregivers of lung cancer patients experience clinically significant depressive or anxiety symptoms (Carmack Taylor et al., 2008; Kim et al., 2005; Mosher, Champion, et al., 2013). Moreover, longitudinal studies suggest that, for many caregivers, psychological distress persists during the months and even years after the patient's diagnosis (Choi et al., 2012; Lambert, Jones, Girgis, & Lecathelinais, 2012). Increased psychological distress in caregivers of lung cancer patients is related to increased caregiving strain and reduced health-related quality of life (Braun, Mikulincer, Rydall, Walsh, & Rodin, 2007; Mellon et al., 2006). The substantial caregiving demands in lung cancer likely contribute to caregivers' psychological distress (Badr & Taylor, 2006; Bakas, Lewis, & Parsons, 2001; Mosher, Bakas, & Champion, 2013). For example, caregivers of lung cancer patients often report spending much of their day providing the patient with emotional support, monitoring and managing the patient's symptoms, and helping with practical tasks (e.g., driving to medical appointments) (Bakas et al., 2001). Caregivers' increased psychological distress may also be related to their own or others' smoking behavior (e.g., the patient continues to smoke despite the caregiver's requests to quit) (Badr & Taylor, 2006). Lastly, many theorize that the burden of caregiving may be particularly high in lung cancer, given patients' poor prognosis and severe symptom burden (Carmack Taylor et al., 2008; Hopwood & Stephens, 1995; Mosher, Champion, et al., 2013; Spiro, Douse, Read, & Janes, 2008).

Dyadic Interventions for Cancer Patients and their Caregivers

Randomized controlled trials (RCTs) of dyadic interventions for cancer patients and their caregivers have demonstrated small to moderate effects on multiple patient and caregiver symptoms (Badr & Krebs, 2013; Baik & Adams, 2011; Li & Loke, 2014; Martire et al., 2010; McLean & Jones, 2007; Regan et al., 2012). The following sections will focus specifically on psychosocial dyadic interventions for the symptoms that were examined in the current study (i.e., patient and caregiver depressive and anxiety symptoms and patient pain, distress related to breathlessness, and fatigue).

Numerous RCTs have shown that dyadic interventions for cancer patients and their caregivers can decrease depressive and anxiety symptoms (Badger, Segrin, Dorros, Meek, & Lopez, 2007; Li & Loke, 2014; L. L. Northouse et al., 2007; Porter et al., 2011). A variety of therapeutic approaches (e.g., cognitive-behavioral therapy [CBT], interpersonal therapy, education) and modalities (e.g., telephone-delivered, group-based, in-person) have been tested, with the majority of interventions including CBT-based techniques (e.g., relaxation, cognitive restructuring) delivered in-person by nurses or mental health professionals (Badr & Krebs, 2013; Li & Loke, 2014). A recent meta-analysis identified 20 RCTs testing dyadic interventions for psychological distress in cancer patients and their caregivers (Badr & Krebs, 2013). The interventions tended to produce small, significant reductions in psychological distress for both patients ($g = 0.25$, 95% CI: 0.12 to 0.32, $k = 17$) and their caregivers ($g = 0.21$, 95% CI: 0.08 to 0.34, $k = 12$) immediately post-intervention. However, the authors noted that most studies had small sample sizes (mean $n = 115.00$, $SD = 77.28$) and short follow-up time frames;

additionally, few studies included a theoretical framework or examined intervention mechanisms.

In contrast to psychological distress, few RCTs have reported dyadic intervention effects on cancer patient pain, distress related to breathlessness, and fatigue (Porter et al., 2011; Regan et al., 2012). Concerning pain, one pilot trial tested the efficacy of a caregiver-guided coping skills intervention for advanced cancer patients at the end of life (*N* = 78 dyads) (Keefe et al., 2005). Compared to treatment as usual, patients in the intervention group showed no significant improvement in pain post-intervention. Conversely, another pilot trial examined a bi-weekly, 6-session relationship enhancement intervention for early-stage breast cancer patients and their male partners (*N* = 14 dyads) (Baucom et al., 2009). Compared to treatment as usual, patients in the intervention group reported significantly less pain immediately post-intervention and at a 1 year follow-up.

To date, only one RCT has reported the effects of a dyadic intervention on cancer patient distress related to breathlessness (Porter et al., 2011). Specifically, Porter et al. (2011) tested a telephone-delivered intervention for 233 lung cancer patients and their caregivers. The authors compared 14 sessions of a coping skills program to an education and support program. The results showed that patients in both conditions reported reductions in pain and lung cancer symptoms, including distress related to breathlessness. Interestingly, the coping skills intervention was most beneficial for dyads with stage II and III cancers, whereas the education and support condition was most beneficial for dyads with stage I cancers. The authors noted that coping skills may be more helpful for dyads with higher symptom burden (i.e., stage II and III cancers).

Lastly, only two RCTs have examined dyadic intervention effects on cancer patient fatigue (Badger et al., 2011; Baucom et al., 2009). First, in a study discussed previously, Baucom et al. (2009) conducted a pilot trial of a relationship enhancement intervention for breast cancer patients and their partners (*N* = 14 dyads). Patients in the intervention arm, compared to treatment as usual, reported less fatigue severity immediately post-intervention and at a 1 year follow-up. Second, Badger et al. (2011) tested two telephone-delivered psychosocial interventions for prostate cancer survivors and their partners (*N* = 70 dyads). The authors compared an 8-week interpersonal counseling intervention to an 8-week health education attention condition. The health education arm included written materials explaining the role of exercise in reducing fatigue. Patients in the health education arm reported less fatigue (combined severity and interference) compared to patients in the interpersonal counseling arm. In sum, given the mixed results and limited number of studies, more research is needed to assess the efficacy of dyadic interventions for cancer patient pain, distress related to breathlessness, and fatigue.

Individual Interventions for Cancer Patient Pain, Distress Related to Breathlessness, and Fatigue

Few studies have examined dyadic interventions for cancer patient pain, distress related to breathlessness, and fatigue; however, numerous studies have tested individual psychosocial interventions for these symptoms in cancer patients (Gorin et al., 2012; Rueda, Solà, Pascual, & Subirana Casacuberta, 2011). First, a meta-analysis identified 38 RCTs that have tested psychosocial interventions for cancer patient pain (Gorin et al., 2012). Most intervention trials compared a combined psychoeducation and coping skills intervention to a usual care control group. The interventions tended to produce moderate, significant reductions in both pain severity (*g* = 0.34, 95% CI: 0.23 to 0.46, *k* = 38) and pain interference (*g* = 0.40, 95% CI: 0.21 to 0.60, *k* = 4) over a median follow-up of 6 weeks (*SD* = 12.4). Additionally, studies that monitored treatment delivery tended to yield even larger effects.

Concerning distress related to breathlessness, a meta-analysis identified three RCTs that have tested nurse-delivered breathlessness management interventions for lung cancer patients (Rueda et al., 2011). These studies included relaxation techniques that targeted both the physiological and emotional aspects of breathlessness (Barton, English, Nabb, Rigby, & Johnson, 2010; Bredin et al., 1999; Corner, Plant, A'hern, & Bailey, 1996). Compared to usual care, the interventions tended to produce significant reductions in distress related to breathlessness. However, these results should be interpreted cautiously due to the small sample sizes of these studies (range = 22 to 109).

Lastly, a meta-analysis identified 57 RCTs that have tested non-pharmacological therapies for fatigue (both severity and interference) in cancer patients (Kangas, Bovbjerg, & Montgomery, 2008). The results suggested that exercise (*k* = 16) and psychosocial (*k* = 41, predominately CBT-based) interventions produced small to moderate reductions in fatigue immediately post-intervention (*d* = -0.41, 95% CI: -0.60 to -0.23 and *d* = -0.31, 95% CI: -0.40 to -0.25, respectively), with no significant differences between the two intervention types. Consistent with these findings, a more recent meta-analysis identified 48 RCTs testing exercise interventions for fatigue in cancer patients and reported a moderate reduction in fatigue immediately post-intervention (*d* = -0.31, 95% CI: -0.40 to -0.22) (J. C. Brown et al., 2011). It is important to note that fatigue was not measured consistently in these studies, and few studies differentiated fatigue interference from severity. Additionally, some of these studies included lung cancer patients along with other cancer types; however, none of the studies in these meta-analyses targeted lung cancer patients specifically. Since these two meta-analyses, Chan, Richardson, and Richardson (2011) conducted an RCT testing a psychoeducational intervention combined with relaxation techniques for 140 lung cancer patients undergoing radiation therapy. The results showed that, compared to usual care, patients in the intervention arm reported less fatigue severity at 3 weeks post-intervention. Due to high attrition, however, intervention effects were not examined at 6 or 12 weeks post-intervention.

Associations Between Intervention Components and Outcomes in Cancer Patients

Understanding how psychosocial interventions work (e.g., intervention mechanisms, effective components) is a crucial yet often overlooked step in developing efficacious and cost-effective interventions (Czaja et al., 2003; C. W. Given et al., 2010; Kazdin, 2007). However, there are numerous methodological challenges related to identifying effective components of complex psychosocial interventions that target multiple symptoms (Andersen et al., 2007; Czaja et al., 2003; C. W. Given et al., 2010). Examining the main effects (i.e., intervention vs. control) of a complex intervention provides data regarding the intervention's overall effectiveness; however, such analyses do not explain which components of the intervention contributed to the effect (Czaja et al., 2003; C. W. Given et al., 2010). The most stringent component analysis studies compare two interventions with only one component varying between groups (Kazdin, 2007). Single-component interventions can answer important questions regarding causality (Kazantzis et al., 2010; Kazdin, 2007). For example, numerous dismantling studies have explored the role of homework assignments in CBT for various disorders (Blanchard et al., 1991; Carroll, Nich, & Ball, 2005; Neimeyer & Feixas, 1990). Meta-analytic results suggest that including homework assignments in CBT interventions produces better post-intervention outcomes when compared to the same intervention without homework assignments ($d = 0.48$, 95% CI: 0.25 to 0.71, $k = 9$) (Kazantzis et al., 2010). However, single-component studies are rarely conducted with medical populations due to theoretical concerns (e.g., is CBT without homework actually CBT?) and feasibility issues (e.g., insufficient power to detect between group differences) (Czaja et al., 2003; Kazantzis et al., 2010).

An alternative method for identifying effective intervention components is to design interventions within a theoretical framework that hypothesizes how specific components should be related to specific outcomes (Czaja et al., 2003; C. W. Given et al., 2010; Kazdin, 2007). Some dyadic interventions for cancer patients and their caregivers are designed based on a theoretical framework (Badr & Krebs, 2013); however, to date, none of these studies have reported results from component-outcome analyses.

In non-dyadic psychosocial interventions for cancer patients, five studies have reported associations between intervention components and outcomes (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007; Matthews et al., 2012; Tremblay et al., 2009). Two of the studies examined components of CBT-based interventions for insomnia in breast cancer patients (Matthews et al., 2012; Tremblay et al., 2009). These studies showed that greater adherence to intervention components (e.g., prescribed rise time, total time in bed) was related to less fatigue and improved sleep quality. The remaining three studies explored component-outcome associations for some of the symptoms examined in the current project, including psychological distress and breathlessness (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007).

First, Andersen et al. (2007) examined data from a 12-month RCT testing a group-based psychosocial intervention for 227 breast cancer survivors. Based on a biobehavioral theoretical framework (Andersen, Kiecolt-Glaser, & Glaser, 1994), specific intervention components (e.g., relaxation exercises, assertive communication) were hypothesized to improve psychological distress and physical symptoms. Intervention components were measured using self-report of coping skills practice. Physical symptom severity was assessed based on a nurse-rated symptom measure that included 22 body categories (e.g., neck, stomach). The results showed that those in the intervention group who more frequently practiced relaxation exercises reported less psychological distress post-intervention. Moreover, those with greater symptom burden at baseline were more likely to practice relaxation exercises daily and had greater nurse-rated global symptom reduction post-intervention. Other intervention components also significantly predicted global symptom reduction, such as assertive communication with treatment providers and increased group cohesion.

Second, Cohen and Fried (2007) compared nine sessions of a CBT-based group intervention to nine sessions of a relaxation group for 114 breast cancer patients. Homework was assigned in both groups and adherence to the assignments was assessed based on self-report. Interestingly, those in the relaxation group were more adherent to assignments than those in the CBT group. However, increased adherence to home practice in both groups was significantly related to post-intervention reductions in psychological distress, sleep difficulties, and fatigue.

Third, Chan et al. (2012) conducted a secondary analysis of an RCT testing two sessions of a psychoeducation and progressive muscle relaxation (PMR) program for symptom management in advanced lung cancer patients receiving radiation therapy. Patients completed the first intervention session one week before starting radiation therapy and completed the second session three weeks later. PMR practice was recorded using a self-report relaxation diary that patients were encouraged to complete every day. In the intervention arm ($N = 70$), patients who practiced PMR more frequently reported less breathlessness intensity and less fatigue at 12 weeks post-intervention. However, PMR practice was not related to post-intervention anxiety or performance status.

Overall, there is some support for associations between intervention components and outcomes in psychosocial interventions for cancer patients (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007; Matthews et al., 2012; Tremblay et al., 2009). However, very few studies have examined these associations and methodological differences (e.g., intervention design) should be noted. Moreover, only one study (Andersen et al., 2007) specified a theoretical framework to guide the component-outcome analyses. Thus, more theory-driven research is needed to identify the most effective components of psychosocial symptom management interventions for cancer patients.

Social Cognitive Theory and Associations Between Intervention Components and Outcomes

Social Cognitive Theory (SCT) provides a theoretical framework for understanding how specific intervention components (e.g., coping skills practice) may be related to decreased symptoms in a dyadic intervention for lung cancer patients and their caregivers (Bandura, 1986, 2004). The following sections will describe SCT and then discuss how practicing specific coping strategies is theorized to improve specific outcomes.

Founded on *reciprocal determinism*, SCT states that behavior, personal factors, and environmental influences are dynamically and reciprocally related such that a person influences his or her environment and vice versa (Bandura, 1986, 2004). SCT posits a core set of determinants and respective mechanisms that explain how people translate knowledge into behavior change (Bandura, 1986, 2004). The specific core determinants include the following: (1) knowledge of benefits/risks associated with a behavior; (2) self-efficacy that one can bring about a desired outcome; (3) expectations of costs/benefits of a behavior; (4) goals, plans, and strategies for implementing a desired behavior; and (5) facilitators and impediments to a desired behavior (Bandura, 2004).

Each of the determinants of behavior change occurs within a social environment where social support and behavioral modeling are of central importance (Bandura, 1986, 2004). In the context of cancer, for example, a patient’s self-efficacy for managing his or her anxiety may be enhanced through receiving encouragement from a family member (i.e., social support) and watching the family member use adaptive coping skills (i.e., behavioral modeling). Substantial research has supported the efficacy of SCT-based components (e.g., enhancing self-efficacy, goal setting) in psychosocial interventions for cancer patients (Faller et al., 2013; Graves, 2003). For example, a meta-analysis of psychosocial interventions for improving cancer patients' quality of life found that interventions with more SCT components produced significantly larger effect sizes than interventions with fewer or no SCT components ($Z = 3.72$, $k = 38$) (Graves, 2003).

According to SCT, it is crucial that the core determinants of behavior change be incorporated into interventions in order for the patient and caregiver to regularly implement and benefit from coping skills (Bandura, 1986, 2004). Specifically, the patient-caregiver dyad should first receive psychoeducation regarding how the symptom is conceptualized and how the specific coping strategy may reduce the symptom (i.e., gain knowledge about the behaviors and set outcome expectations). Following, each member of the dyad should practice the skill during and outside of the session in order to increase their self-efficacy for using the skill. Lastly, the dyad should be instructed to set goals, plans, and strategies for implementing the coping skill as well as discuss possible obstacles to using the skill (i.e., goals and facilitators/impediments). It is important to note that the SCT determinants of behavior mutually influence each other over time (Bandura, 1986, 2004). For example, as the dyad experiences symptom reduction with a specific skill, their self-efficacy for managing that symptom may increase. Thus, they may use the skill more often and experience even greater symptom reduction. Moreover, the dyad members may model the coping skill to each other and reinforce each other's practice of the skill (Bandura, 1986, 2004). Compared to individual interventions, dyadic interventions provide an optimal context for testing SCT-based intervention components because the intervention includes social support and modeling from a close family member (Bandura, 1986, 2004). In sum, a central hypothesis derived from SCT is that as coping skills practice increases, patient and caregiver symptoms will decrease. The following sections describe the theoretical pathways through which specific coping skills may reduce specific symptoms for patients and caregivers.

According to SCT, depressive and anxiety symptoms are the result of an interaction between thoughts, emotions, and behaviors (Bandura, 1986). Consistent with this notion, in CBT, depressive and anxiety symptoms are theorized to be developed and maintained through maladaptive thought patterns (e.g., automatic thoughts) and maladaptive behaviors (e.g., avoidance) (Beck & Weishaar, 1989; Dobson, 2009). Thus, CBT-based intervention components are designed to change maladaptive thoughts and behaviors related to symptoms through specific coping strategies, such as cognitive restructuring, relaxation techniques, and assertive communication (Beck & Weishaar, 1989; Dobson, 2009).

First, cognitive restructuring is one strategy used to reduce depressive and anxiety symptoms by identifying maladaptive thoughts and replacing them with more accurate, adaptive thoughts (Beck & Weishaar, 1989). According to Beck's cognitive theory, depressive and anxiety symptoms are related to underlying dysfunctional schemas that produce negative automatic thoughts (Beck & Weishaar, 1989). These automatic thoughts involve unrealistic, negative interpretations of events, leading to mood disturbance (Beck & Weishaar, 1989; Dobson, 2009). Thus, as the dyad practices cognitive restructuring, their depressive and anxiety symptoms should decrease, reflecting a change in their automatic thoughts (Beck & Weishaar, 1989; Dobson, 2009).

Second, relaxation techniques (e.g., pursed-lips breathing, guided imagery, noticing sounds and thoughts) are included in CBT as behavioral strategies for reducing depressive and anxiety symptoms through multiple pathways, such as reduced emotional arousal and distraction (Beck & Weishaar, 1989; Dobson, 2009). Specifically, relaxation techniques may reduce emotional arousal by counteracting the stress response (i.e., fight or flight response) through slowed breathing, reduced muscle tension, and lowered blood pressure (Andersen et al., 1994; Benson & Klipper, 1992; Dobson, 2009). Moreover, if a patient or caregiver is experiencing anxiety from thinking about the cancer, practicing relaxation exercises can serve as a distraction from negative thoughts and, thus, lead to improved mood (Badger et al., 2007; Porter et al., 2011). In contrast to the other coping skills, patients and caregivers may experience immediate reductions in their distress when performing relaxation exercises, which may enhance their sense of control and self-efficacy for managing emotional distress.

Lastly, in CBT, assertive communication skills are also incorporated for reducing depressive and anxiety symptoms (Beck & Weishaar, 1989; Dobson, 2009). Specifically, assertive communication skills are taught as a means of effectively eliciting social support, communicating thoughts and feelings about cancer, and obtaining medical attention for symptoms (Badr & Taylor, 2006; Keefe et al., 2005). Depressive and anxiety symptoms may be reduced as the dyad improves their ability to communicate with each other and their medical team (Porter et al., 2011).

CBT for pain management includes the same coping strategies discussed above (Keefe, 1996; Morley, Eccleston, & Williams, 1999); however, there are some differences regarding the mechanisms through which these skills may reduce pain (Keefe, Somers, & Abernethy, 2010). According to CBT for pain management and the Gate Control Theory of Pain, pain is a complex interaction between the patient's pathophysiology and his or her thoughts, feelings, and behaviors (Beck & Weishaar, 1989; Dobson, 2009; Keefe, 1996; Melzack & Wall, 1965). The Gate Control Theory of Pain posits that a modifiable "gating system" in the central nervous system controls the transmission of pain signals from the peripheral nerve. The pain experience can thus change depending on internal and external factors: various factors can either "open the gate" (i.e., allow pain signals) or "close the gate" (i.e., stop pain signals). For example, emotional distress has been shown to "open the gate" and, thus, increase the amount of pain a patient experiences (Melzack & Wall, 1965; Turner, Jensen, Warms, & Cardenas, 2002). By using specific coping strategies, it is theorized that patients can "close the gate" and, thus, reduce the severity of their pain (Keefe et al., 2010; Melzack & Wall, 1965).

Some of the specific coping strategies used in CBT for pain management include cognitive restructuring, relaxation exercises, and assertive communication (Keefe, 1996; Keefe et al., 2010; Morley et al., 1999). First, cognitive restructuring begins by helping patients become aware of maladaptive thoughts related to pain (e.g., "I will feel less pain if I just stay in bed today"). Following, the patient is instructed to develop more accurate and/or adaptive thoughts related to pain (e.g., "I will feel less pain if I stay active without overextending myself"). Adaptive thoughts are theorized to reduce pain severity indirectly through mechanisms such as reduced emotional distress and increased physical activity (Beck & Weishaar, 1989; Dobson, 2009; Keefe, 1996; Melzack & Wall, 1965). Second, relaxation exercises (e.g., pursed lips breathing, guided imagery) can decrease pain severity by reducing muscle tension and psychological distress, which in turn may increase the patient’s sense of control and self-efficacy for managing his or her pain (Keefe, 1996; Morley et al., 1999). Moreover, these exercises can also distract the patient from his or her pain during a pain flare-up. Lastly, assertive communication can decrease patient pain via numerous pathways (Keefe, 1996). First, a patient can learn to improve communication with his or her healthcare provider when additional pain control is needed (Keefe et al., 2005). Second, a patient can use assertive communication to elicit support from his or her caregiver, including emotional support or assistance with activities that may exacerbate pain (Porter et al., 2011).

Coping skills taught in CBT may also reduce patient distress related to breathlessness (Barton et al., 2010; Bredin et al., 1999; Portenoy et al., 1994). As with the other symptoms, it is important to note the reciprocal relationship between the patient’s breathlessness and his or her thoughts, emotions, and behaviors (Porter et al., 2011). Although a patient may continue to experience frequent breathlessness, his or her distress related to this symptom may be reduced through cognitive restructuring, relaxation techniques, and assertive communication (Barton et al., 2010; Corner et al., 1996; Porter et al., 2011). First, cognitive restructuring may reduce distress by identifying the patient’s negative thoughts related to his or her breathlessness (e.g., “I won’t be able to catch my breath”) and replacing them with more adaptive thoughts (e.g., “I have dealt with breathlessness before; I can do it again”). Second, some relaxation exercises have produced significant reductions in distress related to breathlessness (Barton et al., 2010; Greer et al., 2015). As noted above, patients may experience immediate reductions in their distress when performing relaxation exercises, which likely enhances their sense of control and self-efficacy for managing breathlessness. Finally, assertive communication may also reduce distress related to breathlessness through helping the patient communicate thoughts and feelings about his or her breathing to the caregiver and medical team, which may lead to action steps (e.g., oxygen use).

Lastly, CBT-based coping skills may reduce the amount of interference a patient experiences from fatigue (Berger, Gerber, & Mayer, 2012; Gielissen, Verhagen, & Bleijenberg, 2007; Kangas et al., 2008). Consistent with the other symptoms discussed, it is crucial to note the reciprocal relationship between a patient's fatigue and his or her thoughts, emotions, and behaviors (Bandura, 2004; Dobson, 2009). In CBT for cancer-related fatigue (Gielissen, Verhagen, Witjes, & Bleijenberg, 2006), fatigue is often conceptualized as being caused by cancer and/or its treatment; in contrast, other factors (e.g., thoughts, emotions, and behaviors) are posited to perpetuate the interference a patient experiences from his or her fatigue. Specific coping skills taught in CBT for cancer-related fatigue include cognitive restructuring, relaxation techniques, and assertive communication (Gielissen et al., 2006; Kangas et al., 2008). First, cognitive restructuring may be used to challenge a patient's catastrophic thinking about the negative impact of fatigue on his or her ability to function (e.g., "I'm helpless when I'm this fatigued; I can't get anything done"). A more adaptive way of thinking about fatigue is posited to increase the patient's sense of control and self-efficacy for managing fatigue (Gielissen et al., 2006). In turn, the patient may increase his or her activity (both physical and social) and, thus, experience less interference from this symptom. Second, relaxation techniques are also posited to reduce fatigue interference by immediately reducing distress related to fatigue, thus enhancing the patient's sense of control and self-efficacy for managing fatigue (Kangas et al., 2008). Relaxation techniques can also help a patient initiate sleep, thereby reducing fatigue. Lastly, assertive communication may reduce a patient’s fatigue interference by helping the patient effectively solicit social and practical support from his or her caregiver (Berger et al., 2012). For example, a patient may request help with certain activities of daily living that may be difficult to complete when fatigued.

PRESENT STUDY

In sum, little research has explored associations between intervention components and outcomes in individual or dyadic interventions for cancer populations; thus, the degree to which certain components of these interventions predict improved health outcomes for cancer patients and their caregivers is largely unknown. Identifying effective intervention components will inform the development of more cost-effective and efficacious interventions (Czaja et al., 2003; Kazdin, 2007). The present study examined associations between coping skills practice and symptom change in a telephone symptom management intervention delivered concurrently to symptomatic lung cancer patients and their family caregivers. The intervention was guided by SCT (Bandura, 1986, 2004) and focused on teaching patient-caregiver dyads specific coping skills, including relaxation exercises (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing), cognitive restructuring, and assertive communication. Thus, based on SCT (Bandura, 1986, 2004) and previous research (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007), the specific aims and hypotheses of this study were as follows:

Aim 1. To examine the extent to which patients' between-session coping skills practice (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing, cognitive restructuring, and assertive communication) was related to their symptoms (i.e., pain severity, distress related to breathlessness, fatigue interference, and depressive and anxiety symptoms) following a dyadic intervention for lung cancer patients and their family caregivers.

Hypothesis 1.1: Patients' increased coping skills practice during the intervention will be related to reduced pain severity at 2 and 6 weeks post-intervention.

Hypothesis 1.2: Patients' increased coping skills practice during the intervention will be related to reduced distress related to breathlessness at 2 and 6 weeks post-intervention.

Hypothesis 1.3: Patients' increased coping skills practice during the intervention will be related to reduced fatigue interference at 2 and 6 weeks post-intervention.

Hypothesis 1.4: Patients' increased coping skills practice during the intervention will be related to reduced depressive symptoms at 2 and 6 weeks post-intervention.

Hypothesis 1.5: Patients' increased coping skills practice during the intervention will be related to reduced anxiety symptoms at 2 and 6 weeks post-intervention.

Aim 2. To examine the extent to which caregivers' between-session coping skills practice (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing, cognitive restructuring, and assertive communication) was related to their depressive and anxiety symptoms following a dyadic intervention for lung cancer patients and their family caregivers.

Hypothesis 2.1: Caregivers' increased coping skills practice during the intervention will be related to reduced depressive symptoms at 2 and 6 weeks post-intervention.

Hypothesis 2.2: Caregivers' increased coping skills practice during the intervention will be related to reduced anxiety symptoms at 2 and 6 weeks post-intervention.

METHODS

Sample Recruitment and Selection

All study procedures were approved by the Indiana University Institutional Review Board. Lung cancer patients and their family caregivers were recruited from three study sites: the Indiana University Simon Cancer Center (IUSCC), Eskenazi Hospital, and the Roudebush VA Medical Center. A trained research assistant first reviewed electronic medical records in order to identify potentially eligible lung cancer patients. Eligible lung cancer patients were 18 years of age or older and at least 3 weeks post-diagnosis of small cell or non-small cell lung cancer. The initial weeks following a cancer diagnosis are often stressful (e.g., frequent medical appointments, adjusting to the diagnosis); thus, we only approached patients who were at least 3 weeks post-diagnosis. Additionally, we recruited patients of all stages because lung cancer patients experience physical and psychological symptoms across the disease trajectory (Hopwood & Stephens, 1995; Hopwood & Stephens, 2000; Kurtz et al., 2002; Rolke et al., 2008; Zabora et al., 2001). Given that the intervention aimed to reduce symptoms, we enrolled patients with at least one moderate to severe symptom (see details below), regardless of their treatment (with the exception of hospice care), time since diagnosis, or disease stage.

Patients were not eligible if they: (1) participated in a qualitative study that involved providing feedback on the current intervention materials, or (2) were receiving hospice care. Those receiving hospice care were excluded to reduce contamination in the control condition, as hospice generally involves the receipt of extensive supportive care services.

Following medical record review, the patient's oncologist was consulted regarding the patient's eligibility. Next, the oncologist or an authorized representative (e.g., a nurse) introduced the research assistant to the patient before or after an oncology clinic visit. The patient was then asked if he or she was currently participating in a psychosocial study. If the patient was not enrolled in another psychosocial study, the research assistant proceeded with the consent process and described the study as one exploring the use of telephone support programs for lung cancer patients and their family members. Then the research assistant asked the patient if he or she had a family caregiver or close friend who provided him or her with support (e.g., driving to appointments, emotional support). Next, the patient was asked if the identified caregiver lived with him or her or had visited at least two times per week over the past month. Living with the patient or frequent in-person contact was required given that the intervention involved the patient and caregiver jointly participating via speakerphone. When multiple caregivers were identified, the patient was asked to select the primary caregiver (i.e., the family member or friend who provided the majority of his or her unpaid, informal care). Patients who identified an eligible caregiver and were interested in the study were then given a consent form, an authorization form, and a study brochure. These materials were carefully reviewed, including the study procedures and health information (i.e., date of diagnosis, cancer stage, and cancer treatments) that would be collected from the patient's medical record should he or she agree to participate. The patient was also informed that participation required a working cell phone or home phone service. The patient was encouraged to ask questions and, after all questions were answered, he or she was invited to complete a screening assessment.

The first step of the screening assessment was the verbal administration of a cognitive screener (Callahan, Unverzagt, Hui, Perkins, & Hendrie, 2002). If the patient made 3 or fewer errors on the cognitive screener, then he or she completed a 5-minute assessment that consisted of five self-report symptom measures (see Measures section for details). In order to be eligible for the study, the patient had to endorse at least one of five symptoms at a moderate to severe level, including anxiety, depressive symptoms, pain, fatigue, or breathlessness. These five symptoms were chosen because they are highly prevalent and tend to cluster together in lung cancer patients (Dudgeon et al., 2001; Hopwood & Stephens, 1995; Kurtz et al., 2002; Rolke et al., 2008; Zabora et al., 2001); additionally, all of these symptoms are amenable to non-pharmacological intervention (Badr & Krebs, 2013; Gorin et al., 2012; Li & Loke, 2014; Rueda et al., 2011). During the screening assessment, the research assistant used his or her clinical judgment to assess for additional exclusion criteria, including: (1) lack of adequate English fluency; and (2) significant psychiatric or cognitive impairment (e.g., active psychosis).

Following the screening assessment, written informed consent was obtained from interested and eligible patients. Additionally, consenting patients were asked to provide written permission for the study team to collect information from their medical records, including the date of the lung cancer diagnosis, the lung cancer type (i.e., small cell or non-small cell) and stage, and treatments received (i.e., surgery, chemotherapy, radiation, chemoradiation).

Following the patient consent process, the caregiver was approached if he or she was present during the clinic visit. The caregiver was presented with the study brochure and consent and authorization forms. The study was reviewed with the caregiver and any questions were answered. Eligible caregivers met the following criteria: (1) were at least 18 years of age; (2) lived with the patient or visited him or her in-person at least two times per week over the past month; (3) had adequate English fluency; and (4) had working phone service. Caregivers were considered ineligible if they: (1) were participating in another psychosocial study; (2) participated in a qualitative study that involved providing feedback on the current intervention materials; or (3) displayed significant psychiatric or cognitive impairment (e.g., active psychosis, dementia) in the judgment of the oncologist or trained research assistant.

After a discussion of the study, interested caregivers provided written informed consent. If the caregiver was not present in clinic, the patient was asked if he or she could hand-deliver the study materials to the caregiver or if the study team may mail the materials to the caregiver. Following, a research assistant contacted the caregiver via telephone to conduct the consent process. If the patient refused to provide contact information for the caregiver or the caregiver refused to participate, both the patient and caregiver were considered ineligible for the study. Lastly, if patients or caregivers refused to participate, they were asked if they would be willing to provide their reason for nonparticipation, age, and gender. Additionally, if caregivers refused, they were asked if they would be willing to provide the nature of their relationship to the patient (e.g., spouse, sibling).

Procedures

Baseline assessments were conducted via telephone with the patient and caregiver participating separately. The assessment took up to 40 minutes to complete and included demographic questions and symptom measures. Additional measures were also administered (e.g., caregiving strain, quality of life); however, only measures analyzed in the current study are described in the following sections.

After the baseline assessment, patient-caregiver dyads were assigned to either the intervention arm or an attention control arm using a stratified block randomization scheme. The randomization scheme was chosen to balance groups based on patient gender and performance status (i.e., ECOG scores 0 or 1 vs. $\geq$ 2) (Oken et al., 1982). Groups were stratified based on patient gender given that women tend to report more physical symptom distress and anxiety and depressive symptoms than men (Hagedoorn et al., 2008; Hirsh et al., 2006; Riley et al., 2001). Additionally, groups were stratified based on performance status to ensure that the groups were similar with respect to cancer treatment, given that lung cancer treatment decisions are often made based on patient performance status (Pfister et al., 2004).

Telephone-delivered symptom management (TSM) was a manualized SCT-based intervention that involved a blend of cognitive-behavioral and emotion-focused strategies for the treatment of patient and caregiver depressive symptoms and anxiety as well as the management of patient physical symptoms (D. H. Barlow, 2014; J. Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Jacobsen, Donovan, Swaine, & Watson, 2006; Nield, Hoo, Roper, & Santiago, 2007; L. L. Northouse, Katapodi, Song, Zhang, & Mood, 2010; Porter et al., 2009; Porter et al., 2011). Each TSM session incorporated the SCT determinants of behavior change (Bandura, 1986, 2004). Specifically, the patient-caregiver dyad received psychoeducation regarding the cognitive-behavioral model of symptoms and how specific coping strategies may reduce the symptoms (i.e., knowledge about behaviors and outcome expectations). Additionally, each member of the dyad was encouraged to practice the coping skills during and outside of the sessions in order to increase their self-efficacy for using the skills. The dyad was also instructed to set goals and devise strategies for implementing the coping skills as well as discuss possible obstacles to using the skills (i.e., goals and facilitators/impediments). Lastly, they were encouraged to practice some of the coping skills together (i.e., modeling behavior and receiving social support).

Before the first session, each dyad member assigned to TSM received a notebook in the mail that included an appointment reminder sheet, calendar, handouts for each session, between-session coping skills practice reminders and tracking sheets, and a CD with guided practices for each of the three relaxation exercises. Patients and caregivers participated in the intervention concurrently via speakerphone. If the dyad did not have access to a speakerphone, they were sent one via mail. TSM was delivered in four, 45-minute weekly phone sessions by licensed clinical social workers with experience working with medical populations. The social workers received initial training in the intervention and weekly supervision by the PI who is a clinical psychologist. Moreover, the PI conducted intervention fidelity checks on 53% of the sessions; the average fidelity rating was 97.5%. Intervention components were equally focused on patient and caregiver concerns, with the rationale for each coping skill tailored to the symptoms reported by the patient and caregiver during each session.

Each of the four TSM sessions followed a similar structure. First, during the first session, the therapist began by introducing herself and establishing rapport with the dyad, whereas during sessions 2, 3, and 4, the therapist began by asking for updates on the cancer and its treatment and assessing between-session practice of the coping skills. Second, patients and caregivers completed brief self-report measures of their symptoms (i.e., patient and caregiver depressive and anxiety symptoms and patient pain, fatigue, and breathlessness) over the past week. Third, one or more coping skills were introduced and the rationale for the skill was tailored to the dyad's symptoms. During sessions 1, 2, and 3, the between-session coping skills practice for the next week was discussed. Lastly, during session 4, a plan for continued coping skills practice was developed. The following sections provide a more detailed description of the four sessions.

The first session began with the therapist building rapport with the dyad. The therapist asked general questions about their lives (e.g., employment, family) and the patient's cancer (e.g., date of diagnosis, treatment history). Following, the therapist provided a rationale for the intervention and an overview of the sessions. Next, the cognitive-behavioral model of symptoms was presented, noting how lung cancer and its treatment can impact the dyad's thoughts, feelings, activities, and physiological responses. Each dyad member was asked to describe one key change in any of these areas since the lung cancer diagnosis. Relaxation was then introduced as an important skill for coping with physical symptoms as well as emotional distress. The rationale for the relaxation exercises was then tailored to the dyad’s symptoms. For example, if the patient was reporting distressing pain, relaxation was discussed as a means of reducing muscle tension and distracting oneself from pain. Three types of relaxation were described and practiced during the session, including noticing sounds and thoughts (a mindfulness exercise), guided imagery, and pursed lips breathing. For between-session practice, the dyad was instructed to listen to a CD that guided them through the three relaxation exercises at least once per day.

The therapist began the second session by reviewing the between-session practice of the relaxation skills, including any barriers to relaxation, and assessed the dyad’s symptoms over the past week. Following, a rationale for examining distressing thoughts was presented. Specifically, the therapist explained that everyone has thoughts constantly going through their minds, known as automatic thoughts. Some automatic thoughts are helpful and true, whereas others can be unhelpful or not true. Identifying and examining automatic thoughts was described as a way to understand their mood and cope more effectively with lung cancer and symptoms.

The patient was then asked to think of a challenging event related to the lung cancer that happened over the past week. The therapist assisted the patient in identifying thoughts and emotions related to the event. Using a handout, the therapist helped the patient to determine whether the thoughts were true or realistic. If the thoughts were true, the patient decided whether they pertained to controllable or uncontrollable circumstances. The therapist then directed the patient to one of three handouts, depending on the nature of the thoughts (i.e., (1) unrealistic thought, (2) true thought about a controllable situation, or (3) true thought about an uncontrollable situation).

First, if the thought was unrealistic, cognitive restructuring was practiced. Specifically, the therapist helped the patient identify automatic thoughts about the event and then gather evidence for and against the thoughts. Following, the therapist assisted the patient in developing a more adaptive thought (i.e., one that considers all of the evidence and leads to less distress). Alternatively, if the patient was having true thoughts about a controllable situation (e.g., "I am in a lot of pain"), problem-solving techniques were presented, and a plan for addressing the situation was developed. Finally, if the patient was having true thoughts about an uncontrollable situation (e.g., "My disease is progressing"), self-soothing and emotion-focused strategies (e.g., relaxation, enjoyable activities, emotional disclosure to others) were suggested and scheduled.

After the patient completed the exercise, the therapist repeated these steps with the caregiver (i.e., examining thoughts related to the patient's lung cancer from the past week and using one of the three coping strategies to address these thoughts). The therapist then referred to handouts and explained any coping strategies that were not already discussed with the dyad (i.e., cognitive restructuring, problem-solving, or self-soothing/emotion-focused strategies). For between-session practice, the dyad was instructed to use the relaxation CD at least once per day. Additionally, they were asked to each write down a few thoughts when they had strong emotions during the week. Using a handout, they were asked to practice the appropriate coping strategy based on the type of thought (i.e., true vs. untrue) and/or situation (i.e., controllable vs. uncontrollable).

The therapist began the third session by reviewing the between-session practice of the relaxation skills and use of skills from the prior session for addressing thoughts. Then the therapist assessed the dyad's symptoms over the past week. Subsequently, an overview of assertive communication was provided, and each member of the dyad identified challenges in communicating with the other dyad member regarding the lung cancer (e.g., discussion of patient symptoms or medical treatment decisions). Then, while referring to handouts, the therapist provided specific instruction in communicating thoughts and feelings in a direct, honest, and respectful manner as well as listening skills. Each dyad member selected a topic and practiced assertive communication with the other dyad member, including expression of thoughts and feelings. The therapist provided feedback and asked each dyad member to provide feedback to each other. Then each dyad member noted a topic to discuss with the other dyad member during the coming week. For between-session practice, the dyad was instructed to do the following: (1) use the relaxation CD at least once per day, (2) write down a few thoughts when they experienced strong emotions and follow the handout describing the appropriate coping strategy for addressing these thoughts, and (3) practice using the assertive communication skills at least once with each other. The use of assertive communication with other individuals (e.g., the doctor, other family members) was also encouraged.

The fourth session began by reviewing the between-session practice of the relaxation skills, skills for addressing thoughts, and assertive communication. Then the therapist assessed the dyad's symptoms over the past week. Next, scheduling pleasurable activities was discussed. Specifically, the therapist noted how lung cancer and its treatment can impact the dyad's valued and enjoyable activities. Each dyad member wrote down three activities that he or she enjoyed and was able to do and selected one activity to do in the coming week. Next, activity pacing was explained. That is, the therapist assisted each dyad member in identifying activities involving overexertion. The goal was to develop an activity-rest cycle that led to increased productivity and reduced pain and other symptoms. When discussing this cycle with patients who had fluctuating symptoms, a different activity-rest cycle was developed for periods with higher or lower symptom burden. A plan for practicing each of the coping skills was then developed. The dyad was encouraged to use the skills as often as necessary and to meet weekly with each other to review their use of the skills. Therapy termination was then discussed, including thoughts and feelings about the ending of the intervention sessions and referral to additional resources, if necessary.

During the intervention, the therapist emphasized the importance of between-session practice of the coping skills. At the end of sessions 1, 2, and 3, the patient and caregiver were given instructions regarding home practice of the skills before the next session. Moreover, they were given handouts detailing each between-session assignment and encouraged to track the number of times they practiced the skill on either the handout or a calendar in the back of their notebook. At the beginning of sessions 2, 3, and 4, the patient and caregiver were asked to refer to a home practice handout and report the number of times they practiced certain skills. Given that each session focused on a different skill, some skills (e.g., relaxation) were practiced and assessed more often than others.

Follow-up assessments were conducted via telephone with the patient and caregiver participating separately. The assessments were administered at approximately 2 and 6 weeks post-intervention by a study team member who was blind to the dyad's group assignment. The assessments took up to 30 minutes to complete and included symptom measures. Participants received a $25 check for completing each assessment (i.e., baseline and two follow-ups). Thus, participants who completed all assessments received $75 for their participation.

Measures

Data were collected in-person during the consent process (i.e., screening assessment), via medical record review at baseline and both follow-ups, and via telephone-administered assessments at baseline and both follow-ups. The following sections describe the study measures and time points for data collection.

During the consent process, the patient completed a screening assessment in order to determine eligibility. Specifically, the patient needed to pass a verbally-administered cognitive screener and endorse at least one moderate to severe symptom based on established cutpoints for self-report questionnaires.

The Six-Item Screener (SIS) was verbally administered to patients (Callahan et al., 2002). The SIS is a well-validated brief cognitive screening assessment that includes three questions assessing temporal orientation (i.e., day of the week, month, year) and three recall items. A cutpoint of 4 or more errors (range = 0 to 6) is commonly used with cancer and other medical populations and identifies cognitive impairment with a sensitivity of 74% and specificity of 96% (Callahan et al., 2002; Kroenke, Theobald, et al., 2010; Wilber, Lofgren, Mager, Blanda, & Gerson, 2005). Thus, patients who made 4 or more errors were considered ineligible for the study because of potential cognitive impairment.

Depressive symptoms were assessed using the 2-item version of the Patient Health Questionnaire (PHQ-2) (Kroenke, Spitzer, & Williams, 2003). The PHQ-2 includes two items from the PHQ-8 that assess depressed mood and loss of interest. The measure uses a 4-point rating scale, with options ranging from 0 (*not at all*) to 3 (*nearly every day*). A sample item is, "Over the last two weeks, how often have you been bothered by little interest or pleasure in doing things?" The PHQ-2 has demonstrated acceptable reliability and validity in cancer and other medical populations, with alpha coefficients around 0.83 (Kroenke, Theobald, et al., 2009; Löwe, Kroenke, & Gräfe, 2005; Löwe et al., 2010). Among medical outpatients, a PHQ-2 score of 3 or greater (range = 0 to 6) is commonly used to identify clinically significant depressive symptoms (Kroenke, Spitzer, Williams, & Löwe, 2010).

Anxiety symptoms were assessed using the 2-item version of the Generalized Anxiety Disorders scale (GAD-2) (Kroenke, Spitzer, Williams, & Löwe, 2009). The GAD-2 includes two items from the GAD-7 that assess feeling anxious and not being able to stop or control worrying. The measure uses a 4-point rating scale, with options ranging from 0 (*not at all*) to 3 (*nearly every day*). A sample item is, "Over the last two weeks, how often have you been bothered by feeling nervous, anxious, or on edge?" The GAD-2 has demonstrated good reliability and validity in cancer and other medical populations, with alpha coefficients around 0.82 (Kroenke, Spitzer, et al., 2009; Kroenke, Theobald, et al., 2009; Löwe et al., 2010). Among medical outpatients, a GAD-2 score of

3 or greater (range = 0 to 6) is commonly used to identify clinically significant anxiety symptoms (Kroenke et al., 2003).

Pain was assessed using the 3-item PEG version of the Brief Pain Inventory-Short Form (BPI-SF) (Krebs et al., 2009). The PEG includes three items from the BPI-SF and assesses average pain severity and pain interference with enjoyment of life and general activity. The measure uses an 11-point rating scale, with options ranging from 0 (*no pain* or *does not interfere*) to 10 (*pain as bad as you can imagine* or *completely interferes*). A sample item is, “What number best describes your pain on average in the past week?” The PEG has shown acceptable reliability and validity in cancer and other medical populations, with alpha coefficients between 0.73 and 0.89 (Krebs et al., 2009; Kroenke, Theobald, et al., 2009). A PEG score of 5 or greater (range = 0 to 10) is commonly used to identify cancer patients with moderate to severe pain (Cleeland et al., 1994; Krebs et al., 2009).

Fatigue was assessed using the 4-item Vitality subscale of the Medical Outcomes Short Form-36 (SF-36) (McHorney, Ware Jr, & Raczek, 1993). Patients were asked to rate how they have been feeling over the past 4 weeks on a scale from 1 (*all of the time*) to 5 (*none of the time*). A sample item is, “How much of the time during the past 4 weeks did you feel worn out?” Among cancer and other medical populations, a Vitality score of 11 or less (range 0 to 20; standardized score $\leq$ 45) is commonly used to classify fatigue as moderate to severe (McHorney et al., 1993; O'Connor, 2004).

Breathlessness severity was assessed using two items from the Memorial Symptom Assessment Scale (MSAS) (Portenoy et al., 1994). Patients were first asked, “During the past week, did you have shortness of breath?” If they answer yes, they were asked, “How severe was it usually?” The MSAS uses a 4-point response scale, with options ranging from 1 (*slight*) to 4 (*very severe*). The MSAS has been well-validated in cancer populations (Tittle, McMillan, & Hagan, 2003). An MSAS shortness-of-breath severity score of 2 or greater (range = 0 to 4) is considered moderate to severe (Portenoy et al., 1994).

Patient medical characteristics were collected at baseline via medical record review, including the date of the lung cancer diagnosis, disease type (i.e., small cell or non-small cell lung cancer) and stage, and cancer treatments received (i.e., surgery, chemotherapy, radiation, chemoradiation). Cancer treatments received since the prior assessment were also collected from medical records at the first and second follow-ups.

Patient and caregiver demographics were collected at baseline via self-report, including gender, age, race/ethnicity, education, household income, employment status, relationship between the patient and caregiver, and whether the patient and caregiver live together. Following, patient and caregiver smoking status were assessed using two well-validated items from the Behavioral Risk Factor Surveillance System (BRFSS) questionnaire (CDC, 2007). Specifically, dyad members were asked if they had smoked more than 5 packs of cigarettes in their lifetime and if they currently smoked cigarettes every day, some days, or not at all (CDC, 2007). Lastly, the patient’s baseline performance status (i.e., ECOG score) was determined based on a validated self-report item (Oken et al., 1982). The ECOG is considered the gold standard measure of performance status for lung cancer patients and demonstrates excellent convergent validity with other well-validated self-report performance status measures (Buccheri et al., 1996; Oken et al., 1982). Scores used in the current study ranged from 0 (*normal with no limitations*) to 4 (*pretty much bedridden, rarely out of bed*) (Oken et al., 1982).

Patient and caregiver depressive symptoms were assessed at baseline and follow-ups using the 8-item version of the Patient Health Questionnaire (PHQ-8) (Kroenke, Spitzer, et al., 2010; Löwe, Unützer, Callahan, Perkins, & Kroenke, 2004). The PHQ-8 uses a 4-point response scale, with options ranging from 0 (*not at all*) to 3 (*nearly every day*). A sample item is, “Over the last two weeks, how often have you been bothered by little interest or pleasure in doing things?” The PHQ-8 has shown excellent reliability and validity in cancer and general population samples, with alpha coefficients around 0.87 and 0.89, respectively (Dwight-Johnson, Ell, & Lee, 2005; Kroenke, Spitzer, et al., 2010; Kroenke, Theobald, et al., 2009; Rief, Nanke, Klaiberg, & Braehler, 2004).

Patient and caregiver anxiety symptoms were assessed at baseline and follow-ups using the 7-item version of the Generalized Anxiety Disorders scale (GAD-7) (Kroenke, Spitzer, et al., 2010; Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007). The GAD-7 uses a 4-point response scale, with options ranging from 0 (*not at all*) to 3 (*nearly every day*). A sample item is, “Over that last two weeks, how often have you been bothered by feeling nervous, anxious, or on edge?” The GAD-7 has demonstrated excellent reliability and validity in cancer and general population samples, with alpha coefficients of 0.92 and 0.89, respectively (Kroenke et al., 2007; Löwe et al., 2008; Spitzer, Kroenke, Williams, & Löwe, 2006).

Patient pain severity was assessed at baseline and follow-ups using the BPI-SF (Cleeland et al., 1994). The BPI-SF consists of four items assessing pain severity. The BPI-SF uses an 11-point response scale, with options ranging from 0 (*no pain*) to 10 (*pain as bad as you can imagine*). A sample item is, "What number best describes your pain on average in the past week?" The BPI-SF has demonstrated good reliability and validity in cancer populations, with alpha coefficients around 0.95 (Tittle et al., 2003).

Patient distress related to breathlessness was assessed at baseline and follow-ups using two items from the Memorial Symptom Assessment Scale (MSAS) (Portenoy et al., 1994). Specifically, patients were first asked, "During the past week, did you have shortness of breath?" If they answered yes, they are asked, "How much did it distress or bother you?" The MSAS uses a 5-point response scale, with options ranging from 0 (*not at all*) to 4 (*very much*). The MSAS has been well-validated in cancer populations (Tittle et al., 2003).

Patient fatigue interference was assessed at baseline and both follow-ups using the Fatigue Symptom Inventory (FSI) (Hann, Denniston, & Baker, 2000). The FSI includes seven items assessing the extent to which, over the past week, fatigue interfered with patients' general level of activity, activities of daily living, work ability (including housework and occupational work, if applicable), concentration, social relationships, life enjoyment, and mood. The FSI uses an 11-point response scale, with options ranging from 0 (*no interference*) to 10 (*extreme interference*). A sample item is, "Rate how much, in the past week, fatigue interfered with your general level of activity." The FSI has demonstrated good reliability and validity in cancer populations, with alpha coefficients between 0.93 and 0.95 (Hann et al., 2000; Hann et al., 1998).

At the beginning of sessions 2, 3, and 4, patients and caregivers were asked to refer to a home practice handout or calendar and report the number of times they practiced certain skills. If they did not recall the referenced skill, they were referred to a handout detailing the specific coping skill exercise. The following sections describe how the between-session practice of the coping skills was assessed and specify when these measures were collected. All of the between-session skill practice items were developed for this study by the PI and me.

At the beginning of intervention sessions 2, 3, and 4, the patient and caregiver were asked to report the number of times they practiced three types of relaxation exercises: noticing sounds and thoughts, guided imagery, and pursed lips breathing. Concerning noticing sounds and thoughts, they were asked, “During the past week, did you practice relaxation by listening to sounds around you or noticing your own thoughts without judging them? How many times did you do this during the past week?” Concerning guided imagery, they were asked, “During the past week, did you imagine yourself in a peaceful place? How many times did you do this during the past week?” Concerning pursed lips breathing, they were asked, “During the past week, did you use pursed lips breathing? How many times did you do this during the past week?” Although dyads were instructed to use a CD to practice the relaxation exercises, practice without the CD was still scored.

At the beginning of sessions 3 and 4, the patient and caregiver were asked, “During the past week, did you replace your negative thoughts with more helpful thoughts? How many times did you do this during the past week?”

At the beginning of session 4, the patient and caregiver were asked, “During the past week, did you practice using the communication skills that we discussed? How many times did you do this during the past week?”

Analyses

All data entry, screening, and variable computation were conducted using SPSS statistical software version 23.0 (Armonk, NY, USA). All data were checked for accuracy by two study personnel. Following, I examined variable frequencies in order to identify data entry mistakes. Measures were then computed based on their respective scoring instructions. Concerning the between-session practice of the coping skills, the frequency of practice was summed across time points in order to assess the total amount of practice reported for each coping skill.

First, preliminary analyses were conducted to identify outliers and assess normality. Outliers were classified as values greater than +/- 3.0 standard deviations (*SD*) from the mean (Tabachnick & Fidell, 2007). When outliers were identified, a Winsorization transformation was applied to reduce the influence of these extreme values (Tukey, 1962). Multivariate outliers were then assessed by calculating Mahalanobis distances for all of the variables included in each model. Mahalanobis distances (D^2) follow a χ^2 distribution, and values with $p < 0.001$ are considered problematic (Tabachnick & Fidell, 2007). Next, the normality of the variables was assessed. As recommended by Kline (2011), skewness and kurtosis indices should be less than the absolute values of 3.0 and 10.0, respectively. Following, baseline descriptive statistics and zero-order correlations between all study variables were computed to characterize the sample. Lastly, alpha coefficients were calculated to examine the internal consistency of the measures.

Concerning missing data, full information maximum likelihood (FIML) data imputation was used in all analyses (Enders, 2001b; Kline, 2011). FIML estimates implied values for missing data based on observed data patterns. Compared to deletion methods (e.g., listwise, pairwise) and single imputation, FIML produces less biased parameter estimates and allows for the retention of the full sample size (Enders, 2001a).

Additionally, auxiliary variables were originally calculated to enhance the effectiveness of FIML data imputation. An auxiliary variable is a variable in a statistical model that is included solely for improving the missing data imputation (Kline, 2011). Specifically, when missing data are not random (e.g., attrition due to disease progression), including a variable that measures the reason for the missing data can improve the accuracy of the parameter estimates (Collins, Schafer, & Kam, 2001). Auxiliary variables were computed based on the reason for attrition, including medical reasons (e.g., illness progression), lack of interest, and lost to follow-up. Each participant received a dummy-coded score for each attrition variable. For example, those who dropped out of the intervention due to illness progression were given a score of 1 on the medical reasons variable, whereas everyone who did not drop out due to medical reasons was given a score of 0. Participants who completed both follow-up time points were given a score of 0 on each auxiliary variable. I attempted running all of the models with every combination of auxiliary variables (e.g., 1 to 3 auxiliary variables per model). Unfortunately, none of the models would converge due to *Phi* or *Psi* matrices being not positive definite. Thus, the final models did not include auxiliary variables. However, I computed Fisher’s exact tests and independent samples *t*-tests to examine potential differences in demographic and medical characteristics and study variables at baseline between those who dropped out after baseline and those who completed at least one follow-up.

The primary analyses were conducted in LISREL 8.8 (Joreskog & Sorbom, 2008) using autoregressive path analysis models. Path analysis was chosen over alternative methods (e.g., multiple regression, repeated measures ANOVA) because it allows for more accurate parameter estimates by using FIML data imputation (Enders, 2001a; Kline, 2011). Current power analysis methods for path analysis models produce unreliable estimates (Kline, 2011; Lei & Wu, 2007); however, it is generally suggested that there should be between 5 and 20 participants per parameter (Browne & Cudeck, 1992; Kline, 2011). Therefore, in order to increase the subject-to-parameter ratio, each of the outcomes were examined in separate models (7 models overall).

Autoregressive models can be used with longitudinal data to assess the stability of a construct over time (Frees, 2004; Kline, 2011). In this study, baseline symptom scores were used to predict symptom scores at the first follow-up, and, in turn, symptom scores at the first follow-up were used to predict symptom scores at the second follow-up. Estimated path coefficients between the same construct (i.e., autoregressive paths) are referred to as stability coefficients, which reflect the consistency of the rank order of participants on a variable over time (Kline, 2011). The term *rank order* refers to a participant’s relative standing on a variable in relation to other participants in the dataset (e.g., the patient with the most pain is ranked as number 1, the patient with the second highest pain is ranked as number 2, etc.).

If a model yields large stability coefficients this suggests that the rank order of the symptom scores remained relatively the same from baseline to the first follow-up and from the first follow-up to the second follow-up (Frees, 2004; Kline, 2011). A large stability coefficient could thus reflect any of the following: (1) symptoms did not change over time; (2) symptoms uniformly increased or decreased over time; or (3) symptoms systematically changed over time with the baseline level of the symptom determining the amount/direction of change (i.e., the fanning effect) (Frees, 2004; Kline, 2011). An example of the fanning effect can be seen in the following scenario with three groups of patients: (1) patients who reported high levels of pain at baseline reported even higher levels of pain at each follow-up; (2) patients who reported moderate levels of pain at baseline reported moderate levels of pain at each follow-up; and (3) patients who reported low levels of pain at baseline reported even lower levels of pain at each follow-up. Note that the rank order of the patients' pain scores remained the same at each time point; thus, the stability coefficients would be large.

In contrast, small (or zero) stability coefficients reflect a re-ordering of the rank order of the symptoms across time (Frees, 2004; Kline, 2011). For example, three groups of patients shift in their respective rank order across time in the following scenario: (1) patients who reported high levels of pain at baseline reported low levels of pain at the first follow-up and high levels of pain at the second follow-up; (2) patients who reported moderate levels of pain at baseline reported high levels of pain at the first follow-up and low levels of pain at the second follow-up; and (3) patients who reported low levels of pain at baseline reported moderate levels of pain at the first follow-up and high levels of pain at the second follow-up.

For Aim 1, five autoregressive models (i.e., patient pain severity, distress related to breathlessness, fatigue interference, depressive symptoms, and anxiety symptoms) were estimated to examine if increased coping skills practice (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing, cognitive restructuring, and assertive communication) was related to reduced patient symptoms at 2 and 6 weeks post-intervention (see Figure 1). For Aim 2, two autoregressive models (i.e., caregiver depressive and anxiety symptoms) were estimated to examine if increased caregiver coping skills practice was related to reduced caregiver symptoms at 2 and 6 weeks post-intervention (see Figure 2).

My original analysis plan for Aim 2 included cross-lagged autoregressive models for patient and caregiver depressive and anxiety symptoms. This approach was proposed due to the dyadic nature of these outcomes. However, these models included more pathways than participants, making the output uninterpretable (Kline, 2011). Thus, I decided to run separate models for patients and caregivers in order to increase the participant-to-path ratio. The lack of dyadic analyses is noted in the Limitations and Future Directions section of the discussion.

Model fit was assessed using the χ^2 statistic and the root mean square error of approximation (RMSEA) statistic (Steiger, 1990). A non-significant χ^2 statistic indicates that the hypothesized model is acceptable because there is no significant difference between the modeled and the observed patterns of relationships (Kline, 2011). The RMSEA statistic is an adjusted estimate of absolute fit accounting for the parsimony of the model; smaller values represent better fit with values below 0.06 indicative of good fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

RESULTS

Preliminary Analyses

The study flow is shown in Figure 3. To summarize, 337 potentially eligible lung cancer patients were approached in clinic. Two hundred and three of the approached patients were excluded due to ineligibility (*n* = 117) or declining participation (*n* = 86). Following initial in-clinic screening, 134 patients and 128 caregivers consented to participate. However, 50 participants (*n* = 28 patients; *n* = 22 caregivers) were withdrawn before randomization for the following reasons: lack of interest (*n* = 12); medical reasons (*n* = 4); lost to follow-up (*n* = 14); ineligibility (*n* = 6); or the other member of the dyad was withdrawn for any reason (*n* = 14). Overall, 106 patients and 106 caregivers completed baseline assessments and were randomized to TSM (*n* = 51 patients; *n* = 51 caregivers) or attention control (*n* = 55 patients; *n* = 55 caregivers).

The current study analyzes data from the TSM condition; thus, attrition from the attention control condition will not be discussed. After being randomized to TSM, 30 participants (*n* = 15 patients; *n* = 15 caregivers) were withdrawn before the 2 week follow-up. Concerning the number of completed TSM sessions, 5 dyads completed 0 sessions, 7 dyads completed 1 session, 1 dyad completed 3 sessions, and 32 dyads completed 4 sessions.

Reasons for withdrawal were the following: lack of interest (*n* = 12); medical reasons (*n* = 5); the other member of the dyad was withdrawn for any reason (*n* = 11); and death (*n* = 2). Thirty-six patients and 35 caregivers completed the 2 week follow-up. Before the 6 week follow-up, one patient died and, thus, his or her caregiver was withdrawn. One caregiver missed the 2 week follow-up time frame, but completed the 6 week follow-up. Thus, 35 patients and 35 caregivers completed the 6 week follow-up; 36 patients and 36 caregivers completed at least one follow-up. Overall there was 31.37% (16/51 dyads) attrition from baseline to the 6 week follow-up for both patients and caregivers.

In the following sections I present data from patients and caregivers from three time points. When patients and caregivers are discussed in the same sentence, I present patients' statistics followed by caregivers' statistics. When variables are discussed across time, I present them chronologically (i.e., baseline, 2 weeks post-intervention, 6 weeks post-intervention).

Patient and caregiver baseline characteristics are shown in Table 1. The majority of patients were White (88.24%), female (54.90%), married (62.75%), and retired (49.02%) or unemployed (25.49%). On average, patients were 63.47 years of age (*SD* = 7.68) and had 12.92 years of education (*SD* = 2.22). Most patients (64.71%) only had a high school degree or equivalent. The median household income for patients was between $51,000 and $99,999, with 32.65% reporting income below $30,999. Nine patients refused to report or did not know their household income. Caregivers were primarily White (88.00%), female (72.55%), married (74.51%), and employed full-time (39.22%) or retired (31.37%). On average, caregivers were 56.33 years of age (*SD* =

14.09) and had 13.94 years of education (*SD* = 2.85). Around 45.10% of caregivers only had a high school degree or equivalent. The median household income for caregivers was also between $51,000 and $99,999, with 25.49% reporting income below $30,999. Six caregivers refused to report or did not know their household income. The majority of caregivers were patients' spouses or partners (62.75%); however, some caregivers were patients' sons or daughters (17.65%) or other family members or friends (19.61%).

Patient medical information is shown in Table 2. Patients were enrolled from the Indiana University Simon Cancer Center (76.47%), the Roudebush VA Medical Center (19.61%), and the Eskenazi Hospital in Indianapolis (3.92%). Forty-four patients had non-small cell lung cancer (NSCLC; 86.27%) and seven had small-cell lung cancer (SCLC; 13.73%). Most patients (62.75%) had advanced-stage disease (i.e., stage III or IV NSCLC or extensive SCLC) and the median time since diagnosis was 0.57 years (*SD* = 2.12). The majority of patients had received chemotherapy (52.94%), followed by surgery (47.06%), radiation (25.49%), and concurrent chemoradiation (23.53%). The mean self-reported ECOG score was 1.43 (*SD* = 0.92), suggesting that the average patient was able to be active but did not feel well (Oken et al., 1982).

Descriptive statistics regarding intervention-period coping skills practice for patients and caregivers are presented in Table 3. From sessions 2 to 4, noticing sounds and thoughts was practiced an average of 12.98 (*SD* = 9.73) and 11.74 (*SD* = 11.83) times. Similarly, from sessions 2 to 4, guided imagery was practiced an average of 11.59 (*SD* = 9.39) and 8.33 (*SD* = 7.48) times. Pursed lips breathing was practiced more frequently than the other coping skills from sessions 2 to 4, with an average of 29.60 (*SD* = 32.56) and 15.05 (*SD* = 17.22) times. From sessions 3 to 4, cognitive restructuring was practiced an average of 9.87 (*SD* = 10.64) and 10.82 (*SD* = 12.07) times. Lastly, from session 4, assertive communication was practiced an average of 4.83 (*SD* = 4.50) and 4.26 (*SD* = 3.80) times.

Descriptive statistics on patient and caregiver depressive and anxiety symptoms are presented in Table 4. The PHQ-8 demonstrated acceptable internal consistency across time points for patients (α coefficients = 0.78, 0.70, and 0.85) and caregivers (α coefficients = 0.87, 0.84, and 0.86). The GAD-7 also had good internal consistency across time points for patients (α coefficients = 0.88, 0.83, and 0.86) and caregivers (α coefficients = 0.88, 0.83, and 0.87).

On average, patients reported mild depressive symptoms (PHQ-8 scores from 5 to 9; Kroenke, Spitzer, Williams, & Löwe, 2010) across time points, with mean PHQ-8 scores of 7.31 (*SD* = 4.77), 6.36 (*SD* = 3.75), and 6.71 (*SD* = 4.77). Caregivers also reported mild depressive symptoms on average across time points, with mean PHQ-8 scores of 5.67 (*SD* = 5.59), 5.09 (*SD* = 4.88), and 4.83 (*SD* = 4.77). Patients reported mild anxiety (GAD-7 scores from 5 to 9; Kroenke, Spitzer, Williams, & Löwe, 2010) at baseline, with mean GAD-7 scores of 5.12 (*SD* = 4.89). However, at 2 and 6 weeks post-intervention, patients reported minimal anxiety (GAD-7 scores from 0 to 4; Kroenke, Spitzer, Williams, & Löwe, 2010), with mean scores of 3.72 (*SD* = 3.45) and 4.06 (*SD* = 3.82). Caregivers reported mild anxiety across time points, with mean GAD-7 scores of 6.10 (*SD* = 5.19), 5.06 (*SD* = 4.28), and 5.00 (*SD* = 4.77).

Patient symptoms across time are presented in Table 5. The symptom measures with multiple items had excellent internal consistency at all time points, including pain severity (α coefficients = 0.94, 0.92, and 0.94) and fatigue interference (α coefficients =

0.94, 0.93, and 0.94). On average, pain severity was consistent from baseline to 2 and 6 weeks post-intervention, with mean scores of 2.61 (*SD* = 2.47), 2.24 (*SD* = 2.16), and 2.64 (*SD* = 2.49). Patients were, on average, below clinical levels of pain (BPI-SF score of 5 or greater; Cleeland et al., 1994) at all time points. Distress related to breathlessness was also consistent across time points on average, with mean scores of 1.22 (*SD* = 1.12), 1.33 (*SD* = 1.35), and 1.20 (*SD* = 1.23). A score of 1 on the MSAS suggests patients were a little distressed or bothered by breathlessness (Portenoy et al., 1994). Lastly, fatigue interference was also consistent across time points, with mean scores of 3.20 (*SD* = 2.46), 2.53 (*SD* = 2.04), and 2.87 (*SD* = 2.44). A fatigue interference score greater than 5 on the FSI is considered clinically meaningful fatigue (Hann et al., 2000).

Preliminary analyses were conducted to identify outliers and assess normality. Univariate outliers were classified as values greater than +/- 3.0 standard deviations from the mean (Tabachnick & Fidell, 2007). Five outliers were identified in the coping skills practice variables (see Table 6). A Winsorization transformation was thus applied to reduce the influence of these extreme values (Tukey, 1962). Based on Mahalanobis distances, there were no multivariate outliers for any combination of the variables included in each model (all D^2 *p*s > 0.001). Variable normality was also assessed. All skewness and kurtosis indices were less than the absolute values of 3.0 and 10.0, respectively (see Tables 3, 4, and 5). Lastly, concerning power, all of the models had a participant-to-parameter ratio of 4.25 (51 participants to 12 pathways), which is below the recommended minimum of 5 participants per path (Browne & Cudeck, 1992; Kline, 2011).

Independent samples *t*-tests and Fisher's exact tests were conducted to examine potential baseline differences between those who dropped out after baseline and those who completed at least one follow-up (see Tables 7 and 8). There were only a few significant between-group differences. Specifically, caregivers who were withdrawn ($n = 15$) were more likely to have lower income ($p < 0.01$) and live with the patient ($p = 0.04$), compared to caregivers who completed at least one follow-up ($n = 36$). All other baseline comparisons were non-significant, including symptom measures (see Table 8). With these few exceptions, there were no other identifiable patterns of missingness. Thus, full information maximum likelihood (FIML) data imputation was used in all path analyses (Enders, 2001a; Kline, 2011). It is important to note, however, that many of the attrition analyses were underpowered due to small sample sizes and unequal variances within some of the groups. Thus, the results should be interpreted cautiously.

Pearson correlations were computed to characterize the relationships between study variables (see Tables 9 to 18). The following sections summarize the results of these analyses.

Concerning patients' coping skills practice (see Table 9), most showed moderate to strong positive associations with one another (*r*s = 0.34 to 0.67, $p < 0.05$). The most notable exception was assertive communication, which was positively associated with noticing sounds and thoughts ($r = 0.51$, $p < 0.01$), but was not significantly related to any of the other coping skills (*p*s > 0.05). Additionally, cognitive restructuring was not significantly related to guided imagery, though there was a positive trend ($r = 0.32$, $p = 0.05$). Most of the caregivers' coping skills practices showed moderate to strong positive associations with one another (*r*s = 0.33 to 0.73, *p*s < 0.05). There were only two exceptions. Similar to patients, caregivers' guided imagery practice was not significantly related to cognitive restructuring or assertive communication practice (rs = 0.05 and 0.07, ps > 0.05).

Patients' and caregivers' coping skills practices tended to be positively correlated, with moderate to strong strength (rs = 0.33 to 0.77, ps < 0.05). There were a few exceptions. Specifically, patients' guided imagery practice was not significantly related to caregivers' pursed lips breathing or assertive communication; however, the effect sizes were moderate and fell just short of significance (rs = 0.31 to 0.30, ps = 0.05 and 0.06). In addition, patients' pursed lips breathing was not significantly related to caregivers' assertive communication ($r = -0.03$, $p > 0.05$). Lastly, caregivers' guided imagery practice was not significantly related to patients' pursed lips breathing, cognitive restructuring, or assertive communication (rs = 0.22, 0.01, -0.02, ps > 0.05, respectively).

Concerning correlations between depressive and anxiety symptoms (see Table 10), I present the following: (1) patients' and caregivers' depressive and anxiety symptoms separately; (2) intercorrelations between patients' and caregivers' depressive symptoms; (3) intercorrelations between patients' and caregivers' anxiety symptoms; and (4) intercorrelations between patients' and caregivers' depressive and anxiety symptoms.

First, patients' depressive symptoms tended to be positively correlated over time and positively correlated with their anxiety symptoms (rs = 0.39 to 0.79, ps < 0.05); there were also six positive correlations that were small to moderate in effect size but non-significant (rs = 0.28 to 0.31, ps = 0.06 to 0.19). Patients' anxiety symptoms at baseline were not significantly related to their depressive symptoms at 2 weeks post-intervention ($r = 0.05$, $p > 0.05$). Similarly, patients' anxiety symptoms at 2 weeks post-intervention were not significantly related to their depressive symptoms at 6 weeks post-intervention ($r = -0.02$, $p > 0.05$). In contrast to patients, caregivers' depressive and anxiety symptoms showed strong positive correlations across all time points (rs = 0.59 to 0.87, ps < 0.01).

Second, patients' and caregivers' depressive symptoms were positively correlated at baseline ($r = 0.32$, $p < 0.05$); however, these associations were not significant at the two follow-ups. There were also a few significant cross-lagged effects. Specifically, caregivers' depressive symptoms at baseline were positively correlated with patients' depressive symptoms at 2 weeks post-intervention ($r = 0.35$, $p < 0.05$); patients' depressive symptoms at 2 weeks post-intervention were positively correlated with caregivers' depressive symptoms at 6 weeks post-intervention ($r = 0.34$, $p < 0.05$).

Third, patients' and caregivers' anxiety symptoms were positively correlated at the same time points (rs = 0.37 to 0.40, ps < 0.05), and there were some significant cross-lagged effects. Specifically, caregivers' anxiety symptoms at baseline were positively associated with patients' anxiety symptoms at 2 weeks post-intervention ($r = 0.51$, $p < 0.01$); similarly, patients' anxiety symptoms at baseline were positively associated with caregivers' anxiety symptoms at 6 weeks post-intervention ($r = 0.38$, $p < 0.05$). Patients' anxiety symptoms at 2 weeks post-intervention were also positively associated with caregivers' anxiety symptoms at 6 weeks post-intervention ($r = 0.53$, $p < 0.01$).

Fourth, patients' and caregivers' depressive and anxiety symptoms were positively correlated at the same time points (rs = 0.34 to 0.40, ps < 0.05), and there were some significant cross-lagged effects. Specifically, caregivers' depressive symptoms at baseline were positively associated with patients' anxiety symptoms at 2 weeks post-intervention ($r = 0.47$, $p < 0.01$); similarly, caregivers' anxiety symptoms at baseline were positively associated with patients' depressive symptoms at 2 weeks post-intervention ($r = 0.35$, $p < 0.05$). Patients' anxiety symptoms at baseline were positively associated with caregivers' depressive symptoms at 6 weeks post-intervention ($r = 0.44$, $p < 0.01$). Lastly, patients' depressive symptoms at 2 weeks post-intervention were positively associated with caregivers' anxiety symptoms at 6 weeks post-intervention ($r = 0.37$, $p < 0.01$); similarly, patients' anxiety symptoms at 2 weeks post-intervention were positively associated with caregivers' depressive symptoms at 6 weeks post-intervention ($r = 0.52$, $p < 0.01$).

The patients' symptoms showed moderate to strong positive correlations from baseline to the two follow-ups, including pain severity (rs = 0.78 to 0.81, ps < 0.01), distress related to breathlessness (rs = 0.45 to 0.72, ps < 0.01), and fatigue interference (rs = 0.50 to 0.65, ps < 0.05). Concerning correlations between symptoms, pain severity was positively associated with fatigue interference across most time points (rs = 0.38 to 0.61, ps < 0.05). The only exceptions were fatigue interference at baseline and 2 weeks post-intervention and pain severity at 6 weeks post-intervention, both of which were positive moderate effects that fell short of significance (rs = 0.32 and 0.33, ps = 0.06). Distress related to breathlessness at baseline was positively associated with fatigue interference at baseline ($r = 0.35$, $p < 0.05$); similarly, distress related to breathlessness at 2 weeks post-intervention was positively associated with fatigue interference at 2 weeks post-intervention ($r = 0.35$, $p < 0.05$). The remaining associations between distress related to breathlessness and the other symptoms tended to be positive, small to moderate effect sizes, and non-significant (rs = 0.17 to 0.33, ps = 0.05 to 0.34).

Correlations were computed for each of the variables included in the seven path models (see Tables 12 to 18). Significant correlations in the predicted directions provide preliminary support for my hypotheses.

Concerning patient coping skills and symptoms (see Tables 12 to 16), there was little preliminary support for my hypotheses. None of the coping skills demonstrated significant negative associations with symptoms at 2 or 6 weeks post-intervention. There were, however, a few non-significant small effects in the predicted directions. Specifically, there were small negative associations between assertive communication and pain severity ($r = -0.23$, $p = 0.20$), depressive symptoms ($r = -0.21$, $p = 0.23$), and anxiety symptoms ($r = -0.20$, $p = 0.25$) at 6 weeks post-intervention. Thus, there was some tentative support for a few pathways posited in Hypotheses 1.2, 1.4, and 1.5.

Unfortunately, some of the patients' coping skills practice demonstrated effects opposite of those predicted. Contrary to Hypothesis 1.2, cognitive restructuring had a significant positive association with distress related to breathlessness at 6 weeks post-intervention ($r = 0.45$, $p < 0.01$). There were other non-significant trends in the opposite direction of my hypotheses, such as the following: (1) cognitive restructuring and distress related to breathlessness at 2 weeks post-intervention ($r = 0.28$, $p = 0.10$); (2) noticing sounds and thoughts and distress related to breathlessness at 6 weeks post-intervention ($r = 0.32$, $p = 0.06$); (3) guided imagery and distress related to breathlessness at 6 weeks post-intervention ($r = 0.27$, $p = 0.12$); (4) cognitive restructuring and depressive symptoms at 6 weeks post-intervention ($r = 0.21$, $p = 0.23$); and (5) cognitive restructuring and anxiety symptoms at 6 weeks post-intervention ($r = 0.30$, $p = 0.08$).

Concerning caregivers' coping skills and symptoms (see Tables 17 and 18), there was no preliminary support for Hypotheses 2.1 or 2.2. None of the coping skills demonstrated significant negative associations with symptoms at 2 or 6 weeks post-intervention. As with patients, there were some non-significant trends in the opposite direction of my hypotheses. Specifically, there were small positive trends between noticing thoughts and sounds, cognitive restructuring, and assertive communication and depressive symptoms at 2 weeks post-intervention (*r*s = 0.23 to 0.26, *p*s = 0.14 to 0.18). There were also small positive trends between noticing thoughts and sounds and guided imagery and anxiety symptoms at 2 weeks post-intervention (*r*s = 0.21 and 0.20, *p*s = 0.24 and 0.26), as well as assertive communication and anxiety symptoms at 6 weeks post-intervention (*r* = 0.20, *p* = 0.25).

Primary Analyses

To test my study hypotheses I ran seven measured-variable path models, with one symptom per model (see Figures 1 and 2 for conceptual models, Figures 4 to 10 for path models, and Appendix B for LISREL syntax). Each model tested relationships between intervention-period coping skills practice and symptom change at 2 and 6 weeks post-intervention. Autoregressive paths were included in each model to control for symptom levels at baseline and 2 weeks post-intervention. Coping skills were allowed to covary in each model. Overall, the models tended to fit the data adequately; however, only some of the hypothesized pathways were supported. The following sections describe the findings of each model.

Model 1 provided some support for Hypothesis 1.1, which posited that patients' increased coping skills practice would be associated with reduced pain severity at 2 and 6 weeks post-intervention (see Figure 4). The model fit the data well, χ^2 (12, N = 51) = 7.78, p = 0.80, RMSEA = 0.00, 90% confidence interval (0.00, 0.10). The two stability coefficients were large and significant (β = 0.77 and β = 0.71, $p < 0.05$), suggesting the rank order of patients' pain severity tended to be stable over time. Contrary to Hypothesis 1.1, most of the coping skills were not significantly associated with pain severity at 2 or 6 weeks post-intervention. The only exception was assertive communication. Specifically, in support of Hypothesis 1.1, greater assertive communication practice was associated with reduced pain severity at 6 weeks post-intervention (β = -0.28, $p < 0.05$). In total, the model accounted for 69% and 65% of the variance in pain severity at 2 and 6 weeks post-intervention.

Model 2 did not provide support for Hypothesis 1.2, which posited that patients' increased coping skills practice would be associated with reduced distress associated with breathlessness at 2 and 6 weeks post-intervention (see Figure 5). The model fit the data well, χ^2 (12, N = 51) = 0.43, p = 0.99, RMSEA = 0.00, 90% confidence interval (0.00, 0.00). The two stability coefficients were large and significant (β = 0.72 and β = 0.50, $p < 0.05$), suggesting the rank order of patients' distress related to breathlessness tended to be stable over time. Contrary to Hypothesis 1.2, none of the coping skills were significantly associated with distress related to breathlessness in the hypothesized direction. Specifically, greater cognitive restructuring practice was associated with greater distress related to breathlessness at 6 weeks post-intervention (β = 0.31, $p < 0.05$).

In total, the model accounted for 59% and 51% of the variance in distress related to breathlessness at 2 and 6 weeks post-intervention.

Model 3 provided mixed support for Hypothesis 1.3, which posited that patients' increased coping skills practice would be associated with reduced fatigue interference at 2 and 6 weeks post-intervention (see Figure 6). The model fit the data well, χ^2 (12, N = 51) = 2.76, $p = 0.99$, RMSEA = 0.00, 90% confidence interval (0.00, 0.00). The two stability coefficients were large and significant ($\beta = 0.71$ and $\beta = 0.51$, $p < 0.05$), suggesting the rank order of patients' fatigue interference tended to be stable over time. Contrary to Hypothesis 1.3, greater practice of noticing sounds and thoughts was associated with greater fatigue interference at 6 weeks post-intervention ($\beta = 0.80$, $p < 0.05$). However, in support of Hypothesis 1.3, greater practice of guided imagery and assertive communication were associated with reduced fatigue interference at 6 weeks post-intervention ($\beta = -0.55$ and $\beta = -0.36$, $p < 0.05$). None of the other pathways were significant. In total, the model accounted for 50% and 44% of the variance in fatigue interference at 2 and 6 weeks post-intervention.

Model 4 provided mixed support for Hypothesis 1.4, which posited that patients' increased coping skills practice would be associated with reduced depressive symptoms at 2 and 6 weeks post-intervention (see Figure 7). The model fit the data well, χ^2 (12, N = 51) = 5.30, $p = 0.95$, RMSEA = 0.00, 90% confidence interval (0.00, 0.02). The two stability coefficients were moderate and significant ($\beta = 0.36$ and $\beta = 0.40$, $p < 0.05$), suggesting the rank order of patients' depressive symptoms were somewhat stable with some fluctuations over time. Contrary to Hypothesis 1.4, greater practice of cognitive restructuring was associated with greater depressive symptoms at 6 weeks post-intervention ($\beta = 0.35$, $p < 0.05$). In support of Hypothesis 1.4, greater practice of assertive communication was associated with reduced depressive symptoms at 6 weeks post-intervention ($\beta = -0.37$, $p < 0.05$). None of the other pathways were significant. In total, the model accounted for 17% and 40% of the variance in depressive symptoms at 2 and 6 weeks post-intervention.

Model 5 provided mixed support for Hypothesis 1.5, which posited that patients' increased coping skills practice would be associated with reduced anxiety symptoms at 2 and 6 weeks post-intervention (see Figure 8). The model fit the data well, χ^2 (12, $N = 51$) = 5.42, $p = 0.94$, RMSEA = 0.00, 90% confidence interval (0.00, 0.03). The first stability coefficient was moderate and significant ($\beta = 0.41$, $p < 0.05$); however, the second stability coefficient was smaller and non-significant ($\beta = 0.28$, $p > 0.05$). This suggests the rank order of patients' anxiety showed moderate change from baseline to 2 weeks post-intervention. From 2 to 6 weeks post-intervention, however, the rank order of patients' anxiety changed substantially. Contrary to Hypothesis 1.5, greater practice of noticing sounds and thoughts as well as cognitive restructuring were associated with greater anxiety symptoms at 6 weeks post-intervention ($\beta = 0.59$ and $\beta = 0.37$, $p < 0.05$). However, in support of Hypothesis 1.5, greater practice of guided imagery and assertive communication were associated with reduced anxiety symptoms at 6 weeks post-intervention ($\beta = -0.48$ and $\beta = -0.45$, $p < 0.05$). None of the other pathways were significant. In total, the model accounted for 19% and 38% of the variance in anxiety symptoms at 2 and 6 weeks post-intervention.

Model 6 did not provide support for Hypothesis 2.1, which posited that caregivers' increased coping skills practice would be associated with reduced depressive symptoms at 2 and 6 weeks post-intervention (see Figure 9). The model showed adequate fit to the data, χ^2 (12, N = 51) = 8.88, p = 0.71, RMSEA = 0.00, 90% confidence interval (0.00, 0.12). Of note, the 90% confidence interval for the RMSEA did include 0.12, which is slightly above the recommended cut-off of 0.10 (Kline, 2011). The two stability coefficients were large and significant (β = 0.77 and β = 0.65, $p < 0.05$), suggesting the rank order of caregivers' depressive symptoms tended to be stable over time. Contrary to Hypothesis 2.1, none of the coping skills were significantly associated with caregivers' depressive symptoms. In total, the model accounted for 66% and 43% of the variance in caregivers' depressive symptoms at 2 and 6 weeks post-intervention.

Model 7 did not provide support for Hypothesis 2.2, which posited that caregivers' increased coping skills practice would be associated with reduced anxiety symptoms at 2 and 6 weeks post-intervention (see Figure 10). The model showed adequate fit to the data, χ^2 (12, N = 51) = 12.40, p = 0.41, RMSEA = 0.03, 90% confidence interval (0.00, 0.16). However, the 90% confidence interval for the RMSEA included 0.16, which is higher than recommendations (Kline, 2011). The two stability coefficients were large and significant (β = 0.64 and β = 0.74, $p < 0.05$), suggesting the rank order of caregivers' anxiety symptoms tended to be stable over time. Contrary to Hypothesis 2.2, none of the coping skills were significantly associated with anxiety symptoms in the hypothesized direction. Indeed, greater guided imagery practice was associated with greater anxiety symptoms at 2 weeks post-intervention (β = 0.31, $p <$ 0.05). In total, the model accounted for 54% and 52% of the variance in caregivers' anxiety symptoms at 2 and 6 weeks post-intervention.

Conclusions from Primary Analyses

To summarize the findings, all models showed at least adequate fit to the data; however, only some of the hypothesized pathways were supported. There were no significant associations in the predicted directions between coping skills practice and patients' physical and psychological symptoms at 2 weeks post-intervention. For patients at 6 weeks post-intervention, more assertive communication practice was associated with less pain severity, fatigue interference, and depressive and anxiety symptoms; additionally, more guided imagery practice was associated with less fatigue interference and anxiety. Contrary to my hypotheses, however, more cognitive restructuring practice was associated with more distress related to breathlessness and depressive and anxiety symptoms. Similarly, more practice of noticing sounds and thoughts was associated with more fatigue interference and anxiety. Concerning caregivers, there was no support for my hypotheses. The only significant association was in the opposite direction of my hypothesis and suggested that more guided imagery practice was associated with more anxiety at 2 weeks post-intervention. All other pathways at 2 and 6 weeks post-intervention were not significant for patients or caregivers.

DISCUSSION

The purpose of this study was to identify effective components of a psychosocial intervention for lung cancer patients and their family caregivers. An essential step in developing more cost-effective and efficacious interventions is determining the degree to which certain intervention components lead to improved health outcomes (Czaja et al., 2003; Kazdin, 2007). This study examined associations between specific intervention components (i.e., coping skills practice) and symptom change in a telephone symptom management (TSM) intervention delivered concurrently to symptomatic lung cancer patients and their family caregivers. My hypotheses were based on social cognitive theory (SCT; Bandura, 1986, 2004), cognitive-behavioral therapy frameworks (CBT; Beck & Weishaar, 1989; Dobson, 2009), and previous research suggesting that greater practice of coping skills may reduce specific symptoms in cancer populations (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007). The results provided mixed support for my hypotheses. Specifically, two coping skills (i.e., assertive communication and guided imagery) showed promising effects for certain patient symptoms; however, the other coping skills (i.e., noticing sounds and thoughts, pursed lips breathing, and cognitive restructuring) showed no effects or effects opposite of those hypothesized for both patient and caregiver symptoms. In the following sections I discuss these findings and their implications for theory, research, and clinical practice. Lastly, I present study strengths, limitations, and future directions.

Coping Skills Practice Associated with Lower Symptoms

There are multiple interpretations of findings consistent with my hypotheses that frame the discussion. Theory (Bandura, 1986, 2004; Beck & Weishaar, 1989; Dobson, 2009) and previous research (Andersen et al., 2007; Chan et al., 2012; Cohen & Fried, 2007) suggest causal relationships between increased coping skills practice and reduced symptoms in cancer patients and their family caregivers. In the current study, autoregressive analyses provide compelling support for causal statements by allowing coping skills to predict changes in symptoms over time (Frees, 2004; Kline, 2011). However, only experimental design can determine cause and effect (Tabachnick & Fidell, 2007). Thus, a negative association between practice of a coping skill and symptom change can be interpreted in the following ways: (1) increased practice of the coping skill decreased the symptom either directly or indirectly; (2) increased practice of the coping skill was reciprocally related to decreases in the symptom over time; or (3) a third variable (e.g., self-efficacy) caused an increase in the practice of the coping skill and a decrease in the symptom, or vice versa (Tabachnick & Fidell, 2007). There are also methodological limitations of this study (e.g., statistical power) that likely influenced the results and warrant consideration (see Limitations and Future Directions). In the next two sections I discuss the findings that were consistent with my hypotheses.

Assertive communication was the coping skill practice most consistently associated with reduced patient symptoms. Patients who more frequently practiced assertive communication during the intervention tended to report less pain severity, fatigue interference, depressive symptoms, and anxiety at 6 weeks post-intervention. To interpret these findings it is important to understand how assertive communication skills were taught in TSM. Specifically, assertive communication was presented to dyads as a means of communicating in a direct, honest, and respectful manner. Dyads were encouraged to use assertive communication to effectively elicit social support, communicate thoughts and feelings about cancer, and obtain medical attention for symptoms (Badr & Taylor, 2006; Keefe et al., 2005). Thus, all three of these areas may be mechanisms through which assertive communication decreased patient symptoms.

First, prior research has shown that eliciting social support can reduce cancer patients' pain severity, fatigue interference, and psychological distress (Badr & Taylor, 2006; Berger et al., 2012; Keefe et al., 2005; Porter et al., 2011). Such findings are not surprising, as each of these symptoms can be exacerbated when a cancer patient does not receive sufficient practical assistance (Walker, Zona, & Fisher, 2006; Whelan et al., 1997). For example, consider a lung cancer patient who needs help with household chores that increase his or her pain, lead to greater fatigue, and increase anxiety and depressive symptoms. Learning to assertively request assistance could help the patient receive practical support and, thus, reduce these symptoms.

Second, assertively communicating thoughts and feelings about cancer may reduce symptoms for some patients (Badr & Taylor, 2006; Berger et al., 2012; Keefe et al., 2010; Porter et al., 2009). Theory and previous research suggests emotional and cognitive processing of cancer-related issues can be hampered by negative social interactions, leading to poorer adjustment and exacerbated symptoms (Adams, Winger, &

Mosher, 2015; Badr & Taylor, 2006; Lepore, 2001; Moyer et al., 2012). There is also some evidence that the health effects of emotional disclosure for cancer patients may be mediated through physiological mechanisms, such as decreased heart rate (Low, Stanton, & Danoff-Burg, 2006). Improving cancer patients' communication skills may enhance emotional disclosure and reduce negative social interactions, thus improving symptoms (Adams et al., 2015; Low et al., 2006; Manne et al., 2007). To date, a few studies have shown beneficial effects of interventions focused on improving patients' ability to communicate their thoughts and feelings about cancer (Manne et al., 2007; Porter et al., 2009). However, more studies with cancer patients are needed to determine which aspects of communication are most amenable to intervention.

Third, obtaining medical attention for symptoms is another explanation for beneficial effects of assertive communication on patient symptoms (Andersen, Golden-Kreutz, Emery, & Thiel, 2009; Andersen et al., 1994; Keefe et al., 2005). It is logical to assume that patients will receive better symptom management if they can effectively communicate with their treatment team (Andersen et al., 2009). However, previous studies show that many patients find it difficult to be assertive during encounters with their providers (Fried, Bradley, O'Leary, & Byers, 2005; Kimberlin, Brushwood, Allen, Radson, & Wilson, 2004). For example, in a qualitative study with cancer patients and their caregivers, some patients reported feeling tension during oncology appointments because they did not know how to communicate their desire for better symptom management (Kimberlin et al., 2004). The current findings are also consistent with a previous study that explored intervention component effectiveness in a 12-month psychosocial RCT for breast cancer patients (Andersen et al., 2007). Specifically, Andersen et al. (2007) found an association between greater practice of assertive communication with treatment providers and global symptom reduction. The assertive communication effects were strongest following chemotherapy treatment when symptoms are typically most severe (Andersen et al., 2007). Thus, the current study provides further evidence that brief assertive communication training may be an effective way to enhance symptom management for cancer patients.

It is worth noting that assertive communication was only significantly associated with certain patient symptoms at 6 weeks post-intervention. There are multiple ways to interpret these findings. One possibility is that patients may have experienced a time lag between their assertive conversations and the receipt of support or treatment changes to better manage their symptoms. For example, a patient may discuss his or her pain management with the treatment team. Such conversations may lead to therapeutic interventions (e.g., palliative radiation) that take time to reduce the patient’s pain. Additionally, assertive communication and symptom change may have been reciprocally related over time. Patients may have started by practicing the skill in minor ways and then progressed to larger requests over time. Consistent with SCT (Bandura, 1986, 2004), as the patient sees positive effects from his or her assertive communication this likely reinforces the skill which, in turn, leads to more use and better results.

Guided imagery was the second coping skill associated with reductions in some patient symptoms**.** Specifically, patients who practiced more guided imagery during the intervention tended to report less fatigue interference and anxiety at 6 weeks post-intervention. These findings are consistent with multiple RCTs and a previous intervention component analysis with cancer patients (Cohen & Fried, 2007; Kangas et al., 2008; Porter et al., 2011; Roffe, Schmidt, & Ernst, 2005). Specifically, Cohen and Fried (2007) explored between-session practice of coping skills in relation to psychological distress (e.g., depressive and anxiety symptoms) and fatigue after two group-based interventions for 114 early-stage breast cancer patients. One of the interventions focused on CBT-based skills, such as cognitive restructuring and problem-solving. The other intervention focused entirely on relaxation, with particular emphasis on guided imagery. These two interventions were compared to a wait-list control group. Relative to the control group, both interventions produced greater reductions in psychological distress; however, the relaxation group also reduced fatigue whereas the CBT group did not. Additionally, patients in the relaxation group practiced coping skills more often than those in the CBT group. Increased coping skills practice in both groups was significantly related to post-intervention reductions in psychological distress and fatigue. Unfortunately, it was not reported whether the associations between coping skills practice and symptom reduction were significantly different between the two intervention groups. The current results extend these findings and suggest practicing guided imagery may be particularly helpful for anxiety and fatigue interference. It should be noted, however, that major differences in study design (e.g., group-based intervention) and cancer population (e.g., early-stage breast cancer) limit these conclusions.

Guided imagery is theorized to reduce fatigue interference and anxiety through multiple mechanisms, including reduced emotional arousal and distraction (Andersen et al., 1994; Benson & Klipper, 1992; Dobson, 2009). Fatigue is often reported as a debilitating symptom that interferes with many aspects of lung cancer patients’ lives (Hickok et al., 1996; Hopwood & Stephens, 1995; Hürny et al., 1993; Okuyama et al., 2001; Tanaka et al., 2002b); additionally, focusing attention on the fatigue is posited to make it interfere even more with the patient's functioning (Berger et al., 2012). Guided imagery, however, can serve as a distraction from this symptom, thus allowing the patient to focus attention on something other than his or her fatigue (Escalante & Manzullo, 2009; Kangas et al., 2008). As the patient gains a greater sense of control over the fatigue, self-efficacy for managing this symptom may increase as well (Bandura, 1986, 2004). Over time, guided imagery may be an effective means of lowering emotional arousal related to fatigue. Lowered emotional arousal may also help some patients initiate sleep, thereby reducing fatigue.

Similarly, guided imagery practice may reduce anxiety in lung cancer patients in multiple ways. Guided imagery is a highly structured coping skill, which is one reason it may be helpful for cancer patients with anxiety (Roffe et al., 2005; Sloman, 2002; Tusek, Church, Strong, Grass, & Fazio, 1997). When a patient's thoughts are consumed with rumination and worry, guided imagery practice may reduce emotional arousal and induce relaxation thus providing a reprieve from the anxiety (Andersen et al., 1994; Benson & Klipper, 1992; Dobson, 2009). Additionally, guided imagery can function as an immediate distraction from anxious thoughts (Roffe et al., 2005). This is particularly helpful when the content of the anxious thoughts is realistic and time bound, such as worrying about an upcoming oncology visit. The patient may have many realistic fears about the visit (e.g., disease progression); thus, problem solving or cognitive restructuring is not an appropriate coping skill to utilize (Greer, Park, Prigerson, & Safren, 2010). As with fatigue, gaining a respite from the anxiety will likely increase the patient's sense of control and self-efficacy for managing this symptom (Bandura, 1986, 2004).

Guided imagery was only related to reduced fatigue interference and anxiety at 6 weeks post-intervention. In contrast to assertive communication, explanations for this finding are not as clear. One possibility is that some patients may have become increasingly skilled with guided imagery and, thus, experienced larger reductions in symptoms over time. Additionally, the stability coefficients for fatigue interference and anxiety suggest there was substantial re-ordering of patients on these symptoms between 2 and 6 weeks post-intervention; thus, there was more variance to predict at 6 weeks post-intervention than at 2 weeks post-intervention. Therefore, significant effects of guided imagery practice may not have been detectable at 2 weeks post-intervention.

Coping Skills Practice Associated with Greater Symptoms

For some of the coping skills, there were surprising associations opposite of those predicted; that is, greater practice was associated with greater symptoms. A positive association between practice of a coping skill and symptom change can be interpreted in the following ways: (1) increased practice of the coping skill increased the symptom either directly or indirectly; (2) increased practice of the coping skill was reciprocally related to increases in the symptom over time; or (3) a third variable (e.g., relationship distress) caused an increase in the practice of the coping skill and an increase in the symptom, or vice versa (Tabachnick & Fidell, 2007). In the following sections I discuss these findings.

For patients, greater practice of cognitive restructuring during the intervention was associated with increased distress related to breathlessness, depressive symptoms, and anxiety at 6 weeks post-intervention. Although these findings are contrary to my hypotheses, numerous authors have argued for the importance of tailoring traditional CBT approaches to populations with advanced disease (Campbell & Campbell, 2012; Dalton, Keefe, Carlson, & Youngblood, 2004; Greer et al., 2010; Greer et al., 2012). As noted by Greer et al. (2010), much of the concern involves the types of thoughts that patients are attempting to restructure. If the thoughts are indeed accurate appraisals of the situation, then cognitive restructuring may, theoretically, increase distress (Greer et al., 2010). TSM was designed specifically with these concerns in mind. When choosing a coping skill, patients and caregivers were instructed to determine whether a distressing thought was accurate or not. If the thought was accurate (e.g., "my cancer is not curable"), self-soothing or emotion-focused strategies were suggested. Thus, cognitive restructuring was only intended to be used for unrealistic thoughts (e.g., "I can't do anything when I'm in pain"). One assumption of this approach, however, is that the patient can accurately assess whether a thought is realistic or not. It may be erroneous to assume that such distinctions are easily ascertained. Indeed, the purpose of cognitive restructuring is to determine if thoughts are realistic or not (Beck & Weishaar, 1989; Dobson, 2009); thus, some patients may have attempted to restructure distressing thought content only to conclude that the thought was accurate (e.g., "my pain is worse because my cancer is spreading").

Another coping skill with effects in the opposite direction of my hypotheses was patients' practice of noticing sounds and thoughts. Specifically, greater practice of noticing sounds and thoughts during the intervention was associated with greater fatigue interference and anxiety at 6 weeks post-intervention. One explanation for these findings is that patients who spent more time noticing their thoughts may have experienced increased awareness of their fatigue interference and anxiety.

Increasing awareness of distressing thought content is one commonality between noticing sounds and thoughts and cognitive restructuring. Both coping skills prompt patients to slow down and think about their thoughts, but in different ways. Specifically, noticing sounds and thoughts is a mindfulness-based skill and cognitive restructuring is a CBT-based skill. The original theoretical conceptualizations of these two coping skills are quite distinct. Mindfulness argues for approaching thoughts non-judgmentally (Kabat-Zinn & Hanh, 2009): CBT argues for judging thoughts to test their validity (Beck & Weishaar, 1989; Dobson, 2009). Combining the two approaches is often done in clinical practice (Shapiro & Carlson, 2009), and there is growing empirical support for integrating mindfulness into CBT-based therapies for various clinical issues across a variety of patient populations (Gu, Strauss, Bond, & Cavanagh, 2015; Ledesma & Kumano, 2009; Segal, Williams, & Teasdale, 2012). To date, however, the most rigorous RCTs of combined mindfulness and CBT interventions for cancer patients have primarily included early-stage breast and prostate cancer survivors (for a review see Ledesma & Kumano, 2009). Lung cancer patients are arguably a very different population from early-stage breast and prostate cancer survivors (Dudgeon et al., 2001; Greer et al., 2010; Linden et al., 2012). Thus, it is unknown whether symptomatic lung cancer patients would benefit from interventions that combine mindfulness and CBT approaches.

Lastly, there are a few important distinctions between the most effective and least effective coping skills. Specifically, guided imagery and assertive communication are highly structured, concrete skills (Dobson, 2009). In contrast, noticing sounds and thoughts and cognitive restructuring may require a greater level of self-awareness and processing ability (Beck & Weishaar, 1989; Kabat-Zinn & Hanh, 2009). For some lung cancer patients, the more complex coping skills may be too difficult to master in brief therapy, given that these skills have less directive instructions (e.g., noticing sounds and thoughts) and multiple steps (e.g., cognitive restructuring). Overall, the results suggest that noticing sounds and thoughts and cognitive restructuring may have the potential for misuse in lung cancer populations; however, these findings should be interpreted very cautiously as there are numerous limitations of the current study (see Limitations and Future Directions).

Guided imagery practice was associated with reductions in certain symptoms for patients; however, it was associated with more anxiety for caregivers at 2 weeks post-intervention. One potential explanation for these results is that there are important distinctions between the challenges that patients face and the challenges that caregivers face (Mosher, Bakas, et al., 2013; Mosher, Champion, et al., 2013; Mosher, Hanna, et al., 2013). For example, some of the anxious thoughts that caregivers report may be related to caregiving tasks (e.g., managing the patient’s medications) that are more appropriately addressed with education and problem-solving—not guided imagery. Practicing guided imagery may have caused some caregivers to feel more anxious by negatively reinforcing their avoidance of difficult situations. Those who felt more anxious at 2 weeks post-intervention may have stopped practicing guided imagery and, thus, reduced their anxiety at 6 weeks post-intervention. Additionally, in contrast to patients’ anxiety, caregivers’ anxiety was less stable between baseline and 2 weeks post-intervention and more stable between 2 and 6 weeks post-intervention. Therefore, significant effects were more likely to be detected at 2 weeks post-intervention. It is also important to note that caregivers were generally not reporting clinically meaningful levels of anxiety at any time point. A significant increase in anxiety should not be equated with a *meaningful* increase.

Coping Skills Not Significantly Associated with Symptoms

With the exception of significant associations previously described, most of the coping skills were not significantly related to patient or caregiver symptoms. There are potential explanations for these null findings that warrant consideration, including specific issues in the following categories: (1) social desirability, (2) symptom stability, (3) pursed lips breathing, (4) distress related to breathlessness, and (5) caregiver distress levels.

First, many of the null findings for patients and caregivers may be related to demand characteristics such as social desirability (Carstensen & Cone, 1983; Diener, Sandvik, Pavot, & Gallagher, 1991; Nichols & Maner, 2008; Orne, 1962; van de Mortel, 2008). Theory (Orne, 1962) and empirical research suggest that some participants desire to be "good subjects" and, thus, behave in ways that they believe will confirm the study hypotheses (Carstensen & Cone, 1983; Diener et al., 1991; Nichols & Maner, 2008; Orne, 1962; van de Mortel, 2008). Demand characteristics have not been studied in the context of dyadic symptom management interventions; however, it is logical that certain study designs may increase demand characteristics. Specifically, in TSM, participants' coping skills practice was assessed during the intervention sessions in front of the therapist and the other member of the dyad. In contrast, all symptoms were assessed for dyad members separately by blinded research assistants. Participants may have misreported their coping skills practice yet accurately reported their symptoms, which would attenuate associations.

Second, symptom stability may explain some of the null findings for patients and caregivers. Specifically, autoregressive models were used to predict the change in symptoms over time; however, if a symptom was very stable there was little change to predict. As noted previously, many patient symptoms tended to change the most from 2 to 6 weeks post-intervention. This is one explanation for why coping skill effects were only detectable at 6 weeks post-intervention for patients. In contrast, caregiver anxiety symptoms changed the most from baseline to 2 weeks post-intervention, increasing the likelihood of detecting coping skill effects at this time point. The lack of symptom variability at certain time points highlights concerns about the intervention's overall effectiveness (Mosher et al., under review). Indeed, the majority of the variance in symptoms was generally stable over time for both patients and caregivers.

Third, pursed lips breathing was the only coping skill that showed no significant associations with any of the patient symptoms. Previous RCTs have found evidence for the effectiveness of pursed lips breathing in reducing multiple symptoms in patients with chronic obstructive pulmonary disease (Gosselink, 2004; Nield, 2000; Nield et al., 2007; Sassi-Dambron, Eakin, Ries, & Kaplan, 1995); however, few studies have tested this coping skill with lung cancer patients (Greer et al., 2015). Recently, Greer et al. (2015) conducted a single-group pilot study to test a brief behavioral intervention for 32 advanced lung cancer patients with moderate to severe breathlessness. The intervention was delivered by nurse practitioners in two sessions and included multiple components, such as psychoeducation on breathlessness, training in pursed lips breathing, directions for operating a battery-powered handheld fan, postural techniques for reducing breathlessness, and relaxation training (e.g., deep breathing, meditation) for times without breathlessness. Compared to baseline assessments, there were significant improvements in breathlessness severity, depressive symptoms, and overall quality of life. These findings should be interpreted cautiously due to the small sample and non-randomized design. Moreover, component-outcome analyses were not reported. Thus, the degree to which pursed lips breathing contributed to symptom change is unknown. More studies testing pursed lips breathing for symptomatic lung cancer patients are needed before conclusions can be made regarding this coping skill.

Fourth, no coping skills were associated with reductions in distress related to breathlessness. There has been mixed evidence from numerous non-pharmacological intervention studies targeting distress related to breathlessness and/or breathlessness severity in lung cancer patients (Bausewein, Booth, Gysels, & Higginson, 2013; Farquhar et al., 2014; Greer et al., 2015; Johnson et al., 2015; Rueda et al., 2011; P. Yates & Zhao, 2012; Zhao & Yates, 2008). However, the most effective interventions tend to combine psychosocial or behavioral approaches (e.g., anxiety management, postural techniques) with medication (e.g., opioids) (Booth, Farquhar, Gysels, Bausewein, & Higginson, 2006; Farquhar, Higginson, Fagan, & Booth, 2009; Farquhar et al., 2014). More rigorous research is needed to determine whether distress related to breathlessness in lung cancer patients can be effectively managed with non-pharmacological methods.

Lastly, none of the coping skills were significantly related to reduced depressive or anxiety symptoms for caregivers. To date, no other studies have reported component-outcome analyses for interventions with caregivers of cancer patients. As noted previously, however, there was little change in caregiver symptoms over time which may explain the lack of significant findings in the current study. Indeed, the main outcomes of the trial testing TSM showed no improvement in these symptoms compared to an attention control condition (Mosher et al., under review). These findings are somewhat inconsistent with meta-analytic evidence (Badr & Krebs, 2013; L. L. Northouse et al., 2010). For example, one meta-analysis found that dyadic interventions with cancer patients and their caregivers (predominately CBT-based) tended to reduce psychological distress (g = 0.21, 95% CI: 0.08 to 0.34, k = 12) for caregivers immediately post-intervention (Badr & Krebs, 2013). However, most of these studies included small samples, short follow-up time frames, no-treatment control groups (e.g., usual care, wait-list), and significant attrition. Moreover, as noted in another meta-analysis, dyadic interventions with more sessions tended to produce larger reductions in caregiver symptoms, but only when the intervention was focused on coping skills (L. L. Northouse et al., 2010). Thus, four sessions of TSM may not have been enough time to effectively train both patients and caregivers in the numerous coping skills. It is also important to note that in the current study there was no distress criterion for caregivers to enter the trial. Indeed, the average caregiver only endorsed mild depressive and anxiety symptoms at all time points. Thus, another explanation for the null results is that there was little room for improvement in symptoms among caregivers. The current findings and main intervention outcomes (Mosher et al., under review) suggest TSM is not an effective intervention for caregivers of lung cancer patients.

Implications from Primary Analyses

The current findings have numerous implications for theory. In support of SCT, there were generally moderate to strong correlations between patients' and caregivers' coping skills practice. SCT emphasizes the importance of social context (Bandura, 1986, 2004). TSM was designed to intervene with both members of the dyad in order to enhance opportunities for modeling coping skills and increasing social support.

In contrast, the majority of the results were not consistent with CBT-based approaches to symptom management (Dobson, 2009; Keefe, 1996; Keefe et al., 2010; Morley et al., 1999). Many of the coping skills were not associated with reduced symptoms, and a few of the coping skills were associated with greater symptoms. Brief intervention may not have provided lung cancer patients and their caregivers with sufficient training and understanding of the coping skills. An implication from these findings is that CBT-based symptom management interventions may need to be tailored specifically for lung cancer patients and their caregivers.

CBT-based interventions have primarily been tested with cancer patients who do not have lung cancer (Faller et al., 2013; Gorin et al., 2012; Hart et al., 2012; Linden & Girgis, 2012), an important gap in the literature addressed by TSM (Mosher et al., under review). Compared to patients with other common cancers (e.g., breast, prostate, colon), lung cancer patients tend to have lower income, less education, and worse health literacy (Forrest, White, Rubin, & Adams, 2014; Halverson et al., 2015; Koay et al., 2013). Health literacy refers to a patient's general ability to gain, understand, and appropriately use health-related information (Nielsen-Bohlman, Panzer, & Kindig, 2004). Health literacy concerns were identified in the initial design stages of TSM. Specifically, lung cancer patients and their family caregivers provided feedback on the intervention materials (Mosher, Ott, Hanna, Jalal, & Champion, in press). Numerous adjustments were made to the intervention after some participants reported difficulty reading and understanding the materials. It is unknown as to whether the adjustments were sufficient. More research is needed to investigate how CBT-based symptom management strategies can be adjusted for patients and caregivers with low health literacy.

There is also some empirical support for socioeconomic variables (e.g., education, income) affecting CBT-based interventions with cancer patients. Specifically, one RCT with newly diagnosed prostate cancer patients (*N* = 740) found that the effects of a psychosocial intervention (e.g., cognitive restructuring, stress-reduction techniques, psychoeducation) were significantly different for three groups of patients: older men, younger men with high education and income, and younger men with low education and income (Chambers, Ferguson, Gardiner, Aitken, & Occhipinti, 2013). Compared to controls, younger men with low education and income did not benefit from the intervention and even reported worse adjustment to cancer over the 12-month follow-up. The authors argued that the intervention may have heightened patients' awareness of their symptoms and lack of resources.

Specific directions for future research are discussed in the Limitations and Future Directions section; however, a few broader implications for research are worth noting. The current study was the first to examine associations between intervention components and symptom change in a dyadic intervention for cancer patients and their family caregivers. Numerous authors have advocated for greater emphasis on identifying effective intervention components (Andersen et al., 2007; Chan et al., 2012; Czaja et al., 2003; Kazantzis et al., 2010; Kazdin, 2007). Indeed, the results of this study highlight the importance of such analyses. The main outcomes of the trial compared TSM to psychoeducation and found no significant between-group differences on any of the patient or caregiver symptoms (Mosher et al., under review). The current study suggests that TSM's effectiveness may have been reduced by certain coping skills, such as pursed lips breathing, cognitive restructuring, and noticing sounds and thoughts. A nuanced examination of intervention components was thus informative for future symptom management interventions in this population. However, more rigorous studies are needed to test intervention components in an experimental design. For example, future dismantling studies could randomize symptomatic lung cancer patients to various coping skill conditions. Each of the coping skills could be explored in isolation or in various combinations. The current findings suggest a combination of assertive communication training and guided imagery should be compared to other coping skills. Such studies would allow for more definitive conclusions regarding differences between skills. The current study can only provide tentative conclusions about associations between coping skills and symptoms.

The current study has multiple implications for clinical practice. The significant effects of coping skills practice were only seen at 6 weeks post-intervention for patients. One potential explanation for these findings is that the effects of the coping skills became more apparent once treatment had ended. This was true for effects in the predicted directions as well as effects in the opposite direction of my hypotheses. These findings suggest it may be helpful to monitor dyads after treatment has ended.

Assertive communication and guided imagery were the most beneficial skills for patients in general. These are straightforward skills that can be taught in a brief amount of time. In contrast, the coping skills that were related to greater symptoms for patients were cognitive restructuring and noticing sounds and thoughts. These two skills arguably take more time to master and require more guidance from a therapist to apply them appropriately. Thus, clinicians should be cautious when teaching these skills to lung cancer patients. As noted previously, some distressed cancer patients may have very realistic thoughts about their disease and mortality. Clinicians should be sensitive to these concerns and check in regularly to review how patients are using the coping skills (e.g., bring thought records to therapy sessions).

None of the coping skills were significantly related to decreases in caregivers' depressive or anxiety symptoms. Indeed, guided imagery practice was related to more anxiety for caregivers. TSM was purposefully designed to train patients and caregivers to use the same coping skills for rather disparate concerns and symptoms. Such an approach makes sense in the context of SCT and CBT: basic coping skills can be applied to a range of presenting issues (Bandura, 1986, 2004; Dobson, 2009). However, caregivers often experience life changes that are different from patients, and thus they may need different types of support (Mosher, Bakas, et al., 2013; Mosher, Champion, et al., 2013; Mosher, Hanna, et al., 2013). Some dyads may present with only the patient reporting clinical levels of symptoms. For example, consider a dyad where the patient reports debilitating levels of pain and the caregiver endorses subclinical levels of anxiety. The patient and caregiver may both be very focused on reducing the patient's pain, which may also reduce the caregiver's anxiety. Thus, rapport may be lost by spending session time focused on the caregiver’s coping strategies. To avoid such issues, a collaborative approach should be used when deciding on treatment goals (Dobson, 2009). Lastly, some caregivers may have been especially hesitant to express their concerns in front of the patient. Literature on the family caregiving role describes how some caregivers desire to “be strong” or “positive” for the patient (B. A. Given, Given, & Kozachik, 2001; Kim, Baker, Spillers, & Wellisch, 2006; Kim & Given, 2008; P. G. Northouse & Northouse, 1988; Weitzner, Haley, & Chen, 2000). For such caregivers, individual therapy may be more beneficial than a dyadic intervention.

Strengths

This study has numerous strengths worth noting, including study design and statistical analyses. First, to my knowledge, this was the first study to explore associations between intervention components and outcomes in a dyadic intervention for cancer patients and their caregivers. Moreover, it included a rigorous longitudinal design with blind assessments of patient and caregiver symptoms, training of staff, and intervention and assessment fidelity monitoring. The study also used well-validated and reliable symptom measures. Concerning the analyses, autoregressive path analyses allowed for associations to be found that otherwise may have been undetected. Specifically, none of the coping skills had significant zero-order correlations with patient or caregiver symptoms at 2 or 6 weeks post-intervention. There were numerous statistical trends, however, that were significant in the path analyses after controlling for the previous levels of the symptoms. Isolating the change in symptoms from baseline to the follow-ups was crucial for identifying coping skill associations with these outcomes.

Limitations and Future Directions

The current study has numerous limitations, including the degree of statistical power, attrition, lack of dyadic models and covariates, coping skill measurement, and study design. First, each of the path analyses were likely underpowered. There is currently no consensus on calculating power for autoregressive path models (Kline, 2011; Lei & Wu, 2007); however, a minimum of 5 participants per pathway is typically suggested (Browne & Cudeck, 1992; Kline, 2011). Each model was under this minimum (4.25 participants-to-parameter). Recently, some have argued that sample size estimates for SEM models are too high (Sideridis, Simos, Papanicolaou, & Fletcher, 2014; Wolf, Harrington, Clark, & Miller, 2013). Indeed, multiple simulation studies have found parameter estimates for smaller sample sizes (e.g., $N = 60$) to be stable for exploratory purposes (Sideridis et al., 2014; Wolf et al., 2013); moreover, the authors argued that underpowered SEM models tend to produce more accurate parameter estimates than linear regression or repeated measures ANOVA. Much of the improvement is related to FIML data imputation used in SEM. In sum, the current results should be interpreted cautiously in light of the sample size.

Contributing to the power concern, the second major limitation of this study was the attrition. There was approximately 31% attrition from baseline to 6 weeks post-intervention, which is comparable to other studies of psychosocial interventions with lung cancer patients (Chan et al., 2011; Porter et al., 2011). FIML produces more reliable parameter estimates than many other commonly used data imputation methods (Enders, 2001b; Kline, 2011); however, FIML assumes that data are missing at random (Enders, 2001a). Auxiliary variables were initially included in the path analyses in order to enhance the data imputation. Unfortunately, these variables prevented the models from converging and were thus removed from the final analyses. However, analyses were conducted to examine potential differences between those who completed at least one follow-up and those who dropped out. The only significant findings were that caregivers who dropped out tended to have lower income and live with the patient. This finding highlights the need for tailoring interventions to lower income populations. For example, caregivers with lower socioeconomic statuses (SES) may be more likely to have trouble attending counseling sessions due to various factors (e.g., working multiple jobs, losing phone service). Future studies should explore potential barriers for engaging in treatment for family caregivers of lung cancer patients of lower SES. Some of the attrition analyses were underpowered due to small samples and unequal variances within the groups; thus, there may be other patterns of missingness that were not detected. In sum, attrition remains a major problem for palliative and other symptom management research (Grande & Todd, 2000; Hudson, Aranda, & McMurray, 2001; Preston et al., 2013). Novel approaches are needed to retain participants.

A third limitation of this study was that none of the models were dyadic or included covariates. As noted previously, the tested models were already underpowered and including dyadic pathways or covariates would result in more pathways than participants. However, there was considerable evidence of dyadic effects, given that certain coping skills and symptoms were moderately to strongly correlated within dyads (Kenny, Kashy, & Cook, 2006). Additionally, in prior research, the study outcomes have been associated with numerous variables including gender, patient performance status, and current treatments (Buccheri et al., 1996; Hagedoorn et al., 2008; Herndon et al., 1999; Hirsh et al., 2006; Hopwood & Stephens, 1995; Hopwood & Stephens, 2000; Riley et al., 2001). For example, female cancer patients often report greater symptom interference then male patients, and thus may benefit more from certain coping strategies (Hagedoorn et al., 2008; Hirsh et al., 2006; Riley et al., 2001). Concerning patient performance status, it is well documented that cancer patients with worse performance statuses tend to have higher symptom burden (Buccheri et al., 1996; Hagedoorn et al., 2008; Herndon et al., 1999; Hirsh et al., 2006; Hopwood & Stephens, 1995; Hopwood & Stephens, 2000; Riley et al., 2001). Performance status could be a third variable influencing both the practice of coping skills and the level of symptoms. For example, a patient who spends the majority of the day in bed may be exacerbating his or her pain and fatigue and have less energy to practice adaptive coping strategies. Thus, coping skills practice and symptoms may be spuriously connected through performance status. Lastly, some research suggests that various cancer treatments are associated with symptoms in lung cancer patients (D. J. Brown et al., 2005; Hopwood & Stephens, 1995; Rolke et al., 2008; Tanaka et al., 2002b). For example, following chemotherapy, some cancer patients experience an immediate increase in fatigue which tends to decline in the days following treatment (Bower et al., 2014; L. F. Brown & Kroenke, 2009). Thus, treatment factors could also serve as third variables impacting coping skills practice and symptom severity. Future studies with larger samples are needed to explore potential dyadic effects and intervention moderators.

A fourth limitation of this study was the measurement of coping skills practice during the intervention period. There are currently no validated measures of coping skills practice frequency for cancer patients or their caregivers. Thus, we developed measures for this study. Future studies should develop and test measures of coping skills practice for this population. Additionally, reporting biases (e.g., recency, saliency, social desirability) may have influenced patients' and caregivers' responses. A calendar and tracking sheet were given to each dyad in an attempt to minimize these biases; however, the extent to which participants used these materials in unknown. Moreover, coping skills practice was not assessed post-intervention. Many of the conclusions assumed dyads continued to practice the skills after the intervention, which is an empirical question that warrants study. Different methods of assessing coping skills practice (e.g., turning in homework logs) should be considered in future work.

Final limitations involve the study design, including number of symptoms targeted, lack of caregiver distress criterion, and telephone delivery. First, a range of symptoms were chosen as outcomes of this study because it is common for lung cancer patients to meet criteria for more than one symptom at a time (Dudgeon et al., 2001; Mercadante & Vitrano, 2010; Potter & Higginson, 2004; Tanaka et al., 2002b; Zabora et al., 2001); additionally, theory and prior research suggest all of the coping skills taught in TSM may reduce each of the targeted symptoms (D. H. Barlow, 2014; J. Barlow et al., 2002; Jacobsen et al., 2006; Nield et al., 2007; L. L. Northouse et al., 2010; Porter et al., 2009; Porter et al., 2011). However, enrolling patients with very disparate symptom profiles may have reduced the impact of the intervention. Indeed, many of the patient symptoms were only moderately correlated at the respective time points and some associations were non-significant. The only exceptions were depressive and anxiety symptoms, which demonstrated stronger associations than the other symptoms. Thus, symptomatic lung cancer patients may be a more heterogeneous group than assumed, and represent different patient populations. A more focused intervention may have a larger effect. Future studies should consider intervening on one or two key symptoms (e.g., distress or pain). Additionally, caregivers were not required to meet a distress criterion. Thus, the null results for caregivers could be related to minimal variance in their depressive and anxiety symptoms. Future studies should consider including a distress criterion for caregivers. Lastly, TSM was delivered via telephone for numerous reasons (e.g., to reduce attrition and burden on dyads); however, this method of delivery may have reduced the effectiveness. More studies are needed comparing telephone-delivered interventions to in-person interventions.

To summarize, future studies should consider designing and testing a simplified symptom management intervention focused on assertive communication and guided imagery for symptomatic lung cancer patients and their distressed caregivers. The intervention should target one or two key symptoms, such as distress or pain. Practice of the coping skills should be assessed concurrently with symptoms. Additionally, attention should be given to tailoring intervention content to patients and caregivers with low health literacy. The sample size should be large enough to use dyadic analyses and include important covariates (e.g., gender, performance status, cancer treatments). The intervention could be tested in face-to-face and telephone-delivered modalities. Lastly, control groups should be carefully considered, given that comparison groups can greatly affect the interpretation of the intervention's effectiveness (Freedland, Mohr, Davidson, & Schwartz, 2011; Schwartz, Chesney, Irvine, & Keefe, 1997). It may be helpful to design studies with more than two conditions (e.g., intervention, attention control, and usual care). Findings from these studies would yield important information regarding the development of effective symptom management interventions for this understudied and burdened population.

Conclusion

In conclusion, the current study highlights the importance of analyzing specific intervention components in relation to specific outcomes in psychosocial interventions for cancer patients and their caregivers. TSM was not significantly different from psychoeducation in its impact on patient or caregiver symptoms (Mosher et al., under review); my findings suggest the effectiveness of TSM may have been reduced by competing and null effects of certain coping skills. For lung cancer patients, future studies should consider focusing on assertive communication and guided imagery, as these two coping skills were most consistently associated with reduced symptoms. In contrast, cognitive restructuring and noticing sounds and thoughts tended to be associated with worse patient symptoms. For caregivers, none of the coping skills were associated with fewer depressive or anxiety symptoms, but they, on average, had mild levels of these symptoms. More studies are needed to better understand these findings and particular caution should be used when applying CBT-based interventions that have not been validated in lung cancer populations.

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TABLES

Table 1. Patient and Caregiver Characteristics at Baseline

	Patients (*n* = 51)	Caregivers (*n* = 51)
Sex, *n* (%)		
Male	23 (45.10)	14 (27.45)
Female	28 (54.90)	37 (72.55)
Age		
Mean	63.47	56.33
SD	7.68	14.09
Range	45-85	20-76
Race, *n* (%)		
Non-Hispanic White	45 (88.24)	44 (88.00)
Missing	0 (0.00)	1 (1.96)
Employment status, *n* (%)		
Employed full-time or part-time	9 (17.65)	23 (45.10)
Retired	25 (49.02)	16 (31.37)
Unemployed/other (e.g., sick leave, homemaker)	17 (33.33)	11 (21.57)
Missing	0 (0.00)	1 (1.96)
Household income, *n* (%)		
\$0 – \$20,999	10 (19.61)	8 (15.69)
\$21,000 – \$50,999	12 (23.53)	11 (21.57)
\$51,000 – \$99,999	13 (25.49)	17 (33.33)
\$100,000 or more	7 (13.73)	9 (17.65)
Missing	9 (17.65)	6 (11.76)
Years of education		
Mean	12.92	13.94
SD	2.22	2.85
Range	9-19	8-20
Married, *n* (%)	32 (62.75)	38 (74.51)
Smoking status, *n* (%)		
Never smoked (or smoked < 100 cigarettes)	6 (11.76)	27 (52.94)
Formerly smoked	34 (66.67)	16 (31.37)
Currently smoke	11 (21.57)	8 (15.69)
Caregiver's relationship to the patient, *n* (%)		
Spouse/partner		32 (62.75)
Son/daughter		9 (17.65)
Other family member or friend		10 (19.61)
Caregiver lives with the patient, *n* (%)		37 (72.55)

Note. *SD* = standard deviation.

Table 2. Patient Medical Information at Baseline (n =51)

Study site, *n* (%)	
Indiana University Simon Cancer Center	39 (76.47)
Roudebush VA Medical Center	10 (19.61)
Eskenazi Hospital in Indianapolis	2 (3.92)
Type of lung cancer, *n* (%)	
NSCLC	44 (86.27)
SCLC	7 (13.73)
Stage of cancer, *n* (%)	
Stage I NSCLC	12 (23.53)
Stage II NSCLC	4 (7.84)
Stage III NSCLC	9 (17.65)
Stage IV NSCLC	19 (37.25)
Limited-stage SCLC	3 (5.88)
Extensive-stage SCLC	4 (7.84)
Early-stage (i.e., stage I, II, or limited)	19 (37.25)
Advanced-stage (i.e., stage III, IV, or extensive)	32 (62.75)
Time since diagnosis in years	
Median	0.57
SD	2.12
Range	0.07-11.99
Missing, *n* (%)	1 (1.96)
Treatments received, *n* (%)	
Chemotherapy	27 (52.94)
Radiation	13 (25.49)
Chemoradiation	12 (23.53)
Surgery	24 (47.06)
Patients’ ECOG score	
Mean	1.43
SD	0.92
Range	0-3

Note. *SD* = standard deviation; NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer; and ECOG = Eastern Cooperative Oncology Group self-reported performance status.

Table 3. Descriptive Statistics for Patient and Caregiver Coping Skills Practice During the Intervention

Coping skill	Patients	Caregivers
Noticing sounds and thoughts		
n	40	40
Mean	12.98	11.74
SD	9.73	11.83
Range	0-36	0-45
Skewness	0.62	1.33
Kurtosis	-0.70	0.88
Guided imagery		
n	40	40
Mean	11.59	8.33
SD	9.39	7.48
Range	0-43	0-32
Skewness	1.25	1.29
Kurtosis	1.96	1.57
Pursed lips breathing		
n	40	40
Mean	29.60	15.05
SD	32.56	17.22
Range	0-133	0-67
Skewness	1.79	1.61
Kurtosis	2.76	2.35
Cognitive restructuring		
n	38	38
Mean	9.87	10.82
SD	10.64	12.07
Range	0-44	0-45
Skewness	1.55	1.53
Kurtosis	2.07	1.42
Assertive communication		
n	38	38
Mean	4.83	4.26
SD	4.50	3.80
Range	0-17	0-15
Skewness	1.03	1.33
Kurtosis	0.47	1.77

Note. All statistics computed after outliers were Winsorized. *SD* = standard deviation. Noticing sounds and thoughts, guided imagery, and pursed lips breathing were assessed at the beginning of sessions 2, 3, and 4. Cognitive restructuring was assessed at the beginning of sessions 3 and 4. Assertive communication was assessed at the beginning of session 4.

Table 4. Descriptive Statistics for Patient and Caregiver Depressive and Anxiety Symptoms

	Patients			Caregivers		
Outcome	Baseline	2 Week Follow-Up	6 Week Follow-up	Baseline	2 Week Follow-Up	6 Week Follow-up
Depressive symptoms						
n	51	36	35	51	35	35
α	0.78	0.70	0.84	0.87	0.84	0.86
Mean	7.31	6.36	6.71	5.67	5.09	4.83
SD	4.77	3.75	4.77	5.59	4.88	4.90
Range	0-21	0-14	0-21	0-23	0-18	0-19
Skewness	0.82	0.05	1.10	1.30	1.29	1.27
Kurtosis	0.66	-0.86	1.74	1.24	1.17	0.90
Anxiety						
n	51	36	35	51	35	35
α	0.88	0.83	0.86	0.88	0.83	0.87
Mean	5.12	3.72	4.06	6.10	5.06	5.00
SD	4.89	3.45	3.82	5.19	4.28	4.77
Range	0-18	0-14	0-18	0-20	0-14	0-17
Skewness	1.15	1.46	1.86	0.92	0.46	1.08
Kurtosis	0.52	2.63	4.93	0.39	-0.86	0.49

Note. α = alpha coefficient; *SD* = standard deviation.

Table 5. Descriptive Statistics for Patient Outcomes

Outcome	Baseline	2 Week Follow-Up	6 Week Follow-up
Pain severity			
n	51	36	35
α	0.94	0.92	0.94
Mean	2.61	2.24	2.64
SD	2.47	2.16	2.49
Range	0-9	0-7	0-7
Skewness	0.66	0.68	0.46
Kurtosis	-0.76	-1.01	-1.19
Distress related to breathlessness			
n	51	36	35
α*	--	--	--
Mean	1.22	1.33	1.20
SD	1.12	1.35	1.23
Range	0-4	0-4	0-4
Skewness	0.53	0.74	0.60
Kurtosis	-0.71	-0.56	-0.91
Fatigue interference			
n	51	36	35
α	0.94	0.93	0.94
Mean	3.20	2.53	2.87
SD	2.46	2.04	2.44
Range	0-9	0-7	0-9
Skewness	0.61	0.80	1.11
Kurtosis	-0.79	-0.27	0.50

Note. α = alpha coefficient; *SD* = standard deviation.

*Distress related to breathlessness was measured using one item.

Table 6. Winsorization of Outliers

	Variable value	
Variable	Original	Winsorized*
Patient Coping Skill		
Assertive communication	40	17
Caregiver Coping Skills		
Assertive communication	40	15
Pursed lips breathing	305	67
Cognitive restructuring	82	45
Cognitive restructuring	55	40

*Winsorizing variables involves changing their value to reflect a z-score of +/- 3.

Table 7. Comparisons of Characteristics at Baseline Between Participants Who Completed at Least One Follow-up and Participants Who Were Withdrawn

	Patients (*n* = 51)			Caregivers (*n* = 51)		
Characteristic	Completed (*n* = 36)	Withdrawn (*n* = 15)	*t*-test/Fisher's exact test *p*	Completed (*n* = 36)	Withdrawn (*n* = 15)	*t*-test/Fisher's exact test *p*
Sex, *n* (%)			0.54			0.73
Male	15 (41.67)	8 (53.33)		9 (25.00)	5 (33.33)	
Female	21 (58.33)	7 (46.67)		27 (75.00)	10 (66.67)	
Age			0.69			
Mean	63.19	64.13		54.06	61.80	0.07
SD	7.98	7.12		14.42	12.01	
Range	49-85	45-77		20-75	40-76	
Race, *n* (%)						
Non-Hispanic White	30 (83.33)	15 (100.00)	0.16	30 (83.33)	14 (93.33)	0.65
Missing	0 (0.00)	0 (0.00)		1 (2.78)	0 (0.00)	
Employment status, *n* (%)						
Employed full-time/part-time	8 (22.22)	1 (6.67)	0.25	17 (47.22)	6 (40.00)	0.76
Retired	16 (44.44)	9 (60.00)	0.37	9 (25.00)	7 (46.67)	0.19
Unemployed/other	12 (33.33)	5 (33.33)	0.99	9 (25.00)	2 (13.33)	0.47
Missing	0 (0.00)	0 (0.00)		1 (2.78)	0 (0.00)	
Household income, *n* (%)						
$0 – $20,999	8 (22.22)	2 (13.33)	0.99	6 (16.67)	2 (13.33)	0.99
$21,000 – $50,999	8 (22.22)	4 (26.67)	0.70	4 (11.11)	7 (46.67)	< 0.01
$51,000 – $99,999	9 (25.00)	4 (26.67)	0.71	16 (44.44)	1 (6.67)	0.02
$100,000 or more	6 (16.67)	1 (6.67)	0.65	7 (19.44)	2 (13.33)	0.99
Missing	5 (13.89)	4 (26.67)		3 (8.33)	3 (20.00)	

Table 7 Continued.

Years of education			0.91			0.16
Mean	12.94	12.87		14.31	13.07	
SD	2.28	2.13		2.97	2.37	
Range	9-19	10-18		8-20	10-18	
Smoking status, *n* (%)						
Never smoked	3 (8.33)	3 (20.00)	0.34	19 (52.78)	8 (53.33)	0.99
Formerly smoked	26 (72.22)	8 (53.33)	0.45	5 (13.89)	3 (20.00)	0.65
Currently smoke	7 (19.44)	4 (26.67)	0.45	12 (33.33)	4 (26.67)	0.65
Married, *n* (%)	22 (61.11)	13 (86.67)	0.10	28 (77.78)	13 (86.67)	0.70
Caregiver's relationship, *n* (%)						
Spouse/partner				20 (55.56)	12 (80.00)	0.12
Son/daughter				7 (19.44)	2 (13.33)	0.71
Other family member or friend				9 (25.00)	1 (6.67)	0.25
Caregiver lives w/ patient, *n* (%)				23 (63.89)	14 (93.33)	0.04
Study site, *n* (%)						
IU Simon Cancer Center	29 (80.56)	10 (66.67)	0.30			
Roudebush VA Medical Center	5 (13.89)	5 (33.33)	0.14			
Eskenazi Hospital Indianapolis	2 (5.56)	0 (0.00)	0.99			
Type of lung cancer, *n* (%)			0.41			
NSCLC	32 (88.89)	12 (80.00)				
SCLC	4 (11.11)	3 (20.00)				
Stage of cancer, *n* (%)			0.76			
Early-stage	14 (38.89)	5 (33.33)				
Advanced-stage	22 (61.11)	10 (66.67)				
Time since diagnosis in years			0.34			
Mean	1.07	1.70				
SD	2.06	2.28				
Range	0.07-11.99	0.08-8.93				
Missing, *n* (%)	1 (2.86)	0 (0.00)				

Table 7 Continued.

Treatments received, *n* (%)			
Chemotherapy	17 (47.22)	10 (66.67)	0.23
Radiation	9 (25.00)	4 (26.67)	0.99
Chemoradiation	9 (25.00)	3 (20.00)	0.99
Surgery	18 (50.00)	6 (40.00)	0.55
Patients' ECOG score			0.13
Mean	1.31	1.73	
SD	0.92	0.88	
Range	0-3	0-3	

Note. *SD* = standard deviation; NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer; and ECOG = Eastern Cooperative Oncology Group self-reported performance status.

Table 8. Comparisons of Symptoms at Baseline Between Participants Who Completed at Least One Follow-up and Participants Who Were Withdrawn

	Patients ($n = 51$)			Caregivers ($n = 51$)		
Symptom	Completed ($n = 36$)	Withdrawn ($n = 15$)	*t*-test *p*	Completed ($n = 36$)	Withdrawn ($n = 15$)	*t*-test *p*
Depressive symptoms			0.07			0.36
Mean	6.56	9.20		5.19	6.80	
SD	4.35	5.37		5.55	5.71	
Range	0-18	0-21		0-23	0-16	
Anxiety			0.31			0.75
Mean	4.58	6.40		5.94	6.47	
SD	4.19	6.25		5.46	4.64	
Range	0-17	0-18		0-20	0-14	
Pain severity			0.61			
Mean	2.49	2.88				
SD	2.64	2.07				
Range	0-9	0-6				
Distress related to breathlessness			0.31			
Mean	1.11	1.47				
SD	1.17	0.99				
Range	0-4	0-3				
Fatigue interference			0.50			
Mean	3.07	3.58				
SD	2.52	2.29				
Range	0-9	0-8				

Table 9. Pearson Correlations for Patient and Caregiver Coping Skills

	1	2	3	4	5	6	7	8	9	10
1. Noticing sounds and thoughts P										
2. Guided imagery P	0.67**									
3. Pursed lips breathing P	0.41**	0.34*								
4. Cognitive restructuring P	0.51**	0.32	0.37*							
5. Assertive communication P	0.51**	0.18	0.05	0.28						
6. Noticing sounds and thoughts C	0.60**	0.33*	0.52**	0.40*	0.38*					
7. Guided imagery C	0.33*	0.43**	0.22	0.01	-0.02	0.50**				
8. Pursed lips breathing C	0.56**	0.31	0.33*	0.43**	0.52**	0.73**	0.33*			
9. Cognitive restructuring C	0.63**	0.36*	0.41*	0.77**	0.44**	0.51**	0.05	0.45**		
10. Assertive communication C	0.44**	0.30	-0.03	0.45**	0.65**	0.45**	0.07	0.46**	0.62**	

Note. *n*s = 38-40 due to missingness. P = patient and C = caregiver.
*$p<0.05$. **$p<0.01$.

Table 10. Pearson Correlations for Patient and Caregiver Depressive and Anxiety Symptoms

	1	2	3	4	5	6	7	8	9	10	11	12
1. PHQ-8 P0												
2. PHQ-8 P1	0.28											
3. PHQ-8 P2	0.46**	0.39*										
4. GAD-7 P0	0.65**	0.05	0.28									
5. GAD-7 P1	0.22	0.53**	-0.02	0.31								
6. GAD-7 P2	0.43*	0.28	0.79*	0.49**	0.23							
7. PHQ-8 C0	0.32*	0.35*	0.09	0.35*	0.47**	0.12						
8. PHQ-8 C1	0.05	0.21	-0.05	0.18	0.40*	0.00	0.78**					
9. PHQ-8 C2	0.24	0.34*	0.19	0.44**	0.52**	0.34*	0.73**	0.63**				
10. GAD-7 C0	0.25	0.35*	0.04	0.39**	0.51**	0.16	0.81**	0.60**	0.73**			
11. GAD-7 C1	-0.03	0.22	-0.03	0.24	0.40*	0.07	0.59**	0.78**	0.57**	0.66**		
12. GAD-7 C2	0.09	0.37*	0.22	0.38*	0.53**	0.37*	0.69**	0.69**	0.87**	0.75**	0.67**	

Note. *n*s = 34-51 due to missingness. PHQ-8 = 8-item Patient Health Questionnaire for depressive symptoms; GAD-7 = Generalized Anxiety Disorders 7-item scale for anxiety symptoms; P0 = patient at baseline; P1 = patient at 2 week follow-up; P2 = patient at 6 week follow-up; C0 = caregiver at baseline; C1 = caregiver at 2 week follow-up; and C2 = caregiver at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 11. Pearson Correlations for Patient Symptoms

	1	2	3	4	5	6	7	8	9
1. Pain severity P0									
2. Pain severity P1	0.81**								
3. Pain severity P2	0.80**	0.78**							
4. Distress related to breathlessness P0	0.27	0.17	0.29						
5. Distress related to breathlessness P1	0.28	0.21	0.28	0.72**					
6. Distress related to breathlessness P2	0.19	0.18	0.25	0.45**	0.56**				
7. Fatigue interference P0	0.44**	0.38*	0.32	0.35*	0.17	0.23			
8. Fatigue interference P1	0.40*	0.54**	0.33	0.24	0.35*	0.28	0.65**		
9. Fatigue interference P2	0.49**	0.43*	0.61**	0.18	0.31	0.33	0.51**	0.50**	

Note. *n*s = 35-51 due to missingness. P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 12. Pearson Correlations for Patient Pain Severity and Coping Skills (Model 1)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts P								
2. Guided imagery P	0.66**							
3. Pursed lips breathing P	0.41**	0.34*						
4. Cognitive restructuring P	0.51**	0.32	0.37*					
5. Assertive communication P	0.51**	0.18	0.05	0.28				
6. Pain severity P0	-0.05	-0.25	-0.27	0.00	-0.16			
7. Pain severity P1	0.17	-0.03	-0.14	0.14	-0.04	0.81**		
8. Pain severity P2	0.09	-0.01	-0.19	0.15	-0.23	0.80**	0.78**	

Note. *n*s = 34-40 due to missingness. P = patient; P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 13. Pearson Correlations for Patient Distress Related to Breathlessness and Coping Skills (Model 2)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts P								
2. Guided imagery P	0.66**							
3. Pursed lips breathing P	0.41**	0.34*						
4. Cognitive restructuring P	0.51**	0.32	0.37*					
5. Assertive communication P	0.51**	0.18	0.05	0.28				
6. Distress related to breathlessness P0	0.10	-0.09	0.00	0.18	0.15			
7. Distress related to breathlessness P1	0.17	0.09	0.19	0.28	0.15	0.72**		
8. Distress related to breathlessness P2	0.32	0.27	0.07	0.45**	0.07	0.45**	0.56**	

Note. *n*s = 34-40 due to missingness. P = patient; P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

**p*<0.05. ***p*<0.01.

Table 14. Pearson Correlations for Patient Fatigue Interference and Coping Skills (Model 3)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts P								
2. Guided imagery P	0.66**							
3. Pursed lips breathing P	0.41**	0.34*						
4. Cognitive restructuring P	0.51**	0.32	0.37*					
5. Assertive communication P	0.51**	0.18	0.05	0.28				
6. Fatigue interference P0	-0.16	-0.25	-0.20	0.06	0.08			
7. Fatigue interference P1	0.06	0.03	-0.11	0.12	0.19	0.65**		
8. Fatigue interference P2	0.12	-0.11	-0.09	0.06	-0.02	0.51**	0.50**	

Note. *n*s = 34-40 due to missingness. P = patient; P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 15. Pearson Correlations for Patient Depressive Symptoms and Coping Skills (Model 4)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts P								
2. Guided imagery P	0.66**							
3. Pursed lips breathing P	0.41**	0.34*						
4. Cognitive restructuring P	0.51**	0.32	0.37*					
5. Assertive communication P	0.51**	0.18	0.05	0.28				
6. Depressive symptoms P0	-0.08	-0.03	-0.17	0.03	-0.08			
7. Depressive symptoms P1	0.08	0.11	0.15	0.00	-0.12	0.28		
8. Depressive symptoms P2	0.04	-0.04	-0.12	0.21	-0.21	0.46**	0.39**	

Note. *n*s = 34-40 due to missingness. P = patient; P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

**p*<0.05. ***p*<0.01.

Table 16. Pearson Correlations for Patient Anxiety Symptoms and Coping Skills (Model 5)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts P								
2. Guided imagery P	0.66**							
3. Pursed lips breathing P	0.41**	0.34*						
4. Cognitive restructuring P	0.51**	0.32	0.37*					
5. Assertive communication P	0.51**	0.18	0.05	0.28				
6. Anxiety symptoms P0	-0.20	-0.04	-0.14	0.07	-0.34*			
7. Anxiety symptoms P1	-0.02	0.11	-0.09	-0.10	-0.08	0.31		
8. Anxiety symptoms P2	0.12	-0.04	0.08	0.30	-0.20	0.49**	0.23	

Note. *n*s = 34-40 due to missingness. P = patient; P0 = patient at baseline; P1 = patient at 2 week follow-up; and P2 = patient at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 17. Pearson Correlations for Caregiver Depressive Symptoms and Coping Skills (Model 6)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts C								
2. Guided imagery C	0.50**							
3. Pursed lips breathing C	0.73**	0.33*						
4. Cognitive restructuring C	0.51**	0.05	0.45**					
5. Assertive communication C	0.45**	0.07	0.45**	0.62**				
6. Depressive symptoms C0	0.12	0.04	0.13	0.13	0.06			
7. Depressive symptoms C1	0.24	0.11	0.16	0.23	0.26	0.78**		
8. Depressive symptoms C2	0.08	-0.12	0.09	0.12	0.07	0.73**	0.63**	

Note. *n*s = 34-40 due to missingness. C = caregiver; C0 = caregiver at baseline; C1 = caregiver at 2 week follow-up; and C2 = caregiver at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

Table 18. Pearson Correlations for Caregiver Anxiety Symptoms and Coping Skills (Model 7)

	1	2	3	4	5	6	7	8
1. Noticing sounds and thoughts C								
2. Guided imagery C	0.50**							
3. Pursed lips breathing C	0.73**	0.33*						
4. Cognitive restructuring C	0.51**	0.05	0.45**					
5. Assertive communication C	0.45**	0.07	0.45**	0.62**				
6. Anxiety symptoms C0	0.06	0.00	0.10	-0.01	-0.03			
7. Anxiety symptoms C1	0.21	0.20	0.18	0.14	0.09	0.66**		
8. Anxiety symptoms C2	0.10	-0.07	0.07	0.13	0.20	0.75**	0.67**	

Note. *n*s = 34-40 due to missingness. C = caregiver; C0 = caregiver at baseline; C1 = caregiver at 2 week follow-up; and C2 = caregiver at 6 week follow-up.

*$p<0.05$. **$p<0.01$.

FIGURES

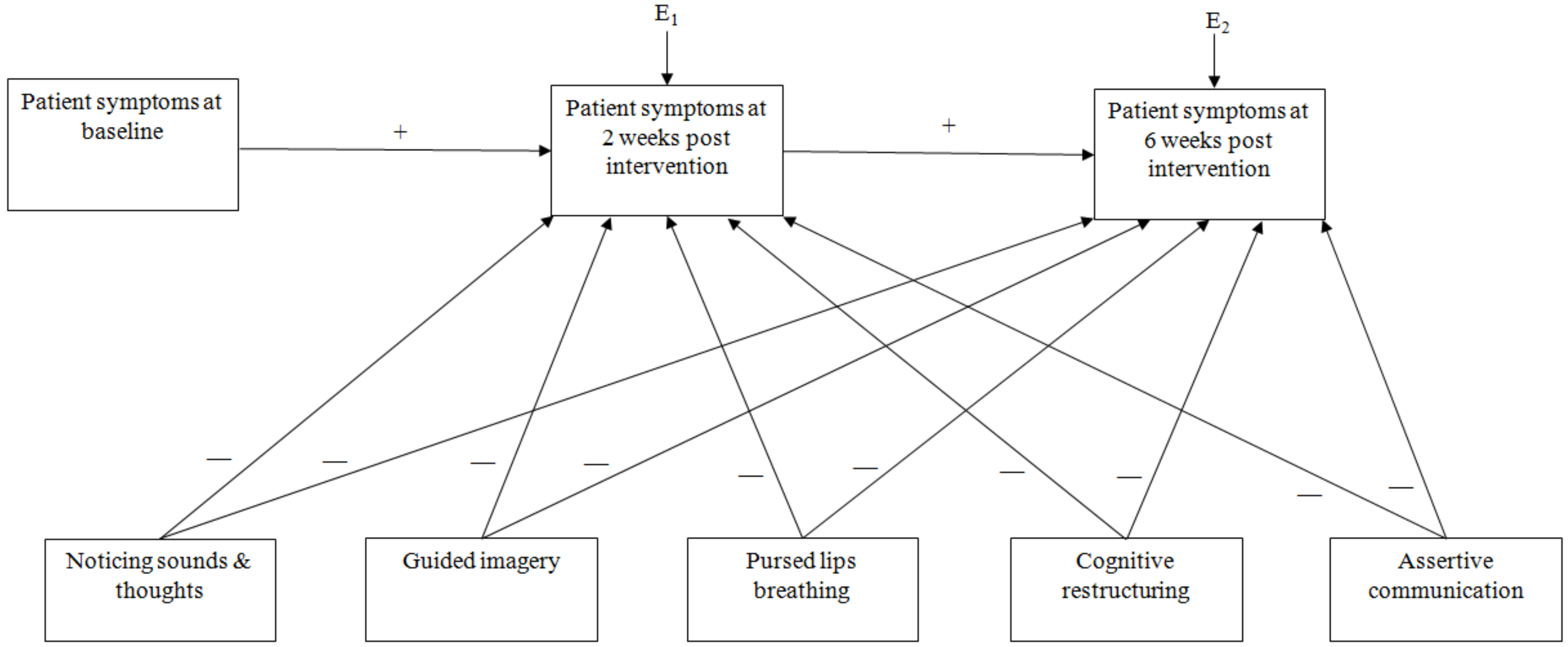

Figure 1. Proposed Relationships Between Patient Coping Skills Practice and Symptoms.

All coping skills allowed to covary.

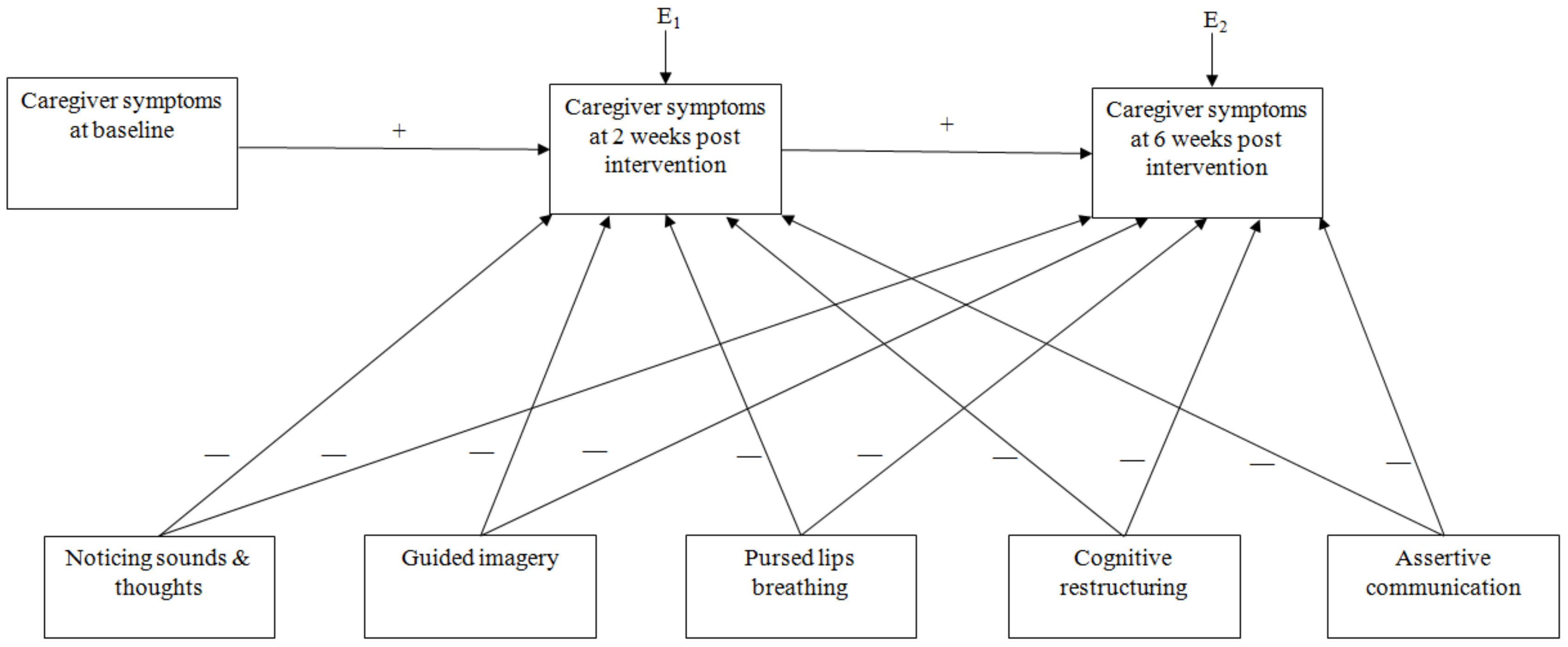

Figure 2. Proposed Relationships Between Caregiver Coping Skills Practice and Symptoms

All coping skills allowed to covary.

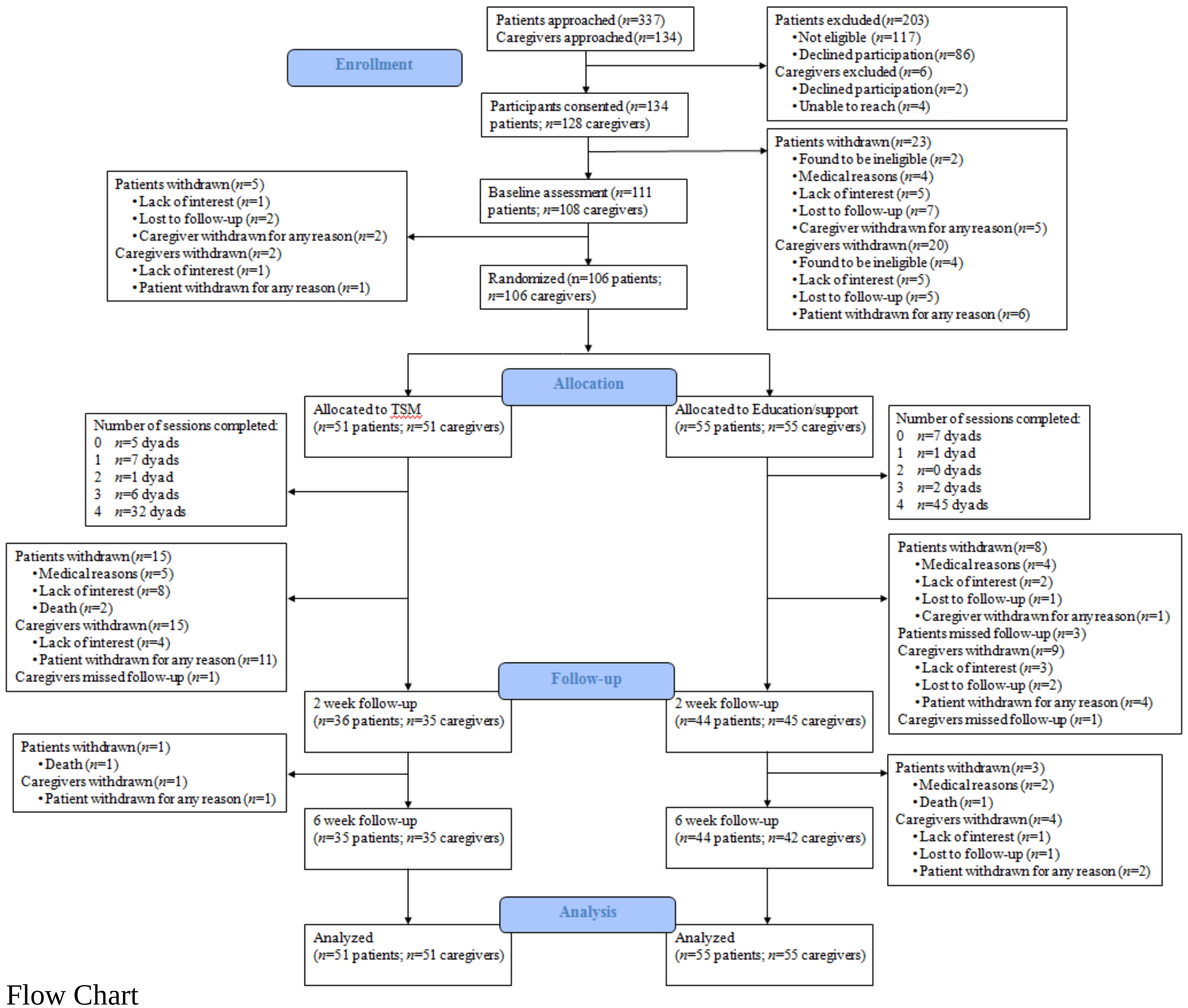

Figure 3. Study Flow Chart

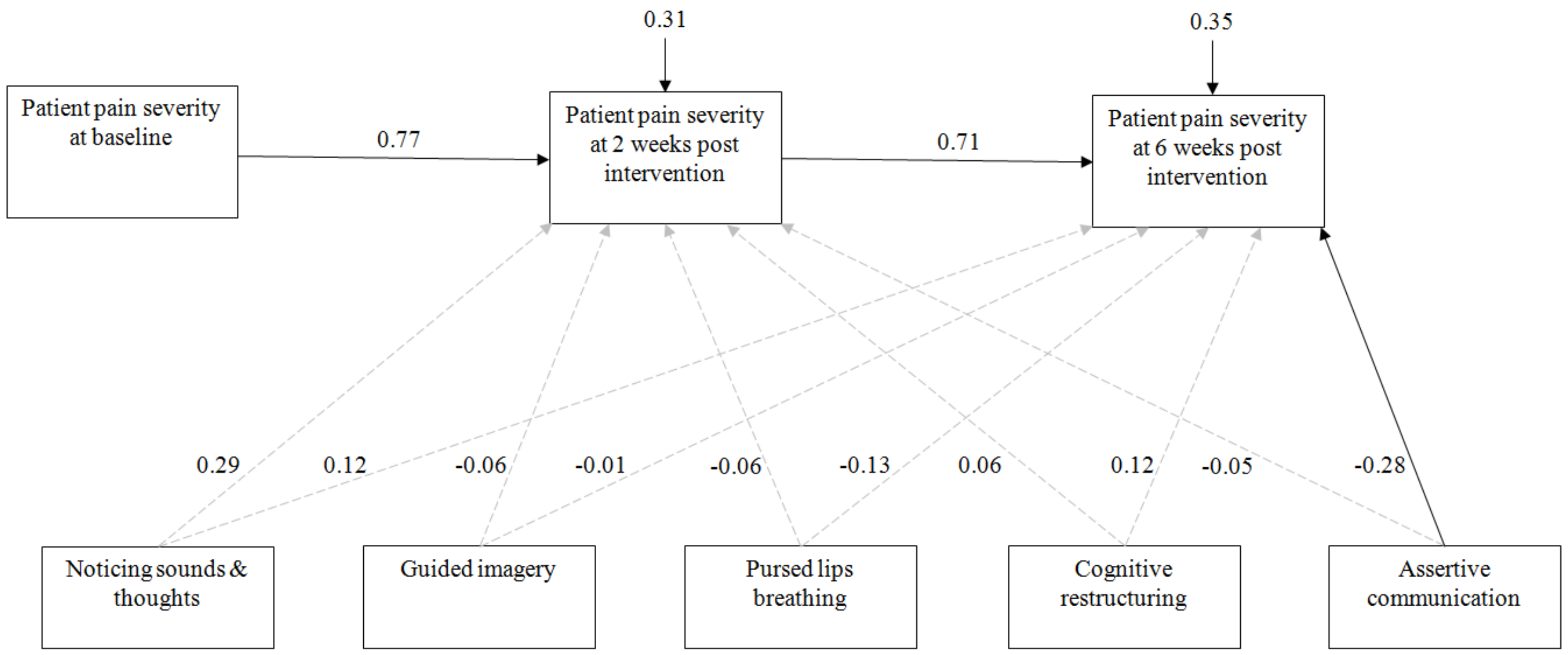

Figure 4. Relationships Between Patient Coping Skills Practice and Patient Pain Severity

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, $N = 51$) = 7.78, $p = 0.80$, RMSEA = 0.00, 90% confidence interval (0.00, 0.10).

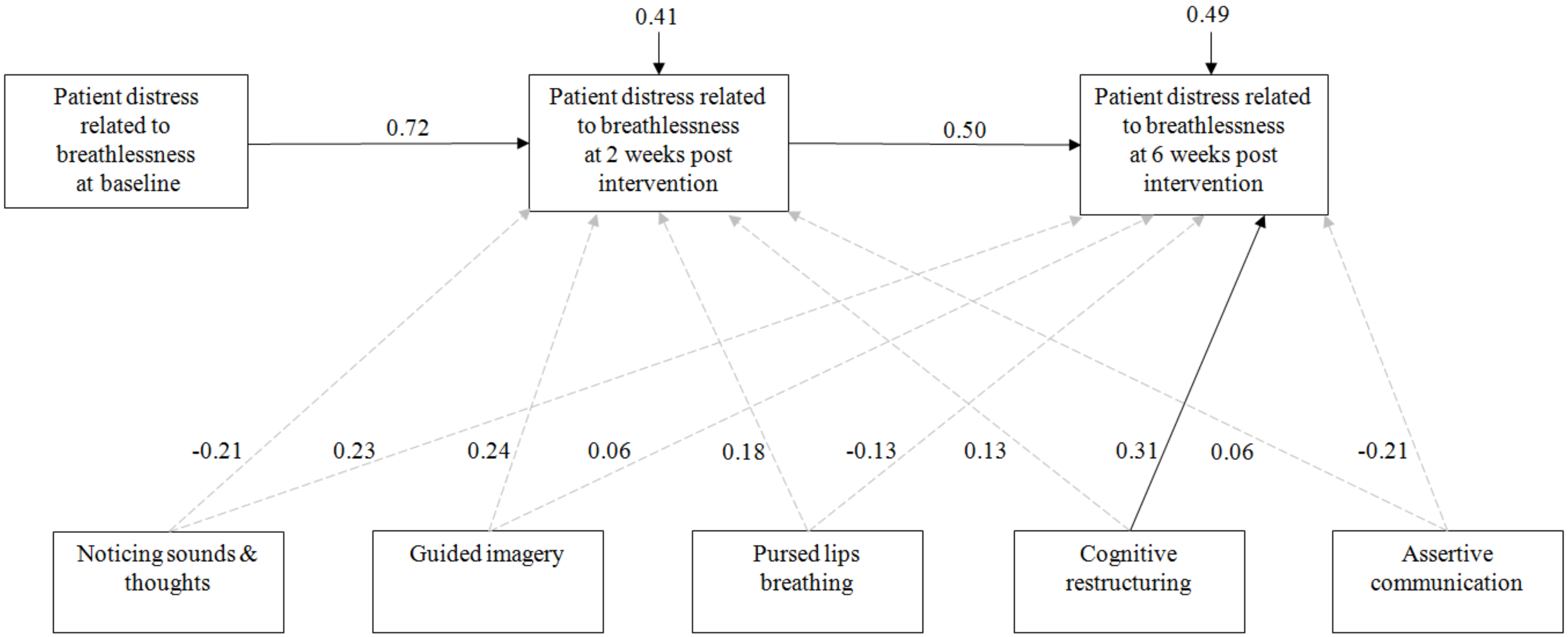

Figure 5. Relationships Between Patient Coping Skills Practice and Patient Distress Related to Breathlessness

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, N = 51) = 0.43, p = 0.99, RMSEA = 0.00, 90% confidence interval (0.00, 0.00).

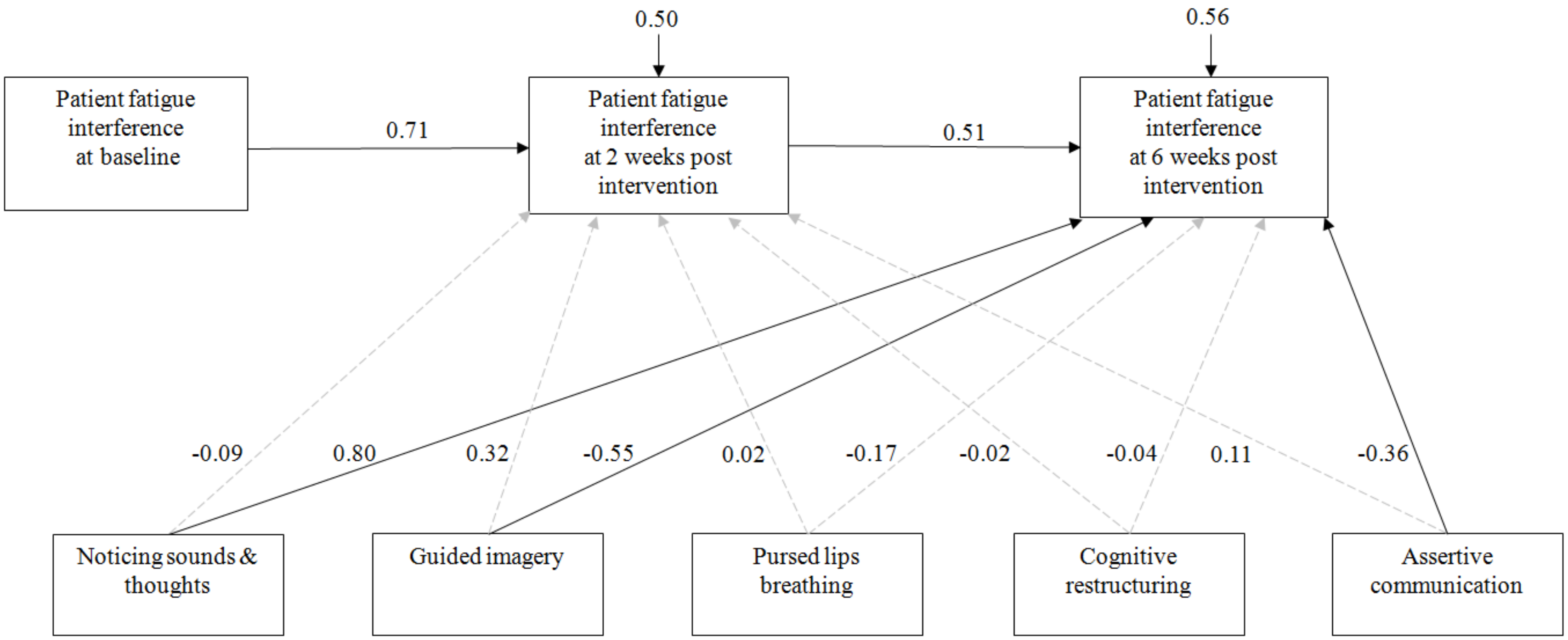

Figure 6. Relationships Between Patient Coping Skills Practice and Patient Fatigue Interference

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, N = 51) = 2.76, p = 0.99, RMSEA = 0.00, 90% confidence interval (0.00, 0.00).

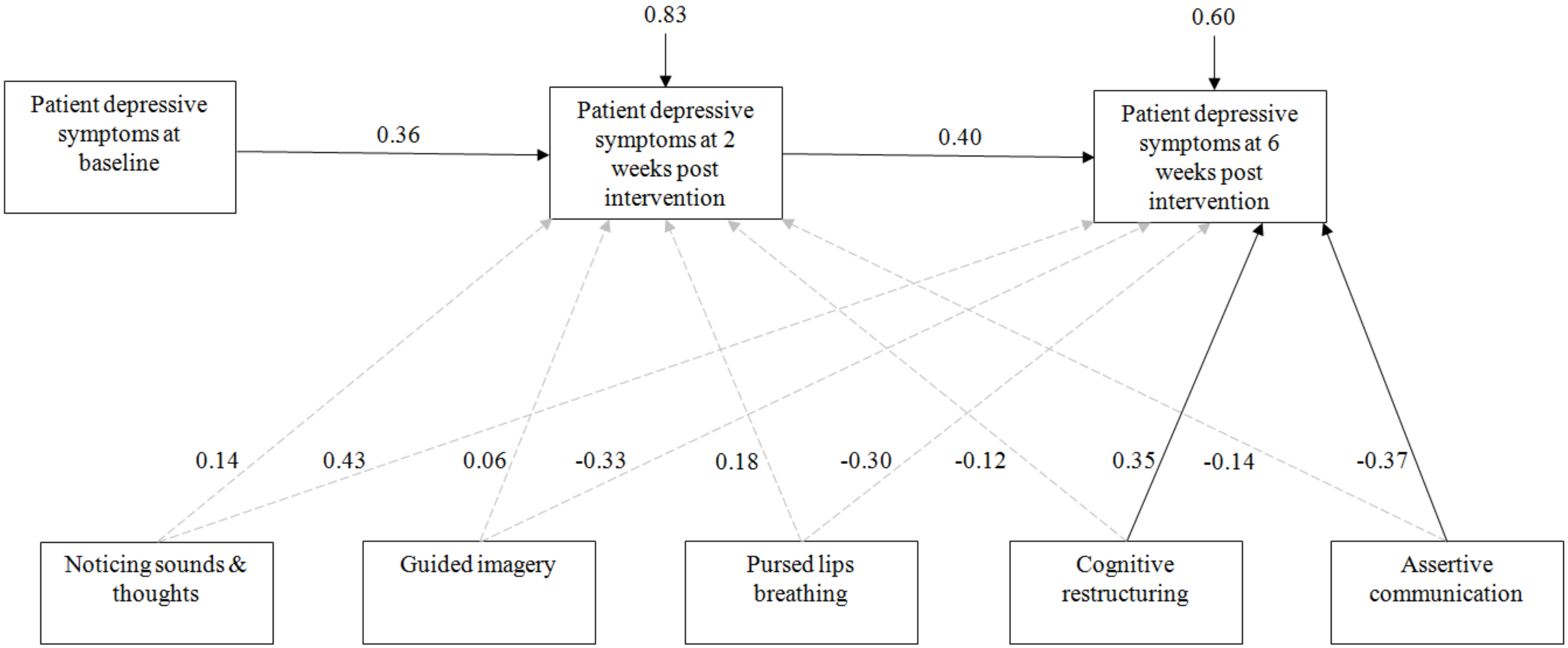

Figure 7. Relationships Between Patient Coping Skills Practice and Patient Depressive Symptoms

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, N = 51) = 5.30, p = 0.95, RMSEA = 0.00, 90% confidence interval (0.00, 0.02).

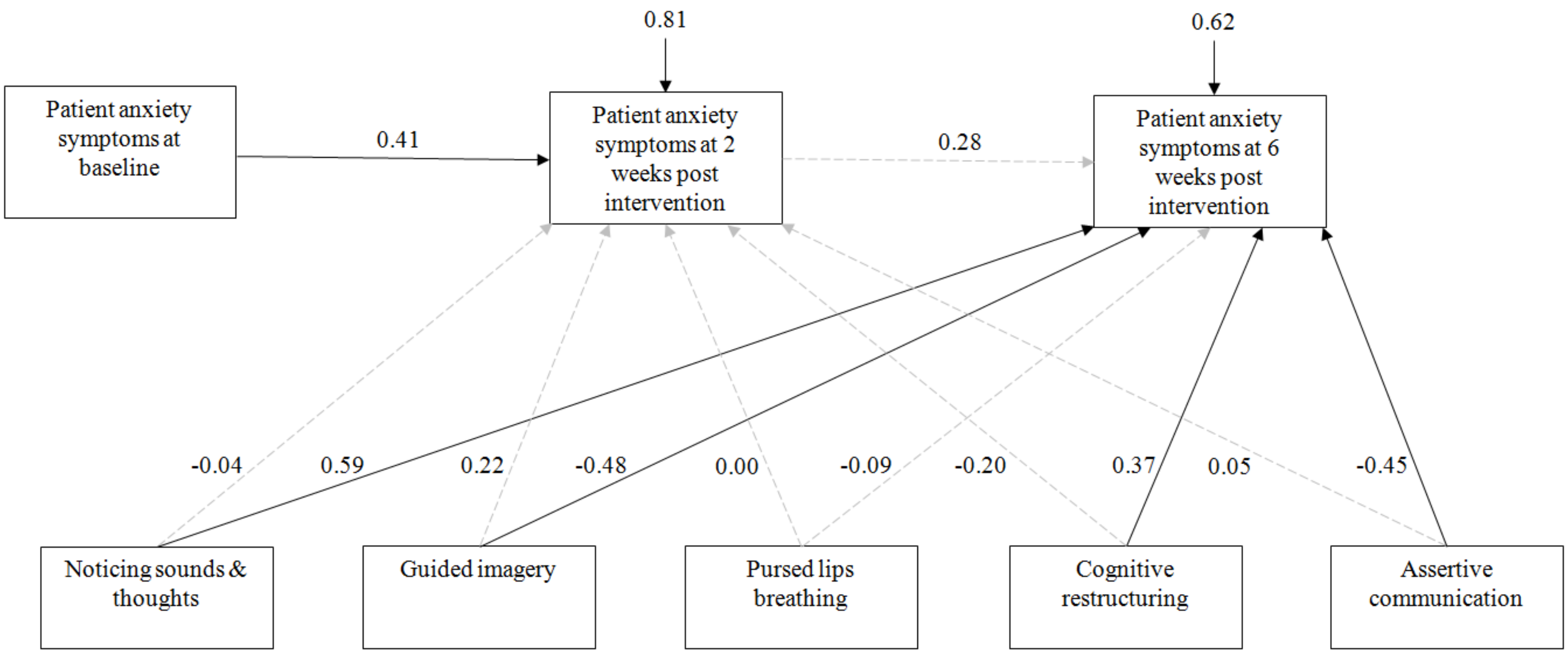

Figure 8. Relationships Between Patient Coping Skills Practice and Patient Anxiety Symptoms

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, N = 51) = 5.42, p = 0.94, RMSEA = 0.00, 90% confidence interval (0.00, 0.03).

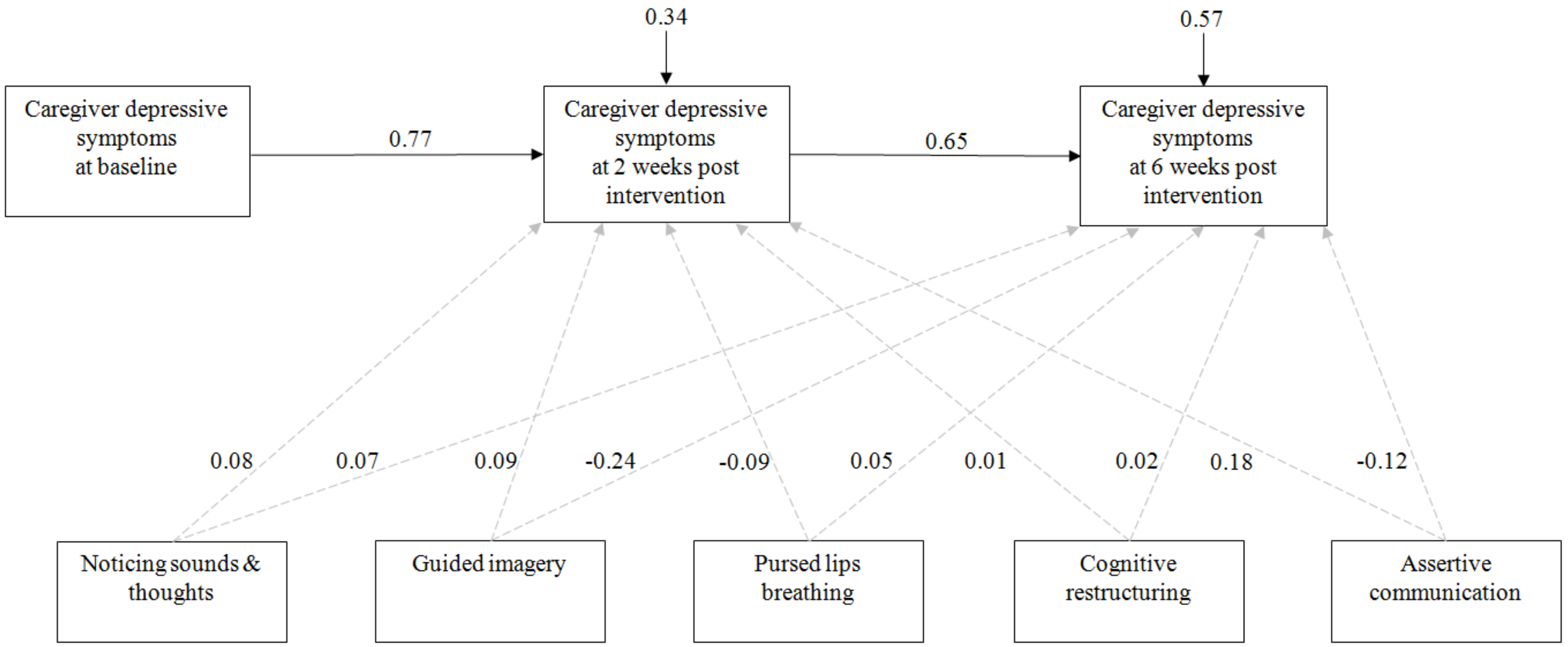

Figure 9. Relationships Between Caregiver Coping Skills Practice and Caregiver Depressive Symptoms

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, N = 51) = 8.88, p = 0.71, RMSEA = 0.00, 90% confidence interval (0.00, 0.12).

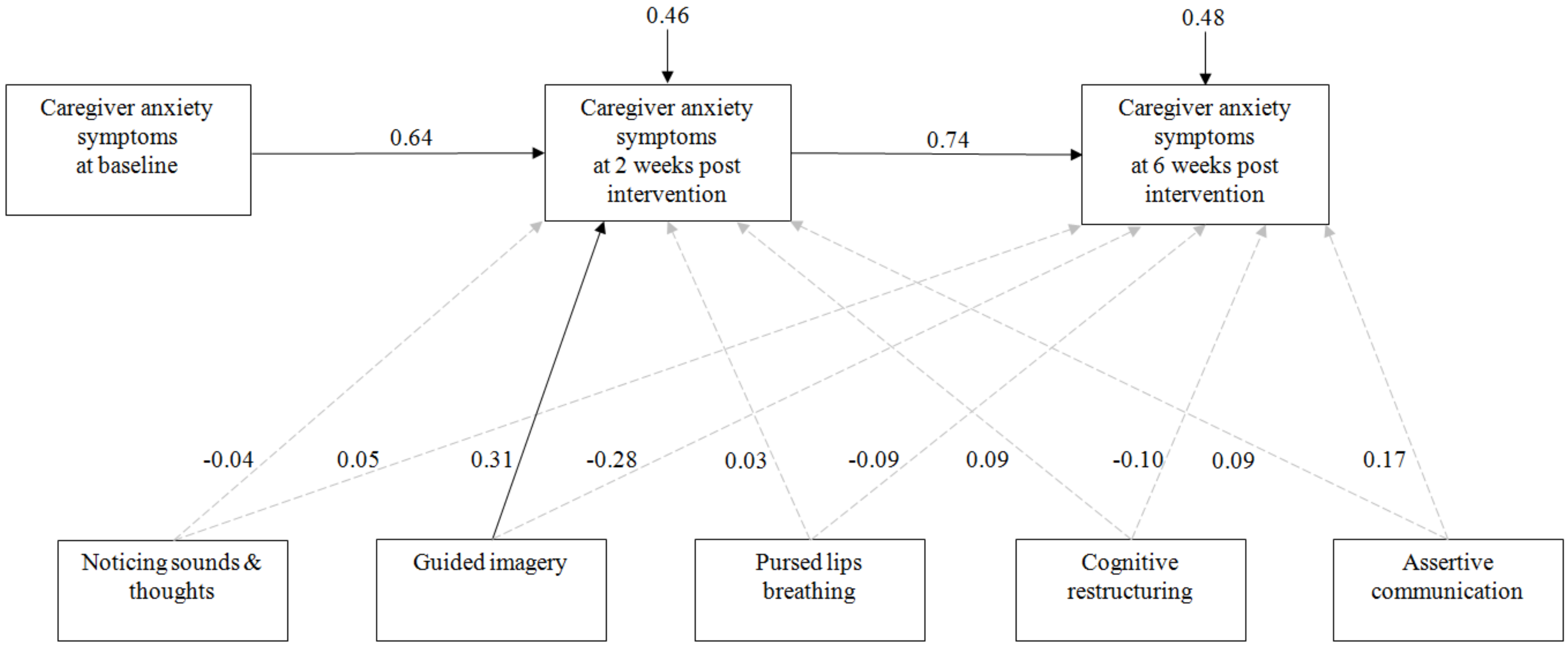

Figure 10. Relationships Between Caregiver Coping Skills Practice and Caregiver Anxiety Symptoms

All coping skills were allowed to covary. Paths represented with solid lines are significant with $p < 0.05$, and dashed lines are non-significant. χ^2 (12, $N = 51$) = 12.40, $p = 0.41$, RMSEA = 0.03, 90% confidence interval (0.00, 0.16).

APPENDICES

Appendix A: Measures

Patient Cognitive Status: The Six-Item Screener (SIS)
(Callahan et al., 2002)

Instructions: I would like to ask you some questions that ask you to use your memory. I am going to name three objects. Please wait until I say all three words, then repeat them. Remember what they are because I am going to ask you to name them again in a few minutes. Please repeat these words for me: APPLE—TABLE—PENNY. (Interviewer may repeat words 3 times if necessary but repetition not scored.)

Did patient correctly repeat all three words?	1=Yes	0=No
	Incorrect	Correct
1. What year is this?	0	1
2. What month is this?	0	1
3. What day of the week?	0	1
What were the three objects I asked you to remember?		
4. *Apple* =	0	1
5. *Table* =	0	1
6. *Penny* =	0	1

Patient Depressive Symptoms: Patient Health Questionnaire (PHQ-2)
(Kroenke, Spitzer, & Williams, 2003)

Over the <u>last 2 weeks</u>, how often have you been bothered by…

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3

Patient Anxiety Sympomts: Generalized Anxiety Disorders scale (GAD-2)
(Kroenke, Spitzer, Williams, & Löwe, 2009)

Over the last 2 weeks, how often have you been bothered by…

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3

Patient Pain Severity and Interference: PEG version of the Brief Pain Inventory-Short Form (BPI-SF)
(Krebs et al., 2009)

1. What number best describes your pain on average in the past week:

0 1 2 3 4 5 6 7 8 9 10

No pain — Pain as bad as you can imagine

2. What number best describes how, during the past week, pain has interfered with your enjoyment of life?

0 1 2 3 4 5 6 7 8 9 10

Does not interfere — Completely interferes

3. What number best describes how, during the past week, pain has interfered with your general activity?

0 1 2 3 4 5 6 7 8 9 10

Does not interfere — Completely interferes

Patient Breathlessness Severity: two items from the Memorial Symptom Assessment Scale (MSAS)

(Portenoy et al., 1994)

During the **past week**, did you have shortness of breath?

No Yes

If Yes, how severe was it usually (circle one answer)?

1. Slight

2. Moderate

3. Severe

4. Very severe

Patient Medical Record Review at Baseline:

1. Date of Diagnosis: ____/____/_____

2. Disease Stage - NSCLC
1 = I
2 = II
3 = III
4 = IV

3. Disease stage - SCLC
1 = limited stage
2 = extensive stage

4. Treatments for Lung Cancer:

Surgery: __ Planned
__ Received

Chemotherapy: __ Planned
__ Received

Radiation: __ Planned
__ Received

Chemoradiation: __ Planned
__ Received

Baseline and Follow-Up Assessments:

1. Gender
Male
Female

2. What race or ethnicity do you consider yourself to be?
White
Black
Asian
Hispanic
Native Hawaiian or other Pacific Islander
American Indian/Alaskan Native
Other (specify): _______

3. What was the last grade you completed in school?
Years of Schooling: __ __

4 . How old are you?
Years __ __ __

5. What is your marital status?
Married
Living with partner
Separated
Single
Divorced
Widowed

6. Thinking about the annual combined income for all family members in your household added together, before taxes is it…
$0-$10,999
$11,000-$20,999
$21,000-$30,999
$31,000-$50,999
$51,000 to $99,999
$100,000 or more

7. What is your current employment status?
Employed full-time
Employed part-time
Student
Homemaker
Retired
Unemployed, looking for paid work
Unemployed due to disability
Other (specify) ________

8. What is your relationship to the patient?
Spouse/Partner
Son/Daughter of the Patient
Sibling
Other Relative
Friend
Parent of the Patient
Other

9. Do you live with the patient?
Yes
No
[If caregiver does not live with the patient] How often did you visit the patient during the past month? _______

Patient and Caregiver Smoking Status: Two items from the Behavioral Risk Factor Surveillance System (BRFSS) Questionnaire
(CDC, 2007)

1. Have you smoked at least 5 packs or 100 cigarettes in your entire life?
Yes
No

2. Do you now smoke cigarettes every day, some days, or not at all?
Every day (Current smoker)
Some days (Current smoker)
Not at all (Former)

Patient Performance Status: Self-Reported ECOG Score
(Oken et al., 1982)

Over the past month I would generally rate my activity as…

0- Normal with no limitations
1- Not my normal self, but able to be up and about with fairly normal activities
2- Not feeling up to most things, but in bed or chair less than half the day
3- Able to do little activity and spend most of the day in bed or chair
4- Pretty much bedridden, rarely out of bed

Patient and Caregiver Depressive Symptoms: Patient Health Questionnaire (PHQ-8) (Kroenke, Spitzer, et al., 2010; Löwe, et al., 2004)

Over the <u>last 2 weeks</u>, how often have you been bothered by…

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling asleep or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite –being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

Patient and Caregiver Anxiety Symptoms: Generalized Anxiety Disorders scale (GAD-7) (Kroenke, Spitzer, et al., 2010; Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007)

Over the last 2 weeks, how often have you been bothered by…

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Having trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

Patient Pain Severity: The Brief Pain Inventory – Short Form (BPI-SF)
(Cleeland et al., 1994)

1. Please rate your pain by choosing the one number that best describes your pain at its **worst** in the last 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

2. Using response scale C, please rate your pain by choosing the one number that best describes your pain at its **least** in the last 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

3. Please rate your pain by choosing the one number that best describes your pain on the **average**.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

4. Please rate your pain by choosing the one number that tells how much pain you have **right now**.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

Patient Distress Related to Breathlessness: Two items from the Memorial Symptom Assessment Scale (MSAS)
(Portenoy et al., 1994)

During the past week did you have shortness of breath?
Yes
No

If Yes: How much did it DISTRESS or BOTHER you?
0 = Not at all
1 = A little bit
2 = Somewhat
3 = Quite a bit
4 = Very much

Patient Fatigue Interference: Fatigue Symptom Inventory (FSI): Interference Subscale
(Hann, Denniston, & Baker, 2000)

1. Rate how much, in the past week, fatigue interfered with your general level of activity.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

2. Rate how much, in the past week, fatigue interfered with your ability to bathe and dress yourself.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

3. Rate how much, in the past week, fatigue interfered with your normal work activity (includes both work outside the home and housework).

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

4. Rate how much, in the past week, fatigue interfered with your ability to concentrate.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

5. Rate how much, in the past week, fatigue interfered with your relations with other people.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

6. Rate how much, in the past week, fatigue interfered with your enjoyment of life.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

7. Rate how much, in the past week, fatigue interfered with your mood.

0	1	2	3	4	5	6	7	8	9	10
No interference										Extreme interference

Assessment of Patient and Caregiver Coping Skills Practice During Intervention Sessions:

Instructions: Ok, now I am going to ask both of you about relaxation and other skills that you may or may not have practiced during the past week. If you wrote down the number of times you practiced the skills on Handout 3D or the calendar in the back of your notebook, please look at it now as I read the questions. Are you ready?

Noticing Sounds and Thoughts:

1. During the past week, did you practice relaxation by listening to sounds around you or noticing your own thoughts without judging them? How many times did you do this during the past week? (**Note**: write down “0” if they did not do the exercise. If only the patient or caregiver responds, say, “What about you Mr./Ms. [insert last name of other person]?”)

___ Times for Patient

___ Times for Caregiver

Guided Imagery:

2. During the past week, did you imagine yourself in a peaceful place? How many times did you do this during the past week?

___ Times for Patient

___ Times for Caregiver

Pursed Lips Breathing:

3. During the past week, did you use pursed lips breathing? How many times did you do this during the past week?

___ Times for Patient

___ Times for Caregiver

Cognitive Restructuring:

4. During the past week, did you replace your negative thoughts with more helpful thoughts? (Say, “We discussed this using Handout 2B” if they do not recall the technique.) How many times did you do this during the past week?

___ Times for Patient

___ Times for Caregiver

Assertive Communication:

5. During the past week, did you practice using the communication skills that we discussed? How many times did you do this during the past week?

___ Times for Patient

___ Times for Caregiver

Appendix B: LISREL Syntax

Model #1 Patient Pain Severity

```
DA NO=51 NI=8 MA=CM ME=ML
RA FI=Pain.lsf

LA
PainSev1 PainSev2 PainSev0 MindfulP ImageP LipsP CogRestP AssertP

SE
PainSev1 PainSev2 PainSev0 MindfulP ImageP LipsP CogRestP AssertP/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

```
Model #2 Patient Distress Related to Breathlessness

DA NO=51 NI=8 MA=CM ME=ML
RA FI=Dyspnea.lsf

LA
DysDis1 DysDis2 DysDis0 MindfulP ImageP LipsP CogRestP AssertP

SE
DysDis1 DysDis2 DysDis0 MindfulP ImageP LipsP CogRestP AssertP/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

Model #3 Patient Fatigue Interference

```
DA NO=51 NI=8 MA=CM ME=ML
RA FI=FSIAllHW.lsf

LA
FSIInt1 FSIInt2 FSIInt0 MindfulP ImageP LipsP CogRestP AssertP

SE
FSIInt1 FSIInt2 FSIInt0 MindfulP ImageP LipsP CogRestP AssertP/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

Model #4 Patient Depressive Symptoms

```
DA NO=51 NI=8 MA=CM ME=ML
RA FI=PtPHQAllHW.lsf

LA
PHQP1 PHQP2 PHQP0 MindfulP ImageP LipsP CogRestP AssertP

SE
PHQP1 PHQP2 PHQP0 MindfulP ImageP LipsP CogRestP AssertP/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

```
Model #5 Patient Anxiety Symptoms

DA NO=51 NI=8 MA=CM ME=ML
RA FI=PtGADAllHW.lsf

LA
GADP1 GADP2 GADP0 MindfulP ImageP LipsP CogRestP AssertP

SE
GADP1 GADP2 GADP0 MindfulP ImageP LipsP CogRestP AssertP/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

Model #6 Caregiver Depressive Symptoms

```
DA NO=51 NI=8 MA=CM ME=ML
RA FI=CGPHQAllHW.lsf

LA
PHQC1 PHQC2 PHQC0 MindfulC ImageC LipsC CogRestC AssertC

SE
PHQC1 PHQC2 PHQC0 MindfulC ImageC LipsC CogRestC AssertC/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

Model #7 Caregiver Anxiety Symptoms

```
DA NO=51 NI=8 MA=CM ME=ML
RA FI=PtGADAllHW.lsf

LA
GADC1 GADC2 GADC0 MindfulC ImageC LipsC CogRestC AssertC

SE
GADC1 GADC2 GADC0 MindfulC ImageC LipsC CogRestC AssertC/
MO NY=2 NX=6 BE=SD,FI GA=FU,FI PH=SY,FI PS=SY,FR

!Autoregressive paths
FR GA(1,1) BE(2,1)

!Freeing HW paths
FR GA(1,2) GA(2,2)
FR GA(1,3) GA(2,3)
FR GA(1,4) GA(2,4)
FR GA(1,5) GA(2,5)
FR GA(1,6) GA(2,6)

!Freeing predictors to correlate
FR PH(2,3)PH(2,4)PH(2,5)PH(2,6)
FR PH(3,4)PH(3,5)PH(3,6)
FR PH(4,5)PH(4,6)
FR PH(5,6)

!Fixing F#1 and F#2 covariance to zero
FI PS(1,2)

PD
OU EF SE
```

VITA

VITA

Joseph Giles Winger
May 2016

EDUCATION

August 2017	**Doctor of Philosophy** *Clinical Psychology* (APA Accredited) IUPUI, Department of Psychology, Indianapolis, IN Track: Clinical Health Psychology Cumulative GPA: 4.0 Dissertation: *Associations Between Coping Skills Practice and Symptom Change in a Psychosocial Symptom Management Intervention for Lung Cancer Patients and their Family Caregivers* (Defended May 9, 2016) Chair: Catherine E. Mosher, Ph.D.
July 2016	**Predoctoral Clinical Psychology Intern** (APA Accredited) Duke University School of Medicine, Durham, NC Track: Cancer Behavioral Symptom Management and Support Focus
June 2014	**Admitted to Doctoral Candidacy** IUPUI, Department of Psychology, Indianapolis, IN Qualifying Exam: *Relations of Meaning in Life and Sense of Coherence to Distress in Cancer Patients: A Meta-Analysis* Chair: Catherine E. Mosher, Ph.D.
December 2013	**Master of Science** *Clinical Psychology* (APA Accredited) IUPUI, Department of Psychology, Indianapolis, IN Track: Clinical Health Psychology Cumulative GPA: 4.0 Thesis: *Diet and Exercise Intervention Adherence and Health-Related Outcomes among Older Long-term Breast, Prostate, and Colorectal Cancer Survivors* Chair: Catherine E. Mosher, Ph.D.

August 2010	**Bachelor of Science** *Psychology* Indiana Wesleyan University, Marion, IN Cumulative GPA: 3.98

FELLOWSHIPS, HONORS, AND AWARDS

April 2016	Recipient of the ***Outstanding Graduate Student Teaching Award***, awarded annually in recognition of teaching performance, Department of Psychology, IUPUI
February 2016	Recipient of the ***IUPUI Athletics Favorite Professor Award***, awarded annually in recognition of outstanding teaching as selected by student-athletes, IUPUI
Summer 2013-Summer 2015	***Behavioral Cooperative Oncology Group (BCOG) Predoctoral Fellowship*** funded by the Walther Cancer Foundation. Primary mentor: Richard M. Frankel, Ph.D. Secondary mentors: Catherine E. Mosher, Ph.D. and Barbara Given, Ph.D.
April 2015	Recipient of the ***Clinical Psychology Award***, awarded annually in recognition of outstanding clinical work, Department of Psychology, IUPUI
April 2014	Recipient of the ***Clinical Psychology Award for Citizenship***, awarded annually in recognition of outstanding performance in service to the department, Department of Psychology, IUPUI
January 2014	Recipient of the ***Alumnus of the Year Award***, awarded to one alumnus annually in recognition of character, scholarship, and leadership, Department of Psychology, Indiana Wesleyan University
Fall 2010	Elected ***Who's Who*** among students in America's colleges and universities

CURRENT RESEARCH INTERESTS

- Psychosocial interventions to improve physical and psychological health in cancer patients and their family caregivers
- Psychosocial intervention mechanisms
- Meaning in life in cancer patients

PEER-REVIEWED PUBLICATIONS

1. Mosher, C. E., **Winger, J. G.**, Hanna, N., Jalal, S. I., Einhorn, L. H., Birdas, T. J., Ceppa, D. P., Kesler, K. A., Schmitt, J., Kashy, D. A., & Champion, V. L. (in press). Randomized pilot trial of a telephone symptom management intervention for symptomatic lung cancer patients and their family caregivers. *Journal of Pain and Symptom Management*.

2. Christy, S. M., **Winger, J. G.**, Raffanello, E. W., Halpern, L. H., Danoff-Burg, S., & Mosher, C. E. (in press). The role of anticipated regret and health beliefs in HPV vaccination intention among young adults. *Journal of Behavioral Medicine*. doi: 10.1007/s10865-016-9716-z

3. Mosher, C. E., **Winger, J. G.**, Given, B. A., Helft, P. R., & O'Neil, B. H. (in press). Mental health outcomes during colorectal cancer survivorship: A review of the literature. *Psycho-Oncology*. doi: 10.1002/pon.3954

4. **Winger, J. G.**, Christy, S. M., & Mosher, C. E. (in press). Associations of health behaviors with human papillomavirus vaccine uptake, completion, and intentions among female undergraduate students. *Journal of Health Psychology*. doi: 10.1177/1359105315569093

5. **Winger, J. G.**, Adams, R. N., & Mosher, C. E. (2016). Relations of meaning in life and sense of coherence to distress in cancer patients: A meta-analysis. *Psycho-Oncology, 25,* 2-10. doi: 10.1002/pon.3798

6. Adams, R. N., **Winger, J. G.**, & Mosher, C. E. (2015). A meta-analysis of the relationship between social constraints and distress in cancer patients. *Journal of Behavioral Medicine, 38,* 294-305. doi: 10.1007/s10865-014-9601-6

7. **Winger, J. G.**, Mosher, C. E., Rand, K. L., Morey, M. C., Snyder, D. C., & Demark-Wahnefried, W. (2014). Diet and exercise intervention adherence and health-related outcomes among older long-term breast, prostate, and colorectal cancer survivors. *Annals of Behavioral Medicine, 48,* 235-245. doi: 10.1007/s12160-014-9598-7

8. Mosher, C. E., **Winger, J. G.**, Hanna, N., Jalal, S. I., Fakiris, A. J., Einhorn, L. H., Birdas, T. J., Okereke, I. C., Kesler, K. A., & Champion, V. L. (2014). Barriers to mental health service use and preferences for addressing emotional concerns among lung cancer patients. *Psycho-Oncology, 23,* 812-819. doi: 10.1002/pon.3488

9. Steenbergh, T. A., Runyan, J. D., Daugherty, D. A., & **Winger, J. G.** (2012). Neuroscience exposure and perceptions of client responsibility among addictions counselors. *Journal of Substance Abuse Treatment, 42,* 421-428. doi: 10.1016/j.jsat.2011.09.015

MANUSCRIPTS IN PREPARATION

10. Tometich, D. B., Mosher, C. E., **Winger, J. G.**, Snyder, D. C., & Demark-Wahnefried, W. (2016). Exercise and dietary behavior in a randomized controlled trial of weight loss in overweight mothers with breast cancer and their overweight daughters. Manuscript in preparation.

PRESENTATIONS AT SCIENTIFIC MEETINGS

1. Chinh, K., Mosher, C. E., **Winger, J. G.**, Sloane, R., Snyder, D. C., Jones, L., & Demark-Wahnefried, W. (2016, June). *Relations of self-efficacy to health behaviors in a weight loss intervention trial for breast cancer survivors and their daughters*. Poster to be presented at the 8th Biennial Cancer Survivorship Research Conference, Washington, DC.

2. **Winger, J. G.**, & Mosher, C. E. (2016, April). *Relations of coping skills practice to symptom change in a psychosocial symptom management intervention for lung cancer patients and their family caregivers*. Poster presented at the 2016 Society of Behavioral Medicine Annual Meeting, Washington, DC.

3. Mosher, C. E., **Winger, J. G.**, Hanna, N., Kashy, D., Champion, V. L. (2015, October). *Randomized pilot trial of a telephone symptom management intervention for lung cancer patients and their family caregivers*. Poster presented at the 2015 Annual Kathleen Foley Palliative Care Retreat, Jackson Hole, WY.

4. **Winger, J. G.**, Adams, R. N., & Mosher, C. E. (2015, April). *Relations of meaning in life and sense of coherence to distress in cancer patients: A meta-analysis.* Poster presented at the 2015 Society of Behavioral Medicine Annual Meeting, San Antonio, TX.

5. **Winger, J. G.**, Christy, S. M., Blatsioris, A. D., & Mosher, C. E. (2014, April). *Health behaviors associated with HPV vaccine receipt and intentions among undergraduate women*. Poster presented at the 2014 Society of Behavioral Medicine Annual Meeting, Philadelphia, PA.

6. Mosher, C. E., & **Winger, J. G.** (2013, April). *Support service use and interest in support services among lung cancer patients.* Poster presented at the 2013 Translational Science Meeting, Washington, DC.

7. Van Antwerp, L. R., **Winger, J. G.**, Christy, S. M., & Mosher, C. E. (2013, April). *Relationships between health behaviors and HPV vaccine receipt and intentions among undergraduate women.* Poster presented at the IUPUI Research Day 2013, Indianapolis, IN.

8. **Winger, J. G.**, & Mosher, C. E. (2013, March). *Support service use among lung cancer patients*. Poster presented at the 2013 Society of Behavioral Medicine Annual Meeting, San Francisco, CA.

9. **Winger, J. G.**, Mosher, C. E., Bakas, T., & Champion, V. L. (2012, April). *Physical and mental health and life changes among family caregivers of lung cancer patients.* Poster presented at the 2012 Society of Behavioral Medicine Annual Meeting, New Orleans, LA.

10. **Winger, J. G.**, Steenbergh, T.A., Runyan, J., & Daugherty, D. (2010, November). *Therapists' views of spirituality in drug and alcohol treatment*. Poster presented at the annual convention of the Association for Behavioral & Cognitive Therapies, San Francisco, CA.

11. Daugherty, D., **Winger, J. G.**, Steenbergh, T.A., & Runyan, J. (2010, October). *Therapists' views of clients' responsibility for alcohol and drug addiction*. Poster presented at Addictions Conference 2010, Arlington, VA.

12. **Winger, J. G.**, Steenbergh, T.A., Runyan, J., & Daugherty, D. (2010, April). *Therapists' views of clients' responsibility for alcohol and drug addiction*. Paper presented at the Indiana Wesleyan University Celebration of Scholarship, Marion, IN.

13. **Winger, J. G.**, Haak, C., Pfleegor, J. & Steenbergh, T. (2009, April). *Cyberporn use and loneliness among undergraduate college students.* Poster presented at the Butler University Undergraduate Research Conference, Indianapolis, IN.

ORAL PRESENTATIONS

1. **Winger, J. G.** (2015, February). *The case of "Jacob."* Clinical case presentation at the Clinical Psychology Proseminar. IUPUI, Indianapolis, IN.

2. **Winger, J. G.** (2014, November). *The relationship between intervention adherence and symptom change in a psychosocial symptom management intervention for lung cancer patients and their family caregivers.* Research presentation at the Behavioral Cooperative Oncology Group Annual Fall Conference. IUPUI, Indianapolis, IN.

3. **Winger, J. G.** (2014, January). *Behavioral medicine: Research and practice*. Invited lecture at the Annual Psychology Colloquium, Indiana Wesleyan University, Marion, IN.

4. **Winger, J. G.** (2013, November). *The relationship between spirituality and distress in advanced cancer patients.* Research presentation at the Behavioral Cooperative Oncology Group Annual Fall Conference. IUPUI, Indianapolis, IN.

5. **Winger, J. G.** (2013, September). *Diet and exercise intervention adherence and health-related outcomes among older long-term breast, prostate, and colorectal cancer survivors.* Research presentation at the Clinical Psychology Proseminar. IUPUI, Indianapolis, IN.

6. **Winger, J. G.** (2013, August). *Behavioral intervention adherence.* Research presentation at the 2013 Behavioral Cooperative Oncology Group Summer Retreat. Michigan State University, Lansing, MI.

GRANTS

April 2016	**IUPUI School of Science Student Funding Award** ($400; travel grant for the 2016 Society of Behavioral Medicine Annual Meeting)
April 2016	**IUPUI School of Science Graduate Student Council Travel Grant** ($300; travel grant for the 2016 Society of Behavioral Medicine Annual Meeting)
March 2016	**IUPUI Graduate-Professional Educational Grant** ($500; travel grant for the 2016 Society of Behavioral Medicine Annual Meeting)
March 2015	**IUPUI Graduate-Professional Educational Grant** ($500; travel grant for the 2015 Society of Behavioral Medicine Annual Meeting)
March 2015	**IUPUI School of Science Graduate Student Council Travel Grant** ($500; travel grant for the 2015 Society of Behavioral Medicine Annual Meeting)
March 2015	**IUPUI School of Science Student Funding Award** ($400; travel grant for the 2015 Society of Behavioral Medicine Annual Meeting)
March 2014	**IUPUI School of Science Student Funding Award** ($1247; travel grant for 2014 Dyadic Data Analysis Workshop, Michigan State University)
March 2013	**IUPUI School of Science Graduate Student Council Travel Grant** ($600; travel grant for the 2013 Society of Behavioral Medicine Annual Meeting)
March 2013	**IUPUI Graduate and Professional Student Government Educational Enhancement Grant** ($500; travel grant for the 2013 Society of Behavioral Medicine Annual Meeting)
May 2012	**IUPUI School of Science Graduate Student Council Travel Grant** ($300; travel grant for the 2012 Society of Behavioral Medicine Annual Meeting)
April 2012	**IUPUI Graduate and Professional Student Government Educational Enhancement Grant** ($500; travel grant for the 2012 Society of Behavioral Medicine Annual Meeting)

April 2012	**IUPUI Department of Psychology Clinical Psychology Program Travel Grant** ($300; travel grant for the 2012 Society of Behavioral Medicine Annual Meeting)
August 2009	**Lilly Undergraduate Research Grant** ($800; Indiana Wesleyan University)

RESEARCH EXPERIENCE

Fall 2011-
Summer 2013

Graduate Research Assistant
Department of Psychology, IUPUI
Indianapolis, IN

Duties:	Recruited participants and conducted assessments for research on the support needs and preferences of lung cancer patients; conducted assessments for a pilot trial testing a telephone-delivered symptom management intervention for lung cancer patients and their family caregivers; conducted literature searches and compiled measures; collected information from medical records; maintained study databases and participant files; assisted with manuscript and grant preparation.
Supervisor:	*Catherine E. Mosher*, Ph.D., Department of Psychology, IUPUI

Spring 2008-
Summer 2011

Undergraduate Research Assistant
Department of Psychology, Indiana Wesleyan University
Marion, IN

Duties:	Assisted with data collection, data analysis, manuscript writing and presentations for projects concerning neuroscience exposure and addiction counselors' perceptions of client responsibility.
Supervisor:	*Timothy A. Steenbergh*, Ph.D., Department of Psychology, Indiana Wesleyan University

EDITORIAL ACTIVITIES

Psycho-Oncology (three mentored reviews, 2013 - 2015)
Annals of Behavioral Medicine (one mentored review, 2014)
Journal of Consulting and Clinical Psychology (one mentored review, 2013)

RESEARCH WORKSHOPS AND TRAININGS

August 2015	***Mixed Effects Longitudinal Modeling*** (2 days) Kevin King, Ph.D., University of Washington
July 2015	***Advanced Scientific Writing from the Reader's Perspective*** (1 day) George D. Gopen, PhD., Professor Emeritus, Duke University
September 2014	***Mediation, Moderation, & Conditional Process Analysis Workshop*** (2 days) Andrew F. Hayes, Ph.D., Professor, The Ohio State University
June 2014	***Dyadic Data Analysis Workshop*** (5 days) Deborah Kashy, Ph.D., Professor, Michigan State University
August 2013	***Introduction to Meta-analysis Workshop*** (3 days) Noel Card, Ph.D., Associate Professor, University of Arizona
August 2013-Present	***Cancer Control Educational Series*** Monthly lectures on research topics related to cancer prevention and control.
July 2013	***Scientific Writing from the Reader's Perspective*** (1 day) George D. Gopen, PhD., Professor Emeritus, Duke University
July 2013	***Grant Writers' Seminars & Workshops*** (2 days) David C. Morrison, Ph.D., Professor, University of Missouri Kansas City
August 2012	***Introduction to Structural Equation Modeling Workshop*** (3 days) Gregory Hancock, Ph.D., Professor, University of Maryland
August 2011-August 2013	***Oncology Faculty Research Group*** Monthly faculty research group meetings led by Victoria Champion, Ph.D., RN, FAAN. Attendees provided feedback on peers' research proposals and grant applications.

CLINICAL EXPERIENCE

Fall 2014

Integrated Primary Care Unit
Psychology Practicum Student
Roudebush VA Medical Center
Indianapolis, IN

Duties: Provided evidence-based individual therapy (Cognitive-Behavioral Therapy, Supportive Psychotherapy, Acceptance and Commitment Therapy, Mindfulness-Based Psychotherapy) to veterans in an integrated primary care setting. Administered neuropsychological assessments, provided test feedback to veterans, and consulted with primary care physicians. Participated in an 8-week Mindfulness-Based Stress Reduction (MBSR) group.

Supervisor: *Jay Summers*, Ph.D.

Summer 2014

Integrated Primary Care Unit
Psychology Practicum Student
Roudebush VA Medical Center
Indianapolis, IN

Duties: Provided evidence-based individual therapy (Cognitive-Behavioral Therapy, Supportive Psychotherapy, Acceptance and Commitment Therapy) to veterans in an integrated primary care setting. Administered neuropsychological assessments, provided test feedback to veterans, and consulted with primary care physicians.
Co-lead Managing Overweight/Obese Veterans Everywhere (MOVE!) groups. Participated in multidisciplinary treatment team meetings.

Supervisor: *Jennifer Lydon-Lam*, Ph.D.

Fall 2013 **Inpatient Palliative Care Unit**
Psychology Practicum Student
Roudebush VA Medical Center
Indianapolis, IN

Duties: Provided evidence-based family and individual therapy (Cognitive-Behavioral Therapy, Supportive Psychotherapy, Grief Counseling, and Symptom Management) to adult medical patients on an inpatient palliative care unit. Participated in multidisciplinary treatment team meetings.

Supervisor: *Samantha Outcalt*, Ph.D., Department of Psychiatry, Indiana University School of Medicine

Spring 2013 **Inpatient Psychiatric Unit**
Psychology Practicum Student
Larue D. Carter Memorial Hospital
Indianapolis, IN

Duties: Provided evidence-based group and individual therapy (Cognitive-Behavioral Therapy, Dialectical Behavioral Therapy, Behavioral Therapy) to adult patients in an inpatient setting. Co-facilitated Anger Management, Severe Mental Illness Stigma, and Stepping Stones (Transition Skills) groups. Administered assessments to individuals with severe mental illness. Participated in multidisciplinary treatment team meetings.

Supervisor: *Sarah Landsberger*, Ph.D., Department of Psychiatry, Indiana University School of Medicine

Fall 2012	**Neuropsychological Assessment** *Psychology Practicum Student* Beacon Psychology Service, LLC Carmel, IN
	Duties: Administered various assessments of intelligence, academic achievement, personality, attention/concentration, presence of autism, and motor functioning to children ages 4-18; scored assessments; wrote integrated reports of assessment findings; conducted intake interviews with children and parents; provided assessment findings to parents and children; co-facilitated a social skills group for boys ages 14-17 who had autism spectrum disorder.
	Supervisor: *Jennifer Horn*, Ph.D., HSPP, Beacon Psychological Services
Fall 2010- Spring 2011	**Inpatient Psychiatric Hospital** *Mental Health Technician* Cedar Springs Hospital Colorado Springs, CO
	Duties: Provided evidence-based group counseling regarding coping skills and drug and alcohol addiction as well as crisis intervention in an inpatient psychiatric facility; used verbal de-escalation protocols to manage conflicts between patients.
	Supervisors: *Cathy Durst*, M.S. L.P.C., *Kina Howard*, R.N., Cedar Springs Hospital

Fall 2009- Spring 2010	**Undergraduate Group Psychotherapy** *Group Counseling Facilitator* Indiana Wesleyan University Marion, IN

Duties:	Provided evidence-based group psychotherapy to undergraduate students enrolled in a group counseling course; participated in weekly individual supervision.
Supervisors:	*Keith Puffer*, Ph.D., *Doug Daugherty*, Psy.D., Department of Psychology, Indiana Wesleyan University

PEER SUPERVISION

Fall 2014	Provided weekly clinical peer supervision to a graduate-level student during the student's neuropsychology practicum placement. Attended a monthly course on providing clinical supervision facilitated by the Director of Clinical Training.
Spring 2014	Provided weekly clinical peer supervision to a graduate-level student during the student's health psychology practicum placement. Attended a monthly course on providing clinical supervision facilitated by the Assistant Director of Clinical Training.

CLINICAL WORKSHOPS AND TRAINING EXPERIENCES

January 2016	***Interpersonal Process Group Therapy*** Diane Sobel, Ph.D., Training Director, University of Kentucky
March 2015	***Acceptance and Commitment Therapy Workshop*** Jennifer Lydon-Lam, Ph.D., Richard L. Roudebush VA Medical Center
April 2014	***Biofeedback Workshop*** Eric Scott, Ph.D., Assistant Professor, Indiana University
April 2013	***Self-Hypnosis for Chronic Pain Management Workshop*** Mark P. Jensen, Ph.D., Associate Professor, University of Washington
Fall 2012- Spring 2015	***Meta-Supervision*** Attended monthly supervision meetings facilitated by a licensed clinical psychologist. Received supervision on clinical work and reported intervention progress. Received feedback on a transcribed therapy session. Received didactics and supervision on clinical peer supervision.

Fall 2011-Present	***Proseminar on Professional Issues in Clinical Psychology*** Weekly professional development course covering advanced clinical topics such as case conference/case conceptualization and clinical practice issues. Relevant topics include: supervision, consulting, diversity, ethics, professionalism, teaching, research methods, licensure, and grant writing.

MEMBERSHIPS IN PROFESSIONAL ASSOCIATIONS

Fall 2011 – Present	**Society of Behavioral Medicine**, Student Member
Fall 2011 – Present	**American Psychological Association**, **Division 38** (Health Psychology), Student Member
Spring 2007 – Present	**Psi Chi**, National Honors Society in Psychology

TEACHING EXPERIENCE

Spring 2016	**B305: Undergraduate Statistics** *Instructor* Department of Psychology, IUPUI Indianapolis, IN
Fall 2015	**B305: Undergraduate Statistics** *Instructor* Department of Psychology, IUPUI Indianapolis, IN
Summer 2015	**B110: Undergraduate Introduction to Psychology** *Instructor* Department of Psychology, IUPUI Indianapolis, IN
Fall 2009-Summer 2010	**Advanced Topics in Learning, Research Methods** *Teaching Assistant* Indiana Wesleyan University Marion, IN

SERVICE ACTIVITIES

Fall 2014	**Interview Housing Coordinator** Organized housing for applicants interviewing for the IUPUI Clinical Psychology Ph.D. program.
Fall 2013	**Psychology Graduate School Information Panelist** Served on a panel about applying to graduate programs in psychology.

Fall 2009- Spring 2010	**Elected President of Psi Chi**, the National Honors Society in psychology, Indiana Wesleyan University
Fall 2007- Spring 2010	**Habitat for Humanity Collegiate Challenge volunteer**