RELATION BETWEEN PERCEIVED INJUSTICE AND DISTRESS IN CANCER: MEANING MAKING AND ACCEPTANCE OF CANCER AS MEDIATORS

by

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To my family, thank you for believing in me and helping me get to where I am today.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Many advanced cancer patients struggle with distress including depressive symptoms, anxiety, anger about cancer, and anger toward God. Cancer patients may perceive their illness as an injustice (i.e., appraise their illness as unfair, severe, and irreparable or blame others for their illness), and this may be a risk factor for distress. To date, illness-related perceptions of injustice have not been examined in cancer patients. Based on prior research and theory (i.e., Just World Theory, Park's Meaning Making Model, and Loneliness Theory), there are multiple ways to conceptualize the relationship between perceived injustice related to the cancer experience and distress. The purpose of this project was to compare two theory-based conceptualizations of the relationships between perceived injustice and distress symptoms in advanced lung and prostate cancer patients. Aims were to (1) examine the direct effects of perceived injustice on distress symptoms; (2) examine the indirect effects of perceived injustice on distress symptoms through meaning making and acceptance of cancer (my conceptual model), examine the indirect effects of perceived injustice on psychological outcomes (i.e., distress symptoms and acceptance of cancer) through meaning making (Park's Meaning Making Model), and compare the two models; (3) examine loneliness as a potential moderator of the mediations based on my conceptual model; and (4) explore whether the associations based on my conceptual model differed between advanced lung and prostate cancer patients. Cross-sectional data from advanced lung (n = 102) and prostate (n = 99) cancer patients were examined. Seven models were tested using path analyses. Results partially supported my conceptual model; perceived injustice was directly and indirectly associated with distress symptoms through acceptance of cancer but not through meaning making. Findings did not support Park's Meaning Making Model, as meaning making did not help account for the associations between perceived injustice and psychological outcomes. Path analyses also indicated that loneliness was not a significant moderator of the mediations based on my conceptual model. Furthermore, associations based on my conceptual model did not differ between advanced lung and prostate cancer patients. Given mixed support for my conceptual model, supplemental path analyses were conducted that included loneliness as an exploratory mediator of associations between perceived injustice and distress symptoms. Findings suggested that perceived injustice was indirectly associated with distress symptoms

through loneliness and acceptance of cancer. Findings support testing acceptance-based interventions to address distress related to perceived injustice in advanced cancer patients.

INTRODUCTION

Lung and prostate cancers are among the most common cancers in the U.S. (American Cancer Society, 2021). Advanced stages of these cancers are associated with high physical and psychological symptom burden (Collins et al., 2019; Downing et al., 2019; Iyer et al., 2014; Joshy et al., 2020; Morrison et al., 2017). Many advanced lung and prostate cancer patients experience moderate to severe psychological distress including anxiety and depressive symptoms (Andersen et al., 2020; Downing et al., 2019; Drudge-Coates et al., 2018; Holm et al., 2018; Morrison et al., 2017; Rolke et al., 2008; Salvo et al., 2012; Skaug et al., 2007). Although prevalence rates of significant anxiety and depressive symptoms vary (14% to 41% in advanced lung cancer and 13% to 43% in advanced prostate cancer) (Andersen et al., 2020; Downing et al., 2019; Pirl et al., 2012; Roth et al., 1998; Sullivan et al., 2016), on average, rates of distress are higher in lung cancer than prostate cancer (Joshy et al., 2020; Linden et al., 2012; Salvo et al., 2012). Increased anxiety and depressive symptoms have been associated with worse social functioning and health-related quality of life as well as non-compliance with cancer treatment (Arrieta et al., 2013; Cooley et al., 2003; Grotmol et al., 2017; Hopwood & Stephens, 2000; Morrison et al., 2017; Theofilou & Panagiotaki, 2012; Zajdlewicz et al., 2017).

Distress after an advanced cancer diagnosis may include significant anger about cancer and existential struggles such as anger toward God. Prevalence rates of anger about cancer and anger toward God among advanced lung and prostate cancer patients have rarely been examined. Regarding anger in general, 9% to 36% of patients with various cancers reported experiencing this emotion to some degree on standardized questionnaires (Anderson et al., 2008; Kissane et al., 1994; McMillan & Weitzner, 2000; Thomas et al., 2000), and observational studies have found that up to 53% of cancer patients express anger during communications with their medical team (Alexander et al., 2011; Anderson et al., 2008; Granek et al., 2019). Further, in survey studies, up to 37% of primarily Christian cancer patients expressed anger toward God and reported feeling punished and abandoned by God post-diagnosis (Alcorn et al., 2010; Hall et al., 2018; Hebert et al., 2009; Sprik et al., 2019; Thuné-Boyle et al., 2011). Differences in anger toward God were not found by disease stage (Hebert et al., 2009). When poorly regulated, anger has been associated with depressive symptoms, maladaptive coping, relationship problems, and

worse adjustment to cancer and health-related quality of life (Alexander et al., 2011; Gall & Bilodeau, 2017; Julkunen et al., 2009; Olson Scott et al., 2014; Rice et al., 2018).

For advanced cancer patients, many cancer-related stressors contribute to their distress. Cancer-related stressors may include loss of personal control, financial strain, deterioration in physical appearance and functioning, loss of social roles (e.g., family relations, employment), growing dependence on caregivers, and confronting one's mortality (Collins et al., 2019; Kim et al., 2009; O'Grady et al., 2012; Philip et al., 2007; Tang et al., 2017; Wright et al., 2002). Some of these stressors may differ between advanced lung and prostate cancer patients. For instance, the majority of lung cancer patients are diagnosed at late stages which are associated with a poor prognosis (i.e., 5-year survival rate for advanced lung cancer is 6%) (American Cancer Society, 2021). In contrast, most prostate cancer patients are diagnosed at earlier stages, and, even at advanced stages, patients have better life expectancies (i.e., 5-year survival rate for advanced prostate cancer is 30%) (American Cancer Society, 2021). In addition, treatments for lung cancer differ from those for prostate cancer and have some different side effects. For example, many advanced lung cancer patients are treated with chemotherapy, targeted therapy, and immunotherapy and commonly experience fatigue, breathlessness, and pain (American Cancer Society, 2021; Cleeland et al., 2013; Iyer et al., 2014). In comparison, most advanced prostate cancer patients are treated with hormone therapy, chemotherapy, and radiation (mainly when bone metastases are present), and many patients report problems with pain, fatigue, urinary incontinence, and sexual dysfunction (American Cancer Society, 2021; Collins et al., 2019; Eton et al., 2010; Holm et al., 2018). Moreover, illness perceptions vary between these groups. For instance, lung cancer patients experience significant internal and external stigma related to smoking, which has been associated with self-blame and distress (Cataldo & Brodsky, 2013; Chambers et al., 2012; Criswell et al., 2016; Else-Quest et al., 2009; Occhipinti et al., 2018; Ostroff et al., 2019). On the other hand, prostate cancer patients report an invisible stigma due to masculinity-related losses, which has been associated with anger and depressive symptoms (Else-Quest et al., 2009; Ettridge et al., 2018; Sharpley et al., 2018; Wood et al., 2018).

For some patients, anger toward God increases in response to cancer-related stressors (Exline et al., 2011; Gall & Bilodeau, 2017; Olson Scott et al., 2014). Patients have various philosophical and theological explanations of human suffering (i.e., *theodicies*) (Hall & Johnson, 2001; Rice, 2014). When attempting to reconcile their suffering with their belief in a good,

loving, omnipotent God, some patients may question God's love or power or perceive God as cruel rather than kind (Exline et al., 2011; Hall et al., 2018; Schreiber, 2011; Thuné-Boyle et al., 2013). God may be viewed as directly responsible for the illness, or patients may blame God for allowing the illness to happen (Exline et al., 2011; Hall et al., 2018; Schreiber, 2011; Thuné-Boyle et al., 2013). For example, Lowery et al. (1993) found that up to 50% of women with breast cancer asked "why me?" regarding their cancer, with 13% attributing their illness to God. Further, some patients struggle with conflicting beliefs about their personal control versus God's control over the course of their illness (Carney & Park, 2018). It should be noted that these findings are based on largely Christian samples (e.g., Alcorn et al., 2010; Hebert et al., 2009; Sprik et al., 2019). However, even among patients who identify as atheists and agnostics, the cancer experience can lead to anger toward God, a Higher Power, or an image of a hypothetical God (Exline et al., 2011). In addition, even though religious and spiritual beliefs often provide a sense of purpose and meaning in life, some patients report difficulty finding meaning in their terminal illness experience and adjusting to cancer-related violations of their worldview (e.g., world is a just place; God is just and benevolent), leading to anger (Exline et al., 2011; Gall & Cornblat, 2002; Pargament et al., 1990; Thomas & Retsas, 1999). One such worldview is the belief in a just world, which, when violated, may lead to perceptions of injustice (Lerner, 1980; Lerner & Miller, 1978).

Just World Theory

According to Just World Theory, individuals have a need to believe that the world is just, or that people generally get what they deserve (Janoff-Bulman, 1992; Lerner, 1980; Lerner & Miller, 1978). Lerner (1980) argued that the belief in a just world allows individuals to view their environment as predictable, stable, ordered, coherent, and meaningful, leading to efforts to control the environment by pursuing goals. However, this sense of stability and order is shattered when circumstances do not align with what individuals feel they deserve, leading to a sense of injustice (Janoff-Bulman, 1992; Lerner, 1980; Lerner & Miller, 1978).

Based on Just World Theory (Lerner, 1980; Lerner & Miller, 1978), *perceived injustice* refers to appraisals reflecting the severity and irreparability of the circumstance, blame, and a sense of unfairness (Sullivan et al., 2008; Sullivan et al., 2012). In general, when individuals are exposed to situations that violate their basic human rights, transgress their status or rank, or

challenge their just world beliefs, they are likely to perceive injustice (Fetchenhauer & Huang, 2004; Hafer & Bègue, 2005; Miller, 2001). Specifically, when individuals believe that they are suffering unnecessarily and undeservedly, they may have a sense of injustice (Miller, 2001).

Given the numerous stressors associated with cancer, it can be perceived as an injustice (Douard, 1991). For example, patients may perceive themselves as "victims," believing that they did not deserve this illness and perhaps that they cannot control the course of the illness (Park et al., 2009). However, to my knowledge, no quantitative studies have examined perceived injustice related to the cancer experience. Most studies of perceived injustice in a medical context have focused on chronic pain. Two studies found that among breast cancer patients, greater pain-related perceptions of injustice were associated with greater pain catastrophizing (Alizadeh-Fard, 2020; Leysen et al., 2021) and poorer health-related quality of life (Leysen et al., 2021). Other studies in chronic pain found that increased pain-related injustice perceptions were associated with worse pain acceptance, which, in turn, was associated with heightened pain intensity, functional impairment, and distress (Carriere et al., 2020; Carriere et al., 2018; Lynch et al., 2021; Martel et al., 2017; Sullivan et al., 2012; Ysidron et al., 2020).

Perceptions of injustice may differ between advanced lung and prostate cancer patients. For advanced lung cancer patients, rapid illness progression (Lim, 2016b) may lead to perceptions of severe and irreparable illness-related losses. Recognizing the terminal nature of their illness and short life expectancy (American Cancer Society, 2021) may heighten patients' sense of injustice. In addition, lung cancer patients face significant stigma related to smoking (Cataldo & Brodsky, 2013; Occhipinti et al., 2018; Ostroff et al., 2019). Although smoking is the leading risk factor for lung cancer (American Cancer Society, 2021), among lung cancer patients, up to 26% of current or former smokers and 73% of never smokers do not blame themselves for their illness (Criswell, 2016; Else-Quest, 2006). However, patients' family members, friends, and even medical staff may believe that the patient is to blame for their illness, which may lead to a greater sense of unfairness (Criswell et al., 2016; Johnson et al., 2019; Occhipinti et al., 2018; Ostroff et al., 2019). On the other hand, some lung cancer patients blame themselves for their illness (Criswell, 2016; Else-Quest, 2006), which may lessen perceptions of injustice.

Some advanced prostate cancer patients perceive severe and irreparable masculinity-related losses due to the illness (e.g., decreased sense of self-reliance and sexual performance) (Sharpley et al., 2014; Sharpley et al., 2018). Patients facing an invisible stigma related to these

losses may not be able to openly talk about their illness with friends, family members, and even physicians, creating a sense of unfairness (Ettridge et al., 2018; Wood et al., 2018). Further, given the diversity of treatment recommendations at earlier stages of prostate cancer, patients may regret their treatment choices and blame themselves or others for the subsequent results, including disease progression and long-term side effects (Hurwitz et al., 2017; Shaverdian et al., 2018; van Stam et al., 2020).

Meaning Making Model

Park's Meaning Making Model suggests that, for both lung and prostate cancer patients, difficulty accepting and finding meaning in the illness may help explain the relationship between heightened perceptions of injustice and distress (Park, 2010, 2012, 2016). The Meaning Making Model posits that when dealing with stressful situations such as cancer, individuals try to find meaning in their circumstances (Park, 2010, 2012, 2013, 2016; Park & Folkman, 1997). According to this model, individuals have two levels of meaning: global and situational. Global meaning refers to individuals' general beliefs about the world and themselves (e.g., belief in a just world), their global goals, and sense of purpose. Situational meaning refers to meaning in a specific situation. Thus, when confronted with a stressful situation, individuals make judgments regarding their situation (i.e., *appraisals*), including the extent to which the stressor is threatening or controllable, stressor-related attributions, and its impact on their life and future. Individuals then identify discrepancies between situational appraisals and their global meaning and whether anything can be done to reduce these discrepancies. Subsequently, some people engage in cognitive and emotional efforts to reduce these discrepancies (i.e., *meaning making processes*) (Park, 2010, 2012, 2013, 2016; Park & Folkman, 1997).

According to Park's Meaning Making Model (2010, 2013), meaning making involves both automatic or unconscious processes (e.g., intrusive thoughts) and effortful coping. Coping refers to cognitive and behavioral efforts to manage the demands of a situation that is appraised as stressful (Folkman, 1997; Lazarus & Folkman, 1984). Meaning making coping refers to strategies aimed at decreasing the discrepancy between situational meaning (i.e., appraisals of a specific situation) and global meanings; thus, this form of coping includes positive reappraisals, goal revision, problem-solving strategies, or the use of religious or spiritual beliefs (Folkman, 1997; Park, 2010, 2013). When successful, meaning making processes result in *meanings made,*

such as having a restored sense of meaning in life, changed identities, beliefs, or goals, perceptions of growth, and acceptance (Park, 2010, 2013; Park & Folkman, 1997). According to the Meaning Making Model, acceptance involves coming to terms with the situation or achieving a sense of peace. Thus, Park (2010) describes acceptance as an outcome of meaning making. On the other hand, acceptance can also be conceptualized as part of ongoing meaning making efforts or as an active coping process (Carver et al., 1989). Indeed, in a prior meta-analytic review, I conceptualized acceptance in a cancer context as "an active willingness to be present with cancer-related realities while giving up efforts to judge or control cancer-related appraisals or feelings" (Secinti et al., 2019, p. 29).

The abovementioned theories may be integrated in multiple ways. First, as Park (2010) describes in the Meaning Making Model, when diagnosed with cancer, patients form appraisals about their cancer and related stressors. These situational appraisals might involve attributions of blame, evaluations of the severity or irreparability of the situation, and threats to the future (Park, 2010, 2012, 2013). When these appraisals conflict with patients' global belief in a just world, perceptions of injustice may occur. When patients perceive injustice, they may struggle to make sense of their experience, resulting in heightened distress and less acceptance of their situation. Thus, Park's theory suggests that greater cancer-related perceived injustice leads to higher distress and lower acceptance through the mechanism of reduced meaning making.

Alternatively, acceptance may be conceptualized as a coping mechanism or process (Carver et al., 1989; Secinti et al., 2019). Thus, when patients perceive injustice related to their cancer experience, they may struggle to make sense of their experience and accept their situation, resulting in heightened distress. In other words, cancer-related perceived injustice may lead to distress through the mechanisms of reduced meaning making and acceptance of cancer. Although prior research has not examined these proposed relations in cancer populations, reduced pain acceptance has mediated the positive relationship between perceived injustice and distress in patients with chronic pain (Carriere et al., 2020; Carriere et al., 2018; Martel et al., 2017; Sullivan et al., 2012; Ysidron et al., 2020).

Loneliness

Among people with greater loneliness, perceptions of injustice may be more strongly related to the processes of meaning making and acceptance of cancer. Loneliness refers to

perceptions of social isolation and is characterized by dissatisfaction with the quality of one's relationships (Peplau & Perlman, 1982). Compared to people with lower loneliness, lonely people have, on average, the same number of individuals in their social network and spend similar amounts of time with others (Cacioppo et al., 2000; Cornwell & Waite, 2009; Coyle & Dugan, 2012). However, lonely people tend to have limited meaningful social interactions with close others (Green et al., 2001; Lee & Ko, 2018; Peplau & Perlman, 1982; Wheeler et al., 1983). Lonely individuals tend to report greater difficulty developing meaningful relationships, potentially due to fear of rejection or negative evaluation (Hawkley & Cacioppo, 2010). Lonely individuals often avoid social situations and engage in limited self-disclosures (Cacioppo, Hughes, et al., 2006; Hawkley & Cacioppo, 2010). Subsequently, they are often dissatisfied with the emotional quality of their social interactions (Hawkley et al., 2003; Hawkley & Cacioppo, 2010; Hawkley et al., 2007). Further, lonely individuals are at risk for distress (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006; Cacioppo, Hughes, et al., 2006).

In the context of cancer, patients may have unrealistic expectations for emotional or practical support from family members or friends, leading to greater loneliness when these expectations are not met (Adams et al., 2017; Adams et al., 2018). Indeed, many cancer patients experience a moderate level of loneliness (Deckx et al., 2014), which is associated with greater social constraints on illness-related disclosure and elevated distress (Adams et al., 2018; Jaremka et al., 2014; Jaremka et al., 2013; Mosher et al., 2012; Pehlivan et al., 2012). In other words, lonely cancer patients may have greater difficulty engaging in cognitive and emotional processing of their illness experience with others, which is central to meaning making and acceptance of the illness and ultimately psychological adjustment (Park, 2010; Park & Blumberg, 2002). Thus, among patients with greater loneliness, heightened perceptions of cancer-related injustice may be more likely to lead to decreased meaning making and acceptance of the disease.

Present Study

To my knowledge, perceived injustice related to the cancer experience has not been examined in prior research. The present study aimed to compare two theory-based conceptualizations of the relationships between perceived injustice and distress symptoms in advanced lung and prostate cancer patients. First, based on my conceptualization, this study examined meaning making and acceptance of cancer as mediators of the relations between

perceived injustice and distress symptoms. Second, based on Park's Meaning Making Model (2010, 2013), this study examined meaning making as a mediator of the relations between perceived injustice and psychological outcomes (i.e., distress symptoms and acceptance of cancer). In addition, loneliness was examined as a potential moderator of the relations between perceived injustice and meaning making and acceptance. Based on Just World Theory (Lerner, 1980; Lerner & Miller, 1978), the Meaning Making Model (Park, 2010, 2013), and Loneliness Theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006), the specific aims and hypotheses of this study are as follows (see Figures 1 to 7 for Proposed Models related to the Aims):

Aim 1. To examine the extent to which perceived injustice related to the cancer experience is associated with distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God) in advanced lung and prostate cancer patients.

Hypothesis 1.1: Higher perceived injustice will be related to higher depressive symptoms.

Hypothesis 1.2: Higher perceived injustice will be related to higher anxiety.

Hypothesis 1.3: Higher perceived injustice will be related to higher anger about cancer.

Hypothesis 1.4: Higher perceived injustice will be related to higher anger toward God.

Aim 2. To examine the extent to which meaning making and acceptance of cancer individually (Aims 2.1-2.2) and synchronously (Aim 2.3) mediate the relationships between perceived injustice related to the cancer experience and distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God), and to examine Park's Meaning Making Model in which meaning making mediates the relationship between perceived injustice and psychological outcomes (i.e., distress symptoms and acceptance of cancer) (Aim 2.4). Models from Aims 2.3 and 2.4 will be compared (Aim 2.5).

Aim 2.1. To examine the extent to which meaning making mediates the relationships between perceived injustice related to the cancer experience and distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God) in advanced lung and prostate cancer patients.

Hypothesis 2.1.1: Higher perceived injustice will be related to higher depressive symptoms though lower meaning making.

Hypothesis 2.1.2: Higher perceived injustice will be related to higher anxiety though lower meaning making.

Hypothesis 2.1.3: Higher perceived injustice will be related to higher anger about cancer though lower meaning making.

Hypothesis 2.1.4: Higher perceived injustice will be related to higher anger toward God though lower meaning making.

Aim 2.2. To examine the extent to which acceptance of cancer mediates the relationships between perceived injustice related to the cancer experience and distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God) in advanced lung and prostate cancer patients.

Hypothesis 2.2.1: Higher perceived injustice will be related to higher depressive symptoms though lower acceptance of cancer.

Hypothesis 2.2.2: Higher perceived injustice will be related to higher anxiety though lower acceptance of cancer.

Hypothesis 2.2.3: Higher perceived injustice will be related to higher anger about cancer though lower acceptance of cancer.

Hypothesis 2.2.4: Higher perceived injustice will be related to higher anger toward God though lower acceptance of cancer.

Aim 2.3. To examine the extent to which meaning making and acceptance of cancer synchronously mediate the relationships between perceived injustice related to the cancer experience and distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God) in advanced lung and prostate cancer patients.

Hypothesis 2.3.1: Higher perceived injustice will be related to higher depressive symptoms though lower meaning making and acceptance of cancer.

Hypothesis 2.3.2: Higher perceived injustice will be related to higher anxiety though lower meaning making and acceptance of cancer.

Hypothesis 2.3.3: Higher perceived injustice will be related to higher anger about cancer though lower meaning making and acceptance of cancer.

Hypothesis 2.3.4: Higher perceived injustice will be related to higher anger toward God though lower meaning making and acceptance of cancer.

Aim 2.4. To examine the extent to which meaning making mediates the relationships between perceived injustice related to the cancer experience and psychological outcomes

(i.e., depressive symptoms, anxiety, anger about cancer, anger toward God, and acceptance of cancer) in advanced lung and prostate cancer patients.

Hypothesis 2.4.1: Higher perceived injustice will be related to higher depressive symptoms though lower meaning making.

Hypothesis 2.4.2: Higher perceived injustice will be related to higher anxiety though lower meaning making.

Hypothesis 2.4.3: Higher perceived injustice will be related to higher anger about cancer though lower meaning making.

Hypothesis 2.4.4: Higher perceived injustice will be related to higher anger toward God though lower meaning making.

Hypothesis 2.4.5: Higher perceived injustice will be related to lower acceptance of cancer though lower meaning making.

Aim 2.5. To statistically compare the models described in Aims 2.3 and 2.4.

Hypothesis 2.5: The model from Aim 2.3 will better explain the relationships between perceived injustice and psychological outcomes than the model from Aim 2.4.

Aim 3. To examine the extent to which loneliness moderates relationships between advanced lung and prostate cancer patients' perceived injustice and the processes of meaning making and acceptance of cancer in the model from Aim 2.3.

Hypothesis 3.1: The relationship between perceived injustice and meaning making will be stronger with increasing loneliness.

Hypothesis 3.2: The relationship between perceived injustice and acceptance of cancer will be stronger with increasing loneliness.

Aim 4. To explore the extent to which the model described in Aim 3 may differ between advanced lung and prostate cancer patients.

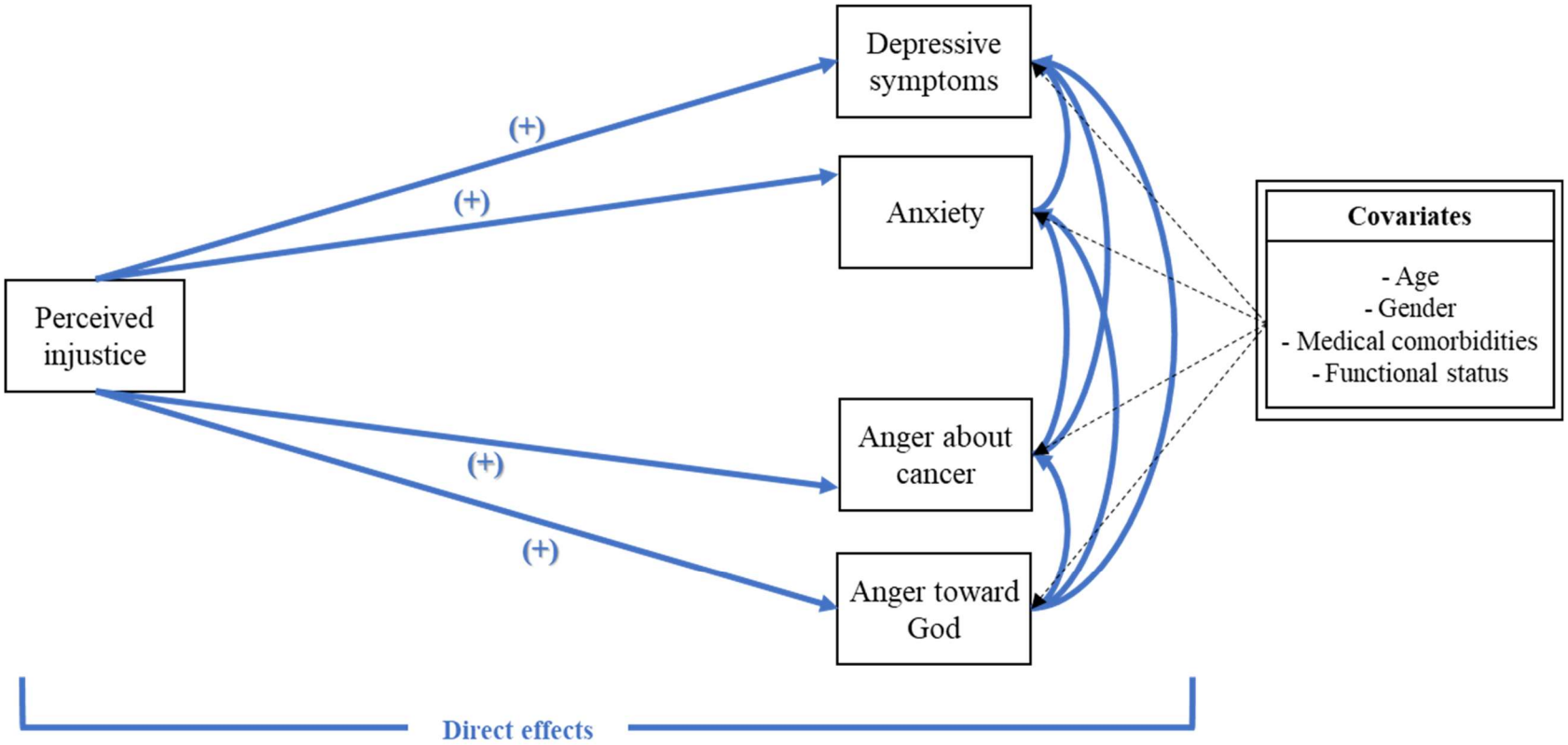

Figure 1. Model 1 (Aim 1) depicting direct effects of perceived injustice on distress symptoms

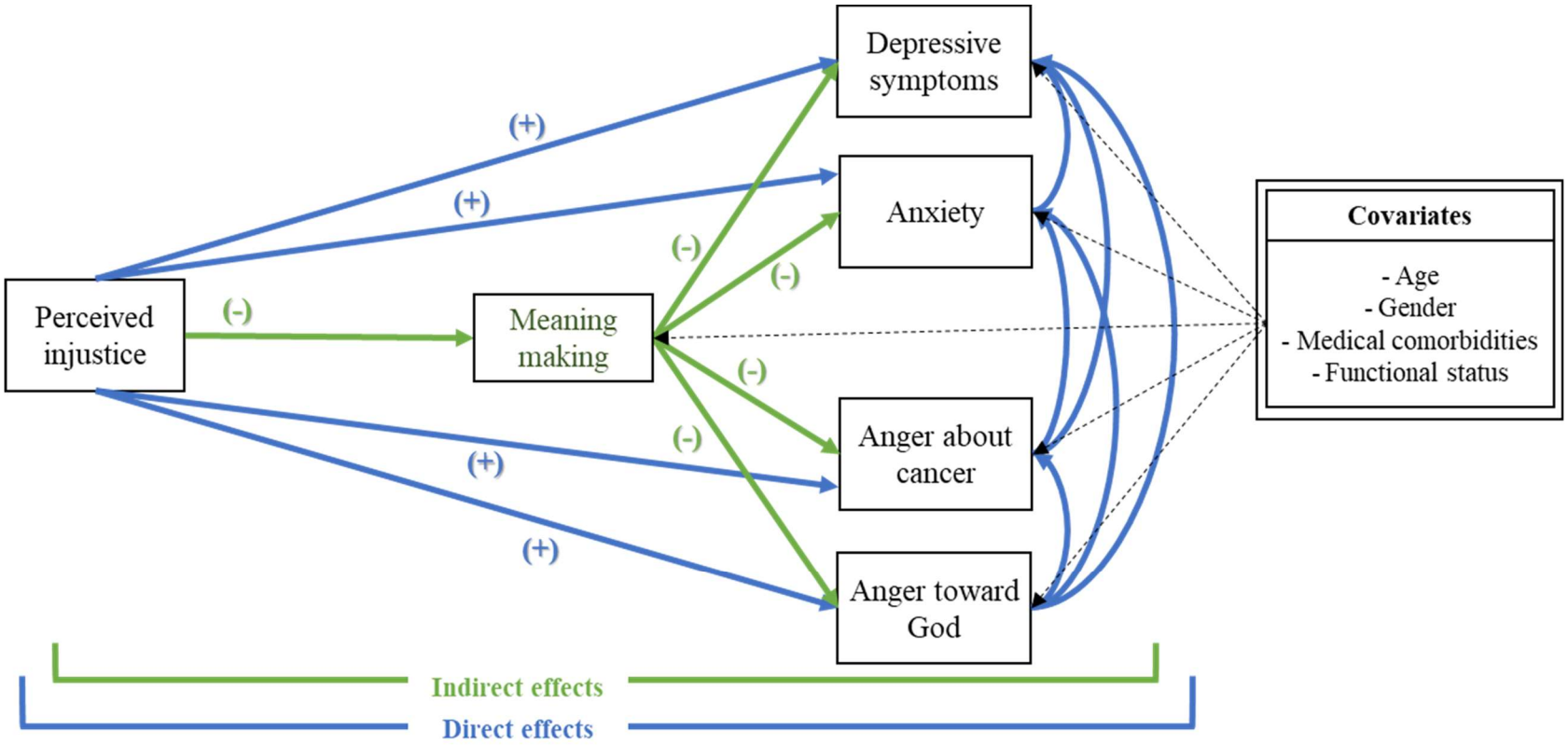

Figure 2. Model 2 (Aim 2.1) depicting direct and indirect effects of perceived injustice on distress symptoms through meaning making.

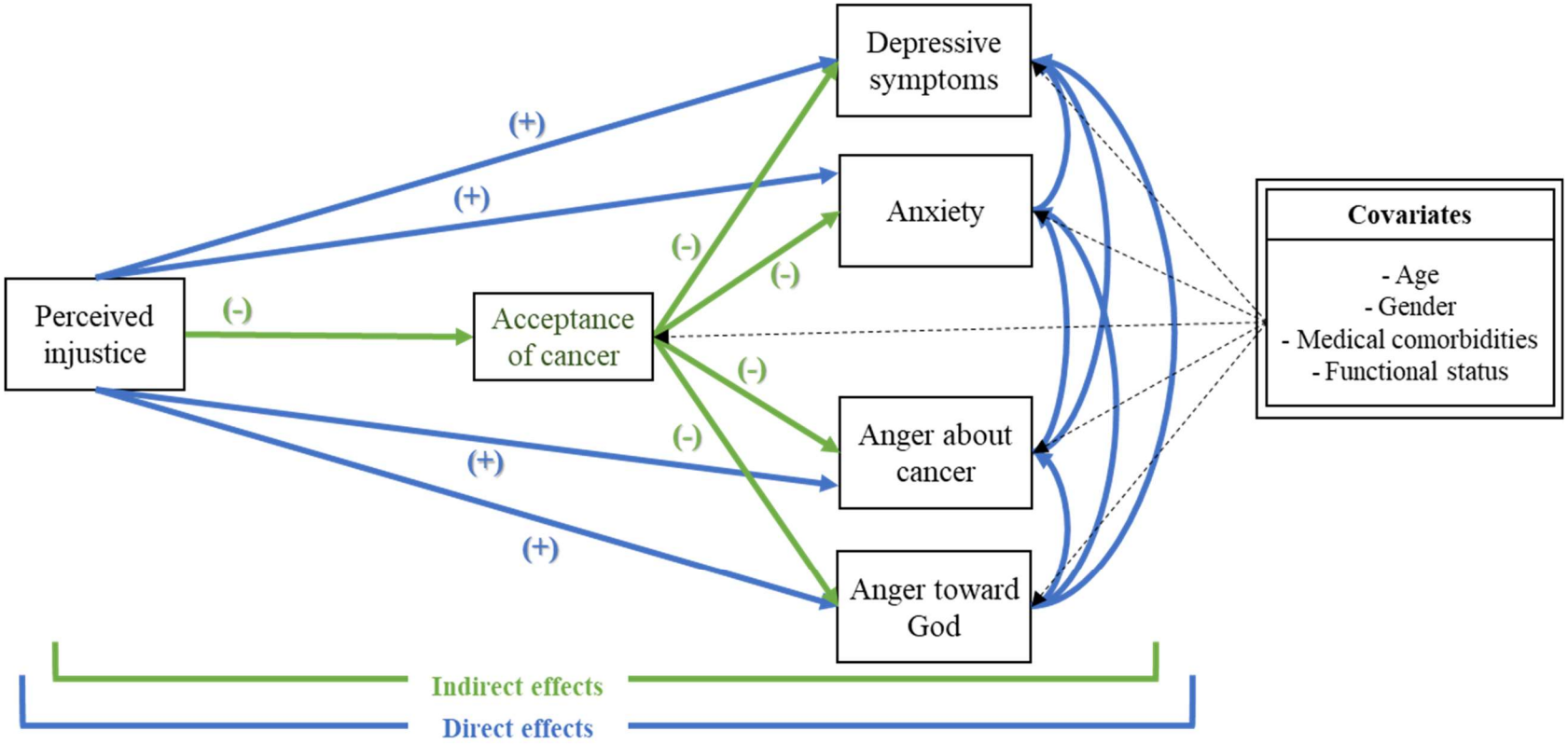

Figure 3. Model 3 (Aim 2.2) depicting direct and indirect effects of perceived injustice on distress symptoms through acceptance of cancer.

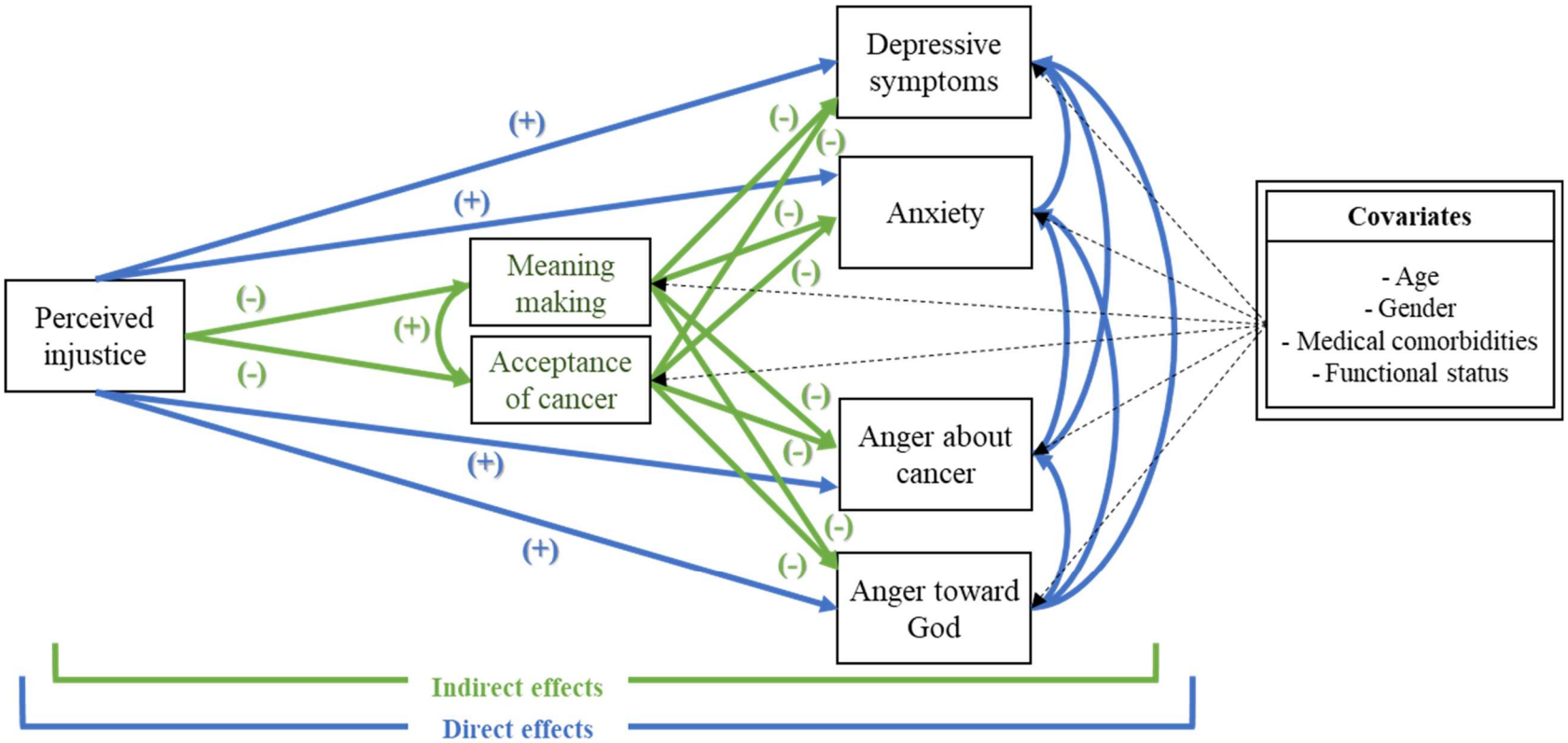

Figure 4. Model 4 (Aim 2.3) depicting direct and indirect effects of perceived injustice on distress symptoms through meaning making and acceptance of cancer.

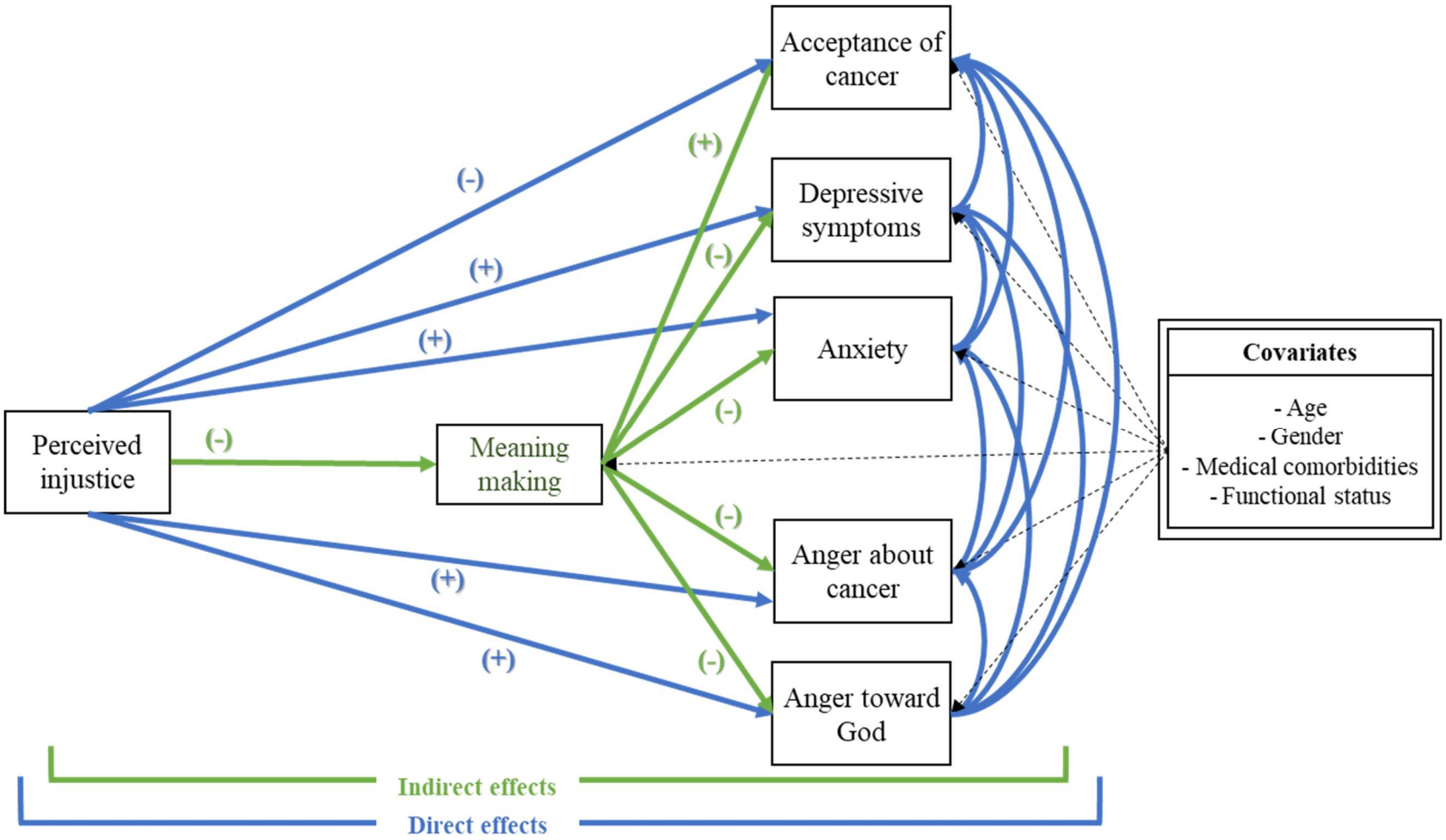

Figure 5. Model 5 (Aim 2.4) depicting direct and indirect effects of perceived injustice on distress symptoms and acceptance of cancer through meaning making.

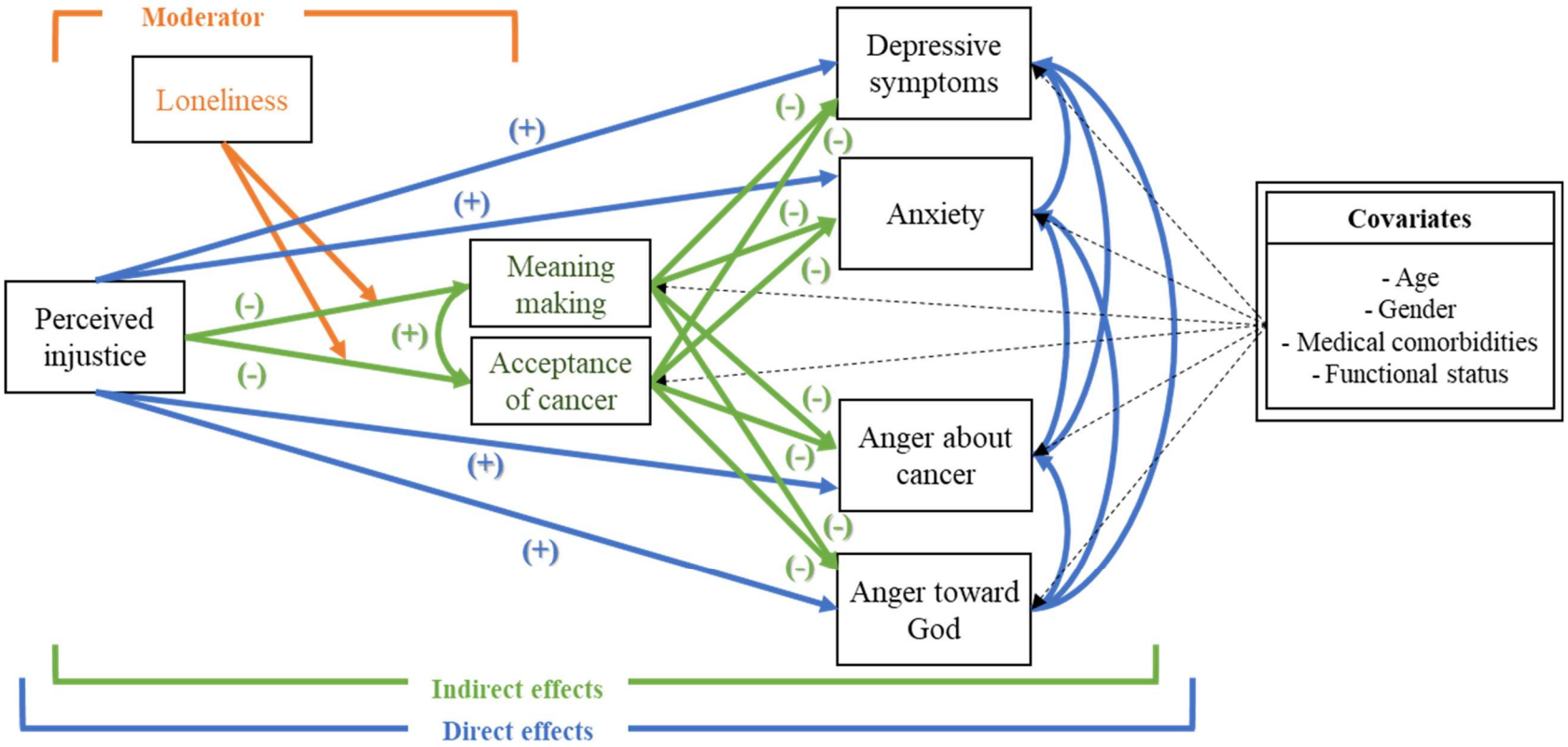

Figure 6. Model 6 (Aim 3) depicting loneliness as a moderator of the relationships between perceived injustice and the processes of meaning making and acceptance of cancer in Model 4.

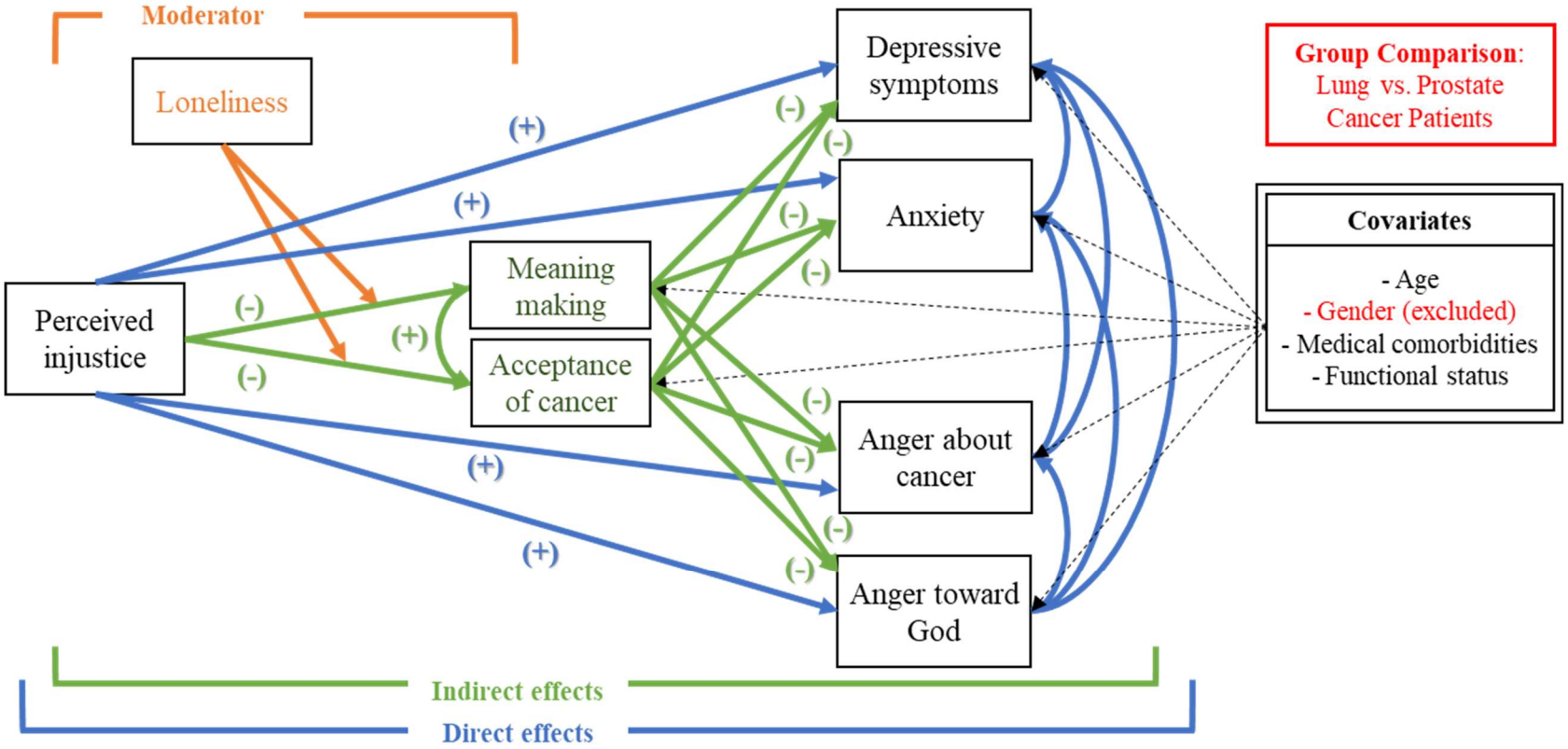

Figure 7. Model 7 (Aim 4) depicting the group comparison of advanced lung and prostate cancer patients in Model 6.

METHODS

Participants

A total of 102 lung cancer patients and 99 prostate cancer patients were recruited to participate in a one-time survey between March and August 2019. To ensure representation of demographic subgroups, purposive sampling was used based on race/ethnicity (both lung and prostate cancer samples) and gender (lung cancer sample only). Approximately equal numbers of male and female lung cancer patients were invited to participate in the study.

Eligible patients were identified through medical record screening and confirmation with attending oncologists. Eligible patients were: (1) at least 3 weeks post-diagnosis of inoperable stage IIIB, IIIC, or IV non-small cell lung cancer, inoperable extensive stage small cell lung cancer, or stage IV prostate cancer; (2) receiving care at Indiana University (IU) Health University Hospital including the IU Simon Comprehensive Cancer Center (IUSCCC); (3) at least 18 years of age; (4) fluent in English; and (5) not exhibiting significant psychiatric or cognitive impairment based on medical record review, investigator judgment, and making < 3 errors on a 6-item cognitive screener (Callahan et al., 2002).

Procedure

All study procedures were approved by the IU Institutional Review Board (1901972719) and the IUSCCC Scientific Review Committee. A waiver of HIPAA authorization was granted for reviewing medical records for recruitment purposes.

Screening

For the prostate cancer sample, a list of potentially eligible patients was requested from the IU Health Cancer Registry. A registrar provided the list of patients, along with patients' medical record numbers, demographic information, and cancer information (i.e., cancer type, stage, date of diagnosis). IU Health medical records were then reviewed to identify potentially eligible patients and check the accuracy of the registrar data (see Appendix A for medical record screening form). IU Health medical records were also reviewed to identify potentially eligible lung cancer patients. Oncologists then confirmed the eligibility of their patients.

Recruitment and Data Collection

Following oncologist approval, recruitment packets were mailed to potentially eligible patients. The packets included an introductory letter about the study, study brochure, and informed consent and HIPAA authorization forms. The letter informed patients that a research assistant would call them in the coming weeks and included a phone number and email address for the research team if they had questions or did not wish to be contacted further.

Approximately 1-2 weeks after the packet was mailed, research assistants called patients who did not opt out. A research assistant reviewed the informed consent and HIPAA authorization forms in detail. Interested patients completed the 6-item cognitive screener (Callahan et al., 2002) over the phone to determine eligibility. Patients were given the opportunity to ask questions about the study before providing verbal consent and authorization to collect medical record information (see Appendix B for information collected from medical records). Eligible and consenting patients were asked for their survey preference (i.e., email survey link to complete online or mail a paper copy) and contact information. Patients who refused to participate were asked if they would be willing to provide a reason for refusal as well as their age, gender, and race. This information was used to examine potential sample selection biases. If a patient was not reached on the phone, a brief voicemail message was left and then the patient was called up to 10 times within the next 1-4 weeks after the first phone call.

Consenting patients were sent the survey via email or postal mail depending on their preference. Online surveys were emailed with an individual link through the Research Electronic Data Capture (REDCap) platform (Harris et al., 2019; Harris et al., 2009). Paper surveys were sent via postal mail along with a self-addressed stamped envelope for survey return. Participants were identified by unique study IDs; thus, they were asked to not provide any identifying information on the surveys. If the survey was not completed within 2 weeks, research assistants provided reminders, speaking to the participant up to five times. Participants who requested online surveys received automated email reminders from REDCap every 4 days for up to 20 days after the initial survey invitation email. Once the research team received the survey, participants were mailed a $25 gift card to a major retailor for participating in the study.

Data Storage and Data Entry

Medical record information and paper survey data were entered into the HIPAA-compliant REDCap system. Study data were only accessible to authorized research team members. Other electronic study data (e.g., recruitment tracking sheets) were stored on a secure Indiana University-Purdue University at Indianapolis (IUPUI) network drive and were only accessible through encrypted computers. All paper files were stored in a locked cabinet in a locked office at the IUPUI Department of Psychology. All entered data were checked for accuracy by two members of the research team.

Measures

The present study focused on a portion of the data from this cross-sectional survey of advanced cancer patients' health and well-being. Measures used in this study are described below (see Appendix C for the questionnaires for lung and prostate cancer patients analyzed in this study).

Descriptive Variables

Demographic and Medical Information. Participants' medical records were reviewed to assess age, gender, cancer type and stage, date of diagnosis, and cancer treatments received (e.g., surgery, chemotherapy, radiation, hormone therapy). Participants reported their race/ethnicity, marital status, education level, employment status, and income level. Participants also reported their smoking history. Smoking history was assessed with three items from the Behavioral Risk Factor Surveillance System (BRFSS) (e.g., "Have you smoked at least 5 packs or 100 cigarettes in your entire life?") (Centers for Disease Control and Prevention, 2007) and four items used in prior research with cancer populations (e.g., "What is the total number of years you smoked every day?") (Williamson et al., 2018). BRFSS items on smoking history have demonstrated good convergent validity with other smoking history measures (Li et al., 2012; Pierannunzi et al., 2013). ***Medical Comorbidities and Functional Status*.** Participants reported whether they had been diagnosed with or treated for eight common medical comorbidities (e.g., arthritis, hypertension) in the last three years using a checklist (Kroenke et al., 2009). This checklist has been used with cancer populations and yielded evidence of adequate validity through

associations with hospitalization and mortality outcomes (Kroenke et al., 2010; Perkins et al., 2004). Participants also reported their general functional status using the activities and function item (i.e., Eastern Cooperative Oncology Group [ECOG] score) from the Patient-Generated Subjective Global Assessment (PG-SGA) (Bauer et al., 2002; Dajczman et al., 2008; Oken et al., 1982). The patient-reported ECOG has been used with cancer populations, demonstrating good convergent validity with other performance status measures (Buccheri et al., 1996; Oken et al., 1982).

Religiosity. The 5-item Duke University Religion Index (DUREL) was used to measure three dimensions of religiosity (Koenig & Büssing, 2010; Koenig et al., 1997). The organizational religious activity item ("How often do you attend church or other religious meetings?") was rated on a 6-point Likert scale ranging from 1 = *Never* to 6 = *More than once/week.* The non-organizational religious activity item ("How often do you spend time in private religious activities such as prayer, meditation or Bible study?") was rated on a 6-point Likert scale ranging from 1 = *Rarely or never* to 6 = *More than once a day*. The three intrinsic religiosity items focused on personal commitment (e.g., "In my life, I experience the presence of the Divine (i.e., God)") and were rated on a 5-point Likert scale ranging from 1 = *Definitely not true* to 5 = *Definitely true of me*. The DUREL has been used with cancer populations and demonstrated evidence of excellent internal consistency reliability (e.g., $\alpha = 0.90$ for the total measure) and good convergent validity with other measures of religiosity (Sherman et al., 2000).

Prognostic Awareness. Prognostic awareness was assessed with a single item on terminal illness acknowledgement (Prigerson, 1992). Participants were asked: "How would you describe your current health status?" with the response options of "relatively healthy," "seriously ill but not terminally ill," and "seriously and terminally ill." Given that all of the participants were diagnosed with advanced stage cancer, those who endorsed being "seriously and terminally ill" were categorized as having prognostic awareness. This measure has been used with advanced cancer patients, showing good convergent validity with other measures of prognostic awareness and good criterion validity as evidenced by associations with physician disclosure of prognosis, receipt of palliative care, and end-of-life discussions (Epstein et al., 2016; Mack et al., 2010; Prigerson, 1992; Ray et al., 2006).

Main Study Variables

***Distress Symptoms*.** Distress symptoms were assessed with self-report measures of depressive symptoms, anxiety, anger about cancer, and anger toward God.

The 4-item Patient-Reported Outcomes Measurement Information System (PROMIS) Depression and Anxiety measures and a modified version of the 5-item PROMIS Anger measure were used to assess depressive symptoms, anxiety, and anger about cancer, respectively (Choi et al., 2010; Pilkonis et al., 2011). The original PROMIS Anger measure assesses anger in general and was modified for this study to assess anger about cancer. All items were revised by including the phrase "when I thought about my cancer." A sample item is "In the past 7 days when I thought about my cancer, I felt angry." A sample item assessing depressive symptoms is "In the past 7 days, I felt depressed," and a sample item assessing anxiety is "In the past 7 days, I found it hard to focus on anything other than my anxiety." For all measures, participants rated their responses on a 5-point Likert scale ranging from 1 = *Never* to 5 = *Always*. PROMIS measures have undergone extensive psychometric testing and demonstrated evidence of reliability and validity in cancer populations (e.g., Cronbach's alphas of 0.95, 0.93, and 0.90 for depressive symptoms, anxiety, and anger, respectively) (Cella et al., 2014; Cella et al., 2010; Jensen et al., 2017; Pilkonis et al., 2011; Schalet et al., 2016; Wagner et al., 2015). Furthermore, original PROMIS measures provide standardized T-scores which allow for comparisons with population norms.

The 4-item Anger/Disappointment subscale of the Attitudes Toward God Scale was used to measure anger toward God (Wood et al., 2010). A sample item is "To what extent do you currently feel angry at God?" Patients were asked to rate responses on an 11-point Likert scale ranging from 0 = *Not at all* to 10 = *Extremely*. The Attitudes Toward God Scale has been used with cancer populations with excellent internal consistency reliability (e.g., $\alpha = 0.95$ for the anger/disappointment subscale) and good criterion validity as evidenced by significant associations with negative attributions about God, worldview violations, and perceptions of being a victim (Exline et al., 2011).

***Perceived Injustice*.** The 12-item Injustice Experience Questionnaire was used to measure perceived injustice (Sullivan et al., 2008; Sullivan et al., 2012). The Injustice Experience Questionnaire was originally developed for pain-related perceptions of injustice, and, thus, the instructions were modified to assess cancer-related perceptions of injustice. The

modified instructions asked participants to "indicate how frequently you experience these thoughts and feelings when you think about your cancer." A sample item is "It all seems so unfair." Participants rated their responses on a 5-point Likert scale ranging from 0 = *Never* to 4 = *All the time.* The original Injustice Experience Questionnaire has shown evidence of good reliability and construct validity in chronic pain populations (Sullivan et al., 2008). This measure has also been used with cancer populations to assess pain-related injustice perceptions with good internal consistency reliability (e.g., $\alpha = 0.82$ for the total instrument) (Alizadeh-Fard, 2020).

***Meaning Making*.** The 4-item Positive Reinterpretation subscale of the COPE measure was used to measure meaning making (Carver et al., 1989). A sample item is "I try to grow as a person as a result of the experience." Items were rated on a 4-point Likert scale ranging from 1 = *I usually don't do this at all* to 4 = *I usually do this a lot*. The COPE has been used with cancer populations and had evidence of good construct validity and internal consistency reliability (e.g., $\alpha = 0.80$ for the positive reinterpretation subscale) (Carver et al., 1989; Rudaz et al., 2018).

***Acceptance of Cancer*.** The 5-item Peaceful Acceptance subscale of the Peace, Equanimity, and Acceptance in the Cancer Experience (PEACE) measure was used to assess patients' acceptance of their cancer (Mack et al., 2008). A sample item is "To what extent are you able to accept your diagnosis of cancer?" Participants were asked to rate the items on a 4-point Likert scale ranging from 1 = *Not at all* to 4 = *To a large extent*. The Peaceful Acceptance subscale has been used with cancer populations, demonstrating acceptable internal consistency reliability (e.g., $\alpha = 0.78$) and good criterion validity as evidenced by significant associations with coping and spirituality (Mack et al., 2008). ***Loneliness*.** The 4-item PROMIS Social Isolation measure was used to assess loneliness (i.e., perceived social isolation) (Cella et al., 2007). A sample item is "I feel isolated from others." Participants rated their responses on a 5-point Likert scale ranging from 1 = *Never* to 5 = *Always*. The PROMIS Social Isolation measure showed evidence of good reliability (e.g., item response theory estimation of standard error of measurement < 3.0) and good criterion and construct validity (Hahn et al., 2014).

Data Analyses

Preliminary Analyses and Data Preparation

Preliminary analyses were conducted using IBM SPSS statistical software (version 25). Descriptive statistics (e.g., means, standard deviations, frequencies) and histograms were used to examine data for normality, outliers, skewness and kurtosis (i.e., extreme values were skewness <3.0 and/or kurtosis <10.0) (Kline, 2015). Correlations between study variables were computed. Data were also examined for missingness using Little's Missing Completely at Random (MCAR) test (Little, 1988).

Given limitations of power analysis for path analysis models, the general recommendation is 5 to 20 subjects per parameter in path analyses (Browne & Cudeck, 1992; Kline, 2015). Thus, to reduce the number of parameters in the models, only four covariates were chosen a priori to be included in the path analyses. Based on prior research, 1) age, 2) gender, 3) number of medical comorbidities, and 4) functional status were selected as covariates due to their significant associations with the distress outcomes (Andersen et al., 2020; Arden-Close et al., 2008; Braamse et al., 2016; Cohee et al., 2020; Erim et al., 2019; Jim et al., 2016; Linden et al., 2012; O'Rourke et al., 2018; Olson Scott et al., 2014; Rottmann et al., 2016).

Analyses for Aims 1-4

Path analyses with the full information maximum likelihood (FIML) procedure were conducted using Mplus statistical software v.8 (Muthén & Muthén, 2017). All of the models for Aims 1-3 included the same set of covariates: age, gender, number of medical comorbidities, and functional status. Path analyses examined whether perceived injustice was directly related to depressive symptoms (Aim 1, Hypothesis 1.1), anxiety (Aim 1, Hypothesis 1.2), anger about cancer (Aim 1, Hypothesis 1.3), and anger toward God (Aim 1, Hypothesis 1.4) in advanced lung and prostate cancer patients. Path analyses then examined whether relationships between perceived injustice and distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, anger toward God) were mediated by meaning making and acceptance of cancer individually (Aims 2.1-2.2, Hypotheses 2.1.1-2.2.4) and synchronously (Aim 2.3, Hypotheses 2.3.1-2.3.4). In addition, path analyses examined Park's Meaning Making Model in which the relationship between perceived injustice and psychological outcomes (i.e., distress symptoms

and acceptance of cancer) were mediated by meaning making (Aim 2.4, Hypotheses 2.4.1-2.4.5). Models from Aims 2.3 and 2.4 were saturated. Thus, to compare models from these two aims, model interpretability and the direction and statistical significance of each hypothesized path were examined instead of model fit indices (Aim 2.5, Hypothesis 2.5). Path analyses also examined whether loneliness moderated the relationships between perceived injustice and the processes of meaning making and acceptance of cancer (Aim 3, Hypotheses 3.1-3.2).

Finally, path analyses using multiple group analysis examined the extent to which the fit of the model described in Aim 3 differed between advanced lung and prostate cancer patients (Aim 4). Given that one of the covariates (i.e., gender) had very limited variability in the prostate cancer patient group (all except one of the prostate cancer patients identified as male), this covariate was excluded from analyses; only age, number of medical comorbidities, and functional status were included as covariates. For multiple group analysis, path analysis was conducted twice: first, all parameters were allowed to freely differ between advanced lung and prostate cancer patients; second, all parameters were constrained to be equal between the advanced lung and prostate cancer patients. Then a Chi-square difference test was conducted to examine whether model fit differed across groups. Based on the theoretical framework (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006; Lerner, 1980; Lerner & Miller, 1978; Park, 2010, 2013), only observed variables were included in the path models; no latent variables were hypothesized.

Good model fit was evaluated holistically as a combination of the following criteria: (1) a non-significant chi-square statistic; (2) comparative fit index (CFI) ≥ 0.95; (3) Tucker Lewis fit index (TLI) ≥ 0.95; (4) root mean square error of approximation (RMSEA) < 0.06; (5) standardized root mean square residual (SRMR) < 0.08; and (6) lower values of the Akaike information criterion (AIC) when comparing models (Byrne, 2012; Hu & Bentler, 1998; Kline, 2015). Indirect effects were assessed by the bias-corrected bootstrapped confidence intervals. Modification index (MI) values were examined to improve model fit. The models were respecified freeing one parameter at a time, starting with the parameter with the highest MI value (Kline, 2015; Tabachnick & Fidell, 2013). Model improvements were made only when they could be justified by the theoretical approach (Byrne, 2012; Kline, 2015).

RESULTS

Sample Characteristics

The study flow charts for the lung and prostate cancer samples are shown in Figures 8 and 9, respectively. Overall, of the 377 patients who met the initial eligibility criteria through medical chart review and were sent recruitment mailings, 60 (16%) could not be reached via phone, 33 (9%) were found to be ineligible, and 61 (16%) declined to participate. The reasons for ineligibility prior to consent included vocal, auditory, or visual impairment (n = 5, 1%) and declining health (n = 4, 1%). The primary reasons for refusal included lack of interest (n = 33, 9%) and lack of time (n = 10, 3%). Of the 223 consenting patients, 10 (4%) chose to withdraw from the study, 3 (1%) died prior to returning the survey, and 8 (4%) were lost to follow-up. Of the 202 consenting patients who returned the surveys, 1 (<1%) was found to be ineligible due to cancer stage and was omitted from the analyses. Patients who completed the survey and those who declined participation did not differ with respect to age ($t(261) = .38$, $p = 0.708$), gender ($\chi^2(1) = .86$, $p = 0.407$), or race/ethnicity ($\chi^2(2) = 1.09$, $p = 0.621$).

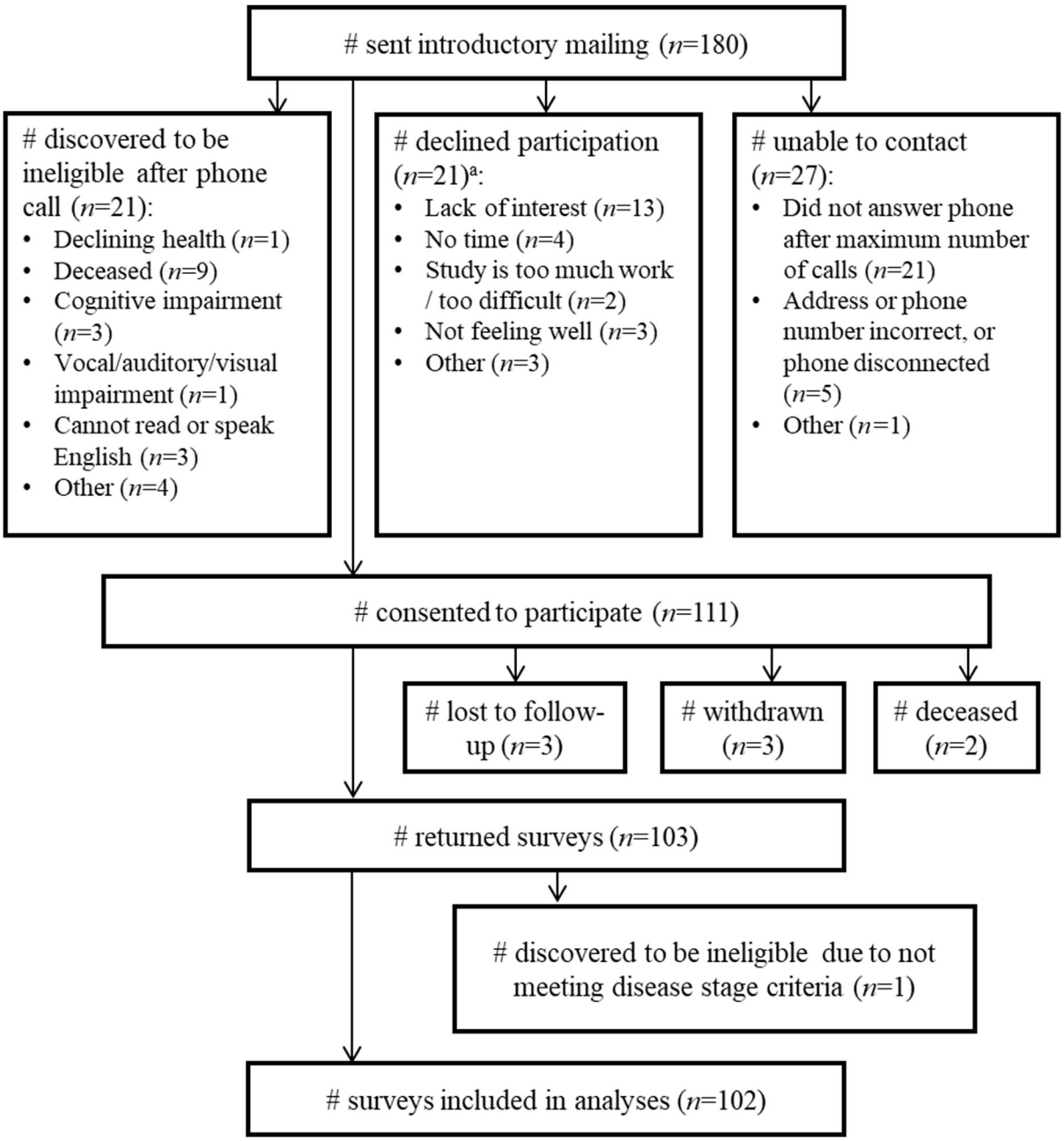

Figure 8. Study flow chart for the advanced lung cancer sample
[a]Some patients provided multiple reasons for declining participation.

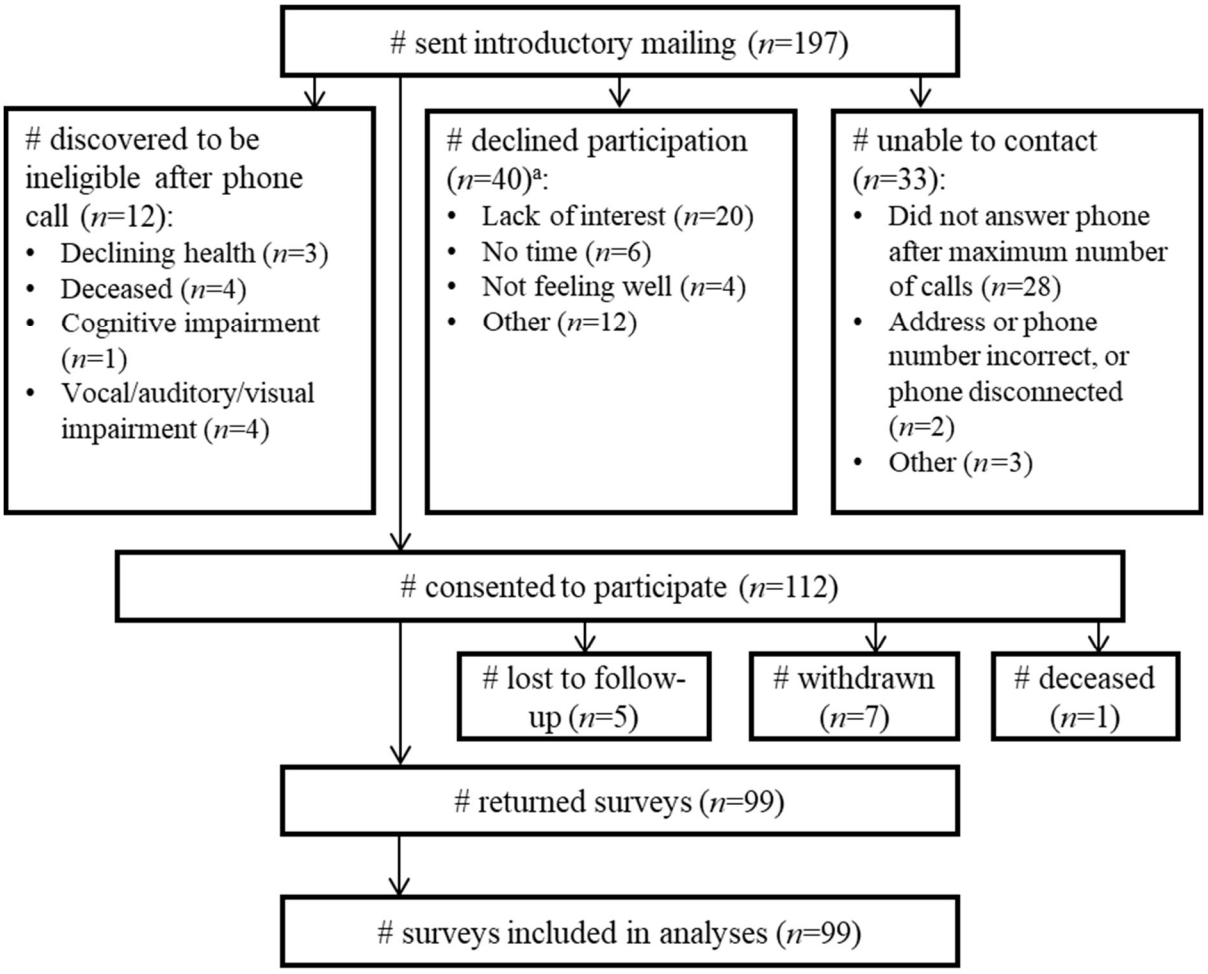

Figure 9. Study flow chart for the advanced prostate cancer sample.
[a]Some patients provided multiple reasons for declining participation.

Participant characteristics are shown in Tables 1 and 2. The sample was mostly non-Hispanic White (85%) with a mean age of 67 (*SD* = 11). The majority of participants were male (72%), married or living with a partner (75%), and had completed at least some college or technical school (72%). Most participants were either retired (51%) or employed full- or part-time (33%). About half of the participants reported household incomes greater than $51,000 (56%). The majority of participants identified as Protestant (70%). Almost half of participants reported engaging in organizational religious activities (e.g., attending church) at least a few times a month (44%) and in non-organizational religious activities such as praying at least once a week (49%). Due to purposive sampling, lung and prostate cancer were evenly represented in the sample. The average time since the advanced or extensive stage diagnosis was 3 years (*SD* = 2.7). Common cancer treatments included surgery (55%), chemotherapy (49%), and hormone therapy (42%). Many participants reported that they previously smoked (48%), and some reported currently smoking (14%). The majority of participants (88%) did not consider themselves to be seriously and terminally ill. Group comparisons showed that age, gender, indicators of socioeconomic status (i.e., education, employment status, income), medical factors (e.g., time since diagnosis, functional status), and smoking status differed significantly between advanced lung and prostate cancer patients (see Tables 1 and 2 for details).

Table 1. Participant Demographic Characteristics

Characteristic	Total Sample (*N = 201*)	Lung Cancer Sample (*n = 102*)	Prostate Cancer Sample (*n = 99*)	Statistic
Age				$t(199) = -2.37$, $p = 0.019$
Mean (SD)	66.71 (10.68)	64.97 (11.86)	68.49 (9.01)	
Range	34.00 - 92.00	34.00 - 92.00	42.00 - 87.00	
Gender, *n* (%)				$\chi^2(2) = 73.91$, $p < 0.001$
Male	145 (72.14%)	47 (46.08%)	98 (98.99%)	
Female	55 (27.36%)	55 (53.92%)	0 (0.00%)	
Other	1 (0.50%)	0 (0.00%)	1 (1.01%)	
Race/ethnicity, *n* (%)				$\chi^2(5) = 3.40$, $p = 0.670$
Non-Hispanic White	171 (85.07%)	84 (82.35%)	87 (87.88%)	
Non-Hispanic Black/African American	22 (10.95%)	13 (12.75%)	9 (9.09%)	
Hispanic	1 (0.50%)	1 (0.98%)	0 (0.00%)	
Asian American	3 (1.49%)	2 (1.96%)	1 (1.01%)	
Native American or Alaska Native	1 (0.50%)	0 (0.00%)	1 (1.01%)	
Multi-racial or other	3 (1.49%)	2 (1.96%)	1 (1.01%)	
Relationship status, *n* (%)				$\chi^2(1) = 7.93$, $p = 0.006$
Married or living with a partner	151 (75.12%)	68 (66.67%)	83 (83.84%)	
Single, divorced, or widowed	50 (24.88%)	34 (33.33%)	16 (16.16%)	
Education level, *n* (%)				$\chi^2(4) = 13.17$, $p = 0.009$
Elementary school or some high school	8 (3.98%)	6 (5.88%)	2 (2.02%)	
High school graduate	47 (23.38%)	28 (27.45%)	19 (19.19%)	
Some college or technical school	54 (26.87%)	32 (31.37%)	22 (22.22%)	
College graduate	48 (23.88%)	24 (23.53%)	24 (24.24%)	
Graduate school	42 (20.90%)	12 (11.76%)	30 (30.30%)	
Missing	2 (1.00%)	0 (0.00%)	2 (2.02%)	
Employment status, *n* (%)				$\chi^2(3) = 15.31$, $p = 0.001$
Employed full- or part-time	67 (33.33%)	27 (26.47%)	40 (40.40%)	
Retired	102 (50.75%)	49 (48.04%)	53 (53.54%)	
Unemployed due to disability	24 (11.94%)	20 (19.61%)	4 (4.04%)	

Table 1, continued.

Other (e.g., student, homemaker, unemployed and looking for a job)	8 (3.98%)	6 (5.88%)	2 (2.02%)	
Household income, *n* (%)				$\chi^2(3) = 7.85$, $p = 0.049$
< $31,000	30 (14.93%)	21 (20.59%)	9 (9.09%)	
$31,000 - $50,999	45 (22.39%)	24 (23.53%)	21 (21.21%)	
$51,000 - $99,999	53 (26.37%)	24 (23.53%)	29 (29.29%)	
≥ $100,000	60 (29.85%)	24 (23.53%)	36 (36.36%)	
Missing	13 (6.47%)	9 (8.82%)	4 (4.04%)	
Religious affiliation, *n* (%)				$\chi^2(3) = 2.21$, $p = 0.534$
Catholic	31 (15.42%)	15 (14.71%)	16 (16.16%)	
Protestant	141 (70.15%)	76 (74.51%)	65 (65.66%)	
Agnostic or Atheist	16 (7.96%)	6 (5.88%)	10 (10.10%)	
Other[a]	10 (4.98%)	4 (3.92%)	6 (6.06%)	
Missing	3 (1.49%)	1 (0.98%)	2 (2.02%)	
Intrinsic religiosity				$t(191) = -1.02$, $p = 0.309$
Mean (SD)	11.34 (3.49)	11.66 (3.18)	11.02 (3.76)	
Range	2.00 - 15.00	3.00 - 15.00	2.00 - 15.00	
Organizational religious activity, *n* (%)				$\chi^2(5) = 4.64$, $p = 0.468$
Never	31 (15.42%)	19 (18.63%)	12 (12.12%)	
Once a year or less	38 (18.91%)	16 (15.69%)	22 (22.22%)	
A few times a year	35 (17.41%)	20 (19.61%)	15 (15.15%)	
A few times a month	25 (12.44%)	14 (13.73%)	11 (11.11%)	
Once a week	42 (20.90%)	18 (17.65%)	24 (24.24%)	
More than once a week	22 (10.95%)	10 (9.80%)	12 (12.12%)	
Missing	8 (3.98%)	5 (4.90%)	3 (3.03%)	
Non-organizational religious activity, *n* (%)				$\chi^2(5) = 7.46$, $p = 0.191$
Rarely or never	65 (32.34%)	28 (27.45%)	37 (37.37%)	
A few times a month	35 (17.41%)	14 (13.73%)	21 (21.21%)	
Once a week	10 (4.98%)	6 (5.88%)	4 (4.04%)	
Two or more times a week	25 (12.44%)	17 (16.67%)	8 (8.08%)	
Daily	47 (23.38%)	25 (24.51%)	22 (22.22%)	
More than once a day	16 (7.96%)	10 (9.80%)	6 (6.06%)	
Missing	3 (1.49%)	2 (1.96%)	1 (1.01%)	

[a]Only some of the participants provided details on their *other* religious affiliation. Examples include "Paganistic Methodist," "Catholic and Protestant," and "I believe in God."

Table 2. Participant Medical Characteristics

Characteristic	Total Sample (*N = 201*)	Lung Cancer Sample (*n = 102*)	Prostate Cancer Sample (*n = 99*)	Statistic
Disease stage, *n* (%)				
NSCLC Stage III-B or III-C	17 (8.46%)	17 (16.67%)	--	
NSCLC Stage IV	78 (38.81%)	78 (76.47%)	--	
SCLC Extensive Stage	7 (3.48%)	7 (6.86%)	--	
Prostate Stage IV	99 (49.25%)	--	99 (100.00%)	
Years since Advanced or Extensive Stage Diagnosis				$t(199) = -2.16, p = 0.032$
Mean (SD)	3.00 (2.71)	2.60 (2.54)	3.41 (2.83)	
Range	0.06 - 15.29	0.06 - 11.30	0.10 - 15.29	
Cancer Treatment History,[a] *n* (%)				
Surgery	110 (54.73%)	31 (30.39%)	79 (79.80%)	$\chi^2(1) = 49.49, p < 0.001$
Chemotherapy	98 (48.76%)	62 (60.78%)	36 (36.36%)	$\chi^2(1) = 11.99, p = 0.001$
Radiation	81 (40.30%)	36 (35.29%)	45 (45.45%)	$\chi^2(1) = 2.16, p = 0.153$
Chemoradiation	26 (12.94%)	26 (25.49%)	0 (0.00%)	$\chi^2(1) = 28.99, p < 0.001$
Targeted therapy	41 (20.40%)	39 (38.24%)	2 (2.02%)	$\chi^2(1) = 40.58, p < 0.001$
Immunotherapy	70 (34.83%)	56 (54.90%)	14 (14.14%)	$\chi^2(1) = 36.77, p < 0.001$
Hormone therapy	84 (41.79%)	2 (1.96%)	82 (82.83%)	$\chi^2(1) = 135.06, p < 0.001$
Clinical trial	25 (12.44%)	15 (14.71%)	10 (10.10%)	$\chi^2(1) = 0.98, p = 0.395$
Other	8 (3.98%)	0 (0.00%)	8 (8.08%)	$\chi^2(1) = 8.58, p = 0.003$
Current Cancer Treatment,[b] *n* (%)				
Chemotherapy	29 (14.43%)	17 (16.67%)	12 (12.12%)	$\chi^2(1) = 0.84, p = 0.424$
Radiation	2 (1.00%)	1 (0.98%)	1 (1.01%)	$\chi^2(1) = 0.00, p = 1.000$
Chemoradiation	3 (1.49%)	3 (2.94%)	0 (0.00%)	$\chi^2(1) = 2.96, p = 0.246$
Targeted therapy	27 (13.43%)	27 (26.47%)	0 (0.00%)	$\chi^2(1) = 30.27, p < 0.001$
Immunotherapy	36 (17.91%)	32 (31.37%)	4 (4.04%)	$\chi^2(1) = 25.53, p < 0.001$
Hormone therapy	58 (28.86%)	2 (1.96%)	56 (56.57%)	$\chi^2(1) = 72.97, p < 0.001$

Table 2, continued.

Clinical trial	5 (2.49%)	3 (2.94%)	2 (2.02%)	$\chi^2(1) = 0.18$, $p = 1.000$
Other	5 (2.49%)	0 (0.00%)	5 (5.05%)	$\chi^2(1) = 5.28$, $p = 0.028$
Patient ECOG score				$t(198) = 3.38$, $p = 0.001$
Mean (SD)	0.94 (0.86)	1.14 (0.88)	0.74 (0.79)	
Range	0.00 - 3.00	0.00 - 3.00	0.00 - 3.00	
Medical comorbidities				$t(199) = 2.46$, $p = 0.015$
Mean (SD)	1.26 (1.05)	1.44 (1.04)	1.08 (1.04)	
Range	0.00 - 5.00	0.00 - 4.00	0.00 - 5.00	
Medical comorbidities, *n* (%)				
Asthma, emphysema, or chronic bronchitis	31 (15.42%)	28 (27.45%)	3 (3.03%)	$\chi^2(1) = 22.97$, $p < 0.001$
High blood pressure or hypertension	105 (52.24%)	55 (53.92%)	50 (50.51%)	$\chi^2(1) = 0.24$, $p = 0.673$
High blood sugar or diabetes	28 (13.93%)	15 (14.71%)	13 (13.13%)	$\chi^2(1) = 0.10$, $p = 0.840$
Arthritis or rheumatism	49 (24.38%)	25 (24.51%)	24 (24.24%)	$\chi^2(1) = 0.00$, $p = 1.000$
Angina, heart failure, or other types of heart disease	20 (9.95%)	10 (9.80%)	10 (10.10%)	$\chi^2(1) = 0.01$, $p = 1.000$
Stroke, seizures, Parkinson's disease, or other neurological condition	10 (4.98%)	5 (4.90%)	5 (5.05%)	$\chi^2(1) = 0.00$, $p = 1.000$
Liver disease	4 (1.99%)	3 (2.94%)	1 (1.01%)	$\chi^2(1) = 0.96$, $p = 0.621$
Kidney or renal disease	7 (3.48%)	6 (5.88%)	1 (1.01%)	$\chi^2(1) = 3.55$, $p = 0.119$
Smoking status, *n* (%)				$\chi^2(2) = 22.91$, $p < 0.001$
Never smoked (or smoked < 100 cigarettes)	76 (37.81%)	22 (21.57%)	54 (54.55%)	
Formerly smoked	96 (47.76%)	62 (60.78%)	34 (34.34%)	
Currently smoke	28 (13.93%)	17 (16.67%)	11 (11.11%)	
Prognostic awareness, *n* (%)				$\chi^2(2) = 9.31$, $p = 0.010$
Seriously and terminally ill	24 (11.94%)	18 (17.65%)	6 (6.06%)	
Seriously ill but not terminally ill	44 (21.89%)	25 (24.51%)	19 (19.19%)	
Relatively healthy	130 (64.68%)	56 (54.90%)	74 (74.75%)	
Missing	3 (1.49%)	3 (2.94%)	0 (0.00%)	

Note. ECOG = Eastern Cooperative Oncology Group. NSCLC = non-small cell lung cancer. SCLC = small cell lung cancer.
[a]Treatment received > 4 weeks before study completion. [b]Treatment received ≤ 4 weeks before study completion.

Descriptive Statistics

Descriptive statistics for the study variables are presented in Table 3. All measures demonstrated good to excellent internal consistency reliability (αs = .83 to .98). All study variables except anger toward God were within normality guidelines (skewness <3.0 and/or kurtosis <10.0) (Kline, 2015). The anger toward God variable was found to have a positive skew and significant kurtosis (skewness = 5.07, kurtosis = 30.74). Thus, data for this variable were logarithmically transformed after adding a constant of 1 to each score to ensure that the smallest logarithmically transformed score was zero.

Table 3. Descriptive Statistics for Main Study Variables

Variable	Total Sample (*N = 201*)	Lung Cancer Sample (*n = 102*)	Prostate Cancer Sample (*n = 99*)	*t*-test
Depressive symptoms				$t(198) = 1.71$, $p = 0.088$
n	200	101	99	
Mean (SD)	49.77 (8.45)	50.78 (8.58)	48.75 (8.23)	
Range	41.00 - 69.50	41.00 - 69.20	41.00 - 69.50	
Skewness	0.41	0.23	0.62	
Kurtosis	-1.03	-1.16	-0.75	
Cronbach's α	0.90	0.88	0.92	
Anxiety				$t(198) = 3.08$, $p = 0.002$
n	200	101	99	
Mean (SD)	51.05 (8.89)	52.92 (8.98)	49.13 (8.41)	
Range	40.30 - 73.30	40.30 - 73.30	40.30 - 69.50	
Skewness	0.22	0.06	0.36	
Kurtosis	-0.99	-0.89	-1.07	
Cronbach's α	0.89	0.88	0.88	
Anger about cancer				$t(199) = 1.07$, $p = 0.287$
n	201	102	99	
Mean (SD)	9.14 (4.00)	9.44 (4.08)	8.84 (3.92)	
Range	4.00 - 23.00	4.00 - 21.00	5.00 - 23.00	
Skewness	0.93	0.78	1.12	
Kurtosis	0.35	-0.17	1.14	
Cronbach's α	0.89	0.90	0.88	
Anger toward God				$t(196) = -0.60$, $p = 0.548$
n	198	100	98	
Mean (SD)	1.63 (5.22)	1.41 (5.15)	1.86 (5.30)	
Range	0.00 - 40.00	0.00 - 40.00	0.00 - 40.00	
Skewness	5.07	5.58	4.67	
Kurtosis	30.74	35.67	28.10	
Cronbach's α	0.96	0.98	0.95	
Anger toward God (log)				$t(196) = -0.90$, $p = 0.370$
n	198	100	98	
Mean (SD)	0.16 (0.36)	0.14 (0.33)	0.19 (0.38)	
Range	0.00 - 1.61	0.00 - 1.61	0.00 - 1.61	
Skewness	2.24	2.63	1.95	
Kurtosis	4.15	6.69	2.67	
Cronbach's α	0.96	0.98	0.95	
Perceived injustice				$t(198) = 2.62$, $p = 0.010$
n	200	101	99	
Mean (SD)	13.08 (10.24)	14.93 (10.87)	11.19 (9.24)	
Range	0.00 - 45.00	0.00 - 45.00	0.00 - 42.00	
Skewness	0.91	0.75	1.06	
Kurtosis	0.59	0.16	1.29	
Cronbach's α	0.93	0.93	0.91	

Table 3, continued.

Meaning making coping				$t(197) = 1.55, p = 0.123$
n	199	101	98	
Mean (SD)	2.99 (0.90)	3.09 (0.85)	2.90 (0.93)	
Range	1.00 - 4.00	1.00 - 4.00	1.00 - 4.00	
Skewness	-0.57	-0.67	-0.47	
Kurtosis	-0.74	-0.56	-0.89	
Cronbach's α	0.90	0.88	0.91	
Acceptance of cancer				$t(198) = -1.84, p = 0.068$
n	200	101	99	
Mean (SD)	16.91 (3.29)	16.49 (3.45)	17.33 (3.07)	
Range	4.00 - 20.00	4.00 - 20.00	5.00 - 20.00	
Skewness	-1.30	-1.24	-1.37	
Kurtosis	1.91	1.75	2.15	
Cronbach's α	0.84	0.83	0.85	
Loneliness				$t(199) = 3.05, p = 0.003$
n	201	102	99	
Mean (SD)	42.91 (8.58)	44.69 (8.71)	41.07 (8.09)	
Range	34.80 - 63.90	34.80 - 63.90	34.80 - 63.90	
Skewness	0.65	0.31	1.10	
Kurtosis	-0.70	-1.01	0.24	
Cronbach's α	0.92	0.90	0.94	

Note. *N*s differ due to missing items.

Missingness

Little's MCAR test suggested that the data were not missing completely at random ($\chi^2(57) = 92.01$, $p = 0.002$). However, less than 2% of data were missing for each main study variable, and overall, less than 5% of data were missing for each variable except for ethnicity and income (5% and 6.5% missing, respectively). Given the small amount of missing data, full information maximum likelihood was used to address the missingness.

Correlations

Pearson correlations were computed to characterize the relationships between study variables (see Table 4). The majority of correlations were statistically significant in the predicted directions, providing preliminary support for my hypotheses. Of note, meaning making was only significantly correlated with acceptance of cancer ($r = 0.16$, $p < 0.05$) and showed correlations approaching zero with all of the other main study variables (rs = -0.09 to 0.01, ps > 0.05).

Table 4. Correlations Between Main Study Variables

	1.	2.	3.	4.	5.	6.	7.
Total Sample (*N* = 201)							
1. Depressive symptoms	--						
2. Anxiety	0.77**	--					
3. Anger about cancer	0.60**	0.59**	--				
4. Anger toward God (log)	0.29**	0.21**	0.37**	--			
5. Perceived injustice	0.60**	0.64**	0.62**	0.35**	--		
6. Meaning making coping	-0.08	-0.04	-0.06	-0.09	0.00	--	
7. Acceptance of cancer	-0.45**	-0.45**	-0.49**	-0.29**	-0.48**	0.16*	--
8. Loneliness	0.59**	0.57**	0.51**	0.27**	0.56**	0.01	-0.36**
Lung Cancer Sample (*n* = 102)							
1. Depressive symptoms	--						
2. Anxiety	0.78**	--					
3. Anger about cancer	0.64**	0.66**	--				
4. Anger toward God (log)	0.15	0.18	0.26**	--			
5. Perceived injustice	0.59**	0.62**	0.64**	0.32**	--		
6. Meaning making coping	-0.12	-0.08	-0.11	-0.08	-0.05	--	
7. Acceptance of cancer	-0.42**	-0.47**	-0.44**	-0.24*	-0.50**	0.23*	--
8. Loneliness	0.59**	0.51**	0.58**	0.27**	0.55**	0.05	-0.27**
Prostate Cancer Sample (*n* = 99)							
1. Depressive symptoms	--						
2. Anxiety	0.75**	--					
3. Anger about cancer	0.56**	0.52**	--				
4. Anger toward God (log)	0.45**	0.29**	0.47**	--			
5. Perceived injustice	0.61**	0.65**	0.60**	0.44**	--		
6. Meaning making coping	-0.08	-0.04	-0.02	-0.09	0.01	--	
7. Acceptance of cancer	-0.46**	-0.40**	-0.53**	-0.37**	-0.43**	0.12	--
8. Loneliness	0.59**	0.59**	0.43**	0.32**	0.54**	-0.07	-0.42**

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

Primary Analyses

Study hypotheses were examined through seven measured-variable path models (see Figures 1 to 7 for proposed conceptual models, Figures 10 to 15 for standardized estimates of the path models, and Appendix D for Mplus syntax). Overall, the majority of the models were saturated; model fit was not evaluated for saturated models (for Models 1-5; see Table 5 for model fit information), and interpretability of the models was examined based on support for the hypothesized pathways.

Aim 1. Hypotheses 1.1-1.4

Model 1 provided support for Hypotheses 1.1-1.4, which posited that higher perceived injustice would be associated with higher depressive symptoms (Hypothesis 1.1), anxiety (Hypothesis 1.2), anger about cancer (Hypothesis 1.3), and anger toward God (Hypothesis 1.4) (see Figure 10). In line with the hypotheses, perceived injustice showed significant, positive associations with depressive symptoms ($\beta = 0.57$, $p < 0.001$), anxiety ($\beta = 0.63$, $p < 0.001$), anger about cancer ($\beta = 0.60$, $p < 0.001$), and anger toward God ($\beta = 0.39$, $p < 0.001$). In total, the model accounted for the following proportions of variance in distress symptoms: 43.8% in depressive symptoms, 49.9% in anxiety, 40.6% in anger about cancer, and 16.7% in anger toward God.

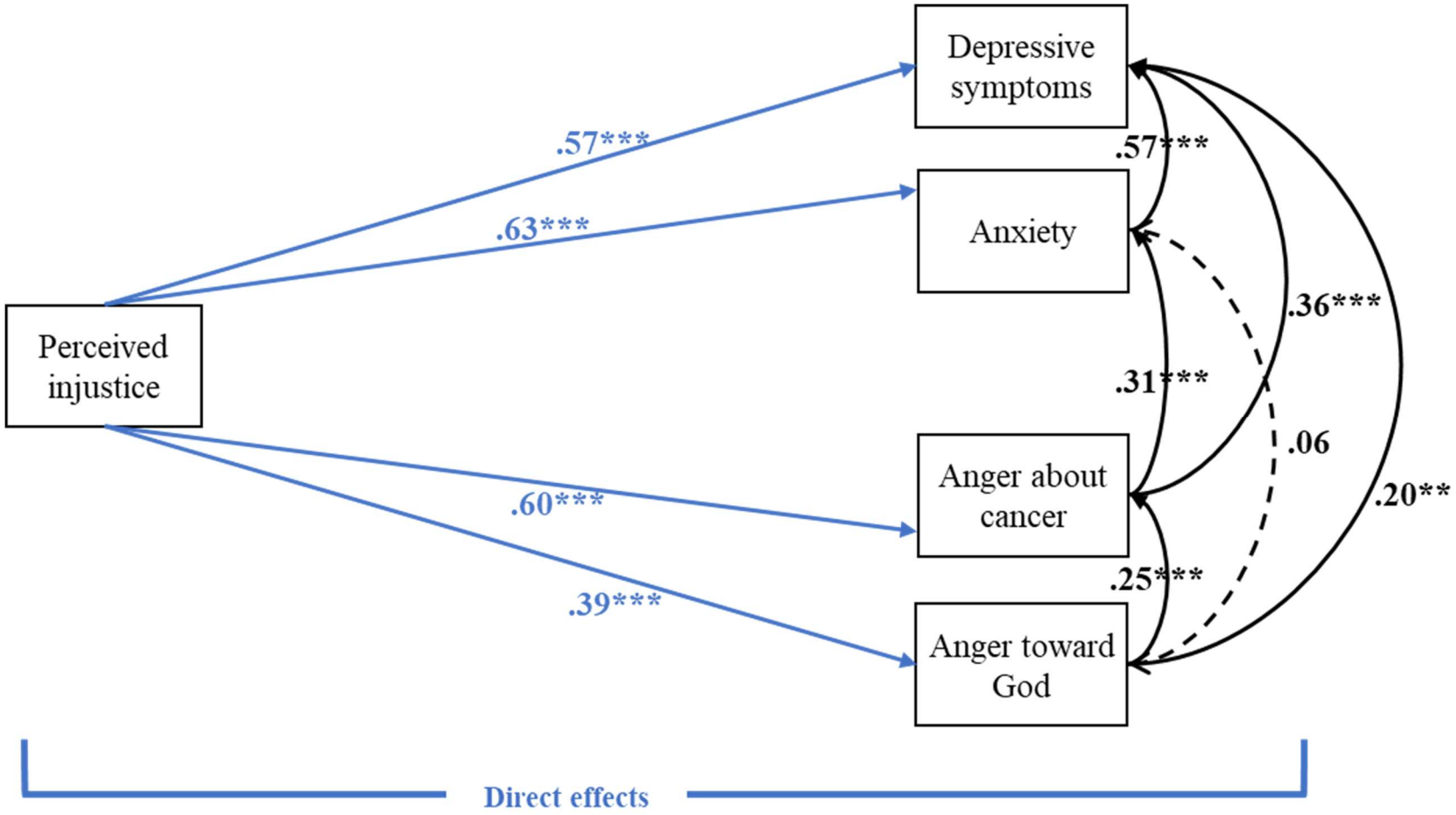

Figure 10. Model 1 (Aim 1) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Aim 2.1. Hypotheses 2.1.1-2.1.4

Model 2 did not provide support for Hypotheses 2.1.1-2.1.4, which posited that meaning making would mediate the relationships between perceived injustice and depressive symptoms (Hypothesis 2.1.1), anxiety (Hypothesis 2.1.2), anger about cancer (Hypothesis 2.1.3), and anger toward God (Hypothesis 2.1.4) (see Figure 11). Meaning making was not related to perceived injustice (β = -0.11, $p > 0.05$) or any of the distress symptoms (βs = -0.11 to -0.04, $ps > 0.05$). Additionally, bootstrapped 95% CIs showed non-significant indirect effects of perceived injustice on distress symptoms through meaning making. In total, the model accounted for the following proportions of variance in distress symptoms: 44.5% in depressive symptoms, 50.1% in anxiety, 40.8% in anger about cancer, and 17.7% in anger toward God.

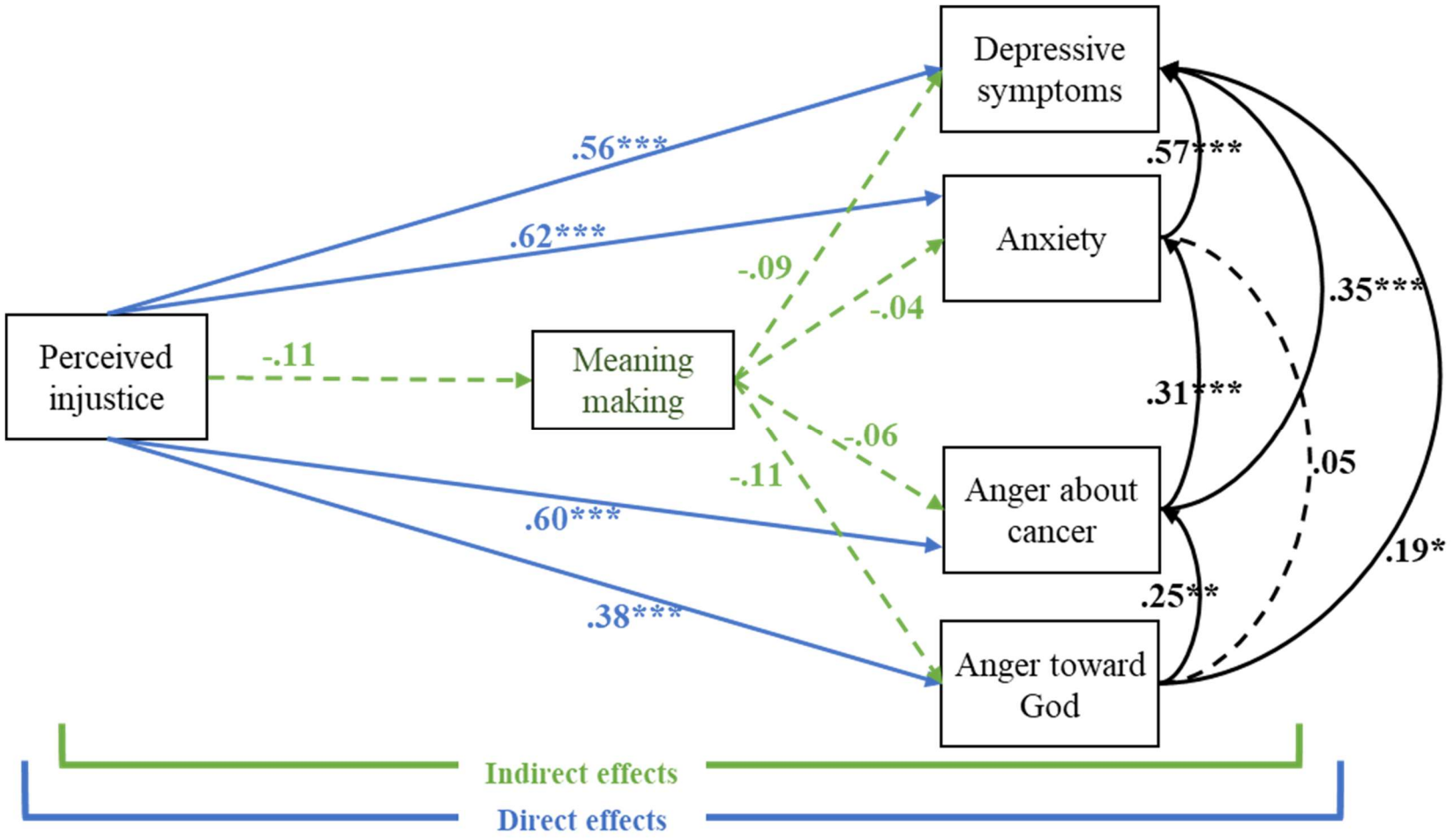

Figure 11. Model 2 (Aim 2.1) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Aim 2.2. Hypotheses 2.2.1-2.2.4

Model 3 provided support for Hypotheses 2.2.1-2.2.4, which posited that acceptance of cancer would mediate the relationships between perceived injustice and depressive symptoms (Hypothesis 2.2.1), anxiety (Hypothesis 2.2.2), anger about cancer (Hypothesis 2.2.3), and anger toward God (Hypothesis 2.2.4) (see Figure 12). Acceptance of cancer was significantly related to perceived injustice (β = -0.51, $p < 0.001$) and the distress symptoms (βs = -0.24 to -0.16, $ps <$ 0.01). Additionally, bootstrapped 95% CIs showed significant indirect effects of perceived injustice on depressive symptoms (β = 0.10, 95% CI: 0.04 to 0.17), anxiety (β = 0.08, 95% CI: 0.02 to 0.15), anger about cancer (β = 0.12, 95% CI: 0.04 to 0.23), and anger toward God (β = 0.10, 95% CI: 0.03 to 0.18) through acceptance of cancer. In total, the model accounted for the following proportions of variance in distress symptoms: 46.5% in depressive symptoms, 51.8% in anxiety, 45.1% in anger about cancer, and 19.4% in anger toward God.

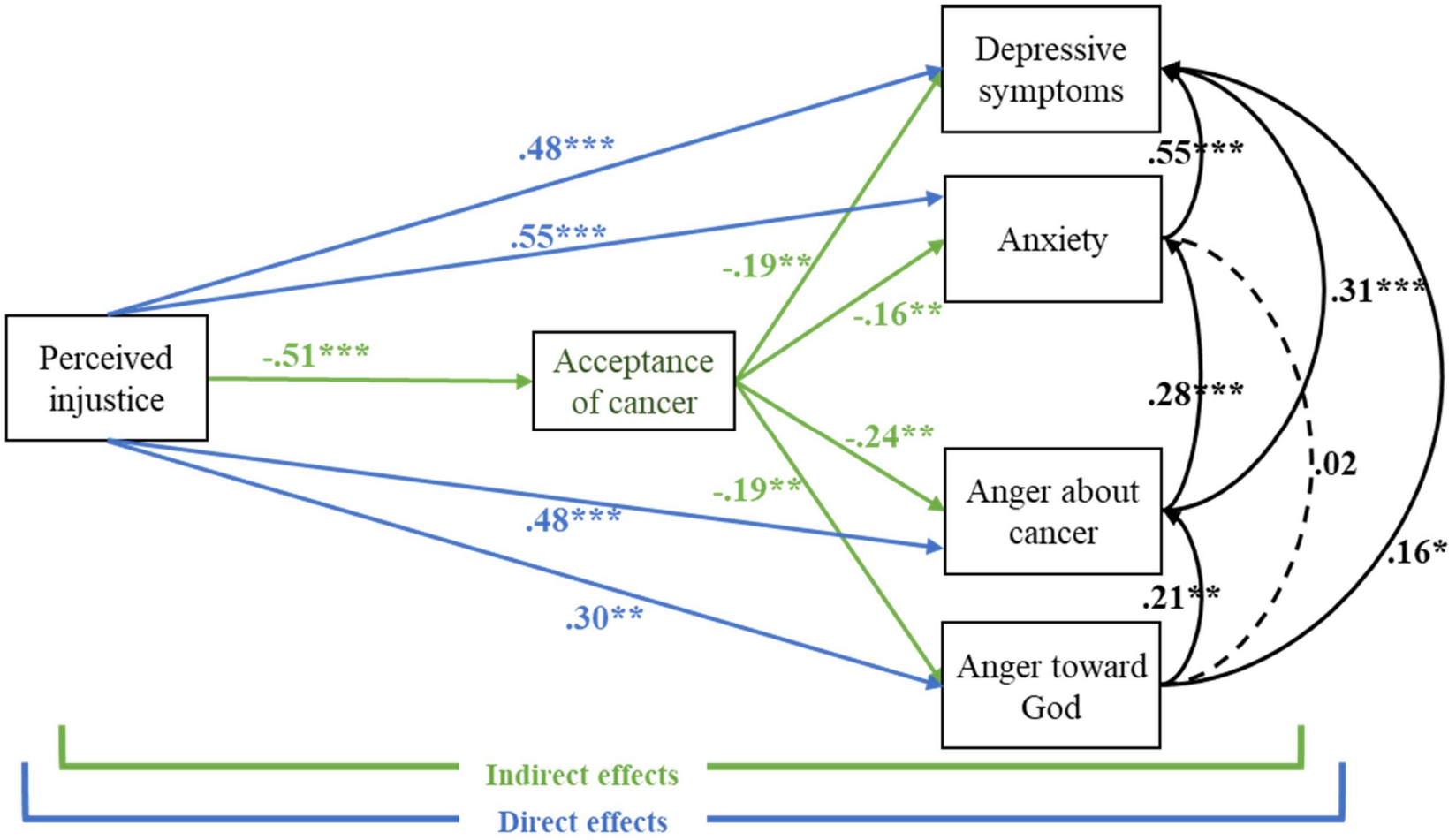

Figure 12. Model 3 (Aim 2.2) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Aim 2.3. Hypotheses 2.3.1-2.3.4

Model 4 provided mixed support for Hypotheses 2.3.1-2.3.4, which posited that acceptance of cancer and meaning making would synchronously mediate the relationships between perceived injustice and depressive symptoms (Hypothesis 2.3.1), anxiety (Hypothesis 2.3.2), anger about cancer (Hypothesis 2.3.3), and anger toward God (Hypothesis 2.3.4) (see Figure 13). Acceptance of cancer was significantly related to perceived injustice (β = -0.51, p < 0.001) and distress symptoms (βs = -0.24 to -0.15, ps < 0.05), whereas meaning making was not significantly related to perceived injustice (β = -0.11, p > 0.05) or any of the distress symptoms (βs = -0.08 to -0.01, ps > 0.05). In line with Hypotheses 2.3.1-2.3.4, bootstrapped 95% CIs showed significant indirect effects of perceived injustice on depressive symptoms (β = 0.09, 95% CI: 0.03 to 0.16), anxiety (β = 0.08, 95% CI: 0.02 to 0.15), anger about cancer (β = 0.12, 95% CI: 0.03 to 0.23), and anger toward God (β = 0.09, 95% CI: 0.02 to 0.17) through acceptance of cancer. However, contrary to hypotheses, bootstrapped 95% CIs showed non-significant indirect effects of perceived injustice on distress symptoms through meaning making. In total, the model accounted for the following proportions of variance in distress symptoms: 46.8% in depressive symptoms, 51.9% in anxiety, 45.1% in anger about cancer, and 19.9% in anger toward God.

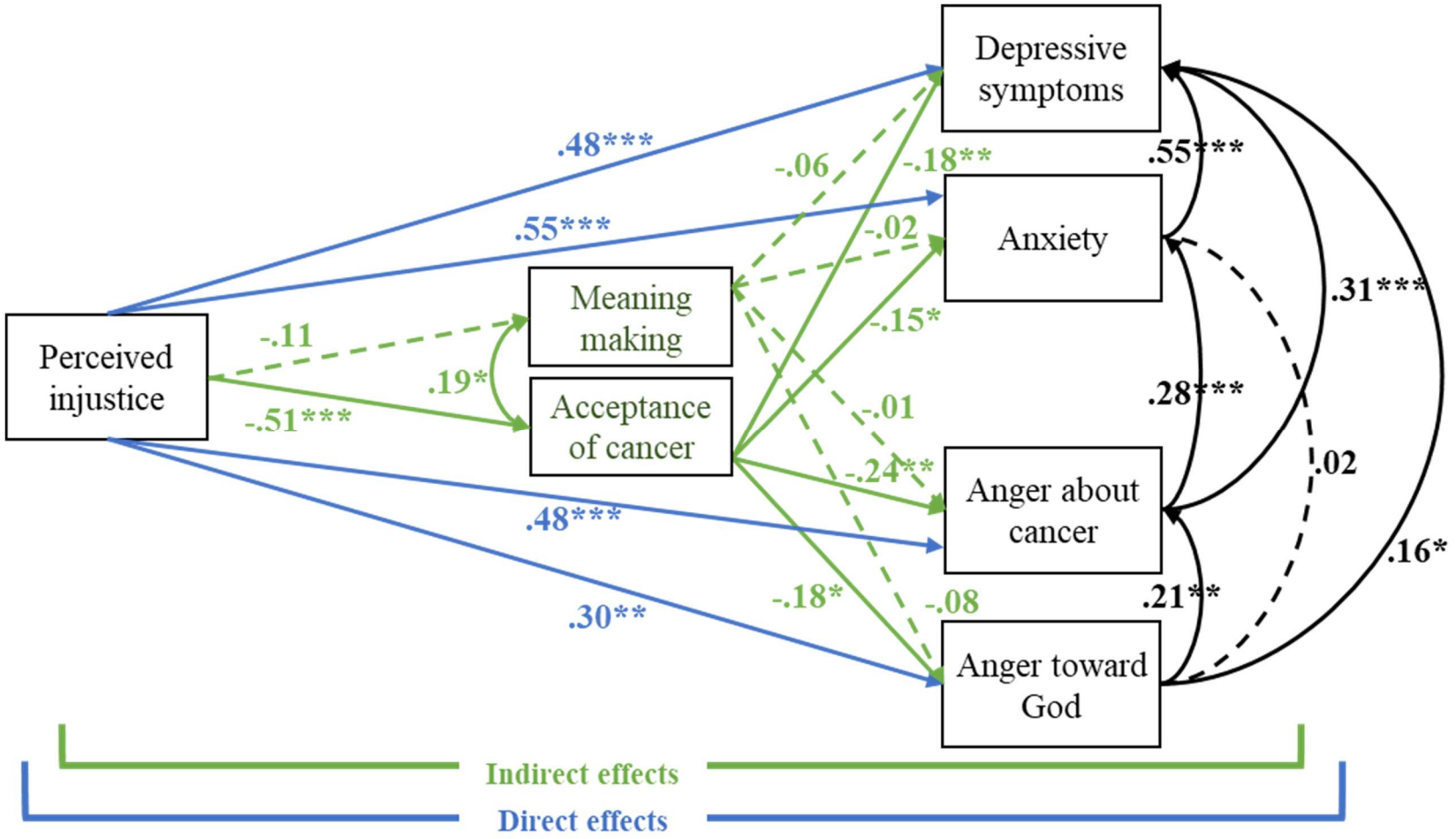

Figure 13. Model 4 (Aim 2.3) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. $^{*}p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

Aim 2.4. Hypotheses 2.4.1-2.4.5

Model 5 did not provide support for Hypotheses 2.4.1-2.4.5, which posited that meaning making would mediate the relationships between perceived injustice and depressive symptoms (Hypothesis 2.4.1), anxiety (Hypothesis 2.4.2), anger about cancer (Hypothesis 2.4.3), anger toward God (Hypothesis 2.4.4), and acceptance of cancer (Hypothesis 2.4.5) (see Figure 14). Meaning making was not related to perceived injustice (β = -0.11, $p > 0.05$) or any of the distress symptoms (βs = -0.11 to -0.05, $ps > 0.05$). Meaning making was only significantly associated with acceptance of cancer (β = 0.18, $p < 0.05$). Contrary to Hypotheses 2.4.1-2.4.5, bootstrapped 95% CIs showed non-significant indirect effects of perceived injustice on distress symptoms and acceptance of cancer through meaning making. In total, the model accounted for the following proportions of variance in distress symptoms and acceptance of cancer: 44.5% in depressive symptoms, 50.1% in anxiety, 40.8% in anger about cancer, 17.7% in anger toward God, and 26.7% in acceptance of cancer.

Aim 2.5. Hypothesis 2.5

Comparison of Models 4 and 5 provided support for Hypothesis 2.5, which posited that Model 4 (from Aim 2.3) would better explain the relationships between perceived injustice and distress outcomes than Model 5 (from Aim 2.4). Model fit indices were not examined because both models were saturated; instead, model interpretability and the direction and statistical significance of each hypothesized path were examined. As described above, Model 4 was partially in line with Hypotheses 2.3.1-2.3.4, indicating that acceptance of cancer was a significant mediator of the relationships between perceived injustice and distress symptoms, whereas Model 5 did not support any of Hypotheses 2.4.1-2.4.5, indicating that meaning making was not a significant mediator of these relationships.

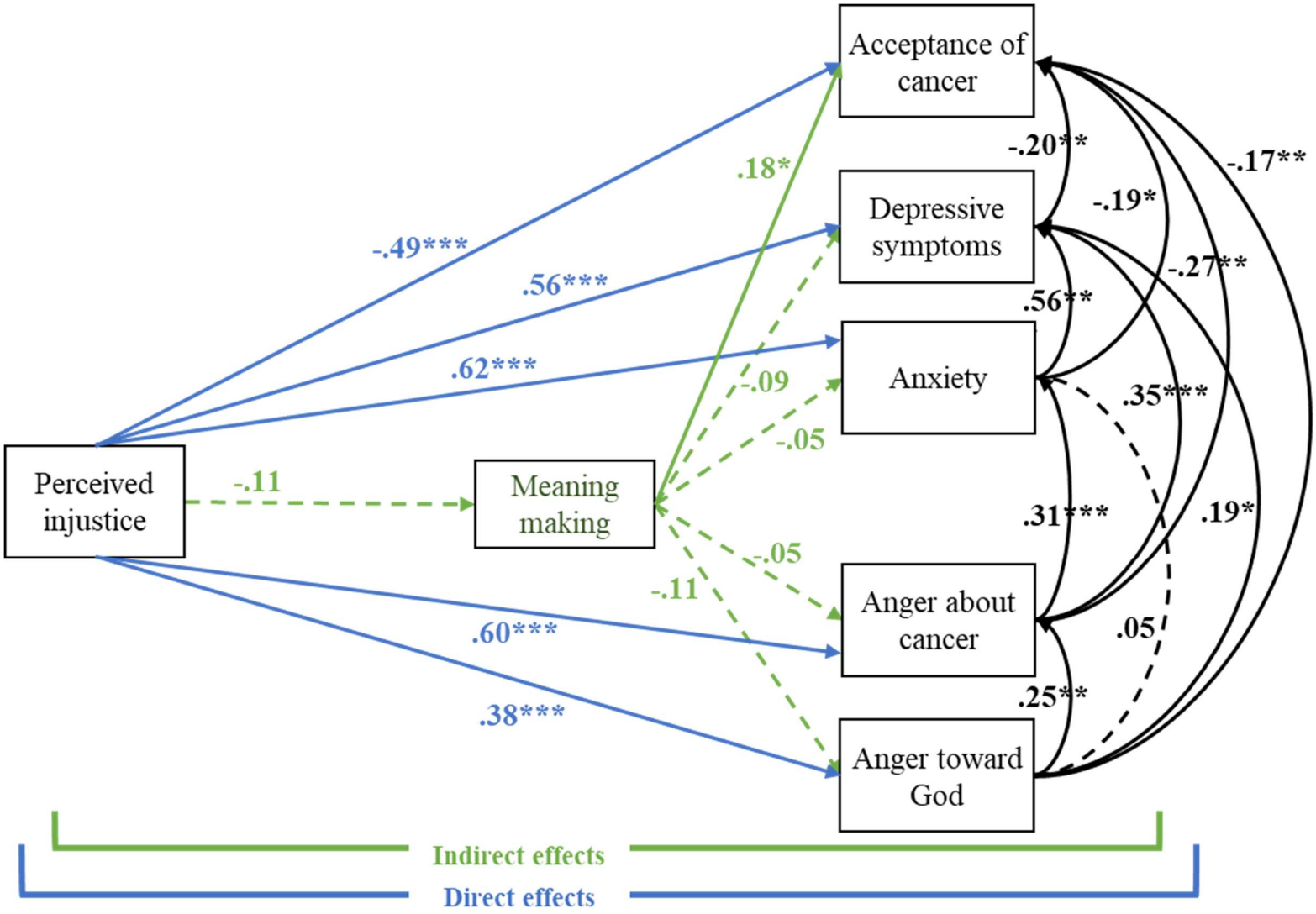

Figure 14. Model 5 (Aim 2.4) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Aim 3. Hypotheses 3.1-3.2

Model 6 did not provide support for Hypotheses 3.1-3.2, which posited that the relationships between perceived injustice and the processes of meaning making (Hypothesis 3.1) and acceptance of cancer (Hypothesis 3.2) would be stronger with increasing loneliness in Model 4 (from Aim 2.3). Contrary to Hypotheses 3.1 and 3.2, loneliness was not a significant moderator of the relationships between perceived injustice and the processes of meaning making and acceptance of cancer. In total, the model accounted for the following proportions of variance in distress symptoms: 46.8% in depressive symptoms, 51.8% in anxiety, 45.1% in anger about cancer, and 19.9% in anger toward God.

Aim 4

A multiple group path analysis approach was used to examine potential differences between the advanced lung and prostate cancer patient samples in Model 6. Given that nearly all prostate cancer patients were male, gender was not a covariate in the multiple group analysis (see Figure 7 for Model 7). To test for weak invariance across groups, the chi-square statistic from a model with all parameters allowed to be freely unequal across groups (no constraints) was compared to the chi-square statistic from a model with the parameters constrained to be equal across groups. The model with all parameters freely estimated in the two groups had poor model fit (CFI = 0.93, TLI = 0.54, RMSEA = 0.16, SRMR= 0.04, $\chi^2(16) = 59.05$). The weak invariance model with parameters constrained to be equal had better model fit (CFI = 0.90, TLI = 0.85, RMSEA = 0.09, SRMR= 0.08, $\chi^2(65) = 122.01$). However, the difference was not statistically significant ($\Delta\chi^2(49) = 62.96$, $p = 0.087$). These findings suggest that model fit did not significantly differ across groups.

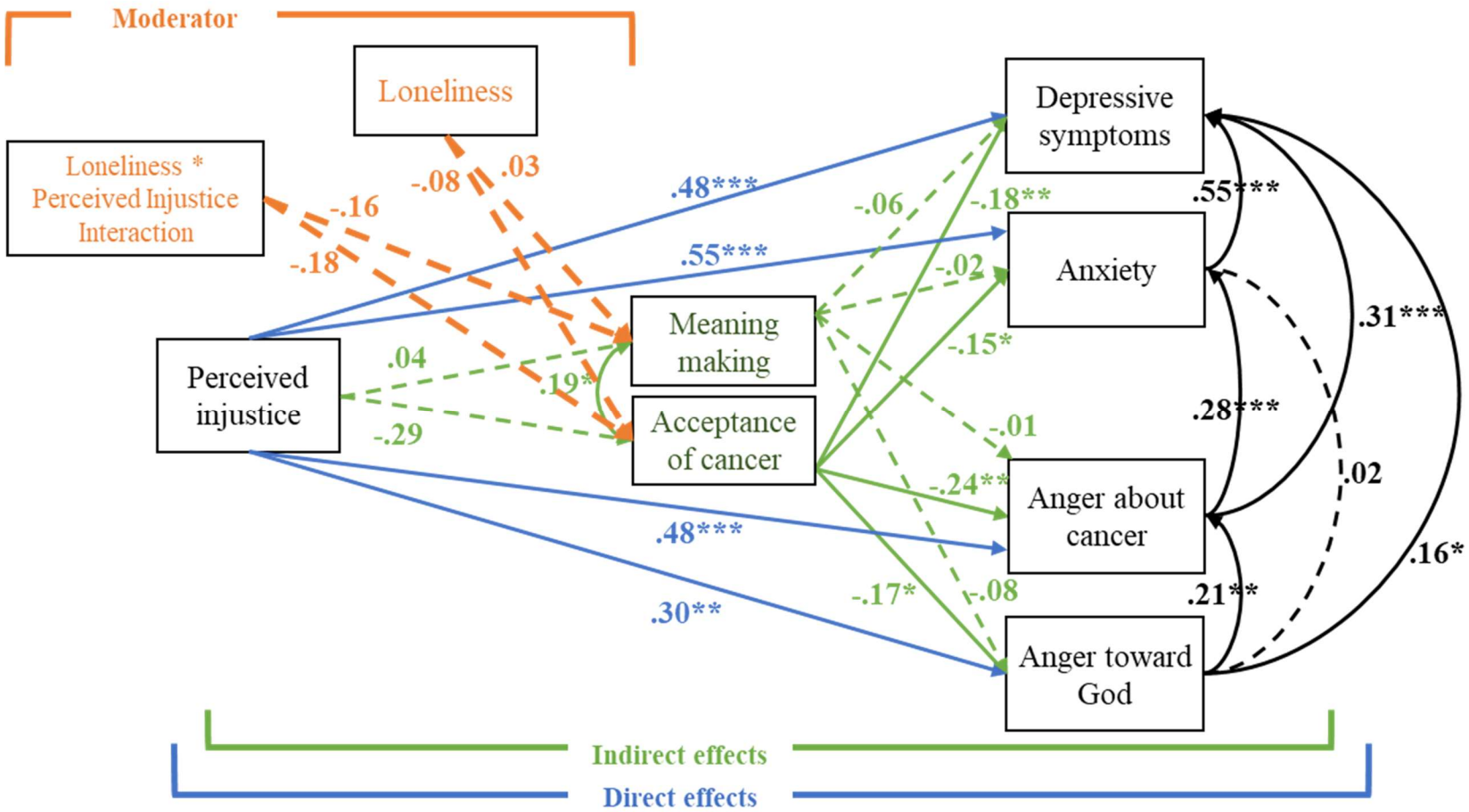

Figure 15. Model 6 (Aim 3) with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, number of medical comorbidities, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 5. Goodness of Fit Indices for Proposed Models

Model	Model Description	Fit Indices					
		χ^2 (*p*-value)	CFI	TLI	RMSEA	SRMR	AIC
Proposed Models:							
1	Aim 1: Perceived injustice is directly related to distress symptoms[a] while controlling for covariates[b].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	3640.58
2	Aim 2.1: The relationships between perceived injustice and distress symptoms are mediated by meaning making while controlling for covariates[b].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	4149.89
3	Aim 2.2: The relationships between perceived injustice and distress symptoms are mediated by acceptance of cancer while controlling for covariates[b].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	4613.83
4	Aim 2.3: The relationships between perceived injustice and distress symptoms are mediated by meaning making and acceptance of cancer synchronously while controlling for covariates[b].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	5120.74
5	Aim 2.4: The relationships between perceived injustice and psychological outcomes (i.e., distress symptoms and acceptance of cancer) are mediated by meaning making while controlling for covariates[b].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	5120.74
6	Aim 3: Loneliness moderates the relationships between perceived injustice and meaning making and acceptance of cancer in the model from Aim 2.3 (Model 4).	29.60 (p <0.001)	0.96	0.74	0.12	0.03	5126.25
7	Aim 4: The model described in Aim 3 (Model 6)[c] may differ between advanced lung and prostate cancer patients. No parameter constraints were applied, allowing lung and prostate cancer sample parameters to differ freely.	59.05 (p <0.001)	0.93	0.54	0.16	0.04	5212.80
7	Aim 4: The model described in Aim 3 (Model 6)[c] may differ between advanced lung and prostate cancer patients. All parameters were constrained to be equal in the lung and prostate cancer samples.	122.01 (p <0.001)	0.90	0.85	0.09	0.08	5177.76

Note. AIC = Akaike information criterion. CFI = Comparative fit index. RMSEA = Root mean square error of approximation. SRMR = Standardized root mean square residual. TLI = Tucker Lewis fit index.

[a]Distress symptoms include depressive symptoms, anxiety, anger about cancer, and anger toward God.

[b]Covariates include age, gender, number of medical comorbidities, and functional status.

[c]Covariates include age, number of medical comorbidities, and functional status. Gender is excluded from this model due to limited variance among prostate cancer patients.

Supplemental Analyses

Given the overall poor model fit and mixed support for the hypotheses related to Model 6, a supplemental path analysis was conducted. In line with theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006; Lerner, 1980; Lerner & Miller, 1978), prior research (Sturgeon et al., 2016), and the guidance of model fit indices, the following supplemental Model 8 was examined in which the relationships between perceived injustice and distress symptoms are mediated by acceptance of cancer and loneliness synchronously while controlling for covariates (i.e., age, gender, and functional status) (see Figure 16 for the proposed model, Figure 17 for the standardized parameter estimates, and Table 6 for model fit information). Based on modification index values, medical comorbidities were excluded from the supplemental model to reduce error variance.

Model 8 was saturated; thus, model fit indices were not examined. Acceptance of cancer was significantly related to perceived injustice (β = -0.50, $p < 0.001$) and the distress symptoms (βs = -0.22 to -0.14, $ps < 0.05$). Bootstrapped 95% CIs showed significant indirect effects of perceived injustice on depressive symptoms (β = 0.08, 95% CI: 0.03 to 0.15), anxiety (β = 0.07, 95% CI: 0.01 to 0.14), anger about cancer (β = 0.11, 95% CI: 0.04 to 0.21), and anger toward God (β = 0.09, 95% CI: 0.03 to 0.17) through acceptance of cancer. In addition, loneliness was significantly related to perceived injustice (β = 0.55, $p < 0.001$) and the distress symptoms (βs = 0.17 to 0.28, $ps < 0.05$). Bootstrapped 95% CIs showed significant indirect effects of perceived injustice on depressive symptoms (β = 0.15, 95% CI: 0.07 to 0.25), anxiety (β = 0.11, 95% CI: 0.03 to 0.18), anger about cancer (β = 0.11, 95% CI: 0.04 to 0.21), and anger toward God (β = 0.09, 95% CI: 0.001 to 0.19) through loneliness. In total, the model accounted for the following proportions of variance in distress symptoms: 51.3% in depressive symptoms, 54.0% in anxiety, 46.9% in anger about cancer, and 21.0% in anger toward God.

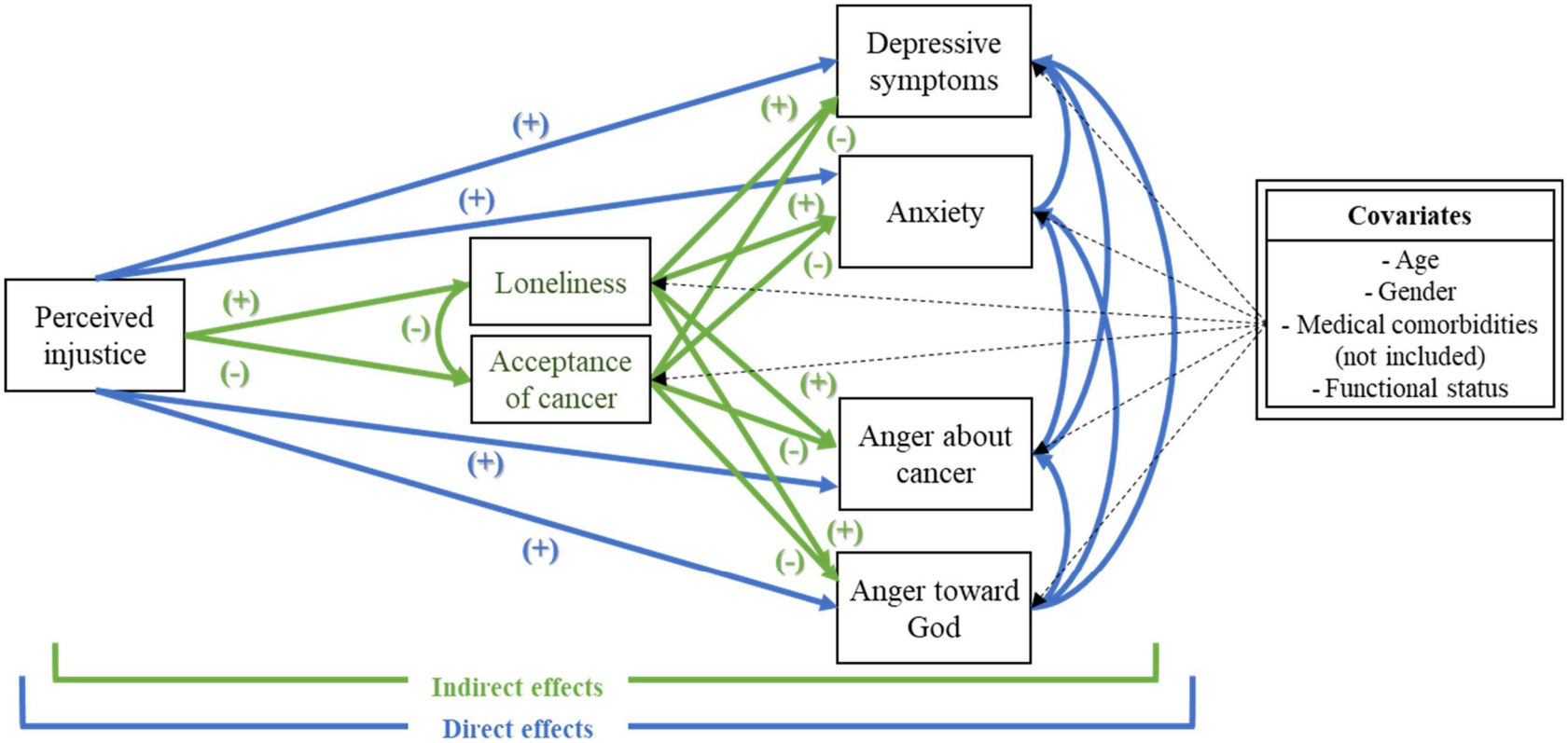

Figure 16. Proposed supplemental Model 8 depicting direct and indirect effects of perceived injustice on distress symptoms through acceptance of cancer and loneliness.

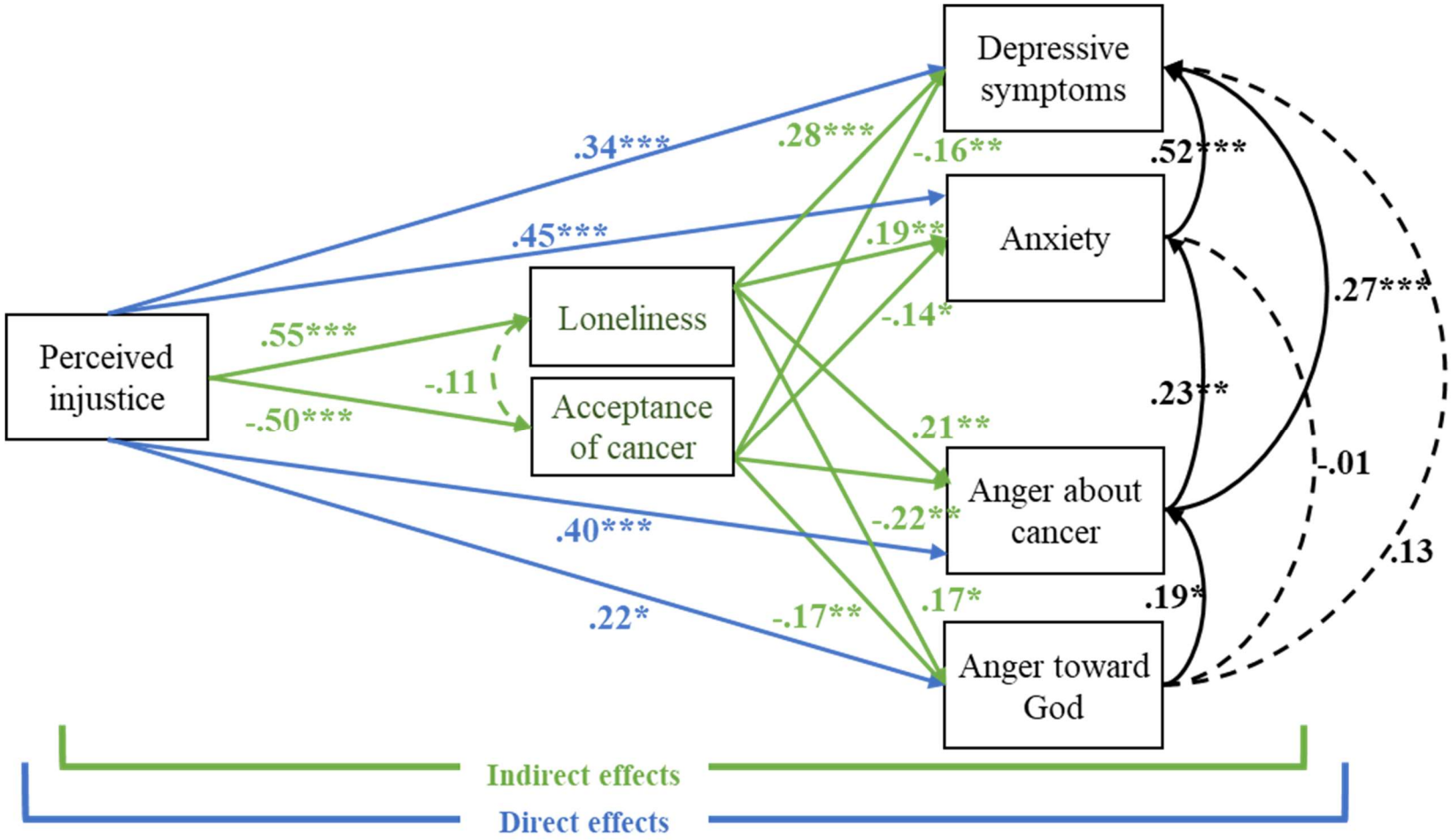

Figure 17. Supplemental Model 8 with standardized estimates.

Note. Paths represented with solid lines are statistically significant at $p < 0.05$, and dashed lines are non-significant. Included covariates are age, gender, and functional status. Covariates are not shown for ease of interpretation. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 6. Goodness of Fit Indices for Supplemental Models

Model	Model Description	Fit Indices					
		χ^2 (*p*-value)	CFI	TLI	RMSEA	SRMR	AIC
Supplemental Models:							
8	The relationships between perceived injustice and distress symptoms are mediated by acceptance of cancer and loneliness synchronously while controlling for covariates[a].	0.00 (p <0.001)	1.00	1.00	0.00	0.00	5921.44
8	Model 8[b] may differ between advanced lung and prostate cancer patients. No parameter constraints were applied, allowing lung and prostate cancer sample parameters to differ freely.	26.20 (p <0.001)	0.97	0.66	0.18	0.04	6012.40
8	Model 8[b] may differ between advanced lung and prostate cancer patients. All parameters were constrained to be equal in the lung and prostate cancer samples.	62.46 (p = 0.010)	0.96	0.94	0.08	0.08	5982.67

Note. AIC = Akaike information criterion. CFI = Comparative fit index. RMSEA = Root mean square error of approximation. SRMR = Standardized root mean square residual. TLI = Tucker Lewis fit index.

[a]Covariates include age, gender, and functional status. Medical comorbidities are excluded from this model to reduce error variance.

[b]Covariates include age and functional status. Medical comorbidities are excluded from this model to reduce error variance. Gender is excluded from this model due to limited variance among prostate cancer patients.

A multiple group path analysis approach was used to explore potential differences between advanced lung and prostate cancer patient samples in Supplemental Model 8 (excluding gender as a covariate due to limited variance in the prostate cancer sample). To test for weak invariance across groups, the chi-square statistic from a model with all parameters allowed to be freely unequal across groups was compared to the chi-square statistic from a model with the parameters constrained to be equal across groups (see Table 6 for model fit information). The model with all parameters freely estimated in the two groups had poor model fit (CFI = 0.97, TLI = 0.66, RMSEA = 0.18, SRMR= 0.04, $\chi^2(6) = 26.20$). The weak invariance model with parameters constrained to be equal had better model fit (CFI = 0.96, TLI = 0.94, RMSEA = 0.08, SRMR= 0.08, $\chi^2(39) = 62.46$). However, the difference was not statistically significant ($\Delta\chi^2(39) = 36.27$, $p = 0.319$). These findings suggest that the model did not significantly differ across cancer groups.

DISCUSSION

The purpose of this study was to examine relations between perceived injustice and distress symptoms and their potential mediators among advanced lung and prostate cancer patients. Illness-related *perceived injustice*, or appraisals reflecting the severity and irreparability of the illness, blame, and a sense of unfairness, may be a risk factor for distress, especially among advanced cancer patients. However, to my knowledge, prior research has not examined injustice perceptions related to the cancer experience, and little is known about potential processes through which injustice appraisals are associated with distress. Based on Just World Theory (Lerner, 1980; Lerner & Miller, 1978), Park's Meaning Making Model (2010, 2013), and Loneliness Theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006), there are multiple ways to conceptualize relationships between perceived injustice and distress. In this study, two theory-based conceptualizations of these relationships were compared. First, based on my conceptualization, meaning making and acceptance of cancer were examined as potential mediators of the relationships between perceived injustice and distress symptoms. Second, based on Park's Meaning Making Model (2010, 2013), meaning making was examined as a mediator of the relations between perceived injustice and psychological outcomes (i.e., distress symptoms and acceptance of cancer). Then, within my conceptual model, loneliness was explored as a potential moderator of the mediations and associations were compared between advanced lung and prostate cancer patients. Findings provided mixed support for the proposed models. Specifically, perceived injustice was directly and indirectly associated with distress symptoms through acceptance of cancer but not meaning making. Additionally, loneliness did not significantly moderate these mediations, and the associations did not differ between advanced lung and prostate cancer patients. Meaning making also did not mediate the association between perceived injustice and acceptance of cancer.

Aim 1: Relations between Perceived Injustice and Distress Symptoms

Regarding the first aim, in line with Just World Theory (Lerner, 1980; Lerner & Miller, 1978), perceived injustice was positively associated with distress symptoms (i.e., depressive symptoms, anxiety, anger about cancer, and anger toward God). One potential explanation is that

patients with greater injustice appraisals view themselves as victims of their illness and circumstances. Violations of their core assumptions about the world as inherently predictable and fair may contribute to a negative cognitive style. For example, patients may engage in greater catastrophizing (i.e., a cognitive distortion that involves assuming the worst and exaggerating the negative elements of the situation) and rumination (McParland & Knussen, 2016; Rodero et al., 2012; Sullivan et al., 2012; Sullivan et al., 2014). These cognitive processes may lead to greater depressive symptoms and anxiety (Boon & Brown, 2020; McLaughlin & Nolen-Hoeksema, 2011). Similarly, perceived injustice may play a role in patients' anger about their cancer experience as well as their anger towards God for allowing this to happen and not miraculously healing them.

Alternatively, higher levels of distress in advanced cancer patients may lead to greater perceived injustice. For example, distressed patients might engage in upward social comparisons—comparing themselves to individuals in better situations (Arigo et al., 2014; Swallow & Kuiper, 1988). These comparisons might lead to feelings of unfairness and perceived injustice (Arigo et al., 2014). In addition, distressed patients may seek negative feedback (e.g., criticism) or excessive reassurance, which may frustrate others, resulting in rejection or avoidance of the patient (Coyne, 1976; Hames et al., 2013). These interpersonal struggles may play a role in patients' perceptions of injustice.

Similar positive associations between perceived injustice and distress symptoms have been observed among people with chronic pain and those with major depressive disorder (Carriere et al., 2020; Carriere et al., 2018; Lynch et al., 2021; Martel et al., 2017; Sullivan et al., 2020). For example, higher levels of perceived injustice were associated with greater catastrophizing and distress among people with chronic pain (Rodero et al., 2012; Sturgeon et al., 2017). Furthermore, recent studies with these populations have suggested that perceived injustice is a distinct antecedent of distress (Scott et al., 2015; Sullivan et al., 2020). One study of patients with chronic pain found that pre-treatment perceived injustice was predictive of change in depressive symptoms over the course of a rehabilitation program (Scott et al., 2015), suggesting that these perceptions might play a role in persistent depressive symptoms. Another study with patients with major depressive disorder showed that during a behavioral activation intervention, early treatment reductions in perceived injustice predicted reductions in depressive symptoms later in treatment, whereas early treatment changes in depressive symptoms failed to predict

subsequent changes in perceived injustice (Sullivan et al., 2020). The directionality of relationships between perceived injustice and distress symptoms could not be determined in the present cross-sectional study; thus, further research is needed to explore potential bi-directional relationships between these variables.

Aim 2: Meaning Making and Acceptance of Cancer as Potential Mediators

For the second aim, meaning making and acceptance of cancer were examined as potential mediators of the relationships between perceived injustice and distress symptoms. Contrary to hypotheses, meaning making was unrelated to perceived injustice and distress symptoms and, thus, did not mediate relationships between these variables. Although the relationship between perceived injustice and meaning making has not been previously examined, prior research, in contrast to the current findings, has found that greater meaning making is associated with lower distress in cancer patients (Kvillemo & Bränström, 2014; Park et al., 2020; Park et al., 2008). These prior findings are in line with Park's Meaning Making Model (2010, 2013). According to this model, meaning making involves reappraising a stressful situation such as cancer in a more positive light, reducing the discrepancy between the situational meaning and global meanings and thereby reducing distress.

There are a number of potential explanations for the current null relations between meaning making and distress symptoms. First, theorists have argued that meaning making leads to better psychological adjustment when positive meanings are made (Park, 2010; Segerstrom et al., 2003). Conversely, until discrepancies between situational and global meanings are resolved, meaning making attempts or searching for meaning may be positively associated with distress (Park, 2010; Segerstrom et al., 2003). Research with cancer patients has supported these hypotheses; although the presence of meaning in life or meanings made has been negatively associated with distress (Winger et al., 2016), searching for meaning has been positively associated with distress (Kernan & Lepore, 2009; Tomich & Helgeson, 2002). Thus, the present findings may reflect the wide variability in time since diagnosis (i.e., 4 weeks to 15 years), with patients at various stages of the meaning making process. In other words, while some patients may have been experiencing distress related to their meaning making efforts, other patients may have made positive meanings from their experience. However, the average time since the

advanced cancer diagnosis was 3 years and, thus, many patients had sufficient time to engage in meaning making.

Second, meaning making may not be as central to psychological adjustment when illness is perceived as less threatening. The majority (88%) of patients in this study did not classify their illness as terminal, and most patients (65%) considered themselves to be relatively healthy. According to Park's Meaning Making Model (2010, 2013), individuals engage in meaning making processes when there are discrepancies between their global meanings (e.g., "the world is a safe, just, controllable place") and situational meanings (e.g., "this is unfair, everything is out of control"). When patients consider their illness to be curable, these discrepancies may be less severe, and other coping strategies such as planning may be more adaptive for their psychological adjustment. For example, one study showed that among advanced cancer patients, greater use of meaning making (assessed as positive reinterpretation) was associated with better quality of life and less depressive symptoms only among those who accurately identified their terminal illness status (Nipp et al., 2017).

Third, some theorists have argued that individuals who do not engage in meaning making are better off than those who do (Bonanno et al., 2005; Wortman & Silver, 2001). For example, Bonanno and colleagues (2005) have proposed that meaning making could be part of unproductive rumination reflecting greater distress. Specifically, in the context of bereavement, they found that initial grief processing, a variant of meaning making, was a strong predictor of long-term grief processing and distress rather than adaptive recovery. In other words, continued meaning making efforts were akin to unproductive rumination and led to long-term distress (2005). However, the items of the current meaning making measure do not appear to reflect rumination, but, rather, positive reinterpretation of the cancer experience.

Fourth, findings may reflect limitations in the measurement of meaning making. Park (2010) noted that while meaning making includes both deliberate coping efforts (e.g., using positive reinterpretation, problem-focused coping) and automatic processes (e.g., intrusive thoughts that lead to less discrepancy between the appraised meaning of the stressor and global meanings), most measures do not incorporate both of these aspects (Park & George, 2013). In addition, patients may not be aware of their automatic meaning making efforts. For example, when diagnosed with terminal cancer, an individual with global meanings such as "the world is a just, orderly, controllable place" may appraise their situation as unfair and uncontrollable. To

reduce the discrepancy between these meanings, individuals may engage in deliberate meaning making efforts such as trying to positively reframe the events. They may also have intrusive thoughts about their illness (e.g., "Why me?" or "I did not deserve this."), which could also facilitate integration of the global meanings with the situational meanings. To date, researchers have used measures reflecting various conceptualizations of meaning making (Park, 2010; Park & George, 2013). In general, automatic meaning making processes have been assessed with measures of intrusive thoughts such as the Impact of Event Scale (Horowitz et al., 1979) or the Event-Related Rumination Inventory (Cann et al., 2011). However, these measures are also conceptualized as indices of post-traumatic stress; thus, the extent to which these measures assess automatic meaning making vs. distress is not clear (Park, 2010; Park & George, 2013). Regarding deliberate meaning making, some researchers have simply asked participants whether they have been trying to make sense of their situation or search for meaning, whereas others have used subscales of coping instruments (Park, 2010; Park & George, 2013).

The present study used the COPE Positive Reinterpretation subscale (Carver et al., 1989), a common measure of deliberate meaning making focused on personal growth and learning from experience (Park, 2010; Park & George, 2013). However, it is restricted in its scope—the items do not include other meaning making strategies such as revising goals, problem-focused coping, or activating spiritual beliefs and experiences. In addition, one of the items (i.e., "I learn something from the experience") can be considered *meanings made* rather than a meaning making process. Indeed, some prior studies using this measure have failed to identify significant associations between meaning making and distress in cancer patients (e.g., David et al., 2006; Stanton et al., 2000).

Finally, these null findings may reflect sample characteristics. For instance, the study sample tended to have limited distress with few patients reporting anger about cancer and anger toward God and many patients endorsed high levels of meaning making. This limited variability may have reduced my ability to identify significant relations between meaning making and other study variables. In this primarily White Protestant sample, the high levels of reported meaning making may reflect strong cultural expectations for religious-based meaning making, rather than actual meaning making. In general, Christian cancer patients may rely on various theodicies (i.e., philosophical/theological explanations of human suffering) (Hall & Johnson, 2001; Rice, 2014). In the current sample, it is possible that participants mainly relied on the "soul-making

theodicy"–the explanation that suffering is essential for moral growth and character development (Lundmark, 2016; McMartin et al., 2020; Rice, 2014). Given the limited anger towards God in the sample, patients may have also relied on the "perfect plan theodicy" that God is in complete control and everything that happens to them is part of God's perfect plan, or the "free will theodicy" that God never meant for individuals to suffer, and suffering is a consequence of misused free will (Rice, 2014). Theodicies were not measured in this study; thus, future research is needed to clarify how theodicies may impact meaning making and the associations between perceived injustice and distress. Additionally, this retrospective report of meaning making may not accurately represent their change over time. Indeed, a recent study with patients who had undergone hematopoietic stem-cell transplantation compared retrospective vs. prospective reports of post-traumatic growth—a form of meanings made—and found weak non-significant correlations between these measurements (Corman et al., 2021).

The present null findings also suggest that patients' meaning making efforts were not related to perceived injustice. Although Park's Meaning Making Model (2010, 2013) assumes that discrepancies between global and situational meanings (e.g., just world violations) lead to meaning making attempts, studies have found mixed evidence for the link between these appraisals and meaning making (Park, 2010; Park & Fenster, 2004; Park et al., 2001). For example, among cancer survivors, reports that having cancer violated their belief in a just world were unrelated to meaning making as measured by positive reinterpretation coping (Park et al., 2008). Violations of global just world beliefs were not examined in this study; thus, further research may explore the relations between this variable and perceived injustice and meaning making in a cancer context.

Consistent with Just World Theory (Lerner, 1980; Lerner & Miller, 1978) and my hypothesis, acceptance of cancer mediated relationships between perceived injustice and distress symptoms. Results suggest that acceptance of cancer may be a process or coping strategy by which patients come to terms with their illness and its perceived unfairness, leading to reduced distress. Conversely, when the illness is perceived as unjust or the result of someone else's negligence, patients may struggle to accept it, resulting in heightened distress. It is possible that patients with higher levels of perceived injustice may be less willing to make peace with their illness and engage in meaningful actions despite their illness. These individuals may also use maladaptive coping strategies (e.g., avoidance, emotional numbing, and behavioral

disengagement) that contribute to increased distress (e.g., Kvillemo & Bränström, 2014; Morris et al., 2018). Indeed, similar results were found among people with chronic pain; greater perceived injustice was associated with lower pain acceptance, which, in turn, was associated with greater distress (Ysidron et al., 2020).

Alternatively, cancer patients with greater acceptance of their illness might be less likely to perceive their illness as unjust, which, in turn, might lead to less distress. For example, patients who feel loved and have a greater sense of inner peace may be less likely to focus on the unfairness of their illness. Indeed, the present study used the Peace, Equanimity, and Acceptance in the Cancer Experience scale (PEACE; Mack et al., 2008), a widely used measure of peaceful acceptance of cancer which includes items such as "*Do you feel well loved now.*" However, this measure has been criticized, as it does not assess different aspects of acceptance (e.g., behavioral willingness, nonjudgmental stance towards thoughts and feelings about cancer) or acceptance of specific cancer-related stressors (e.g., the prospect of death, changes in physical appearance, role changes) (Secinti et al., 2019). Thus, future studies measuring acceptance of cancer as a multifaceted construct might show more complex relations between perceived injustice, acceptance, and distress symptoms.

As part of Aim 2, two theoretical conceptualizations of the relations between perceived injustice and distress were compared: (1) my integration of Just World Theory (Lerner, 1980; Lerner & Miller, 1978) and Park's Meaning Making Model (2010, 2013), or the hypothesis that meaning making and acceptance of cancer would synchronously mediate the relationships between perceived injustice and distress symptoms, and (2) Park's Meaning Making Model (2010, 2013) which posited that meaning making would mediate the relationships between perceived injustice and psychological outcomes including distress symptoms and acceptance of cancer. Contrary to both conceptualizations, meaning making was not a significant mediator of the relationships between perceived injustice and distress symptoms. Further, contrary to Park's Meaning Making Model (2010, 2013), meaning making was not a significant mediator of the relationship between perceived injustice and acceptance of cancer. In line with my integrated model, results provided support for acceptance of cancer as a mediating process rather than an outcome (i.e., *meanings made*). Thus, findings suggest that when patients perceive their cancer experience as an injustice, engaging in acceptance but not meaning making coping may lead to lower distress. In other words, rather than being caught up in efforts to control or positively

reinterpret their injustice perceptions, adopting an open, compassionate, and accepting stance may allow patients to experience cancer-related realities with greater ease. Future research is needed to assess the directionality of these relationships.

Comparisons of the current findings to prior literature should be made with caution. Some studies have measured meaning making by combining measures of acceptance of cancer, positive reinterpretation, and other coping scales (e.g., Boehmer et al., 2007; Gan et al., 2013). Indeed, Park stated that "If meaning making is defined more broadly to include a variety of coping strategies (e.g., Folkman, 1997), the wider literature regarding effects of the use of coping involving positive reinterpretation, religious coping, emotional social support, acceptance, and emotional processing coping on adjustment should also be considered" (2010, p. 286). Thus, the divergence of the present results from the meaning making literature may reflect differences in definitions and measurement of meaning making.

Aim 3: Loneliness as Potential Moderator

Contrary to Loneliness Theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006) and hypotheses, the strength of associations between perceived injustice and the processes of meaning making and acceptance of cancer did not differ by level of loneliness. Loneliness Theory suggests that lonely people experience greater social constraints and struggle to engage in cognitive and emotional processing of their illness experience with significant others, which is crucial to meaning making and acceptance of cancer (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006). Accordingly, it was hypothesized that among patients with greater loneliness, increased perceived injustice would be more likely to lead to decreased meaning making and acceptance of cancer. However, results did not support this hypothesis; loneliness was not a significant moderator of these associations. In addition, when loneliness was introduced to the model, neither meaning making nor acceptance of cancer significantly mediated associations between perceived injustice and distress symptoms. Findings suggest that the relationship between perceived injustice and acceptance of their illness did not vary based on participants' level of loneliness. However, these results should be interpreted with caution, as moderation analyses were underpowered due to the sample size and range restriction for the loneliness variable. Compared to U.S. population norms, almost all participants in this study reported

loneliness scores within normal limits, with few reporting mild to moderate levels of loneliness (Cella et al., 2010; Rothrock et al., 2010).

Alternative relations among these variables warrant mention. Even though loneliness was not a significant moderator of the mediations, correlational analyses showed that greater loneliness was significantly associated with higher levels of perceived injustice, lower acceptance of cancer, and greater distress symptoms. Perceived injustice and loneliness may be interrelated. Specifically, patients with a negative cognitive style may be more likely to perceive their cancer experience as unjust and perceive the quality of their relationships as unsatisfactory. It is also possible that when patients have greater perceptions of injustice related to their cancer experience, this leads to disrupted relationships and an increasing sense of social isolation associated with distress. Perceived unfairness and blame, key aspects of perceived injustice, are tied to social experiences. Perceptions of unfairness are likely to involve a degree of social comparison. In addition, patients may direct feelings of blame towards others responsible for treating their illness (e.g., medical providers) or providing care (e.g., family caregivers), thereby harming their relationships. These experiences may lead to loneliness, a risk factor for distress among cancer patients (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006; Cacioppo, Hughes, et al., 2006). Although these associations have not been examined in cancer patients, studies with people with chronic pain have suggested that perceived injustice may influence their level of loneliness, perhaps by increasing conflict with significant others due to feeling misunderstood (Sturgeon et al., 2016; Sullivan et al., 2014; Trost et al., 2015). For example, one study found that among patients with chronic pain, social isolation significantly mediated the relationship between perceived injustice and anger (Sturgeon et al., 2016).

Aim 4: Exploring Potential Group Differences between Advanced Lung and Prostate Cancer Patients

Potential differences in the model for Aim 3 between advanced lung and prostate cancer patients were explored. The associations between perceived injustice and distress symptoms were similar across groups. Thus, cancer type may not impact the strength or direction of the relationship between perceived injustice and distress symptoms. In other words, irrespective of their experiences related to cancer type (e.g., life expectancy, smoking-related stigma, masculinity-related losses), patients who perceive greater injustice may be more likely to

experience distress. However, this study only explored differences between advanced lung and prostate cancer patients; thus, the extent to which findings generalize to patients with diverse cancer types warrants study.

Alternatively, these findings may reflect the lack of significant differences in main study variables between advanced lung and prostate cancer patients. Indeed, these groups reported similar levels of meaning making, acceptance of cancer, depressive symptoms, anger about cancer, and anger towards God. On the other hand, lung cancer patients reported greater perceived injustice, anxiety, and loneliness. These null findings may also reflect limitations regarding the sample size and covariates. Although this study included 200 participants, this is a relatively small sample size for complex models, which limited statistical power for detecting group differences in the moderated mediation model (Kline, 2015). To maximize power, only a few covariates were included in the analyses, which may have reduced my ability to identify group level differences.

Supplemental Findings

Aiming to improve model fit and interpretability, supplemental analyses examined a revised conceptualization of the relations between perceived injustice regarding cancer and distress symptoms. Based on Just World Theory (Lerner, 1980; Lerner & Miller, 1978), Loneliness Theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006), and a prior study (Sturgeon et al., 2016), the revised model explored whether acceptance of cancer and loneliness synchronously mediated the relationships between perceived injustice and distress symptoms. Findings supported the model, showing that greater perceived injustice was associated with lower levels of acceptance of cancer and greater loneliness, which, in turn, were associated with greater distress symptoms. In other words, when patients believe that their cancer experience is not fair, they may struggle to accept this experience. They may also withdraw from their social network, feel constrained in discussing their cancer experience with family and friends, and experience greater loneliness. Additionally, loneliness may be related to interpersonal conflict. In a lung cancer context in particular, patients who feel that the illness is unjust may perceive that others do not validate their viewpoint, resulting in heightened distress.

The temporal order of these associations warrants further study. Patients with negative appraisals of their illness may subsequently generalize their negative appraisals to their relations

with other people, the world, and the future, thereby experiencing greater loneliness and distress. Alternatively, patients with chronic distress prior to the cancer diagnosis may be more likely to perceive their illness as an injustice, struggle to accept the illness, and experience loneliness.

It is also possible that psychological inflexibility plays a role in patients' perceived injustice, acceptance of the illness, and pursuit of valued social relationships. From an Acceptance and Commitment Therapy (ACT) perspective, people with higher psychological inflexibility struggle with mindful awareness and acceptance of the present moment, show cognitive fusion (i.e., allowing thoughts to overly influence behavior), and have difficulty aligning actions with personal values (Hayes et al., 2006). Thus, patients who dwell on the unfairness of their cancer experience to the extent that they refuse to accept this reality or withdraw from meaningful relationships and activities may be showing psychological inflexibility. This inflexibility increases their risk of further suffering. Indeed, prior studies have shown that greater psychological inflexibility is associated with lower levels of acceptance of cancer and greater distress among cancer patients (Fashler et al., 2018; González-Fernández & Fernández-Rodríguez, 2019; Hulbert-Williams & Storey, 2016; Lewson et al., 2020; Mosher et al., 2021).

Limitations

Limitations of this study should be noted. Given the cross-sectional design, the directionality of associations cannot be inferred. Additionally, the majority of the sample was non-Hispanic White, male, well-educated, living with a partner, and Christian. All participants were residing in the midwestern United States and were diagnosed with either advanced lung or prostate cancer. Thus, generalizability of the findings may be limited due to sample characteristics. Furthermore, many participants endorsed low levels of distress symptoms and loneliness. Of note, 79% of the participants reported no anger toward God. Therefore, range restrictions may have limited my ability to detect significant associations.

Limitations related to self-report data and measurement error should also be considered. Self-report data may be influenced by social desirability and recall biases. Additionally, current measures of meaning making and acceptance of cancer may be restricted in their scope (Park & George, 2013; Secinti et al., 2019). For example, Park (2010) highlighted that positive reinterpretation coping is only one aspect of deliberate meaning making; the broader construct of

meaning making could also include problem-focused coping or automatic processing of intrusive thoughts. Similarly, the PEACE measure (Mack et al., 2008) used in this study to assess acceptance mainly focuses on having a sense of inner peace. It does not assess the multifaceted nature of acceptance of cancer (e.g., behavioral willingness, acceptance of specific cancer-related stressors such as role changes) (Secinti et al., 2019).

Limitations related to data availability should also be noted. Data were collected as part of a larger study examining advanced cancer patients' health and well-being. Thus, some relevant constructs such as participants' global beliefs (e.g., just world beliefs), religious coping strategies, and theodicies were not assessed to reduce participant burden. In addition, cancer-specific measures of anxiety and depressive symptoms were not administered, and one might hypothesize that such assessments would be more highly correlated with cancer-related perceptions of injustice than general anxiety and depression measures. However, in the present study, measures of general anxiety and depressive symptoms were highly correlated with anger about cancer, and path analyses found highly similar associations between perceived injustice and each of these distress symptoms (i.e., anxiety, depressive symptoms, and anger about cancer). Moreover, studies measuring general and cancer-related distress often find moderate to high positive correlations between these measures (e.g., Deimling et al., 2006; Gibbons et al., 2016). Finally, despite the relatively large sample size, there was limited power to examine moderation and cancer group differences in the moderated mediation model.

Implications and Directions for Future Research and Clinical Practice

Building on these findings, important directions for future research in advanced cancer may be proposed. First, Park's Meaning Making Model (2010, 2013) could be more fully assessed by including measures of automatic (e.g., intrusive thoughts) and deliberate (e.g., positive reinterpretation, problem-focused coping) meaning making processes. Assessments could also include measures of global meaning (e.g., beliefs about the world) and meanings made (e.g., post-traumatic growth). Additionally, researchers may continue to examine potential mechanisms through which cancer-related perceived injustice might lead to increased distress and identify subgroups of patients who are at higher risk for distress symptoms. For example, based on an ACT framework (Hayes et al., 2006) and Loneliness Theory (Cacioppo et al., 2014; Cacioppo, Hawkley, et al., 2006), mindful illness-related communication and social withdrawal

may be tested as mediators of the effect of perceived injustice on distress. Researchers could also test potential moderators of the effect of perceived injustice on distress, such as prognostic awareness, religiosity, theodicies, smoking status, cancer-related stigma, and cancer type. Longitudinal studies could assess the directionality of associations between perceived injustice and distress symptoms. Moreover, findings warrant replication in diverse samples of cancer patients, especially with respect to cancer type, socioeconomic status, and cultural or religious contexts. For example, Yamada et al. (2016) found differences in the factor structure of the perceived injustice measure between American and Japanese patients with chronic pain and argued that these could be related to cultural differences in responses to emotional situations (Lim, 2016a).

Findings also have a number of important implications for assessment and intervention in clinical practice. Clinicians working with cancer patients may assess perceived injustice related to the cancer experience. This information could be useful when developing a case conceptualization that informs the development of a behavioral treatment plan tailored to the patients' needs. For example, clinicians could inquire about patients' theodicies and discuss potential religious coping strategies if patients express injustice appraisals associated with anger toward God. In addition, clinicians could discuss effective anger management strategies or self-advocacy within the healthcare system if patients report injustice appraisals and anger towards the medical system or staff. Clinicians should consider systemic inequalities in healthcare, especially regarding racial minorities and those with low income, when deciding on the intervention approach (Minas et al., 2021; Trinh et al., 2017; Zavala et al., 2021). Further, informing medical staff of the patient's perceived injustice and feelings of anger might prompt strategies to improve the working alliance with the patient. Indeed, one descriptive study in chronic pain found that patients with higher perceived injustice expressed higher levels of anger in general, which, in turn, was associated with poor working alliance with rehabilitation professionals (Scott et al., 2016).

Regarding interventions, the present findings provide preliminary support for targeting acceptance of cancer rather than meaning making (or positive reinterpretation) to reduce distress symptoms related to perceived injustice. Thus, clinicians may use acceptance-based interventions such as ACT to foster cognitive defusion (i.e., getting disentangled from thoughts) and acceptance of cancer-related experiences. To date, ACT has shown preliminary evidence of

efficacy in reducing distress in cancer patients (Fashler et al., 2018; Li, Wu, et al., 2021; Li, Li, et al., 2021; Zhao et al., 2021). Recent meta-analyses in cancer patients found moderate to large effects of ACT on general distress, anxiety, and depressive symptoms, especially in the short-term (Li, Wu, et al., 2021; Li, Li, et al., 2021; Zhao et al., 2021). However, among cancer patients, acceptance-based interventions have not targeted anger about cancer or anger towards God.

Several interventions have been adapted to ameliorate pain-related perceptions of injustice among patients with chronic pain, showing preliminary evidence of efficacy (Scott et al., 2015; Scott et al., 2019; Sullivan et al., 2009; Yakobov et al., 2016). For example, rehabilitation programs combining exercise with coping strategies and self-management skills led to small improvements in pain-related perceptions of injustice (Scott et al., 2015; Sullivan et al., 2009; Yakobov et al., 2016). Similarly, an interdisciplinary ACT-based program resulted in significant improvement in perceived injustice from pre- to post-treatment (Scott et al., 2019). However, no intervention study has specifically targeted perceived injustice in cancer patients. Thus, intervention research targeting cancer-related perceived injustice is an important future direction. For example, adaptations could be made to ACT for cancer patients, such as increasing mindful awareness of injustice appraisals, promoting cognitive defusion and acceptance of cancer-related thoughts and feelings, and encouraging mindful illness-related communication with their treatment team and close others.

Conclusions

To my knowledge, this study was the first to examine perceived injustice related to the cancer experience and its relations with distress outcomes. Findings indicate that among advanced lung and prostate cancer patients, perceived injustice was directly associated with distress symptoms and indirectly related to these symptoms through acceptance of cancer and loneliness. Contrary to Park's Meaning Making Model (2010, 2013), meaning making was unrelated to perceived injustice and distress symptoms. Further research is needed to assess the temporal order of relations among study variables. Examining the role of perceived injustice in distress across diverse cancer patients and identifying mediators of this relationship will inform the development and tailoring of future interventions to improve psychological adjustment to cancer.

APPENDIX A. MEDICAL RECORD SCREENING FORM

Indiana University Health
Survey of Health and Well-Being in Advanced Cancer Patients
Screening Form (to determine eligible patients)

Date: _____/_____/_____
Patient's Name: _____
MRN: _____

Eligibility Screening: Record Review and Physician Contact	**Yes**	**No**
1) Is the patient ≥3 weeks post-diagnosis of inoperable stage IIIB, IIIC, or stage IV non-small cell lung cancer? ☐ ← (if yes, check one) ***/or/*** Is the patient ≥3 weeks post-diagnosis of inoperable extensive stage small cell lung cancer? ☐ ***/or/*** Is the patient ≥3 weeks post-diagnosis of stage IV prostate cancer? ☐		
2) Has received care at an IU Health University Hospital, including the Indiana University Simon Cancer Center?		
3) Is 18 years of age or older?		
4) Can speak and read English?		
5) Has ***NO*** severe cognitive impairment (see page 2 below for cognitive screener)?		
*All boxes must be checked "Yes" for patient to be eligible for the study***.**		

☐ **Patient agreed to participate:**
Consent Date: ___/___/___

☐ **Patient declined participation (please check ALL that apply):**
(1) ___ Not interested
(2) ___ Not feeling well or has other health reasons
(3) ___ No time
(4) ___ Study participation is too much work/Too difficult
(5) ___ Other (specify): _____

Patient Age: ____
Patient Gender: _____
Patient Race: _____

APPENDIX B. INFORMATION COLLECTED FROM MEDICAL RECORDS

Medical Record Information (retrieved for consenting patients only)

Patient's Demographics:

(1) Age: _____

(2) Gender: ☐ Male ☐ Female

Patient's Cancer History:

(1) ☐ stage IIIB non-small cell lung cancer; date of Diagnosis: ____/____/_____
(2) ☐ stage IIIC non-small cell lung cancer; date of Diagnosis: ____/____/_____
(3) ☐ stage IV non-small cell lung cancer; date of Diagnosis: ____/____/_____
(4) ☐ extensive stage small cell lung cancer; date of Diagnosis: ____/____/_____
(5) ☐ stage IV prostate cancer; date of Diagnosis: ____/____/_____

Treatments for Cancer (check all that have been received at any time):

☐ Surgery
☐ Chemotherapy
☐ Radiation
☐ Chemoradiation (concurrent chemotherapy and radiation)
☐ Targeted therapy
☐ Immunotherapy
☐ Hormone therapy
☐ Other: _____

Treatments for Cancer (check all that are <u>current</u> treatments; last dose given ≤ 4 weeks ago):

☐ Chemotherapy
☐ Radiation
☐ Chemoradiation (concurrent chemotherapy and radiation)
☐ Targeted therapy
☐ Immunotherapy
☐ Hormone therapy
☐ Other: _____

APPENDIX C. STUDY QUESTIONNAIRES

Indiana University Health

Study ID: _____

We deeply appreciate you taking the time to complete this survey. Please be assured that the completed questionnaires are kept strictly confidential; to help ensure this, please **do not write your name or any other identifying information anywhere on this packet**. We will identify you using your Study ID above, so please do not remove this page.

Please read all the instructions carefully as they vary from page to page, and provide the most honest and accurate answers possible. This survey will likely take 30 minutes to complete. You may notice that some of the items seem repetitive; however, each item is uniquely important.

If you have any questions or concerns, please call the research team at (317) 278-2989 or email us at cancerq@iu.edu.

Please respond to the following items by marking one line per question, except where instructed otherwise.

1. What ethnicity do you consider yourself to be?

   ___Hispanic or Latino/a

   ___non-Hispanic or Latino/a

2. What race do you consider yourself to be? Check all that apply.

- White
- Black or African American
- Asian American
- Native American or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Other (please specify): _____

3. What is your marital status?

   ___Living with partner

   ___Married

   ___Separated

   ___Divorced

   ___Widowed

   ___Single

4. What is your current employment status?

   ___Employed full-time

   ___Employed part-time

   ___Student

   ___Homemaker

   ___Retired

   ___Unemployed, looking for work

   ___Unemployed due to disability

   ___Other (please specify): _____

5. What is the highest grade or year of school you completed?

___Never attended school or only attended kindergarten

___Grades 1 through 8 (Elementary)

___Grades 9 through 11 (Some high school)

___Grade 12 or GED (High school graduate)

___College 1 year to 3 years (Some college or technical school)

___College 4 years or more (College graduate)

___Graduate school (Master's degree, Doctorate, etc.)

6. What is the annual, combined income range for all family members in your household?

___Less than $21,000

___$21,000 - $30,999

___$31,000 - $50,999

___$51,000 - $99,999

___$100,000 or more

7. What is your religious affiliation?

___Catholic

___Protestant (e.g., Baptist, Methodist, Presbyterian, Lutheran, etc.)

___Agnostic (unsure whether God exists)

___Atheist (belief that there is no God)

___Buddhist

___Hindu

___Jewish

___Muslim

___Other, please specify _____

Please respond to each question or statement by marking one box per row.

		Never	Once a year or less	A few times a year	A few times a month	Once a week	More than once/week
1	How often do you attend church or other religious meetings?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
		Rarely or never	**A few times a month**	**Once a week**	**Two or more times/week**	**Daily**	**More than once a day**
2	How often do you spend time in private religious activities, such as prayer, meditation or Bible study?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6

Below are 3 statements about religious belief or experience. Please mark the extent to which each statement is true or not true for you.

		Definitely not true	Tends not to be true	Unsure	Tends to be true	Definitely true of me
1	In my life, I experience the presence of the Divine (i.e., God).	□ 1	□ 2	□ 3	□ 4	□ 5
2	My religious beliefs are what really lie behind my whole approach to life.	□ 1	□ 2	□ 3	□ 4	□ 5
3	I try hard to carry my religion over into all other dealings in life.	□ 1	□ 2	□ 3	□ 4	□ 5

1. Besides cancer, indicate all medical conditions that a doctor or other health care worker has diagnosed you with or treated you for during the past 3 years. Check all that apply.

    - ☐ Asthma, emphysema, or chronic bronchitis
    - ☐ High blood pressure or hypertension
    - ☐ High blood sugar or diabetes
    - ☐ Arthritis or rheumatism (inflammation of the joints)
    - ☐ Angina, heart failure, or other types of heart disease
    - ☐ Strokes, seizures, Parkinson's disease, or other neurological condition
    - ☐ Liver disease
    - ☐ Kidney or renal disease

2. Over the last month, I would generally rate my activity as:

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

3. How would you describe your current health status?

    - ☐ Relatively healthy
    - ☐ Seriously ill but not terminally ill
    - ☐ Seriously and terminally ill

Please respond to each question or statement by marking one box per row.

	In the past 7 days…	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
1	I felt fearful.	□ 1	□ 2	□ 3	□ 4	□ 5
2	I found it hard to focus on anything other than my anxiety.	□ 1	□ 2	□ 3	□ 4	□ 5
3	My worries overwhelmed me.	□ 1	□ 2	□ 3	□ 4	□ 5
4	I felt uneasy.	□ 1	□ 2	□ 3	□ 4	□ 5
5	I felt worthless.	□ 1	□ 2	□ 3	□ 4	□ 5
6	I felt helpless.	□ 1	□ 2	□ 3	□ 4	□ 5
7	I felt depressed.	□ 1	□ 2	□ 3	□ 4	□ 5
8	I felt hopeless.	□ 1	□ 2	□ 3	□ 4	□ 5

Please respond to each question or statement by marking one box per row.

	In the past 7 days when I thought about my cancer…	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
1	I was irritated more than people knew.	□ 1	□ 2	□ 3	□ 4	□ 5
2	I felt angry.	□ 1	□ 2	□ 3	□ 4	□ 5
3	I felt like I was ready to explode.	□ 1	□ 2	□ 3	□ 4	□ 5
4	I was grouchy.	□ 1	□ 2	□ 3	□ 4	□ 5
5	I felt annoyed.	□ 1	□ 2	□ 3	□ 4	□ 5

Please read the statement carefully and then choose the number which is most true for you.

	To what extent do you currently…	**Not at all**										**Extremely**
1	Feel angry at God	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6	□ 7	□ 8	□ 9	□ 10
2	Feel that God has let you down	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6	□ 7	□ 8	□ 9	□ 10
3	View God as unkind	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6	□ 7	□ 8	□ 9	□ 10
4	Feel abandoned by God	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6	□ 7	□ 8	□ 9	□ 10

Please respond to each question or statement by marking one box per row.

		Never	**Rarely**	**Sometimes**	**Usually**	**Always**
1	I feel left out.	□ 1	□ 2	□ 3	□ 4	□ 5
2	I feel that people barely know me.	□ 1	□ 2	□ 3	□ 4	□ 5
3	I feel isolated from others.	□ 1	□ 2	□ 3	□ 4	□ 5
4	I feel that people are around me but not with me.	□ 1	□ 2	□ 3	□ 4	□ 5

1. Have you smoked at least 5 packs or 100 cigarettes in your entire life?

   ___Yes

   ___No If **no**, please skip questions 2-7 and go to the next set of questions.

2. How old were you when you first started smoking cigarettes fairly regularly? _____ years old
3. Do you now smoke cigarettes every day, some days, or not at all?

   ___Every day

   ___Some days

   ___Not at all If **not at all**, please skip to question 5.

4. On how many of the past 30 days did you smoke cigarettes? _____day(s)
5. On average, ***when you smoked,*** about how many cigarettes did you smoke per day?

   _____

6. What is the total number of years you smoked EVERY DAY? Do not include any time you stayed off cigarettes for 6 months or longer. _____years.
7. How long has it been since you **last smoked a cigarette**, even one or two puffs?

   - Within the past month (less than 1 month ago)
   - Within the past 3 months (1 month but less than 3 months ago)
   - Within the past 6 months (3 months but less than 6 months ago)
   - Within the past year (6 months but less than 1 year ago)
   - Within the past 5 years (1 year but less than 5 years ago)
   - Within the past 10 years (5 years but less than 10 years ago)
   - 10 years or more
   - Never smoked regularly
   - Don't know/Not sure

Using the scale below, please indicate how frequently you experience these thoughts and feelings when you think about your cancer.

		Never	Rarely	Sometimes	Often	All the time
1	Most people don't understand how severe my condition is.	□ 0	□ 1	□ 2	□ 3	□ 4
2	My life will never be the same.	□ 0	□ 1	□ 2	□ 3	□ 4
3	I am suffering because of someone else's negligence.	□ 0	□ 1	□ 2	□ 3	□ 4
4	No one should have to live this way.	□ 0	□ 1	□ 2	□ 3	□ 4
5	I just want to have my life back.	□ 0	□ 1	□ 2	□ 3	□ 4
6	I feel that this has affected me in a permanent way.	□ 0	□ 1	□ 2	□ 3	□ 4
7	It all seems so unfair.	□ 0	□ 1	□ 2	□ 3	□ 4
8	I worry that my condition is not being taken seriously.	□ 0	□ 1	□ 2	□ 3	□ 4
9	Nothing will ever make up for all that I have gone through.	□ 0	□ 1	□ 2	□ 3	□ 4
10	I feel as if I have been robbed of something very precious.	□ 0	□ 1	□ 2	□ 3	□ 4
11	I am troubled by fears that I may never achieve my dreams.	□ 0	□ 1	□ 2	□ 3	□ 4
12	I can't believe this has happened to me.	□ 0	□ 1	□ 2	□ 3	□ 4

These items deal with ways you've been coping with any stress in your life that may have resulted from your cancer. Please choose the number that best shows how much you use each of these ways of coping.

		I usually don't do this at all	I usually do this a little bit	I usually do this a medium amount	I usually do this a lot
1	I try to grow as a person as a result of the experience.	□ 1	□ 2	□ 3	□ 4
2	I try to see it in a different light, to make it seem more positive.	□ 1	□ 2	□ 3	□ 4
3	I look for something good in what is happening.	□ 1	□ 2	□ 3	□ 4
4	I learn something from the experience.	□ 1	□ 2	□ 3	□ 4

Choose the number for the answer that best describes how you are feeling now.

		Not at all	To a slight extent	To some extent	To a large extent
1	To what extent are you able to accept your diagnosis of cancer?	□ 1	□ 2	□ 3	□ 4
2	To what extent would you say you have a sense of inner peace and harmony?	□ 1	□ 2	□ 3	□ 4
3	To what extent do you feel that you have made peace with your illness?	□ 1	□ 2	□ 3	□ 4
4	Do you feel well loved now?	□ 1	□ 2	□ 3	□ 4
5	To what extent do you feel a sense of inner calm and tranquility?	□ 1	□ 2	□ 3	□ 4

APPENDIX D. MPLUS SYNTAX

Model 1

```
TITLE: Aim 1 Model 1
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog;

MISSING all (9999);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;

MODEL:
```

```
    [depress];
    depress ON injust;

    [anxiety];
    anxiety ON injust;

    [anger];
    anger ON injust;

    [angerGlg];
    angerGlg ON injust;

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;

    depress  ON age gender2 meddx ecog;
    anxiety ON age gender2 meddx ecog;
    anger ON age gender2 meddx ecog;
    angerGlg ON age gender2 meddx ecog;

OUTPUT:
    SAMPSTAT;
    STANDARDIZED ;
    MODINDICES (ALL);

PLOT:
    Type is Plot3;
```

Model 2

```
TITLE: Aim 2.1 Model 2
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog cope;

MISSING all (9999);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;

MODEL:
   [depress];
```

```
    depress ON injust cope;

    [anxiety];
    anxiety ON injust cope;

    [anger];
    anger ON injust cope;

    [angerGlg];
    angerGlg ON injust cope;

    [cope];
    cope ON injust;

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;

    depress  ON age gender2 meddx ecog;
    anxiety ON age gender2 meddx ecog;
    anger ON age gender2 meddx ecog;
    angerGlg ON age gender2 meddx ecog;

    cope ON age gender2 meddx ecog;

MODEL INDIRECT:
    depress IND cope injust;
    anxiety IND cope injust;
    anger IND cope injust;
    angerGlg IND cope injust;
```

```
OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BOOTSTRAP);
    TECH1 TECH4;

PLOT:
   Type is Plot3;
```

Model 3

```
TITLE: Aim 2.2 Model 3
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog accept;

MISSING all (9999);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;

MODEL:
   [depress];
```

```
    depress ON injust accept;

    [anxiety];
    anxiety ON injust accept;

    [anger];
    anger ON injust accept;

    [angerGlg];
    angerGlg ON injust accept;

    [accept];
    accept ON injust;

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;

    depress  ON age gender2 meddx ecog;
    anxiety ON age gender2 meddx ecog;
    anger ON age gender2 meddx ecog;
    angerGlg ON age gender2 meddx ecog;

    accept ON age gender2 meddx ecog;

MODEL INDIRECT:
    depress IND accept injust;
    anxiety IND accept injust;
    anger IND accept injust;
    angerGlg IND accept injust;
```

```
OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BOOTSTRAP);
   TECH1 TECH4;

PLOT:
   Type is Plot3;
```

Model 4

```
TITLE: Aim 2.3 Model 4
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog cope accept;

MISSING all (9999);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;

MODEL:
   [depress];
```

```
depress ON injust cope accept;

[anxiety];
anxiety ON injust cope accept;

[anger];
anger ON injust cope accept;

[angerGlg];
angerGlg ON injust cope accept;

[cope];
cope ON injust;

[accept];
accept ON injust;

depress  WITH anxiety anger angerGlg;
anxiety WITH anger angerGlg;
anger WITH angerGlg;

accept WITH cope;

depress  ON age gender2 meddx ecog;
anxiety ON age gender2 meddx ecog;
anger ON age gender2 meddx ecog;
angerGlg ON age gender2 meddx ecog;

cope ON age gender2 meddx ecog;
accept ON age gender2 meddx ecog;
```

```
MODEL INDIRECT:
   depress IND cope injust;
   anxiety IND cope injust;
   anger IND cope injust;
   angerGlg IND cope injust;

   depress IND accept injust;
   anxiety IND accept injust;
   anger IND accept injust;
   angerGlg IND accept injust;

OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BOOTSTRAP);
   TECH1 TECH4;

PLOT:
   Type is Plot3;
```

Model 5

```
TITLE: Aim 2.4 Model 5
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog cope accept;

MISSING all (9999);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;

MODEL:
   [depress];
```

```
depress ON injust cope;

[anxiety];
anxiety ON injust cope;

[anger];
anger ON injust cope;

[angerGlg];
angerGlg ON injust cope;

[accept];
accept ON injust cope;

[cope];
cope ON injust;

depress  WITH anxiety anger angerGlg;
anxiety WITH anger angerGlg;
anger WITH angerGlg;

accept WITH depress anxiety anger angerGlg;

depress  ON age gender2 meddx ecog;
anxiety ON age gender2 meddx ecog;
anger ON age gender2 meddx ecog;
angerGlg ON age gender2 meddx ecog;

cope ON age gender2 meddx ecog;
accept ON age gender2 meddx ecog;
```

```
!injust;


MODEL INDIRECT:
   depress IND cope injust;
   anxiety IND cope injust;
   anger IND cope injust;
   angerGlg IND cope injust;
   accept IND cope injust;

OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BOOTSTRAP);
  TECH1 TECH4;

PLOT:
   Type is Plot3;
```

Model 6

```
TITLE: Aim 3 Model 6
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 meddx ecog cope accept
   lonely LonInjst;

MISSING all (9999);

DEFINE:
   LonInjst = injust * lonely;

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
```

```
  BOOTSTRAP = 2000;

MODEL:
  [depress] (b10);
  depress ON injust (c1);
  depress ON cope (b11);
  depress ON accept (b12);

  [anxiety] (b20);
  anxiety ON injust (c2);
  anxiety ON cope (b21);
  anxiety ON accept (b22);

  [anger] (b30);
  anger ON injust (c3);
  anger ON cope (b31);
  anger ON accept (b32);

  [angerGlg] (b40);
  angerGlg ON injust (c4);
  angerGlg ON cope (b41);
  angerGlg ON accept (b42);

  [cope] (a10);
  cope ON injust (a11);
  cope ON lonely (a12);
  cope ON LonInjst (a13);

  [accept] (a20);
  accept ON injust (a21);
  accept ON lonely (a22);
```

```
    accept ON LonInjst (a23);

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;
    accept WITH cope;

    depress  ON age gender2 meddx ecog;
    anxiety ON age gender2 meddx ecog;
    anger ON age gender2 meddx ecog;
    angerGlg ON age gender2 meddx ecog;
    cope ON age gender2 meddx ecog;
    accept ON age gender2 meddx ecog;

MODEL CONSTRAINT:
    NEW(LOW_W MED_W HIGH_W
    Iy1m1_lo ! I= Indirect y1=Depression, m1=cope, lo=low loneliness
    Iy1m1_me
    Iy1m1_hi
    Iy1m2_lo !y1=Depression, m2=accept, lo=low loneliness
    Iy1m2_me
    Iy1m2_hi
    Iy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness
    Iy2m1_me
    Iy2m1_hi
    Iy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness
    Iy2m2_me
    Iy2m2_hi
    Iy3m1_lo !y3=Anger, m1=cope, lo=low loneliness
    Iy3m1_me
    Iy3m1_hi
```

Iy3m2_lo !y3=Anger, m2=accept, lo=low loneliness
Iy3m2_me
Iy3m2_hi
Iy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness
Iy4m1_me
Iy4m1_hi
Iy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness
Iy4m2_me
Iy4m2_hi

Ty1m1_lo !T = total y1=Depression, m1=cope, lo=low loneliness
Ty1m1_me
Ty1m1_hi
Ty1m2_lo !y1=Depression, m2=accept, lo=low loneliness
Ty1m2_me
Ty1m2_hi
Ty2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness
Ty2m1_me
Ty2m1_hi
Ty2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness
Ty2m2_me
Ty2m2_hi
Ty3m1_lo !y3=Anger, m1=cope, lo=low loneliness
Ty3m1_me
Ty3m1_hi
Ty3m2_lo !y3=Anger, m2=accept, lo=low loneliness
Ty3m2_me
Ty3m2_hi
Ty4m1_lo !y4=Anger God, m1=cope, lo=low loneliness
Ty4m1_me
Ty4m1_hi

```
Ty4m2_lo !y4=Anger God, m2=accept, lo=low loneliness
Ty4m2_me
Ty4m2_hi);

LOW_W = 40;
MED_W = 50;
HIGH_W = 60;

!calculating conditional indirect effects
Iy1m1_lo = a11*b11 + a13*b11*LOW_W;
Iy1m1_me = a11*b11 + a13*b11*MED_W;
Iy1m1_hi = a11*b11 + a13*b11*HIGH_W;
Iy1m2_lo = a21*b12 + a23*b12*LOW_W;
Iy1m2_me = a21*b12 + a23*b12*MED_W;
Iy1m2_hi = a21*b12 + a23*b12*HIGH_W;

Iy2m1_lo = a11*b21 + a13*b21*LOW_W;
Iy2m1_me = a11*b21 + a13*b21*MED_W;
Iy2m1_hi = a11*b21 + a13*b21*HIGH_W;
Iy2m2_lo = a21*b22 + a23*b22*LOW_W;
Iy2m2_me = a21*b22 + a23*b22*MED_W;
Iy2m2_hi = a21*b22 + a23*b22*HIGH_W;

Iy3m1_lo = a11*b31 + a13*b31*LOW_W;
Iy3m1_me = a11*b31 + a13*b31*MED_W;
Iy3m1_hi = a11*b31 + a13*b31*HIGH_W;
Iy3m2_lo = a21*b32 + a23*b32*LOW_W;
Iy3m2_me = a21*b32 + a23*b32*MED_W;
Iy3m2_hi = a21*b32 + a23*b32*HIGH_W;

Iy4m1_lo = a11*b41 + a13*b41*LOW_W;
```

```
Iy4m1_me = a11*b41 + a13*b41*MED_W;
Iy4m1_hi = a11*b41 + a13*b41*HIGH_W;
Iy4m2_lo = a21*b42 + a23*b42*LOW_W;
Iy4m2_me = a21*b42 + a23*b42*MED_W;
Iy4m2_hi = a21*b42 + a23*b42*HIGH_W;

!calculating conditional total effects
Ty1m1_lo = c1 + Iy1m1_lo;
Ty1m1_me = c1 + Iy1m1_me;
Ty1m1_hi = c1 + Iy1m1_hi;
Ty1m2_lo = c1 + Iy1m2_lo;
Ty1m2_me = c1 + Iy1m2_me;
Ty1m2_hi = c1 + Iy1m2_hi;

Ty2m1_lo = c2 + Iy2m1_lo;
Ty2m1_me = c2 + Iy2m1_me;
Ty2m1_hi = c2 + Iy2m1_hi;
Ty2m2_lo = c2 + Iy2m2_lo;
Ty2m2_me = c2 + Iy2m2_me;
Ty2m2_hi = c2 + Iy2m2_hi;

Ty3m1_lo = c3 + Iy3m1_lo;
Ty3m1_me = c3 + Iy3m1_me;
Ty3m1_hi = c3 + Iy3m1_hi;
Ty3m2_lo = c3 + Iy3m2_lo;
Ty3m2_me = c3 + Iy3m2_me;
Ty3m2_hi = c3 + Iy3m2_hi;

Ty4m1_lo = c4 + Iy4m1_lo;
Ty4m1_me = c4 + Iy4m1_me;
Ty4m1_hi = c4 + Iy4m1_hi;
```

```
   Ty4m2_lo = c4 + Iy4m2_lo;
   Ty4m2_me = c4 + Iy4m2_me;
   Ty4m2_hi = c4 + Iy4m2_hi;

   ! Loop to plot conditional indirect effect of X on Y
   ! for each combination of low, med, high moderator values
   ! Injustice (xvalues min=0, max=45, interval=1)

 PLOT(LOMOD MEDMOD HIMOD);
   LOOP(XVAL,0,45,1);

   LOMOD = (b10 + a10*b11 + a12*b11*LOW_W) + Iy1m1_lo*XVAL;
   MEDMOD = (b10 + a10*b11 + a12*b11*MED_W) + Iy1m1_me*XVAL;
   HIMOD = (b10 + a10*b11 + a12*b11*HIGH_W) + Iy1m1_hi*XVAL;

OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BCBOOTSTRAP);
   TECH1;     TECH4;

PLOT:
   Type is Plot3;
```

Model 7 with no constraints

```
TITLE: Aim 4 Model 7 no constraints
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age meddx ecog cope accept
   lonely LonInjst;

MISSING all (9999);

GROUPING IS type (0 = lung, 1= prostate);

DEFINE:
   LonInjst = injust * lonely;

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
```

```
  ITERATIONS = 2000;
  CONVERGENCE = .00001;
  BOOTSTRAP = 2000;

MODEL:
  [depress] ;
  depress ON injust cope accept;

  [anxiety] ;
  anxiety ON injust  cope accept;

  [anger] ;
  anger ON injust cope accept;

  [angerGlg] ;
  angerGlg ON injust cope accept;

  [cope] ;
  cope ON injust lonely LonInjst;

  [accept] ;
  accept ON injust lonely LonInjst;

  depress  WITH anxiety anger angerGlg;
  anxiety WITH anger angerGlg;
  anger WITH angerGlg;
  accept WITH cope;

  depress  ON age  meddx ecog;
  anxiety ON age  meddx ecog;
  anger ON age  meddx ecog;
```

```
    angerGlg ON age  meddx ecog;
    cope ON age  meddx ecog;
    accept ON age  meddx ecog;

MODEL lung:
    [depress] (lb10);
    depress ON injust (lc1);
    depress ON cope (lb11);
    depress ON accept (lb12);

    [anxiety] (lb20);
    anxiety ON injust (lc2);
    anxiety ON cope (lb21);
    anxiety ON accept (lb22);

    [anger] (lb30);
    anger ON injust (lc3);
    anger ON cope (lb31);
    anger ON accept (lb32);

    [angerGlg] (lb40);
    angerGlg ON injust (lc4);
    angerGlg ON cope (lb41);
    angerGlg ON accept (lb42);

    [cope] (la10);
    cope ON injust (la11);
    cope ON lonely (la12);
    cope ON LonInjst (la13);

    [accept] (la20);
```

```
    accept ON injust (la21);
    accept ON lonely (la22);
    accept ON LonInjst (la23);

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;
    accept WITH cope;

    depress  ON age  meddx ecog;
    anxiety ON age  meddx ecog;
    anger ON age  meddx ecog;
    angerGlg ON age  meddx ecog;
    cope ON age  meddx ecog;
    accept ON age  meddx ecog;

MODEL prostate:
    [depress] (pb10);
    depress ON injust (pc1);
    depress ON cope (pb11);
    depress ON accept (pb12);

    [anxiety] (pb20);
    anxiety ON injust (pc2);
    anxiety ON cope (pb21);
    anxiety ON accept (pb22);

    [anger] (pb30);
    anger ON injust (pc3);
    anger ON cope (pb31);
    anger ON accept (pb32);
```

```
    [angerGlg] (pb40);
    angerGlg ON injust (pc4);
    angerGlg ON cope (pb41);
    angerGlg ON accept (pb42);

    [cope] (pa10);
    cope ON injust (pa11);
    cope ON lonely (pa12);
    cope ON LonInjst (pa13);

    [accept] (pa20);
    accept ON injust (pa21);
    accept ON lonely (pa22);
    accept ON LonInjst (pa23);

    depress  WITH anxiety anger angerGlg;
    anxiety WITH anger angerGlg;
    anger WITH angerGlg;
    accept WITH cope;

    depress  ON age  meddx ecog;
    anxiety ON age  meddx ecog;
    anger ON age  meddx ecog;
    angerGlg ON age  meddx ecog;
    cope ON age  meddx ecog;
    accept ON age  meddx ecog;

MODEL CONSTRAINT:
    NEW(LOW_W MED_W HIGH_W
    LIy1m1_lo ! I= Indirect y1=Depression, m1=cope, lo=low loneliness
```

LIy1m1_me

LIy1m1_hi

LIy1m2_lo !y1=Depression, m2=accept, lo=low loneliness

LIy1m2_me

LIy1m2_hi

LIy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness

LIy2m1_me

LIy2m1_hi

LIy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness

LIy2m2_me

LIy2m2_hi

LIy3m1_lo !y3=Anger, m1=cope, lo=low loneliness

LIy3m1_me

LIy3m1_hi

LIy3m2_lo !y3=Anger, m2=accept, lo=low loneliness

LIy3m2_me

LIy3m2_hi

LIy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness

LIy4m1_me

LIy4m1_hi

LIy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness

LIy4m2_me

LIy4m2_hi

LTy1m1_lo !T = total y1=Depression, m1=cope, lo=low loneliness

LTy1m1_me

LTy1m1_hi

LTy1m2_lo !y1=Depression, m2=accept, lo=low loneliness

LTy1m2_me

LTy1m2_hi

LTy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness

LTy2m1_me

LTy2m1_hi

LTy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness

LTy2m2_me

LTy2m2_hi

LTy3m1_lo !y3=Anger, m1=cope, lo=low loneliness

LTy3m1_me

LTy3m1_hi

LTy3m2_lo !y3=Anger, m2=accept, lo=low loneliness

LTy3m2_me

LTy3m2_hi

LTy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness

LTy4m1_me

LTy4m1_hi

LTy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness

LTy4m2_me

LTy4m2_hi

PIy1m1_lo ! I= Indirect y1=Depression, m1=cope, lo=low loneliness

PIy1m1_me

PIy1m1_hi

PIy1m2_lo !y1=Depression, m2=accept, lo=low loneliness

PIy1m2_me

PIy1m2_hi

PIy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness

PIy2m1_me

PIy2m1_hi

PIy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness

PIy2m2_me

PIy2m2_hi

PIy3m1_lo !y3=Anger, m1=cope, lo=low loneliness

PIy3m1_me

PIy3m1_hi

PIy3m2_lo !y3=Anger, m2=accept, lo=low loneliness

PIy3m2_me

PIy3m2_hi

PIy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness

PIy4m1_me

PIy4m1_hi

PIy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness

PIy4m2_me

PIy4m2_hi

PTy1m1_lo !T = total y1=Depression, m1=cope, lo=low loneliness

PTy1m1_me

PTy1m1_hi

PTy1m2_lo !y1=Depression, m2=accept, lo=low loneliness

PTy1m2_me

PTy1m2_hi

PTy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness

PTy2m1_me

PTy2m1_hi

PTy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness

PTy2m2_me

PTy2m2_hi

PTy3m1_lo !y3=Anger, m1=cope, lo=low loneliness

PTy3m1_me

PTy3m1_hi

PTy3m2_lo !y3=Anger, m2=accept, lo=low loneliness

PTy3m2_me

PTy3m2_hi

PTy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness

```
PTy4m1_me
PTy4m1_hi
PTy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness
PTy4m2_me
PTy4m2_hi     );

LOW_W = 40;
MED_W = 50;
HIGH_W = 60;

!calculating conditional indirect effects
LIy1m1_lo = la11*lb11 + la13*lb11*LOW_W;
LIy1m1_me = la11*lb11 + la13*lb11*MED_W;
LIy1m1_hi = la11*lb11 + la13*lb11*HIGH_W;
LIy1m2_lo = la21*lb12 + la23*lb12*LOW_W;
LIy1m2_me = la21*lb12 + la23*lb12*MED_W;
LIy1m2_hi = la21*lb12 + la23*lb12*HIGH_W;

LIy2m1_lo = la11*lb21 + la13*lb21*LOW_W;
LIy2m1_me = la11*lb21 + la13*lb21*MED_W;
LIy2m1_hi = la11*lb21 + la13*lb21*HIGH_W;
LIy2m2_lo = la21*lb22 + la23*lb22*LOW_W;
LIy2m2_me = la21*lb22 + la23*lb22*MED_W;
LIy2m2_hi = la21*lb22 + la23*lb22*HIGH_W;

LIy3m1_lo = la11*lb31 + la13*lb31*LOW_W;
LIy3m1_me = la11*lb31 + la13*lb31*MED_W;
LIy3m1_hi = la11*lb31 + la13*lb31*HIGH_W;
LIy3m2_lo = la21*lb32 + la23*lb32*LOW_W;
LIy3m2_me = la21*lb32 + la23*lb32*MED_W;
LIy3m2_hi = la21*lb32 + la23*lb32*HIGH_W;
```

```
LIy4m1_lo = la11*lb41 + la13*lb41*LOW_W;
LIy4m1_me = la11*lb41 + la13*lb41*MED_W;
LIy4m1_hi = la11*lb41 + la13*lb41*HIGH_W;
LIy4m2_lo = la21*lb42 + la23*lb42*LOW_W;
LIy4m2_me = la21*lb42 + la23*lb42*MED_W;
LIy4m2_hi = la21*lb42 + la23*lb42*HIGH_W;

!calculating conditional indirect effects
PIy1m1_lo = pa11*pb11 + pa13*pb11*LOW_W;
PIy1m1_me = pa11*pb11 + pa13*pb11*MED_W;
PIy1m1_hi = pa11*pb11 + pa13*pb11*HIGH_W;
PIy1m2_lo = pa21*pb12 + pa23*pb12*LOW_W;
PIy1m2_me = pa21*pb12 + pa23*pb12*MED_W;
PIy1m2_hi = pa21*pb12 + pa23*pb12*HIGH_W;

PIy2m1_lo = pa11*pb21 + pa13*pb21*LOW_W;
PIy2m1_me = pa11*pb21 + pa13*pb21*MED_W;
PIy2m1_hi = pa11*pb21 + pa13*pb21*HIGH_W;
PIy2m2_lo = pa21*pb22 + pa23*pb22*LOW_W;
PIy2m2_me = pa21*pb22 + pa23*pb22*MED_W;
PIy2m2_hi = pa21*pb22 + pa23*pb22*HIGH_W;

PIy3m1_lo = pa11*pb31 + pa13*pb31*LOW_W;
PIy3m1_me = pa11*pb31 + pa13*pb31*MED_W;
PIy3m1_hi = pa11*pb31 + pa13*pb31*HIGH_W;
PIy3m2_lo = pa21*pb32 + pa23*pb32*LOW_W;
PIy3m2_me = pa21*pb32 + pa23*pb32*MED_W;
PIy3m2_hi = pa21*pb32 + pa23*pb32*HIGH_W;

PIy4m1_lo = pa11*pb41 + pa13*pb41*LOW_W;
```

```
PIy4m1_me = pa11*pb41 + pa13*pb41*MED_W;
PIy4m1_hi = pa11*pb41 + pa13*pb41*HIGH_W;
PIy4m2_lo = pa21*pb42 + pa23*pb42*LOW_W;
PIy4m2_me = pa21*pb42 + pa23*pb42*MED_W;
PIy4m2_hi = pa21*pb42 + pa23*pb42*HIGH_W;

!calculating conditional total effects
LTy1m1_lo = lc1 + LIy1m1_lo;
LTy1m1_me = lc1 + LIy1m1_me;
LTy1m1_hi = lc1 + LIy1m1_hi;
LTy1m2_lo = lc1 + LIy1m2_lo;
LTy1m2_me = lc1 + LIy1m2_me;
LTy1m2_hi = lc1 + LIy1m2_hi;

LTy2m1_lo = lc2 + LIy2m1_lo;
LTy2m1_me = lc2 + LIy2m1_me;
LTy2m1_hi = lc2 + LIy2m1_hi;
LTy2m2_lo = lc2 + LIy2m2_lo;
LTy2m2_me = lc2 + LIy2m2_me;
LTy2m2_hi = lc2 + LIy2m2_hi;

LTy3m1_lo = lc3 + LIy3m1_lo;
LTy3m1_me = lc3 + LIy3m1_me;
LTy3m1_hi = lc3 + LIy3m1_hi;
LTy3m2_lo = lc3 + LIy3m2_lo;
LTy3m2_me = lc3 + LIy3m2_me;
LTy3m2_hi = lc3 + LIy3m2_hi;

LTy4m1_lo = lc4 + LIy4m1_lo;
LTy4m1_me = lc4 + LIy4m1_me;
LTy4m1_hi = lc4 + LIy4m1_hi;
```

```
    LTy4m2_lo = lc4 + LIy4m2_lo;
    LTy4m2_me = lc4 + LIy4m2_me;
    LTy4m2_hi = lc4 + LIy4m2_hi;

!calculating conditional total effects
    PTy1m1_lo = pc1 + PIy1m1_lo;
    PTy1m1_me = pc1 + PIy1m1_me;
    PTy1m1_hi = pc1 + PIy1m1_hi;
    PTy1m2_lo = pc1 + PIy1m2_lo;
    PTy1m2_me = pc1 + PIy1m2_me;
    PTy1m2_hi = pc1 + PIy1m2_hi;

    PTy2m1_lo = pc2 + PIy2m1_lo;
    PTy2m1_me = pc2 + PIy2m1_me;
    PTy2m1_hi = pc2 + PIy2m1_hi;
    PTy2m2_lo = pc2 + PIy2m2_lo;
    PTy2m2_me = pc2 + PIy2m2_me;
    PTy2m2_hi = pc2 + PIy2m2_hi;

    PTy3m1_lo = pc3 + PIy3m1_lo;
    PTy3m1_me = pc3 + PIy3m1_me;
    PTy3m1_hi = pc3 + PIy3m1_hi;
    PTy3m2_lo = pc3 + PIy3m2_lo;
    PTy3m2_me = pc3 + PIy3m2_me;
    PTy3m2_hi = pc3 + PIy3m2_hi;

    PTy4m1_lo = pc4 + PIy4m1_lo;
    PTy4m1_me = pc4 + PIy4m1_me;
    PTy4m1_hi = pc4 + PIy4m1_hi;
    PTy4m2_lo = pc4 + PIy4m2_lo;
    PTy4m2_me = pc4 + PIy4m2_me;
```

```
   PTy4m2_hi = pc4 + PIy4m2_hi;

 PLOT(LLOMOD LMEDMOD LHIMOD
         PLOMOD PMEDMOD PHIMOD);
   LOOP(XVAL,0,45,1);

   LLOMOD = (lb10 + la10*lb11 + la12*lb11*LOW_W) + LIy1m1_lo*XVAL;
   LMEDMOD = (lb10 + la10*lb11 + la12*lb11*MED_W) + LIy1m1_me*XVAL;
   LHIMOD = (lb10 + la10*lb11 + la12*lb11*HIGH_W) + LIy1m1_hi*XVAL;

   PLOMOD = (pb10 + pa10*pb11 + pa12*pb11*LOW_W) + PIy1m1_lo*XVAL;
   PMEDMOD = (pb10 + pa10*pb11 + pa12*pb11*MED_W) + PIy1m1_me*XVAL;
   PHIMOD = (pb10 + pa10*pb11 + pa12*pb11*HIGH_W) + PIy1m1_hi*XVAL;

OUTPUT:
   SAMPSTAT;
   STANDARDIZED ; STDYX;
   CINTERVAL(BCBOOTSTRAP);
   TECH1;   TECH4;

PLOT:
   Type is Plot3;
```

Model 7 with equal constraints

```
TITLE: Aim 4 Model 7 equal constraints
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age meddx ecog cope accept
   lonely LonInjst;

MISSING all (9999);

GROUPING IS type (0 = lung, 1= prostate);

DEFINE:
   LonInjst = injust * lonely;

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
```

```
  ITERATIONS = 2000;
  CONVERGENCE = .00001;
  BOOTSTRAP = 2000;

MODEL:
  [depress] ;
  depress ON injust cope accept;

  [anxiety] ;
  anxiety ON injust cope accept;

  [anger] ;
  anger ON injust cope accept;

  [angerGlg] ;
  angerGlg ON injust cope accept;

  [cope];
  cope ON injust lonely LonInjst;

  [accept] ;
  accept ON injust lonely LonInjst;

  depress  WITH anxiety anger angerGlg;
  anxiety WITH anger angerGlg;
  anger WITH angerGlg;
  accept WITH cope;

  depress  ON age  meddx ecog;
  anxiety ON age  meddx ecog;
  anger ON age  meddx ecog;
```

```
    angerGlg ON age  meddx ecog;
    cope ON age  meddx ecog;
    accept ON age  meddx ecog;

MODEL lung:
    [depress] (b10);
    depress ON injust (c1);
    depress ON cope (b11);
    depress ON accept (b12);

    [anxiety] (b20);
    anxiety ON injust (c2);
    anxiety ON cope (b21);
    anxiety ON accept (b22);

    [anger] (b30);
    anger ON injust (c3);
    anger ON cope (b31);
    anger ON accept (b32);

    [angerGlg] (b40);
    angerGlg ON injust (c4);
    angerGlg ON cope (b41);
    angerGlg ON accept (b42);

    [cope] (a10);
    cope ON injust (a11);
    cope ON lonely (a12);
    cope ON LonInjst (a13);

    [accept] (a20);
```

```
accept ON injust (a21);
accept ON lonely (a22);
accept ON LonInjst (a23);

depress  WITH anxiety (d11)
             anger (d12)
             angerGlg (d13);
anxiety WITH anger (d14)
            angerGlg (d15);
anger WITH angerGlg (d16);
accept WITH cope (d17);

depress  ON age (e11)
           meddx (e12)
           ecog (e13);
anxiety ON age  (e14)
          meddx (e15)
          ecog (e16);
anger ON age  (e17)
         meddx (e18)
         ecog (e19);
angerGlg ON age  (e20)
           meddx (e21)
           ecog (e22);
cope ON age  (e23)
        meddx (e24)
        ecog (e25);
accept ON age  (e26)
         meddx (e27)
         ecog (e28);
```

```
MODEL prostate:
   [depress] (b10);
   depress ON injust (c1);
   depress ON cope (b11);
   depress ON accept (b12);

   [anxiety] (b20);
   anxiety ON injust (c2);
   anxiety ON cope (b21);
   anxiety ON accept (b22);

   [anger] (b30);
   anger ON injust (c3);
   anger ON cope (b31);
   anger ON accept (b32);

   [angerGlg] (b40);
   angerGlg ON injust (c4);
   angerGlg ON cope (b41);
   angerGlg ON accept (b42);

   [cope] (a10);
   cope ON injust (a11);
   cope ON lonely (a12);
   cope ON LonInjst (a13);

   [accept] (a20);
   accept ON injust (a21);
   accept ON lonely (a22);
```

```
accept ON LonInjst (a23);


depress  WITH anxiety (d11)
             anger (d12)
             angerGlg (d13);
anxiety WITH anger (d14)
            angerGlg (d15);
anger WITH angerGlg (d16);
accept WITH cope (d17);

depress  ON age (e11)
           meddx (e12)
           ecog (e13);
anxiety ON age  (e14)
          meddx (e15)
          ecog (e16);
anger ON age  (e17)
         meddx (e18)
         ecog (e19);
angerGlg ON age  (e20)
           meddx (e21)
           ecog (e22);
cope ON age  (e23)
        meddx (e24)
        ecog (e25);
accept ON age  (e26)
          meddx (e27)
          ecog (e28);
```

```
MODEL CONSTRAINT:
  NEW(LOW_W MED_W HIGH_W
  Iy1m1_lo ! I= Indirect y1=Depression, m1=cope, lo=low loneliness
  Iy1m1_me
  Iy1m1_hi
  Iy1m2_lo !y1=Depression, m2=accept, lo=low loneliness
  Iy1m2_me
  Iy1m2_hi
  Iy2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness
  Iy2m1_me
  Iy2m1_hi
  Iy2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness
  Iy2m2_me
  Iy2m2_hi
  Iy3m1_lo !y3=Anger, m1=cope, lo=low loneliness
  Iy3m1_me
  Iy3m1_hi
  Iy3m2_lo !y3=Anger, m2=accept, lo=low loneliness
  Iy3m2_me
  Iy3m2_hi
  Iy4m1_lo !y4=Anger God, m1=cope, lo=low loneliness
  Iy4m1_me
  Iy4m1_hi
  Iy4m2_lo !y4=Anger God, m2=accept, lo=low loneliness
  Iy4m2_me
  Iy4m2_hi

  Ty1m1_lo !T = total y1=Depression, m1=cope, lo=low loneliness
  Ty1m1_me
  Ty1m1_hi
  Ty1m2_lo !y1=Depression, m2=accept, lo=low loneliness
```

```
Ty1m2_me
Ty1m2_hi
Ty2m1_lo !y2=Anxiety, m1=cope, lo=low loneliness
Ty2m1_me
Ty2m1_hi
Ty2m2_lo !y2=Anxiety, m2=accept, lo=low loneliness
Ty2m2_me
Ty2m2_hi
Ty3m1_lo !y3=Anger, m1=cope, lo=low loneliness
Ty3m1_me
Ty3m1_hi
Ty3m2_lo !y3=Anger, m2=accept, lo=low loneliness
Ty3m2_me
Ty3m2_hi
Ty4m1_lo !y4=Anger God, m1=cope, lo=low loneliness
Ty4m1_me
Ty4m1_hi
Ty4m2_lo !y4=Anger God, m2=accept, lo=low loneliness
Ty4m2_me
Ty4m2_hi);

LOW_W = 40;
MED_W = 50;
HIGH_W = 60;

!calculating conditional indirect effects
Iy1m1_lo = a11*b11 + a13*b11*LOW_W;
Iy1m1_me = a11*b11 + a13*b11*MED_W;
Iy1m1_hi = a11*b11 + a13*b11*HIGH_W;
Iy1m2_lo = a21*b12 + a23*b12*LOW_W;
Iy1m2_me = a21*b12 + a23*b12*MED_W;
```

```
Iy1m2_hi = a21*b12 + a23*b12*HIGH_W;

Iy2m1_lo = a11*b21 + a13*b21*LOW_W;
Iy2m1_me = a11*b21 + a13*b21*MED_W;
Iy2m1_hi = a11*b21 + a13*b21*HIGH_W;
Iy2m2_lo = a21*b22 + a23*b22*LOW_W;
Iy2m2_me = a21*b22 + a23*b22*MED_W;
Iy2m2_hi = a21*b22 + a23*b22*HIGH_W;

Iy3m1_lo = a11*b31 + a13*b31*LOW_W;
Iy3m1_me = a11*b31 + a13*b31*MED_W;
Iy3m1_hi = a11*b31 + a13*b31*HIGH_W;
Iy3m2_lo = a21*b32 + a23*b32*LOW_W;
Iy3m2_me = a21*b32 + a23*b32*MED_W;
Iy3m2_hi = a21*b32 + a23*b32*HIGH_W;

Iy4m1_lo = a11*b41 + a13*b41*LOW_W;
Iy4m1_me = a11*b41 + a13*b41*MED_W;
Iy4m1_hi = a11*b41 + a13*b41*HIGH_W;
Iy4m2_lo = a21*b42 + a23*b42*LOW_W;
Iy4m2_me = a21*b42 + a23*b42*MED_W;
Iy4m2_hi = a21*b42 + a23*b42*HIGH_W;

!calculating conditional total effects
Ty1m1_lo = c1 + Iy1m1_lo;
Ty1m1_me = c1 + Iy1m1_me;
Ty1m1_hi = c1 + Iy1m1_hi;
Ty1m2_lo = c1 + Iy1m2_lo;
Ty1m2_me = c1 + Iy1m2_me;
Ty1m2_hi = c1 + Iy1m2_hi;
```

```
    Ty2m1_lo = c2 + Iy2m1_lo;
    Ty2m1_me = c2 + Iy2m1_me;
    Ty2m1_hi = c2 + Iy2m1_hi;
    Ty2m2_lo = c2 + Iy2m2_lo;
    Ty2m2_me = c2 + Iy2m2_me;
    Ty2m2_hi = c2 + Iy2m2_hi;

    Ty3m1_lo = c3 + Iy3m1_lo;
    Ty3m1_me = c3 + Iy3m1_me;
    Ty3m1_hi = c3 + Iy3m1_hi;
    Ty3m2_lo = c3 + Iy3m2_lo;
    Ty3m2_me = c3 + Iy3m2_me;
    Ty3m2_hi = c3 + Iy3m2_hi;

    Ty4m1_lo = c4 + Iy4m1_lo;
    Ty4m1_me = c4 + Iy4m1_me;
    Ty4m1_hi = c4 + Iy4m1_hi;
    Ty4m2_lo = c4 + Iy4m2_lo;
    Ty4m2_me = c4 + Iy4m2_me;
    Ty4m2_hi = c4 + Iy4m2_hi;

  PLOT(LOMOD MEDMOD HIMOD);
    LOOP(XVAL,0,45,1);

    LOMOD = (b10 + a10*b11 + a12*b11*LOW_W) + Iy1m1_lo*XVAL;
    MEDMOD = (b10 + a10*b11 + a12*b11*MED_W) + Iy1m1_me*XVAL;
    HIMOD = (b10 + a10*b11 + a12*b11*HIGH_W) + Iy1m1_hi*XVAL;

OUTPUT:
    SAMPSTAT;
    STANDARDIZED ; STDYX;
```

```
  CINTERVAL(BCBOOTSTRAP);
  TECH1; TECH4;


PLOT:
  Type is Plot3;
```

Supplemental Model 8

```
TITLE: Supplemental Model 8
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age gender2 ecog accept
   lonely;

MISSING all (9999);

 ANALYSIS:
    TYPE = GENERAL;
    ESTIMATOR = ML;
    ITERATIONS = 2000;
    CONVERGENCE = .00001;
    BOOTSTRAP = 2000;

 MODEL:
```

```
[depress];
depress ON injust lonely accept;

[anxiety];
anxiety ON injust lonely accept;

[anger];
anger ON injust lonely accept;

[angerGlg];
angerGlg ON injust lonely accept;

[lonely];
lonely ON injust;

[accept];
accept ON injust;

depress  WITH anxiety anger angerGlg;
anxiety WITH anger angerGlg;
anger WITH angerGlg;
lonely WITH accept;

depress  ON age gender2   ecog;
anxiety ON age gender2   ecog;
anger ON age gender2   ecog;
angerGlg ON age gender2   ecog;

accept ON age gender2   ecog;
lonely ON age gender2   ecog;
```

```
MODEL INDIRECT:
    depress IND lonely injust;
    anxiety IND lonely injust;
    anger IND lonely injust;
    angerGlg IND lonely injust;

    depress IND accept injust;
    anxiety IND accept injust;
    anger IND accept injust;
    angerGlg IND accept injust;

OUTPUT:
    SAMPSTAT;
    STANDARDIZED ; STDYX;
    CINTERVAL(BCBOOTSTRAP);
    TECH1 TECH4;


PLOT:
   Type is Plot3;
```

Supplemental Model 8: Multiple group analysis with no constraints

```
TITLE: Supplemental Model 8 - Multiple Group Analysis
       no constraints
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age ecog accept lonely type;

MISSING all (9999);

GROUPING IS type (0 = lung 1= prostate);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;
```

```
MODEL:
   [depress];
   depress ON injust lonely accept;

   [anxiety];
   anxiety ON injust lonely accept;

   [anger];
   anger ON injust lonely accept;

   [angerGlg];
   angerGlg ON injust lonely accept;

   [lonely];
   lonely ON injust;

   [accept];
   accept ON injust;

   depress  WITH anxiety anger angerGlg;
   anxiety WITH anger angerGlg;
   anger WITH angerGlg;

   lonely WITH accept;

   depress  ON age    ecog;
   anxiety ON age    ecog;
   anger ON age    ecog;
   angerGlg ON age    ecog;
```

```
    accept ON age    ecog;
    lonely ON age    ecog;

MODEL INDIRECT:
    depress IND lonely injust;
    anxiety IND lonely injust;
    anger IND lonely injust;
    angerGlg IND lonely injust;

    depress IND accept injust;
    anxiety IND accept injust;
    anger IND accept injust;
    angerGlg IND accept injust;

OUTPUT:
    SAMPSTAT;
    STANDARDIZED ; STDYX;
    CINTERVAL(BCBOOTSTRAP);
   TECH1 TECH4;

PLOT:
    Type is Plot3;
```

Supplemental Model 8: Multiple group analysis with equal constraints

```
TITLE: Supplemental Model 8 - Multiple Group Analysis
       equal constraints
DATA: FILE IS Dissertation PCOQ_mplus.01.26.21.dat ;

VARIABLE:
NAMES ARE
   studyid age gender2 type dxstage ethnic race race2
   relation employ educat income ecog prognoss timedx
   married employed edu incomeC meddx
   multmorb religs ORA NORA INTrelig serious
   terminal healthy anxiety depress anger lonely
   angerG angerGlg injust cope accept smoke4 smoke3
   smoker nsmoker fsmoker;

USEVARIABLES ARE
   injust depress  anxiety anger angerGlg
   age ecog accept lonely type;

MISSING all (9999);

GROUPING IS type (0 = lung 1= prostate);

ANALYSIS:
   TYPE = GENERAL;
   ESTIMATOR = ML;
   ITERATIONS = 2000;
   CONVERGENCE = .00001;
   BOOTSTRAP = 2000;
```

```
MODEL:
   [depress];
   depress ON injust lonely accept;

   [anxiety];
   anxiety ON injust lonely accept;

   [anger];
   anger ON injust lonely accept;

   [angerGlg];
   angerGlg ON injust lonely accept;

   [lonely];
   lonely ON injust;

   [accept];
   accept ON injust;

   depress  WITH anxiety anger angerGlg;
   anxiety WITH anger angerGlg;
   anger WITH angerGlg;

   lonely WITH accept;

   depress  ON age    ecog;
   anxiety ON age    ecog;
   anger ON age    ecog;
   angerGlg ON age    ecog;

   accept ON age    ecog;
```

```
  lonely ON age    ecog;

MODEL lung :
  [depress] (1);
  depress ON injust (2)
          lonely (3)
          accept (4);

  [anxiety] (5);
  anxiety ON injust (6)
          lonely (7)
          accept (8);

  [anger] (9);
  anger ON injust (10)
         lonely (11)
         accept (12);

  [angerGlg] (13);
  angerGlg ON injust (14)
           lonely (15)
           accept (16);

  [lonely] (17);
  lonely ON injust (18);

  [accept] (19);
  accept ON injust (20);

  depress  WITH anxiety (21)
            anger (22)
```

```
            angerGlg (23);
   anxiety WITH anger (24)
            angerGlg (25);
   anger WITH angerGlg (26);

   lonely WITH accept (27);

   depress  ON age  (28)
            ecog (29);
   anxiety ON age (30)
            ecog (31);
   anger ON age  (32)
           ecog (33);
   angerGlg ON age  (34)
            ecog (35);

   accept ON age (36)
           ecog (37);
   lonely ON age (38)
           ecog (39);


MODEL prostate :
   [depress] (1);
   depress ON injust (2)
            lonely (3)
            accept (4);

   [anxiety] (5);
   anxiety ON injust (6)
            lonely (7)
```

```
          accept (8);

[anger] (9);
anger ON injust (10)
        lonely (11)
        accept (12);

[angerGlg] (13);
angerGlg ON injust (14)
          lonely (15)
          accept (16);

[lonely] (17);
lonely ON injust (18);

[accept] (19);
accept ON injust (20);

depress  WITH anxiety (21)
            anger (22)
            angerGlg (23);
anxiety WITH anger (24)
           angerGlg (25);
anger WITH angerGlg (26);

lonely WITH accept (27);

depress  ON age  (28)
          ecog (29);
anxiety ON age (30)
          ecog (31);
```

```
    anger ON age  (32)
           ecog (33);
    angerGlg ON age  (34)
              ecog (35);

    accept ON age (36)
            ecog (37);
    lonely ON age (38)
            ecog (39);

MODEL INDIRECT:
    depress IND lonely injust;
    anxiety IND lonely injust;
    anger IND lonely injust;
    angerGlg IND lonely injust;

    depress IND accept injust;
    anxiety IND accept injust;
    anger IND accept injust;
    angerGlg IND accept injust;

OUTPUT:
    SAMPSTAT;
    STANDARDIZED ; STDYX;
    CINTERVAL(BCBOOTSTRAP);
    TECH1 ; TECH4;

PLOT:
    Type = Plot3;
```

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