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Optimism and Physical Health-Related Quality of Life in Chronic Illness: Mediating Effects of Control Beliefs and Health Behaviors

Morgan Treaster
East Tennessee State University

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Optimism and Physical Health-Related Quality of Life in Chronic Illness: Mediating Effects of Control Beliefs and Health Behaviors

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by
Morgan Kate Treaster
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Jameson K. Hirsch, Ph.D., Chair
Julia Dodd, Ph.D.
Kelly Moore, Ph.D.
Alyson Chroust, Ph.D.

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ABSTRACT

Optimism and Physical Health-Related Quality of Life in Chronic Illness: Mediating Effects of Control Beliefs and Health Behaviors

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Among persons living with, or recovering from, chronic illness, poor physical health-related quality of life is a concern, as current and residual illness symptoms and treatment side effects may deleteriously impact physical functioning and fulfillment of daily roles. Numerous cognitive, emotional, and behavioral factors may impact perceptions of health status. Optimism, for example, is conceptualized as belief in the occurrence of positive future outcomes, and is beneficially associated with physical health-related quality of life. Further, optimism may contribute to enhanced perceptions of control and efficacy over disease symptoms and general health, manifesting as proactive health behaviors (e.g., wellness behaviors; treatment adherence) and, in turn, improved health-related quality of life. Across independent samples of persons living with remitted cancer (*N* = 164) or fibromyalgia (*N* = 508), we examined the serial mediating effects of health-related self-efficacy and proactive health behaviors in the relation between dispositional optimism and physical health-related quality of life. Participants completed online self-report measures, including the Life Orientation Test – Revised, Control Beliefs Inventory, Multidimensional Health Profile – Health Functioning Index, Wellness Behaviors Inventory, Medical Outcomes Study General Treatment Adherence Scale, and the Short-Form Health Survey. Significant serial mediation was observed across samples; higher dispositional optimism was associated with greater health-related self-efficacy and, in turn, greater engagement in proactive health behaviors and better physical health-related quality of life. For persons with remitted cancer, absence of other specific indirect effects indicates a need to consider the potential impact of unique aspects of disease, such as late effects of treatment or fear of recurrence, that may limit the beneficial effects of optimism exclusively through health-related self-efficacy or wellness behaviors. For persons with fibromyalgia, we found specific indirect effects through each mediating variable, lending support for the decoupling of cognitive and behavioral factors, consistent with pathophysiological and psychosomatic explanations of illness symptoms and approaches to treatment. Interventions designed to enhance optimism (e.g., cognitive-behavioral therapy; best possible self exercise) or self-efficacy (e.g., exercise skills training) may have positive downstream effects on health behavior engagement and perceptions of physical health-related quality of life among individuals living with remitted cancer or fibromyalgia.

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While characteristics such as dedication, perseverance, and self-discipline have been necessary in the pursuit of academic goals, my accomplishments were also made possible by the support and guidance from so many individuals. First, I want to extend my appreciation to Dr. Hirsch, who has served as my academic and research advisor for the entirety of graduate school. You have been patient during my times of confusion, a source of calm when I am anxious, and an encouragement in the face of challenging circumstances. I am also grateful to Dr. Moore, Dr. Dodd, and Dr. Chroust for your devotion of time and willingness to serve on my dissertation committee. Each one of you has enhanced my appreciation and understanding of novel perspectives on health psychology concepts, not to mention the professional development I experienced as a result of learning from each of you in graduate courses or clinical supervision.

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CHAPTER 1

INTRODUCTION

Chronic illness is a significant public health concern in the United States (U.S.), with approximately six in ten adults experiencing at least one chronic disease (Centers for Disease Control and Prevention [CDC], 2019), equating to an estimated 133 million individuals (Raghupathi & Raghupathi, 2018). By 2020, this number is projected to grow to 157 million, and nearly 81 million persons will be living with multiple chronic diseases (National Health Council, 2014). Numerous factors contribute to the increased prevalence of chronic disease, including poor nutrition, poverty, substance use, a sedentary lifestyle, and an aging population (Bodenheimer, Chen, & Bennett, 2009; CDC, 2019). Of note, treatment of chronic illnesses, many of which are preventable, accounts for 86% of healthcare spending in the U.S. (Chapel, Ritchey, Zhang, & Wang, 2017).

With such trends in mind, researchers and clinicians have noted the importance of understanding the lived experiences of persons with chronic illnesses, given that such a patient-centered perspective can facilitate effective treatment and improve wellbeing (Wagner et al., 2005). Patient perception of physical health related quality of life (PHRQL) may represent a pertinent starting point to this investigation, as disease symptoms and treatment side effects may contribute to functional limitations (e.g., bending; lifting) and role restrictions (e.g., employment; family; Jones, Rutledge, Jones, Matallana, & Rooks, 2008; Schaefer et al., 2011). Of note, persons living with remitted cancer (CDC, 2019; Crocetti et al., 2013) and pain-related disorders, such as Fibromyalgia Syndrome (CDC, 2017; Spaeth, 2009), often report debilitating illness symptoms which adversely impact perceptions of PHRQL. Yet, despite illness or impairment, not all individuals report poor PHRQL, perhaps due to the presence of adaptive individual-level cognitive-emotional and behavioral characteristics.

One such potential protective factor is dispositional optimism, which is conceptualized as a tendency to hold globalized positive expectancies about the future (Carver & Scheier, 2014). As well, optimistic individuals often display motivational and behavioral patterns consistent with an adaptive vision of the future, thus maximizing likelihood of achieving positive outcomes (Avvenuti, Baiardini, & Giardini, 2016; Rasmussen, Wrosch, Cheier, & Carver, 2006). Optimism has been beneficially and directly linked to PHRQL among chronically ill persons, perhaps because it promotes a positive perception of current physical health and abilities, which is a robust indicator of objectively-assessed current and future physical functioning (Allison, Guichard, & Gilain, 2000; Tsakogia, Lyrakos, Damimgos, Mayreas, & Dimoliatis, 2010).

In addition to a direct linkage between optimism and PHRQL, an indirect association is also likely via cognitive, emotional and behavioral mechanisms, such as the perception of control over disease or general health and engagement in wellness behaviors. For example, sense of health-related self-efficacy (HRSE), conceptualized as belief in one’s ability to successfully engage in behaviors necessary to influence health status (Affleck et al., 2001; Cross, March, Lapsley, Byrne, & Brooks, 2006), may be an important linking mechanism in the association of optimism and PHRQL (Gallagher, Long, Richardson, & D’Souza, 2019; Taylor, Adelstein, Fischer-White, Murugesan, & Anderson, 2016). When present, HRSE may promote a sense of responsibility for self-directed maintenance of health and improvements in health status and, when accompanied by optimism, beliefs in personal ability to attain such health goals may be enhanced.

When efforts to control illness symptoms or to attain health goals are enacted, HRSE may be channeled into engagement in proactive health behaviors, including adherence to a provider's treatment recommendations, with positive implications for PHRQL. For example, internal control and self-efficacy have been positively linked to dietary habits, exercise, medication compliance, and substance use among persons with remitted cancer or FMS (Cedraschi et al., 2004; Kanera et al., 2016; Náfrádi, Nakamoto, & Schulz, 2017; Rooks et al., 2007). Additionally, an optimistic outlook regarding the benefits of, and one's efficacy for, health habits is linked to increased engagement in wellness behaviors, with consequent positive effects on PHRQL (Ramírez-Maestre, Esteve, & López, 2012; Ungar, Rupprecht, Steindorf, Wiskemann, & Sieverding, 2019).

Yet, the interrelations between these variables have not been previously assessed. In our current study, we posit that optimism, HRSE, and health behaviors are serially related to PHRQL, and we test this hypothesis in a dual sample of persons living with remitted cancer and fibromyalgia. In the following sections, we provide a review of the extant literature on the occurrence of these variables in the context of chronic illness.

Cancer Survivors

Ranked as the second leading cause of death and disability in the U.S. (CDC, 2019), cancer is characterized by abnormalities of cell division (e.g., tumor or lesion growth), including the survival of old or damaged cells and formation of new cells when they are not needed (American Cancer Society [ACS], 2016). Compared to other regions, North America has the second highest cancer prevalence, behind only East Asia, and approximately 38.5% of individuals in the U.S. will receive a cancer diagnosis during their lifetime (Crocetti et al., 2013; National Cancer Institute [NCI], 2017a). Risk for diagnosis across the lifespan is higher among men (42%) compared to women (38%; ACS, 2016). Additional individual-level factors, many of which are modifiable, also influence risk, including genetic predispositions, substance use (e.g., smoking; alcohol), lack of physical activity, medications (e.g., hormone therapy), unprotected sun exposure, nutrient deficiencies, and obesity (Pomerantz & Freedman, 2011; Stein & Colditz, 2004). Once receiving a cancer diagnosis, many individuals engage in treatment, with some of the most common approaches being chemotherapy, radiation therapy, immunotherapy, or surgical procedures (ACS, 2017).

Primarily due to advancements in such treatment approaches, along with early detection and diagnosis, there is an increasing number of cancer survivors in the U.S. In 2012, there was an estimated 13.7 million U.S. individuals with a cancer history (de Moor et al., 2013), representing a nearly four-fold increase since 1971, and most cancer survivors are 65 years of age or older (Parry, Kent, Mariotto, Alfano, & Rowland, 2011). The number of survivors is expected to increase to 18 million over the next decade, with female breast cancer comprising a majority of the diagnoses (22%), followed by prostate cancer (20%), colorectal cancer (9%), melanoma (7%), corpus uterus cancer (5%), bladder cancer (4%), thyroid cancer (4%), non-Hodgkin lymphoma (4%), lung cancer (3%), and leukemia (2%; de Moor et al., 2013).

Among cancer survivors, approximately 64% are expected to live five or more years (Gilbert, Miller, Hollenbeck, Montie, & Weis, 2008). Some variation does exist regarding survivorship rates, depending upon the stage of disease at diagnosis and the specific type of cancer (ACS, 2017). General patterns of findings reveal better five-year survival for persons with prostate and female breast cancers, and worse prognosis among individuals with brain, lung, liver, or stomach cancers (DeSantis et al., 2014; NCI, 2017a).

Racial and ethnic disparities in mortality and survivorship have also been identified relative to cancer subtype; for example, mortality rates for cancer of the lungs or bronchus among males is highest for African Americans, followed by Hawaiians, Whites, Chinese, Japanese, Hispanics, Filipinos, and American Indians, with similar trends observed for other subtypes including prostate, colon or rectum, esophagus, and pancreatic cancers (Parker et al., 1998). The same study revealed greater variability among females; for instance, Alaska Natives and Hawaiians displayed higher mortality rates for lung and bronchus cancers compared to Whites, and African American women were more likely than most racial and ethnic groups to experience death from breast, colon, or rectal cancers.

In terms of survivorship, across individuals from multiple socioeconomic classes, five-year survival rates, regardless of cancer subtype, are highest for non-Hispanic White males (51.7% to 61.5%), whereas ranges are less favorable for Hispanic-Latinos (53.8% - 59.9%), African Americans (45.3% - 57.5%), Asian/Pacific Islanders (43.7% - 54.9%), and American Indian/Alaskan Natives (38% - 42.1%; Ward et al., 2004). Among females, five-year survival rates were highest among Hispanic-Latinos (59.6% - 64.7%), followed by Asian/Pacific Islanders (56.1% - 65.8%), Non-Hispanic Whites (54.5% - 63.3%), African Americans (47.8% - 58.5%), and American Indian/Alaskan Natives (44.1% - 53.2%). Other literature suggests that Asians and Pacific Islanders, regardless of sex, have the highest probability of five-year survival (69.5%), and American Indian/Alaska Native men have the lowest probability (56.8%; Siegel, Ma, Zou, & Jemal, 2014). Racial and ethnic differences also exist for stage of cancer at diagnosis, such that minorities are more likely to be diagnosed later in the disease process, with negative implications for survival (Ellis et al., 2018).

Although achievement of remission represents an important disease milestone, survivorship is also accompanied by a wide range of challenges, such as coping with the long-term impact of disease and treatment-related side effects (Gilbert et al., 2008). Broadly, out of a sample of 1,822 cancer survivors, 25% reported poor PHRQL compared to 10% (out of *N* = 24,804) of individuals living without a cancer history (Weaver et al., 2012). Lingering disease symptoms include, but are not limited to, cognitive deficits (e.g., memory impairment), fatigue, chronic pain, loss of bone density, cardiotoxicity, pulmonary dysfunction, and reproductive health concerns (de Moor et al., 2013; Siegel et al., 2012). Abnormalities of bodily systems and other illness symptoms may, in turn, contribute to functional limitations (e.g., walking) or difficulties with completion of daily roles and responsibilities (e.g., employment; Ness, Wall, Oakes, Robison, Gurney, 2006). Indeed, cancer survivors are more likely than individuals living without a medical history to report physical performance limitations (53% vs. 21%) or restrictions in role participation (e.g., social activities; 31% vs. 13%; Ness et al., 2006).

Cancer survivors may perceive a need to overcome such lingering symptoms and impairments, and maintain a healthy lifestyle (e.g., balanced diet; exercise), to maximize well-being and minimize risk of cancer recurrence (Alwhaibi, Lilly, Hazard, & Kelly, 2019; Velicer & Ulrich, 2008). Though rates of cancer recurrence vary greatly relative to subtype, stage at initial diagnosis, and treatment modalities (Primeau, 2018), many survivors continue to experience fear of receiving a future diagnosis, especially when PHRQL is poor. Supporting this assertion, 67.6% of survivors (from a sample of *N* = 1,281) who reported a greater number of lingering disease symptoms, also reported moderate fear of cancer recurrence (Mehnert, Koch, Sundermann, & Dinkel, 2013).

Thus, identification of factors influencing PHRQL has implications for the physical and mental well-being of the rapidly growing U.S. cancer survivor population. Despite not having a current diagnosis, persons living with remitted cancer may continue to experience illness-related symptoms, treatment side effects and health concerns, warranting investigation of their ability to cope with the sequelae of disease and maintain well-being and quality of life.

Fibromyalgia Syndrome

Although typically not life-threatening, pain-related diseases, such as Fibromyalgia Syndrome, can exact a debilitating toll on quality of life. Diagnostic criteria for fibromyalgia put forth by the American College of Rheumatology include: (1) chronic (i.e., lasting more than three months) widespread pain above and below the waist, on the left and right side of the body, and in the axial skeleton region; and (2) pain in 11 of 18 tender point sites upon digital palpitation (Wolfe et al., 1990). Other commonly reported symptoms of fibromyalgia include joint tenderness and stiffness, fatigue and nonrestorative sleep, cognitive difficulties (e.g., memory; concentration), and mood disturbances (e.g., irritability; depression; Arnold, Clauw, & McCarberg, 2011). Medical comorbidities may also be present, with some degree of symptom overlap, such as restless legs syndrome, osteoarthritis, and irritable bowel syndrome (Jahan, Nanji, Qidwai, & Qasim, 2012). Furthermore, many of the symptoms endorsed by persons with fibromyalgia overlap with those reported by cancer survivors including, but not limited to, bodily pain (especially in joints or muscles), cognitive impairments, and sleep disturbances (Bennett, Jones, Turk, Russell, & Matallana, 2007; Siegel et al., 2012). Given such overlap in current and lingering disease characteristics, it may be possible to draw comparisons between the illnesses in terms of factors affecting perceptions of PHRQL.

To begin, just as cancer is highly prevalent in the U.S., fibromyalgia ranks as the third most common rheumatic disorder (Spaeth, 2009), affecting an estimated 2% of the U.S. adult population, which equates to about four million persons (CDC, 2017). Risk for diagnosis varies relative to sex, with between 75% (from sample of N = 33,176; Berger, Dukes, Martin, Edelsberg, & Oster, 2007) and 96.8% of fibromyalgia patients (from sample of N = 2,569) identifying as female (Bennett et al., 2007). Risk for fibromyalgia diagnosis also tends to increase with age. For example, in a cross-country study, rates of fibromyalgia began to rise between 35 and 44 years old and steadily increased until 85-years-old (Branco et al., 2010), consistent with other literature indicating that most individuals diagnosed with fibromyalgia are between 30 and 50-years-old (Queiroz, 2013).

Persons living with fibromyalgia often experience significant stigma and discrimination (e.g., from family and healthcare providers), as the disease is usually diagnosed in the absence of any known contributing biological factors (Sabik, 2010). There is much uncertainty regarding the etiology of fibromyalgia, with much of the literature positing abnormal functioning of the neuroendocrine or autonomic nervous systems as potential causal mechanisms, such that individuals have impairments of inhibitory pain pathways and overactive sympathetic nervous systems resulting in pain amplification (Bellato et al., 2012; Bradley, 2009). Genetics (e.g., serotonin polymorphism), environmental factors (e.g., trauma; stress), and psychiatric illness (e.g., somatization; anxiety) have also been implicated (Arnold et al., 2011; Bellato et al., 2012).

Such diffuse etiological potential contributes to a lack of agreement regarding the best treatment modalities for symptom relief (Lawson, 2008). Treatment goals typically include an alleviation of pain, improvement of physical functioning, and increasing restorative sleep (Bellato et al., 2012). Cognitive-behavioral therapy (e.g., reframing of pain experience;

relaxation training) and exercise-based interventions (e.g., aerobic endurance training; aquatic exercise) are often utilized as primary interventions (Häuser et al., 2009; Koçak & Kurt, 2018). Pharmacological treatment may also be incorporated, whether for pain management or comorbid psychiatric conditions (Bellato et al., 2012; Häuser et al., 2009; Jahan et al., 2012). Finally, complementary and alternative medicine (CAM) approaches are sometimes used and may include temperature-based techniques (e.g., cryotherapy), acupuncture, or electrical stimulation (e.g., transcranial magnetic stimulation; Koçak & Kurt, 2018).

Despite the wide array of treatment options, persons with fibromyalgia often report minimal symptom improvement and, as such, tend to experience persistent poor quality of life and negative perceived health status (Lawson, 2008). Importantly, due to the lack of etiological specificity for fibromyalgia, and the resultant lack of treatment efficacy, investigation of patient-centered markers and mechanisms of well-being and health-related quality of life are warranted. Given the potential symptom overlap between remitted cancer and fibromyalgia, our study may also provide insight into the linkage between individual-level characteristics, including resiliency traits, and quality of life, as it manifests in the context of chronic illness and during the years following achievement of disease-free status.

Physical Health-Related Quality of Life

Broadly, health-related quality of life refers to one's subjective assessment of well-being in terms of physical, mental, emotional, and social functioning (Revicki et al., 2000; Wilson & Cleary, 1995). For persons with remitted or current chronic health conditions, perceptions of physical health-related quality of life (PHRQL) are pertinent to explore, given the potential extensive impact of disease symptoms and treatment-related side effects on self-rated health (Shi et al., 2011; Wuytack & Miller, 2011). As a construct, PHRQL encompasses the extent to which functionality is impaired, whether in terms of bodily movements (e.g., bending), activities of daily living (e.g., cooking), interpersonal relationships, or fulfillment of roles and responsibilities (e.g., employment; Siegel et al., 2012). Functional limitations may be due to many factors including, but not limited to, bodily pain and fatigue. For instance, among persons with fibromyalgia, pain was a significant predictor of lower scores on the Late Life Function and Disability Index (Torma, Houck, Wagnild, Messecar, & Jones, 2013). Similarly, among endometrial cancer survivors, both pain and fatigue were inversely related to physical activity levels (Basen-Engquist et al., 2009). Such patterns of effects illustrate the extent to which PHRQL may be influenced by disease characteristics.

Perceptions of PHRQL are also influenced by many other individual-level, cognitive-emotional, and contextual factors including, but not limited to, demographics (e.g., age; sex/gender), personal values (e.g., physical fitness; disease prevention), psychological well-being (e.g., depression; anxiety; self-esteem), or disease characteristics (e.g., time since diagnosis; Sosnowski et al., 2017). Understanding PHRQL of persons with chronic conditions may be complex, though it represents an important area of research given that subjective ratings of health-related quality of life are often robust predictors of morbidity and mortality compared to objective measures of well-being (e.g., physician assessment or medical records; Cella & Stone, 2015), including among persons in the cancer survivor population (Osoba, 2011).

Physical Health-Related Quality of Life in Cancer Survivors

Much attention has been given to the PHRQL of persons living with a past or current chronic illness. For cancer survivors, the extant literature emphasizes the degree to which disease symptoms and late effects of treatment impact physical functioning or social participation (e.g., family-oriented activities; Cella & Stone, 2015). Nearly 50% of cancer survivors experience lingering treatment-related side effects (e.g., fatigue; bone atrophy or deformity; Ganz, 2006; Valdivieso, Kujawa, Jones, & Baker, 2012), and report greater prevalence of physiological symptoms than the general population. In another study of 1,904 cancer survivors, 34% reported pain and 30% endorsed symptoms of insomnia, compared to rates of 19% and 17%, respectively, in healthy persons from the general population (control group sample of *N* = 29,092; Mao et al., 2007). Among healthy controls and cancer survivors of four or more years, persons with remitted cancer were more likely to report chronic pain and urinary and bowel incontinence (Keating, Nørredam, Landrum, Huskamp, & Meara, 2005).

Illness symptoms may continue to linger during the recovery process, thus impacting PHRQL, as long-term survivors report poorer self-rated health and more days absent from primary roles (e.g., employment) than persons without a cancer history (Eakin et al., 2006). Further, 53% of long-term cancer survivors (from sample of *N* = 434) reported physical performance limitations (e.g. lifting or carrying 10 pounds) compared to 21% of a control group (from sample of *N* = 9,370), and a greater percentage of survivors (31%) reported participation restrictions (e.g., shopping; sporting events) compared to controls (13%; Ness et al., 2006). As a final example, 18% of cancer survivors (from sample of *N* = 1,823) reported an inability to work due to health problems, and 11.4% reported needing assistance with instrumental activities of daily living (e.g., dressing), compared to rates of 10.3% and 6.5%, respectively, reported by noncancer counterparts (*N* = 5,469 total persons in control group; Yabroff, Lawrence, Clauser, Davis, & Brown, 2004).

Physical Health-Related Quality of Life in Fibromyalgia

Persons living with fibromyalgia also report poor physical HRQL due, in large part, to the debilitating impact of illness symptoms, which tend to fluctuate in severity (Sallinen, Kukkurainen, Peltokallio, & Mikkelsson, 2009). In a study of fibromyalgia patients (*N* = 203), 66% reported severe symptoms (e.g., pain; movement difficulties), with lower percentages reporting moderate (24%) or mild (10%) symptoms (Schaefer et al., 2011). In an internationally representative sample of 800 persons with fibromyalgia, participants reported an average of seven out of 14 symptoms, with chronic widespread pain (65%), fatigue (56%), sleep problems (55%), and concentration difficulties (54%) as the most common complaints (Choy et al., 2010).

Presence of such symptoms is associated with poor subjective ratings of PHRQL, including physical functioning impairments and restrictions in daily roles. Sleep difficulties (e.g., restlessness) are associated with lower PHRQL ratings in persons with fibromyalgia compared to healthy controls (Wagner, DiBonaventura, Chandran, & Cappelleri, 2012) and, in another study, number of tender points in the body was inversely associated with walking distance and ability to stand up from a seated position (Carbonell-Baeza, Aparicio, Sjöström, Ruiz, & Delgado-Fernández, 2011). In a comparative study of pain-free women and persons with fibromyalgia, those with fibromyalgia displayed greater impairments in balance and gait, partially explained by pain, stiffness, and fatigue (Costa et al., 2017). Pain intensity also had a stronger negative correlation with PHRQL for fibromyalgia patients compared to persons with other pain conditions and healthy controls (Laursen, Bajaj, Olesen, Delmar, & Arendt-Nielsen, 2005). As a final example, in a nationally representative sample of 1,735 women with fibromyalgia, over 60% reported difficulty with minor household tasks, walking, or lifting/carrying 10 pounds, and more than 90% experienced difficulty with major household tasks, lifting/carrying 25 pounds, or completion of strenuous activities (Jones et al., 2008; Matallana, & Rooks, 2008).

Beyond physical impairment, persons with fibromyalgia also report limitations in activities of daily living and in fulfillment of their daily roles and responsibilities, often due to chronic pain and movement fatigue (Dailey et al., 2016). In women with fibromyalgia, 25% experienced difficulty with personal caretaking (e.g., bathing; Jones et al., 2008). Illness symptoms (e.g., stiffness; sensitivity to sensory input) were also associated with reduced activities of daily living in a sample of 34 persons with fibromyalgia, including inability to garden (41%), vacuum (41%), or walk more than one kilometer (35%; Lindberg & Iwarsson, 2002). Consistent with such findings, nearly 50% of fibromyalgia patients (from sample of N = 31) report avoidance of daily activities (e.g., shopping; dusting) due to their illness (Gaston-Johansson, Gustafsson, Felldin, & Sanne, 1999). Finally, employment difficulties are commonly reported by persons with fibromyalgia, including a need for accommodations (e.g., reduction of demanding tasks; adjustment of hours), frequent absences, or a complete inability to work (Sallinen et al., 2009). Among 800 persons with fibromyalgia, 18% reported a job loss, 22% were unable to work, and 34% reported a lack of career advancement due to illness (Choy et al., 2010). In another study of 270 fibromyalgia patients, 57.1% were unable to work and, among those still working, 59.4% reported working fewer hours (Bernard, Prince, & Edsall, 2000).

Such functional and role restrictions contribute to poor PHRQL for persons with fibromyalgia. Compared to healthy controls, patients with fibromyalgia report lower scores on the Physical Health Composite Scale (PCS) of the Short Form Health Survey – 36 (SF-36; Salaffi et al., 2009), and worse physical performance and perceived health functioning, including deficits in body strength, aerobic endurance, gait, velocity, and balance (Jones, Rutledge, & Aquino, 2010). Finally, when compared to population norms on physical HRQL measures (i.e., SF-36; Nottingham Health Profile), persons with fibromyalgia reported worse general health perception and greater incidence of physical problems (Nogueras, Pinto, & Arenillas, 2010).

Taken together, our review of the literature suggests that persons with remitted cancer and fibromyalgia consistently demonstrate concern with PHRQL, often attributable to current disease activity and prognosis or the long-lasting impact of treatment. In the following sections, however, we discuss additional factors, unrelated to illness or treatment, that can also contribute to perceptions of quality of life.

Factors Influencing Perceptions of Physical Health-Related Quality of Life

The likelihood, manifestation and experience of illness are dependent on numerous biopsychosocial factors, including demographic characteristics such as age, sex, race and ethnicity, and socioeconomic status. For individuals with a history of head or neck cancer, males and older individuals reported worse PHRQL, but disease stage at study baseline was not associated with perceived health at a three-year follow-up (Hammerlid & Taft, 2001). Older age is also associated with worse illness symptom severity in fibromyalgia (Campos & Vázquez, 2013). Sex differences also exist for HRQL in fibromyalgia; for example, females tend to endorse greater fatigue, and men report greater overall disease impact (Aparicio et al., 2012).

Individual-level personality, psychopathological and psychosocial factors, such as those examined in our study, are also consistent contributors to PHRQL. Both anxious and depressive symptoms are strong predictors of quality of life in breast cancer survivors (Weitzner, Meyers, Stuebing, & Saleeba, 1997) and, in persons with fibromyalgia, negative mood is deleteriously associated with completion of daily activities (e.g., eating regular meals) and functional ability (Kurtze, Gundersen, & Svebak, 2011). Lack of social support is also related to poor health-related quality of life, in prostate cancer survivors (Paterson, Robertson, & Nabi, 2015) and individuals with fibromyalgia (Franks, Cronan, & Oliver, 2004).

Cognitive-emotional personality characteristics, including both positive and negative views of the future, may also influence perceptions of PHRQL across chronic illness groups. Greater levels of uncertainty (e.g., about future planning and recurrence) were associated with poorer PHRQL ratings among persons transitioning into cancer survivorship (Garofalo, Choppala, Hamann, & Gjerde, 2009). Yet, to the extent individuals report positive cognitions, such as perceived sense of personal control over health, they may experience better quality of life, as demonstrated among African American and Latina breast cancer survivors (Miller, Ashing, Modeste, Herring, & Sealy, 2015) and survivors of non-Hodgkin lymphoma (Jensen et al., 2013). Engaging in an accepting attitude toward illness symptoms, rather than catastrophizing, is also associated with reduced severity of disease impact and better psychosocial adjustment (Kratz, Davis, & Zautra, 2007).

Finally, disease-related variables may impact perceptions of wellbeing and quality of life. For persons with cancer, time since diagnosis and length of survivorship period are important considerations for PHRQL (Jansen, Koch, Brenner, & Arndt, 2010). After five years of remission, improvements in urinary, bowel, and sexual functioning were reported by prostate cancer survivors (Potosky et al., 2004) and, after five or more years, elderly female cancer survivors had abilities similar to the general population for going out of the home and meal preparation, but experienced significant limitations with housework, walking, and maneuvering stairs (Sweeney et al., 2006). Recurrence of symptoms after remission may also deleteriously impact PHRQL. Survivors with recurrent cancer diagnoses reported lower quality of life than persons with a single diagnosis (Gotay, Ransom, & Pagano, 2007).

In sum, our review of the literature suggests that persons with, or recovering from, chronic illness, including cancer and fibromyalgia, report poor PHRQL due, in large part, to biophysiological factors such as disease symptoms, treatment side effects and role limitations, as well as psychological and interpersonal factors. Given that symptoms, side effects and physical deficits may not always be malleable, and that PHRQL is a person/patient-centered reporting of well-being, it may be important to identify individual-level cognitive, emotional and behavioral factors that can beneficially impact quality of life. In the context of chronic illness, maintaining an adaptive view of one's past (e.g., loss of previous abilities), present (e.g., coping with pain and symptoms) and future (e.g., health goals), or time perspective, may be especially influential in the successful navigation of disease trajectories. For example, there is a well-established beneficial association between optimistic expectancies and mental and physical health outcomes, including health-related quality of life. In the following section, we discuss the conceptualization of optimism and its linkage to objective health outcomes and subjective health ratings (i.e., PHRQL) in persons with chronic illness.

Optimism

Though many forms of optimism exist (e.g., attributional, realistic, or unrealistic optimism), we focus on dispositional optimism given its well-established association to physical and mental health, and to subjective well-being (Aikaterini et al., 2015; Forgeard & Seligman, 2012; Mishra, 2013). Conceptually informed by a range of theories, including personality, social cognition, motivation, and behavioral self-regulation theories, dispositional optimism is defined as the global expectation of a future characterized by positive events, with such expectations based on the presence of internal characteristics (e.g., self-efficacy) or external factors (e.g., social support) conducive to such outcomes (Avvenuti et al., 2016; Bruininks & Malle, 2005; Bryant & Cvengros, 2004; Carver & Scheier, 2014).

Optimism is distinct from trait hope, albeit the terms are often used interchangeably in the literature. Hope is defined as the perceived capacity to achieve meaningful, future goals (i.e., agency), and the ability to solve problems and overcome barriers to attain those goals (i.e., pathways; Snyder, 2002). Thus, both constructs focus on future expectations, though optimism emphasizes general expectancies for the future (e.g., good health) rather than concrete, specific outcomes (e.g., alleviation of pain). Optimism also has a less explicit emphasis on problem-solving and identifying specific ways to achieve goals (i.e., pathways), instead focusing on continuous adjustment of behavioral patterns and flexibility (e.g., cognitions or behaviors) to maximize likelihood of the occurrence of positive future outcomes (Chang, 2001). To the extent individuals experience difficulties with successful goal adjustment and possess negative expectancies of the future, they are described as pessimistic, and though controversial, it has been suggested that optimism and pessimism are independent, related constructs rather than existing as opposite ends of a continuum (Kubzansky, Kubzansky, & Maselko, 2004).

Personality traits, such as dispositional optimism, exert influence on the approach or response to life situations, including goal setting, positive reappraisal of thwarted goals, and establishment of new goals (Wrosch & Scheier, 2003). Optimistic future expectancies are often shaped by one’s confidence in such events occurring, perhaps dependent on external factors (e.g., illness characteristics; resource availability) or personal efforts and, as such, optimism tends to overlap with motivational and behavioral self-regulation processes (Avvenuti et al., 2016). For example, when discrepancies exist between the current reality of one’s life and future expectations, individuals may engage in, or disengage from, certain behaviors as an attempt to move toward desired outcomes (Rasmussen et al., 2006). Behavioral success, or lack thereof, serves as feedback to an individual and, in turn, may result in further adjustments, whether in the form of increasing efforts toward a desired outcome or goal disengagement and redirecting efforts if conditions seem unfavorable to success (Carver & Scheier, 2014). Drawing from Albert Bandura's social cognitive theory, behavioral patterns, especially in the context of failures, are also influenced by self-efficacy beliefs, or the degree to which individuals believe personal skills and abilities will lead to various outcomes, with higher self-efficacy linked to an optimistic view of desired outcomes (Bandura, 2008).

Furthermore, despite conceptualization as a dispositional tendency to think or behave in certain ways, the malleability of optimism has also been demonstrated in the literature via the influence of individual-level characteristics (e.g., other personality traits) or external factors (e.g., illness experience; Hudson & Fraley, 2015; Steyer, Schmitt, & Eid, 1999). In a community sample, optimism scores significantly increased for participants who engaged in a two-week intervention focused on daily visual imagery of the best possible self (Meevissen, Peters, & Alberts, 2011). Shifts in optimism were also observed over a four-year time span in older adults, with higher optimism ratings during periods of fewer chronic illnesses and better self-rated health (Chopik, Kim, & Smith, 2015).

The association between optimism and physical health and wellbeing is well-documented, including beneficial linkages between optimism and engagement in preventative health behaviors, delayed onset of disease, lower illness severity, faster recovery from disease, and decreased likelihood of relapse in both community and diverse clinical samples, including persons with pain and arthritic conditions (Barker, 2007; Chang, 2001; Davidson & Prkachin, 1997). Among a general population sample, optimism was related to lower incidence of chronic illnesses, better self-reported HRQL, and lower mortality rates (Chopik et al., 2015; Converseano et al., 2010; Kubzansky et al., 2004) and, among patients hospitalized for diverse chronic diseases, optimism was associated with better health-related quality of life, as evidenced by higher scores on all SF-36 subscales (Kepka et al., 2013). Such health benefits may be due, in part, to the linkage between optimism and approach-oriented coping, which is enacted to eliminate, reduce, or manage ongoing stressors and life difficulties (e.g., chronic illness; Converseano et al., 2010; Nes & Segerstrom, 2006). Opposite patterns of findings have been observed for pessimism. For example, pessimism is associated with passivity and avoidance-based coping in the context of illness, and to poorer subjective health ratings, greater physical functioning impairments, and more frequent illnesses over a one-year time span, for community dwelling young adults and persons living with chronic knee pain (Brenes, Rapp, Rejeski, & Miller, 2002; Lin & Peterson, 1990).

In sum, previous research indicates a robust association between the presence of optimism and better physical health, including in the context of chronic illness. In the following sections, we review the literature focused on the impact of optimism for persons living with remitted cancer and fibromyalgia, which also suggests that optimism can exert a positive influence, either directly or indirectly, on subjective ratings of PHRQL for these illness groups.

Optimism and Physical Health-Related Quality of Life in Cancer Survivors

After successfully overcoming a potentially life-threatening illness, such as cancer, dispositional optimism may be an important, individual-level resiliency trait that directly contributes to the healing and recovery process and to better perceptions of quality of life. In a two-year longitudinal study of patients with head and neck cancer, optimists, compared to pessimists, reported higher PHRQL ratings following cessation of treatment (Allison et al., 2000). Optimism, measured broadly, is also related to better general health ratings among women with breast or gynecological cancer (Thieme, Einenkel, Zenger, & Hinz, 2017) and adult cancer survivors (Gallagher et al., 2019) and, similarly, focus-specific optimism (e.g., about future course of illness) is associated with PHRQL in young adult cancer survivors (Stam, Grootenhuis, Caron, & Last, 2006). Finally, for breast cancer survivors, a non-pessimistic explanatory style was associated with better HRQL, as evidenced by higher scores on all subscales of the SF-12 and SF-36 (Petersen et al., 2008).

Additional aspects of health-related functioning are beneficially impacted by optimism in cancer survivors, including role functioning and mortality. Optimism is a significant predictor of work engagement in breast cancer survivors (Hakanen & Lindbohm, 2008). Among a sample of colorectal cancer survivors, less optimism was associated with a lower score on the Functional Assessment of Cancer Therapy – Colorectal (FACT-C), indicating poor physical (e.g., nausea; pain) and functional (e.g., employment; recreational activities) well-being (Dunn et al., 2013). Finally, in a diverse sample of cancer survivors, optimism was linked to better PHRQL and lower mortality rates, whereas pessimism was associated with worse PHRQL and greater mortality (de Rooij et al., 2018). Taken together, our review of the literature indicates that optimism exerts a direct, beneficial effect on physical health status in the cancer population, and in those recovering from cancer.

Optimism and Physical Health-Related Quality of Life in Fibromyalgia

Similar patterns of findings are also evident in persons with other types of chronic illnesses. Yet, to our knowledge, no study has examined the direct linkage of dispositional optimism and PHRQL among persons living with fibromyalgia, although advanced understanding of this association is warranted given the potential benefits of optimism for assuaging the impact of fibromyalgia symptoms (Sallinen et al., 2009). Because of the lack of research on the optimism-PHRQL linkage in persons with fibromyalgia, it is necessary to draw upon studies focused on persons with rheumatic and chronic pain disorders, which are illnesses that often present with symptomology and impairment profiles similar to fibromyalgia (Haliloglu, Carlioglu, Akdeniz, Karaaslan, & Kosar, 2014; Clauw & Katz, 1995).

Importantly, optimism has been directly linked to physical functioning and impairment, and PHRQL, in persons with rheumatic or pain conditions. Among persons with rheumatoid arthritis, low optimism was associated with reports of higher pain severity (Kwissa-Gajewska & Gruszczynska, 2018) whereas, among chronic pain patients, greater dispositional optimism was associated with better HRQL (i.e., higher PCS score on SF-12), controlling for pain intensity (Tsakogia et al., 2010). Among older adults with chronic knee pain, optimism was associated with better walking abilities (Brenes et al., 2002) and, in persons with generalized shoulder pain, optimism was associated with better shoulder functioning via reductions in pain catastrophizing (Coronado et al., 2017). Similarly, positive future expectancies were associated with less physical impairment and better physical functioning among chronic pain patients in Spain (Ramírez-Maestre et al., 2012).

Optimism is also beneficially linked to health-related role functioning. Among rheumatoid arthritis patients, positive pre-surgery expectations regarding future functional abilities (e.g., hand movement) and physical activity engagement (e.g., housework) significantly predicted post-surgery physical health status (Chung et al., 2015). Optimism was also beneficially associated with employment status among chronic back pain patients completing an exercise and group therapy intervention program (Härkäpää, Järvikoski, & Estlander,1996).

In sum, previous research suggests that, optimism appears to exert direct, positive effects on subjective ratings of physical health-related quality of life among individuals living with, or in recovery from, chronic health conditions. Yet, the mechanisms of action for this linkage are largely unknown. For example, how do positive expectancies for the future translate into better perceptions of health-related quality of life, in the present moment? Cognitive-emotional factors, such as locus of control and HRSE, and behavioral factors, such as engagement in proactive health behaviors, are posited to play a role in the association between optimism and PHRQL and are discussed in the following sections.

Perceived Control

The concept of perceived control is rooted in Julian Rotter's social learning theory, which posits that events and behaviors are strongly influenced by one's cognitive assessment of the situation, including the degree to which it is within the realm of personal influence, beliefs about one's efficacy to resolve a situation, and outcome expectancies associated with behaviors (De Valack & Vinck, 1996; Wallston, 2001). Among persons living with a chronic health condition, control beliefs may influence response to diagnosis and extent of engagement in health promotion behaviors to maximize physical well-being (Brooks et al., 2018). This paradigm is referred to as health locus of control and represents the degree to which individuals believe they have personal control over health outcomes, whether alleviation of symptoms or disease recovery (Cross et al., 2006).

Perceptions of control depend, in part, on the types and focus of control beliefs endorsed in the context of disease. Some individuals report having an external locus of control, such that health outcomes are believed to be the result of luck, chance, fate, or actions of other powerful individuals (e.g., doctors; Wallston, 2001). Externally oriented control beliefs may emerge from past experiences of unsuccessful resolution or influencing of situational outcomes (e.g., bloodwork results), contributing to a lack of confidence in ability to engage in health behaviors (e.g., maintaining balanced diet) and the degree to which such behaviors will beneficially impact physical well-being (Faller, Schilling, & Lang; Norton et al., 2005; Wallston, 2001).

On the one hand, an external locus of control may be an adaptive perspective for minimizing psychological distress associated with the illness experience. Belief in the control of a higher power over illness was inversely associated with perceived stress, in breast cancer patients (Cousson-Gélie, Irachabal, Bruchon-Schweitzer, Dilhuydy, & Lakdja, 2005). Among Latina advanced cancer patients, anxiety about disease prognosis and treatment was lower to the extent participants were able to relinquish control to doctors and a higher power (Nedjat-Haiem, Lorenz, Ell, Hamilton, & Palinkas, 2012). However, on the other hand, attributing health outcomes to external causes may be a maladaptive way of viewing the disease experience. For example, relinquishing control of health to external factors (e.g., higher power; chance) is associated with engagement in unhealthy behaviors (e.g., substance use) and treatment noncompliance in persons with chronic illness (Drew & Schoenberg, 2011; Niederdeppe & Levy, 2007).

Despite feeling as though health may be unpredictable or uncontrollable at times, other individuals with chronic illness may maintain an internal locus of control over health, or belief in their ability to control disease or specific aspects of the illness experience (e.g., symptoms; treatment efficacy; O’Hea et al., 2005; Wallston, 2001). Sense of internal perceived control often emerges from previous success at engaging in health behaviors (e.g., treatment compliance; daily vitamins) and subsequent recognition of the degree to which such behaviors led to health improvements (e.g., less pain or fatigue; Ranchor et al., 2010). Furthermore, positive experiences of self-management of health contribute to a sense of health-related self-efficacy (i.e., HRSE;

belief in capability of successfully performing health behaviors), which can then be relied upon in future illness-related challenges (Bandura, 2004).

HRSE is posited as a specific type of internal control belief, closely tied to motivation for goal-directed behaviors and perseverance when faced with setbacks (Börsbo, Gerdle, & Peolsson 2010; Feltz & Payment, 2005). For persons experiencing a chronic illness, this sense of internally focused HRSE may exert a positive effect on perceptions of PHRQL, with optimism serving as a potential facilitator of this personal process of adaptive ability to influence health outcomes.

Health-Related Self-Efficacy and Physical Health-Related Quality of Life in Cancer Survivors

In persons diagnosed with and recovering from cancer, HRSE is consistently linked to higher subjective ratings of PHRQL, despite cancer often being uncontrollable and having varying rates of treatment responsiveness and the possibility of recurrence. Fear of cancer recurrence is negatively associated with HRSE in breast cancer survivors (Ziner et al., 2012), with other literature noting that perceptions of control may vary throughout the illness experience. In a longitudinal study of cancer patients in the Netherlands, low levels of perceived control were observed immediately before and after receiving a diagnosis, with slight improvements observed at the one-year mark, though still much lower than ratings among persons without cancer (Ranchor et al., 2010). Earlier diagnosis and more elapsed time since initial diagnosis are also linked with greater perceptions of control in breast cancer survivors (*N* = 114), with 89% of participants reporting a perceived personal ability to control likelihood of recurrence (Alwhaibi et al., 2019).

To the extent cancer survivors endorse a sense of HRSE, they may also report better PHRQL, with existing literature supporting a direct association between these variables. Among Latina breast cancer survivors, a sense of self-efficacy for cancer management was positively associated with self-rated health (García-Jimenez et al., 2014) and, in a comparable sample, self-efficacy was associated with more favorable scores on subscales of the Functional Assessment of Cancer Therapy – Breast questionnaire (DiSipio, Hayes, Newman, & Janda, 2009). Finally, after one year, among post-treatment survivors with diverse cancer subtypes, low self-efficacy was reported for fatigue management, and higher ratings were reported for accessing cancer-related information, with HRSE least likely to be endorsed by persons with poor general well-being (Foster et al., 2015).

HRSE has also been linked specifically to physical functioning and fulfillment of daily roles. Among breast cancer survivors, self-efficacy for task performance was associated with better physical well-being and quality of life (Rojas-Guyler, Webler, King, Swoboda, & Vidourek, 2016). In colorectal cancer survivors, self-efficacy for completing daily activities is associated with better health-related quality of life (Johansson et al., 2018). Finally, baseline perceptions of low internal control were associated with worse physical functioning at a five-year follow-up, among individuals with a recurrent cancer diagnosis (Tomich & Helgeson, 2006). Thus, despite the uncertainty and unpredictability of future cancer recurrence, HRSE appears to foster positive perceptions of current PHRQL among cancer survivors.

Health-Related Self-Efficacy and Physical Health-Related Quality of Life in Fibromyalgia

Control beliefs may also have important implications for PHRQL among persons living with fibromyalgia, given the uncertainty and unpredictability of the presence or severity of symptoms. In a study of patients with fibromyalgia (*N* = 51), 58% attributed the cause of their disease and symptoms to an external source, with the associated belief that medical treatment would be ineffective at managing the disease (van Wilgen, van Ittersum, Kaptein, & van Wijhe, 2008).

Yet, to the extent that persons with fibromyalgia experience HRSE, they may also report better PHRQL. For example, in a study of fibromyalgia patients, self-efficacy for pain management, symptom control, and functionality was associated with reduced perceptions of negative disease impact (Sahar, Thomas, & Clarke, 2016). In another fibromyalgia sample, self-efficacy for completion of daily activities and pain management was positively associated with generalized subjective ratings of disease severity (Du Plessis, Steel, & Möller, 2009). HRSE is also associated with higher PCS scores on the SF-36 for persons with fibromyalgia (Lee et al., 2017) and for those living with different types of arthritis (Cross et al., 2006).

In addition to subjective perceptions of quality of life, in persons with fibromyalgia, HRSE is also linked to better physical functioning and greater fulfillment of daily roles and responsibilities. Among fibromyalgia patients, belief in ability to control pain is related to fewer functional limitations and lower pain severity (Puente et al., 2015), and disease-related self-efficacy is associated with greater physical activity engagement (Buckelew, Murray, Hewett, Johnson, & Huyser, 1995). Self-efficacy also emerged as the only significant predictor of physical functioning and pain intensity in a one-year longitudinal study of fibromyalgia patients (Van Liew, Brown, Cronan, Bigatti, & Kothari, 2013). Additionally, self-efficacy and perceived health competence were associated with reduced pain intensity and better mobility, body care, and movement in persons with fibromyalgia (Lledó-Boyer et al., 2010). Regarding role limitations, internal locus of control for pain management was associated with a greater likelihood that persons with fibromyalgia would return to work following completion of a multidisciplinary treatment program (Torres et al., 2009). As a final example, in chronic pain patients, low HRSE was associated with unemployment and prolonged illness-related absence from work (Busch, Göransson, & Melin, 2007; Rahman, Reed, Underwood, Shipley, & Omar, 2008).

Overall, for both persons with remitted cancer or pain-related conditions, such as fibromyalgia, our review of the literature suggests that there is a well-established linkage between HRSE and PHRQL. From a clinical and health promotion standpoint, when working with persons experiencing or recovering from chronic illness, it will be valuable to identify factors that contribute to a sense of self-efficacy, with implications for bolstering positive perceptions of PHRQL.

Optimism, Health-Related Self-Efficacy, and Physical Health-Related Quality of Life in Cancer Survivors

Given the adaptive benefit of HRSE on PHRQL, developing an understanding of its origins in the context of disease may be of importance to maximizing subjective ratings of health status among persons living with a past or present illness. Optimism has been put forth as one potential individual-level factor, given its beneficial linkage with health-related perceptions of control in persons with chronic illness (Ruthig, Hanson, Pedersen, Weber, & Chipperfield, 2011; Zhang et al., 2016). It may be that an optimistic perspective contributes to the development of beliefs about PHRQL, such that individuals manifest a positive attitude and outlook about their health but also about their ability to influence and attain desired health outcomes.

Although limited research exists, several previous studies indicate an association between optimism, control beliefs, and PHRQL in persons with cancer. In a qualitative study of hematological cancer patients, emergent themes included deliberate attempts to remain in control of illness and maintaining a sense of optimism regarding the future (Bulsara, Ward, & Joske, 2004). Among breast cancer survivors, better quality of life was attributed to maintaining positive perspectives of illness and functioning (e.g., managing treatment side effects) and the future (e.g., second chance at life), and exerting control over health (e.g., nutritional supplements; exercise; Milne, Guilfoyle, Gordon, Wallman, & Courneya, 2007). Finally, in adult cancer survivors, optimism and HRSE, combined, contributed to higher perceived physical health ratings (Gallagher et al., 2019).

Optimism, Health-Related Self-Efficacy, and Physical Health-Related Quality of Life in Fibromyalgia

As with cancer, only minimal research exists on the linkage between optimism, HRSE, and PHRQL for persons with fibromyalgia, yet there is some precedent for these associations in persons with rheumatic and pain conditions. In persons living with rheumatoid arthritis, optimism was related to an internal locus of control over pain, and to greater behavior engagement despite the presence of pain (Bargiel-Matusiewicz & Krzyszkowska, 2009). Relatedly, in a qualitative study of patients with fibromyalgia, some emphasized the importance of maintaining a sense of optimism regarding future health, with associated motivation and desire to control symptoms and pursue valued activities (e.g., employment; Taylor, Adelstein, Fischer-White, Murugesan, & Anderson, 2016). Among patients with chronic low back pain, optimistic views about health, combined with minimal levels of external control beliefs, were associated with better self-reported functional capacity and greater likelihood of employment following completion of a treatment program (Ramírez-Maestre et al., 2010). Finally, in a qualitative study of persons with knee osteoarthritis, many respondents were unable to endorse a positive future outlook (Pouli, Nair, Lincoln, & Walash, 2014) and, further, negative expectations regarding treatment efficacy (e.g., poor outcomes for surgery and pharmacological intervention) contributed to perceptions that the disease was outside of personal control, resulting in decreased engagement in adaptive health behaviors.

Overall, our review of the literature on persons with fibromyalgia, and related rheumatic and pain conditions, and cancer, suggests that optimism appears to directly influence PHRQL, and to indirectly impact PHRQL via enhanced sense of HRSE. Yet, simply perceiving control over health and illness may be insufficient for improvement of PHRQL, which may require actual behavioral changes, perhaps in the form of greater engagement in proactive health behaviors that actually benefit health functioning, to be perceived as improved.

Health Behaviors

Among persons living with a past or present chronic illness, engagement in proactive health behaviors and treatment adherence are vital components of disease management and minimizing risk of future health complications. As a result, self-ratings of PHRQL may be influenced by the degree to which individuals report engaging in wellness behaviors and adhering to the recommendations of health providers. Although treatment adherence, defined as "the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (WHO, 2003, p. 3), is critical for maintenance of chronic disease, many individuals experience difficulties following provider recommendations. In a meta-analysis of a nationally representative series of data (i.e., Health and Retirement Study [HRS]), the pooled primary nonadherence rate was 14.6% for chronic disease medications (Lemstra, Nwankwo, Bird, & Moraros, 2018). For persons living with chronic health problems, including diabetes and hypertension, adherence rates to diet and exercise recommendations varied relative to race and ethnicity, though Whites consistently reported lower rates of compliance compared to Blacks, Vietnamese, and Latinos (Orzech, Vivian, Torres, Armin, & Shaw, 2012).

Numerous factors may impact rates of engagement in health behaviors and compliance to formal treatment regimens. Demographic characteristics, such as age, sex, race/ethnicity, education level, and socioeconomic status, are linked to health behavior change (Theofilou & Panagiotaki, 2012; World Health Organization [WHO], 2003). For instance, women are more likely to utilize formal health care services, and routine health screenings are more common among older individuals (Deeks, Lombard, Michelmore, & Teede, 2009). Regarding race and ethnicity, biological predispositions (e.g., metabolism; disease risk) and social factors (e.g., discrimination; acculturation) are associated with engagement in health behaviors (Williams & Jackson, 2005). Health disparities may also exist due to socioeconomic factors, including education and income. A higher level of education is related to adoption of proactive health behaviors, perhaps reflecting greater exposure to and understanding of health information and risks (Margolis, 2013). Rates of engagement in unhealthy behaviors are inversely related to socioeconomic status, perhaps due to resource deprivation (e.g., lack of health insurance) and existence of chronic stressors (e.g., substance use to alleviate financial worry) in low-income and economically-marginalized persons (LIEM; Pampel, Krueger, & Denney, 2010).

Additional individual-level psychosocial characteristics are also implicated. For example, psychopathological symptoms (e.g., anxiety; depression) and personal health beliefs, such as one’s cost-benefit analysis of health behavior change or expectations of efficacy for illness management (Martin, Williams, Haskard, & DiMatteo, 2005; Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992), contribute to engagement in proactive health behaviors, or the lack thereof. Finally, the influence of illness, impairment and treatment-specific factors must be acknowledged, including the impact of disease severity, functional limitations, side effects, and duration and complexity of a treatment regimen (WHO, 2003).

Understanding how such factors might encourage or hinder proactive health behaviors is challenging, given the complex interactions of influence across individuals. However, what is more straightforward is the notion that unhealthy behaviors and treatment noncompliance have a detrimental effect on PHRQL, whereas engagement in proactive health behaviors and adherence to treatment recommendations are associated with better health-related quality of life. In the following sections, we review the existing literature addressing these potential interrelations among persons living with remitted cancer or fibromyalgia.

Health Behaviors and Physical Health-Related Quality of Life in Cancer Survivors

Following achievement of cancer remission, survivors are encouraged to engage in numerous wellness behaviors aimed at minimizing risk of recurrence and maximizing quality of life. Specifically, the World Health Organization (2003) recommends the following: (1) accumulate a minimum of 150 minutes of moderate to strenuous, or 60 minutes of strenuous physical activity, per week; (2) consume a minimum of five daily servings of fruits and vegetables; and (3) avoid smoking. Expanding upon these guidelines, in terms of diet, survivors are encouraged to choose lean proteins and whole grains, limit red and processed meats, and to consume foods with healthy omega-3 fats or vitamin D (National Comprehensive Cancer Network [NCCN, 2019). Limiting alcohol consumption to one beverage daily for women, and two for men, is also encouraged among cancer survivors (ACS, 2016; NCCN, 2019).

Health behavior guidelines are believed to maximize post-treatment PHRQL and minimize risk of cancer recurrence. Broadly, a well-balanced diet and physical activity have been linked to better weight management, lower stress levels, and improved cardiovascular functioning, all of which may protect against the onset of secondary chronic diseases and help to overcome detrimental effects of cancer treatment on the functioning of bodily systems (Demark-Wahnefried & Jones, 2008; Watson & Leonard, 2020). Dietary quality has also been linked to inflammatory processes and immune system functioning, with potential influence on the severity of late onset treatment effects or likelihood of acquiring a future illness (George et al., 2010). It is also important that survivors reduce or cease use of substances (e.g., cigarettes; alcohol), given their adverse physiological effects that heighten risk for cancer recurrence and poorer treatment responsiveness if recurrence occurs (Meadows & Zhang, 2015; Passarelli & Newcomb, 2017).

Despite personal history with a potentially life-threatening diagnosis, and fear of recurrence, many cancer survivors do not follow such recommendations and, as a result, have a greater likelihood of experiencing poor PHRQL. Broadly, in a study of cancer survivors, 12.5% (from total sample of *N* = 9,015) failed to meet any of the WHO guidelines (Blanchard, Courneva, & Stein, 2008). In another study of 17,158 cancer survivors, nearly 73% did not meet the dietary recommendations (Nayak, Paxton, Holmes, Nguyen, & Elting, 2015) and, in a study of 66 male breast cancer survivors, only 22.7% of the total sample reported eating five daily servings of produce (Andrykowski, 2012). Further illustrating poor dietary choices, among early stage breast cancer survivors (*N* = 2,321), approximately 25% of the total sample consumed diets averaging 40% of daily caloric intake from unhealthy sources of fat (Caan et al., 2005).

Regarding physical activity levels, relative to the WHO guidelines, rates of noncompliance for physical activity recommendations ranged from 13% - 31% among breast cancer survivors (*N* = 106) in California (DeNysschen, Brown, Baker, Tetewsky, & Dodd, 2015). Similarly, among cancer survivors of various subtypes, exercise noncompliance ranges from 41% (Andrykowski, 2012) to 53% (Blanchard et al., 2008; Nayak et al., 2015), reaching as high as 76.9% (Krebs et al., 2012).

Finally, regarding substance misuse, among lung cancer survivors (*N* = 183), 5.4% of men and 17.3% of women exceeded the alcohol intake guideline (Krebs et al., 2012) and, in another study of 66 cancer survivors, 15.1% reported drinking more than the recommended limit (Hyland et al., 2018). Regarding tobacco usage, among 619 survivors living with various types of cancer, nearly 22.5% continued to smoke after their diagnosis (Mayer et al., 2007), with similar findings (20.2%) obtained in a much larger, diverse sample of cancer survivors (total sample of *N* = 7,384; Bellizzi, Rowland, Jeffery, & McNeel, 2005).

Failure to meet dietary and exercise guidelines, and the misuse of substances, are consistently associated with poor PHRQL in those diagnosed with, and in remission from, cancer. In cancer survivors younger than 50 years old who reported an inability to consume five servings of fresh produce and high levels of sedentary behavior, 12% experienced three or more functional limitations (Caan et al., 2005). For long-term colorectal cancer survivors, low physical activity level was associated with poor HRQL, including impaired physical and social functioning, (Rodriguez, Hawkins, Berkowitz, & Li, 2015). Recognition of the deleterious impact of misuse of substances is also noted. In a sample of 509 cancer survivors, 52% reduced or ceased alcohol usage one-year post-diagnosis, given its exacerbation of cancer-related fatigue and negative association with quality of life (Eng et al., 2019). Finally, in a study of 142 lung cancer survivors, 13.4% continued to smoke and 58% reported alcohol consumption, both of which were related to poor health related quality of life (Evangelista, Sarna, Brecht, Padilla, & Chen, 2003).

On the other hand, many survivors of cancer report making proactive lifestyle changes following achievement of remission, and those who do tend to report better PHRQL. In a study of cancer survivors (total sample of *N* = 6,309), 4.7% quit smoking after receiving their diagnosis (Westmaas, Berg, Alcaraz, & Stein, 2015), and non-smoking status is associated with better PHRQL in breast, prostate, and colorectal cancer survivors (Blanchard et al., 2008). For colorectal cancer survivors, non-drinking status increased from 65.5% (pre-diagnosis) to 67.5% two years after diagnosis (Satia et al., 2004), which is important because moderate alcohol consumption, in conjunction with other proactive health behaviors, is associated with better physical functioning and global quality of life in the cancer population (Grimmett, Bridgewater, Steptoe, & Wardle, 2011).

After remission, changes to dietary and exercise patterns are often evident. For instance, 35% of prostate cancer survivors (from total sample of *N* = 20) reported dietary changes following their diagnosis (Coa, Smith, Klassen, Thorpe, & Caulfield, 2015) and, in a two-year longitudinal study of 278 colorectal cancer survivors, consumption of recommended amounts of vegetables increased from 1.1% to 4.3%, and multivitamin use also increased from 31.3% to 42.8% (Satia et al., 2004). Among 227 breast cancer survivors, 32% increased their engagement in exercise and many made dietary changes including greater fiber intake (42%), consumption of more produce (43%), and decreased fat intake (44%; Alfano et al., 2009).

Such adaptive changes to diet and engagement in high levels of physical activity are associated with better PHRQL. For long-term breast cancer survivors, adherence to exercise recommendations is related to better PCS scores on the SF-36, resulting in PHRQL ratings similar to those observed in the general population (Kendall, Mahue-Giangreco, Carpenter, Ganz, & Berstein, 2005). In breast cancer survivors, greater engagement in recreational activity was associated with less fatigue, lower pain severity, and better PHRQL (Alfano et al., 2007). Among endometrial cancer survivors, both exercise and body mass index were independently associated with quality of life, including physical well-being, functional status, and levels of fatigue (Courneya et al., 2005). Finally, for breast cancer survivors, regular exercise and daily consumption of fruit and vegetables was associated with better PHRQL (Gong et al., 2017).

In sum, the existing literature suggests that not all persons in recovery from cancer make adaptive health behavior changes; however, those that do appear to benefit from improvements in wellbeing and health-related quality of life.

Health Behaviors and Physical Health-Related Quality of Life in Fibromyalgia

For persons living with fibromyalgia, there is a wide array of potential treatment options to mitigate pain, including use of medications (e.g., painkillers; mood stabilizers), physically-oriented interventions (e.g., exercise programs; relaxation training), and cognitive strategies (e.g., mindfulness; cognitive-behavioral therapy; Chakrabarty & Zoorob, 2007; Kia & Choy, 2017). Each of these therapeutic approaches has the potential to exert a beneficial impact on perceived quality of life for persons living with fibromyalgia. To begin, pharmacotherapy (e.g., tricyclic antidepressants; opioids) has been utilized for pain management and alleviation of comorbid psychopathology (Smith & Barkin, 2011). Exercise programs result in anti-inflammatory effects while also strengthening and retraining weakened muscle groups (Mizelle & Fontaine, 2011; Ortega et al., 2009). With similar physiological effects, heart rate variability biofeedback facilitates autonomic changes that may reduce heightened arousal (e.g., stress response), beneficially impacting sleep quality and pain severity (Hassett et al., 2007).

Psychotherapeutic intervention strategies also appear to have benefits for persons with fibromyalgia. For instance, mindfulness activities can facilitate awareness, acceptance, and tolerability of unpleasant internal and external experiences, and can ameliorate pain-related catastrophizing and hypervigilance (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007). Participation in cognitive-behavioral therapy can result in changes in connectivity for brain regions involved in pain-processing, thereby reducing pain catastrophizing and perceptions of symptom severity (Ehde, Dillworth, & Turner, 2014; Lazaridou et al., 2017). As a final example, therapeutically promoting coping strategies (e.g., imagery training; stimulus control) may improve sleep hygiene, fatigue, and daily functioning (Martínez et al., 2014).

Yet, despite these well-established benefits, persons with fibromyalgia and related conditions exhibit considerable variability in rates of compliance with recommended lifestyle changes and treatment regimens. Many persons with fibromyalgia report erratic use of prescriptions and high rates of discontinuation. In a study of fibromyalgia patients after six months of treatment, discontinuation rates exceeded 50% for five different medications (Liu, Qian, & Yang, 2016). In another study of patients with fibromyalgia (*N* = 127), a nonadherence rate of 47.2% was obtained after two weeks of treatment (Sewitch et al., 2004). Among 100 patients with chronic pain, 57% reported nonadherence, with 29% of non-adherents reporting both intentional and nonintentional nonadherence, including self-management of dosing and frequency based on pain severity (*n* = 26), and using less often (*n* = 14) or more frequently (*n* = 9) than prescribed (Markotic et al., 2013). In a study of chronic pain patients, which utilized toxicology results rather than self-report measures, 43.3% were classified as noncompliant with medications (Kipping, Maier, Bussemas, & Schwarzer, 2014). Finally, rates of adherence also appear to decline longitudinally, as evidenced in a sample of patients with FMS (*N* = 3,932), in which only 9.3% of the sample were still taking medications as prescribed after one year (Shor et al., 2017).

Typically, medication compliance or nonadherence is associated with better PHRQL, although some persons with fibromyalgia, or chronic pain, may perceive worse health based on the need for pharmacotherapy. A higher rate of compliance was associated with worse PHRQL in persons with rheumatic disorders, suggesting that poor health could have motivated greater adherence (Hromadkova, Soukup, & Vlcek, 2015).

Yet, in large part, medication adherence is related to better PHRQL for chronic pain patients, including an association between medication compliance and less disease symptomology (e.g., less tenderness or joint stiffness) among persons with rheumatoid arthritis (Gadallah, Boulos, Gebrel, Dewedar, & Morisky, 2015; Ragab, Zayed, Abdelaleem, & Girgis, 2017). Similarly, for osteoarthritis patients, PHRQL ratings were higher for those reporting greater treatment satisfaction and adherence (Conaghan, Serpell, McSkimming, Junor, & Dickerson, 2016). As a final example, in a study of arthritis patients, there was a positive association between non-adherence to anti-rheumatic drugs and number of bodily regions affected by symptoms (e.g., pain; stiffness) after six months of treatment (Pasma et al., 2015).

Beyond use of pharmacotherapy, treatment of fibromyalgia often focuses on mobility and physical activity levels, and the literature is mixed regarding rates of compliance with this health behavior. In a 16-week, home-based aerobic exercise program for persons with fibromyalgia (N = 143), drop-out rates were 38% for a condition requiring twice-daily, short exercise bursts and 29% for a condition requiring once-daily exercise for an equivalent period of time, ranging from 10-30 total minutes (Schachter, Busch, Peloso, & Sheppard, 2003). In another study of low intensity aerobic fitness training for persons with fibromyalgia, approximately half of individuals across treatment conditions failed to achieve a participation rate greater than 67% (van Santen et al., 2002). Yet, other research shows more promising results; in a meta-analysis of adherence to exercise regimens, rates of adherence to walking-based interventions ranged from 73% - 87.2% (Sanz-Baños et al., 2018).

Intuitively, greater physical activity engagement is associated with better ratings of PHRQL. Across studies of fibromyalgia patients, a greater number of steps per day has been linked with less pain and fewer functional impairments (Fontaine, Conn, & Clauw, 2010; Kaleth, Slaven, & Ang, 2014), and engagement in relaxation exercises and aerobic or strength training were associated with better physical functioning ability (Rutledge, Jones, & Jones, 2007). Less sedentary time, and greater engagement in moderate or vigorous physical activity, were independently associated with less pain, fatigue, and disease impact among persons with fibromyalgia (Segura-Jiménez et al., 2015). As a final example, among 212 fibromyalgia patients assigned to ten weeks of active physical treatment, CBT, or a combination treatment, 83% attended more than two-thirds of sessions, with self-reported improvements in functional limitations and pain intensity across treatment modalities compared to a control group (Smeets et al., 2006).

Thus, for persons living with, or recovering from, chronic illness, positive PHRQL may depend, in part, on adherence to medical, psychotherapeutic and pharmacotherapeutic recommendations and on adoption of a healthy lifestyle including, but not limited to, a balanced diet, regular exercise, and cessation of substance use. Yet, as previously noted, numerous factors may influence the uptake and continuation of wellness behaviors and ability to adhere to a healthcare providers' recommendations. In our study, we examine the role of individual-level cognitive factors, including optimism and HRSE, as potential contributors to better health-related quality of life. Relative to expectations of the future and beliefs about whether anticipated outcomes are amenable to personal control, likelihood of engaging in proactive health behaviors may be impacted, with implications for PHRQL.

Optimism, Health-Related Self-Efficacy, Health Behaviors, and Physical Health-Related Quality of Life in Cancer Survivors

Currently, there is minimal research examining the independent or interrelated effects of optimism and HRSE on health behavior patterns for persons with chronic illness, including those with remitted cancer. Some work, however, has been conducted focused on the linkage between expectancies regarding the efficacy of future health behavior engagement and health-related quality of life. Among breast cancer survivors, most endorsed negative outcome expectancies regarding the influence of exercise engagement on PHRQL (e.g., mitigation of treatment side effects; Hirschey, Docherty, Pan, & Lipkus, 2017) and, further, in a study of cancer patients, both positive and negative future-oriented expectancies for physical activity and quality of life were associated with degree of engagement in exercise (Ungar et al., 2019). For persons with head, neck, or lung cancer, perception of low cancer recurrence risk was associated with greater likelihood of continued smoking behaviors, and such optimistic bias may be incongruent with current health behavior risks (Schnoll et al.,2003; Sharot, 2011). As a final example, among long-term cancer survivors, optimism and self-efficacy for health behavior engagement were positively associated with health behavior intentions, including intent to change nutritional habits, exercise, and substance use resistance (Hartono & Pohan, 2017).

The importance of HRSE for enhancement of PHRQL has also been investigated. In colorectal cancer survivors, lack of confidence in personal abilities was noted as a primary barrier to health behavior engagement (e.g., exercise for weight loss; Hardcastle et al., 2016). On the other hand, having an internal health locus of control was associated with engaging in a health promoting lifestyle (e.g., nutritional balance) in Korean breast cancer survivors (Yi & Kim, 2013). For early cancer survivors, self-efficacy was associated with adherence to a wide array of wellness behaviors, including physical activity, healthy dietary patterns, and limited substance use (Kanera et al., 2016). Greater physical activity, via the mediating effects of HRSE, is also associated with better quality of life, including functional well-being, in breast cancer survivors (Phillips & McAuley, 2014).

Thus, for persons living with remitted cancer, the extant literature suggests that future-oriented expectations, whether positive or negative, may influence the degree to which cancer survivors perceive themselves to be capable of successfully adhering to treatment recommendations and engaging in health promotion behaviors. In turn, such behavioral change may impact PHRQL, with potential long-term health implications including impact on potential future cancer recurrence.

Optimism, Health-Related Self-Efficacy, Health Behaviors, and Physical Health-Related Quality of Life in Fibromyalgia

Relative to cancer survivors, who are recovering from chronic illness, persons with fibromyalgia live with an active diagnosis and symptomology, yet there are similarities in the individual-level cognitive-emotional factors that influence PHRQL across both disease groups. Of note, existing research on the interrelations between optimism, HRSE, health behaviors, and PHRQL is far more limited for persons with fibromyalgia, than for cancer, but remains supportive of our proposed models. In female osteoarthritis patients, those who endorsed positive future-oriented expectancies were more likely to engage in self-management behaviors (e.g., stretching muscles) meant to prevent symptom flare-ups and slow illness progression (Alberts & Dunton, 2008). For chronic pain patients, a higher level of optimism was linked to greater usage of active coping strategies for disease management (e.g., taking medicine) and, in turn, to better physical functioning and lower pain intensity (Ramírez-Maestre et al., 2012).

The linkages between self-efficacy, health behaviors, and quality of life, for persons with fibromyalgia and related diseases, are also substantiated in the extant literature. In a fibromyalgia sample, greater self-efficacy for symptom management was related to higher rates of engagement in exercise (Oliver & Cronan, 2002) and, in a qualitative study of low back pain patients, repetitive practice and greater experience, implying a sense of mastery/efficacy, were noted as important factors for continued participation in formal exercise programs (Saner, Bergman, de Bie, & Sieben, 2018). Consequently, engaging in such wellness and exercise programs may benefit perceptions of PHRQL. Fibromyalgia patients, who participated in disease self-management programs focused on relaxation training and physical activity skill building, reported greater perceived control of symptoms, higher self-efficacy ratings for future health behavior engagement, and decreased perceptions of functional consequences of disease (Cedraschi et al., 2004; Rooks et al., 2007). In persons with fibromyalgia, greater HRSE and adherence to pain self-management strategies (e.g., activity pacing) were associated with less pain and disability (Nicholas et al., 2012). Finally, among 86 persons with rheumatoid arthritis, low self-efficacy was associated with high nonadherence (55%) to health care recommendations (e.g., physical therapy; joint protection), with many respondents also reporting activity limitations (51%), high levels of pain (20%), and mobility restrictions (14%; Taal, Rasker, Seydel, & Wiegman, 1993).

In sum, our review of the literature supports the notion that an optimistic outlook for the future can have a direct impact on PHRQL among persons living with remitted cancer or fibromyalgia. Furthermore, persons living with a chronic disease may consider personal abilities as a means of attaining positive future expectancies and enhancing perceptions of health-related quality of life. That is, persons with chronic illness who can maintain an optimistic future orientation may more-readily develop greater HRSE for disease and health management, which may manifest as successful engagement in proactive health behaviors, with consequent beneficial impact on physical health-related quality of life.

Statement of the Problem

To our knowledge, no previous research has examined the serial interrelations of optimism, HRSE, health behaviors, and PHRQL, including across illness samples. By conducting such analyses, we may gain clarity regarding potential pathways through which personality and cognitive-emotional traits are associated with subjective improvements in PHRQL, including via health behavior engagement. Furthermore, our study may offer insight regarding similarities and/or differences in these interrelations between disease groups, including between those living with current disease and those recovering from chronic illness. As such, we examined the association between optimism and PHRQL, and the potential serial mediating effects of HRSE and proactive health behaviors, in samples of persons living with remitted cancer or fibromyalgia.

Hypotheses

1. At the bivariate level, in the remitted cancer sample, we hypothesized that optimism, HRSE, wellness behaviors, and PHRQL would be positively associated.
2. At the bivariate level, in the fibromyalgia sample, we hypothesized that optimism, HRSE, treatment adherence, and PHRQL would be positively associated.
3. At the multivariate level, in the remitted cancer sample, we hypothesized that the linkage of optimism and PHRQL would be serially mediated by HRSE and wellness behaviors.

Higher levels of optimism would be associated with higher levels of HRSE and, in turn, to greater engagement in wellness behaviors and better PHRQL.

4. At the multivariate level, in the fibromyalgia sample, we hypothesized that the linkage of optimism and PHRQL would be serially mediated by HRSE and treatment adherence. Higher levels of optimism would be associated with higher levels of HRSE and, in turn, to greater rates of treatment adherence and better PHRQL.

CHAPTER 2

METHOD

Participants and Procedure

Our studies were approved by an Institutional Review Board, and data was collected from individuals living in the United States who self-reported being in remission from cancer or living with fibromyalgia. Participants were recruited from disease-related state and national-level organizations, support groups, blogs, and social media websites. Through Survey Monkey, which is a secure online server, all participants provided electronic informed consent before completing self-report measures. Respondents did not receive compensation for their participation.

Remitted Cancer Sample

Across studies, not all respondents answered every demographic item, resulting in different sample sizes for characterizing variables. Our sample of persons living with remitted cancer (*N* = 164) had a mean age of 62 (standard deviation [SD] = 31.99) and was primarily female (65.2%; *n* = 107), with 34.8% identifying as male (*n* = 57). Most respondents indicated being White/Caucasian (90.9%; *n* = 149), and a smaller percentage reported being Hispanic or Latino/a (2.4%; *n* = 4), Multiracial (2.4%; *n* = 4), Black/African American (1.8%; *n* = 3), or American Indian or Alaska Native (1.2%; *n* = 2). Additionally, the sample was predominantly married (71.3%; *n* = 117), with the remainder identifying as divorced (12.2%; *n* = 20), single and never married (10.4%; *n* = 17), widowed (3.0%; *n* = 5), married according to common law (1.8%; *n* = 3), or legally separated (0.6%; *n* = 1). Education levels varied considerably, including 32.3% (*n* = 53) who reported having a bachelor’s degree, 23.8% (*n* = 39) with some college experience, 17.1% (*n* = 28) with a master’s degree, 11% (*n* = 18) an associate’s degree, 6.7% (*n* = 11) a doctoral degree, 6.7% (*n* = 11) a high school diploma or equivalent, and 6.7% (*n* = 11) having less than a high school degree. In terms of employment, 38.4% (*n* = 63) were retired, and 34.8% (*n* = 57) reported current full-time paid employment. Smaller percentages reported part-time paid employment (11%; *n* = 18), disability compensation (8.5%; *n* = 14), being a homemaker (3%; *n* = 5), unemployment and not seeking paid work (1.8%; *n* = 3), being a current student (0.6%; *n* = 1), and being unemployed while seeking paid work (0.6%; *n* = 1). Considerable variability in gross family income existed, with 11.6% (*n* = 19) reporting making less than $30,000 per year, 20.1% (*n* = 33) who made $30,000 - $59,999 annually, 12.2% (*n* = 20) who made $60,000 – $79,000, 12.8% (*n* = 21) who made between $80,000 - $99,999, and 26.8% (*n* = 44) who reported making $100,000 or more per year. Most reported having health insurance coverage (95.7%; *n* = 157), and private insurance (62.8%; *n* = 103) was more common than public or government supplied (30.5%; *n* = 50) coverage.

Regarding disease history, most of our sample had a single past cancer diagnosis (75%; *n* = 123), with the remainder reporting recurrent cancer including two past diagnoses (11.6%; *n* = 19), three diagnoses (3.7%; *n* = 6), four diagnoses (0.6%; *n* = 1), and five diagnoses (0.6%; *n* = 1). For those who experienced recurrent cancer (*n* = 77), the average age of their most recent diagnosis was 42.21 (SD = 29.31). Prostate cancer (27.4%; *n* = 45) was the most common type of reported cancer, followed by breast (24.4%; *n* = 40), colorectal (15.2%; *n* = 25), skin (5.5%; *n* = 9), non-Hodgkin’s lymphoma (5.5%; *n* = 9), cervical (4.3%; *n* = 7), leukemia (3.7%; *n* = 6), lung (1.8%; *n* = 3), bladder (1.2%; *n* = 2), endometrial (1.2%; *n* = 2), kidney (1.2%; *n* = 2), esophagus (0.6%; *n* = 1), and thyroid (0.6%; *n* = 1) cancers. Numerous forms of treatment were utilized by participants, including surgical procedures on affected bodily regions (62.8%; *n* = 103), chemotherapy (47%; *n* = 77), radiation therapy (42.1%; *n* = 69), pharmacotherapy (12.8%; *n* = 21), blood product donation or transfusion (7.3%; *n* = 12), targeted therapy (5.5%; *n* = 9), immunotherapy (3.7%; *n* = 6), stem cell transplantation (1.2%; *n* = 2), lasers (0.6%; *n* = 1), and photodynamic therapy (0.6%; *n* = 1).

Fibromyalgia Sample

Our sample of persons who self-reported living with fibromyalgia (*N* = 508) was predominantly female (82.5%; *n* = 401), with another 3.5% (*n* = 18) identifying as male. The mean age of respondents was 47.72 (SD = 13.14). Additionally, most respondents identified as White/Caucasian (75.4%; *n* = 383), with the remainder identifying as Black/African American (2.6%; *n* = 13), Multiracial (2.2%; *n* = 11), Asian/Asian Indian (1.2%; *n* = 6), or Native Hawaiian/Pacific Islander (0.2%; *n* = 1). Additionally, most respondents indicated they were married (47%; *n* = 239), and the rest of the sample was divorced (14.2%; *n* = 72), single or never married (16.3%; *n* = 83), widowed (2.4%; *n* = 12), or separated (1.6%; *n* = 8). Regarding educational status, 27.6% (*n* = 140) had a high school diploma or equivalent degree, 19.1% (*n* = 97) had a bachelor’s degree, 17.1% (*n* = 87) had an associate’s degree, 10.4% (*n* = 53) had a masters’ degree, and 1.2% (*n* = 6) had a doctoral or postdoctoral degree. Regarding current employment status, 26.2% (*n* = 133) reported being on disability, 15% (*n* = 76) had full-time paid employment, 10.2% had part-time paid employment, 9.4% (*n* = 48) were retired, 7.9% (*n* = 40) were unemployed and not seeking paid employment, 6.3% (*n* = 32) were homemakers, and 3.1% (*n* = 16) were unemployed and seeking paid employment. Though specific income ranges were not obtained, 28.3% (*n* = 144) reported their spouse or another family member as the primary source of income. The remainder attributed their income to personal salary (19.3%; *n* = 98), disability benefits (18.5%; *n* = 94), retirement benefits (8.5%; *n* = 43), government or state social services (3%; *n* = 15), and unemployment benefits (1.6%; *n* = 8). Finally, 69.5% reported having health insurance (*n* = 353), with a greater proportion having private insurance coverage (40%; *n* = 203) compared to public or government supplied (25.4 %; *n* = 129) health insurance.

Measures

Life Orientation Scale – Revised (LOT-R)

Across samples, dispositional optimism was assessed by the 10-item Life Orientation Scale – Revised (LOT-R; Carver, 2013; Scheier, Carver, & Bridges, 1994). The LOT-R contains three positively worded items (e.g., “in uncertain times, I usually expect the best”), three negatively worded items (“if something can go wrong for me, it will”), and four filler items (e.g., “it’s easy for me to relax”). Respondents rate their agreement with each statement using a 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). Summed subscale scores for positively and negatively worded items yield independent measures of dispositional optimism and pessimism and, as in our study, negatively worded items are reverse scored to yield a total summed score. Total scores range from 0 – 24, with higher scores indicating a greater level of dispositional optimism.

The LOT-R has been established as a reliable measure, including acceptable internal consistency (Cronbach’s alpha [α]) = .78 and test-retest correlation coefficients of .68 (four months), .60 (twelve months), .56 (24 months), and .79 (twenty-eight months) among undergraduate students (Scheier, Carver, & Bridges, 1994). It has been used extensively in the cancer population, with acceptable (α = .74 for pessimism) to good (α = .80 for optimism) internal consistency for subscales (Hakanen & Lindbohm, 2008) and good internal consistency (α = .80) for the total measure (Gallagher et al., 2019). Three-month test-retest reliability (*r* = .60) was noted in gynecological cancer patients (Thieme et al., 2017). For individuals living with fibromyalgia or related conditions, internal consistency ranges from questionable (α = .60;

Fournier, de Ridder, & Bensing, 2002) to good (α = .88; Tsakogia et al., 2010) to excellent (α = .90; Esteve et al., 2018). In our study, the scale had good internal consistency for persons with remitted cancer (α = .86) and fibromyalgia (α = .89).

The LOT-R has also been established as a valid measure and exhibits convergent and discriminant validity with physical and mental well-being in expected directions. For example, among community-dwelling persons in Germany, the total score of the LOT-R was positively related to measures of life satisfaction (*r* = .45) and self-related health (*r* = .32), and negatively related to pain severity (*r* -.18), anxiety (*r* = -.22), and depression (*r* = -.32; Glaesmer et al., 2012). Among university students, the LOT-R is also positively associated with the Pearlin-Schooler Mastery Scale (*r* = .60; Chiesi, Galli, Primi, Borgi, & Bonacchi, 2013).

Control Beliefs Inventory (CBI)

In the remitted cancer sample, mastery/HRSE was assessed by the Control Beliefs Inventory (CBI), which is one of four subscales comprising a 26-item multidimensional measure of perceived control (Sirois, 2003a; Sirois 2003b). The general control subscale (7 items) assesses beliefs that one’s actions can influence health at a broad level, and the symptom control subscale (6 items) estimates the degree to which individuals believe that ongoing health issues and symptoms can be successfully managed, rather than cured. The 5-item chance control subscale assesses the degree to which individuals believe health is controlled by random or chance events. Finally, the 8-item subscale of mastery/HRSE, which we used in our study, assesses the degree to which one feels confident and capable of doing what is necessary to control their health. Sample items include “I know that I can do what is necessary to improve my health” and “I am confident that I could deal with unexpected health problems.” Across all items, participants respond on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Negatively worded items are reverse scored, and subscale items are summed and averaged. Total scores range from 8 – 48, with higher scores indicative of greater levels of control beliefs.

Psychometric support for the CBI has been established in community and clinical samples. For instance, in arthritis and inflammatory bowel disease, α values ranged from acceptable to excellent for all subscales, including general control (.86 - .91), symptom control (.80 - .89), chance control (.70 - .78), and mastery/HRSE (.82 - .86; Sirois, 2003a). For our sample of persons in cancer remission, the mastery/HRSE subscale had good internal consistency (α = .86).

Criterion validity has also been established for the measure, including significant positive correlations between CBI internal control subscales (i.e., general; symptoms, HRSE) and the internal control subscale of the Multidimensional Health Locus of Control (MHLC) measure and the Perceived Self-Efficacy Scale (Sirois, 2003a). An inverse, significant relation was also found between CBI internal control subscales and the chance control subscale of the MHLC. Criterion validity has also been demonstrated such that perceptions of internal control predicted adjustment to disease in tinnitus patients (Sirois, Davis, & Morgan, 2006). Additionally, perceived control over symptoms has been identified as a predictor of intent to use complementary and alternative medicine in patients living with chronic health conditions (Sirois & Purc-Stephenson, 2008). Lending additional support for the association of the CBI and health behaviors, Wilson and Sirois (2010) found that HRSE was predictive of choosing a midwife or caregiver among pregnant Canadian women. Finally, although the CBI has not been directly utilized in persons with cancer or fibromyalgia, within a sample of persons living with diverse medical problems, the HRSE subscale was inversely related to the number of acute health problems (Sirois, 2004). Thus, its strong psychometric support and previous use in chronic illness samples make it suitable for utilization in our study.

Multidimensional Health Profile – Health Functioning Index (MHP-HF)

Health self-efficacy in the fibromyalgia sample was assessed using the Multidimensional Health Profile – Health Functioning Index (MHP-H; Karoly, Ruehlman, & Lanyon, 2005), a 69-item measure of behaviors, attitudes, and beliefs that may influence utilization of health care services or health-related quality of life. The MHP-H yields numerous subscales which fall under five major domains, including response to illness (e.g., professional help; self-help), health habits (i.e., positive or negative), adult health history (e.g., chronic illness; impairment), health care utilization (e.g., office visits; emergency room visits), and health beliefs and attitudes (e.g., self-efficacy; health values). In our study, we utilized only the 4-item self-efficacy subscale, including items such as "I am very good at taking care of my own health" and "I set specific goals for my health and fitness." Participants indicate their rate of agreement with each statement using a 5-point Likert scale ranging from 1 (don't agree at all) to 5 (strongly agree). Summed total scores range from 4 – 20, with higher scores indicating greater self-efficacy.

Little psychometric research has examined the MHP-H, with no identified studies conducted among persons with fibromyalgia. However, in our sample, the subscale had acceptable internal consistency (α = .71). In research conducted in community samples, the MHP-H had a three-week test-retest reliability correlation of 0.57, and convergent validity was illustrated by positive correlations between the self-efficacy subscale and proactive health behaviors (*r* = .26), health vigilance (*r* = .35), and health values (*r* = .18; Karoly et al., 2005). Similarly, convergent validity was demonstrated in a sample of women with polycystic ovarian syndrome; the self-efficacy subscale was positively correlated to overall health history (*r* = .26) and health vigilance (*r* = .37; Kozica, Gibson-Helm, Teede, & Moran, 2013). Finally, for individuals in the pre-operative phase of gastric bypass surgery, self-efficacy was inversely related to hypochondriasis (*r* = .18), hysteria (*r* = -.19), and depression (*r* = -.18; Lanyon, Maxwell, Karoly, & Ruehlman, 2007). Thus, in both community and clinical samples, the self-efficacy subscale of the MHP-H is associated with mental and physical health status, providing support for inclusion in our study.

Wellness Behaviors Inventory (WBI)

Persons living with remitted cancer completed the Wellness Behaviors Inventory (WBI), a 12-item measure assessing how often proactive health behaviors were performed over the last three months (Sirois, 2001; 2019). Sample items include “I exercise for 20 continuous minutes or more, to the point of perspiration” and “I eat fresh fruits and/or vegetables.” Participants respond to each item using a 5-point Likert scale ranging from 1 (less than once a week or never) to 5 (every day of the week). After reverse-coding two items and excluding two statements pertaining to vitamin and supplement use, an average score is calculated, with higher values indicating greater engagement in health promoting behaviors.

To date, psychometric support is limited to samples of college students and community dwelling adults. Across studies, internal consistency is acceptable, with Cronbach alpha values ranging from .71 to .75 in community dwelling adults (Dunne, Sheffield, & Chilcot, 2016; Sirois, 2007). In our sample of cancer survivors, there was questionable internal consistency (α = .68), although this might be anticipated from a varied checklist of health behaviors and is similar to observations from previous studies.

Evidence for the convergent validity of the WBI comes from significant correlations to other variables in expected directions. For instance, among undergraduate students, the WBI was positively correlated to personality traits of conscientiousness (*r* = .29 - .32) and agreeableness (*r* = .13 - .21), and negatively related to neuroticism (*r* = -.20 - .21; Sirois & Hirsch, 2015). Additionally, among community-residing adults, the WBI was positively related to self-efficacy (*r* = .44), positive affect (*r* = .37), and health behavior intentions (*r* = .27), and inversely related to negative affect (*r* = -.27; Sirois, 2015). Finally, in a sample of adults from the general population, scores on the WBI were positively associated with engagement in preventative health behaviors, including medical (*r* = .35) and dental (*r* = .20) check-ups, and negatively related to acute physical health problems (*r* = -.12; Sirois, 2007). Thus, despite no previous use with the cancer population, strong psychometric support provides a basis for inclusion of the WBI in our study.

Medical Outcomes Study General Adherence Scale (MOSGA)

Participants living with fibromyalgia completed the 5-item Medical Outcomes Study General Adherence Scale (MOSGA; DiMatteo, Hays, & Sherbourne, 1992), which provides an estimate of adherence to a healthcare provider’s recommendations over the last four weeks. Sample items include “I had a hard time doing what the doctor suggested I do” and “I followed my doctor’s suggestions exactly.” Participants respond to each item using a 6-point Likert scale ranging from 1 (none of the time) to 6 (all of the time). Negatively worded items are reverse scored, and total summed scores range from 5 to 30, with higher values indicating greater treatment adherence.

Reliability of the MOSGA is well-established in clinical samples. Adequate internal consistency has been demonstrated in primary care patients (α = .81; DiMatteo et al., 1992), a mixed sample of primary care and internal medicine patients (α = .82; Cvengros, Christensen, Hillis, & Rosenthal, 2007), and individuals living with diverse chronic health conditions (α = .87

and .78; Jerant, DiMatteo, Arnsten, Moore-Hill, & Franks, 2008; Kravitz et al., 1993). Relevant to our study, good internal consistency has been longitudinally demonstrated in cancer patients, at baseline (α = .80) and at a six-week follow-up (α = .89; Jerant, Franks, Tancredi, Saito, & Kravitz, 2011). Among fibromyalgia patients, after initiating participation in a multimodal treatment program, internal consistency was acceptable at one month (α = .72), questionable at the two-month point (α = .66), and acceptable at three months (α = .75; Dobkin et al., 2008). In our sample of persons with fibromyalgia, there was good internal consistency (α = .87).

Validity of the MOSGA has also been documented. Lending support for convergent validity, significant correlations have been found between the MOSGA and other measures of treatment adherence including the Medication Event Monitoring System among hypertension patients (Hamilton, 2003) and the Left Ventricular Assist Device Patient Home Management Adherence Scale (*r* = .33; Casida, Wu, Harden, Chern, & Carie, 2015) for end-stage heart failure patients. As another example of convergent validity, the MOSGA was positively related to a measure of pill-taking behaviors (*r* = .11 - .13) among persons living with diverse physical or mental health conditions, including arthritis, asthma, chronic lung disease, congestive heart failure, diabetes, and depression (Jerant et al., 2008). Predictive validity was also found in a study of cancer patients; treatment adherence predicted pain severity over a twelve-week time span (Jerant et al., 2011). Such previous psychometric support suggests that the MOSGA may be a suitable measure of treatment adherence for our FMS sample.

Short-Form Health Survey (SF-36v2 and SF-12v2)

Physical health-related quality of life, over the last four weeks, was assessed via the Short-Form Health Survey, Version 2. Our FMS sample completed the original 36-item measure (SF-36v2; McHorney, Ware, & Raczek, 1993), which assesses eight domains, including: general health, physical functioning, role limitations due to physical health, bodily pain, vitality, social functioning, role limitations due to emotional health, and mental health. In addition to subscale scores, the SF-36v2 also yields composite scores including the Physical Components Summary (HRQL-PCS) and Mental Components Summary (HRQL-MCS). Persons in our remitted cancer sample completed the SF-12v2 (Ware, Kosinski, & Keller, 1995, 1996), which is an abbreviated version containing the same subscales and composite scores.

In our study, we focus only on the subscales of physical functioning and role limitations due to physical health, given our interest in health-related outcomes and previous literature linking self-reported perceptions of health to objective health functioning among persons living with remitted cancer or chronic pain conditions, such as fibromyalgia (Brinkman et al., 2013; Sturgeon, Dixon, Darnall, & Mackey, 2015; Syrjala, Stover, Yi, Artherholt, & Abrams, 2010). Furthermore, fibromyalgia and cancer, despite remission, are characterized by significant physical symptomatology, warranting investigation of factors that impact perceptions of health and quality of life (Bennett et al., 2007; Ganz, 2006).

The physical functioning (HRQL-PF) subscale (SF-36 = 10 items; SF-12 = 2 items) assesses the extent to which poor health limits engagement in physical activities. Sample items include “walking more than a mile” and “lifting or carrying groceries.” Participants indicate perceived difficulty associated with each activity on a 3-point Likert scale ranging from 1 (yes, limited a lot) to 3 (no, not limited at all). We also administered a subscale (SF-36 = 4 items; SF-12 = 2 items) that assesses role limitations due to physical functioning (HRQL-RP). Sample items include “accomplished less than you would like” and “were limited in the kind of work or other activities.” On the SF-36, in the fibromyalgia sample, participants responded on a 5-point Likert scale ranging from 1 (all of the time) to 5 (none of the time). Total scores range from 4 –

20, with higher scores indicating fewer limitations and better quality of life. On the SF-12, in the remitted cancer sample, response options were yes (1) or no (2), with higher scores indicating better quality of life. Across both versions of the measure, subscales can be linearly transformed to a scale of zero – 100, with higher scores representing better perceived health.

Psychometric support for the SF-36v2 has been demonstrated in clinical samples, including persons living with fibromyalgia and related conditions (Cross, March, Lapsley, Byrne, & Brooks, 2006; Lee et al., 2017; Rooks et al., 2007). For example, among persons with rheumatoid arthritis, the SF-36v2 has demonstrated adequate two-week test-retest reliability for subscales (α = .93 for HRQL-PF; kappa coefficient = .37 for HRQL-RP) and composite scores (α = .80 for HRQL-PCS; α = .58 for HRQL-MCS; Ruta, Hurst, Kind, Hunter, & Stubbings, 1998). Among arthritis patients, the SF-36v2 discriminated between individuals based on disease severity, and poorer HRQL was associated with several other measures of disease impact, including pain intensity, duration of morning stiffness, and time required to walk 50 feet (Kosinski, Keller, Ware, Hatoum, & Kong, 1999).

Furthermore, the SF-12v2 has demonstrated psychometric equivalence to the original version, with significant associations between matched subscales across independent samples of fibromyalgia patients, including HRQL-PF (*r* = .82 and .90) and HRQL-RP (*r* = .90 and .96; Lee, Browell, & Jones, 2008). Additionally, evidence exists for a two-factor structure (i.e., HRQL-PCS and HRQL-MCS) in a clinical sample of persons living with osteoarthritis or rheumatoid arthritis (Gandhi et al., 2001). Finally, in a sample of colorectal cancer survivors, reliability has been demonstrated for all subscales in the abbreviated version, including HRQL-PF (α = .77) and HRQL-RP (α = .86), and concurrent validity was illustrated via a positive association with scores on the Bowel Function Index (Wendel et al., 2014).

In our study, both versions of the measure displayed acceptable to good internal consistency. For the remitted cancer sample, we obtained an acceptable Cronbach's alpha value (.74) for the role limitations due to physical health subscale and a good value (.83) for the physical functioning subscale, the latter of which is noteworthy given the potential for poor internal consistency when using a measure with few items (Tavakol & Dennick, 2011). Good internal consistency was also demonstrated for physical functioning ($\alpha = .87$) and role physical ($\alpha = .88$) subscales in the fibromyalgia sample.

Statistical Analyses

Covariates

Numerous individual-level characteristics or disease factors could exert an influence on variables in our study and, as such, we included these variables as covariates in all multivariate analyses. For example, age disparities have been identified for risk of diagnosis (Parry et al., 2011; Queiroz, 2013), treatment adherence (Huyser, Buckelew, Hewett, & Johnson, 1997), and PHRQL (Hammerlid & Taft, 2001; Jones et al., 2010) in remitted cancer and FMS patients. Sex differences in diagnosis and quality of life also exist among persons living with fibromyalgia or a cancer history (Branco et al., 2009; Hammerlid & Taft, 2001; Siegel et al., 2012). Additionally, literature is mixed regarding the impact of racial and ethnic identity on risk for diagnosis and perceptions of health status, with different cultural values (e.g., faith; substance use) and biological predispositions (e.g., genetics) serving as both risk and protective factors for illness and the disease adjustment process (García-Jimenez et al., 2014; Nayak et al., 2015). Socioeconomic status also impacts chronic illness, exerting an influence on degree of perceived control, accessibility of treatment, and PHRQL ratings (Foster et al., 2015; Júnior & Ramos, 2019; Weaver et al., 2012). Because of such differences and disparities, age, sex, race/ethnicity, and socioeconomic status were included as covariates, with the latter being accounted for by gross annual income (cancer sample) or employment status (fibromyalgia sample).

Health and disease-specific factors were also considered as potential confounders. Availability and type of health insurance has been linked to health behaviors and perceptions of control in chronically ill populations (Iuga & McGuire, 2014; Theofilou & Panagiotaki, 2012; Wallston, 2001) and, as such, type of health insurance (i.e., private versus public/government supplied) was covaried. Finally, in our remitted cancer sample, we accounted for the experience of a single episode versus recurrent cancer diagnoses, as multiple past diagnoses could erode perceptions of control and quality of life to a greater extent (Gotay et al., 2007).

Bivariate Analyses

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS), Version 25. Pearson's product moment bivariate correlations were used to examine associations between, and independence of, dispositional optimism, HRSE, wellness behaviors, treatment adherence, and PHRQL. To minimize risk of biased parameter estimates and consistent with recommendations put forth in the social sciences, a multicollinearity cutoff of $r > .80$ was utilized across samples (Abu-Bader, 2011).

Serial Multivariate Mediation Analyses

Multivariate mediation analyses were conducted using Model 6 from PROCESS macro for SPSS, Version 2.16 (Hayes, 2013). In the remitted cancer sample, we examined HRSE as a first order mediator and wellness behaviors as a second order mediator in the relation between dispositional optimism and PHRQL (i.e., HRQL-PF and HRQL-RP subscales in separate models). In the fibromyalgia sample, we examined HRSE and treatment adherence as first and second order mediators, respectively, in the relation between dispositional optimism and

PHRQL. Thus, our analyses entailed four independent serial mediation models. Sample sizes varied across all models due to missing responses.

In serial mediation analyses, several associations can be examined among study variables. A *specific indirect effect* refers to the effect of the independent variable (IV) on the dependent variable (DV) through one or both mediators. In our study, the following specific indirect effects were observed: a_1b_1 = optimism related to PHRQL through HRSE; $a_1a_3b_2$ = optimism related to PHRQL through HRSE and wellness behaviors (remitted cancer sample) or treatment adherence (FMS sample); a_2b_2 = optimism related to PHRQL through wellness behaviors (remitted cancer sample) or treatment adherence (fibromyalgia sample). The total indirect effect, denoted as $a_{123}\,b_{12}$ in our study, is the sum of all specific indirect effects. Additionally, c\` represents the direct effect, or the effect of the IV on the DV after controlling for all mediators. Thus, in our study, $c$\` represented the relation between optimism and PHRQL, accounting for the effects of HRSE and wellness behaviors or treatment adherence. Finally, c symbolizes the total effect of the IV on the DV which, in our study, represented the association between optimism and PHRQL through the mediators of HRSE and wellness behaviors (remitted cancer sample) or treatment adherence (fibromyalgia sample).

As a methodological technique, there are several advantages to using serial mediation (Preacher & Hayes, 2008). First, comparison of mediator contribution to the linkage between IV and DV relative to the presence or absence of other variables in a model, is possible. Second, potential confounding variables can be included as mediators or covariates, reducing likelihood of biased parameter estimates. Third, bootstrapping is utilized, which is a resampling technique that involves taking *n* cases, with replacement, from the original sample, allowing for an estimation of the indirect effect in each resampled data set and the calculation of confidence intervals. Bootstrapping lowers risk of Type I error and elevates power, especially for small sample sizes, by creating empirical approximations of the sampling distribution and increasing the likelihood of it resembling the actual distribution within the general population. Thus, serial mediation represents a strong methodological approach to data analysis and interpretation in correlational-based research.

CHAPTER 3

RESULTS

Bivariate Correlations

Remitted Cancer Sample

Pearson's product-moment correlational analyses were utilized to test the first hypothesis, which was largely supported (see Table 1).

Table 1

Bivariate Correlations of Study Variables in Remitted Cancer Sample

	Mean [SD]	Score Range	HRSE	WBI	PF	RP
Optimism (OPT)	12.14 [2.79]	3 – 15	.31**	.24**	.17	.25**
Health-Related Self-Efficacy (HRSE)	4.68 [.72]	2.38 – 6	---	.14	.29**	.20*
Wellness Behaviors (WBI)	3.58 [.64]	2 – 5	---	---	.34**	.32**
Physical Functioning (PF)	47.37 [11.04]	22.11 – 56.47	---	---	---	.45**
Role Physical (RP)	25.96 [3.92]	20.32 – 29.54	---	---	---	---

Note: Sample size = 164. SD = Standard Deviation. Score Range = minimum and maximum values for study variables. Optimism = Life Orientation Test - Revised; Health-Related Self-Efficacy = Control Beliefs Inventory; Wellness Behaviors = Wellness Behaviors Inventory; Physical Functioning and Role Physical = Short Form Health Survey, Version 2, Short Form.
* $p < .05$; ** $p < .01$

All variables were related in hypothesized directions, though a few were not statistically significant. Optimism was positively and significantly correlated to health-related self-efficacy ($r = .31$; $p < .001$), wellness behaviors ($r = .24$; $p = .008$), and role limitations due to physical health ($r = .25$; $p = .006$). For health-related self-efficacy, significant and positive correlations were observed with physical functioning ($r = .29$; $p = .001$) and role limitations ($r = .20$; $p = .03$). Wellness behaviors were also positively and significantly ($p < .001$) related to physical functioning ($r = .34$) and role limitations ($r = .32$). A significant, positive correlation was also found between physical functioning and role limitations ($r = .45$; $p < .001$). Nonsignificant, positive correlations were identified for the relations between optimism and physical functioning ($r = .17$; $p = .07$) and between health-related self-efficacy and wellness behaviors ($r = .14$; $p = .13$).

Fibromyalgia Sample

In the fibromyalgia sample, hypotheses were fully supported (see Table 2).

Table 2

Bivariate Correlations of Study Variables in Fibromyalgia Sample

	Mean [SD]	Score Range	HRSE	TXA	PF	RP
Optimism (OPT)	9.07 [2.68]	3 – 15	.29**	.24**	.16**	.21**
Health-Related Self-Efficacy (HRSE)	13.85 [3.12]	4 – 20	---	.26**	.25**	.22**
Treatment Adherence (TXA)	20.41 [5.37]	5 – 30	---	---	.21**	.28**
Physical Functioning (PF)	31.70 [20.99]	0 – 100	---	---	---	.53**
Role Physical (RP)	25.28 [19.51]	0 – 100	---	---	---	---

Note: Sample size = 508. SD = Standard Deviation. Score Range = minimum and maximum values for study variables. Optimism = Life Orientation Test – Revised; Health-Related Self-Efficacy = Multidimensional Health Profile – Health Functioning Index; Treatment Adherence = Medical Outcomes Study General Adherence Scale; Physical Functioning and Role Physical = Short Form Health Survey, Version 2.
** $p < .01$

All variables were significantly related to one another in the expected directions. Optimism was positively associated with health-related self-efficacy ($r = .29$; $p < .001$), treatment adherence ($r = .24$; $p < .001$), physical functioning ($r = .16$; $p = .004$), and role limitations due to physical health ($r = .21$; $p < .001$). Health-related self-efficacy was also positively related to treatment adherence ($r = .26$; $p < .001$), physical functioning ($r = .25$; $p < .001$), and role limitations ($r = .22$; $p < .001$). Treatment adherence had a positive correlation with physical functioning ($r = .21$; $p < .001$) and role limitations ($r = .28$; $p < .001$). Finally, physical functioning and role limitations were positively related to each other ($r = .53$; $p < .001$).

Serial Mediation Results

Remitted Cancer Sample

Proposed serial mediation analyses were conducted among 164 persons living with remitted cancer of various subtypes. Covariates included age, sex, race/ethnicity, annual gross income, type of health insurance, and number of cancer diagnoses. Across models, multivariate hypotheses were supported.

The first model contained optimism as a predictor of physical functioning via the serial mediating effects of health-related self-efficacy and wellness behaviors. A significant total effect was observed ($c = .75$, $SE = .38$, $p = .0497$, *95% Confidence Interval [CI]* = .001 to 1.50). The direct effect of optimism on physical functioning was nonsignificant when mediators were added to the model ($c' = .28$, $SE = .43$, $p = .52$, *95% CI* = -.57 to 1.12), indicating mediation. Specific indirect effects were also observed. Health-related self-efficacy and wellness behaviors significantly and serially mediated the relationship between optimism and physical functioning ($a_1a_3b_2 = .23$, $SE = .12$, *95% CI* = .03 to .51). Approximately 12% of the indirect effect variance was accounted for by our model ($R^2 = .12$, $p = .07$).

The second model contained role limitations due to physical health as an outcome variable instead. Consistent with the previous model, a significant total effect was observed (c = .41, *SE* = .13, p = .003, *95% CI* = .14 to .68). The direct effect of optimism on role limitations was nonsignificant when mediators were added (c' = .21, *SE* = .15, p = .16, *95% CI* = -.09 to .52), indicating mediation. In the relationship of optimism and role limitations, significant serial mediation was observed through health-related self-efficacy and wellness behaviors ($a_1a_3b_2$ = .07, *SE* = .04, *95% CI* = .002 to .17). Approximately 11% of the variance was accounted for by our model (R^2 = .11, p = .09). See Table 3 and Figure 1.

Table 3

Remitted Cancer – Specific Indirect Effects between Optimism and Physical Health-Related Quality of Life Serial Mediation Utilizing Health-Related Self-Efficacy and Wellness Behaviors

	Effect	b	95% CI	
			Lower	Upper
Physical Functioning	ab	.48	-.03	1.01
	a_1b_1	.25	-.27	.76
	$a_1a_3b_2$	.23	.03	.51
	a_2b_2	-.01	-.25	.20
	R^2	.12		
Role Limitations	ab	.19	.003	.38
	a_1b_1	.12	-.08	.30
	$a_1a_3b_2$	.07	.002	.17
	a_2b_2	.002	-.08	.30
	R^2	.11		

Note. a, b, c, and c' represent unstandardized regression coefficients: a_1 = direct effect of optimism on health-related self-efficacy; a_2 = direct effect of optimism on wellness behaviors; a_3 = direct effect of health-related self-efficacy on wellness behaviors; b_1 = direct effect of health-related self-efficacy on physical health-related quality of life; b_2 = direct effect of wellness behaviors on physical health-related quality of life; ab = Total Indirect Effect; a_1b_1 = specific indirect effect through health-related self-efficacy; $a_1a_3b_1$ = specific indirect effect through health-related self-efficacy and wellness behaviors; a_2b_2 = specific indirect effect through wellness behaviors. R^2 = total indirect effect variance accounted for by the model. CI = 95% confidence interval; 10,000 bootstrap samples; age, sex, race/ethnicity, gross annual income, type of health insurance, and number of cancer diagnoses used as covariates. Sample size = 164.

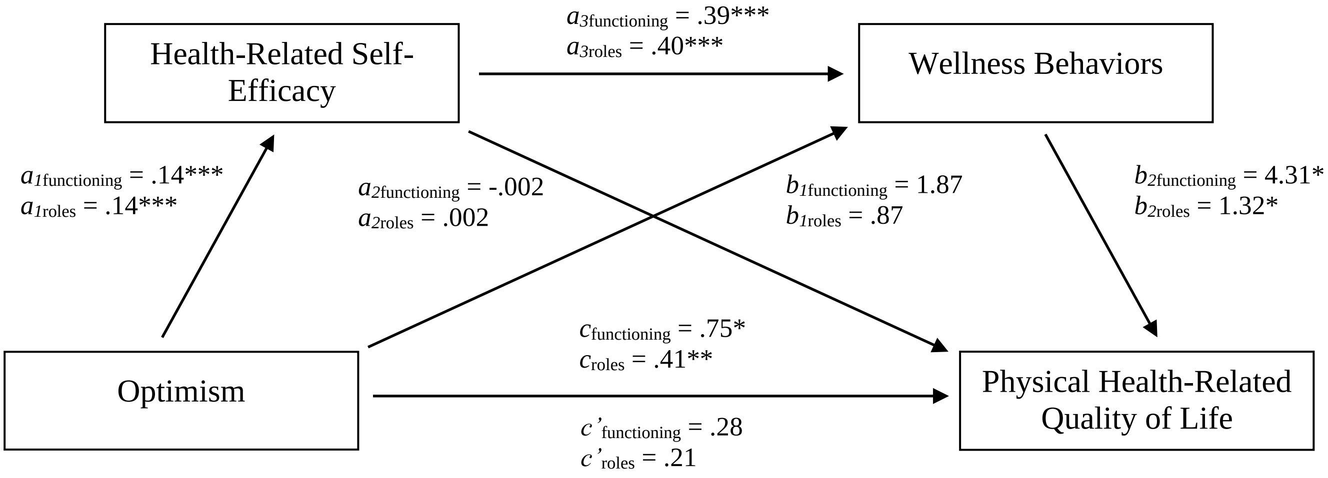

Figure 1. Remitted cancer – serial indirect effects model for physical health-related quality of life. Sample size = 164. “Functioning” refers to the physical functioning subscale, and “roles” refers to the role limitations due to physical health subscale, for our PHRQL measure. a_1b_1 = specific indirect effect (optimism related to physical health-related quality of life through health-related self-efficacy); $a_1a_3b_2$ = specific indirect effect (optimism related to physical health-related quality of life through health-related self-efficacy and wellness behaviors); a_2b_2 = specific indirect effect (optimism related to physical health-related quality of life through wellness behaviors); $a_{123}\,b_{12}$ = total indirect effect (optimism related to physical health-related quality of life via health-related self-efficacy and wellness behaviors); c = total effect (optimism related to physical health-related quality of life); c' = indirect effect (optimism related to physical health-related quality of life accounting for health-related self-efficacy and wellness behaviors).
* $p < .05$; ** $p < .01$; *** $p < .001$

Fibromyalgia Sample

Proposed serial mediation analyses were also examined in a separate, independent sample of 508 persons living with fibromyalgia. Covariates included age, sex, race/ethnicity, and employment status. Multivariate hypotheses were supported across both models. Findings were consistent with those obtained in the remitted cancer sample, though additional specific indirect effects were identified as well.

The first model examined the serial mediating effects of health-related self-efficacy and treatment adherence in the relationship between optimism and physical functioning. A significant total effect was observed ($c = .75$, *SE* = .26, $p = .005$, *95% CI* = .23 to 1.27). The direct effect became nonsignificant when mediators were added (*c'* = .44, *SE* = .28, *p* = .11, *95% CI* = -.10 to .98), indicating mediation. Additionally, specific indirect effects were identified in the model. Optimism and physical functioning were serially mediated by health-related self-efficacy and treatment adherence ($a_1a_3b_2$ = .03, *SE* = .02, *95% CI* = .003 to .09). A specific indirect effect was also observed through treatment adherence (a_2b_2 = .14, *SE* = .07, *95% CI* = .02 to .30). Approximately 10% of the variance was accounted for by our model (R^2 =.10 *p* < .001).

In the second multivariate model containing role limitations due to physical health as an outcome variable, similar patterns of findings emerged. There was a significant total effect (*c* = .72, *SE* = .25, *p* = .004, *95% CI* = .23 to 1.21) and a direct effect that dropped out of significance when mediators were added to the model (*c'* = .29, *SE* = .25, *p* = .26, *95% CI* = -.21 to .79), indicating mediation. Health-related self-efficacy and treatment adherence significantly and serially mediated the relationship between optimism and role limitations ($a_1a_3b_2$ = .06, *SE* = .03, *95% CI* = .01 to .12). Specific indirect effects were also observed through treatment adherence (a_2b_2 = .20, *SE* = .08, *95% CI* = .05 to .38) and health-related self-efficacy (a_1b_1 = .18, *SE* = .09, *95% CI* = .03 to .37). Approximately 9% of the variance was accounted for by our model (R^2 = .09, *p* < .001). See Table 4 and Figure 2.

Table 4

Fibromyalgia – Specific Indirect Effects between Optimism and Physical Health-Related Quality of Life for Serial Mediation Utilizing Health-Related Self-Efficacy and Treatment Adherence

			95% CI	
	Effect	*b*	Lower	Upper
Physical Functioning	ab	.31	.11	.56
	a_1b_1	.13	-.02	.33
	$a_1a_3b_2$	.03	.003	.09
	a_2b_2	.14	.02	.30
	R^2	.10***		
Role Limitations	ab	.43	.21	.71
	a_1b_1	.18	.03	.37
	$a_1a_3b_2$	.06	.01	.12
	a_2b_2	.20	.05	.38
	R^2	.09***		

Note. a, b, c, and c' represent unstandardized regression coefficients: a_1 = direct effect of optimism on health-related self-efficacy; a_2 = direct effect of optimism on treatment adherence; a_3 = direct effect of health-related self-efficacy on treatment adherence; b_1 = direct effect of health-related self-efficacy on physical health-related quality of life; b_2 = direct effect of treatment adherence on physical health-related quality of life; ab = Total Indirect Effect; a_1b_1 = specific indirect effect through health-related self-efficacy; $a_1a_3b_1$ = specific indirect effect through health-related self-efficacy and treatment adherence; a_2b_2 = specific indirect effect through treatment adherence. R^2 = total indirect effect variance accounted for by the model. CI = 95% confidence interval; 10,000 bootstrap samples; age, sex, race/ethnicity, employment status, and type of health insurance used as covariates. Sample size = 508.
*** $p < .001$

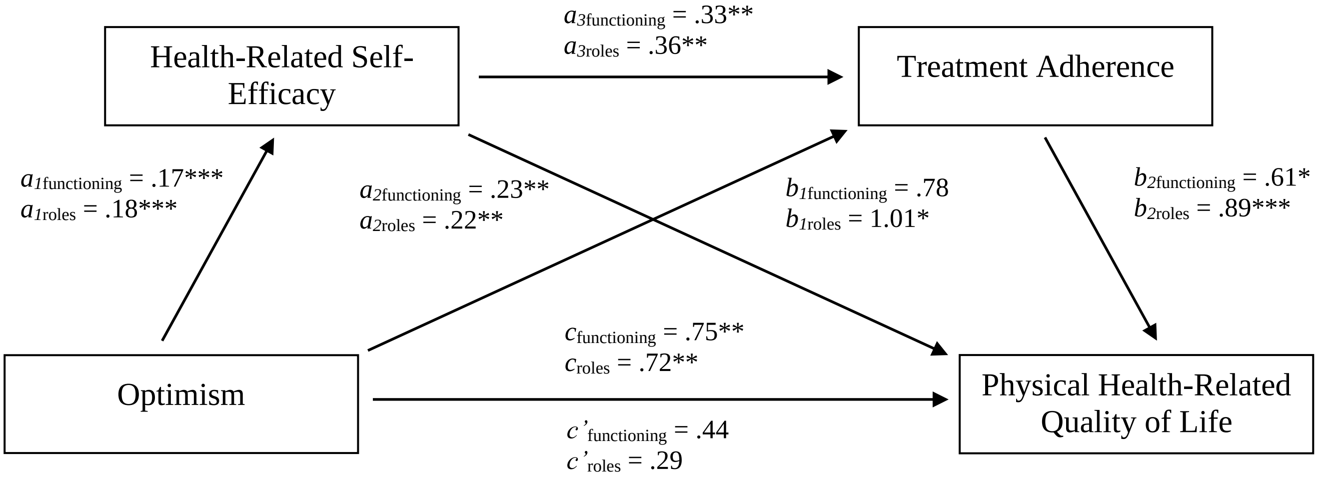

Figure 2. Fibromyalgia – serial indirect effects model for physical health-related quality of life. Sample size = 508. “Functioning” refers to the physical functioning subscale, and “roles” refers to the role limitations due to physical health subscale, for our PHRQL measure. a_1b_1 = specific indirect effect (optimism related to physical health-related quality of life through health-related self-efficacy); $a_1a_3b_2$ = specific indirect effect (optimism related to physical health-related quality of life through health-related self-efficacy and treatment adherence); a_2b_2 = specific indirect effect (optimism related to physical health-related quality of life through treatment adherence); $a_{123}\,b_{12}$ = total indirect effect (optimism related to physical health-related quality of life via health-related self-efficacy and treatment adherence); c = total effect (optimism related to physical health-related quality of life); c' = indirect effect (optimism related to physical health-related quality of life accounting for health-related self-efficacy and treatment adherence).
* $p < .05$; ** $p < .01$; *** $p < .001$

CHAPTER 4

DISCUSSION

In the context of living with a past or current chronic disease, numerous physical (e.g., treatment side effects) and psychosocial (e.g., fear of symptom worsening or recurrence) factors may adversely impact physical health-related quality of life. Yet, the presence of adaptive cognitive-emotional and behavioral characteristics may contribute to beneficial downstream effects on perceptions of quality of life. For example, as was hypothesized, dispositional optimism may be associated with a greater sense of health-related control and self-efficacy and, in turn, to a willingness to engage in proactive health behaviors or adhere to treatment recommendations, with consequent positive effects on PHRQL.

In bivariate analyses with our sample of persons with remitted cancer, hypotheses were largely supported. Optimism was significantly, positively related to better health-related self-efficacy, increased engagement in wellness behaviors, and fewer role limitations. Positive associations were also found between health-related self-efficacy and PHRQL (i.e., physical functioning; role limitations), between wellness behaviors and PHRQL, and between both quality of life variables. Positive, albeit nonsignificant, associations were observed between optimism and physical functioning and between health-related self-efficacy and wellness behaviors. In our sample of persons with fibromyalgia, our bivariate hypotheses were fully supported. Optimism, health-related self-efficacy, treatment adherence, and PHRQL were all significantly, positively associated.

Our multivariate analyses were also supported, in both samples. Among persons with remitted cancer, significant serial mediation was observed across models. Health-related self-efficacy and wellness behaviors serially mediated the relations between optimism and physical functioning, and between optimism and role limitations). No specific indirect effects were observed in this sample.

In our fibromyalgia sample, significant serial mediation was observed for both PHRQL outcomes. For the relation between optimism and physical functioning, health-related self-efficacy and treatment adherence were significant serial mediators, and a specific indirect effect was found via treatment adherence. For our model examining the association between optimism and role limitations, health-related self-efficacy and treatment adherence were significant serial mediators and, as well, both exerted a specific indirect effect on this linkage.

Overall, our results suggest that dispositional optimism exerts a positive influence on PHRQL, perhaps due to cognitive shifts regarding competence in controllability of disease and proactive engagement in health behaviors. Furthermore, these cognitive-emotional and behavioral processes appear to manifest similarly across the disease trajectory, from currently living with, to recovering from, a chronic condition, as suggested by our consistent findings across samples of persons with remitted cancer and current fibromyalgia. In the following sections, we consider possible explanations for our bivariate and multivariate findings, including the degree to which there may be similarities or differences in the linkages between our study variables relative to the absence or presence, and type of, disease.

Bivariate Associations of Study Variables

Our bivariate findings contribute to existing literature indicating an association between dispositional optimism, health-related self-efficacy, health behaviors, and PHRQL in the context of living with, or recovering from, a chronic illness (Harper et al., 2006; Smith et al., 2011; Taylor, Adelstein, Fischer-White, Mrugesan, & Anderson, 2016).

Broadly, optimism is posited to influence how an individual explains, predicts and copes with past, present, and future life events (Converseano et al., 2010). Among persons with chronic illness, dispositional optimism may be linked to cognitive, emotional, and behavioral adaptation to the disease experience. It has been posited that optimism is most beneficial when a person holds realistic outcome expectancies about, and believes in their ability to control, events that are within the realm of personal influence (Bortolotti, 2018), which may not always be the case with chronic illness. Yet, resiliency traits, such as optimism, may be important for persons living with or recovering from unpredictable diseases, such as fibromyalgia (e.g., stress-based transient symptoms) and cancer (e.g., recurrence; Johnson, Zautra, & Davis, 2006; Ziner et al., 2012). Supporting this proposition, we found a positive association between optimism and self-efficacy, in both disease samples, suggesting that an adaptive view of the future may contribute to perceptions of capability and controllability over health. Our finding is consistent with previous literature indicating that optimists may manifest a beneficial informational bias toward possibilities of well-being (e.g., view health or recovery as a challenge) rather than toward threat (e.g., viewing illness as insurmountable; Karademas, Kafetsios, & Sideridis, 2007).

Optimism, which can be characterized as positive expectancies about one’s abilities and the future, is also associated with a tendency to utilize approach-oriented and goal-focused coping mechanisms (e.g., seeking health information; lifestyle changes; Nes & Segerstrom, 2006). Persons living with or recovering from chronic illness, who are also optimistic, may be more likely to experience motivation to engage in healthy lifestyle habits (e.g., balanced nutrition) and to avoid behaviors known to be detrimental to health (e.g., substance use; Carver & Scheier, 2014). This assertion is supported by our finding, across disease samples, of a positive association between optimism, wellness behaviors, and treatment adherence.

Furthermore, in the face of health setbacks or obstacles, optimistic individuals are more likely to adaptively disengage with unattainable goals and redirect efforts elsewhere, rather than experiencing an erosion of health-related self-efficacy (Conner, 2010; Rasmussen et al., 2006). For persons living with the unpredictability of chronic illness, such goal-directed flexibility and resiliency of efficacy, may help to facilitate and maintain linkages between optimism and engagement in proactive lifestyle changes focused toward disease management (Bennett et al., 2007; Palesh et al., 2017).

As in previous research, positive future expectancies were linked to better PHRQL in our cancer survivor and fibromyalgia samples. Similarly, in a study of breast and colorectal cancer patients, optimistic coping style was positively associated with physical and mental health-related quality of life (Goli, Scheidt, Gholamrezaei, & Farzanegan, 2014), whereas, in a sample of colorectal cancer survivors, less optimism was related to poorer ratings for quality of life including for the domains of functional impairment, social/family, emotional, and a cancer-specific domain (i.e., Functional Assessment of Cancer Therapy – Colorectal Cancer measure; Dunn et al., 2013). Finally, while controlling for pain intensity, dispositional optimism was linked to better quality of life ratings for chronic pain patients (Tsakogia et al., 2010).

In our cancer survivor sample, failing to support hypotheses, optimism was not significantly related to self-reported physical functioning, although the association was positive. There may be several reasons for this pattern of association. To begin, this disconnect may be an artifact of the self-regulatory process of optimists, which may result in decreased behavioral efforts in unfavorable circumstances (Carver & Scheier, 2014). For persons recovering from cancer, treatment-related physiological and biological changes (e.g., inflammation and mitochondrial damage) may contribute to impairment (e.g., fatigue which limits physical activity

(LaVoy, Fagundes, & Dantzer, 2016), reducing the ability of optimism to directly impact physical functionality. On the other hand, given their positive outlook, optimists may be able to more accurately assess and respond to health-related threats (e.g., illness symptoms) which may, paradoxically, result in reduced beneficial impact on physical functioning (Aspinwall & Brunhart, 2000). There is some precedent for these assertions. For example, across chronic disease samples, optimism did not significantly alter self-reported symptoms and, as in our sample, was positively but not significantly related to physical functioning abilities (de Ridder, Fournier, & Bensing, 2004). More pragmatically, as survivors, our sample of persons recovering from cancer may have regained much of their previous physical capabilities, following completion of treatment (Zandbergen et al., 2019), thereby limiting the direct impact of positive expectancies.

We also found positive associations between health-related self-efficacy, wellness behaviors, and treatment adherence across our samples, confirming previous research. Across disease groups, there is a well-established linkage between perceptions of internal control and assumption of responsibility for health, including engagement in proactive lifestyle changes to manage symptoms or minimize risk of recurrence (Anand et al., 2008; Logan, 2003; Rooks et al., 2007). For instance, perceived behavioral control was associated with greater physical activity and exercise in persons with chronic pain (Brooks et al., 2018) and, for head, neck and lung cancer patient self-efficacy for cessation was a predictor of reduced likelihood of relapse and continued smoking (Schnoll et al., 2003). Yet, as described by Australian colorectal cancer survivors, to the extent efficacy or motivation is lacking, participation in health behaviors may be more challenging (Hardcastle et al., 2016).

Of note, we found a positive, albeit nonsignificant, association between self-efficacy and wellness behaviors, in our remitted cancer sample. Although potentially resilient, cancer survivors may also endorse a degree of fatalism, including awareness of persistent symptoms and the possibility of cancer recurrence despite engagement in behaviors (e.g., seeking health information; dietary changes) designed to influence current and future health (Alwhaibi et al., 2019; Hamilton, Best, Galbraith, Worthy, & Moore, 2005). When confronted with knowledge of the biological and physiological etiology for the onset and maintenance of cancer, and their vulnerability, perhaps self-efficacy is insufficient for behavioral change (Brufsky, 2008; NCI, 2017b; Wang, 2008). Similarly, cancer may arise despite preventive efforts (Wu, Zhu, Thompson, & Hannun, 2018), thereby eroding perceptions of control. Despite lack of significance, self-efficacy was related to wellness behaviors in the hypothesized direction, suggesting a broad linkage between perceptions of control and PHRQL.

As expected, our PHRQL outcomes of physical functioning and role limitations due to physical health, were positively associated. Individuals affected by chronic disease often report comorbid impairments, including illness symptoms, reduced functionality and inability to maintain role expectations. As an example, in persons with cancer, chemotherapy-induced neuropathy is associated with functional impairments (e.g., falling) and role limitations (e.g., shopping for personal items; housework; Gewandter et al., 2013). Similarly, individuals with fibromyalgia experience mobility limitations (e.g., gait; balance; da Silva Costa et al., 2017) and difficulties with daily responsibilities, including employment and household chores (Collado et al., 2014).

With an eye toward potential clinical implications of our findings, it is noteworthy that the individual-level malleable factors of internal perceived control and health behaviors were associated with PHRQL, as in previous research. For example, in fibromyalgia patients, perceived disease severity, which is a marker of sense of control over illness, was related to self-efficacy and HRQL (Alok et al., 2014). Perceptions of control may be important for persons with fibromyalgia, who often have lower rates of treatment adherence and worse PHRQL, compared to persons without a musculoskeletal condition (Lorente, De Stefani, & Martins, 2014).

A similar pattern of effects emerged in our sample of persons with remitted cancer, paralleling past research. For example, in a sample of persons with breast or gastrointestinal cancer, self-efficacy was associated with better physical health-related quality of life (Hashim & Khalil, 2018). Additionally, in a qualitative study of cancer survivors, better physical health was attributed, in part, to engagement in proactive health behaviors, including community gardening and nutritious eating (Spees, Joseph, Darragh, Lyons, & Wolf, 2015).

Overall, results from our bivariate analyses indicate beneficial associations between our study variables, including between the potentially protective factors of optimism, self-efficacy and adaptive health behaviors, and our outcome of physical health-related quality of life. The presence of these linkages for both active and remitted disease groups suggests the potential robustness of this protective effect across the illness trajectory. However, the multivariable interrelations and ordering of our study variables are largely unknown. In the following sections, we discuss our serial mediation findings and the linked associations between optimism, health-related self-efficacy, health behaviors, and PHRQL among persons with remitted cancer or fibromyalgia.

Multivariate Analyses

Across disease samples, our serial mediation hypotheses were supported. In our sample of 164 cancer survivors, greater dispositional optimism was associated with higher ratings of health-related self-efficacy and, in turn, to increased engagement in wellness behaviors and better PHRQL, including enhanced perceptions of physical functioning abilities and fewer role limitations. Specific indirect effects were not observed through either mediator alone, suggesting that self-efficacy and wellness behaviors function together, rather than independently, to explain the linkage between optimism and quality of life.

For our sample of 508 persons living with fibromyalgia, a similar pattern of findings emerged and, additionally, specific indirect effects were identified. Health-related self-efficacy and treatment adherence serially mediated the association between optimism and PHRQL (i.e., physical functioning; role limitations); higher optimism was associated with greater levels of health-related self-efficacy and, in turn, to increased treatment adherence and better PHRQL. Additionally, in our model examining physical functioning as the outcome variable, a specific indirect effect was observed through treatment adherence. When our outcome was role limitations due to physical health, specific indirect effects occurred via health-related self-efficacy and treatment adherence. Thus, in cancer survivors, our mediators may function in a serial fashion, or independently, to link optimism to PHRQL. In the following sections, we will review the extant theoretical and empirical literature for each linkage of our model, synthesizing it with our cross-disease findings.

Optimism and Physical Health-Related Quality of Life

Of the primary positive psychology constructs, optimism has been widely studied in the context of health, disease and recovery and, as supported by our findings, has a well-established association with mental and physical health-related quality of life, including in the cancer population (Applebaum et al., 2014; Gallagher et al., 2019) and, to a lesser extent, persons with fibromyalgia (Tsakogia et al., 2010). We confirm this linkage in our own samples of persons with remitted cancer and self-reported fibromyalgia.

Remitted cancer. To begin, in our sample of persons recovering from diverse types of cancer, optimism was positively related to PHRQL. Similarly, in a study of colorectal cancer survivors, optimism was associated with better physical, functional, social/family, and emotional quality of life (Dunn et al., 2013) and, among post-treatment head and neck cancer patients, was associated with less pain and fewer role limitations resulting from illness (Allison et al., 2000).

For persons recovering from illness, an important aspect of resiliency of health may include attempts to return to previous levels of functioning and resumption of former responsibilities and roles (Lauver, Connolly-Nelson, & Vang, 2007). Adaptive views of the future may facilitate motivationally oriented thoughts and behaviors toward accomplishment of such health-related goals (Alberts & Dunton, 2008; Livneh, 2016). For example, breast cancer survivors who reported high optimism were more likely to remain engaged at work, perhaps due to the ability of optimism to ameliorate the impact of negative workplace experiences (e.g., lack of support after illness; Hakanen & Lindbohm, 2008). On the other hand, breast cancer survivors with lower optimism reported greater difficulties across life domains (e.g., domestic responsibilities; employment), attributed to socially constrained support systems, disengagement coping and rumination (Kolokotroni, Anagnostopoulos, & Hantzi, 2018). Such findings are consistent with the notion that, when present, optimism may promote adaptive coping and positive expectancies even in the face of setbacks or challenges and, when diminished, may impair interpersonal and emotional functioning, leading to poor psychosocial adjustment to illness (Karademas et al., 2007).

Fibromyalgia. As in our sample of persons with fibromyalgia, a positive, direct association between optimism and PHRQL has been previously identified among persons living with chronic pain and rheumatic conditions. For example, among 226 persons with muscle disease, dispositional optimism was predictive of better health-related quality of life, including less pain, fatigue and weakness, and enhanced social functioning and activity engagement (Graham et al., 2014). Similarly, in a mixed sample of persons with diabetes, rheumatoid arthritis, and multiple sclerosis, optimistic beliefs were beneficially associated with mental and physical quality of life (Fournier et al., 2002). Such benefits for PHRQL are particularly important for persons with fibromyalgia, whose physical impairments and role limitations are well-documented and may include difficulty with mobility, self-care tasks, cooking, cleaning, and employment (Kawai, Kawai, Wollan, & Yawn, 2017; Mehnert, de Boer, & Feuerstein, 2013; Råheim & Håland, 2006).

Previous studies, using objective health indicators, may offer insight into potential mechanisms of action for the optimism-PHRQL linkage, for persons experiencing pain. To begin, pathophysiological mechanisms may be involved. For example, in persons with knee arthritis, positive future expectancies were related to reduced activation of pain neurons and, as a result, less perception of pain (Goodin et al., 2013). Optimism may also help to regulate cortisol secretion in the context of stress reactions (Jobin, Wrosch, & Scheier 2014) which, for persons with fibromyalgia, are characterized by reduced activation of the sympathoadrenal system and hypothalamic-pituitary-adrenocortical axis, with associated reports of difficulties with strength, endurance, fatigue, and pain (Kadetoff & Kosek, 2010). Thus, for persons experiencing chronic pain, including fibromyalgia, PHRQL may be predicated on physiological adaptivity in response to positive future-oriented thinking. Given that pain is a transdiagnostic symptom, such explanations may also extend to persons with other diseases, including the cancer population (Mao et al., 2007).

Underlying cognitive and emotional processes, including perceptions of efficacy and control as assessed in our current study, may also contribute to the linkage between optimism and PHRQL. For instance, among individuals with shoulder pain, high optimism lessened pain catastrophizing, with consequent improvements for shoulder functioning at a three-month follow-up (Coronado et al., 2017). Additionally, for persons with chronic musculoskeletal pain, optimism is related to goal persistence and flexibility, positive affect, and persistence in activity completion (Esteve et al., 2018). Positive future expectancies, therefore, appear to contribute to a beneficial adaptation of perceptions of illness and pain, and of mood, with resultant improvements to health-related quality of life (Pulvers & Hood, 2013).

Taken together, the extant literature suggests that, within the context of disease, optimism has a beneficial association with health-related quality of life and this linkage may be due to both physiological and psychological salutogenic processes. In our study, across disease samples, we examined the association between optimism and PHRQL from the latter perspective, investigating cognitive-emotional and behavioral characteristics as potential mechanisms of action, which we discuss below.

Serial Mediating Effects of Health-Related Self-Efficacy and Health Behaviors

Beyond the direct association between optimism and PHRQL, positive future expectancies also influence, and interact with, additional cognitive-emotional and behavioral characteristics to exert an effect on health-related quality of life among persons with chronic illness. Further, although previous research has examined basic associations between our study variables, we offer, to our knowledge, the first attempt to utilize serial mediation to substantiate potential mechanisms of action for the optimism-PHRQL linkage. In our study, across both disease samples, health-related self-efficacy and active management of disease (i.e., wellness behaviors or treatment adherence) emerged as serial mediators of the association between optimism and PHRQL, which we discuss below.

Remitted cancer. In our sample of persons recovering from cancer, we observed serial mediating effects of health-related self-efficacy and wellness behaviors for the association between optimism and PHRQL. In addition, we found no specific indirect effects via either mediator, suggesting that health efficacy and wellness behaviors function together, rather than independently, to link optimism to PHRQL among persons with remitted cancer.

In previous cancer research, optimism and health-related self-efficacy have been linked to better physical functioning and fewer health-related role limitations. In adult cancer survivors, optimism emerged as a significant predictor of health-related self-efficacy, and both variables were associated with physical health improvements (Gallagher et al., 2019). Similarly, optimism and self-efficacy were linked to better quality of life in persons with breast cancer (Sadoughi, Mehrzad, & Salehi, 2017) and individuals undergoing bone marrow transplantation (Hochhausen et al., 2007). Such associations may be understood from the perspective of melanoma survivors who, in a qualitative study, reported that maintaining a sense of optimism, and positive reframing of attitudes regarding their cancer experience and the future, contributed to greater belief in personal ability to maintain health during and following completion of treatment (Banerjee, D’Agostino, Gordon, & Hay, 2018).

Such patterns of findings suggest that although optimism broadly encompasses positive future expectancies across life domains, it is also specifically relevant to the illness experience, and may influence perceptions of personal control over symptoms and physical well-being. Less clear from the existing research is how a sense of health-related self-efficacy translates into subjective impressions of better PHRQL. Our findings indicate that cancer survivors with higher self-efficacy may, in turn, be more likely to act upon their feelings of personal control by engaging in wellness behaviors known to reduce risk for recurrence and the severity of treatment-related side effects, with beneficial consequences for perceptions of health-related quality of life.

Our findings are consistent with the theory of planned behavior (TPB), which is derived from a reasoned action model and has been utilized to understand engagement in risk and protective health behaviors (Ajzen, 1991). According to the TPB, valence of outcome expectancies (e.g., good versus bad; optimistic versus pessimistic), attitudes regarding behavioral change, and internal control factors (e.g., perceived personal abilities and deficiencies) are associated with behavioral intentions (Conner, 2010), which are conceptualized as one’s motivation to execute a conscious plan and are an antecedent to behavioral engagement (Sommer, 2011). The principles of TPB may be most effective when applied to singular health behaviors characterized by some degree of volitional control (e.g., eating healthy fats) rather than broader goals (e.g., good health) which may be influenced by numerous, perhaps uncontrollable, factors (Sommer, 2011).

Thus, for persons recovering from chronic illness, it can reasonably be posited that an optimistic outlook and sense of self-efficacy would enhance engagement in wellness behaviors, with implications for PHRQL. Indeed, among long-term cancer survivors, optimism and health-related self-efficacy explained approximately 67% of the variance in health behavior intention for nutrition, physical exercise, smoking, and alcohol use (Hartono & Pohan, 2017). As another example, in endometrial cancer survivors, 34.1% of the variance in exercise behavior was accounted for by constructs of the theory of planned behavior (i.e., attitudes, norms, control beliefs), with intention and self-efficacy emerging as independent correlates (Karvinen et al., 2007).

Yet, in only one study were optimism and self-efficacy linked to health behavior engagement, for persons in remission from cancer. Among endometrial cancer survivors, positive outcome expectations and self-efficacy ratings were predictors of amount of daily exercise (Basen-Engquist et al., 2013). Thus, our we address a gap in the literature, examining these linkages in an understudied sample and assessing a wider array of health behaviors, including nutrition and sleep. We also extend previous research by describing a serial mechanism of action through which health self-efficacy and engagement in wellness behaviors contribute to enhanced perceptions of quality of life, a robust indicator of objective health (Gilbert et al., 2016; Wu et al., 2013). Our findings are not surprising, however, given an extensive body of literature documenting positive associations between PHRQL and lifestyle factors such as balanced nutrition (George et al., 2014), exercise (Courneya et al., 2005), and avoidance of smoking (Garces et al., 2004), among persons in remission from cancer.

A final noteworthy finding from analyses using our cancer sample, was the absence of specific indirect effects, via health-related self-efficacy or wellness behaviors, linking optimism to PHRQL. Specifically, although optimism was related to health efficacy, there was no serial association with PHRQL and, further, although wellness behaviors were associated with PHRQL, this linkage was not influenced by optimism. Our findings suggest, therefore, that positive future expectancies beneficially contribute to perceived efficacy over illness, but that this optimism-driven sense of control may be insufficient, on its own, to improve perceptions of health-related quality of life.

As indicated by previous research, the presence of behavioral intention and belief in personal capacity for behavioral change, may not always manifest as actual behavioral change (Sheeran et al., 2016). As well, although there is a clear association between wellness behaviors and PHRQL, this linkage is not predicated directly on optimism; that is, simply having positive future expectancies does not necessarily translate into behavioral action toward wellness behaviors (Boehm et al., 2018).

Thus, for cancer survivors, it appears that both perceived control and engagement in wellness behaviors are necessary elements allowing optimism to facilitate better PHRQL. There is some precedent for this finding; for example, it has been posited that both positive outcome expectancies and self-efficacy are necessary prerequisites for health behavior intention and engagement (Schwarzer & Renner, 2000) and, as we suggest, perhaps all of these are necessary to manifest enhancements to health-related quality of life. Unique disease experiences (e.g., concerns about successful resumption of previous roles) may interfere with the development of one or both of these requisite components (e.g., reduced efficacy or behavioral motivation), thus limiting any downstream positive effects for PHRQL (Tiedtke, de Rijk, Donceel, Christiaens, & Dierckx de Casterlé, 2012).

From a more pragmatic perspective, many individuals with chronic illness may believe in their ability to engage in health promotion behaviors but fail to take action because of a lack of health knowledge, lack of understanding of treatment regimens or a lack of recognition of the importance of such actions for improving health-related quality of life (Beehler, Rodrigues, Kay, Kiviniemi, & Steinbrenner, 2014). In a diverse sample of long-term cancer survivors, most participants reported unmet information needs in categories including side effects and symptoms (75.8%), tests and treatment (71.5%), and health promotion (64.5%; Kent et al., 2012). Similarly, in another study, survivors requested more information on cancer screening tests (42.5%), long-term treatment effects (33.1%), and behaviors that should be adopted to maintain health (31.9%; Playdon et al., 2016). Finally, in persons with a colorectal cancer history, 15% denied awareness of alcohol consumption guidelines, 13% never heard of restricting their fat intake, and 11% lacked familiarity with the recommended quantities of daily fruits and vegetables (Hawkins, Berkowitz, & Rodriguez, 2015).

Accessibility of information and satisfaction with the degree of communication from healthcare providers have been linked to better physical and mental health-related quality of life in the cancer population (Miyashita et a., 2015). Thus, unmet educational needs could help to explain the high rates of engagement in detrimental health behaviors observed among persons in remission, despite having a previous diagnosis that has potential to be a teachable moment for health behavior change (Clark et al., 2015; Clifford et al., 2018). As an example, in a study of cancer survivors, 44% were physically inactive, 18% currently smoked, and 18% engaged in risky alcohol use (Harding, 2012). Finally, among cervical cancer survivors, 14.5% were current smokers, 13.3% consumed more than four alcoholic beverages per week, and 31.5% reported no weekly physical activity (Iyer et al., 2016).

As an alternative explanation, it may also be that, upon successful remission, cancer survivors are optimistically biased, or have reduced worry, about future risk, thereby creating a disconnect between health beliefs and actions (Rhee et al., 2008). To begin, in a study of cancer survivors, less than half (42%) endorsed clinically significant fear of recurrence (Simard & Savard, 2015) and, further, in a study of head and neck cancer survivors, optimism was related to less fear of recurrence (Llewellyn, Weinman, McGurk, & Humphris, 2008). Even when present, risk perception and worry about recurrence may not always be sufficient to facilitate preventive behaviors (Burris, Jacobsen, Loftus, & Andrykowski, 2012).

Taken together, multivariate analyses from our remitted cancer sample indicate an ordered pattern of associations between optimism and better health-related quality of life, whereby the beneficial effects of positive future expectancies are serially related to both cognitive-emotional (i.e., perceptions of control, efficacy) and behavioral elements (i.e., engagement in wellness behaviors) and, in turn, to enhanced PHRQL. Our results can be understood within the context of the Health Belief Model (HBM), which is often used to conceptualize patient management of illness (Rosenstock, 1974). Individual-level beliefs, including about benefits of and barriers to engagement in health behaviors, health self-efficacy, and the degree of health threat, along with demographic characteristics and personality factors (e.g., optimism), exert an influence on movement toward health goals (Champion & Skinner, 2008). Of note, the HBM model has been applied to understand rates of engagement in cancer prevention behaviors and follow-up care (Guilford, McKinley, & Turner, 2017; Michel et al., 2011), and quality of life in the cancer population (Zheng, Lee, Zhou, & Li, 2019).

The Health Belief Model may also apply to the findings from our sample of persons with fibromyalgia, which were similar, although we also found specific indirect effects for both health efficacy and health behaviors (i.e., treatment adherence), suggesting that the mechanisms of action linking optimism to PHRQL may differ in complexity between disease groups. Next, we discuss our multivariate serial mediation results for our sample of persons with fibromyalgia and, following this, we explore the implications of the similarities and differences between our models, across disease type (i.e., cancer and fibromyalgia) and status (i.e., active and remitted).

Fibromyalgia. For our sample of persons living with fibromyalgia, health-related self-efficacy and treatment adherence were significant serial mediators of the association between optimism and PHRQL and, additionally, specific indirect effects were found for both efficacy and adherence. Like our sample of cancer survivors, individuals with fibromyalgia appear to reap health benefits from positive future-oriented expectancies. As we have noted, maintaining an optimistic outlook in the context of disease may enhance beliefs about illness management, including expectancies for success with self-regulation and control over health (Carver & Scheier, 2014). Additionally, optimism may facilitate adaptive reinterpretation of the illness experience and appraisals of the self (e.g., personal control), thereby promoting resiliency in the face of challenging circumstances (Bortolotti, 2018). For instance, in a qualitative study of individuals living with disease, including chronic pain, many reported maintaining a positive outlook and, additionally, having the courage to actively manage their disease (Kristjansdottir et al., 2018). Similarly, in another qualitative study, persons with fibromyalgia endorsed a strong reliance on optimism and faith to cope with their illness, acknowledging the adaptive effects of such perspectives on beliefs about their abilities (e.g., role fulfillment) in the context of distress-provoking functional and social losses (Taylor et al., 2016).

As with our cancer survivor sample, persons with fibromyalgia who manifest a sense of efficacy derived from optimism, are also more likely to engage in proactive health behaviors, including following treatment recommendations from their health care provider. In addition to the theory of planned behavior, which we previously discussed, Albert Bandura’s social cognitive theory (Bandura, 1989) represents a related theoretical framework for understanding the linkage of self-efficacy and proactive health behaviors. As we found in our study, social cognitive theory posits that self-efficacy beliefs influence behavioral patterns (i.e., adherence to treatment), with perceived controllability determined by a variety of factors including, but not limited to, past mastery experiences and outcome expectancies (i.e., optimism for success) (Beauchamp, Crawford, & Jackson, 2018). Individuals also engage in a continuous process of self-regulation, which involves monitoring, evaluating, and adjusting their motivation levels, goals, or actions based on failures or successes (Nabavi, 2012). On the one hand, the experience of chronic illness may disrupt self-regulatory processes, by thwarting motivation and frustrating goal pursuit (Janse, Sprangers, Ranchor, & Fleer, 2016), whereas, on the other hand, optimism may help to counteract such disruption, by sustaining motivation via a positive and future-oriented perspective on attainment of health goals and the success of health behaviors (Esteve et al., 2018; Rasmussen et al., 2006).

In our study, we illustrate the effects of such adaptive future-oriented expectations (i.e., optimism) on health-related self-efficacy, with beneficial downstream impact on treatment adherence and PHRQL, though our cross-sectional design precludes drawing conclusions regarding shifts in control beliefs and behavioral patterns across the illness trajectory. Yet, our findings are consistent with existing literature indicating an association between self-efficacy beliefs, treatment adherence, and PHRQL among persons with fibromyalgia. As an example, self-efficacy for pain management and physical activity were significant predictors of exercise levels, and greater physical activity was linked to fewer role limitations in daily living (e.g., shopping), in a sample of fibromyalgia patients (Culos-Reed & Brawley, 2000). In another study, chronic pain patients reported self-efficacy for a variety of behaviors (e.g., balanced diet; relaxation exercises; activity pacing), with expectations for symptom alleviation if these recommendations were followed (Anderson, Hurley, Staud, & Robinson, 2016). Our findings extend this past research in several ways, including by assessing optimism as a predictor, by assessing the clinically relevant health behavior of treatment adherence, and by examining an additional marker of PHRQL, physical functioning, as an outcome, in addition to substantiating previous work linking engagement in health behaviors to improvements in physical functioning and role limitations, among persons with fibromyalgia (Gowans & deHueck, 2004; Slim et al., 2016).

Of note, unlike in our remitted cancer sample, we found that, for persons with fibromyalgia, health-related self-efficacy, and treatment adherence function as independent mediators of the association between optimism and PHRQL. In other words, optimism is related to PHRQL independently via both efficacy and adherence, suggesting a potential decoupling of cognitive and behavioral processes, a conceptualization that has been previously applied to the categorization and treatment of fibromyalgia (Thieme, Flor, & Turk, 2006). For persons with fibromyalgia, this may mean that precipitating external and internal events (e.g., negative life events; optimistic expectancies) can impact overall well-being in two ways, by separately disrupting or enhancing self-perceptions (e.g., perceived control; self-efficacy) and behavioral routines (e.g., proactive health behaviors; Cedraschi et al., 2013; Pulido-Martos et al., 2020).

A potential explanation for this finding could be the strong psychosomatic and emotionally disruptive nature of fibromyalgia pathology which contributes to and exacerbates physical symptoms (Eich, Hartmann, Müller, & Fischer, 2009). For example, persons with fibromyalgia tend to display hypervigilance to bodily sensations (e.g., pain), and often report low self-esteem regarding pain-based functional limitations and negative perspectives regarding the disease trajectory (Galvez-Sánchez, Duschek, & Reyes del Paso, 2019). Such psycho-physiological vulnerabilities may make it more likely that persons with fibromyalgia will perceive a poor quality of life when psychologically challenged (e.g., low optimism), given the existence of two potential mechanistic pathways of action via either cognitive or behavioral disruption (van Middendorp & Evers, 2016).

Additionally, for persons with fibromyalgia, optimism, or the lack thereof, may be associated with PHRQL via a cognitive pathway alone, in the absence of behavioral change. There is a precedent for this pattern of effects in persons with chronic pain, whereby cognitive factors are directly associated with HRQL outcomes. For instance, chronic musculoskeletal pain patients who reported less catastrophizing (e.g., pain severity; future trajectory of disease) and higher pain self-efficacy were more likely to report better health-related quality of life (Chumbler et al., 2013). Similarly, fibromyalgia patients with greater anxiety, depression, negative affect, and stress were more likely to report limitations in physical functioning, whereas pain self-efficacy and positive affect were associated with better functional abilities (Furlong, Zautra, Puente, López-López, & Valero, 2010). Under circumstances in which persons with fibromyalgia have fewer negative cognitions (e.g., psychopathological traits), including the presence of an optimistic outlook, it appears that there may be a direct beneficial effect on perceived quality of life (Edwards, Bingham, Bathon, & Haythornthwaite, 2006; Marks, 2014). In other words, fluctuations in cognitive-emotional functioning may independently impact self-assessments of physical health, without a behavioral component, suggesting that maladaptive mood and thoughts are a critical contributor to perceived wellbeing in persons with fibromyalgia.

Alternatively, optimism may be related to PHRQL via an independent indirect effect on behavioral engagement; that is, precipitating external (e.g., stressors) or internal (e.g., pessimism) stimuli may result in behavioral and biological reactivity, and consequent impact on HRQL. For example, in an experimental study among persons with fibromyalgia, the perceived unpleasantness of stimuli was associated with hypervigilance (González et al., 2010) and, in another study, persons with fibromyalgia displayed amplified brain signaling in response to facial expressions of pain and anger, indicating heightened sensitivity and responsiveness to negative stimuli or sensory experiences (González-Roldán, Muñoz, Cifre,Sitges, & Montoya, 2013). Of note, biases in information processing and allocation of attentional resources are consistent with some conceptualizations of chronic pain (Miró et al., 2011), suggesting that persons experiencing pain may sometimes react physiologically or behaviorally to triggering stimuli, without appropriate cognitive-emotional gating.

In addition to disease-related differences in cognitive processing, optimists and pessimists also differ in their evaluative approaches to disease, such that optimists engage in elaborate information processing and extract the most helpful and personally relevant elements (e.g., benefits of exercise; risks of nonadherence), whereas pessimists display a limited ability to determine the relevance and importance of information (Abele & Gendolla, 2007; Aspinwall, Richter, & Hoffman, 2001). Thus, for persons with fibromyalgia, who might be hampered by disease-related cognitive processing deficits, optimism may promote a holistic and accurate assessment of the illness experience, with consequent engagement in adaptive health behaviors. Lending support for this claim, among persons with chronic movement disorders, positive future orientation was directly associated with preventive health behavior engagement (e.g., nutritious diet; exercise; Kupcewicz, Szypulska, & Doboszyńska, 2019).

It appears, thus, that persons with fibromyalgia or related conditions who can respond with positive future-oriented expectations or health promoting behavioral patterns, are more likely to experience better PHRQL. For example, an optimistic outlook has been directly associated with decreased knee pain severity, a marker and predictor of HRQL (Pazdi-Ravandi et al., 2013; Thompson et al., 2018). Additionally, in persons with fibromyalgia, maintaining medication regimens was associated with reduced pain severity and interference, and fewer disability-related functional impairments (Robinson et al., 2013). On the other hand, for persons with arthritis, difficulties with adherence to recommended lifestyle changes (e.g., physical activity) were related to greater PHRQL impairments (Abell, Hootman, Zack, Moriarty, & Helmick, 2004; Austin, Qu, & Shewchuk, 2011). Thus, our study, and the existing literature, suggests a pattern of effects that may be either beneficial or detrimental in nature; that is, whereas positive stimuli may have an impact on PHRQL via adaptive behavioral responses (Pulido-Martos et al., 2020), negative stimuli may deleteriously impact PHRQL by catalyzing maladaptive behavioral responses (Cedraschi et al., 2013).

Finally, there may also be a pragmatic explanation for our finding of this indirect effect, which is that, for some types of chronic illnesses or treatments, self-efficacy may not always be a prerequisite for adhering to a provider's recommendations, as some treatment strategies could require less motivation, confidence, or effort than others. For instance, medications are a common treatment regimen in fibromyalgia and may require less self-efficacy for successful engagement than is needed for other types of interventions (e.g., diabetes maintenance; Adu et al., 2019; Middleton, Anton, & Perri, 2016). In sum, persons with fibromyalgia who have a sense of optimism may be able to follow some of a provider's recommendations, with consequent benefits to health-related quality of life, without needing high levels of efficacy.

Comparative Multivariate Results Across Disease Samples

Although patterns of results were similar across our samples of persons with fibromyalgia or remitted cancer, consideration must be given to understanding these commonalities, and any differences, relative to the type of chronic illness. Some overlap in presenting symptoms (e.g., pain) and disease impact (e.g., impairment) exists across our illness groups (Kawai et al., 2017;

Krouse et al., 2009), yet differences exist in the etiology, manifestation, trajectory, treatment of, and recovery from, cancer compared to fibromyalgia. As well, differences exist in the experience of living with a current illness, as with our fibromyalgia sample, and the experience of recovering from an illness, as with our sample of cancer survivors (Asbring, 2001; Lu et al., 2009). Each of these illness-related parameters may impact the outcome and interpretation of our hypothesized models.

To begin, our findings illustrate the robustness of cognitive, emotional, and behavioral factors as contributors to PHRQL, with similar patterns of effects emerging across samples of persons living with fibromyalgia or recovering from cancer. Regardless of point of progression through the illness trajectory, optimistic expectations for the future appear to exert a positive influence on perceptions of PHRQL, consistent with the notion that personality dispositions (i.e., optimism) remain stable across time, even in the context of suffering (Schou, Ekeberg, Sandvik, & Ruland, 2005). Our findings also suggest that adaptive future-oriented thought processes (e.g., controllability; optimism) are situationally important, including across disease statuses. Optimism appears to exert a beneficial effect on PHRQL both during the active experience of disease (Chang et al., 2019), as with our sample of persons with fibromyalgia, and during the recovery process, which may involve persistent after-effects of disease or treatment and fear of recurrence (Carver et al., 2005), as with our sample of persons with remitted cancer.

Also consistent across disease groups, optimism may facilitate a sense of control over health management by promoting adaptive engagement in healthy lifestyle behaviors or treatment adherence, with beneficial downstream effects on PHRQL. Indeed, maintaining a positive outlook of the future is a resiliency trait in chronic illness, with optimists reporting greater likelihood of possessing adaptive control beliefs and engaging in health-oriented behaviors that facilitate better quality of life (Kupcewicz, Szypulska, & Doboszyńska, 2019; Schiavon, Marchetti, Gurgel, Busnello, & Reppold, 2017). Our findings align with existing literature, from other chronic illness samples (e.g., asthma; diabetes), suggesting that perceived control and self-efficacy not only assuage illness symptoms (Calfee et al., 2006; Johnston-Brooks, Lewis, & Garg, 2002) but also reduce disease recurrence (De Boer et al., 1998). From a translational perspective, patient belief in capacity to successfully adhere to treatment or engage in wellness behaviors may be critical for effective disease management, given the high likelihood of secondary comorbid health problems in both fibromyalgia (Peter et al., 2006) and remitted cancer (Deimling, Sterns, Bowman, & Kahana, 2005). Similarly, our proposed motivational-cognitive-behavioral sequence of effects may help to maintain a homeostatic balance of adaptive and preventive health functioning, which is important given the variability of symptom severity over time for fibromyalgia (Walitt et al., 2011) and the risk of recurrence of cancer (Kwan et al., 2010; Meyerhardt et al., 2007).

In addition to the commonality of findings across our samples, we also identified nuanced differences in effect patterns, warranting consideration of variability in the influence of risk and resiliency factors relative to the type of disease and position in the disease trajectory (i.e., past versus current illness). In our remitted cancer sample, we found a specific indirect effect only through health-related self-efficacy, but not via wellness behavior. There may be some aspects of recovering from a disease, or fearing recurrence of a disease, that differ from the experience of living with a current diagnosis, which contribute to this pattern of findings.

To begin, upon completion of treatment and achievement of disease remission, cancer survivors may be able to endorse a positive future outlook (Phillips & Jones, 2014) and experience a sense of self-efficacy (e.g., task completion; Foster et al., 2014), having overcome a potentially life-threatening illness. Although important for successful adjustment in persons with current disease, including cancer and fibromyalgia (Manne et al., 2006; Mannerkorpi, Svantesson, & Broberg, 2006), the pathway through self-efficacy may be especially salient for survivors. Resolving symptoms and accomplishing treatment goals often involves rigorous and complex treatment regimens, the completion of which likely necessitates and builds upon optimism and self-efficacy (Buffart, Galvão, Brug, Chinapaw, & Newton, 2014; Fisher et al., 2015). Thus, cancer survivors may have a determined attitude (e.g., inner strength), based on successful previous coping, that contributes to perceptions of wellbeing (Stewart, Wong, Duff, Melancon, & Cheung, 2001).

As an alternative explanation for the salience of self-efficacy as a linking mechanism, when initially diagnosed and undergoing treatment, cancer patients may seek to identify ways through which to enhance perceptions of control (Covelli, Baxter, Fitch, McCready, & Wright, 2015). For instance, 41% of oncology patients reported use of proactive (e.g., lifestyle changes) or reactive (e.g., stoic behavior) control-based strategies, with higher rates of utilization among individuals who endorsed a “fighting spirit” and confidence of being cured in the future (Link, Robbins, Mancuso, & Charlson, 2004). As well, perceptions of control are likely to remain upon treatment completion, with positive correlations to physical health and psychological distress in breast cancer survivors (Bárez, Blasco, Fernández-Castro & Viladrich, 2009).

To the extent individuals with cancer also endorse an optimistic outlook, there may be a more robust sense of self-efficacy for making treatment-related decisions and engaging in health-related behaviors that will maximize quality of life. As an example, optimistic cancer patients reported greater self-efficacy and, in turn, less difficulty and greater satisfaction with the process of making decisions related to treatment (Orom et al., 2009). Exertion and perceptions of control during the treatment phase have been further linked to health-related behaviors including access of online health information (Bass et al., 2006), complementary and alternative medicine (Henderson & Donatelle, 2003), and adherence to opioid medications (Liang, Yates, Edwards, & Tsay, 2008). Thus, internal perceived control appears to be an important mechanism for promotion of PHRQL (Shelby et al., 2014), especially given extensive documentation regarding negative outlooks of the future (e.g. unpredictability of recurrence; Koch, Jansen, Brenner, & Arndt, 2012) and perceived helplessness within the cancer population (Watson, Homewood, Haviland, & Bliss, 2005).

Furthermore, our study also revealed that, in the absence of self-efficacy, optimism did not directly impact engagement in wellness behaviors and consequent PHRQL, suggesting a potential disconnect between beliefs and behaviors. Having overcome an illness, cancer survivors may have an enhanced sense of optimism but, in community and clinical samples, positive expectancies are not always related to health-promoting behaviors (Davidson & Prkachin, 1997).

As a potential explanation for this disconnect between beliefs and behaviors, it has been suggested that optimism’s positive effects on active goal pursuit (e.g., healthy lifestyle; symptom alleviation) may be moderated by how highly a goal is prioritized (Geers, Wellman, & Lassiter, 2009). Cancer survivors may have multiple conflicting life goals and priorities following achievement of remission, and wellness behaviors and quality of life may not be highly valued, especially in the absence of health-related self-efficacy. Lending empirical support, in a sample of prostate cancer survivors, most failed to make positive dietary changes, citing work engagement as more important (Coa et al., 2015). Yet, in a study of veterans who had survived cancer, productive work engagement was deemed less important than other meaningful activities and abilities (e.g., autonomy, reciprocal interpersonal relationships, control bodily functions) (Karel et al., 2016), illustrating diversity in the prioritization of health outcomes for cancer survivors and, perhaps, providing insight into the decoupling of beliefs and behaviors in our sample.

It may also be the case that survivors of disease can develop inaccurate or unrealistic expectations for the future, which are detrimental to proactive behavioral engagement and quality of life. For example, an unrealistic optimistic bias may manifest as an underestimation of cancer risk (e.g., “It’s not going to happen to me again”) or the health impact of lifestyle choices (e.g., smoking; Weinstein, Marcus, & Moser, 2004). Although no previous research has examined the linkage between optimistic bias and health behaviors in survivors, being overly optimistic about personal risk for cancer is associated with less intention to utilize protective measures (e.g., sun protection; Bränström, Kristjansson, & Ullén, 2006) and engagement in detrimental lifestyle habits (e.g., substance use; Masiero, Riva, Oliveri, Fioretti, & Pravettoni, 2018). Some survivors may also endorse the perception that their cancer was caused by nonmodifiable factors (e.g. genetics), so that proactive behavior change is viewed as unnecessary or undesirable (Corbett et al., 2018). However, cancer survivors do engage in proactive lifestyle changes when they expect positive future outcomes (e.g., lower chance of recurrence) as a result, especially if their initial diagnosis was attributed to an unhealthy lifestyle (e.g., alcohol consumption; insufficient exercise; Rabin & Pinto, 2006). Thus, the effects of optimism on health behaviors may need to be considered in the context of the accuracy of diagnostic attributions.

On the other hand, for our sample of persons with fibromyalgia, we found specific indirect effects through both self-efficacy and treatment adherence, linking optimism to PHRQL.

Thus, for persons with fibromyalgia, future expectancies appear to impact efficacy and adherence independently, suggesting that perceptions of health may be predicated on reactivity within either of these motivational-cognitive or motivational-behavioral pathways, potentially without coordination. Supporting this, many symptoms of fibromyalgia, and associated functional impairments, are attributable to heightened psychosocial dysregulation and maladaptive behavioral coping mechanisms which have an identifiable physiological impact (Racine et al., 2018; Tan, Jaaniste, & Champion, 2019; Verbunt, Pernot, & Smeets, 2008). Theoretically, the biopsychosocial model allows for such a multi-faceted approach to understanding the contributions of adaptive cognitive and/or behavioral processes, and their interrelations, to perceptions of health, including in fibromyalgia (Turk & Adams, 2016).

Supporting our findings, fibromyalgia symptom severity has been explained through independent and interconnecting multidimensional physical (e.g., active lifestyle) and psychological (e.g., optimism) pathways (Pulido-Martos et al., 2019). From a cognitive perspective, the disease experience may disrupt the content and valence of thought processes regarding the self (i.e., self-efficacy versus lack of control) and the future (i.e., optimism versus pessimism), with implications for perceptions of health status irrespective of any behavioral responses. For persons with fibromyalgia, this linkage may be understood in the context of experiences of stigma (e.g., attributions of laziness) and delegitimization of illness (e.g., accusations of faking symptoms) from healthcare providers and significant others (Slade, Molloy, & Keating, 2009). Such negative feedback may be integrated into sense of personal identity; for example, in a sample of persons with fibromyalgia, internalized stigma was associated with negative perceptions of current or future circumstances (e.g., catastrophizing) and lower levels of pain-related self-efficacy (Waugh, Byrne, & Nicholas, 2014). Similarly, perceptions of invalidation and discounting of concerns are linked to greater physical disability and pain severity ratings (Kool et al., 2010), perhaps due to pessimism and perceived uncontrollability of disease (Blom et al., 2012; Franks et al., 2004).

Another salient aspect of the disease experience for persons with fibromyalgia, is high rates of affective dysregulation and psychological distress that may skew future-oriented cognitions, self-efficacy, or perceptions of health-related quality of life. For instance, persons with fibromyalgia frequently experience psychiatric comorbidities such as anxiety and depression (Arnold et al., 2006; Consoli et al., 2012) which may manifest, for example, as maladaptive cognitions regarding living circumstances (e.g., worry and rumination about current or future health) and negative self-conceptualizations (e.g., low self-efficacy for health management; Malin & Littlejohn, 2015; Van Liew, Brown, Cronan, & Bigatti, 2013). In fibromyalgia samples, such psychological distress is associated with less dispositional optimism (Ramírez-Maestre et al., 2012) and to an external locus of control in chronic illness (Shuster, McCormack, Riddell, & Toplak, 2009). Thus, as in our study, it is reasonable to suggest a robust linkage between cognitive-emotional characteristics, such as optimism/pessimism and self-efficacy, and health perceptions, without requisite associated behavioral patterns. For instance, pessimistic persons with chronic pain were more likely to endorse psychopathological symptoms, low confidence to cope with pain, and greater pain intensity, compared to non-pessimistic counterparts (Rapp et al., 2010). Similarly, in a sample of persons with fibromyalgia, daily pain reports were predicated on catastrophic thinking (e.g., expecting worst case outcomes now or in future) and coping self-efficacy (Taylor, Davis, Yeung, Zautra, & Tennen, 2017).

Our results also lend support for the independent involvement of health-related behavior (i.e., treatment adherence) as a mechanism of action linking optimism to perceptions of health.

Outcome expectancies, whether positive or negative, may motivate or discourage behaviors related to the management of symptoms or illness, consequently impacting perceptions of health. For example, among persons living with pain, optimism emerged as the best predictor of engagement in goal-directed activities (Judge, Clasey, Crofford, & Segerstrom, 2020). In a study of persons with chronic musculoskeletal pain, positive future-oriented expectancies were directly related to adherence to a healthcare providers' recommendations (e.g., activity persistence), despite pain and in an attempt to achieve health-related goals (e.g., pain alleviation; Esteve et al., 2017). For persons with fibromyalgia, maintaining a positive future outlook may be especially important for ongoing health behavior engagement, given numerous diagnostic (e.g., lack of clear etiology) and treatment-related frustrations (e.g., ineffective symptom alleviation) experienced by patients and providers alike (Bernard et al., 2000; Briones-Vozmediano, Vives-Cases, Ronda-Pérez, & Gil-González, 2013).

As a resiliency trait, optimism also has the potential to buffer against maladaptive behavioral coping mechanisms (e.g., passive or avoidant coping) commonly associated with illness (Reich, Johnson, Zautra, & Davis, 2006). For example, a positive future-oriented outlook could help to overcome disease-related fears (e.g., avoidance of physical activity due to fear of movement; Nijs et al., 2013) or sense of learned helplessness (e.g., inaction due to past failures with self-management; Moyano et al., 2019), which are characteristics previously endorsed by persons with fibromyalgia. In one study, fibromyalgia patients reported maintaining a positive view of life and using evidence-based behavioral coping mechanisms (e.g., exercise; slow tempo; splitting activities), to promote ongoing work engagement (Löfgren, Ekholm, & Öhman, 2006). Finally, in patients with chronic pain undergoing acupuncture, baseline positive expectancies for treatment effectiveness were linked to perceptions of better health-related quality of life following completion of treatment, with gains maintained at a six-month follow-up (Linde et al., 2007).

Taken together, our findings indicate that positive future expectancies, or optimism, are beneficially associated with PHRQL for persons with fibromyalgia and remitted cancer, with transmission of effects occurring via cognitive and/or behavioral pathways. More specifically, across samples, health-related self-efficacy and health behaviors serially mediated the linkage between optimism and PHRQL. Our results align with the Health Belief Model and Theory of Planned Behavior, which posit that a multitude of factors influence health behavior engagement and quality of life including, but not limited to, personality traits, future-oriented expectancies, attitudes regarding change, and perceptions of control (Ajzen, 1991; Rosenstock, 1974). For persons living with, or recovering from, chronic illness, a positive future orientation may have implications for self-perception, including beliefs about ability to successfully manage health through engagement in proactive health behaviors that maximize likelihood of optimal functional ability (Phillips & McAuley, 2014; Ramírez-Maestre et al., 2012).

Yet, there may also be differences in the interrelations between cognitive, emotional, and behavioral characteristics relative to the type of chronic illness and status of disease. In our remitted cancer sample, self-efficacy and wellness behaviors functioned together, rather than independently. Although successfully completing treatment and overcoming disease may contribute to a positive view of the future, it does not necessarily mean that survivors will manifest self-efficacy or engage in positive health behaviors. These independent disconnects between positive expectancy motivation and efficacy/engagement may be due to intrapersonal, and disease and treatment related, factors, such as long-lasting unavoidable treatment side effects, bias in perception of personal risk for recurrence, unpredictability of cancer recurrence, life priorities aside from health, and failure to recognize the importance of health behavior change for mitigating disease risk (Beehler et al., 2014; Geers et al., 2009; Weinstein et al., 2004).

Similarly, the unique aspects of living with fibromyalgia may help to account for the independent contributions of cognitive and behavioral factors to PHRQL, and their serial explanatory pathway. This pattern of effects is consistent with pathophysiological and psychosomatic explanations, including from experimental research, for the onset and maintenance of fibromyalgia symptoms (Pulido-Martos et al., 2019). Finally, the delegitimization and stigma that often accompanies fibromyalgia may reinforce maladaptive future-oriented cognitions, negative self-perspectives, and/or behavioral disengagement (Slade et al., 2009).

Limitations and Future Research Directions

Our novel findings must be interpreted in the context of study limitations. To begin, our cross-sectional design does not allow for determination of causality. Although development of our statistical models was guided by existing theory, previous research suggests that our study variables could be related in alternative ways. As an example, poor PHRQL in cancer survivors and chronic pain patients may contribute to negative cognitions regarding current living circumstances or the future (Fauske, Bondevik, Bruland, & Ozakinci, 2015; Hellström, Jansson, & Carlsson, 2000). Similarly, quality of life, as well as degree of success with health behaviors, may impact perceived control over disease (Anderson, Steele, & Coyle, 2013; van Wilgen et al., 2008). Thus, although our statistical models were based on existing theory and previous research, prospective, longitudinal studies are needed to substantiate our findings. Such an approach would provide greater understanding of the sequencing of our study variables, including changes in associations across disease and recovery trajectories (Caruana, Roman, Hernández-Sánchez, & Solli, 2015).

Our results may also be limited in terms of generalizability, due to our small samples of only two disease groups that were primarily comprised of White females. Although we controlled for the impact of demographic characteristics, group differences may exist across study variables. For example, due to a multitude of factors including genetics, socioeconomic status, and discrimination, many racial and ethnic minority groups experience heightened risk for cancer and chronic pain, insufficient access to treatment, elevated symptom severity, and higher mortality rates (Anderson, Green, & Payne, 2009; Kamath & O'Connor, 2011; Wrinkleby & Cubbin, 2004). Sex-based differences in the pathophysiology of pain and factors known to impact quality of life ratings are also noted in the literature (Bellato et al., 2012; West et al., 2015). As an example, among female rectal cancer survivors, quality of life was most affected by fatigue, weight loss, defecation problems, and future perspective, whereas men's ratings for role functioning were significantly impacted by pain, defecation problems, and financial difficulties (Kinoshita et al., 2015).

Generalizability of our findings may also be impacted by the age of our participants, as the extant literature indicates age-related variability in our study variables. For instance, young and middle-aged persons report worse fibromyalgia symptoms and quality of life, than older individuals (Jiao, Vincent, Cha, Luedtke, & Oh, 2014). On the other hand, older cancer survivors have demonstrated less awareness about the consequences of substance use on their health and are less likely to meet exercise recommendations (Niu et al., 2015).

In our sample, most respondents reported having health insurance, a factor known to play an important role in disease management given the economic burden of chronic illness (Hoffman

& Paradise, 2008; Lacasse, Bourgault, & Choinière, 2016). Loss of health insurance, high premiums, co-payments, and gaps in coverage may all have a deleterious impact on quality of life for cancer survivors (Banegas et al., 2019). Noted as a proxy marker of health insurance, socioeconomic status is robustly linked to the onset of chronic illness, morbidity, and mortality (Oates et al., 2017; Stringhini et al., 2017). Our findings, therefore, may not extend to persons living in poverty, a factor that has been identified as a correlate of health-related quality of life in fibromyalgia (Da Costa et al., 2000) and cancer survivors (Ross, Hall, Fairley, Taylor, & Howard, 2008). Related to disease management, we did not assess healthcare utilization (e.g., frequency of medical appointments) or the sources and content of health-related information. Reliability and accessibility of health information, and perceived importance of provider recommendations, may vary relative to the source of information (e.g., online forums compared to licensed doctors; Daraz, MacDermid, Wilkins, Gibson, & Shaw, 2011; Shea-Budgell, Kostaras, Myhill, & Hagen, 2014). Future research, with additional demographic and disease samples, is needed to verify the consistency of our findings across diverse groups.

Despite the clinical relevance of our study variables and findings, there may be additional unexamined variables that are important to consider. For example, although we focused on health-related self-efficacy, other types of control beliefs may also exert an impact on quality of life in the context of chronic disease, including belief in powerful others (e.g., doctors), chance, fatalism, and internal and external locus of control (Otto et al., 2011). Externally oriented causal attributions and perceptions of control have been linked to future-oriented thinking and adjustment to the disease experience in cancer survivors (Carney & Park, 2017) and fibromyalgia patients (Furness et al., 2018; Giesecke et al., 2003). Yet, uncertainty exists regarding the role of external perceived control in the manifestation of physical and psychosocial adjustment to disease. For instance, in a study of Iranian breast cancer survivors, despite attributing their experiences to the will of God (i.e., external control), they continued to actively engage in medical treatment (Harandy et a., 2009). Similarly, in a qualitative study of Dominican breast cancer patients, attitudes toward disease (e.g., caused by genetics or God) and treatment (e.g., engaging in screening) were simultaneously influenced by perceptions of internal (e.g., *destino*) and external control (e.g., *fatalism*; Flórez et al., 2009). Future research is needed that explores contextual factors and perceptions of control over specific elements of the disease experience, to provide greater clarification about our study variables and their interrelations.

Additionally, in our study, we limited our dependent variables to physically related HRQL measures, though literature illustrates a high rate of psychosocial distress across disease samples (Consoli et al., 2012; Weaver et al., 2012). In future research, alternative types of control beliefs could be explored as predictors or mediators and, as well, psychopathological factors, such as anxiety, depression and stress, should be examined as outcomes given their association to our model constructs (Niedzwiedz, Knifton, Robb, Katikireddi, & Smith, 2019; Norton et al., 2005; Okifuji, Turk, & Sherman, 2000; Schleicher et al., 2005). Assessment of a wider range of temporally oriented predictor variables is also desirable. For instance, though both have demonstrated importance for physical and psychosocial adjustment in chronic illness, optimism is distinguished from hope, which is comprised of the motivational components of agency (e.g., goal-setting ability) and pathways (e.g., problem-solving ability; Bryant & Cvengros, 2004; Rajandram et al., 2011). Understanding the role of time perspective (e.g., via use of the Zimbardo Time Perspective Inventory), including the potentially negative factors of fatalism and hedonism, may also be informative, given the association between time perspective and proactive health behaviors known to influence risk for chronic illness, such as cancer screening, reduced substance misuse and increased exercise (Henson, Carey, Carey, & Maisto, 2006; Roncancio, Ward, & Fernandez, 2014).

Another limitation of our data is our inability to control for the effects of diagnosed medical or mental health comorbidities, and our disease samples may not have been mutually exclusive. Other disease factors that could not be accounted for include time since diagnosis, for both disease groups, and length of cancer survivorship period. For example, health-related quality of life has been shown to improve with the passage of time in persons with remitted cancer (Derogar & Lagergren, 2012) and, for persons with fibromyalgia, significant variability in illness symptom severity exists, including for daily severity ratings and the disease trajectory in its entirety (Adams et al., 2016). Such potential fluctuations could be partially addressed through use of a longitudinal research design and, further, future researchers are encouraged to consider inclusion of measures (e.g., disease comorbidity checklists) to enable covariation of the effects of additional diagnosed medical conditions.

Finally, study limitations may exist due to our use of online survey administration and self-report measures. Although this approach is cost-effective, time efficient, and easily accessible, reliability may be jeopardized due to social desirability in responses, inability to confirm the authenticity of respondents (e.g., demographic characteristics), and minimal opportunity to provide clarification if individuals are confused by the procedure or test items (van de Mortel, 2008; Ward, Clark, Zabriskie, & Morris, 2014). With sufficient resources, a mixed methods research design would be a plausible solution, as use of in-person interviews, focus groups or open-ended response options help to enrich and distinguish quantitative findings from the lived experiences of participants (Shorten & Smith, 2017). Use of objective measures to assess health behaviors and treatment adherence may also help to reduce potential sources of bias, given the frequency of discordance between self-report and objective adherence tracking strategies (Font et al., 2012; Garber, Nau, Erickson, Aikens, & Lawrence, 2004). Thus, to supplement subjective reports, alternative measurement options may include mineral and metabolite levels in blood or urine samples, pill counts, or electronic monitoring systems such as the refill date for prescriptions (Anghel, Farcas, & Oprean, 2019). Objective monitoring of lifestyle changes and physical health, perhaps via built-in smartphone features (e.g., accelerometers) and applications (e.g., FitBit; My Fitness Pal), could be effectively utilized for tracking daily caloric intake, substance use, exercise, or sleep cycles (Han & Lee, 2018; Higgins, 2016; Hoeppner et al., 2017). As well, dietary or physical activity patterns could be assessed using biomarkers including, but not limited to, body mass index, blood pressure, glucose levels, and lipids (Schmidt, Cleland, Thomson, Dwyer, & Venn, 2008).

Despite these limitations, our study represents an important step toward developing an understanding of individual-level cognitive-emotional and behavioral factors that promote better PHRQL for cancer survivors and individuals with fibromyalgia. Although there remains much to explore to clarify the interrelations between future-oriented cognitions, control beliefs, health behaviors, and quality of life, our preliminary findings may help to inform the development of targeted interventions to improve PHRQL in persons with chronic illness.

Clinical Implications

Our findings may have important clinical implications for the promotion of optimism, self-efficacy, health behaviors, and improvement of PHRQL among persons with or recovering from disease. Numerous therapeutic approaches are efficacious for addressing mental and physical wellbeing in vulnerable medical populations, including positive psychology interventions, psychoeducation, structured psychotherapy, and self-management programs.

Positive Psychology Interventions

To begin, positive psychology interventions may represent an important modality for the enhancement of individual-level resiliency traits such as dispositional optimism and self-efficacy. As one example, using the Best Possible Self intervention (i.e., write a life in the future where everything turns out for the best) compared to a typical day control condition (i.e., notice and write about ordinary details in the day), the experimental group reported greater optimism and less pain-related interference for executive task performance (Boselie, Vancleef, Smeets, & Peters, 2014). Similarly, fibromyalgia patients who participated in the Best Possible Self intervention reported significant improvements in self-efficacy post-intervention, and greater optimism at a three-month follow-up (Molinari et al., 2018). For cancer survivors, participation in the framed portrait experience intervention, which involves reviewing meaningful personal pictures and allows creation of an integrated narrative of past, present, and future selves, resulted in improvements in self-efficacy, particularly competence, and self-esteem (Saita & Acquati, 2020).

Other studies have examined the effectiveness of more complex interventions, which use multiple exercises to promote positive psychological characteristics. As an example, in a 14-week group intervention, breast cancer patients learned skills such as emotional communication strategies, mindfulness exercises, and cognitive restructuring and, compared to a waitlist control group, reported higher scores for optimism, self-esteem, and several other indicators of well-being (Cerezo, Ortiz-Tallo, Cardenal, & Torre-Luque, 2014). In an internet-delivered comparative study, chronic pain patients engaged in either cognitive-behavioral therapy or a positive psychology program (e.g., “best possible self” visualization; three good things exercise), and patients in both treatment groups reported improvements in acceptance, flexible goal adjustment, and optimism (Peters et al., 2017).

Overall, such findings indicate that persons with cancer and fibromyalgia can benefit from participation in programs aimed at strengthening resiliency characteristics. There is also evidence of some degree of equivalency between positive psychology interventions and traditional psychotherapy techniques, supporting their usage. In the subsequent sections, we review the suitability of, and empirical support for, traditional treatment modalities to encourage future orientation, personal control, adaptive behavior, and better perceptions of health.

Cognitive and Behavioral Interventions

As previously noted, Cognitive Behavioral Therapy (CBT; Beck, 1995) has been utilized successfully in persons with chronic illness, resulting in significant improvements in individual-level factors known to influence quality of life. For example, improvements in optimism and resilience were observed for pediatric cancer patients who participated in a five-week CBT program (Zhang, Mo, Torres, & Huang, 2019). In a study of breast and colorectal cancer patients, participation in a four-session meaning-making intervention that addressed emotional responses to, and cognitive appraisals of, the illness experience, resulted in greater levels of optimism and self-efficacy (Lee, Cohen, Edgar, Laizner, & Gagnon, 2006).

Other interventions comprised of cognitive and behavioral techniques have demonstrated effectiveness in the promotion of self-efficacy for disease management and improvement of health. For example, in a sample of early stage breast cancer patients, participation in CBT group therapy promoted a reduction in external locus of control across a four-month timespan (Cohen & Fried, 2007). Drawing from the fibromyalgia literature, after ten sessions of CBT, individuals with fibromyalgia or chronic lower back pain experienced significant improvements in self-efficacy, pain severity, and disability, with gains sustained at a one-year follow-up (Wells-Federman, Arnstein, & Caudill-Slosberg, 2003). Consistent with these findings, fibromyalgia patients reported significant improvements in symptom severity and functional capacities after completing an eight-week program characterized by cognitive-behavioral strategies (e.g., psychoeducation about mind-body connection), relaxation/meditation training, and movement therapy (Creamer, Singh, Hochberg, & Berman, 2000).

Physical health-related quality of life may also be enhanced through participation in cognitive and behaviorally oriented treatment programs. As an example, following completion of a blended CBT program (i.e., individual therapy plus internet or phone consultations), breast, prostate, and colorectal cancer survivors reported less fear of cancer recurrence and fewer functional impairments (van de Wal, Thewes, Gielissen, Speckens, & Prins, 2017). In a longitudinal study, eleven years after a ten-week cognitive-behavioral stress management intervention, breast cancer survivors continued to report better quality of life ratings, compared to participants in a psychoeducational control group (Stagl et al., 2015). For persons with chronic pain, participation in a three-week cognitive-behavioral pain management group resulted in reduced psychopathology and improvements in activity level and disability severity (McCracken, MacKichan, & Eccleston, 2007).

Some interventions for improving health and wellbeing have been developed that include proscribed behavioral components. In a study of persons with fibromyalgia, participation in an operant behavioral treatment program (e.g., pain incompatible behavior; time contingent medication use) resulted in reduced pain severity, activity interference, medication consumption, and utilization of the healthcare system (Thieme, Gromnica-Ihle, & Flor, 2003). Similarly, in another study of persons with fibromyalgia, improvements in illness symptoms (e.g., pain;

fatigue) and psychopathology resulted from engagement in an online program involving use of SMARTLogs (e.g., diet; activity) and receipt of feedback on connections between lifestyle entries and symptoms (Collinge, Yarnold, & Soltysik, 2013).

Our review of the literature suggests that, for persons with cancer and cancer survivors, and for persons with pain-related conditions, interventions focused on reframing cognitive processes and altering behavioral patterns appear to exert a beneficial effect on individual-level resiliency traits and health-related quality of life.

Acceptance and Commitment Therapy

A derivative of cognitive-behavioral therapies, Acceptance and Commitment Therapy (ACT) has also been utilized with cancer survivors and fibromyalgia patients, and includes techniques such as cognitive defusion exercises, mindfulness activities, and fostering commitment to engagement in values-oriented behaviors (Harris & Hayes, 2008; Luoma, Hayes, Walser, 2017). Emphasis is placed on promotion of psychological flexibility (McCracken & Vowles, 2014), and a mindful, non-judgmental and accepting attitude toward situations and distress (Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

For persons with chronic illness, the tenets of ACT may encourage adaptive perspectives on the disease experience and self-efficacy for health behavior engagement, with consequent beneficial impact on quality of life. At present, only minimal research exists examining the influence of ACT on time perspective or health behaviors, in the cancer population. As one example, for a sample of patients with breast cancer, completion of eight sessions of ACT group therapy resulted in improvements in resiliency and quality of life, compared to a control group (Sadeghi, Hassani, Emamipour, & Mirzaei, 2018). Similarly, among breast cancer patients undergoing chemotherapy, participation in eight sessions resulted in improved self-efficacy for cancer management behaviors (Daneshvar, Vakilian, Zadeh-Emran, & Zadeh, 2020). Finally, in another sample of breast cancer patients, CBT integrated with mindfulness, a core component of ACT, was associated with significant improvements in pain management self-efficacy and decreased pain severity (Mozafari-Motlagh, Nejat, Tozandehjani, & Samari, 2019).

The benefits of ACT for pain management extend to other disease groups, including individuals with arthritis and other chronic pain conditions. In a sample of fibromyalgia patients, for example, participation in 12 group sessions of ACT resulted in greater cognitive flexibility regarding pain perceptions and improvements in self-efficacy for pain management (Olsson et al., 2012). Even briefer interventions can be effective; for instance, a 4-session group-based form of ACT delivered in primary care, resulted in less disability and greater pain acceptance, with gains maintained at a three-month follow-up (McCracken, Sato, & Taylor, 2013). Of note, ACT has demonstrated equivalency to CBT; for example, in a sample of chronic pain patients, participation in either ACT or CBT resulted in improvements in pain-related interference and psychopathological symptoms, with no significant differences observed across treatment modalities (Wetherell et al., 2011).

Taken together, current evidence suggests that therapeutic strategies such as fostering non-judgmental awareness and acceptance of illness experiences, and promoting values-oriented actions despite unpleasant inner experiences, may contribute to enhanced self-efficacy and better PHRQL among persons with chronic disease. Yet, in addition to structured psychotherapy, there may be other worthwhile interventions designed to enhance health-related knowledge and corresponding engagement in proactive health behaviors.

Self-Management Programs

Beyond use of specific theoretical orientations or treatments, psychoeducation and skills training programs have demonstrated high effectiveness for enhancing optimism and health-related self-efficacy, with potential benefits for health behavior engagement and treatment adherence, and for reducing lingering side effects and risk for recurrence. As an example, in a 12-week web-based tailored psychoeducation program, clinically distressed breast cancer survivors reported increased optimism and perceptions of control over their future (Admiraal et al., 2017). For breast and prostate cancer survivors, a ten-month mailed psychoeducational intervention (e.g., health information, goal setting and progress) contributed to significant improvements in self-efficacy for fat restriction and greater consumption of fresh produce (Mosher et al., 2008). Finally, as yet another example, after completion of a year-long supervised exercise program, individuals who reported high levels of self-efficacy were more likely to be active six months later (Loprinzi, Cardinal, Si, Bennett, & Winters-Stone, 2012).

Similar strategies, often with exercise as a focal component, have been applied to persons with fibromyalgia and related conditions, with high levels of success. After completing the eight-week People with Arthritis Can Exercise (PACE) program, participants reported significant improvements in self-efficacy for arthritis management and functional abilities (e.g., chair stands), with gains maintained at a six-month follow-up (Callahan et al., 2008). Positive results were also found for fibromyalgia patients, after supervised participation in a twelve-week group tai chi program, including greater self-efficacy for pain control, enhanced balance and functional mobility, and lower severity of disease impact (Jones et al., 2012). As another example, after completing the eight-week Lifestyle Counts intervention program, which emphasized sleep, exercise, healthy eating, and stress management, persons with fibromyalgia reported improvements in self-efficacy, health behavior engagement and quality of life, and reductions in perceived severity of disease (Stuifbergen et al., 2010). Finally, among persons with early rheumatoid arthritis, use of electronic patient-reported outcome measures (ePROM) was associated with greater adherence to antirheumatic therapy and a trend toward less disease activity, including reduced tenderness and functional impairment (El Miedany et al., 2016), suggesting that digital self-monitoring may be a low-cost alternative to therapy for promoting adherence and quality of life.

In conclusion, to improve PHRQL among persons living with fibromyalgia or remitted cancer, numerous interventions may be useful in fostering optimism and health efficacy, with consequent facilitation of engagement in proactive health behaviors. Individuals living with a past or current chronic illness may benefit from engagement in strengths-based therapeutic activities, including experiential or writing exercises, cognitive restructuring techniques, and shifts to behavioral coping patterns. Such efforts may facilitate adaptive views of the future, positive self-perceptions and healthy lifestyle changes. With appropriate psychoeducation, skills training, and support from healthcare professionals, persons with remitted cancer or fibromyalgia may be better equipped for the self-management of health and may experience improved health-related quality of life across the illness trajectory.

Conclusion

Across our samples of 164 cancer survivors and 508 individuals with fibromyalgia, we found a direct association between optimism and PHRQL, and evidence for the serial mediating effects of health-related self-efficacy and health behaviors for this association. Additionally, in our sample of persons with fibromyalgia, we found specific indirect effects linking optimism to PHRQL via both health-related self-efficacy and treatment adherence.

By examining similar cognitive, emotional, and behavioral factors across disease samples, we illustrated the robust nature of resiliency traits in persons coping with an active chronic disease and in those recovering from a previous medical illness. Yet, our differential findings across samples also suggest that unique disease and recovery experiences may influence the interrelations between our study variables. Future longitudinal research, with diverse demographic and disease samples, and using objective and multi-method assessment, is needed to address limitations and substantiate our findings. In sum, our study advances understanding of potential mechanisms of action linking optimism and PHRQL in vulnerable medical populations and can inform the development of tailored clinical interventions to improve quality of life in persons with active and remitted disease.

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VITA

MORGAN KATE TREASTER

Education:	Ph.D. Psychology, Concentration in Clinical Psychology, East Tennessee State University, Johnson City, TN, 2021 M.A. Psychology, Concentration in Clinical Psychology, East Tennessee State University, Johnson City, TN, 2018 B.A. Psychology, Susquehanna University, Selinsgrove, PA, 2016 High School Diploma, East Juniata High School, McAlisterville, PA, 2012
Professional Experience:	2020. Peer Supervisor. ETSU Behavioral Health and Wellness Clinic. Johnson City, TN. 2019-2020. Behavioral Health Consultant. ETSU Pediatrics. Externship. Johnson City, TN. 2018-2019. Behavioral Health Consultant. ETSU Family Medicine Associates. Externship. Johnson City, TN. 2018-2019. Clinician. ETSU Behavioral Health and Wellness Clinic. Practicum. Johnson City, TN. 2016-2018. Graduate/Research Assistant. East Tennessee State University, Department of Psychology, Johnson City, TN.
Publications:	Hirsch, J.K., Treaster, M.K., Kaniuka, A.R., Brooks, B.D., Sirois, F.M., Kohls, N., Nöfer, E., Touissant, L.L., & Offenbächer, M. (2019). Fibromyalgia impact and depressive symptoms: Perception of silver lining as a moderator. *Scandinavian Journal of Psychology.*
Honors and Awards:	Graduate Student Board of Psychology, Senior Representative for Clinical Psychology Concentration (2019-2020) Article in *Illuminated Magazine* for Graduate Research at ETSU (2019) ETSU Department of Psychology Research Travel Award (2019; 2017) American Psychological Association – Division 38 (Health Psychology) Research Award (2017)
Professional Affiliations:	Society for a Science of Clinical Psychology (2019) American Psychological Association (2018) Honor Society of Phi Kappa Phi – ETSU Chapter (2017-2018) Association for Psychological Science (2016)