



Resilience and Coping in Cancer Survivors: The Unique Effects of Optimism and Mastery

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Published online: 1 November 2018
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Abstract

Optimism and mastery are two cognitive traits that involve positive expectations for the future and that have been demonstrated to be important predictors of reduced anxiety as well as superior coping and physical health in many populations, including cancer survivors. There is limited research, however, examining the unique effects of these traits when examined simultaneously. The present cross-sectional study used structural equation modeling to examine the unique effects of optimism and mastery on emotion, coping, and health in 603 adult cancer survivors, and whether results were consistent in men and women. Results indicated that both optimism and mastery were associated with improved emotion, coping, and health and together accounted for a small to moderate amount of variance. Although the effects of optimism were generally greater, mastery also uniquely predicted most dependent variables and there was some evidence that gender influenced these effects, with optimism predicting health control more so in women and mastery predicting health control more so in men. These results demonstrate that it is important to examine both generalized positive expectancies such as optimism and positive expectancies regarding mastery when investigating resilience and emotional well-being in cancer survivors.

Keywords Optimism · Mastery · Cancer · Coping · Anxiety · Resilience

Cancer affects more than 14 million people a year, making it one of the leading causes of morbidity and the second biggest cause of mortality worldwide (Ferlay et al. 2015). New treatments such as immunotherapy and improvements in early detection have led to increased survival rates, but have not alleviated the tremendous cost burden, with a worldwide annual estimate of \$1.16 trillion USD (Montani et al. 2015; Pardoll 2012; Steward and Wild 2014). Cancer diagnoses can lead to heterogeneous outcomes, but are often accompanied by prolonged illness. Although some benefit from post-traumatic growth, many individuals experience negative psychosocial outcomes such as poorer emotional health, anxiety, and maladaptive health behaviors (Andrykowski et al. 2008; Lelorain et al. 2010).

Anxiety and Depression in Cancer Survivors

Many studies have found a higher prevalence of mental illness in cancer patients. A meta-analysis of studies that used structured clinical interviews found the prevalence of mental health disorders in acute care cancer patients to be 31% (Singer et al. 2009), which is higher than the prevalence of mental health disorders in the general population of US (26.2%), the UK (16%), or Germany (20%; Jenkins et al. 2003). Not surprisingly, given the chronic stress that often accompanies a diagnosis of cancer, many studies have also documented a high prevalence of anxiety disorders in cancer patients (Stark and House 2000). For example, a 6-year study found that 19.0% of cancer patients in Canada had clinical levels of anxiety (Linden et al. 2012), which is higher than the prevalence of 10.4% reported in European and Anglo countries from a recent meta-analysis (Baxter et al. 2013). Cancer may also lead to symptoms of post-traumatic stress disorder (PTSD), with estimates from a meta-analysis of PTSD after cancer diagnosis indicating an odds ratio of 1.66 as compared with the general population (Swartzman et al. 2017). Depression is also a common issue in cancer survivors. A systematic review of major depressive

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disorder in cancer patients found a prevalence of up to 16% in outpatients, up to 14% in inpatients and up to 49% in palliative care (Walker et al. 2012).

The negative consequences of cancer due to both physical and mental illness can be reduced by certain health-promoting resilience factors. Proposed resilience factors in cancer patients cluster around the categories of positive personality traits, and social support (Friborg et al. 2005). The former includes coping skills and cognitive traits that represent positive expectations of the future. Fortunately, recent developments in cancer treatment options have led to increases in survivorship rates across many forms of cancer. The identification of factors that promote resilience and quality of life in cancer survivors has therefore become increasingly important. The present study examines the unique effects of optimism and mastery, two cognitive traits that have been found to promote resilience and well-being in many populations, including in cancer survivors (Steward and Yuen 2011).

Optimism and Mastery as Resilience Factors

Optimism and mastery are both cognitive traits that involve positive expectancies for the future. However, these traits are conceptually and empirically distinct and, in theory, should uniquely contribute to resilience (Scheier et al. 1994). Optimism is defined as the dispositional tendency to expect more positive outcomes in the future than negative outcomes (Scheier and Carver 1992). Decades of research have demonstrated that higher levels of optimism are associated with positive outcomes in many domains, including physical health (Carver et al. 2010; Rasmussen et al. 2017). In contrast to optimism, which focuses on more globalized, generalized positive expectancies, mastery emphasizes perceived control over outcomes (Pearlin and Schooler 1978), and is therefore more similar to other forms of positive expectancies such as self-efficacy (Bandura 1977) and hope (Snyder 2002) that emphasize the role of personal agency. Both optimism and mastery are conceptualized as protective factors that promote emotional well-being, lower levels of anxiety, higher levels of adaptive health behaviors and improved physical health outcomes (Hart et al. 2008; Spencer and Patrick 2009). There is extensive research demonstrating that these positive expectancies do, in fact, promote positive outcomes across many contexts, including in cancer survivors, although more studies have investigated the effects of optimism than the effects of mastery (Carver et al. 2010). A limiting factor in much of this research, however, is that the potential benefits of optimism and mastery are often examined in isolation, so there is less evidence regarding the unique effects of optimism and mastery when both are examined simultaneously as predictors of resilience or coping. Broadly speaking, optimism is distinct from mastery

in its emphasis on an individual's expectation of positive outcomes, regardless of his or her agency in promoting those outcomes. Since optimism is more generalized than mastery, distinguishing its unique contribution to positive coping and health outcomes will help clinician's determine whether more general positive expectancy characteristics are more impactful than positive expectancy characteristics specific to the individual's perceived control over their circumstances.

Optimism and Mastery Promote Coping

A major pathway by which both optimism and mastery are hypothesized to promote resilience in general and specifically in cancer survivors is the influence of these positive expectancy traits on coping strategies and behaviors. Although many models of coping have been proposed, one common distinction that is widely supported is between emotion-focused coping and problem-focused coping. Problem-focused coping involves efforts to change or regulate the stressful situation, while emotion-focused coping involves managing the emotional response one may have towards the situation (see Penley et al. 2002). Although both forms of coping may be adaptive in certain contexts, emotion-focused coping is often viewed as more maladaptive, and possibly less effective, than problem-focused coping due to its inclusion of avoidance behaviors (Coyne and Racioppo 2000; Stanton and Franz 1999). Given that cancer diagnoses and treatment often represent a chronic stressor that can persist for years and the evidence that treatment success in cancer is linked with the ability to cope with the stress and burden caused by the illness and treatment (Chida et al. 2008), it is important to examine the impact of psychological resources on coping behaviors.

Consistent with the theoretical models, both optimism and mastery have been linked to the use of more adaptive coping strategies. For example, optimism has a strong positive association with adaptive coping styles such as problem-focused coping strategies, acceptance, and positive reassessment (Prati and Pietrantonio 2009), and individuals reporting high levels of optimism consistently choose these adaptive coping styles over time (Billingsley et al. 1993). One meta-analysis found that optimism had a weak to moderate positive association with adaptive approach coping ($r = .17$) and a moderate negative association ($r = -.21$) with emotion-focused avoidance coping (e.g., denial, distancing, social withdrawal; Nes and Segerstrom 2006). The inverse relationship with emotion-focused avoidance coping may indicate that optimism protects against maladaptive forms of emotion-focused coping that have been associated with negative outcomes (Hagger et al. 2017). Mastery may also facilitate adaptive coping strategies, particularly problem-focused coping, by encouraging internal attribution (Ross and Mirowsky 2013).

The positive influence of optimism and mastery and coping has also been demonstrated in cancer patients. Higher levels of optimism were associated with less avoidant coping strategies in a sample of individuals with advanced-stage cancer diagnoses (Sumpio et al. 2017), and optimism was found to indirectly influence greater quality of life and lower overall distress in cancer patients via adaptive coping strategies (Carver et al. 1993; Friedman et al. 2006). Similarly, in a group of Chinese cancer survivors, higher mastery was positively associated with more active problem solving and reappraisal coping (Tang et al. 2010). However, there is less research examining how optimism and mastery uniquely predict emotion-focused and problem-focused coping in cancer survivors.

Optimism and Mastery Promote Emotional Health

Mastery and optimism are also thought to be important factors in promoting positive emotions and in providing resilience to negative emotions and emotional disorders such as anxiety disorders. Higher levels of optimism and mastery can promote resilience against the experience of anxiety by influencing how individuals respond to uncertainty and threat (Bandura 1988; Schwarzer 2014). The individual's response to uncertainty and threat is considered crucial factor in determining anxiety (Barlow 2002) and may be particularly relevant in coping with cancer given the uncertainty often involved with prognoses following cancer diagnoses and treatment. The benefits of optimism and mastery in reducing negative affect and anxiety may be reinforced by the impact of promoting positive emotions given evidence that positive emotions lead to an upward spiral that contributes to the individual's ability to cope with future adversity (Garland et al. 2010), and positive emotions may undo the effects of negative emotions (Fredrickson and Branigan 2005). Consistent with this, optimism has been repeatedly demonstrated to be associated with higher positive and lower negative emotions, even when controlling for other personality factors such as the big five and hope (Ciarrocchi and Deneke 2005; Gallagher and Lopez 2009). A recent meta-analysis found a significant moderate to strong negative association between optimism and anxiety (Alarcon et al. 2013). Mastery also has been shown to be an important predictor of emotional well-being. Higher levels of mastery are associated with reduced depressive symptoms and lower levels of anxiety symptoms across time (Gallagher et al. 2011; Raeifar et al. 2017).

Optimism and mastery also appear to be important predictors of emotional outcomes such as anxiety in cancer populations. Among cancer patients, higher optimism is significantly related to lower levels of anxiety (Allison et al. 2003; Wang et al. 2016; Zenger et al. 2010). While less research has been conducted regarding the relationship between

mastery and anxiety in cancer patients, there is some evidence that mastery predicts lower levels of cancer-related anxiety (Vodermaier et al. 2010). There is also evidence that self-efficacy, a construct closely related to mastery, is a protective factor against anxiety in cancer survivors (Ziner et al. 2012).

Optimism and Mastery Promote Physical Health

Optimism and mastery are also conceptualized to promote physical health both indirectly by promoting emotional well-being and adaptive coping as discussed, but also via directly influencing perceptions of health and perceived control over health. Meta-analytic reviews have demonstrated the robust evidence that positive expectancies are positive correlated with improved health outcomes (Rasmussen et al. 2009). Higher levels of mastery are also generally associated with a more positive perception of health status in samples with chronic illness (e.g., multiple sclerosis patients; Krokavcova et al. 2008). One reason for this may be that patients with a greater perceived control over treatment experience greater satisfaction, adherence to treatment, and positive treatment outcomes (Tennstedt 2000).

Optimism and mastery also predict a variety of improved health outcomes when specifically examining cancer survivors. Dispositional optimism is associated with lower perceived cancer risk (McGregor et al. 2004), better quality of life (Applebaum et al. 2014), and a higher likelihood of survival status 1 year post cancer diagnosis (Allison et al. 2003). The positive association between optimism and health outcomes in cancer populations has also been supported in meta-analytic reviews (Rasmussen et al. 2009). Similarly, self-efficacy is associated with lower perceived cancer recurrence in breast cancer survivors (Ziner et al. 2012), and cancer patients who believed they could control their cancer experienced lower distress (Barez et al. 2009; Taylor et al. 1984), and perceived control predicts behaviors that are protective of cancer risk (McCaul et al. 1993). As with other outcomes discussed, the majority of this past work has examined the benefits of these cognitive resilience traits in isolation.

The Present Study

Although there is promising evidence that both of these cognitive factors generally influence anxiety and physical health and are also relevant in cancer survivors, there are some important limitations of existing work. Much of the research examining these cognitive processes has examined them in isolation. In addition, more research has been conducted regarding the effects of optimism on well-being, particularly in cancer patients (Allison et al. 2003; Applebaum et al. 2014; Krokavcova et al. 2008) than the effects of mastery.

We therefore have promising evidence that mastery and optimism are important sources of resilience when examined in isolation, but there is less clarity regarding their unique effects on anxiety, coping, and perceived health in cancer survivors when examined together. Additionally, given that gender influences the prevalence of different cancer types, levels of anxiety both in general (McLean et al. 2011) and in cancer survivors (Bhattacharjee and Banerjee 2016; Zajac et al. 2006), and coping strategies (Tamres et al. 2002) that may influence emotional and physical health in cancer survivors, it is important to understand the extent to which any resiliency conferred by mastery and optimism is consistent across genders.

The present study therefore examined the unique effects of optimism and mastery on emotional, coping, and physical health in cancer survivors. In doing so, we hoped to demonstrate that optimism and mastery are conceptually and empirically distinct forms of positive thinking that may uniquely contribute to lower levels of anxiety and higher levels of emotional well-being and may therefore be important potential targets of promoting resilience in cancer survivors. More specifically, we expected that greater levels of optimism and mastery would be associated with lower levels of anxiety, higher levels of more adaptive coping styles, better perceived health, and greater levels of PA along with lower levels of NA, and that both optimism and mastery would uniquely contribute to each dependent variable examined. Additionally, we expected that the benefits of optimism and mastery would be largely consistent across gender.

Methods

Procedures

Data from the 3rd wave of the Midlife in the U.S. National Study of Health and Well-being (MIDUS) project was utilized for the study. A nationally representative sample of the United States was originally recruited via random digit dialing for the first wave of the MIDUS project. Participants completed a telephone interview followed by a battery of self-report questionnaires that were received by mail across the 3 longitudinal waves of the MIDUS project (1995–1996 for wave 1, 2004–2006 for wave 2, and 2013–2015 for wave 3). Participants could receive a total of \$62 at wave 3 after completing both the initial phone interview and self-report questionnaires.

Participants

The current study included 603 adults that indicated that they had been diagnosed with cancer (i.e. answered “yes” to the question “Have you ever had cancer”) when completing

the third wave of the MIDUS project. Participant ages ranged from 43 to 92 ($M = 69.21$; $SD = 10.57$), and 45.4% of the sample identified as male. In terms of ethnicity, 4.3% of the sample identified as Hispanic/Latinx. In terms of racial background, the sample was 91.4% White, 2.3% Black/African American, 0.5% Native American/Alaska Native, 1% Native Hawaiian/Pacific Islander, and 5.1% Other. The most common forms of cancer included skin cancer ($n = 247$, 48.6% Male), breast cancer ($n = 121$, 0.9% Male), and prostate cancer ($n = 83$, 100% Male).

Measures

Optimism was measured using the Life-Orientation Test-Revised (Scheier et al. 1994). The LOT-R is based on a unidimensional theory of dispositional optimism, and includes two 3-item subscales measuring optimism, or positive generalized outcome expectancies (e.g., “In uncertain times, usually expect best”) and pessimism, or negative generalized outcome expectancies (e.g., “I Hardly ever expect things to go my way”). Participants respond using a 5-point Likert scale, and items were coded so that higher scores represent greater levels of optimism (e.g., pessimism items were reverse coded). The internal consistency was $\alpha = 0.81$ for the full LOT-R, $\alpha = 0.70$ for the optimism subscale, and $\alpha = 0.80$ for the pessimism subscale. The optimism and pessimism subscale showed a strong inverse association ($r = -.48$).

Mastery was measured using items from Pearlin and Schooler’s (1978) Mastery Scale (e.g. “Whether or not I am able to get what I want is in my own hands,” “I can do just about anything I really set my mind to”) in addition to items developed in the context of the study (Lachman and Weaver 1998). Participants responded to the four items using a 7-point Likert scale, and items were coded so that greater scores were associated with higher levels of mastery. The Pearlin mastery scale is a widely used measure that has demonstrated sufficient construct validity (Korkeila et al. 2007; Mausbach et al. 2007; Pearlin et al. 1981; Stephens et al. 1999), and the mastery items included in the present study have been utilized in previous research (Ettner and Gryzywacz 2001; Soederberg Miller and Lackman 2000; Prenda and Lachman 2001). The internal consistency of the mastery scale was $\alpha = 0.72$ in the current study.

Physical health dependent variables included a single item to assess self-rated global health as well three items that were used to specific a latent variable of perceived control over health. Perceived health was measured with the following item, “Using a scale from 0 to 10 where 0 means ‘the worst possible health’ and 10 means ‘the best possible health,’ how would you rate your health these days?” Perceived control over health was measured using three items developed within the context of the study: “Keeping healthy depends on things that I can do,” “There

are certain things that I can do for myself to reduce the risk of getting cancer,” and “I work hard at trying to stay healthy.” Participants responded to items using a 7-point Likert scale, with higher scores associated with greater perceived control over health. The internal consistency of items measuring perceived control over health was $\alpha = 0.70$.

Emotional health dependent variables included positive and negative affect as well as symptoms of generalized anxiety disorder. Positive and Negative affect were measured using 12 items from the Negative and Positive Affect Scale (NAPAS; Mroczek 2004; Mroczek and Kolarz 1998), which was created in the context of the MIDUS study and was based off of commonly used instruments assessing affect (Crawford and Henry 2004; Watson et al. 1988). Frequency of experiencing different forms of positive and negative affect during the previous 30 days was recorded using a 5-point Likert scale. Items were coded so that high scores represented a greater frequency of positive or negative affect. Internal consistencies were 0.90 for positive affect items and 0.83 for negative affect items.

Generalized Anxiety Disorder was assessed using 10 items based off of criteria from the revised third edition of the Diagnostic and Statistical Manual (DSM-III-R; American Psychiatric Association 1987) and was operationalized in screening versions of the World Health Organization’s “Composite International Diagnostic Interview,” version 10 (CIDI; WHO 1990; Kessler et al. 1998). CIDI diagnoses have demonstrated validity and test–retest reliability (Blazer et al. 1994; Wittchen 1994). Generalized anxiety disorder symptoms were assessed when participants answered that they worried “a lot more” than most people, that they either worried “just about every day” or “most days,” and that they worried about either “more than one thing” or have different worries “at the same time.” Participants responded to the 10 items on a 4-point Likert scale, with higher scores associated with greater generalized anxiety. The internal consistency of the 10 GAD items was 0.73.

Coping was measured using items from the COPE Inventory (Carver et al. 1989). Problem-focused coping was assessed using three subscales: Positive Reappraisal ($\alpha = 0.77$), Active coping ($\alpha = 0.73$), and Planning ($\alpha = 0.81$), each included 4 items. Problem-focused coping was assessed using three subscales: Focus on and Venting Emotions ($\alpha = 0.82$), Denial ($\alpha = 0.71$), and Behavioral Disengagement ($\alpha = 0.69$), which also included 4 items each. Items for each subscale were rated using a 4-point Likert scale, and responses were coded so that higher scores were associated with greater usage of a particular coping style. The mean of item responses for each associated subscale was calculated in order to assess problem- and emotion-focused coping.

Analytic Plan

Descriptive statistics were calculated using IBM SPSS version 24.0 and Mplus version 7.4 (Muthén and Muthén 2016). Means and standard deviations of study variables were calculated for the total sample as well as by gender. Correlations were also calculated to characterize the relationships between latent variables included in the study (i.e. optimism, mastery, emotion-focused coping, problem-focused coping, NA, and PA) as well as mental and physical health.

Study hypotheses were tested with structural equation modeling in Mplus version 7.4 (Muthén and Muthén 2016). Confirmatory factor analysis (CFA) was used to examine the measurement models of each latent construct and to identify latent correlations among all constructs. The latent construct of optimism was modeled using three parcels (Little et al. 2002) that each consisted one item from the optimism subscale and one reverse coded item from the pessimism subscale. Positive affect and negative affect were each modeled using three parcels consisting of the means of pairs of scale items. GAD was similarly modeled using 5 parcels. The latent construct of mastery was identified by specifying the four individual items as indicators. Model fit was deemed acceptable if Root Mean Square Error (RMSEA) < 0.06 , and both the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) > 0.90 . Afterwards, the structural models were used to examine the unique effects of optimism and mastery on health, coping strategies, and emotion latent variables. First, the direct effects of both optimism and mastery on perceived health, perceived control over health, positive affect, negative affect, GAD symptoms, problem-focused coping, and emotion-focused coping was examined (Fig. 1). The same SEM analysis was then examined separately in the male and female subsamples to examine whether the effects of optimism and mastery are consistent across gender. In all models, all constructs other than the global health rating were specified as latent variables and results were interpreted based on the completely standardized effects as well as the 95% confidence intervals of those effects. Missing data was handled using robust maximum likelihood estimation.

Results

Latent Associations

The associations between optimism, mastery, and all dependent variables were examined first using CFA. The model fit for the CFA in the full sample demonstrated acceptable to good fit ($\chi^2 (df = 315) = 606.99, p > .05, RMSEA = 0.04, TLI = 0.94, CFI = 0.93$) and the latent correlations from this CFA are reported in Table 1. As expected, optimism and mastery demonstrated a large, positive association with

Fig. 1 Structural equation model of optimism and mastery predicting coping, emotional health, and physical health. Note: Latent variables are represented as ovals and manifest variables are represented as rectangles

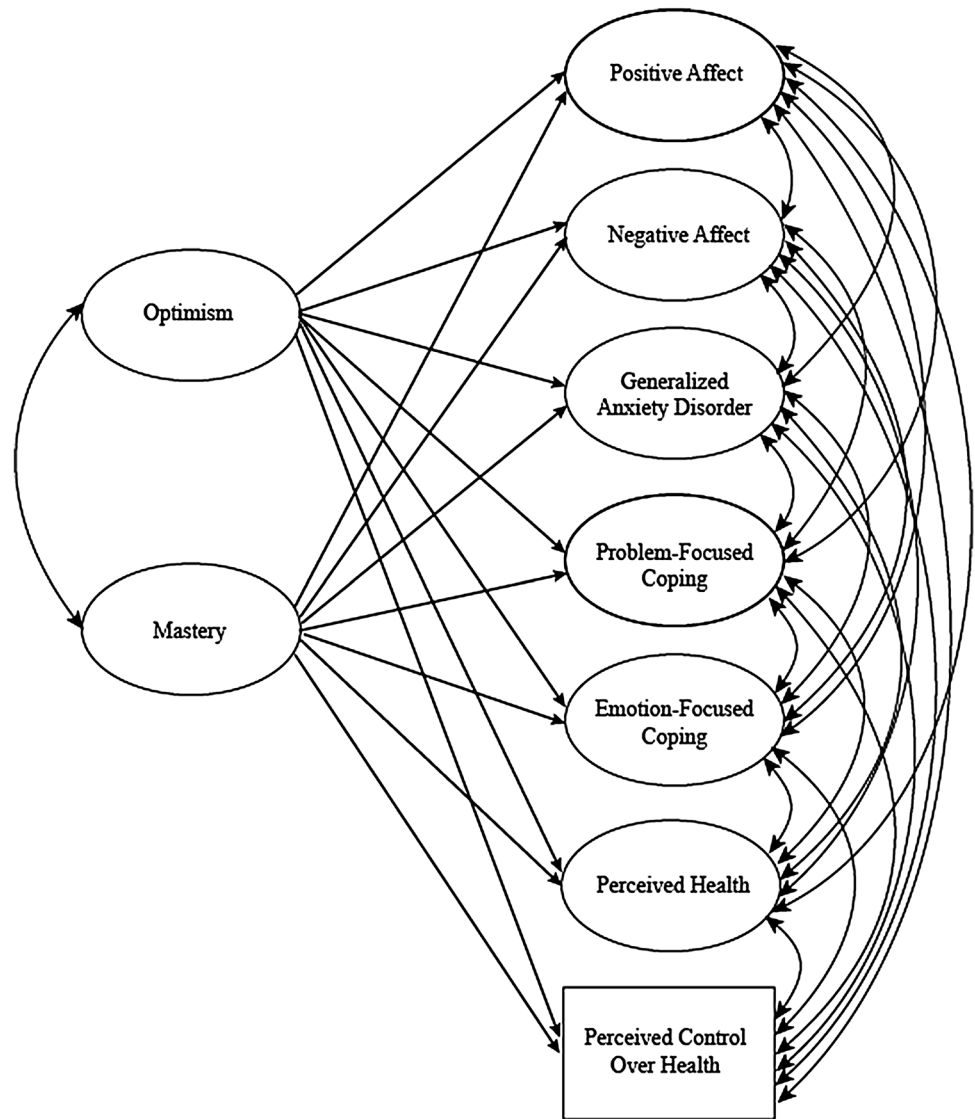


Table 1 Latent correlations between optimism, mastery, coping, emotional health, and physical health in CFA model in full sample ($n=603$)

	Optimism	Mastery	Emotional coping	Problem coping	Positive affect	Negative affect	GAD	Health control	Health rating
Optimism	1								
Mastery	0.51*	1							
Emotional coping	-0.47*	-0.32*	1						
Problem coping	0.43*	0.43*	-0.28*	1					
Positive affect	0.51*	0.35*	-0.22*	0.27*	1				
Negative affect	-0.52*	-0.24*	0.42*	-0.16*	-0.64*	1			
GAD	-0.21	0.04	0.01	-0.13	-0.02	0.07	1		
Health control	0.33*	0.38*	-0.13	0.31*	0.30*	-0.21*	-0.18	1	
Health rating	0.29*	0.28*	-0.20*	0.09	0.32*	-0.41*	-0.10	0.47*	1

* $p < .01$

one another and both optimism and mastery demonstrated moderate to large latent correlations with emotion focused coping and problem focused coping in the hypothesized directions. For the emotional latent constructs, optimism appeared to generally have a stronger relationship with positive affect, negative affect, and GAD symptoms than mastery, although mastery was statistically significantly correlated with both positive and negative affect as well in the hypothesized directions. Finally, both optimism and mastery demonstrated moderate positive latent correlations ($r_s > .28$) with both the latent variable of health control and the manifest global rating of perceived health.

Unique Effects of Optimism and Mastery

We next examined the unique effects of optimism and mastery on emotion, coping, and health using SEM (see Fig. 1). The model fit for the SEM in the full sample demonstrated acceptable to good fit ($\chi^2 (df = 315) = 606.99, p > .05, RMSEA = 0.04, TLI = 0.94, CFI = 0.93$) and the completely standardized beta coefficients (with 95% CI) and R^2 for each latent construct from this SEM are reported in Table 2. As expected, both optimism and mastery were associated with higher levels of perceived health and the latent variable of health control. The magnitude of the effects of optimism and mastery were similar for perceived health and slighter higher for mastery than optimism for health control, although the effects were not statistically significantly different based on the confidence intervals. Combined, optimism and mastery predicted a small to moderate amount of variance in perceived health ($R^2 = .11$) and health control ($R^2 = .17$). These results suggest that both optimism and mastery are relevant

and uniquely contribute to the prediction of health in cancer survivors.

Findings were more mixed when examining the unique effects of optimism and mastery on problem focused and emotion focused coping. Both optimism and mastery predicted higher levels of problem focused coping as expected, and the magnitude of the completely standardized effects of optimism and mastery on problem focused coping were almost identical. In contrast, only optimism was found to be a statistically significant predictor of lower levels of emotion focused coping and the magnitude of the optimism effect was greater than mastery based on the confidence intervals of the beta coefficients. Combined, optimism and mastery predicted a small to moderate amount of variance in problem focused coping ($R^2 = .25$) and emotion focused coping ($R^2 = .23$). These results suggest that both optimism and mastery are relevant and uniquely contribute to problem focused coping, but that optimism is a better predictor of emotion focused coping.

Findings were also more mixed when examining the unique effects of optimism and mastery on emotional latent constructs of positive affect, negative affect, and GAD symptoms. Optimism, but not mastery, was found to be a statistically significant predictor of higher levels of positive affect and lower levels of negative affect and GAD symptoms. The magnitude of the optimism effects was also greater than mastery based on the confidence intervals of the beta coefficients for all three emotional latent constructs. Combined, optimism and mastery predicted a small to moderate amount of variance in positive affect ($R^2 = .27$) and negative affect ($R^2 = .27$), but just a small amount of variance in GAD symptoms ($R^2 = 0.07$). These results suggest that optimism is a better predictor than mastery of both anxiety disorder

Table 2 Unique effects of optimism and mastery on coping, emotional, and health in SEM analyses for overall sample, women, and men

Dependent variable	Full sample ($n = 603$)			Women ($n = 329$)			Men ($n = 274$)		
	Opt B (95% CI)	Mast B (95% CI)	R^2	Opt B (95% CI)	Mast B (95% CI)	R^2	Opt B (95% CI)	Mast B (95% CI)	R^2
Problem coping	0.28 (0.17, 0.39)	0.29 (0.17, 0.42)	0.25	0.34 (0.19, 0.50)	0.28 (0.12, 0.45)	0.30	0.20 (0.04, 0.36)	0.32 (0.13, 0.52)	0.21
Emotion coping	-0.42 (-0.59, -0.25)	-0.11 (-0.27, 0.05)	0.23	-0.43 (-0.70, -0.17)	-0.04 (-0.27, 0.18)	0.21	-0.43 (-0.67, -0.19)	-0.15 (-0.40, 0.11)	0.27
Positive affect	0.46 (0.35, 0.56)	0.12 (-0.00, 0.23)	0.27	0.43 (0.30, 0.57)	0.23 (0.08, 0.38)	0.34	0.48 (0.32, 0.64)	-0.01 (-0.19, 0.17)	0.23
Negative affect	-0.53 (-0.64, -0.43)	0.03 (-0.09, 0.14)	0.27	-0.54 (-0.68, -0.40)	-0.01 (-0.17, 0.15)	0.30	-0.50 (-0.66, -0.34)	0.06 (-0.12, 0.24)	0.22
GAD	-0.31 (-0.57, -0.05)	0.20 (-0.09, 0.48)	0.07	-0.37 (-0.68, -0.06)	0.19 (-0.17, 0.54)	0.10	-0.22 (-0.71, 0.27)	0.43 (-0.15, 1.00)	0.14
Health rating	0.20 (0.09, 0.32)	0.18 (0.05, 0.30)	0.11	0.22 (0.07, 0.38)	0.16 (-0.00, 0.32)	0.11	0.16 (-0.01, 0.32)	0.21 (0.00, 0.42)	0.10
Health control	0.19 (0.03, 0.34)	0.29 (0.10, 0.48)	0.17	0.40 (0.21, 0.59)	0.22 (-0.05, 0.48)	0.30	-0.09 (-0.29, 0.12)	0.42 (0.17, 0.67)	0.15

Results represent completely standardized beta coefficients from SEM analyses. Effects in bold are statistically significant at $p < .05$

symptoms and of more global emotional constructs of positive and negative affect, but that the impact of optimism may be greater for more global emotional health variables.

Influence of Gender

We next examined differences in positive thinking by gender and whether the benefits of optimism and mastery varied by gender. Comparisons of mean levels by gender revealed that men had higher levels of optimism ($d=0.05$; 95% CI $-0.11, 0.21$) and mastery ($d=0.09$; 95% CI $-0.07, 0.25$) than women, although the magnitude of the effect size differences was very small and not statistically significant. CFA models were then specified to examine the latent correlations among latent constructs within each gender. The model fit for the CFAs both the male ($\chi^2(df=315)=506.00$, $p>.05$, RMSEA = 0.05, TLI = 0.91, CFI = 0.90) and female ($\chi^2(df=315)=488.67$, $p>.05$, RMSEA = 0.04, TLI = 0.94, CFI = 0.93) subsamples demonstrated acceptable to good fit. The latent correlations from the CFAs in males/females are reported in Table 3. The pattern of associations was largely consistent across genders in terms of directionality of associations, although the magnitude of latent correlations for both optimism and mastery with dependent variables was often larger in women than men.

Finally, we examined the unique effects of optimism and mastery on emotion, coping, and health using SEM within men and women. Results were largely consistent in both genders when examining perceived health as the dependent variable, but varied significantly for men and women when examining the prediction of the health control latent variable. Only optimism was a statistically significant positive predictor of health control for women, whereas only mastery was a statistically significant positive predictor of

health control for men, and the amount of variance explained by the two positive thinking factors was doubled in women ($R^2=.30$) vs men ($R^2=.15$). For coping, both optimism and mastery were both moderate positive predictors of higher levels of problem focused coping in both men and women, but only optimism was a statistically significant predictor of lower levels of emotion focused coping in both men and women. There were also gender differences when examining the prediction of emotional health. Optimism was again the more consistent predictor and predicted higher levels of positive affect and lower levels of negative affect in both men and women. Mastery was only a statistically significant predictor of higher levels of positive affect in women and appeared unrelated to negative affect in women or positive or negative affect in men. The amount of variance in positive and negative affect predicted by optimism and mastery was roughly 10% higher in women than men. Finally, the only statistically significant relationship with GAD symptoms was optimism as a negative predictor of GAD in women.

Discussion

Optimism, Mastery and Physical Health

The present study examined the unique effects of optimism and mastery on coping, emotional health, and physical health in cancer survivors. Optimism and mastery both uniquely contributed to greater control over health and, to a slightly lesser degree, perceived physical health in the full sample. However, for male cancer survivors, only mastery was associated with greater perceived control over physical health, demonstrating a moderate effect size. Conversely, optimism predicted a greater amount of perceived control

Table 3 Latent correlations between optimism, mastery and emotion, coping, and health latent constructs in CFA model in women ($n=329$) and men ($n=274$) subsamples

	Optimism	Mastery	Emotional coping	Problem coping	Positive affect	Negative affect	GAD	Health control	Health rating
Optimism	1	0.50*	-0.51*	0.36*	0.48*	-0.47*	-0.01	0.13	0.26*
Mastery	0.51*	1	-0.37*	0.42*	0.23*	-0.19	0.32	0.38*	0.29*
Emotional coping	-0.46*	-0.27*	1	-0.19	-0.22	0.41*	-0.23	-0.01	-0.18
Problem coping	0.49*	0.46*	-0.36*	1	0.23*	-0.05	0.01	0.26*	0.06
Positive affect	0.55*	0.45*	-0.22	0.31*	1	-0.52*	0.05	0.18	0.26*
Negative affect	-0.55*	-0.29*	0.42*	-0.27*	-0.75*	1	-0.14	0.00	-0.38*
GAD	-0.28	0.00	0.06	-0.15	-0.06	0.17	1	-0.26	0.00
Health control	0.51*	0.42*	-0.21	0.36*	0.40*	-0.38*	-0.24	1	0.29*
Health rating	0.30*	0.27*	-0.22*	0.13	0.37*	-0.44*	-0.14	0.56*	1

Correlation in women are below the diagonal, correlation in men are above the diagonal

* $p<.01$

over health among female cancer survivors, demonstrating a moderate effect size, while mastery was not significantly associated with either physical health construct. So while our findings suggest that the relative contribution of different forms of positive thinking may vary by gender, our results are largely consistent with previous work demonstrating that, broadly speaking, positive thinking influences physical health across gender (Khallad 2013; Cabras and Mondo 2018). Studies conducted with cancer survivors have similarly found that mastery and optimism were associated with less self-reported pain and fatigue, and the strength of this relationship was similar for both forms of positive thinking (Allison et al. 2000; Kurtz et al. 2008). Our study extends this work, demonstrating that this relationship is consistent across gender among cancer survivors as well.

Fewer studies have examined the link between positive thinking and perceptions of control over health. Some have demonstrated a link between optimism and greater health internal locus of control, as well as lower levels of cancer worry among cancer survivors (Pinquart and Frohlich 2009; Hodges and Winstanley 2012). A link between optimism and health locus of control has also been demonstrated among other patient populations and older adults (Gruber-Baldinia et al. 2009; Kostka and Jachimowicz 2010). Similarly, mastery is associated with greater internal health locus of control in cancer survivors as well as patients with chronic illness (Park and Kim 2015; Younger et al. 1995). Furthermore, self-efficacy, which also emphasizes personal agency, has been found to be associated with health internal locus of control as well (Wu et al. 2004). Our results extend this work by examining the influence of gender, suggesting that optimism is a stronger predictor of health control among female cancer survivors, while mastery is more relevant for male cancer survivors.

Optimism, Mastery and Emotional Health

When considering emotional health, optimism was a comparatively stronger predictor than mastery and was associated with positive functioning. These included greater levels of positive affect as well as lower levels of negative affect and GAD in the full sample, demonstrating medium-to-large effect sizes. Mastery did not predict a significant amount of variance in any of the emotional health dependent variables for the full sample. Positive thinking predicted more variance in the global emotional latent constructs compared to the more specific mental health dependent variable of GAD. Our findings are consistent with other research that has demonstrated a relationship between optimism and superior emotional functioning among cancer survivors, including less anxiety regarding care seeking, reduced pre-op anxiety, improved psychological adjustment, and greater positive affect (Ai et al. 2012; Carver et al. 2005; Lauver and

Tak 1995; Pinquart and Frohlich 2009; Taber et al. 2016). While other studies have found a link between mastery and distress among cancer survivors (Hinnen et al. 2009), our results indicate that optimism is a stronger predictor of positive emotional health when both forms of positive thinking are examined concurrently.

Furthermore, positive thinking explained a greater amount of variance in emotions for women compared to men. While the relationship of optimism with the global emotional latent constructs was consistent across genders, optimism was associated with lower levels of GAD only among female cancer survivors. Furthermore, mastery was associated with greater positive affect among female cancer survivors as well. Positive thinking may predict more variance in emotions for women because women demonstrate more variance in emotional experience in general (e.g. frequency, range, intensity; Brody and Hall 2008; Fischer et al. 2004; Grossman and Wood 1993; Fujita et al. 1991) and the well documented gender disparity in the prevalence of anxiety and depressive disorders (McLean et al. 2011).

Optimism, Mastery and Coping

Optimism and mastery both predicted greater levels of problem focused coping, demonstrating comparable small-to-medium effect sizes. However, optimism was a stronger predictor of emotion-focused coping. Greater optimism was also associated with less emotion focused coping, demonstrating a moderate effect size, while mastery did not predict a significant amount of variance in emotion focused coping. These relationships were largely consistent across gender. The present findings are consistent with previous research indicating a robust relationship between optimism and adaptive forms of approach coping such as problem-focused coping, as well as an inverse relationship between optimism and emotion-focused coping strategies (Nes and Segerstrom 2006). While mastery has demonstrated similar relationships with coping (Pearlin and Bierman 2013; Folkman 1984; Fleishman 1984; Parker et al. 2015; Tan et al. 2015), the findings from this study suggest that optimism contributes to a comparatively larger amount of variance in emotion-focused coping in cancer survivors.

Study Strengths and Limitations

A strength of the current study is that the sample of cancer survivors were identified from a large, nationally representative sample of adults in the United States. However, the cross-sectional nature of the data limits conclusions regarding causality and the reliance on self-report measures may have artificially inflated or biased results. Furthermore, because this data was collected within the context of an ongoing longitudinal study, the available measure of GAD

was based on the DSM-III-R in order to remain consistent with previous waves. Furthermore, information about symptoms of generalized anxiety disorder was only available for approximately one-fourth of the current sample due to the screening methodology that was employed within the context of the larger MIDUS study. In addition, we aimed to examine gender differences in coping as well as emotional and physical functioning among cancer survivors. However, the results may have been confounded by cancer type given that two of the most common types of cancer among the sample, breast and prostate cancer, disproportionately affect females and males, respectively. Finally, we were not able to distinguish between individuals who are actively fighting cancer versus those who are in remission. The acute stressors encountered by individuals diagnosed with cancer vary across time as individual adjust to an initial diagnosis, progress through treatment, and hopefully achieve remission and we were not able to distinguish how optimism and mastery influence anxiety and coping across the different stages of diagnosis, treatment, and recovery.

Future Directions and Clinical Implications

The results of the current study indicate that optimism and mastery promote resilience and healthy coping in the context of cancer populations that face significant stressors and for whom negative cognitive processes often confer an elevated risk of developing anxiety and other emotional disorders. Future studies may want to examine these processes within a sample of cancer survivors that endorse high levels of anxiety and determine whether they are consistent across individuals with different types of cancer. Future research should also examine how factors such as cancer stage, time since diagnosis, and remission status may influence resilience in cancer survivors. It will also be important to examine further whether there are some circumstances in the process of coping with cancer in which optimism and mastery are either not helpful or even potentially maladaptive as it may be the case that sometimes acceptance or other cognitive strategies are more beneficial than positive thinking. In addition, future studies may benefit from using multi-method approaches to examining optimism and mastery, such as behavioral or objective measures in addition to questionnaires and examining whether optimism and mastery interact such that high levels of both confer additional benefits. Furthermore, previous research suggests that adaptive coping may mediate the relationship between positive thinking and superior mental and physical health outcomes (Carver et al. 2010). Longitudinal studies will help clarify the mechanisms underlying this relationship.

Finally, the results suggest that optimism and mastery may be fruitful targets for intervention for this population. Future research may examine these forms of positive

thinking as mechanisms of change within the context of interventions to promote emotional well-being and reduce mental illness among cancer survivors. Our results provide promising additional evidence of the potential benefits of positive thinking in the form of optimism and mastery in promoting adaptive coping, higher levels of emotional well-being, and lower levels of anxiety. It will therefore be important to build upon these findings to understand whether promoting optimism and mastery in the aftermath of a cancer diagnosis may help to minimize the development of anxiety disorders and promote resilience.

Compliance with Ethical Standards

Conflict of interest Matthew W. Gallagher, Laura J. Long, Angela Richardson and Johann M. D'Souza declare that they have no conflict of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Research Involving Animal Rights This article does not contain any studies with animals performed by any of the authors.

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