Association of Stress Management Skills and Perceived Stress with Physical and Emotional Well-Being Among Advanced Prostrate Cancer Survivors Following Androgen Deprivation Treatment

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Abstract Advanced prostate cancer (APC) is associated with disruptions that compromise health related quality of life (HRQOL). Treatment often includes androgendeprivation therapy (ADT), which results in a range of side effects (e.g., fatigue, urinary dysfunction) that further impact HRQOL. Despite these challenges, there are limited evaluations of the impact of stress and stress management skills on HRQOL among APC survivors on ADT. This study evaluated relationships among stress, stress management skills, and HRQOL, and it was hypothesized that better stress management skills would relate to greater physical and emotional well-being by mitigating perceived stress levels. Participants ($N = 77$) were 69.7 years old (SD = 9.8), 18.6 months post-treatment (SD = 17.5), and ethnically diverse (65 % Non-Hispanic White, 13 % Hispanic, 21 % African-American). Measures included the Measure of Current Status for stress management skills, the Perceived Stress Scale for perceived stress, and the Medical Outcomes Study—Short Form (MOS SF-36; physical functioning and emotional well-being subscales) for HRQOL. Direct effects and mediation models were evaluated to determine the relationships between perceived stress, stress management skills, and HRQOL domains, controlling for relevant covariates. Stress management skills and perceived stress were significantly associated with physical functioning ($\beta = .24$, $p < .05$ and $\beta = -.43$, $p < .01$, respectively) and emotional well-being ($\beta = .35$, $p < .01$ and $\beta = -.64$, $p < .01$, respectively). Regression analyses supported the hypothesis that reduced perceived stress mediated the relationship between stress management skills and both physical functioning and emotional well-being. These results demonstrate that one way stress management skills may impact HRQOL is by lessening ongoing perceptions of stress.

Keywords Prostatic neoplasms · Stress management · Health related quality of life · Physical functioning · Emotional well-being · Prostate cancer

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Introduction

Prostate cancer (PC) is the most common non-skin cancer for men in the U.S. with over 2.2 million current survivors and over 220,000 new diagnoses estimated in 2010 (American Cancer Society [ACS] 2010). Survival rate for men diagnosed with localized PC is almost 100 %, while the 5-year survival rate for men with advanced prostate cancer (Stage III–IV: APC) is approximately 33 % with lower rates for

ethnic minority men (30 %; ACS, 2010). About 70 % of men with APC receive androgen ablation treatment (ADT; i.e., androgen-ablation; androgen-deprivation; chemical castration) to control the tumor and relieve pain and other symptoms (ACS, 2010). ADT serves to reduce levels of male hormones (e.g., testosterone) in the APC survivor, resulting in slowing of cancerous growth in the prostate gland.

Health Related Quality of Life (HRQOL) in Advanced Prostate Cancer

APC survivors undergoing ADT report decrements in HRQOL across a number of domains and often experience greater symptom burden than men undergoing treatment for localized PC. Disease progression is associated with greater bodily pain, less vitality, fewer social interactions, and worse emotional well-being (Albertsen, Aaronson, Muller, Keller, & Ware, 1997). Men also often face additional psychosocial concerns related to morbidity and mortality (e.g., end of life concerns) that men with localized PC may not be concerned with, which may further compromise HRQOL (Gomella, 2007; Litwin, Lubeck, Stoddard, Pasta, Flanders, & Henning, 2001). Furthermore, disease-related concerns are often exacerbated by treatment side effects and lead to greater decrements in HRQOL (Potosky et al., 2002).

Although relatively effective for delaying progression, ADT results in a range of side effects including fatigue, mood swings, hair loss, sexual dysfunction, weight gain, hot flashes, and loss of bone density. Treatment-related side effects may be chronic and debilitating, with symptoms often lasting up to 5 years post-treatment (Nygård, Norum, & Due, 2001; Potosky et al., 2002; Stanford et al., 2000). Consequently, men receiving ADT report poorer HRQOL compared to no-treatment peers (Potosky et al., 2002). Compromises in HRQOL are a persistent source of concern and bother (Cooperberg et al., 2003; Penson, Litwin, & Aaronson, 2003; Schover et al. 2002; Wei et al., 2002).

ADT may extend survival for men with APC beyond 3 years after initiation (Oefelein, Agarwal, & Resnick, 2004), however, the benefit is often offset by symptom burden and poor HRQOL. Given that the goal of treatment for APC survivors is not curative, the impact of disease and treatment on HRQOL during post-treatment survivorship is critically important. Moreover, APC survivors who receive ADT have been shown to report greater levels of psychological distress up to 12 months post-treatment compared to APC survivors who do not undergo ADT (Northouse et al., 2007). ADT has been associated with worse physical symptoms and sexual problems compared to no treatment controls (Potosky et al., 2002) and in one study was the only significant predictor of multiple domains of HRQOL, including physical symptoms and functioning, fatigue/malaise, sexual dysfunction, and general and cancer specific psychological distress (Kornblith, Herr, Ofman, Scher, & Holand, 1994). ADT has also been associated with decrements in emotional well-being, including symptoms of depression and anxiety, decreased mental acuity, and emotional lability (ACS, 2010; Gomella, 2007; Lofters, Juffs, Pond, & Tannock, 2002).

Perceived Stress and HRQOL

Stressor appraisals and the ability to manage stress appear to be associated with HRQOL among PC survivors. For example, in cross-sectional analysis, lower self-efficacy and confidence in managing symptoms have been associated with lower HRQOL, including urinary, bowel, and hormonal symptoms, physical functioning, and emotional well-being, in a mixed sample (localized and advanced) of PC survivors following primary treatment (Campbell et al., 2004). Longitudinal analysis has demonstrated that increased levels of perceived stress, at baseline, predict poorer physical functioning up to two years later among localized PC survivors, controlling for baseline physical functioning and relevant covariates (Zhou et al., 2010). Conversely the use of more active coping and less avoidant coping predicted better mental HRQOL at follow-up, whereas less negative appraisal of illness predicted better physical HRQOL (Kershaw et al., 2008). In this study, survivors with more advanced disease were more likely to engage in avoidant coping strategies that led to poorer emotional well-being (Kershaw et al., 2008). Together these results suggest that some PC survivors may be at a particular disadvantage due to their reduced ability to manage stress.

Indeed, psychosocial interventions aimed at improving stress management skills and decreasing levels of perceived stress have been shown to have beneficial effects across a range of HRQOL outcomes among PC survivors, including physical, social/family, emotional, and functional domains (Carlson, Speca, Patel, & Goodey, 2004; Grossman, Neimann, Schmidt, & Walach, 2004; Penedo et al., 2004) and improved mood (Parker et al., 2009).

Current Study

Increased attention has been given to the psychosocial needs and HRQOL compromises of localized PC survivors following treatment, yet there has been limited work documenting the psychosocial correlates of physical and emotional well-being among APC survivors undergoing ADT—a distinct and significantly compromised subgroup of PC survivors. This group faces a number of unique challenges due to the effects of advancing disease and ADT treatment that may be stressful. Thus, the current study specifically addressed the gaps in the current literature by: (a) examining the association between stress management

skills and physical and emotional well-being, and (b) the extent to which having stress management skills might improve physical and emotional well-being by mitigating ongoing stress levels.

Methods

Participants and Procedures

Participants were recruited as part of a larger intervention study. A variety of recruitment methods were used including referrals from urology clinics, distribution of study flyers, community presentations, and through the use of the Florida Cancer Data System (FCDS; a cancer registry maintained by the Florida Department of Health). Initial eligibility was assessed either in person at the time of recruitment or over the telephone. Men who were eligible and expressed interest in participation were scheduled for a baseline visit to assess additional eligibility criteria and complete a baseline psychosocial assessment. Those who met full eligibility criteria were enrolled in the study.

Participants were required to be diagnosed with stage III or IV prostate cancer and had experienced ADT-related symptoms (e.g., erectile dysfunction, loss of libido, hot flashes, weight gain) within the past 12 months. Men diagnosed with APC at younger ages tend to have more rapidly progressing disease and greater distress associated with the diagnosis (Lin, Porter & Montgomery, 2009). Therefore, age 50 was used as a cut-off to reduce confounding factors related to psychological reactions associated with being diagnosed with advanced stage cancer. Participants were also required to be fluent in English and to have at least a ninth grade education to ensure adequate understanding of study materials. The Mini Mental State Examination (MMSE) was used to identify cognitive impairment (Folstein, Folstein, & McHugh, 1975). A score at or above a 26 was required to participate in the study to rule out cognitive impairment. The Structured Clinical Diagnostic Interview (SCID) for DSM-IV was used to exclude any individuals with a history of or current psychosis, current substance use/dependence disorders, organic mental disorder, and active suicidal ideation or panic disorder (First, Spitzer, Gibbon, & Williams, 2002). Eligible participants were asked to read and sign an informed consent form approved by the University of Miami Institutional Review Board and were enrolled in the study. A battery of tests was administered to enrolled participants to assess a range of factors related to psychosocial well-being and physical health. Monetary compensation ($50) was given to participants for their time and effort.

Measures

Demographics and Medical Variables

Standard demographic (e.g., age, years of formal education) and treatment-related (e.g., time since diagnosis, time since treatment) information was collected via interview using a standard questionnaire. Information regarding comorbid medical conditions was collected using the Charlson Comorbidities Index, a weighted index of 19 medical conditions (Charlson, Pompei, Ales, & MacKenzie, 1987). It is a widely used measure that takes into account the number and severity of comorbid medical conditions, has been validated in a number of medical populations, and has been shown to predict risk of death from comorbid disease up to 5 years after initial assessment (Charlson, Szatrowski, Peterson, & Gold, 1994).

Stress Management Skills

The Measure of Current Status, a 17-item self-report measure, was used to assess stress management skills (Carver, 2006). Participants were asked to rate the degree to which they perceived themselves as able to adequately respond to the challenges and demands of everyday life on a 5-point scale that ranged from "1—I cannot do this at all" to "5—I can do this extremely well". Examples of stress-management skills that are assessed include, "I am confident about being able to choose the best coping responses for hard situations", "I am able to use mental imagery to reduce any tension I experience", and "I can clearly express my needs to other people who are important to me." Scores on the MOCS can range from 0 to 100 with higher scores indicating better perceived stress management skills. The MOCS demonstrated adequate psychometric properties and internal consistency in the current study (Cronbach's alpha = .90).

Perceived Stress

Perceived stress was measured using the Perceived Stress Scale (PSS), a 14-item self-report measure that asks participants to answer questions regarding their thoughts and feelings over the past month on a "0—Never" to "4—Very Often" scale (Cohen, Kamarck, & Mermelstein, 1993). Items on the PSS measured the degree to which participants considered situations to be unpredictable and/or overwhelming, such as "How often have you been upset because of something that happened unexpectedly?" and "How often have you dealt successfully with irritating life hassles?" The PSS total score can range from 0 to 100 with higher scores indicating greater levels of perceived stress. In the current study, the PSS demonstrated adequate

psychometric properties and internal consistency (Cronbach's alpha = .87).

Physical and Emotional Well-Being

The Medical Outcomes Study—Short Form (MOS SF-36) physical functioning (10-items; e.g., ability to climb several flights of stairs, ability to lift/carry groceries) and emotional well-being (5-items; e.g., feeling happy, feeling nervous) subscales were used to assess these respective domains of HRQOL (Ware & Sherbourne, 1992; Ware, Kosinski, & Keller, 1994). The MOS SF-36 has been used extensively to measure different domains of health across a range of conditions and diseases, including prostate cancer (Schlenk et al., 1998). Participants were asked to answer questions regarding their physical and emotional health status over the past month (e.g., "Are you now limited in moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf?"; "How much time during the past 4 weeks have you felt downhearted and blue?"). Scores are standardized and range from 0 to 100 with higher scores representing better HRQOL. The physical functioning and emotional well-being subscales demonstrated adequate psychometric properties and internal consistency in the current study (Cronbach's alpha = .90 and .80, respectively).

Analytic Strategy

Statistical analyses were performed using the SPSS software package (version 18.0; SPSS Inc., Chicago, IL). Pearson correlations were used to determine relevant control variables. Relationships between possible control variables including age, years of education, time since diagnosis, time since treatment and number of medical comorbidities, and our outcome variables of interest were examined. The covariates that were significantly related ($p < .10$) with the outcome variables were retained in subsequent analyses. Multiple regression analyses were conducted to determine the relationships between stress management skills, perceived stress, and HRQOL outcomes. Physical functioning and emotional well-being have been shown to be relatively orthogonal constructs that may be differentially associated with stress management and perceived stress (McHorney, Ware, John, & Raczek, 1993). Therefore, analyses were conducted separately for physical and emotional well-being outcome measures to determine independent relationships within these domains.

In order to better understand the relationships among stress management skills, perceived stress, and HRQOL, mediation models were tested. Analyses were conducted following standard procedures specified by Baron and Kenny (Baron & Kenny, 1986). As the first step in determining mediation, stress management skills were evaluated as a correlate of physical and emotional well-being. Stress management skills were then evaluated as a predictor of perceived stress, the proposed mediator in our model. In the third step, we identified whether the mediator predicted physical and emotional well-being. Finally, the fourth step involved testing mediation models that explored whether levels of perceived stress significantly mediated the relationships between stress management skills and physical and emotional well-being. Following Baron and Kenny's (1986) recommendations, full mediation was determined if the relationship between stress management skills and physical and emotional well-being was completely explained by the inclusion of perceived stress in the model (i.e., the effect of stress management skills on physical and emotional well-being was reduced to zero). Partial mediation was indicated if the effect of stress management skills on physical and emotional well-being remained non-zero even when perceived stress was included in the model. Sobel tests were used to test the significance of partial mediation (Sobel, 1982). Statistical significance for main analyses was determined using p values <.05.

Results

Study Sample

A total of 318 men were approached, of these, 69 % were ineligible due to reasons such as not currently receiving hormone treatment or did not speak fluent English, and 6 % were excluded due to refusal to participate, lost to contact after initial recruitment, or were determined to be ineligible based on further assessment (e.g., did not reside in South Florida full time). Eighty-one participants were consented to the study; however, 4 participants did not provide complete data at their baseline psychosocial assessment visit. Therefore, 77 APC survivors were evaluated for the current study. Participants were an average of 69.7 (SD = 9.8) years of age, 37.4 (SD = 32.5) months post-diagnosis, and 18.6 (SD = 17.5) months post-treatment. The sample was ethnically diverse, with approximately 65 % Non-Hispanic White, 13 % Hispanic and 21 % African-American. The majority (67 %) of the sample was married at the time of assessment. Participants indicated an average of 2.3 (SD = 2.7) comorbid medical conditions, including 29 % with diabetes, 27 % with arthritis and 15 % with a history of a heart attack. Perceptions of stress management skills were fairly high (M = 68.0, SD = 12.9) and above reported means in the literature of cancer patients (Faul, Jim, Williams, Loftus, & Jacobsen, 2010). Mean levels of physical functioning and emotional well-

being were 75.6 (SD = 22.4) and 79.4 (SD = 16.6), respectively. Levels of physical functioning were below and levels of emotional well-being were comparable to reported means of PC patients and age-matched normative samples (Schlenk et al., 1998). This is consistent with the literature such that PC patients are more likely to acknowledge and report physical symptoms related to disease and treatment compared to emotional ones (Clark et al., 2003). In fact, research suggests that the majority of PC survivors are characterized by levels of emotional well-being above age-matched norms (Hoffman, Gilliland, Penson, Stone, Hunt & Potosky 2004; Korfage et al., 2005).

Amongst the demographic study variables, only years of education was significantly correlated with a study outcome (SF-36 physical functioning; $r = .35$; $p < .01$). The number of medical co-morbidities was significantly correlated with a study outcome as well (i.e., SF-36 physical functioning; $r = -.48$; $p < .01$). Participant age, time since diagnosis and time since treatment were not significantly associated with the study outcomes. Full descriptive information for the sample and correlations among variables are provided in Tables 1 and 2, respectively.

Relationship Among Stress Management Skills, Perceived Stress and HRQOL

Results indicated that stress management skills were positively associated with physical functioning ($\Delta R^2 = .06$,

Table 1 Demographic, medical and psychosocial descriptives for the sample of advanced prostate cancer survivors ($N = 77$)

	Mean	SD
Age (years)	69.7	9.8
Education (years)	15.1	3.0
Months since diagnosis	37.4	32.5
Months since treatment	18.6	17.5
Medical co-morbidities	2.3	2.7
Stress management skills (MOCS)	68.0	12.9
Perceived stress (PSS)	17.9	8.1
Physical functioning (SF-36)	75.6	22.4
Emotional well-being (SF-36)	79.4	16.6
		% of sample
Ethnicity		
Non-Hispanic White		65.4
Hispanic		12.8
African-American		20.5
Marital status		
Married		66.7
Not married		33.3

$\beta = .24$, $p < .05$), whereas levels of perceived stress were negatively associated with physical functioning ($\Delta R^2 = .19$, $\beta = -.43$, $p < .01$). Stress management skills were positively associated with emotional well-being ($\Delta R^2 = .12$, $\beta = .35$, $p < .01$). As with physical functioning, greater perceived stress was negatively associated with emotional well-being ($\Delta R^2 = .41$, $\beta = -.64$, $p < .01$). The relationship between greater stress management skills and less perceived stress was also supported ($\Delta R^2 = .40$, $\beta = -.51$, $p < .01$).

Mediation Models

Adding perceived stress to the analysis regressing physical functioning on stress management skills created a non-significant relationship between stress management skills and physical functioning ($\Delta R^2 < .01$, $\beta = .04$, $p > .05$). (Sobel statistic = 3.23; $p < .01$; Fig. 1). With respect to emotional well-being, the addition of perceived stress to the regression of emotional well-being on stress management skills also dropped the relationship between stress management skills and emotional well-being to non-significance ($\Delta R^2 < .01$, $\beta = -.01$, $p > .05$). (Sobel statistic = 4.21; $p < .01$; Fig. 2). Results of the final hierarchical regression models are presented in Table 3.

Discussion

The present study aimed to evaluate the relationships between stress management skills, perceived stress, and HRQOL among men undergoing ADT for APC. Prior research suggests that these are critical factors predicting survivors' ability to effectively cope with their cancer experience and minimize decrements in HRQOL (Grossman et al., 2004; Lev et al., 2004). While a growing number of studies have addressed these associations in PC, the vast majority of the existing literature has targeted men treated for localized disease. However, the challenges faced by APC survivors are notably different. In particular, ADT is the primary treatment for APC and is characterized by chronic and debilitating disease and treatment related side effects. Such side effects, coupled with the challenges associated with living with advanced disease, can critically compromise quality of life outcomes. Therefore, there is a need to identify psychosocial processes that promote adjustment and well-being in APC survivors to better inform clinical care and psychosocial intervention efforts.

Our aim was to address the extent to which stress management skills and perceived stress were associated with two critical indices of HRQOL—physical functioning and emotional well-being. We also tested whether the relationship between stress management skills and HRQOL

Table 2 Pearson zero-order correlations between study variables

	1	2	3	4	5	6	7	8	9
1. Age	1								
2. Education	.19	1							
3. Months since diagnosis	.15	−.21	1						
4. Months since treatment	.19	.11	.26*	1					
5. Medical comorbidities	.11	−.03	.12	−.11	1				
6. Stress management skills	−.11	.02	.16	.11	−.23*	1			
7. Perceived stress	.002	−.15	−.003	−.09	.24*	−.51**	1		
8. Physical functioning	−.06	.35**	−.02	.14	−.48**	.24*	−.43**	1	
10. Emotional well-being	.09	.05	.08	.14	−.14	.35**	−.64**	.21*	1

Variables are: age (years), education (years), months since diagnosis, and months since treatment, number of medical comorbidities, stress management skills (Measure of Current Status), perceived stress (Perceived Stress Scale), physical functioning and emotional well-being (Short Form 36 physical functioning and emotional well-being subscales, respectively)
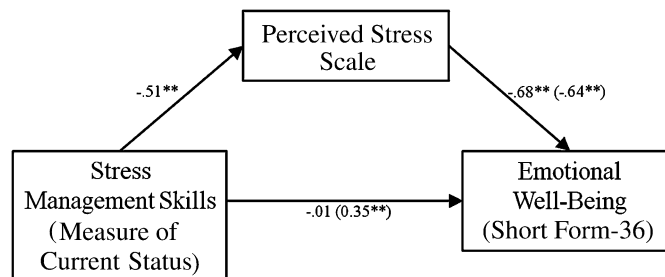
$* p < .05; ** p < .01$

Fig. 1 Perceived stress mediates the relationship between stress management skills and physical functioning. Standardized Beta coefficients for the direct paths presented *in parentheses*, while standardized Beta coefficients for the mediation model presented *outside of parentheses*
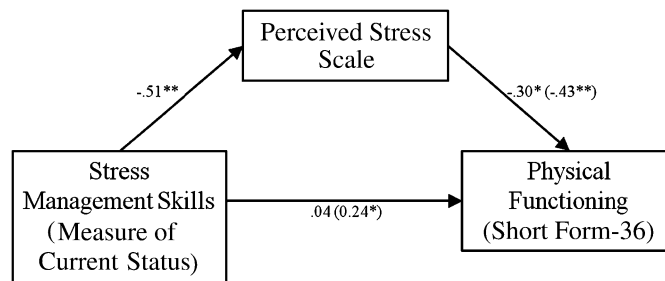
Fig. 2 Perceived stress mediates the relationship between stress management skills and emotional well-being. Standardized Beta coefficients for the direct paths presented *in parentheses*, while standardized Beta coefficients for the mediation model presented *outside of parentheses*

Table 3 Perceived stress is a significant mediator of the relationship between stress management skills and physical functioning and emotional well-being in separate hierarchical regression analyses

Step	Factor	R^2	ΔR^2	ΔF	p	β	p
Physical functioning							
1	Education	.27	.27	13.97	<.001	.17	.08
	Medical comorbidity					−.40	<.001
2	Perceived stress	.36	.10	10.39	<.01	−.30	.01
3	Stress management skills	.37	<.01	.05	.82	.04	.82
Emotional well-being							
1	Perceived stress	.41	.41	51.39	<.001	−.68	<.001
2	Stress management skills	.41	<.01	.09	.76	−.01	.76

was mediated by perceived stress—that is, does the ability to manage stress impact a survivor's perception and impact of stress, and do such perceptions relate to HRQOL while considering demographic, medical, and treatment related factors. As hypothesized, stress management skills and perceived stress were significantly associated with

HRQOL, including both physical and emotional well-being domains. This is consistent with prior work in localized PC and other cancers (Grossman et al., 2004; Parker et al., 2009; Penedo et al., 2004). To our knowledge, our study is among the first to document such associations among men with APC who underwent ADT. These findings suggest that despite the challenges associated with living with advanced stage disease, psychosocial resources (e.g., stress management skills) and perceptions of stress can still impact HRQOL, above and beyond relevant covariates.

We were also interested in determining whether the relationship between participants' stress management skills and HRQOL was mediated by their perceptions of stress. Prior work has shown that the degree to which cancer survivors are able to effectively manage stress can impact HRQOL (Lev et al., 2004). Thus, one mechanism by which the ability to manage stress has an impact on HRQOL occurs via lessened perceptions of stress. As hypothesized, we found that having greater confidence in one's stress management skills related to experiencing better physical functioning and emotional well-being via an association between greater stress management skills and sensing less stress in one's life.

These findings highlight the role of psychological factors in relation to HRQOL in the context of advanced disease and suggest the potential value of offering stress management interventions to this population. Prior work has demonstrated the beneficial effects of reducing stress and teaching stress management skills among men with localized PC (Parker et al., 2009; Penedo et al., 2004), but to our knowledge, no psychosocial interventions have been specifically tailored to, and conducted among, APC survivors. Despite experiencing greater disease burden, it seems that perceptions of stress and the extent to which men feel capable of handling their stress are critical factors in maintaining an adequate level of HRQOL. Thus, intervention components of stress management could be tailored to meet the specific needs of APC survivors, as they encounter different and unique stressors associated with advanced disease and ADT treatment in comparison to localized PC survivors. To this end, men will be better equipped to adjust to their disease, cope with distressing side effects, and maintain adequate levels of HRQOL. As the goal of ADT is not curative, APC survivors who have developed effective stress management techniques may also be better positioned to face future challenges associated with inevitable disease progression.

There are several limitations to this study that need to be noted. Although our findings were statistically significant, analyses were based on a small sample that reported relatively high levels of psychosocial functioning. Furthermore, analyses were cross-sectional and preclude any causal inferences from being made. It is plausible that

associations between stress management skills and perceived stress are bi-directional, as lower levels of perceived stress may result in a reduced need for stress management by the APC survivor. The lack of ongoing stress management needed might also impact the perceived level of skill the individual has in their ability to manage future stress. The same may be true for associations between perceptions of HRQOL and both stress and stress management skills. Subsequently, improved HRQOL may have the potential to lower perceptions of stress and, consequently, the need for active stress management. Further work should be conducted to evaluate the longitudinal relationships that describe how stress management, perceived stress, and HRQOL evolve over time in a larger sample of APC survivors undergoing ADT.

Despite these limitations, we believe these findings contribute to a limited literature evaluating the psychosocial needs of a compromised subgroup of cancer survivors. Although extensive work has been conducted among localized PC, little is known about psychological factors related to HRQOL in APC. The present study identified modifiable factors (stress management skills) related to physical functioning and emotional well-being that may be targeted by psychosocial interventions tailored to this subgroup of PC survivors.

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