The Effects of Exercise on Perceived Barriers and Benefits of Exercise by Cancer Survivors Post Treatment

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Abstract: Exercise may be used to attenuate cancer treatment-related side effects. However, the majority of cancer survivors do not participate in regular exercise.

Purpose: This study examined changes in fitness parameters as well as perceived exercise benefits and barriers held by post-treatment adult cancer survivors, who participated in a 12-week structured exercise program.

Methods: This study used a randomized controlled trial design. Participants were 24 post-treatment adult cancer survivors with various cancer diagnoses. The Exercise Benefits /Barriers Subscale (EBBS) questionnaire was used to evaluate perceived exercise benefits and barriers. Data was analyzed using a mixed-between-within ANOVA.

Results: There were no significant differences in the total EBBS score (128.7 ± 23.2 v. 142.6 ± 17.8; *p*=.20) or the benefits (86.4 ± 17.2 v. 96.3 ± 12.9; *p*=.31) and barriers subscales (42.3 ± 7.8 v. 46.5 ± 6.1; *p*=.14). However, those in the exercise group were significantly more likely to respond that exercise participation would not cause fatigue (2.42 ±.90 v. 3.25 ± .45; *p*=0.04), but may decrease fatigue (3.0 ± .60 v. 3.17 ±.58; *p*=.03).

Conclusion: Among cancer survivors, exercise participation may strengthen the perception that exercise reduces, rather than causes, fatigue.

Keywords: Cancer, Exercise, Fatigue, Post-Treatment, Survivorship, Exercise Beliefs.

INTRODUCTION

Patients are surviving cancer at a much greater rate, which may be attributed to improved methods of detection, treatment and care [1, 2]. While treatments may be more effective at treating cancer, they may also cause a variety of side effects that may negatively impact a cancer survivor's physical and/or emotional health, decreasing their quality of life [3]. Physically, cancer survivors may experience fatigue, reduced muscle strength and weight gain. Emotionally, cancer survivors may experience symptoms such as depression, anxiety and fear of recurrence [2-4].

Exercise can effectively improve a cancer survivor's muscular strength and endurance, as well as cardiovascular and pulmonary function, while reducing treatment-related side effects and maintaining and restoring health and fitness [3-5]. Cancer survivors who participate in regular moderate exercise, consisting of aerobic and resistance training components, experience positive adjustments to their psychosocial well-being with improved body-image and self-concept. Cancer survivors who engage in regular exercise may also experiences a decrease in distress symptoms, which include fatigue, sleeping difficulties, nausea, depression, and anxiety [3, 5].

Despite the documented benefits of exercise, 30% of cancer survivors will decrease their physical activity levels upon receiving a cancer diagnoses. Furthermore, it is estimated that 70% of cancer survivors do not meet the U.S national recommendations for exercises, which is a150 minutes a week of moderate physical activity [6, 7].

To understand why cancer survivors are not engaging in exercise, researchers have focused their efforts on understanding cognitive variables that effect levels of participation in exercise. Through numerous investigations, two particular cognitive variables have become the focal point and they are perceived benefits and perceived barriers of health behaviors [8]. Perceived benefits are identified as an individual's judgment of the potential positive benefits (e.g. increased fitness) associated with participating in a particular health behavior. Perceived barriers refer to an individual's assessment of possible obstacles (e.g. limited time) that keep the individual from participating in a health behavior. These variables are part of several models of behavior, most notably, the Health Belief Model.

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The Health Belief Model is the most commonly used theory in health education and health promotion [9]. The fundamental concept of the Health Belief Model is that health behavior varies by the individual and is determined by each individual's own beliefs and perceptions and the resources available to decrease a disease occurrence [10]. Various intrapersonal factors will influence each individual's perception, and thus, affect health behavior. The health belief model suggests that health-related behavior depends on a person's perception of four critical areas; 1) The severity of a potential illness, 2) The person's susceptibility to that illness, 3) The benefits of taking preventative action, and 4) The barriers to taking that action [11].

Thus, applying the Health Belief Model, cancer survivors may not participate in exercise because they do not perceive exercise participation as helping them with their treatment-related side effect [12]. Furthermore, treatment-related side effects such as pain and fatigue, may make it difficult to initiate exercise engagement [12, 13]. Therefore, barriers to exercise may be associated with a lack of perceived benefits of exercise as it relates to their cancer treatment side effects and the perceived barrier and difficulty of overcoming the presence of treatment-related side effects.

While there are many treatment-related side effects that cancer patients may experience, cancer-related fatigue and physical deconditioning caused by treatments are reported to be the primary reasons for why cancer patients are not interested in or motivated to participate in exercise [12, 13]. Cancer-related fatigue is a complex and multidimensional clinical problem that 40% to 100% of cancer survivors deal with. Cancer-related fatigue is not alleviated by sleep and may have a physical, psychological, social, and spiritual impact on a cancer survivors' well-being, limiting their ability to participate in various activities [14]. Extensive research on physical activity and fatigue suggest that supervised exercise will have a favorable effect on cancer-related fatigue, helping patients of all cancer types, manage their fatigue levels [15].

Participation in an exercise program can positively influence how an individual may perceive the benefits of exercise as well as reduce the perceived barriers to exercise. Specifically, previous research has demonstrated that the realization of and satisfaction with progress made during an exercise intervention can boost beliefs in the effectiveness of exercise, positively impacting self-efficacy healthy adults [16, 17]. Therefore, an exercise intervention that combines low-to-moderate aerobic and modified whole-body resistance exercises may positively impact the perceived exercise benefits and barriers cancer survivors have towards exercise. The American College of Sports Medicine "recommends" that aerobic exercise may utilize treadmills, and stationary bicycles; resistance exercise may include, free-weights, thera bands, and weight machines [3]

METHODS

A quazi-experimental, randomized controlled trial design was used to evaluate the impact a 12-week exercise program has on the perceptions cancer survivors have towards exercise when compared to cancer survivors who do not exercise. There were two treatment groups: exercise vs. control. Following randomization and group assignment, participants were assessed at baseline and again following the 12-week exercise intervention.

Participants

Twenty-four participants 18 years of age or older who had completed various treatment types (chemotherapy, radiation, surgery) for different types of cancers (breast, colon, testicular, pancreatic, balder) were recruited by the use of flyers placed throughout various communities in central New Jersey. Participants were excluded from this study if they participated in regular exercise, defined as engaging in both aerobic and resistance training, at least 2 times per week. Participates were also excluded if they had any physical impairment that would prevent participation in the aerobic or resistance training exercises. Participants voluntarily provided written informed consent and completed Kean University's Institutional Review Board-approved research protocol.

Measures and Outcomes

The Exercise Benefits/Barriers Scale (EBBS) questionnaire was used to assess the participant's perceived exercise benefits and barriers. The questionnaire was administered to the all the participants prior to and after completion of the 12-week exercise. The EBBS was developed to evaluate individuals' perceptions towards the benefits and barriers of regular exercise participation and is composed of two subscales: a benefits scale, which consists of questions that address the perceived

benefits of exercise and a barriers scale, which consists of questions that address perceived barriers towards exercising. The EBBS uses a four-response, forced-choice Likert-type scoring system that ranges from 4 (strongly agree) to 1 (strongly disagree). The barrier scale is reversed scored [18].

The 43-item EBBS has a standardized Cronbach's alpha reliability coefficient of .952, while the 29-item benefits subscale and 14-item barriers subscale have standardized Cronbach's alpha reliability coefficients of .953 and .886. The test-retest reliability of the total EBBS instrument is .89, while the benefits and barrier subscales have a test-retest reliability of .89 and .77 [18]. Permission was granted to use the EBBS.

Study Intervention

The participants in the control group continued their normal daily routines while the participants in the exercise group took part in two exercise session per week for 12 weeks; each exercise session consisted of aerobic and resistance training. The exercise sessions were held in a small group setting under guidance of the primary investigator who is certified as a Cancer Exercise Trainer (ACSM/ACS-CET). The structured exercise program lasted 60 minutes in duration, took a whole body approach targeting major muscle groups, and consisted of 10 to 12 resistance exercises performed during each session. A variety of resistance exercise modes were utilized which included free weights, physioballs, free-motion pin-select machines, and resistance bands. The participants in the exercise group performed the same exercises at the same relative intensities, which was monitored using the 6-20 Borg. This scale was used to ensure the exercise prescription for both the resistance training and aerobic training were consistent with the guidelines provided by the American College of Sports Medicine specific for cancer survivors. Resistance training sessions were separated by a minimum of 72 hours.

Statistical Analysis

Data are presented as means ± SD and are reported as the exercise group vs. control, unless otherwise noted. Descriptive statistics (mean & standard deviation) were calculated for all participants and on each outcome variable at baseline and post-intervention. The authors used SPSS version 15.0 to conduct a mixed-between-within ANOVA that examined both treatment groups (exercise or control) and time: (pre-and post-study). The alpha level of significance was set at $p<.05$.

RESULTS

Twenty-four participants were recruited for the present study, 22 of which were female and 2 were male. Table **1** displays the physical characteristics of the participants and Table **2** displays the cancer diagnosis and treatments received by the participants. The two treatments (exercise vs. control) were compared in terms of whether there was a significant difference in their effectiveness in changing the scores of the total EBBS questionnaire, as well as the benefits and barriers subscales over the course of the study (main effect for group). Table **3** displays the means and

Table 1: Descriptive Data of Participants

Descriptive Data	n	Mean	SD
All Participants			
Age (yrs)	24	57.0	9.5
Height (m)	24	1.6	.1
Weight (kg)	24	78.5	13.9
Exercise Group			
Age (yrs)	12	54.7	2.9
Height(m)	12	1.7	.04
Weight (kgs)	12	78.5	3.8
Control Group			
Age (yrs)	12	59.3	2.5
Height (m)	12	1.6	.02
Weight (kgs)	12	78.5	4.4

Table 2: Descriptive Data of Participants-Cancer Diagnoses and Treatments Received of Participants

Cancer Type	n
Breast Cancer	19
Colon Cancer	1
Testicular Cancer	1
Pancreatic Carcinoma	1
Cancer of the Bladder	1
Non Hodgkin's Lymphoma	2
Treatment Types	
Chemotherapy	16
Radiation Therapy	12
Double Mastectomy	4
Right Mastectomy	2
Lumpectomy	7
Removal of Lymph nodes	9
Removal of Ovaries	1
Transurethral Resection of Bladder Tumor (TURBT)	1
Bacillus Calmette-Guerin (BCG) Therapy	1

Table 3: Participant Responses to EBBS Questionnaire and Barriers and Benefits Subscale, Pre –and Post-Intervention

Item	Group	Mean	SD	P-value
Pre-Total EBBS	Exercise	128.7	23.2	.14
	Control	124.0	15.6	
Post-Total EBBS	Exercise	142.6	17.8	
	Control	128.8	17.1	
Pre-Benefits	Exercise	86.4	17.2	
	Control	84.4	13.6	
Post-Benefits	Exercise	96.3	12.9	.22
	Control	87.8	11.2	
Pre-Barriers	Exercise	42.3	7.8	
	Control	39.6	8.1	
Post-Barriers	Exercise	46.5	6.1	.30
	Control	41.0	6.9	

Note: Pre-Total = Score of Total Questionnaire Pre-Intervention. Post-Total = Score of Total Questionnaire Post-Intervention. Pre- Benefits = Score of Only Exercise Benefits Questions Pre-Intervention. Post-Benefits = Score of Only Exercise Benefits Questions Post-Intervention. Pre-Barriers= Score of Only Exercise Barriers Questions Pre-Intervention. Post-Barriers = Score of Only Benefits Questions Post-Intervention.

standard deviations of the participants' pre and post EBBS scores. There was no significant change in total EBBS score over the study period, (128.7 ± 23.2 v. 142.6 ± 17.9; p= .20). Additionally, there was no significant difference in the Benefits Subscale (84.6 ± 17.2 v. 96.3 ± 12.9; p=.32) or the Barriers Subscale (42.3 ± 7.8 v. 46.5 ± 6.1; p =.14).

Table **4** displays the mean and standard deviation of the participant's pre and post scores for specific questions within the EBBS questionnaire. Each question within the EBBS questionnaire addressed a different perceived exercise benefit or barrier and each question was analyzed independently. There were only a few questions which showed a significant change

Table 4: Participant Responses to Individual Questions on Exercise Benefits and Barriers Questionnaire

Question	Pre Intervention				Post Intervention				P-Value
	Exercise Group		Control Group		Exercise Group		Control Group		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Q1 I enjoy Exercise	2.75	1.06	2.58	1.08	3.25	.97	3.00	.85	.58
Q2 Exercise decreases feelings of stress and tension for me	3.08	.67	3.08	.90	3.50	.52	3.17	.83	.54
Q3: Exercise improves my mental health	3.00	.74	3.08	.67	3.42	.51	3.25	.75	.86
Q4: Exercise takes too much of my time***	2.75	1.14	2.33	.78	3.42	.67	2.42	.79	.02
Q5: I will prevent heart attacks by exercising	3.25	.87	2.92	.67	3.25	.75	3.17	.58	.43
Q6: Exercise tires me	2.58	.99	2.25	.62	3.00	.85	2.58	.90	.26
Q7: Exercise increases my muscle strength	3.08	.67	3.33	.89	3.58	.51	3.33	.65	1.00
Q8: Exercise gives me a sense of personal accomplishment	3.08	.90	3.25	.75	3.67	.49	3.33	.78	.72
Q9: Places for me to exercise are too far away	3.33	.49	3.33	.78	3.17	.83	3.33	.49	.73
Q10: Exercise makes me feel relaxed	2.67	.89	2.67	.65	3.33	.65	2.92	.67	.40
Q11: Exercising lets me have contact with friends & persons I enjoy	2.58	.79	2.25	.87	3.17	.72	2.58	.79	.14
Q12: I am too embarrassed to exercise	3.17	.72	3.25	.75	3.50	.52	3.17	.72	.61
Q13: Exercising will keep me from having high blood pressure	2.83	.72	2.75	.97	3.33	.65	2.92	.51	.35
Q14: It costs too much to exercise	2.75	1.14	2.75	1.06	2.83	.94	3.17	.58	.64
Q15: Exercising increases my level of physical fitness	3.33	.65	3.25	.87	3.67	.49	3.33	.49	.33
Q16: Exercise facilities do not have convenient schedules for me	3.33	.49	3.08	.67	3.25	.75	3.17	.58	.47
Q17: My muscle tone is improved with exercise	3.25	.62	3.17	.83	3.58	.51	3.25	.62	.41
Q18: Exercising improves functioning of my cardiovascular system	3.33	.65	3.33	.65	3.58	.51	3.33	.49	.54
Q19: I am fatigued by exercise***	2.42	.90	2.27	.65	3.25	.45	2.45	.52	.04
Q20: I have improved feelings of wellbeing from exercise	3.25	.75	3.08	.67	3.58	.51	3.08	.67	.16
Q21: My spouse (or sig. other) does not encourage exercising	3.0	1.13	3.00	.74	3.33	1.15	2.83	.83	.44
Q22: Exercise increases my stamina	3.08	.67	3.00	.74	3.42	.51	3.25	.45	.54
Q23: Exercises improves my flexibility	3.17	.58	3.17	.39	3.50	.52	3.33	.49	.21
Q: 24: Exercise takes too much time from family relationships	3.25	.75	2.83	.83	3.50	.52	3.08	.67	.10
Q25: My disposition is improved with exercise	3.00	.85	2.83	.56	3.25	.75	2.83	.57	.27
Q26: Exercising helps me sleep better at night	2.83	.83	2.83	.94	3.08	.79	3.00	.60	.88
Q27: I will live longer if I exercise	3.08	.90	2.92	.90	3.25	.62	3.17	.58	.64
Q28: I think people in exercise cloths look funny	3.58	.51	3.42	.67	3.50	.52	3.50	.67	.7
Q29: Exercise helps me decrease fatigue***	3.00	.60	2.50	.67	3.17	.58	2.67	.49	.03
Q30: Exercising is a good way for me to meet new people	2.92	.67	2.50	.90	3.08	.51	2.58	.79	.80
Q31: My physical endurance is improved by exercising	3.00	.60	3.25	.87	3.42	.51	3.17	.58	1.00

(Table 4). Continued.

Question	Pre Intervention				Post Intervention				P-Value
	Exercise Group		Control Group		Exercise Group		Control Group		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Q32: Exercising improves my self-concept	3.00	.74	3.17	.58	3.33	.65	2.83	.58	.43
Q33: My family members do not encourage me to exercise	3.25	.62	3.08	.99	3.67	.65	2.83	.72	.06
Q34: Exercising increases my mental alertness	3.08	.67	3.08	.51	3.33	.78	3.08	.51	.58
Q35: Exercise allows me to carry out normal activities without becoming tired	3.08	.67	2.92	.79	3.08	.67	2.92	.51	.47
Q36: Exercises improves the quality of my work	2.83	.58	2.42	.67	3.00	.74	2.83	.39	.15
Q37: Exercise takes too much time from my family responsibilities***	3.25	.62	2.92	.79	3.58	.51	2.92	.67	.05
Q38: Exercise is good entertainment for me	2.33	.98	2.17	.83	3.25	.62	2.50	.52	.07
Q39: Exercising increases my acceptance from others	2.00	.74	1.92	.51	2.58	.79	2.33	.65	.50
Q40: Exercise is hard work for me	2.33	1.23	2.33	.78	2.83	.83	2.58	.79	.71
Q41: Exercise improves overall body functioning	3.17	.83	3.08	.51	3.33	.49	3.08	.29	.39
Q42: There are too few places for me to exercise	3.42	.51	3.42	.51	3.33	.65	3.25	.45	.84
Q43: Exercise improves the wat my body looks	3.17	.94	3.42	.51	3.42	.51	3.33	.49	.72

Note: '***' indicates significance change as a result of exercise participation.

after the intervention. Two of the questions that had a significant change were related to fatigue. Question 19 ("I am fatigued by exercise"; p=.04) had pre-and-post-intervention means of 2.42 ± .90 and 3.25 ± .45, respectively (p=.04). Question 29 ("exercise helps me decrease fatigue"), also showed a significant change (p=.03) in scores with pre-and-post-intervention means of 3.0 ±.60 and 3.17 ± .58, respectively. Question 4 ("exercise takes too much of my time") had pre-and post-intervention means of 2.33 ± .78 and 3.42 ± .67, respectively (p=.02). Lastly, the change in scores pre-and-post-intervention for question 37 ("exercise takes too much time from my family responsibilities") showed a trend to significance (p=.05) with pre-and-post-intervention means of 3.25 ±.62 3.58 ±.51, respectively. The other questions did not change significantly. Analysis of the individual benefits subscale questions indicated that prior to the intervention, all participants perceived benefits of exercise to include general areas of fitness such as muscular strength (Q#7), muscular endurance (Q#22), flexibility, cardiovascular (Q#18), and physical fitness (Q#15).

DISCUSSION

Cancer survivors who participate in supervised exercise programs, composed of aerobic training, whole body resistance training, and flexibility, performed at low-to-moderate intensity, may attenuate their treatment related side effects and improve their physical and emotional well-being [4]. Despite the positive effects exercise may afford cancer survivors, the majority of cancer survivors do not regular participate in physical activity or structured exercise programs as they do not perceive exercise as being beneficial towards alleviating symptoms associated with cancer and its treatments [12].

The purpose of this study was to evaluate the effect of participating in a 12-week structured exercise program has on perceived benefits and perceived barriers post-treatment adult cancer survivors hold towards exercise. The current study demonstrated that regular exercise participation did not positively influence the perceived benefits and barriers towards exercise in its entirety as evaluated by the EBBS questionnaire. However, item analysis of the EBBS questionnaire indicated significant changes to specific questions as a result of participating in the exercise intervention; the most notable change was fatigue in that cancer patients no longer perceived exercise as causing fatigue, but may help them with their fatigue. The lack of significant change in perceived benefits and

barriers of exercise as assessed by the EBBS questionnaire may impart be due to the participants previously held exercise perceptions. Prior to this study, the participants perceived the benefits of exercise to include general areas of fitness such as muscular strength, muscular endurance, flexibility, cardiovascular, and overall health.

However, these perceived benefits of exercise were not enough to encourage regular engagement in physical activity because the participants in the present study were non-exercisers. This suggests that perceiving general health benefits may not be enough to encourage exercise engagement; cancer survivors may only engage in exercise if they perceive exercise to help them alleviate treatment-related side effects [19]. Cancer survivors may experience a variety of treatment-related side effects such as pain, weakness, fatigue, and nausea, as well as anxiety and dissatisfaction with their self-image, causing them to be physically uncomfortable with their own bodies [2]. Therefore, cancer survivors may participate in regular exercise only if they perceive that participating in exercise will decrease treatment-related side effects. This is consistent with the Health Belief Model in that individuals may only engage health behavior if they perceive that behavior as having a positive impact on their disease and they do not perceive barriers to that activity or treatment. So, the reason why the exercise intervention did not positively influence the perceived benefits and barriers towards exercise as a whole may be due to the generality of the EBBS questionnaire. The questionnaire asked general questions about the benefits and barriers of exercise; the questionnaire did not ask specific questions related to the impact of exercise on treatment-related side effects, such as nausea, anxiety and self-image.

While significant changes were not observed in the EBBS questionnaire or the Benefits and Barriers subscale as a whole, a few significant changes did occur within individual questions. First, the present study demonstrated a reduction in barriers in regards to time in that participants no longer perceived exercising as taking away from time spent with family. This is significant because it shows a re-organization in priorities and an increased emphasis in participating in a behavior that positively affects quality of life.

Secondly, and most significantly, the present study found that exercise participation reduced the perception that exercise causes fatigue as well as enhanced the belief that exercise can eliminate fatigue. This finding is significant because of all treatment related side effects, fatigue is the most debilitating and is experienced by 75-99% of all cancer survivors [20, 21]. Previous research has established that exercise participation can positively impact a cancer survivor's quality of life and has been postulated that exercise can decrease fatigue [4,15]. The present study builds upon previous research in that exercise participation reduces the perceived belief that exercise causes fatigue, and builds upon the perception that exercise will decrease a cancer survivors' fatigue. Therefore, with fatigue no longer seen as a barrier towards exercise, but a benefit, post-treatment adult cancer survivors may be more likely to participate in a regular exercise program, thus receiving positive benefits to their emotional and physical well-beings and overall quality of life.

Exercise interventions will provide many benefits for cancer survivors through the survivorship continuum. These benefits may include the amelioration of functional impairments, prevention of disability, as well as the restoration and improvement of physical and emotional well-being [3, 4, 22, 23]. Since exercise will alleviative treatment related-side effects and improve physical and emotional health, exercise interventions should be presented to cancer patients by health care providers as soon as possible within the cancer survivorship continuum. In speaking to cancer survivors, about exercise, health care providers should take the Health Belief model approach and speak about how exercise can attenuate treatment related side effects, especially fatigue. Health care providers should conduct screenings to gauge the level of a fatigue cancer survivors may be experiencing so that an appropriate exercise program may be prescribed as well as provide counseling and education on how exercise can alleviate fatigue. In turn, regular exercise participation may increase, improving the quality of life for cancer survivors.

LIMITATIONS

Despite these findings, this study had several limitations. The Exercise Benefits/Barriers Survey was composed of questions that addressed general perceptions towards exercise and was not specific or sensitive to cancer and treatment specific issues. At this time, there are no surveys directly related to cancer survivors and exercise perceptions, thus making it difficult to evaluate. Additionally, the present study's sample contained various cancer diagnosis and treatments received, and therefore, diverse treatment-

related side effects were also present. Since exercise barriers are associated with treatment-related side effects, future research with a larger sample is needed so that the effects of exercise can be evaluated in light of the type of cancer and treatment received.

Future studies should utilize a cancer-sensitive exercise questionnaire as well as a larger sample, which would allow for controllability of possible confounders such as cancer type and treatment, age, length of time since last treatment, and previous exercise history.

The present study has important practical implications. The findings suggest that cancer survivor's perceptions towards exercise benefits and barriers can be positively improved after participating in a regular, structured exercise program. Specifically, cancer survivors may come to the self-realization that exercise participation can reduce cancer-related fatigue, which often has debilitating effects on a cancer survivor's quality of life and ability to function.

CONCLUSION

In conclusion, the present study demonstrated that exercise participation among cancer survivors attenuates the perception that exercise may cause fatigue, and in fact, enhances the perception that exercise may reduce their fatigue. This is significant because fatigue is a debilitating treatment-related side effect experienced by the most cancer survivors. As suggested by the Health Belief Model, cancer patients may increase their engagement in exercise programs if they perceive exercise as helping them with the symptom of fatigue. When promoting an exercise behavior to a cancer survivor, health care providers must relate the benefits of exercise to the treatment-related side effect that particular cancer survivor may be dealing with. In doing so, a cancer survivor may begin engaging in the behavior of exercise. Cancer survivors may be told to exercise by various health care providers, but, a self-realization of the impact of exercise on cancer-related fatigue may be even more influential on exercise adherence.

COMPETING INTERESTS

None of the authors declare competing financial interests.

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