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## Physical activity preferences of early-stage lung cancer survivors

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### Abstract

**Purpose**—Engagement in physical activity can provide important benefits for cancer patients and survivors, including those diagnosed with lung cancer. Despite this, many survivors do not engage in recommended levels of physical activity and little is known about the obstacles encountered by lung cancer survivors. The current study examines the physical activity preferences of early-stage lung cancer survivors.

**Method**—As part of a larger survey study, 175 non-small cell lung cancer survivors who were on average 3.6 years from surgical treatment responded to questions regarding their preferences for physical activity and physical activity advice. Demographic and medical characteristics were also collected.

**Results**—The majority of respondents (62%) reported a desire to receive advice regarding physical activity, predominantly before treatment (68%), in face-to-face interactions (95%) with a physician (80%), and within the context of a cancer care center (92%). Approximately half of participants indicated they would be interested in an exercise program tailored to lung cancer survivors and most individuals (73%) reported feeling capable of engaging in an exercise program. Differences in physical activity preferences emerged based on demographic and disease characteristics.

**Conclusions**—The majority of participants reported a desire for physical activity advice and a willingness to engage in physical activity. Important differences were found based on demographic and medical characteristics, which may warrant consideration in the development and dissemination of physical activity interventions for this cancer survivor population.

### Keywords

Lung cancer; Physical Activity Preferences; Survivorship

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#### Conflict of Interest Statement

All authors confirm no financial relationship with the sponsoring organization. The authors possess control of all primary data and agree for data to be reviewed by the journal if requested.

## Introduction

In response to increasing survival rates across many cancer diagnoses, there has been a growing focus upon symptom management, health promotion and enhanced quality of life after treatment [1]. Engagement in physical activity, both during treatment and in survivorship, can confer important benefits, including enhanced quality of life and physical function and reduced symptom burden [2–6]. Despite this empirical evidence, and growing awareness amongst health professionals, many cancer survivors do not engage in recommended levels of physical activity [1]. To enhance understanding of patients' engagement in physical activity, research has examined several patient (e.g. perceived barriers, correlates of physical activity) and environment-based factors (e.g. neighborhood) [7–9]. The current study seeks to extend this literature through examination of patient preferences for physical activity and their association with demographic and medical factors in a sample of early-stage non-small cell lung cancer (NSCLC) survivors.

In the United States, there are over 228,000 cases of lung cancer diagnosed each year (14% of all new cancers) [10]. Although most cases diagnosed at later stages are associated with poor prognosis, early detection and improved treatment modalities have increased survival rates, with 52% of those diagnosed with localized disease expected to live beyond five years [11]. Survivorship can be associated with significant and ongoing symptom burden, including psychological distress, impaired quality of life, dyspnea, and fatigue [12–16].

Recognizing that many lung cancer survivors will have impaired cardiorespiratory fitness, physical activity has been examined as a modality that may improve quality of life and disease-related outcomes. Evidence among lung cancer survivors suggests that physical activity is associated with enhanced overall functioning, improved quality of life and reduced symptom burden [6, 17]. However, similar to the broader survivor population, the majority of lung cancer survivors fail to meet recommendations for engagement in at least 150 minutes per week of moderately strenuous physical activity [18, 19].

The diagnosis and treatment of cancer involves extended contact with a health care team, and has been identified as a 'teachable moment' in which individuals may be more motivated to engage in health promoting activities, such as tobacco cessation, healthy diet and physical activity [20]. The cancer survivorship setting may be an important opportunity to promote health in this growing population. A growing area of research has focused on examining the physical activity preferences of cancer survivors across disease sites [21–29]. Jones and Courneya [29] examined the preferences of 307 mixed-diagnosis survivors, reporting that more than 80% expressed desire for exercise counseling at some point during their cancer experience. Whereas clear preferences emerged across certain domains (e.g. face-to-face advice from an exercise specialist), there was also variation across others (e.g. when to start exercise program). Finally, a small study of 81 Taiwanese lung cancer survivors also identified strong interest in participating in an exercise program [30].

The current study focuses on physical activity preferences of lung cancer survivors and explores potential differences based on demographic, medical and health behavior factors. The primary aim is to establish survivors' preferences concerning engagement in physical activity and receiving physical activity advice in the context of their cancer care. These findings will provide insight into the health-related preferences of lung cancer survivors, and help guide the development and implementation of effective interventions to promote physical activity.

## Method

### Participants and Procedure

The full details of the current study have been published previously [18]. In brief, 514 potentially eligible individuals were identified through review of clinical and research databases of thoracic surgery at a major urban cancer center and screened for study inclusion. Eligibility criteria included (a) primary pathological stage IA or IB NSCLC, (b) surgical resection from 1–6 years prior to study, (c) no current evidence of cancer and (d) permission from oncologist to contact the patient. Those individuals identified as eligible were sent a consent form and an invitation to participate in a one-time survey. Individuals who consented to participate completed a questionnaire packet by telephone or mail. This study was approved by the Institutional Review Board of Memorial Sloan-Kettering Cancer Center.

### Measures

**Demographic and Medical Characteristics**—Participants were asked to report their gender, age, race/ethnicity, education, income, marital status, employment status, height and weight, current and prior smoking history and current comorbid conditions [31]. In addition, electronic databases and medical charts were reviewed to obtain participants' pathologic stage, time since treatment completion and type of treatment received.

**Physical Activity**—The current study used a modified version of the Godin Leisure-Time Exercise Questionnaire [GLTEQ; 32] to assess participants' current physical activity. Participants reported their weekly frequency and average number of minutes per week spent engaging in each of light (e.g. easy walking), moderate (e.g. brisk walking), and strenuous leisure-time activities (e.g. running). The current number of minutes per week participants engaged in each type of activity was calculated and compared to national physical activity guidelines (which recommend engaging in 150 minutes of at least moderate intensity activities per week [33, 34]).

Participants were considered sedentary if reporting no engagement in any moderate or strenuous activity. The GLTEQ has good test-retest reliability, has shown convergent validity with objective and other self-report physical activity measures [35], and has been used in prior studies of physical activity in cancer survivors [36–38].

**Physical Activity Preferences**—Questions were drawn from previous published research [29] to assess participants' physical activity preferences. Participants responded to five questions concerning their preferences in receiving physical activity advice, including when (before, during, after treatment), by whom (e.g. physician, exercise specialist, cancer survivor), where (e.g. cancer center, gym), and preferred modality (e.g. face-to-face, telephone). An additional twelve questions assessed participants' preferences for engagement in physical activity. The full list of questions asked, along with participants' response frequencies, can be found in Tables 1 and 2.

### Statistical analysis

Descriptive statistics were used to report participants' physical activity preferences. To examine the relationship between demographic and medical characteristics and study outcomes, chi-square analyses were employed. Demographic and medical variables were selected based on clinical guidance and relevance to the goals of the paper. Each demographic/medical characteristic was dichotomized or trichotomized so that response options were adequately represented based on relevant clinical and statistical considerations. Participants' age was dichotomized as at or below 70 years old, the number of comorbid

conditions was dichotomized as 0 to 2 or greater than 2, weight status was dichotomized as obese (BMI  $\geq 30$ ) or non-obese (BMI  $< 30$ ), time since diagnosis was dichotomized as between 0 to 2 years post-treatment and 3 to 5 years, and education was dichotomized as either less than or equal to high school or education beyond high school. Finally, physical activity level was trichotomized as either sedentary (no moderate or vigorous activity), insufficiently active ( $< 150$  minutes per week of moderate or vigorous activity) or meeting guidelines (engaging in  $\geq 150$  minutes of at least moderate intensity activities per week). Physical activity preference questions were dichotomized or trichotomized where appropriate. All analyses were conducted using SPSS V.19. A cutoff of  $p < .05$  was used to determine statistical significance.

## Results

Detailed information regarding study recruitment, as well as a comparison of responders and nonresponders, has been published previously [8]. To summarize, 275 of 514 patients screened were eligible for study inclusion, of which 175 consented and completed questionnaires (response rate = 63.6%). Responders and nonresponders did not differ across demographic or medical characteristics. Participants had a mean age of 68.73 (SD=9.62) years, and were predominantly female (63.4%), Caucasian (92.6%), married (62.3%) and retired (53.8%). Approximately 66% of the sample reporting income had an annual median household income above the U.S. average (\$51,914). The mean number of years since diagnosis was 3.62 (SD=1.23). The majority of participants had stage IA disease at diagnosis and received surgical treatment only (91.4%). Of the 175 participants, 90 were not engaging in any moderate or strenuous exercise, 41 were insufficiently active and 44 were currently meeting physical activity guidelines. Other demographic and medical characteristics of this population have been published previously [8].

Participants' preferences for physical activity advice are displayed in Table 1. In brief, the majority of respondents (62%) reported a desire to receive advice regarding physical activity, predominantly before treatment (68%), face-to-face (95%) from a physician (80%), and within the context of their cancer care (92%). Table 2 displays participants' preferences for physical activity. Approximately half of participants indicated they would be interested in an exercise program tailored to lung cancer survivors. Most individuals (73%) reported feeling capable of engaging in an exercise program at the present time, and nearly half noted walking as their preferred physical activity modality (43%).

In order to examine the role of demographic and medical characteristics on variation in patient preferences for physical activity, chi-square analyses were conducted. Significant differences in preferences are presented in Table 3, with selected highlights noted here. In comparison to those over the age of 70, younger individuals preferred to receive information regarding physical activity from a physician and to exercise at a gym or exercise center associated with a cancer center. Female participants were more interested than males in taking part in an exercise program tailored for lung cancer survivors, while individuals reporting a higher annual income preferred information from a physician and were more likely to report feeling capable of engaging in an exercise program. Participants with less than or equal to a high school education reported a number of differences in preferences compared to those with higher education. Specifically, those with no more than a high school education preferred to receive advice from a health care provider other than a physician, after treatment rather than before treatment, and within the context of a non-cancer care setting. No significant differences in preferences emerged based on smoking history (defined as having smoked 100 lifetime cigarettes).

## Discussion

The development and implementation of physical activity programs tailored to the needs of cancer patients and survivors is integral to health promotion efforts. In the current study, early-stage lung cancer survivors expressed notable physical activity preferences, while a number of differences emerged across demographic and medical characteristics. These results provide insight into both challenges and opportunities in the development of effective interventions for lung cancer survivors.

The majority of lung cancer survivors indicated that they would have liked advice regarding physical activity during their initial diagnosis and treatment, preferably face-to-face from a physician within a cancer care setting. These results are consistent with a recent report of Taiwanese lung cancer patients [30], although the number expressing a desire for physical activity advice was lower in the current study (62% vs. 85%). Notably, patients in the current study were generally older, had more limited disease, and possessed a greater number of comorbidities than those in the Taiwanese sample. Consistent with previous research on survivors of other cancers, the current study cohort of lung cancer survivors reported a preference for engaging in low or moderate intensity exercise [24, 25, 27, 29], with walking identified as the preferred modality [29, 39].

Approximately half of respondents reported that they would have been willing to take part in an exercise program tailored for lung cancer survivors at some point during their continuum of cancer care. This is lower than reported by Trinh and colleagues in their study of kidney cancer survivors [40]. A preliminary examination of reasons for refusal indicated that of those individuals who were not interested in taking part in a program, approximately one third indicated that they had their own preferred program of physical activity already in place. A further one third reported practical barriers to engagement (e.g. lack of time and difficulty traveling to the cancer center), while one third reported that their health was too compromised before and after their treatment to engage in a program. In the current study, nearly three-quarters of participants indicated that they currently felt capable of engaging in an exercise program. This is similar to findings reported in kidney and ovarian cancer survivor cohorts [26, 40], and marginally higher than research examining the preferences of endometrial and non-Hodgkin lymphoma survivors [27, 39].

A high percentage of participants expressed a desire to receive physical activity advice from their physician (80%) compared to other health professionals (0%) or exercise specialists (overall 13%). This preference for receiving advice from a physician is higher than that reported in previous studies of kidney [40], breast [25], endometrial [39] and mixed-diagnosis [29] cancer survivors, who reported greater preference for receiving physical activity information from fitness experts. These preferences emphasize the prominent role that oncologists play in the promotion of health behaviors among cancer survivors, a role being increasingly recognized by professional organizations [41]. Importantly however, despite this preference, non-physician providers within the cancer care setting may possess greater specific expertise and/or more time to discuss physical activity with patients. This may have important implications in regard to the format and implantation of physical activity services. For example, a physician's recommendation or referral may serve to engage and motivate a patient, such that more extensive information and interventions can be delivered by other health care professionals or exercise specialists. Related to this implementation issue, over 90% of respondents indicated that they preferred information to come from professionals within a cancer care setting, considerably higher than previously reported in other cancer survivor populations [29, 39]. This suggests the importance of integrating physical activity facilities and services within routine post-treatment care of lung cancer survivors.

Participants in the current study also expressed a strong preference for face-to-face delivery of physical activity advice, with only a small number selecting brochures or other forms of printed patient education as an alternative modality. This finding is in line with previous research across a number of survivor populations [24, 25, 29, 39]; however Trinh and colleagues reported kidney cancer survivors to prefer print material [40]. The preference for face-to-face information may be indicative of uncertainty surrounding physical activity after lung cancer treatment, or the desire for individual reinforcement from a health professional with expertise in lung cancer. This finding may also emphasize the challenge of widespread dissemination of interventions to promote behavior change, and that more personal and individually-tailored interactions with thoracic oncology care providers may be viewed as necessary to prompt increased physical activity. These findings possess implications for intervention development and the importance of identifying which health professionals and resources may be available and most effective in promoting physical activity.

Further, the majority of participants indicated that they would have preferred to both receive advice and begin an exercise program before treatment began. In considering these findings, it is important to note that participants were on average 3.6 years from the time of surgical resection of their cancer. Participants retrospectively reported their preferences for physical activity during treatment, and thus their responses may be different to those currently undergoing treatment. For example, the provision of physical activity advice and services prior to treatment, while desirable in retrospect, may not always be feasible. Patients are often managing significant stress associated with diagnosis and multiple health care appointments at this time. It would therefore be important to consider patient preferences regarding discussion of physical activity in relation to other pertinent issues discussed prior to treatment (e.g. surgical risk and follow-up care, long-term prognosis, smoking cessation), along with their ability to retain and implement provider recommendations. While there is growing interest in the potential benefits of physical activity across the cancer continuum [42], the appropriate time at which to address physical activity and health promotion with cancer patients and survivors warrants further consideration.

### **Differences based on demographic and medical characteristics**

A number of potentially instructive differences in physical activity preferences emerged based on demographic and medical characteristics. Females reported a greater level of interest in participating in an exercise program than males, a finding consistent with a previous study of kidney cancer survivors [40]. In addition, compared to individuals over the age of 70, individuals below this age reported a greater preference for receiving physical activity information from a physician, along with a greater preference to exercise at a cancer center. This may reflect the greater mobility of younger patients in being able to travel to a cancer center compared to exercising at home or at a nearby community gym.

Differences also emerged based on level of education and reported income. Analyses examining the impact of participants' income bracket revealed some group differences, with those reporting higher incomes feeling more capable of engaging in a physical activity program and preferring to receive information from a physician. Importantly, these differences emerged despite the relatively high income of the study cohort, with 44% of participants reporting annual incomes above \$90,000. Further, the analysis revealed that those individuals possessing less than or equal to a high school degree reported a preference for physical activity advice from a non-physician within a non-cancer setting.

Finally, individuals reporting a higher level of comorbid disease burden expressed a preference for low intensity physical activity, while sedentary individuals reported feeling less capable of engaging in physical activity compared to those who were insufficiently active or those meeting physical activity recommendations. Recognition of the role of



demographic and medical characteristics in guiding preferences may assist in targeting recruitment for physical activity interventions, as well as identifying and motivating subgroups that are at greater risk of remaining sedentary during and after treatment.

## Limitations

The current study provides important information regarding the physical activity preferences of lung cancer survivors; however these results must be considered in light of study limitations. An individual's preference is an important determinant of health behavior change; however one must recognize its limitations in predicting actual engagement in physical activity programs. Finally, the present study was conducted within a large urban cancer care center. This may have implications for some of the preferences reported by participants (e.g. difficulty traveling to the cancer center may have influenced preferred exercise location) and require consideration when applying these results to a broader population.

Physical activity is an important component of survivorship follow-up care for lung cancer survivors; however few meet current guidelines and there exists a paucity of research regarding patient preferences for advice and engagement in physical activity. The majority of participants in the current study reported a desire for physical activity advice and willingness to take part in physical activity programs, with notable preferences for face-to-face consultations with physicians in the context of a cancer setting. Potentially important differences were also found based on demographic and medical characteristics, which may warrant consideration in the development and dissemination of physical activity interventions for this survivor population.

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**Table 1**

## Lung Cancer Survivors Preferences for Physical Activity Advice (N=175)

<b>Preference variable</b>		
Would you have liked to receive advice about exercise and PA at some point before or after your treatment for lung cancer? (N=172)		
Yes		109 (63%)
No <sup>^</sup>		44 (26%)
Maybe		19 (11%)
Who would you have preferred to receive advice from? (N=126)		
Physician		101 (80%)
<b>Nurse</b>		<b>0 (0%)</b>
Exercise specialist in Cancer Center		14 (11%)
Exercise specialist in a gym		2 (2%)
Cancer patient/survivor		1 (1%)
No preference		8 (6%)
How would you have preferred to receive advice? (N=125)		
Face to face		119 (95%)
Videotape		1 (1%)
Brochure/Pamphlet		5 (4%)
Where would you have preferred to receive advice? (N=125)		
Cancer Center		116 (93%)
Gym/Community Center		3 (2%)
At home		6 (5%)
When would you have preferred to receive advice about exercise and PA? (N=124)		
Before treatment		85 (68%)
Immediately after treatment		28 (23%)
3-6 months post-treatment		9 (7%)
At least 1 year post-treatment		2 (2%)

Valid percentages reported, \*PA Physical Activity,

<sup>^</sup> If participant responded no, remaining questions were skipped

**Table 2****Lung Cancer Survivors Preferences for Physical Activity (N=175)**

<b>Preference variable</b>		
Any time before or after treatment, would you have been interested in taking part in an exercise program tailored to lung cancer survivors? (N=173)		
	Yes	90 (52%)
	No <sup>^</sup>	66 (38%)
	Maybe	17 (10%)
When would you like to start an exercise program? (N=106)		
	Before treatment	63 (60%)
	Immediately after treatment	15 (14%)
	3-6 months post-treatment	14 (13%)
	At least 1 year post-treatment	4 (4%)
	No preference	10 (9%)
What type of exercise would you prefer to do? (N=108)		
	Walking	45 (42%)
	Swimming	10 (9%)
	No preference	20 (19%)
Where would you prefer to exercise? (N=106)		
	At home	21 (20%)
	At a gym	31 (29%)
	Outdoors	10 (9%)
	Cancer center gym	18 (17%)
	No preference	26 (25%)
Would you prefer to exercise alone or with other people? (N=107)		
	Alone	23 (22%)
	Family member	5 (5%)
	One or two people	5 (5%)
	Large group	22 (19%)
	No preference	52 (49%)
Would you like your exercise program to consist of low, moderate or high intensity activities? (N=107)		
	Low	42 (39%)
	Moderate	47 (44%)
	High	4 (4%)
	No preference	14 (13%)
Do you currently feel capable of engaging in an exercise program? (N=172)		
	Yes	126 (74%)
	No	24 (14%)
	Maybe	22 (12%)

Valid percentages reported

<sup>^</sup> If participant responded no, remaining questions were skipped

**Table 3**

## Associations between Patient Preferences and Demographic/Medical Characteristics

Demographic/Medical Variable	Physical Activity Preferences
Age 70 and under vs. Over 70	Prefer information from physicians compared to other providers (93.9% vs. 79.6%, $\chi^2(1) = 5.41, p=.020$ ) Prefer to exercise at a cancer gym/exercise center (35.1% vs. 11.6%, $\chi^2(1) = 6.3, p=.012$ )
Female vs. Male	More interested in taking part in an exercise program (58.7% vs. 40.6%, $\chi^2(1) = 5.29, p=.021$ )
High -School Education vs. Beyond High-School Education	Prefer to receive advice after treatment compared to before treatment (48.6% vs. 25.6%, $\chi^2(1) = 6.14, p=.013$ ) Prefer information from other providers compared to physician (21.9% vs. 8.4%, $\chi^2(1) = 3.9, p=.048$ ) Prefer advice from non-cancer center compared to cancer center (16.7% vs. 4.4%, $\chi^2(1) = 5.26, p=.022$ ) Prefer to exercise in afternoon or evening compared to morning (36.7% vs. 18.2%, $\chi^2(1) = 3.89, p=.049$ ) Prefer walking as type of exercise compared to other exercise (73.3% vs. 42.4%, $\chi^2(1) = 7.65, p=.006$ )
Over 90K vs. 50K to 90K vs. Less than 50K	Feel capable of engaging in an exercise program (85.0% vs. 64.5% vs. 65.2%, $\chi^2(2) = 7.01, p=.030$ ) Prefer information from physician compared to other providers (95.7% vs. 81.8% vs. 75.0%, $\chi^2(2) = 6.87, p=.032$ ) Prefer to exercise at a community gym/exercise center (40.0% vs. 64.7% vs. 20.0%, $\chi^2(2) = 8.54, p=.014$ )
Meeting Guidelines vs. Insufficiently Active vs. Sedentary	Feel capable of engaging in an exercise program (86.0% vs. 80.0%, vs. 64.0%, $\chi^2(2) = 8.37, p=.015$ ) Prefer to receive advice face-to-face rather than by other modes (100.0% vs. 100.0% vs. 90.3%, $\chi^2(2) = 6.50, p=.039$ )
More than 2 comorbid diseases vs. 2 or less comorbid disease	Prefer exercise to consist of low intensity activities compared to moderate or high intensity activities (57.7% vs. 30.2%, $\chi^2(1) = 7.16, p=.007$ )
3-5 years post-treatment vs. 1-2 years post-treatment	Prefer to start an exercise program before treatment compared to after treatment (71.4% vs. 51.4%, $\chi^2(1) = 3.92, p=.048$ )
<b>Obese vs. Non-obese</b>	<b>Prefer to exercise away from the home (100% vs. 69.2%, <math>\chi^2(1) = 4.59, p=.032</math>)</b>