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Correlates of Physical Activity Among Lung Cancer Survivors

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Abstract

Objective—Lung cancer survivors commonly experience impairments in quality of life, which may be improved through regular physical activity. However, little is known regarding correlates of physical activity in this survivor population. The current study addressed this research gap.

Methods—The participants were 175 survivors of early-stage non-small cell lung cancer who completed surgical treatment from one to six years previously. Information regarding medical factors was obtained from chart records and from participant self-report. Participants also answered questions about demographic and social cognitive factors that may be associated with physical activity, which was assessed as reported engagement in moderate/strenuous activities and leisurely walking.

Results—Participants reported an average of 77.7 minutes of moderate/strenuous weekly activity and 64.6% reported engaging in leisurely walking at least three times per week. Less leisurely walking was reported by older individuals ($p = .001$) and those with a lower education level ($p < 0.001$), who also reported less engagement in moderate/strenuous activities ($p = .004$). Individuals with poorer pre-operative pulmonary function reported less moderate/strenuous physical activity ($p = .014$) and the number of surgical complications was inversely associated with leisurely walking ($p = .003$). Multiple social cognitive constructs were associated with moderate/strenuous activity and leisurely walking.

Conclusions—The study identified several lung cancer survivor subgroups who may be most in need of physical activity interventions. Identification of social cognitive correlates of physical activity provides valuable information regarding theory-guided constructs that should be targeted in future physical activity interventions for lung cancer survivors.

Keywords

cancer; oncology; exercise; physical activity; lung cancer; survivors

Cancer survivors may experience improvements in quality of life and physical functioning by engaging in regular physical activity [1-4]. However, consistent with data from non-

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cancer populations, the vast majority of cancer survivors do not meet national guidelines for engaging in regular aerobic activity [5-8]. Physical activity interventions for cancer survivors are likely to be optimally efficacious when they adopt a theory-driven approach and target psychosocial factors that are associated with activity in the relevant survivor population. Identification of demographic and medical correlates of physical activity among cancer survivors provides important information on specific subgroups that are most in need of activity interventions. Several studies have examined correlates of physical activity in diverse cancer survivor groups [9-15] (for a review, see reference [16]). To our knowledge, no prior research has examined correlates of physical activity in lung cancer survivors, which is the focus of the current study.

Lung cancer is the leading cause of U.S. cancer-related deaths and has an overall five-year survival rate of 15.2% [17]. This is largely due to the fact that most patients present with advanced disease. However, the 16% of individuals diagnosed with localized disease have a five-year survival rate of 49.5% [17]. Approximately 80% of lung cancer cases are non-small cell lung cancer (NSCLC). Lung cancer survivors are usually older adults, many of whom have medical comorbidities [18] and have undergone curative surgery involving extensive pulmonary resection. They commonly experience impairments in psychological well-being, physical functioning, and role functioning [19]. Engaging in regular physical activity has the potential to enhance lung cancer survivors' quality of life (QOL), reduce the risk of multiple chronic diseases, and aid management of comorbid conditions [20].

Several different theoretical frameworks have been employed in prior studies of physical activity correlates in cancer survivors [16]. The current study was guided by social cognitive theory [21], which has not been widely utilized in studies of physical activity in cancer survivors, despite its extensive use in physical activity research in other medical and non-medical populations [22]. One advantage of social cognitive theory is its inclusion of a broad array of potential correlates [23], including environmental factors (e.g., availability of recreational facilities) that may influence physical activity. There is equivocal evidence regarding the role that environmental factors play in determining individuals' engagement in physical activity [24,25], but they have not been examined in prior studies of physical activity correlates among cancer survivors. Additional social cognitive correlates that we examined were physical activity self-efficacy (i.e., perceived ability to engage in regular physical activity), outcome expectations (i.e., perceived positive and negative outcomes of engaging in physical activity), perceived barriers, and social support from family and friends, and we hypothesized that each would be associated with physical activity. Further, consistent with the conceptual underpinnings of social cognitive theory [26] and prior empirical findings [27,28], we hypothesized that self-efficacy would mediate the associations of social support and perceived environmental factors with physical activity. We also examined whether demographic and medical factors were associated with physical activity among lung cancer survivors but did not posit specific hypotheses in this regard.

Methods

Participants and Procedure

We used clinical and research databases of thoracic surgery patients at Memorial Sloan-Kettering Cancer Center to identify 514 potentially eligible participants. Eligibility criteria for the study were as follows: diagnosis of primary pathological stage IA or IB NSCLC; underwent surgical resection from one to six years previously; no current evidence of any cancer; and permission from the oncology treating physician to contact the patient. Individuals not found to be ineligible based on a review of electronic medical records were mailed a consent form and letter inviting them to take part in a study of physical activity and inactivity in lung cancer survivors. The letter also encouraged individuals to call us if they

did not wish to be contacted further or if they had any questions. Individuals who had not called us to decline study participation two weeks following receipt of the invitation letter received a phone call from a research assistant inviting their study participation. Individuals who were not reached by phone after several attempts were mailed another invitation letter. Study participants provided informed consent and completed a survey by telephone or mail. Institutional Review Board approval was obtained for this study.

Measures

In addition to the measures listed below, the survey included several measures related to topics beyond the scope of the current study.

Demographics—Participants were asked questions regarding their sex, age, race/ethnicity, education, marital status, and employment status.

Medical characteristics—We extracted information from electronic database records and medical charts to document participants' pathological disease stage, pre-surgical pulmonary function (i.e., forced expiratory volume in the first second; FEV1 % predicted), time since surgical resection, treatment(s) received, extent of surgical resection, length of hospital stay after surgical resection, and presence of post-resection complications. Participants completed questions regarding their current and prior smoking, current height and weight (from which we calculated body mass index [29]), and current comorbid medical conditions [30].

Social cognitive variables—Physical activity self-efficacy was measured using the Barriers Self-Efficacy Scale (BSES) [31], which assesses perceived ability (from 0 = *not at all confident* to 4 = *extremely confident*) to engage in regular physical activity when faced with common physical activity barriers. The BSES has 13 items, to which we added 3 items (lack of energy, lack of time, and health problems) to more fully capture potential activity barriers ($\alpha = .93$). We used the 16-item Exercise Decision Balance Questionnaire (EDBQ) [32] to assess physical activity outcome expectations. The EDBQ includes potential positive and negative outcomes of physical activity and responses were rated on a 5-point Likert-type scale (from 1 = *strongly disagree* to 5 = *strongly agree*). A total score was calculated by subtracting the mean of the negative outcome items ($\alpha = .66$) from the mean of the positive outcome items ($\alpha = .89$). Thus, a higher score represents more positive outcome expectations. Perceived barriers to physical activity were assessed using a 10-item list of barriers [33,34]. Participants rated the extent (from 0 = *not at all* to 4 = *an extreme amount*) to which their level of physical activity is influenced by each barrier ($\alpha = .72$).

The Social Support for Exercise Scale (SSES) [35] was used to assess perceived social support (from 0 = *never* to 4 = *very often*) from family and friends. The SSES includes 13 items that are completed separately with regard to social support from family and friends. We excluded the two negatively-phrased items due to low item-total correlations ($rs \leq |.22|$) and created scale scores by summing across the remaining 11 items for each of the family ($\alpha = .86$) and friends ($\alpha = .89$) scales. We assessed participants' perceptions of environmental factors that may support physical activity using six items drawn from the Environmental Supports for Physical Activity Long Questionnaire [36]. Two items asked about the presence of sidewalks and whether the neighborhood has public recreation facilities. The remaining four items asked how pleasant the neighborhood is as a place to walk, how good the street lighting is for walking at night, how safe from crime the neighborhood is, and how physically active people in the neighborhood are. Consistent with prior research, we examined the association between each environmental support item and physical activity [37].

Physical activity—We used a modified version of the Godin Leisure-Time Exercise Questionnaire (GLTEQ) [38] to assess participants' current engagement in moderate and strenuous intensity physical activities. Participants reported their current weekly frequency and average number of minutes spent engaging in moderate (e.g., brisk walking) and strenuous (e.g., running) leisure-time activities. We calculated the total number of weekly minutes that each participant engaged in moderate and strenuous activities combined. As part of the GLTEQ, participants also completed questions about light intensity activities, which has been shown to minimize over-reporting of higher intensity activities [39], but we did not use those data in the current study. The GLTEQ has good psychometric properties and has demonstrated good convergent validity with other self-report and objective physical activity measures [40]. We used the two-item leisurely walking index from the Yale Physical Activity Survey [41] to assess participants' past month engagement in leisurely walking (defined as walking for at least 10 minutes that is not strenuous enough to cause large increases in breathing, heart rate, or leg fatigue or to cause perspiration). A higher score on the leisurely walking index denotes greater engagement in walking. We focused on walking, as it is an activity commonly reported by older adults [42] and cancer survivors [43], is often the focus of intervention studies for cancer survivors [3], and is associated with multiple health benefits [44,45].

Statistical Analysis

Chi-square tests and independent samples *t* tests were conducted to examine potential demographic and medical differences between study participants and those who declined study participation. We conducted a series of separate multiple linear regression analysis with robust standard errors to examine the association of each type of independent variable (i.e., demographic, medical, or social cognitive) with the moderate/strenuous physical activity and leisurely walking dependent variables. In order to test whether self-efficacy mediated the associations of social support and perceived environmental factors with the physical activity dependent variables, we adapted the mediation methods of Baron and Kenny [46]. As noted by Robins [47] and Pearl [48], identification of mediated effects using the Baron and Kenny approach requires stringent assumptions. Hence we tested the mediation pathways in multiple linear regression models to lessen the assumptions needed for unbiasedness of the results. We used a bootstrap method [49] to estimate whether the attenuation of effects after inclusion of the self-efficacy variable, which would indicate potential mediation, was statistically significant. A cutoff of $p < .05$ was used to determine statistical significance and all statistical analyses were two-sided.

Results

Of the 514 potentially eligible individuals, 191 were found to be ineligible after an initial review of medical records. Thus, 323 individuals were mailed a consent form and invitation letter. Overall, a total of 239 individuals were found to be ineligible, primarily due to current evidence of cancer ($n = 73$), being more than 6 years post surgical resection ($n = 49$), deceased ($n = 31$), or diagnosis of pathological stage II-IV disease ($n = 30$). Of the remaining 275 individuals, 175 provided informed consent and participated in the study (response rate = 63.6%). Reasons for not participating in the study were as follows: passive refusal ($n = 32$), not reachable by phone ($n = 28$), no reason given ($n = 12$), lack of interest ($n = 11$), not wishing to talk about lung cancer ($n = 11$), current medical issues ($n = 5$), unable to recall activity levels ($n = 1$). The survey was completed as a telephone interview by 148 participants and in a mailed paper and pencil format by 27 participants. Individuals completing a mailed survey were less likely to be currently employed ($\chi^2 = 12.65$, $p = .013$), were older ($t = 2.39$, $p = .018$), and reported a lower level of education ($\chi^2 = 9.04$, $p = .029$)

than those completing a telephone interview, but they did not differ with regard to other demographic or any medical characteristics.

Comparison of Study Participants and Individuals Who Declined Participation

Study participants did not differ from individuals who declined study participation with regard to sex, age, pathological stage, pre-operative pulmonary function, time since surgical resection, type of surgical resection, length of hospital stay, or the number of post-resection complications (ts ≤ 1.42, χ^2s ≤ 5.58, ps ≥ .114).

Sample Demographic and Medical Characteristics

The demographic and medical characteristics of the sample are presented in Table 1. The study participants were almost two-thirds female and primarily white and well educated. The most common surgical procedure received was a lobectomy (removal of a single lung lobe) and few individuals reported having non-surgical treatment. The current rate of smoking was very low (5.8%), but 79.8% reported a prior history of smoking.

Prevalence of Physical Activity

On average, participants reported engaging in 77.7 minutes (SD = 115.9) of moderate/strenuous activity per week (for moderate activity, M = 59.8 minutes/week; for strenuous activity, M = 17.9 minutes/week). Half of the participants (51.4%) reported engaging in no weekly moderate/strenuous activity, and 72.6% did not engage in sufficient physical activity to meet national guidelines [8]. Just under two-thirds (64.6%) of participants reported engaging in leisurely walking at least three times per week on average. Around one in five participants (18.3%) reported engaging in no weekly leisurely walking. Among individuals who reported engaging in leisurely walking, more than two-thirds (68.1%) usually walked for a period of 10–30 minutes.

Demographic Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

The results of the multiple linear regression analyses examining demographic correlates of moderate/strenuous physical activity and leisurely walking are shown in Table 2. Older individuals reported engaging in significantly less leisurely walking than younger individuals (p = .001). Education level was associated with both moderate/strenuous physical activity (p = .004) and leisurely walking (p < .001), such that individuals with at least a college education reported engaging in more activity than individuals with less education. None of the other demographic factors were significantly associated with either moderate/strenuous physical activity or leisurely walking.

Medical Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

Table 3 shows the results of the multiple linear regression analyses examining the medical correlates of moderate/strenuous physical activity and leisurely walking. The only medical factor that was significantly associated with moderate/strenuous physical activity was pre-operative pulmonary function. Specifically, individuals with poorer pre-operative pulmonary function reported less engagement in such activity. The association between type of treatment received and moderate/strenuous physical activity approached significance (p = 0.084), such that activity was lower for individuals treated with chemotherapy or radiotherapy as well as surgery. The association for smoking status and moderate/strenuous physical activity also approached significance (p = .099), with current or former smokers reporting less engagement in activity than individuals who never smoked. With regard to leisurely walking, individuals experiencing a greater number of surgical complications reported engaging in less leisurely walking. There was also a marginally significant association (p = 0.098) between body mass index and leisurely walking, with obese

individuals reporting less leisurely walking than normal weight individuals. The association between the number of comorbid medical conditions and leisurely walking approached significance ($p = .104$), such that individuals with more comorbidities reported engaging in less leisurely walking.

Social Cognitive Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

The results of multiple linear regressions examining social cognitive correlates of moderate/strenuous physical activity and leisurely walking are shown in Table 4. The results of the regression analyses excluding self-efficacy as an independent variable are shown in the top portion of the table (labeled “Model 1”). Neither social support nor any of the perceived environmental factors were associated with moderate/strenuous physical activity, which disconfirmed the hypothesized mediational relationships. The bottom portion of Table 4 (labeled “Model 2”) depicts the results of the regression analyses in which self-efficacy was included as an independent variable along with the other social cognitive variables. This regression model explained 38% of the variance in moderate/strenuous physical activity. Physical activity self-efficacy was significantly associated with moderate/strenuous physical activity, such that less activity was reported by individuals with lower self-efficacy. Physical activity outcome expectations were also significantly associated with moderate/strenuous physical activity.

As shown in the top portion of Table 4 (labeled “Model 1”), of the social support and perceived environment variables, only social support from friends was significantly associated with leisurely walking, such that individuals with lower social support reported less leisurely walking. The bottom portion of Table 2 (labeled “Model 2”) shows the results of the regression which included physical activity self-efficacy as an independent variable. This regression model explained 19% of the variance in leisurely walking. Physical activity self-efficacy was significantly associated with leisurely walking, with less walking reported by individuals with lower self-efficacy. The association between leisurely walking and each of outcome expectations ($p = .053$) and social support from friends ($p = .059$) approached significance. Bootstrap-derived inferences suggested that the change in the effect of social support from friends after inclusion of self-efficacy was not statistically significant ($p = 0.494$). Further, in a multiple linear regression of self-efficacy on the remaining social cognitive variables, social support from friends was not significantly associated with self-efficacy ($b = .006$, $p = .454$). Thus, self-efficacy did not mediate the association between social support from friends and leisurely walking.

Discussion

The goal of this study was to identify demographic, medical, and social cognitive correlates of physical activity in a sample of early-stage lung cancer survivors. Individuals with less education reported lower engagement in moderate/strenuous physical activity and leisurely walking. This is consistent with findings from several studies in other cancer survivor populations [10,14], as well as prior research on general adult populations [22]. There are multiple potential explanations for such associations, including lower physical functioning, poorer overall health, and lower awareness of the health benefits of physical activity among individuals with less education [50]. Lung cancer survivors with lower levels of education may be especially in need of interventions to promote physical activity. Older lung cancer survivors may also gain particular benefit from physical activity interventions, as they reported less engagement in leisurely walking. This may in part be due to older individuals' greater likelihood of having comorbid medical conditions that impair mobility [51]. Additionally, individuals having a greater number of surgical complications reported engaging in less leisurely walking. Future research is needed to examine explanations for

this association, such as whether complications were experienced to a greater degree by high-risk patients [52] whose impairments and comorbidities contributed to their lower engagement in physical activity. Similarly, survivors with poorer pre-operative pulmonary function reported less engagement in moderate/strenuous physical activity, as assessed up to six years after surgery. These individuals may have an impaired functional ability to engage in moderate/strenuous physical activities and may benefit from interventions that promote low intensity activities.

With regard to the social cognitive variables, there was little evidence for associations between the perceived environmental factors and either moderate/strenuous physical activity or leisurely walking. Previous research has found inconsistent evidence regarding such associations in general adult populations [24,25]. Although there is limited relevant research in medical populations, there is some evidence linking perceived environmental factors with physical activity among individuals with chronic diseases such as multiple sclerosis [53] and type 2 diabetes [54]. Thus, further examination of potential associations between environmental factors and physical activity is warranted in future studies of physical activity correlates in cancer survivors. These studies may benefit from examination of a broader set of environmental factors and types of activity (e.g., separate walking categories for recreation, transport, and work [55]) than in the current study.

As hypothesized, lower levels of moderate/strenuous physical activity were reported by individuals with less positive physical activity outcome expectations and greater physical activity self-efficacy. This latter finding is consistent with prior research indicating that perceived behavioral control (a construct from the theory of planned behavior that is conceptually similar to self-efficacy) is associated with cancer survivors' physical activity intentions and behaviors [16]. These results suggest that future interventions designed to increase lung cancer survivors' engagement in moderate/strenuous physical activity should focus on increasing individuals' physical activity outcome expectations and physical activity self-efficacy, which may be achieved via discussion of prior positive experiences with physical activity, modeling of vicarious experiences, and the provision of positive encouragement [26]. Together, the social cognitive constructs explained 38% of the variance in moderate/strenuous physical activity, which compares favorably with the 14% to 37% of variance explained in prior studies that have utilized the theory of planned behavior to examine physical activity correlates in other cancer survivor populations [16].

Reported physical activity social support from friends was positively associated with leisurely walking. Self-efficacy did not mediate this association, but was itself positively associated with leisurely walking. The association between outcome expectations and leisurely walking approached significance. Overall, these results indicate that interventions to promote leisurely walking among lung cancer survivors should target self-efficacy and outcome expectations, as well as encouraging individuals to identify one or more friends who can motivate, or join in with, survivors' walking activities. Together, the social cognitive constructs explained 19% of the variance in leisurely walking. This lower explained variance in leisurely walking compared to moderate/strenuous physical activity may in part be due to the fact that the measures of the social cognitive constructs referred to physical activity in general, rather than the specific behavior of leisurely walking.

In separate analyses of data from the current study, we found that individuals reporting lower activity had poorer QOL in several domains (Coups et al., unpublished data). Combining this knowledge with the results presented in this paper, there is a clear need to develop and test theory-driven physical activity interventions for lung cancer survivors. Such interventions should take into account the fact that lung cancer survivors are commonly older adults, many of whom have comorbid medical conditions along with

impairments in multiple QOL domains [56]. Interventions that promote walking may be well tolerated by lung cancer survivors, as it is a safe and commonly practiced activity that older adults can engage in at varying intensities. However, future research is needed to examine lung cancer survivors' preferences with regard to physical activity interventions. The current study focused on lung cancer survivors who completed surgical treatment from one to six years previously. Recent research has documented beneficial effects of immediately pre- or post-operative exercise training or pulmonary rehabilitation on multiple outcomes in lung cancer patients, including cardiorespiratory fitness, functional ability, peak exercise capacity, pulmonary function, and dyspnea [57-61]. Such interventions also have the potential to reduce surgical complications and aid recovery [62,63].

Study Limitations and Strengths

The study findings should be considered in view of several limitations. The sample consisted primarily of well educated, non-Hispanic white individuals, who were surgically treated for early-stage NSCLC. Thus, the results may not extrapolate to lung cancer patient groups with other demographic and medical characteristics. For the majority of participants, surgery consisted of a lobectomy. Future research is needed to further examine whether the extent of surgical resection is associated with subsequent physical activity. The cross-sectional study design did not permit testing of the causal direction of associations between social cognitive constructs and physical activity. Similarly, the mediational relationships examined in this study should be further tested in future longitudinal descriptive and intervention research. Future research on physical activity among lung cancer survivors may also benefit from the combined use of self-report and objective assessments of physical activity, as well as examination of potential reasons for differences in correlates of varying physical activity outcomes such as moderate/strenuous activity and leisurely walking. Strengths of the current study include its focus on an understudied cancer survivor population, a good response rate, and examination of a comprehensive set of demographic, medical, and social cognitive correlates of both moderate/strenuous physical activity and leisurely walking.

Conclusions

This study provides novel, important information regarding the correlates of physical activity in survivors of early-stage NSCLC. The study results highlight several subgroups of lung cancer survivors who may be most in need of physical activity interventions. Further, by identifying multiple social cognitive correlates of physical activity, the current study provides valuable information regarding theory-guided constructs that should be targeted in future physical activity interventions for lung cancer survivors. Such interventions have the potential to enhance lung cancer survivors' QOL and physical functioning.

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Table 1

Sample Demographic and Medical Characteristics (N = 175)

	Sample %	Mean (*SD*)
Sex		
Male	36.6	
Female	63.4	
Missing (*n*)	0	
Age (years)		68.73 (9.62)
39–59	16.6	
60–69	31.4	
70–79	42.9	
80–89	9.1	
Missing (*n*)	0	
Race/ethnicity		
Non-Hispanic white	92.6	
Non-Hispanic black	3.4	
Non-Hispanic Asian/Pacific Islander	2.3	
Non-Hispanic other	0.6	
Hispanic	1.1	
Missing (*n*)	0	
Education		
≤High school graduate	29.9	
Some college	20.1	
College graduate	24.7	
Graduate degree	25.3	
Missing (*n*)	1	
Married/partnered		
No	37.7	
Yes	62.3	
Missing (*n*)	0	
Employment status		
Employed	32.4	
Homemaker	6.4	
Unemployed	3.5	
Retired	53.8	
Unable to work	4.1	
Missing (*n*)	2	
Pathological stage		
IA	69.7	
IB	30.3	
Missing (*n*)	0	
Pre-operative FEV1 (% predicted)		89.66 (19.37)

	Sample %	Mean (*SD*)
40–59%	8.1	
60–79%	18.5	
80–99%	42.8	
100–119%	24.3	
120–139%	6.4	
Missing (*n*)	2	
Time since surgical resection		3.62 (1.23)
1–<2 years	8.0	
2–<3 years	29.7	
3–<4 years	26.3	
4–<5 years	20.0	
5–<6 years	16.0	
Missing (*n*)	0	
Treatment received		
Surgery only	91.4	
Surgery + neoadjuvant chemotherapy	5.7	
Surgery + adjuvant chemotherapy	2.3	
Surgery + adjuvant radiation therapy	0.6	
Missing (*n*)	0	
Extent of surgical resection		
Wedge	8.0	
Segmentectomy	7.4	
Lobectomy	80.0	
Bilobectomy	2.3	
Pneumonectomy	2.3	
Missing (*n*)	0	
Length of hospital stay (days)		7.88 (5.35)
2–5 days	33.1	
6–10 days	48.0	
11–15 days	13.7	
≥16 days	5.1	
Missing (*n*)	0	
Number of surgical complications[a]		0.47 (0.73)
0	65.1	
1	25.1	
2	7.4	
3	2.3	
Missing (*n*)	0	
Current smoking status		
Current smoker	5.8	
Former smoker	79.8	
Never smoker	14.5	

	Sample %	Mean (*SD*)
Missing (*n*)	2	
Current weight status		25.85 (4.45)
Normal weight (BMI <25kg/m^2)	45.9	
Overweight (BMI 25–29.9kg/m^2)	38.2	
Obese (BMI ≥30kg/m^2)	15.9	
Missing (*n*)	5	
Number of current comorbid medical conditions[b]		2.47 (1.64)
0	10.4	
1	19.1	
2	27.2	
3	16.8	
4	15.6	
≥5	11.0	
Missing (*n*)	2	

Note. FEV1 = forced expiratory volume in the first second. BMI = body mass index.

[a]The most prevalent surgical complications were atrial fibrillation (14.9%), prolonged air leak (6.3%), pneumonitis (5.7%), and pneumothorax (4.0%).

[b]Commonly reported comorbidities included having a cataract (39.9%), a prior cancer other than lung cancer (32.4%), osteoarthritis (31.8%), chronic obstructive pulmonary disease (24.9%), osteoporosis (20.8%), asthma (20.8%), and heart disease (13.3%).

Table 2

Results of Multiple Linear Regression Analyses Examining Demographic Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

	Moderate/Strenuous Physical Activity (Model: R^2 = .08, p = .059)		**Leisurely Walking (Model: R^2 = .13, p < .001)**	
	b (95% CI)	*p* Value	*b* (95% CI)	*p* Value
Sex	−14.14 (−55.32, 27.04)	.499	−0.55 (−1.56, 0.47)	.288
Age	−1.72 (−3.96, 0.52)	.131	−0.09 (−0.13, −0.04)	.001
Race/ethnicity	29.40 (−49.51, 108.31)	.463	−0.19 (−1.54, 1.16)	.778
Education level	49.63 (16.26, 83.01)	.004	1.74 (0.82, 2.65)	<.001
Marital status	−32.23 (−75.07, 10.61)	.139	−0.34 (−1.30, 0.62)	.483
Employment status	1.20 (−35.26, 37.67)	.948	−0.06 (−1.19, 1.08)	.921

Note. *b* = unstandardized regression coefficient. Age was entered as a continuous variable. Race/ethnicity was coded as non-Hispanic white vs. other. Education level was coded as less than college graduate vs. college graduate or higher. Employment status was coded as employed vs. not employed.

Table 3

Results of Multiple Linear Regression Analyses Examining Medical Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

	Moderate/Strenuous Physical Activity (Model: R^2 = .12, p = .021)		**Leisurely Walking (Model: R^2 = .13, p = .006)**	
	b (95% CI)	*p* Value	*b* (95% CI)	*p* Value
Pathological stage	−27.96 (−66.89, 10.97)	.158	0.00 (−1.04, 1.04)	.998
Pre-operative pulmonary function	1.17 (0.24, 2.10)	.014	0.01 (−0.01, 0.03)	.408
Time since surgical resection	2.28 (−12.33, 16.89)	.758	0.18 (−0.19, 0.55)	.335
Treatment received	−29.26 (−62.53, 4.01)	.084	−0.49 (−1.70, 0.71)	.419
Extent of surgical resection	−20.22 (−65.35, 24.91)	.377	−0.82 (−2.02, 0.39)	.182
Length of hospital stay	1.97 (−2.12, 6.05)	.343	0.06 (−0.03, 0.15)	.226
Number of surgical complications	−10.88 (−36.54, 14.78)	.404	−1.07 (−1.77, −0.38)	.003
Smoking status	−32.52 (−71.24, 6.21)	.099	−0.51 (−1.71, 0.68)	.397
Normal weights vs. overweight	0.29 (−40.15, 40.72)	.989	−0.65 (−1.71, 0.41)	.229
Normal weight vs. obese	−9.73 (−52.82, 33.37)	.656	−1.04 (−2.28, 0.20)	.098
Number of current comorbid medical conditions	−7.83 (−19.35, 3.69)	.181	−0.25 (−0.54, 0.05)	.104

Note. *b* = unstandardized regression coefficient. Pre-operative pulmonary function assessed using forced expiratory volume in the first second (% predicted). Treatment received was coded as surgery only vs. surgery and other treatment. Extent of surgical resection was coded as wedge or segmentectomy vs. lobectomy, bilobectomy, or pneumonectomy. Smoking status was coded as never smoker vs. current or former smoker.

Table 4

Results of Multiple Linear Regression Analyses Examining Social Cognitive Correlates of Moderate/Strenuous Physical Activity and Leisurely Walking

	Moderate/Strenuous Physical Activity (Model 1: R^2 = .27, p < .001; Model 2: R^2 = .38, p < .001)		**Leisurely Walking (Model 1: R^2 = .14, p = .003; Model 2: R^2 = .19, p < .001)**	
	b (95% CI)	*p* Value	*b* (95% CI)	*p* Value
Model 1 (Excluding Self-Efficacy)				
Outcome expectations	40.18 (28.63, 51.73)	<.001	0.71 (0.29, 1.14)	.001
Perceived barriers	−35.28 (−64.27, −6.28)	.017	−0.40 (−1.32, 0.52)	.395
Social support from family	−0.94 (−2.93, 1.04)	.349	−0.01 (−0.07, 0.05)	.673
Social support from friends	1.66 (−0.71, 4.03)	.168	0.06 (0.00, 0.12)	.034
Presence of sidewalks	13.14 (−26.48, 52.76)	.513	0.39 (−0.73, 1.52)	.492
Presence of recreational facilities	−19.14 (−52.97, 14.69)	.266	−0.90 (−1.97, 0.16)	.096
Neighborhood walkability	−6.98 (−38.32, 24.36)	.661	−0.22 (−1.18, 0.73)	.647
Quality of street lighting	−12.34 (−25.19, 0.52)	.060	−0.20 (−0.62, 0.22)	.357
Neighborhood safety	2.14 (−21.16, 25.45)	.856	−0.23 (−0.91, 0.45)	.505
Activity of people in neighborhood	11.29 (−9.86, 32.43)	.293	0.56 (−0.12, 1.24)	.108
Model 2 (Including Self-Efficacy)				
Outcome expectations	24.18 (12.56, 35.81)	<.001	0.42 (−0.01, 0.84)	.053
Perceived barriers	−18.11 (−42.25, 6.04)	.141	−0.08 (−0.98, 0.82)	.857
Social support from family	−1.04 (−2.89, 0.80)	.266	−0.01 (−0.07, 0.05)	.636
Social support from friends	1.38 (−0.81, 3.57)	.214	0.06 (0.00, 0.11)	.059
Presence of sidewalks	4.55 (−31.45, 40.54)	.803	0.23 (−0.85, 1.32)	.670
Presence of recreational facilities	−7.90 (−40.35, 24.56)	.631	−0.70 (−1.75, 0.35)	.191
Neighborhood walkability	−3.96 (−33.81, 25.89)	.794	−0.17 (−1.12, 0.78)	.731
Quality of street lighting	−11.81 (−23.44, −0.19)	.046	−0.19 (−0.58, 0.21)	.353
Neighborhood safety	0.29 (−21.63, 22.21)	.979	−0.27 (−0.91, 0.38)	.420
Activity of people in neighborhood	−1.66 (−21.82, 18.50)	.871	0.32 (−0.35, 0.99)	.349
Self-efficacy	49.69 (29.05, 70.32)	<.001	0.92 (0.40, 1.43)	.001

Note. *b* = unstandardized regression coefficient. Neighborhood walkability was coded as not at all pleasant, not very pleasant, or somewhat pleasant vs. very pleasant.