

Study title

Exercise levels and preferences on exercise counselling and programming among older cancer survivors: A mixed-methods study

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Abstract

Objectives: To assess exercise levels and exercise counselling /programming preferences among older cancer survivors.

Materials and Methods: A mixed-methods study design was employed. Quantitative instruments on exercise levels, exercise counselling and programming preferences, frailty status, and cancer-related symptoms were administered to 290 post-treatment older cancer survivors aged ≥ 65 . Twelve participants with different exercise levels and different views on exercise counselling and programming were purposively selected to participate in semi-structured interviews.

Results: Overall, 58.3% of participants did not meet the recommended exercise guidelines, and 44.1% were not engaging in any vigorous or moderate exercise. Frail survivors were less likely to meet the guidelines (aOR = 0.194, 95%CI = 0.053, 0.712) compared to their robust counterparts. However, 66.9% and 62.8% of participants expressed a definite or possible interest in receiving exercise counselling and participating in an exercise program, respectively. Particularly, survivors who are male, did not receive chemotherapy, are less educated, and have higher symptom burden were less likely to show interest. Most preferred low-intensity exercise (59.8%) and wanted to start the exercise program after treatment (68.2%), which differs from the literature on general adult survivors. The major trigger to initiate and maintain exercise behaviors was the benefits of exercise and a common barrier to exercising was lack of time.

Conclusion: Most older cancer survivors did not meet the recommended exercise guidelines, but they were open to exercise counselling and programming. Reviewing education on the benefits of exercise is especially important after treatment completion to promote healthy lifestyles.

Keywords: Exercise preferences; exercise counselling; older adults; cancer survivors; exercise

Abbreviations: aORs, adjusted odds ratios; CIs, confidence intervals

Introduction

Due to the combined adverse effects of cancer and aging, older cancer survivors suffer from more frequent frailty, more falls, lower self-rated health, and reduced quality of life than older adults without a history of cancer [1-2]. Interventions that alleviate these effects among post-treatment older cancer survivors are important, and exercise can improve the well-being of this population, including physical function, psychological outcomes, quality of life, and even survival [3-5]. Despite the well-documented benefits, research has consistently found that older cancer survivors are less likely to maintain and improve their exercise levels to meet the recommended guidelines than younger survivors [6].

Exercise counselling (i.e., a discussion process to promote exercise that is tailored to an individual's physical condition and motivation level) and exercise programs can be effective in enhancing exercise levels in cancer survivors in general [7]. However, little research on exercise counselling and programs has specifically focused on older adult populations. Older cancer survivors are more likely than middle-aged survivors to struggle in participating in exercise-related interventions and to have more difficulty adhering to an exercise program, even within confines of a clinical trial [8]. It is possible that the offered exercise counselling and programs do not always meet the preferences of the older cancer survivors [9]. Addressing older survivors' preferences regarding exercise counselling and programming may be important to influence their exercise participation and adherence. Most theories concerning behavior change suggest that enabling people to choose health behavior they like may enhance motivation and even therapeutic outcomes [10].

Previous literature has identified preferences on exercise counselling and programming and their correlates in post-treatment adult cancer survivors, including sociodemographic factors and disease characteristics [11-14]. Although age significantly affected the interest in and preferences on participating in exercise-related interventions [12-14], studies targeting older cancer survivors are scarce. Only one qualitative study of 29 older breast cancer survivors reported that these survivors prefer gentle activities that are tailored to age and cancer-related abilities [15]. More in-depth investigations involving a larger sample of older cancer survivors are needed to provide stronger evidence to design suitable exercise counselling and programs in this population. Also, cancer-related symptoms such as fatigue can affect

exercise adherence in cancer survivors [16, 17]; however, little is known of their role in affecting interest in exercise counselling and programming.

The aims of the study are (i) to report the exercise levels of older cancer survivors, (ii) to assess and explore their exercise counselling and programming preferences, and (iii) to examine the correlates of exercise levels and interest in exercise counselling and programming. The findings will inform researchers and clinicians about recruitment strategies for such programs and the factors to consider when counselling on older cancer survivors' exercise behaviors and designing cancer survivorship exercise programs targeting older adults.

Materials and Methods

Study design

This is a mixed-methods, sequential, explanatory design in two parts: (i) a cross-sectional quantitative study and (ii) a descriptive qualitative study. In the quantitative part, the exercise levels and preferences about exercise counselling and programming of older cancer survivors were examined, whereas the qualitative study sought an in-depth understanding of how and why some participants viewed exercise positively while some had negative views. The recruitment was conducted in an oncology outpatient clinic of a public hospital in Hong Kong from September 2019 to October 2020. Ethical approval was obtained from the Institutional Review Board of The University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW19550).

Participants and Settings

The inclusion criteria were as follows: (i) aged 65 or above; (ii) a confirmed diagnosis of cancer; (iii) completion of primary cancer treatment for at least 3 month prior to recruitment with no evidence of recurrence or occurrence of additional cancers. Participants were excluded from the study if they were unable to communicate in Cantonese or Putonghua (the two main dialects spoken in Hong Kong) or were not competent to provide written informed consent. Due to the lack of related studies in older cancer survivors, the sample size of the quantitative study was based on previous studies with sample mean age close to 60, in which the proportions of participants meeting exercise guidelines and showing interest in exercise counselling/programming were approximately 25% and 75%, respectively [18-20]. To construct a

95% confidence interval for such proportions with a margin of error of 5%, at least 288 participants were needed.

For the qualitative study, participants who completed the quantitative data collection were purposefully selected as a group of representative cases based on their exercise levels, different views on exercise counselling/programming, and major background characteristics (gender and time since last treatment). Sampling continued until data saturation was reached.

Measurement

Exercise levels were measured by the International Physical Activity Questionnaire Short Form (IPAQ-SF) [21]. The total minutes of moderate and vigorous exercise per week were computed to determine whether a participant met the recommended exercise guideline by the American College of Sports Medicine Roundtable (150 min of moderate aerobic exercise or 75 min of vigorous exercise per week) [22].

Preferences about exercise counselling and programming were assessed using the questionnaire designed for cancer survivors by Jones and Corneya [23]. The questionnaire has two parts: five closed-ended questions to assess exercise counselling preferences and 10 items designed to tap the preferred specifics of an exercise program. The questionnaire was translated into Chinese and used with Chinese cancer survivors [19].

Frailty status was assessed using the Fried frailty criteria [24]: slowness; weakness; weight loss; exhaustion [25]; and low activity [21]. The cut-off was based on the Taiwanese population [26]. Participants who fulfilled none of the criteria were considered robust, participants who fulfilled 1 or 2 criteria were considered pre-frail, and participants who fulfilled ≥ 3 criteria were considered frail.

Cancer-related symptoms were measured by the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire. The questionnaire consists of nine symptom scales/items, with higher scores on symptom scales/items representing higher levels of symptom burden [27].

The demographic and disease characteristics of participants were assessed using an investigator-designed questionnaire.

Procedures

Convenience sampling was used to identify survivors who met the eligibility criteria for the quantitative study. When research assistants identified potentially eligible participants at the recruitment site, they explained the study's purpose and procedures. Those who agreed to participate were further screened for eligibility and, if deemed eligible, were asked to give written informed consent. After providing consent, the participants completed the aforementioned questionnaires. Purposive sampling was adopted for participants in the qualitative study. Each selected participant attended an individual semi-structured interview with a researcher with experience in conducting qualitative research over the telephone. Each interview took approximately 20-30 minutes and followed a structured set of open-ended questions to capture information not covered by the preferences survey (e.g., why no interest in an exercise program) (Supplementary Material 1). Interviews were audio-recorded with permission of participants and transcribed verbatim by trained research assistants.

Statistical analysis

Statistical analysis was conducted using SPSS, Version 23.0 (IBM Corp., Armonk, NY, USA) and the level of significance was set at $p < 0.05$. Demographics composition, symptom scores, and preferences of exercise counselling and programming of the sample were presented with descriptive statistics. To determine any correlates of exercise levels and interest in exercise counselling and programming, multiple logistic regression analysis was performed by including potential factors, i.e., gender, education, presence of comorbidity, frailty status, cancer treatment received, months since treatment completion, and symptom scores [11-14, 16-17], as independent variables. Whether the participant met the recommended exercise guidelines was further included as an independent variable in the models regarding interest in exercise counselling and programming. The results are expressed as adjusted odds ratios (aORs) accompanied by 95% confidence intervals (CIs). Participants with missing data were excluded from the corresponding models.

For qualitative analysis, the transcripts were analyzed independently by two trained researchers. Meaningful words and phrases were located and classified into categories. Similar categories were merged to form themes. The categories and themes were then critically reviewed. Any disagreement was discussed,

and revisions were made as appropriate. The findings were presented as descriptive summaries supported by quotes from the raw data.

Results

Quantitative findings

Background characteristics and exercise levels

To summarize, 567 survivors were approached, of whom 290 consented and completed questionnaires (response rate = 51.1%). The major reasons for non-participation were lack of interest in research and lack of time to complete questionnaires. The mean age was 70.11 (SD = 4.79; range=65-94) (Table 1). In the sample, breast cancer was the most prevalent type of cancer (39.7%), while other major cancer types included lung, colorectal, and prostate cancer. Survivors had completed cancer treatment for approximately 69 months (SD = 78) on average. The prevalence of pre-frailty and frailty in the sample were 74.5% and 9.3% respectively. The mean scores of each symptom scale/item were all below 25, with the most severe symptoms being insomnia (22.18 SD = 29.77), fatigue (15.71 SD = 20.30), and pain (14.54 SD = 19.76). Overall, 58.3% of participants did not meet the recommended exercise guidelines, and 44.1% were not engaging in any vigorous or moderate exercise (Table 2).

Preferences on exercise counselling and programming

Table 3 shows the details of the exercise counselling and programming preferences of participants. Overall, 50.7% and 16.2% of participants expressed a definite or possible preference to receive exercise counselling during their cancer experience, respectively, while 33.1% did not. Most participants expressed no preference on who provided exercise counselling (31.7%). Most survivors preferred to receive exercise counselling after treatment (67.6%). Specifically, most participants favored at least 1 year after treatment (29%), particularly those not meeting recommended exercise guidelines (35.5%). A similar proportion of survivors said they would prefer the counselling to take place at a cancer center (36.2%) or home (33.8%). Face to face was the preferred way to conduct exercise counselling (77.9%).

Just 42.8% expressed a definite interest in engaging in an exercise program, 20% may be interested, and 46.6% believed that they could participate in such a program. Around one third of survivors preferred to exercise alone, while 42.1% had no preference. Most survivors preferred to exercise outdoor (39.0%) and in the early morning or morning (60%). Those not meeting the exercise guidelines were more

likely to prefer to start an exercise program at least 1 year after treatment than those meeting the exercise guidelines (39.6% vs. 24.8%). Additionally, most survivors preferred walking (61%), a flexible exercise program structure (63.1%), recreational activities (99.3%), supervised exercise (70.3%), and the same activity each time they exercised (69.3%). Those not meeting the exercise guidelines tended to favor low-intensity exercise more (59.8%) and moderate-intensity exercise less (26%), while there was a similar preference for low-intensity (41.3%) and moderate exercise (42.1%) for those meeting the exercise guidelines.

Correlates of exercise levels and interest in exercise counselling and programming

As Table 4 shows, frail survivors were less likely to meet the recommended exercise guidelines (aOR = 0.194, 95%CI = 0.053, 0.712), while those with higher pain levels were more likely to meet the exercise guidelines (aOR = 1.017, 95%CI = 1.002, 1.033). Preferring to receive exercise counselling was positively associated with secondary education or above (aOR = 2.316, 95%CI = 1.293, 4.146), prior treatment with chemotherapy (aOR = 1.909, 95%CI = 1.073, 3.396), and levels of fatigue (aOR = 1.023, 95%CI = 1.004, 1.042), but negatively associated with levels of dyspnea (aOR = 0.982, 95%CI = 0.964, 1.000). Additionally, interest in an exercise program was positively associated with being female (aOR = 2.106, 95%CI = 1.147, 3.867), secondary education or above (aOR = 2.797, 95%CI = 1.517, 5.155), and receipt of chemotherapy (aOR = 2.148, 95%CI = 1.178, 3.917), but negatively associated with levels of nausea and vomiting (aOR = 0.929, 95%CI = 0.867, 0.996) and constipation (aOR = 0.983, 95%CI = 0.967, 0.999).

Qualitative findings

Five themes were identified from the analysis of the interviews with 12 participants. Interviewees' characteristics and more detailed quotes are in Supplementary Material 2 and 3 respectively:

Theme 1: Reasons for exercising regularly

Among those who exercise regularly, the main reasons were to maintain health and because they enjoy the benefits of exercise. Most participants started exercising after retiring and some started exercising after cancer diagnosis.

I realized that my blood pressure is calmer and (the number) looks better after exercise. (#082)

I started chemo infusions after surgery and felt so uncomfortable after the infusion. But after running in the park and showering after getting home, (I felt) great and very energetic. (#205)

Theme 2: Reasons for not exercising regularly

Lack of time due to work or caregiving was the principal reason for abandoning or not taking up physical exercise. Other reasons included physical symptoms (such as drooling, lower limb pain, fatigue) and laziness.

Because I wake up at 4 am to cook and leave for work at 5 am. Sometimes when I come home from work, I have to do chores. I have to take care of my husband too, who is over 80 years old. (#008)

I don't know why, but I don't have much interest in exercise. Plus, I am looking after my mom right now. I don't have the time to join. Everyone knows exercising is good, but ... it's all laziness. Also, sometimes when (I) walk for a long time, my feet hurt. (#165)

Theme 3: Favorable exercise modalities

Walking was the favorable exercise modality for most interviewees because it was convenient, can be done anywhere any time, and allows self-adjustment of the intensity. Also, it is suitable for individuals with physical limitations. Another popular option was qigong, such as Tai Chi or badjwanjin.

It's convenient because of the flexibility (walking). (#110)

Now I walk for an hour daily, (I am) doing well now, the shortness of breath is gone. (#171)

Theme 4: Previous experience of exercise counselling/programs

Physiotherapists and nurses provided more detailed exercise advice and coaching related to stretching, with some survivors still doing the stretching as advised, yet some did not follow any instructions.

I have done physiotherapy, (the therapist) asked me to do this and do that. I got too lazy to do it after three times. (#165)

Some participated in exercise programs offered by community centers for the older adults and a diabetes unit in the hospital. Programs that teach home-based exercise may result in more long term adherence.

I found out I have diabetes at that outpatient clinic, and they recommended a program that lasted four weeks.... The lesson consisted of exercise components training different muscles over the period of an hour. (#110)

Theme 5: Perspectives on exercise counselling/programming

Among those who exercised regularly, some participants did not want exercise counselling/programming because they were satisfied with their exercise pattern, while others did. Some physically inactive participants were interested in exercise counselling through brochures/websites but not an exercise program due to lack of time, while one was interested in both exercise counselling and programs because she lacked motivation to exercise herself .

I don't want the limitations. I do whatever I like. I want to make my own choices. (#023)

The physically active ones would like to learn exercise that is more skillful, such as Tai Chi, while the physically inactive would like to learn home-based exercise that can be integrated with their routine.

As long as it's not monotonous or too basic like moving your arms and legs like elementary or kindergarten students. (#082)

It can be something you can incorporate into daily life, like when doing chores. (#208)

Discussion

More than half of older cancer survivors did not meet the recommended exercise guidelines, while most participants expressed a definite or possible interest in receiving exercise counselling and participating in an exercise program. The literature suggests that exercise participation rates declined with age in general populations and cancer survivors [28]. In the present study, the observed rates are relatively lower than those of young and middle-aged adult cancer survivors (ranging from 75% to 87%) [13, 18, 19, 29]. However, a significant proportion of older cancer survivors is interested in being counselled on exercise behavior and participating in exercise programs. This forms a strong basis for providing exercise counselling services and exercise programs as part of standard post-cancer treatment survivorship care in older adults.

Findings on the preferences of exercise counselling and programming among older survivors that are different from those in studies involving general adult survivors were identified from the quantitative part of this study. First, most older participants preferred to receive exercise counselling and start an

exercise program at least 1 year after treatment. In other studies of adult survivors, most preferred exercise programs before [20], right after, or 3-6 months after treatment [13, 19, 29]. This difference may be attributed to the longer lasting impact of cancer treatment on older cancer survivors [30], or lower motivation to exercise among older adults. However, the period post active treatment is considered a teachable moment, the time period following a health-related life-changing event in which a patient is most receptive to lifestyle changes [31]. Also, there is abundant evidence supporting the benefits of exercise on reducing cancer recurrence and mortality [32]. In the qualitative analysis, the major motivating factor for habitual exercise was getting to know and feel the benefits of exercise. Therefore, education on the benefits of exercise is needed to encourage survivors to start exercise as early as possible after treatment completion. On the other hand, exercise has been considered as a fundamental intervention of cancer prehabilitation – a process on the continuum of care that occurs before starting acute treatment aimed at preventing or reducing the severity of anticipated treatment-related impairments that may cause significant disability [33-35]. It represents an opportunity to decrease morbidity, improve physical and psychological health outcomes, increase available treatment options, and decrease hospital stay and/or readmissions. Despite the observed patient preference for starting exercise after treatment completion, patient education on exercise should indeed begin at the time of cancer diagnosis and be reemphasized post-treatment so that patients at different points of cancer journey are fully informed of benefits of exercise and make their own choices in making behavior change. Second, most participants in this study preferred low intensity exercise, while most participants in other studies preferred moderate intensity [13, 18-20]. Although moderate-intensity or vigorous exertion has greater benefits than low-intensity exercise for cancer survivors [36], low-intensity exercise can also improve physical and cognitive health for older adults [37], and it may be more appropriate when considering factors such as fall risk, safety, and compliance [37].

This preferences study serves as an important addition to the literature also because such data in Asian or Chinese populations are scarce. A systematic review included forty-one observational studies on exercise preferences of cancer patients [11], in which only one study was conducted in Taiwan [19], while the remaining studies were conducted in United States, Canada, or Australia. Although methodological differences should be taken into account, whether the findings have remarkable differences between Chinese and Western populations is worth exploration. Most preferences in our sample are in line with

those in Western populations, including preference for exercising alone and in the morning, starting an exercise program after treatment, and walking as the most favorite exercise modality. A major difference is that most Western findings indicated that participants preferred to exercise at home [11], while majority of participants in the present study and the study conducted in Taiwan [19] preferred to exercise outdoors. Such difference is potentially attributed to the variations in infrastructure in Chinese and Western countries such as transportation and house size. More variations in preferences across cultural groups are yet to be uncovered using standardized methodological designs to inform tailored exercise interventions.

Some factors can affect exercise levels and interest in exercise counselling and programming, which can inform future planning and recruitment. First, frail survivors were less likely to meet exercise guidelines. This is reasonable because frail survivors have limited mobility and strength. Indeed, this group is very likely to benefit from exercise, because research has consistently suggested that frailty is reversible and that exercise is a critical component in its treatment [38]. Second, more education and female gender had positive associations with interest in an exercise counselling and exercise program, as in some previous studies [13, 20, 29]. This suggests that conventional recruitment strategies for exercise interventions may disproportionately attract better-educated and female cancer survivors. Third, prior treatment with chemotherapy was associated with wanting exercise counselling and programs in the present study, while in past studies findings were mixed [18, 29]. More exploratory research is needed to uncover how cancer treatment types may affect the preferences and attitudes towards exercise of cancer survivors. Interestingly, those with higher levels of fatigue were more likely to be interested in exercise counselling. Another study also found most cancer survivors were experiencing fatigue, yet more than half expressed an interest in taking part in exercise [39]. However, fatigue has been found to be a predictor of poor exercise adherence and maintenance among cancer survivors [16, 17, 40]. This may mark a disconnect between interest in exercise and actual exercise behavior. More research is needed to identify strategies to translate interest and awareness into action among survivors with fatigue.

Strengths and limitations

This is the first study to assess exercise levels along with preferences about exercise counselling and programming among older cancer survivors. A mixed-methods approach was used to enhance the breadth and depth of the data collected. The study has several limitations. First, it used a convenience

sample of older cancer survivors recruited from one hospital. So, the generalizability of the findings to the wider cancer population is limited. Although our findings are potentially transferrable to other Chinese populations, the transferability may be limited to cities with similar stage of development as Hong Kong, as literature has demonstrated that places with different stage of development may have different built environment (such as residential density, access to open spaces, and transportation infrastructure), hence contributing to differences in exercise habits [41, 42]. Second, the interest in exercise counselling/programming might be overestimated, because participants who have a more positive attitude about exercise are more likely to consent to the study. Third, the data on exercise levels were self-reported. It may be a norm to express interest in exercise, and participants may tend to overstate their exercise levels because of the focus on health in society. So, the findings may be subject to self-selection bias and socially motivated responder bias. Fourth, the study was conducted among post-treatment cancer survivors, which may have affected their preferences in timing of receiving exercise counselling and starting an exercise program. Lastly, part of the sample was recruited after COVID-19 began. The findings on exercise levels and preferences (such as face-to-face vs remote exercise counselling, venue of exercise programs) might have been influenced by the pandemic. However, the extent of influence was not certain because recruitment was conducted in the time periods where daily local COVID-19 infections were in single digits or zero (i.e., Jun 2020 – early Jul 2020, Sept 2020 – mid Nov 2020) to ensure staff and participants' safety. Future studies on the specific impact of pandemics and social distancing on exercise levels and preferences in older cancer survivors are needed.

Conclusions

In summary, while fewer than half the participants met the recommended exercise guidelines, most older cancer survivors expressed a definite or possible interest in receiving exercise counselling and participating in an exercise program. Offering face-to-face exercise counselling to older cancer survivors and providing subsequent home-based support is recommended to balance survivors' preferences and practicability. To optimize the teachable moment, cancer survivors during the transition from active cancer treatment into survivorship should be educated about their increased health risks and the benefits of exercise. Training exercise specialists to provide exercise counselling could be included in care with minimal expense. Because there are mixed responses to preferences of exercise programming, the most

appropriate recommendation would be to offer an outdoor walking program starting at low intensity, and gradually increasing to moderate intensity under supervision as tolerated by the survivors. Finally, special emphasis should go on recruiting men and those who have lower education levels, have not had chemotherapy, or suffer from higher symptom burden into exercise trials, as they may be less interested in participating. Assisting frail survivors and those with other duties to form specific feasible plans of how, when, and where to exercise may help to increase their confidence to take up exercise habits.

Authors' contributions

All authors contributed to the study conception and design. Material preparation and data acquisition were performed by Denise Shuk Ting Cheung and Naomi Takemura. Analysis was performed by Denise Shuk Ting Cheung, Naomi Takemura, Pui Hing Chau, Alina Yee Man Ng, and Xinyi Xu. The first draft of the manuscript was written by Denise Shuk Ting Cheung and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Declaration of Competing Interest

The authors declare that there is no conflict of interests.

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Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration

and its later amendments or comparable ethical standards. The study was approved by the Institutional Review Board of The University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW19550).

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Table 1. Participant characteristics

Variables	Number (%)
Age, mean (SD), years ^a	70.11 (4.79)
Female ^a	186 (64.1%)
Marital status ^a	
Married or cohabiting	225 (77.6%)
Single or divorced or widowed	65 (22.4%)
Education ^a	
Primary or none	96 (33.1%)
Secondary or above	194(66.9%)
Presence of comorbidity ^a	
Yes	207 (71.4%)
No	83 (28.6%)
Type of cancer	
Colorectal	57 (19.7%)
Lung	13 (4.5%)
Breast	115 (39.7%)
Prostate	45 (15.5%)
Other ^b	59 (20.3%)
Missing	1 (0.3%)
Stage of cancer ^a	
I/II	140 (48.3%)
III/IV	75 (25.9%)
Not sure	75 (25.9%)
Treatment received	
Surgery only	81 (27.9%)
Chemotherapy with or without surgery	51 (17.6%)

Chemotherapy and radiotherapy with or without surgery	71 (24.5%)
Radiotherapy with or without surgery	75 (25.9%)
Other	8 (2.8%)
Missing	4 (1.4%)
Time since treatment completion, mean (SD), months ^a	68.81 (77.50)
Smoking behavior ^a	
Yes	9 (3.1%)
No	281 (96.9%)
Drinking behavior ^a	
Yes	25 (8.6%)
No	265 (91.4%)
Frailty status ^a	
Robust	47 (16.2%)
Pre-frail	216 (74.5%)
Frail	27 (9.3%)
Symptom subscales/items ^a	
Fatigue, mean(SD)	15.71 (20.30)
Nausea and vomiting, mean(SD)	0.98 (4.38)
Pain, mean(SD)	14.54 (19.76)
Dyspnea, mean(SD)	6.44 (15.59)
Insomnia, mean(SD)	22.18 (29.77)
Appetite loss, mean(SD)	4.37 (14.01)
Constipation, mean(SD)	8.16 (18.97)
Diarrhea, mean(SD)	3.68 (12.16)
Financial difficulties, mean(SD)	3.22 (12.60)

^a No missing data

^b Other: Liver, stomach, thyroid, laryngeal, cervical, lymphoma, esophageal, bladder, kidney

Table 2. Exercise levels of participants

Exercise behaviors	Number (%)
Engaged in vigorous exercise^a	
No	243 (83.8%)
Yes	47 (16.2%)
Average days a week, mean(SD)	0.74(1.98)
Average duration of exercise each time, mean(SD), minutes	9.72(28.64)
Engaged in moderate exercise^a	
No	152 (52.4%)
Yes	138 (47.6%)
Average days a week, mean(SD)	2.43(3.01)
Average duration of exercise each time, mean(SD), minutes	35.14(57.6)
Not meeting the recommended exercise guidelines^{a,b}	169 (58.3%)
Did not engage in any moderate and vigorous exercise^a	128 (44.1%)

^a No missing data

^b 150 min of moderate aerobic exercise or 75 min of vigorous exercise per week.

Table 3. Exercise counselling and programming preferences

	Total (n=290)	Meeting recommended exercise levels (n=121)	Not meeting recommended exercise levels (n=169)	p-value ^b
Exercise counselling preferences				
Would you prefer to receive exercise counselling? ^a				0.388
Yes	147 (50.7%)	67(55.4%)	80(47.3%)	
No	96 (33.1%)	37(30.6%)	59(34.9%)	
Maybe	47 (16.2%)	17(14%)	30(17.8%)	
From whom would you prefer to receive exercise counselling?				0.076
Oncologist	83 (28.6%)	28(23.1%)	55(32.5%)	
Nurse	29 (10%)	15(12.4%)	14(8.3%)	
Exercise specialist affiliated with a cancer center	52 (17.9%)	25(20.7%)	27(16%)	
Exercise specialist affiliated with a community center	27 (9.3%)	6(5%)	21(12.4%)	
Another cancer patient/survivor	2 (0.7%)	1(0.8%)	1(0.6%)	
No preference	92 (31.7 %)	45(37.2%)	47(27.8%)	
Missing	5 (1.7%)	1 (0.8%)	4 (2.4%)	
When would you prefer to receive exercise counselling?				0.009
Before treatment	47 (16.2%)	29(24%)	18(10.7%)	
During treatment	42(14.5%)	20(16.5%)	22(13%)	
Immediately after treatment	53 (18.3%)	22(18.2%)	31(18.3%)	
3-6 months after treatment	59 (20.3%)	25(20.7%)	34(20.1%)	
At least 1 year after treatment	84 (29%)	24(19.8%)	60(35.5%)	
Missing	5 (1.7%)	1 (0.8%)	4 (2.4%)	
Where would you prefer to receive exercise counselling?				0.311
Cancer center	105 (36.2%)	43 (35.5%)	62(36.7%)	
Community center	80 (27.6%)	31(25.6%)	49(29 %)	
Home	98 (33.8%)	46(38%)	52(30.8%)	
Missing	7 (2.4%)	1 (0.8%)	6 (3.6%)	
How would you most prefer to receive exercise counselling?				0.530
Face to face	226 (77.9%)	97(80.2%)	129(76.3%)	
By telephone	32 (11%)	14(11.6%)	18(10.7%)	
Videotape	5 (1.7%)	3(2.5%)	2(1.2%)	
Brochure/ pamphlet	12 (4.1%)	4(3.3%)	8(4.7%)	
Over the internet	10 (3.4%)	2(1.7%)	8(4.7%)	
Missing	5 (1.7%)	1 (0.8%)	4 (2.4%)	
Exercise programming preferences				
Would you be interested in an exercise program? ^a				0.774
Yes	124 (42.8%)	49(40.5%)	75(44.4%)	

No	108 (37.2%)	46(38%)	62(36.7%)	
Maybe	58 (20.0%)	26(21.5%)	32(18.9%)	
Are you able to participate in an exercise program?				0.704
Yes	135 (46.6%)	56(46.3%)	79(46.7%)	
No	92 (31.7%)	38(31.4%)	54(32%)	
Maybe	62 (21.4%)	26(21.5%)	36(21.3%)	
Missing	1 (0.3%)	1 (0.8%)	0(0%)	
Most preferred exercise company ^a				0.716
Alone	96 (33.1%)	39(32.2%)	57(33.7%)	
With 1-2 cancer survivors	8 (2.8%)	2(1.7%)	6(3.6%)	
With 1-2 non-cancer survivors	33 (11.4%)	15(12.4%)	18(10.7%)	
With a group of cancer survivors	22 (7.6%)	9(7.4%)	13(7.7%)	
With a group of non-cancer survivors	9 (3.1%)	2(1.7%)	7(4.1%)	
No preference	122 (42.1%)	54(44.6%)	68(40.2%)	
Where would you prefer to exercise?				0.042
At home	44 (15.2%)	15(12.4%)	29(17.2%)	
At a community exercise center	53 (18.3%)	19(15.7%)	34(20.1%)	
Outdoors	113 (39.0%)	60(49.6%)	53(31.4%)	
No preference	77 (26.6%)	26(21.5%)	51(30.2%)	
Missing	3 (1.0%)	1 (0.8%)	2 (1.2%)	
What time of day would you prefer to exercise?				0.063
Early morning	88 (30.3%)	47(38.8%)	41(24.3%)	
Morning	86 (29.7%)	29(24%)	57(33.7%)	
Noon	12 (4.1%)	6(5%)	6(3.6%)	
Afternoon	21 (7.2%)	9(7.4%)	12(7.1%)	
Evening	18 (6.2%)	4(3.3%)	14(8.3%)	
No preference	64 (22.1%)	25(20.7%)	39(23.1%)	
Missing	1 (0.3%)	1 (0.8%)	0	
What type of exercise would you most prefer to do? ^a				0.269
Walking	177 (61.0%)	70(57.9%)	107(63.3%)	
Dance	12 (4.1%)	6(5%)	6(3.6%)	
Swimming	15 (5.2%)	8(6.6%)	7(4.1%)	
Cycling	9 (3.1%)	4(3.3%)	5(3%)	
Jogging	6 (2.1%)	4(3.3%)	2(1.2%)	
Ball sports	6 (2.1%)	2(1.7%)	4(2.4%)	
Weight training	2 (0.7%)	1(0.8%)	1(0.6%)	
Qigong	22 (7.6%)	5(4.1%)	17(10.1%)	
Setting-up exercise	19 (6.6%)	7(5.8%)	12(7.1%)	
Other	22 (7.6%)	14(11.6%)	8(4.7%)	
When would you prefer to start an exercise program?				0.054
Before treatment	70 (24.1%)	36(29.8%)	34(20.1%)	
During treatment	22 (7.6%)	13(10.7%)	9(5.3%)	
Immediately after treatment	46 (15.9%)	20(16.5%)	26(15.4%)	
3-6 months after treatment	54 (18.6%)	22(18.2%)	32(18.9%)	
At least 1 year after treatment	97 (33.4%)	30(24.8%)	67(39.6%)	
Missing	1 (0.3%)	0(0%)	1 (0.6%)	

What type of activity would you like to perform? ^a				0.582
Same each time	201 (69.3%)	86(71.1%)	115(68%)	
Different each time	89 (30.7%)	35(28.9%)	54(32%)	
How would you prefer to perform these exercises? ^a				0.063
Supervised	204 (70.3%)	78(64.5%)	126(74.6%)	
Unsupervised	86 (29.7%)	43(35.5%)	43(25.4%)	
How would you prefer the structure of your exercise program to be? ^a				0.930
Spontaneous/flexible	183 (63.1%)	76(62.8%)	107(63.3%)	
Scheduled	107 (36.9%)	45(37.2%)	62(36.7%)	
What type of activities would you prefer? ^a				0.812
Recreational	288 (99.3%)	120(99.2%)	168(99.4%)	
Competitive	2 (0.7%)	1(0.8%)	1(0.6%)	
What intensity would you prefer your exercise program to be? ^a				0.008
Low	151 (52.1%)	50(41.3%)	101(59.8%)	
Moderate	95 (32.8%)	51(42.1%)	44(26%)	
High	6 (2.1%)	4(3.3%)	2(1.2%)	
No preference	38 (13.1%)	16(13.2%)	22(13%)	

^a No missing data

^b Obtained by chi-square tests examining the difference in exercise counselling and programming preference items between those meeting and not meeting the recommended exercise levels.

Table 4. Correlates of exercise levels and interest in exercise counselling and programming

Outcomes	Adjusted odds ratio (95% CI)	p-value
Meet the exercise guidelines		
Female (vs. Male)	0.726 (0.411, 1.284)	0.271
Secondary education or above (vs. Primary education or below)	0.956 (0.547, 1.673)	0.876
Pre frail (vs. Robust)	0.551 (0.276, 1.100)	0.091
Frail (vs. Robust)	0.194 (0.053, 0.712)	0.013
Received chemotherapy (vs. Did not receive chemotherapy)	1.011 (0.596, 1.716)	0.968
Time since completion of treatment (months)	0.998 (0.995, 1.002)	0.351
Fatigue	0.992 (0.975, 1.009)	0.349
Nausea and vomiting	1.009 (0.946, 1.077)	0.779
Pain	1.017 (1.002, 1.033)	0.031
Dyspnoea	0.982 (0.963, 1.002)	0.076
Insomnia	0.998 (0.988, 1.008)	0.657
Appetite loss	1.000 (0.981, 1.019)	0.987
Constipation	0.994 (0.979, 1.009)	0.400
Diarrhoea	1.000 (0.978, 1.023)	0.992
Financial difficulties	1.022 (1.000, 1.045)	0.051
Comorbidity	1.053 (0.585, 1.896)	0.863
Prefer to receive exercise counselling		
Female (vs. Male)	1.294 (0.713, 2.349)	0.397
Secondary education or above (vs. Primary education or below)	2.316 (1.293, 4.146)	0.005
Pre frail (vs. Robust)	0.779 (0.356, 1.707)	0.533
Frail (vs. Robust)	0.408 (0.122, 1.369)	0.147
Received chemotherapy (vs. Did not receive chemotherapy)	1.909 (1.073, 3.396)	0.028
Time since completion of treatment (months)	1.000 (0.996, 1.004)	0.988
Fatigue	1.023 (1.004, 1.042)	0.017
Nausea and vomiting	0.991 (0.927, 1.060)	0.794
Pain	1.001 (0.986, 1.017)	0.858
Dyspnoea	0.982 (0.964, 1.000)	0.048
Insomnia	0.999 (0.989, 1.009)	0.822
Appetite loss	1.004 (0.983, 1.027)	0.694
Constipation	0.989 (0.974, 1.004)	0.152

Diarrhoea	1.007 (0.983, 1.032)	0.551
Financial difficulties	0.984 (0.962, 1.006)	0.144
Active (vs. Inactive)	1.300 (0.735, 2.297)	0.367
Comorbidity	1.300 (0.705, 2.394)	0.401
Interested in an exercise program		
Female (vs. Male)	2.106 (1.147, 3.867)	0.016
Secondary education or above (vs. Primary education or below)	2.797 (1.517, 5.155)	0.001
Pre frail (vs. Robust)	1.030 (0.487, 2.178)	0.939
Frail (vs. Robust)	1.794 (0.471, 6.828)	0.391
Received chemotherapy (vs. Did not receive chemotherapy)	2.148 (1.178, 3.917)	0.013
Time since completion of treatment (months)	0.997 (0.993, 1.000)	0.086
Fatigue	1.018 (0.998, 1.038)	0.079
Nausea and vomiting	0.929 (0.867, 0.996)	0.037
Pain	1.014 (0.996, 1.032)	0.120
Dyspnoea	0.985 (0.966, 1.004)	0.131
Insomnia	1.011 (1.000, 1.023)	0.056
Appetite loss	1.013 (0.989, 1.038)	0.286
Constipation	0.983 (0.967, 0.999)	0.038
Diarrhoea	1.025 (0.998, 1.052)	0.067
Financial difficulties	0.975 (0.950, 1.001)	0.055
Active (vs. Inactive)	0.923 (0.517, 1.648)	0.787
Comorbidity	1.874 (0.994, 3.533)	0.052

Note: A total of 274 cases were included in the models after excluding cases with missing data.