

Assessment of Physical Activities of Older Midwestern Breast Cancer Survivors using Community Healthy Activities Model Program for Seniors (CHAMPS)

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Abstract

Aims: This study applied the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire to describe lifestyle physical activities among older community-dwelling breast cancer survivors (BCSs) living in a medium-sized Midwestern city in the United States.

Methods: BCS participants completed the CHAMPS at baseline ($n = 146$) and 12-month follow-up ($n = 67$). Generalized linear mixed-effects models, logistic regression, and Wilcoxon signed-rank tests were used to analyze the quantitative data. Qualitative responses were categorized and quantified using frequencies.

Results: A total of 247 responses to CHAMPS survey were received from participants ($n = 146$) who averaged 67 years of age and 10 years post-surgery. About 84% of respondents reported at least some moderate-intensive exercise in the past week for a median of 4 h. For a participant 10 years younger than another, the odds of having at least some moderate and intensive exercise were doubled (odds ratio [OR] = 2.01, $P = 0.00$) in hours and 89% higher (OR = 1.89, $P = 0.00$) in caloric expenditure. No statistically significant differences were found between the annual surveys in exercise caloric expenditures. Additional activities, including farm work, woodworking/carpentry, construction activities, and caring for grandchildren, were reported. Item missing rate was only 1.05%.

Conclusion: CHAMPS is useful in measuring the lifestyle physical activities among Midwestern older BCS. Further analysis of the constructs of the demographic relevant activities is necessary for optimizing the use of the tool among the aging Midwestern population.

Keywords: Cancer survivorship, community health, older adult, exercise, lifestyle medicine

INTRODUCTION

Breast cancer is the most common cancer diagnosis among women in the United States (U.S.), with an estimated 3.8 million survivors.^[1] Breast cancer, like many other cancers, is primarily

diagnosed among older adults. Over 64% of survivors are 65 years and older, becoming the fastest-growing segment of the breast cancer population.^[2] Physical activity and exercise play a critical role in body weight control and improving function and quality of life for people undergoing cancer treatment,^[2,3] as well as reducing the risk of cancer recurrence or new cancers.^[4] Physical inactivity and sedentary lifestyle are associated with poorer health outcomes, such as cardiovascular, musculoskeletal, and mental health disorders.^[5] The profile of the lifestyle physical activity may be specific to the population and geographic location^[6] and requires reliable measurement.

Levels of physical activity in older adults have been examined in relation to health outcomes, such as cancer risk factors,

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cardiovascular risk factors, mental health, and quality of life.^[7,8] Characteristics of physical activity, such as frequency, duration, and intensity, are associated with the subjective well-being.^[9] Researchers have developed interventions to promote physical activity among older adults,^[10] given the well-known benefits of physical activity. Many studies focus on measuring the adherence to prescribed exercises and structured vigorous activities,^[11] without considering the changes of the lifestyle physical activity level among older adults. Using a reliable instrument that can detect the changes in natural physical activity levels is essential for examining the health effects of physical activity and measuring the effectiveness of the interventions for promoting physical activity.

The Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire developed by the University of California San Francisco Center for Aging is established as a useful, self-reported tool for measuring “lifestyle” physical activities in older adults.^[12] CHAMPS aimed to increase older adults’ lifestyle physical activity by encouraging individuals to participate in everyday physical activities of their choice based on their readiness, health, and abilities. Although initially designed for residents in the San Francisco Bay Area, the CHAMPS questionnaire has been used in diverse communities^[13] and translated into and validated in Spanish. The CHAMPS questionnaire addresses special concerns for older adults, including age-appropriate activities and lifestyle physical activities (e.g., gardening), and is formatted to accommodate visual and memory limitations common with aging. The questionnaire pre-defines the intensity of each activity instead of requiring self-estimation.

Many reports do not discuss the population-specific feasibility and validity of instruments used to measure the lifestyle physical activity.^[14] Our review of the literature found few studies reporting the use of the CHAMPS questionnaire with aging breast cancer survivors (BCSs) living in the Midwestern U.S. To inform the research team regarding the utility of the CHAMPS questionnaire in a future interventional study, the objectives of this study were to assess the use of CHAMPS in measuring the lifestyle physical activities among older BCSs from a researcher-developed participant pool, living in a medium-sized Midwestern city and surrounding area.

METHODS

Research design and participants

Survey research methods were employed to collect survivors’ physical activity data. Following consenting and enrollment, CHAMPS surveys were administered in person at the time of scheduled visits from March to early August. The CHAMPS survey was mailed to the same participants 12 months later over the same months using prepaid return envelopes. Participants were community-dwelling BCSs who had completed active treatment, who spoke and read English at least at a 6th grade level, and who were capable of informed consent to participate in the study. A convenience sample was drawn from the team’s

Institutional Review Board (IRB)-compliant database since the purpose was to inform the team of using CHAMPS among the targeted participants in a future study, rather than generalizing physical activity level for the whole survivorship population in the Midwest. Participants were recruited from an IRB-compliant database of BCSs and a BCS group. This study was approved by the IRB. Informed consent was obtained from all participants included in the study.

Measures

Sociodemographics

Birthdate, breast surgery date, survey date, and body weight were recorded at the time of the survey.

Physical activity

CHAMPS is a validated 41-item self-report questionnaire assessing the weekly frequency and duration of various physical activities typically undertaken by older adults. Twenty-eight items in the questionnaire refer to exercise-related activities (e.g., dancing, sweeping, and vacuuming); 20 of the 28 activities are moderate-intensity exercise-related activities (e.g., playing tennis and heavy gardening such as spading), while 12 are sedentary activities (e.g., drawing and attending church). The last question (#41) records additional information about other unlisted activities that the respondent is involved in (as an open-ended question). Estimated caloric expenditure can be calculated based on the duration of exercise-related activities per scoring instructions.^[12]

Several tests of construct validity were previously conducted, and sensitivity to change was analyzed based on response to the CHAMPS intervention. In a sample ($n = 249$) comprise of underactive persons ($n = 173$ from the CHAMPS trial) and active persons ($n = 76$), aged 65–90 years ($X = 74$ years, $SD = 6$), 64% female, and 9% minorities, 6-month reliability ranged from 0.58 to 0.67, using intraclass correlation coefficients. Nearly all construct validity hypotheses were confirmed, though correlations were modest. All measures were sensitive to change ($P \leq 0.01$), with small-to-moderate effect sizes (0.38–0.64).

Statistical analysis

In this study, descriptive analysis included calculations of means, standard deviations, medians, range, and 5% and 95% quantiles. Spearman rho correlations were used to examine the relationships between independent and dependent variables. Time since surgery and age were calculated based on birthdate, surgery date, and survey date recorded at the time of the initial survey. Generalized linear mixed-effects models (GLMMs) were used to model the response from different distributions and to account for the dependencies inherent in having repeated observations ($n = 247$). Logistic regressions were used to examine the relationships between age, time since surgery, and having at least some hours and caloric expenditure in moderate-intensive exercise. Observations with extreme values were removed from the analysis. Wilcoxon signed-rank tests were used to compare the physical activities between the initial

responses and annual follow-up. Data with the later survey date collected in the initial year were paired and compared with the outcomes of the follow-up year ($n = 67$). Item missing rates were presented by frequencies and percentages. Per CHAMPS instruction, for activities not endorsed (no) or for when frequency/duration is missing when it is endorsed (yes), the value is coded as 0 for calculating the sum score. The analyses were carried out by RStudio Version 1.3.1093.^[15] R Package “lme4” was employed to carry out GLMMs.^[16] Qualitative responses in the questionnaire were categorized and quantified using frequencies.

RESULTS

The total sample included 146 enrolled participants who provided a total of 247 responses with the CHAMPS survey over 2 years. One hundred and eighty CHAMPS questionnaires were collected March through July in 2014. Twenty-eight of the 180 were collected through in-person interviews at the laboratory. One hundred and fifty-two of the 180 were collected through home mail back. Nine of the 28 (32%) participants who were assessed by interview at the laboratory also responded to the mail-back survey during the initial year. Sixty-seven of the original 146 participants responded to the mail-back survey again 12 months later. All participants were female.

Participants and physical activity characteristics

Participants were an average age of 67 years and 10 years post-breast cancer surgery (range 1–29 years). Age and time since surgery followed a close-to-normal distribution. We observed a positively skewed distribution for exercise (frequency, duration, and caloric expenditure), suggesting that more participants had lower frequency and less duration of exercise per week. More than half of the responses had all types of exercise activities totaling 11 h/week. The majority of the responses (90%) had exercise-related caloric expenditures in the range of 393–8540, with an estimated mean caloric expenditure of 3291. Among their exercise activities, 84% (208/247) of the responses reported at least some moderate-intensive exercise in their past week. Participants engaged in moderate exercises for a median of 5 times and an accumulative duration of 4 h/week. The estimated mean of moderate-intensive caloric expenditure among the participants was 2025 calories. About 90% of responses had moderate-intensive caloric expenditure between 195 and 5483. More than half of the responses had <1700 caloric expenditure from moderate-intensive exercise. Participants had a median of 18 sedentary activities totaling 23 h/week. Table 1 presents the participants' demographic and physical activity characteristics.

Other physical activities (CHAMPS question 41)

Participants reported other activities that may be new or related to one or more items in the CHAMPS questionnaire: Playing and taking care of grandchildren ($n = 7$); farm work, woodworking/carpentry, and construction activities ($n = 12$) that required prolonged standing, heavy lifting and pushing, or

walking; climbing stairs ($n = 12$); and attending gym training, such as planks, squats, and cardio classes ($n = 6$).

Age and time since surgery predictors

Age did not significantly predict the frequency or hours of all exercise. However, age was a significant predictor of having at least some hours ($b = -0.07$, $P = 0.00$, 95% CI $[-0.13, -0.02]$) and caloric expenditure ($b = -0.06$, $P = 0.00$, 95% CI $[-0.11, -0.02]$) of moderate and intensive exercise. For a person who was 10 years younger than another, the odds ratio of having at least some moderate-intensive exercise hours was 2.01 (95% CI $[1.23, 3.50]$) and caloric expenditures were 1.89 (95% CI $[1.19, 3.01]$). Time since surgery did not significantly predict hours of exercises alone nor in the model with age.

Annual survey follow-up

For participants who responded to the follow-up survey at 12 months ($n = 67$), Wilcoxon signed-rank tests found no statistical differences between the annual surveys in terms of activity frequency or caloric expenditures. Statistical differences between initial and annual follow-up survey occurred in hours of all exercise ($z = 3.57$, $P = 0.00$) and sedentary activities ($z = 3.91$, $P = 0.00$), but not in moderate-intensive exercise. The differences could be due to weather or other factors. When examined individually, three participants were found to report comparably large differences in caloric expenditures of all exercise (value of differences: 2890, 4097, and 5554). The differences in the responses of these individuals could be due to the exercise pattern changes since the responses were an average of 3 months apart or it is possible the participants gave different answers, even though there was no change.

Missing item response

The first step questions of CHAMPS (yes or no of the activity) have the most response missing (missing rate = 1.07%, $n = 106$). When “yes” for the activities was checked, the frequency of the activities was reported in almost all responses (missing rate = 0.01%, $n = 1$) with a few not reporting duration (missing rate = 0.16%, $n = 16$) if the frequency is recorded as non-zero. The number of total responses for each category is 9880 (247 observations multiply 40 questions for each step). Item 41 is an open-ended question asking about uncovered activities and was not counted toward response missing.

DISCUSSION

The CHAMPS questionnaire presented good consistency in measuring the community physical activities of BCSs. CHAMPS captured most of the community physical activities among aging BCS living in the Midwestern small town. The overall low missing item responses and higher missing to the open-ended question support the thoroughness of the CHAMPS in covering general community-based physical activities among older adults. Participants reported additional activities, such as taking care of grandchildren, which were

Table 1: Participant's characteristics

Variable	All obs. (n=247) ^a				Mean (SD)	
	n (%)	Mean (SD)	Quantiles (0.05–0.95)	Median (range)	2014 (n=67) ^c	2015 (n=67)
Age (years)	245 (99)	67.1 (9.5)	52.2–82.0	67 (39–89)	67.4 (9.2)	68.4 (9.2)
Time since surgery (years)	247 (100)	10.4 (4.1)	4.0–17.7	10 (1–29)	10.4 (3.7)	11.4 (3.6)
Weight (lbs)	247 (100)	164 (36.9)	114–225	158 (99–297)	159.0 (33.6)	159.0 (33.6)
CHAMPS						
Frequency (times/week)						
All exercise		17.5 (12.8)	0–40.7	16 (0–75)	19.3 (12.4)	17.7 (13.9)
Moderate-intensive exercises		6.5 (6.3)	0–20	5 (0–25)	7.4 (7.0)	7.4 (6.7)
Non-exercise		20.2 (14.3)	2.3–42.0	18 (0–124)	21.9 (13.7)	20.1 (16.6)
Duration (hours/week) ^b						
All exercise		13.4 (9.7)	1.8–32.5	11.5 (0–58.5)	15.2 (10.4)	11.4 (7.6)
Moderate-intensive exercises		5.7 (5.6)	0–16.7	4 (0–26.8)	5.9 (5.9)	5.2 (4.6)
Non-exercise		24.6 (11.8)	7.33–46.7	23 (1.5–60.3)	26.8 (12.4)	22.0 (9.2)
Caloric expenditure/week						
All exercise		3291.0 (2671.8)	393.3–8540.0	3043.1 (0–16,138)	3117.7 (2524.6)	2573.5 (1665.6)
Moderate-intensive exercises		2025.3 (1750.8)	194.6–5483.1	1657.1 (0–8764)	1656.6 (1668.2)	1438.4 (1208.7)

*The significance level of 0.05 was used. ^aObs. (Observations) represents to the number of responses to the survey, ^bCHAMPS does not record exact time for corresponding physical activities, instead it records categorical durations which was recoded to numeric duration per instruction: <1 h=0.5, 1–2.5 h 1.75, 3–4.5 h=3.75, 5–6.5 h=5.75, 7–8.5 h=7.75, 9 or more h=9.75, ^cSummary of responses from the *paired subjects* were used to conduct comparison between 2014 and 2015. If a participant responded more than once in a year, the responses closest to the month in another year was used. SD: Standard deviation, CHAMPS: Community Healthy Activities Model Program for Seniors

highly relevant to the older adults' activities, although this requires further analysis of their complex constructs. Our data suggested several novel views of using CHAMPS in our population, the older BCSs living in the small town of central Midwest, which are discussed below.

Consistent with most cross-sectional studies,^[17,18] our CHAMPS data indicated a decrease of time and caloric expenditure of moderate-intensive physical activities as age increased. This supports the sensitivity of CHAMPS for measuring the moderate-intensive physical activities in relation to age among older BCSs using data collected at a single point in time. Interestingly, some longitudinal analyses found different patterns between age and physical activity.^[19,20] Our consecutive-year comparison did not show a change in physical activity level among our participants. Following up with the cohort for a longer time with a larger sample using CHAMPS may provide further evidence of the associations between physical activity level and demographic predictors. Longitudinal evidence would be meaningful for designing interventions to promote healthy lifestyles and revealing effects over time in cancer survivorship.^[21]

For our targeted participant pool, the reported frequency and duration of our participants engaging in weekly moderate exercises exceed the recommended dose based on the guideline from the American College of Sports Medicine for cancer survivors.^[22] Notably, the surveys were conducted during the spring and summer when people usually would be expected to have more leisure physical activities than their annual average. Our participants living in the Central Midwest may have different lifestyle and physical activity profiles compared to older adults living in metropolitan areas and other regions.^[23] An early study found that people living in a coastal city were less likely to report a sedentary lifestyle.^[6,24] Most of our participants lived in car-dependent areas, as the distance

between residential areas and community services is often substantial and precludes walkability. Environmental factors such as walkability and recreational spaces highly contribute to the geographic influences on the physical activity.^[25] On the other hand, some of our participants reported farm labor and woodworking/construction activities as their regular physical activity. These Midwestern town cultural activities may not be common among residents in larger cities where the CHAMPS questionnaire was initially conceptualized.^[26,27] The similar activities of residents in the medium-sized Midwestern town need to be further studied in addition to CHAMPS activities.

Aging BCSs have their own special characteristics, compared to older adults without a cancer diagnosis and survivors with other types of cancer, in terms of community physical activity. Breast cancer predominately (> 99%) affects females, the gender of all participants in our sample. Gender is a strong determinant of physical activity participation; women usually report less overall activity expenditure and more indoor exercises than men.^[28–30] Some cancer survivors may report less moderate-intensive exercise and light activity throughout the day; additionally, studies also indicated that clinical characteristics, such as weight, comorbidity, disease stage, and smoking;^[31,32] and socioeconomic attributes, such as income, ethnicity, and education,^[28,30,31,33] may influence survivors' engagement in physical activities. To develop effective community-based physical activity interventions, it is essential to understand the physical activity patterns and their relationship to these characteristics, specific to the aging BCSs and this population in the Central Midwest.

CONCLUSION

CHAMPS is useful in measuring the lifestyle physical activities among older BCS living in the Midwest of the U.S. The demographic relevant lifestyle activities, such as farm and

woodworking and taking care of grandchildren, require further analysis of their complex constructs regarding caloric expenditure.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest and no relevant financial or non-financial interests to disclose.

ETHICAL APPROVAL

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

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