**Title:** Age-related differences in exercise and quality of life among breast cancer survivors

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**Short Title:** Exercise, quality of life and breast cancer

**Abstract**

**Purpose**: Physical activity has become a focus of cancer recovery research as it has the potential to reduce treatment-related burden and optimize health-related quality of life (HRQoL). However, the potential for physical activity to influence recovery may be age-dependent. This paper describes physical activity levels and HRQoL among younger and older women after surgery for breast cancer and explores the correlates of physical inactivity. **Methods**: A population-based sample of breast cancer patients diagnosed in South-East Queensland, Australia, (n=287) were assessed once every three months, from 6 to 18 months post-surgery. The Functional Assessment of Cancer Therapy-Breast questionnaire (FACTB+4) and items from the Behavioral Risk Factor Surveillance System (BRFSS) questionnaire were used to measure HRQoL and physical activity, respectively. Physical activity was assigned metabolic equivalent task (MET) values, and categorized as < 3, 3 to 17.9 and 18+ MET-hours/weeks. Descriptive statistics, generalized linear models with age stratification (<50 years versus 50+ years), and logistic regression were used for analyses (p=0.05, two-tailed). **Results**: Younger women who engaged in 3 or more MET-hours/week of physical activity reported a higher HRQoL at 18 months compared to their more sedentary counterparts (p<0.05). Older women reported similar HRQoL irrespective of activity level and consistently reported clinically higher HRQoL than younger women. Increasing age, being overweight or obese, and restricting use of the treated side at six months post-surgery increased the likelihood of sedentary behavior (OR≥3, p<0.05). **Conclusions**: Age influences the potential to observe HRQoL benefits related to physical activity participation. These results also provide relevant information for the design of exercise interventions for breast cancer survivors and

highlights that some groups of women are at greater risk of long-term sedentary behavior.

**Keywords**: Oncology, Recovery, Physical Activity, Age factors, Correlates

## Introduction

**Paragraph Number 1** As survival following breast cancer continues to improve exploring ways to reduce the burden of the disease and to optimize survival requires attention. Physical activity has become a focus of cancer recovery research and its effects on treatment-related symptoms and recovery outcomes have been assessed in observational studies (30, 31) and randomized controlled trials (10, 13, 28, 33). Several systematic reviews summarizing this literature conclude that participation in regular physical activity plays an important role in reducing the frequency and intensity of side-effects of breast cancer treatment, such as fatigue, pain and psychological distress, and is associated with improvements in upper-body and general physical function (9, 24, 32, 34). More recent results, derived from observational research, have demonstrated that physical activity may also increase duration of survival and reduce the risk of breast cancer recurrence (18, 19).

**Paragraph Number 2** Acute physical side-effects and psychological distress often combine during treatment to negatively impact a woman's health-related quality of life (HRQoL). These declines in HRQoL are most commonly reported after the initial diagnosis and treatment period, returning to levels comparable to the general population by 12 months following diagnosis (2, 12). Participation in physical activity during treatment and throughout recovery has the potential to minimize declines and

hasten improvements in HRQoL. Randomized controlled trials of exercise interventions have reported such benefits, most commonly in the areas of physical and functional well-being and in the area of breast cancer-related concerns (10, 11, 27, 29), although, conclusions from systematic reviews have been less definitive (24, 32, 34).

**Paragraph Number 3** One possibility for variability across studies and less favorable conclusions in systematic reviews is that the relationship between physical activity and HRQoL varies by other factors that differ across studies, such as age. Age-related differences in HRQoL are known to exist among women with breast cancer (2, 12), with older women usually defined as aged 50+ years, fairing significantly better than younger women. Younger women predominately report deficits in emotional and social well-being as well as role (i.e. work- and home-related activities) and cognitive function during the first year after diagnosis (2). The impact of diagnosis on a younger woman's emotional well-being may persist, with deficits being reported even 18 months after diagnosis (12). Younger women also express an unmet need for age-appropriate support and services to aid them following breast cancer diagnosis (7, 35). Hence, it is not known whether physical activity is equally beneficial to HRQoL for younger and older women.

**Paragraph Number 4** The aim of this paper is to explore levels of physical activity in a population-based sample of breast cancer patients from 6 to 18 months post-surgery. The effect of this physical activity on HRQoL at 18 months post-surgery is examined with a particular focus on the differences between younger (30-49 years) and older (50-74 years) women. Personal, treatment and behavioral characteristics

associated with level of activity are also explored, with the aim of identifying subgroups that could most benefit from physical activity interventions.

## Methods

*Study Sample*

**Paragraph Number 5** Women newly diagnosed with a primary, invasive, unilateral breast cancer in 2002, aged 20 to 74 years and living within a 100km radius of Brisbane, Queensland, were randomly selected from the Queensland Cancer Registry to participate in the study (n=511). The morphology of breast cancer and the risk factor profile for the disease differ among younger and older women, with the more common postmenopausal disease typically occurring around age 50 years when the rate of increase in the incidence of breast cancer levels off (3). Therefore, women younger than 50 years were over-sampled to ensure sufficient numbers for age-specific analyses. The ethical approval process required the treating doctor's consent before contacting potential study participants and was obtained for 417 women (82%). Written informed participant consent was then obtained from 296 women (71%). Subsequently, two women were deemed ineligible and a further seven decided not to participate or could not be re-contacted, hence 287 (69%) women completed the baseline measure. Numbers vary in specific analyses due to some loss-to-follow-up and missing data.

*Data Collection*

**Paragraph Number 6** Participants completed a self-administered questionnaire at five time-points over a 12-month period. Baseline measures were assessed at six months following breast cancer surgery and occurred every three months thereafter

until 18 months following surgery. Self-administered questionnaires collected information on personal characteristics (age, marital status, income, health insurance coverage), treatment-related characteristics (surgery, chemotherapy, radiotherapy), general health characteristics (weight, smoking status), physical activity and HRQoL. Tumor characteristics were abstracted from pathology reports located at the Queensland Cancer Registry.

*Physical activity assessment*

**Paragraph Number 7** Physical activity was assessed using questions from the Behavioral Risk Factor Surveillance System (BRFSS) (6). Two questions asked women to report on the amount of vigorous and moderate activities carried out in a usual week. Examples of activities were listed along with descriptions of vigorous-*(high-energy activities that cause large increases in breathing or heart rate)* and moderate-intensity exercise *(medium-level exercises that cause some increase in breathing or heart rate)* to help guide respondents to accurately report activity. Women were required to list the types of activities they performed along with the number of days per week and minutes per day spent in the two types of activity. Good to excellent reproducibility (kappa=0.52-0.83, with 77-93% agreement) have been demonstrated with these questions (21).

**Paragraph Number 8** Metabolic equivalent task (MET) values were assigned to each type of activity based on intensity (4.0 for moderate activity, 8.0 for vigorous activity as specified in the International Physical Activity Questionnaire) (15). One MET is considered the resting metabolic rate obtained during quiet sitting (1). Assigned MET values were multiplied by the number of hours per day and by the number of days per

week to obtain the total MET-hours per week of activity. Consistent with previous work (19, 26), resulting MET-hours per week were then categorized as less than 3, 3 to 17.9 and 18 or more.

*Health-related quality of life assessment*

**Paragraph Number 9** The Functional Assessment of Cancer Therapy-Breast questionnaire, with the addition of the arm morbidity subscale (FACT-B+4), was used to assess HRQoL (4). Items are rated on a five-point Likert scale (ranging from 0 'not at all' to 4 'very much') relating to four dimensions of HRQoL: physical, social, emotional and functional well-being, plus the additional concerns subscale related specifically to breast cancer concerns. The addition of the final four questions addresses arm morbidity (8). Higher scores represent better well-being for overall HRQoL (range 0 – 160) and for each of the subscales of physical, social and functional well-being (range 0 – 28), emotional well-being (range 0 – 24), and additional concerns plus arm morbidity (range 0 – 52). The FACT scales have been widely used in cancer research and have shown excellent internal consistency (alpha = 0.90) and test-retest reproducibility (r=0.85) (4).

*Statistical Analysis*

**Paragraph Number 10** A generalized estimating equations approach with time-dependent co-variates was employed using SUDAAN (Release 9.0.1). Level of physical activity in MET-hours per week (< 3, 3-17.9, and 18+) at each of the five study phases were analyzed in a single multivariable model to assess the pattern of physical activity as it varied over time and its relationship to HRQoL at 18 months post-surgery. Six separate models were conducted, one for the global FACTB+4 score

and one for each of the five HRQoL subscales (physical, functional, emotional, social and additional concerns plus arm morbidity). All models were adjusted for baseline HRQoL, age, upper-body function (poorer than most vs better than most) and arm swelling as the only identified confounders. The analyses were stratified by younger (< 50 years) and older (50+ years) age to examine differences between these two groups of women. Results are expressed as means and 95% confidence intervals (CIs), with a two-tailed $p<0.05$ taken as evidence of statistical significance. An eight-point difference on the FACTB+4 score or a two-point difference on any of the subscales (three points for additional concerns plus arm morbidity) is considered clinically important (5).

**Paragraph Number 11** Binary logistic regression was used to explore the personal, treatment and behavioral characteristics associated with participation in fewer than three MET-hours of weekly activity. Results are expressed as odds ratios (OR) and 95% CIs, with two-tailed $p<0.05$ taken as evidence of statistical significance. Clinical importance was defined as an $OR \geq 2.0$ or $\leq 0.60$. Characteristics that were theoretically (known from literature), statistically or clinically important were retained in one final model to consider the independent relationships.

## Results

*Sample characteristics*

**Paragraph Number 12** The demographic and disease characteristics of the participants in this study, presented in Table 1, were similar to those of the target sample identified from the population of breast cancer patients in the Queensland Cancer Registry (16). The proportion of older women was higher than younger

women (67% of women were aged over 50 years), as expected due to the distribution in the general population and our study design. Older women were more likely ($p<0.01$) to have lower levels of education (64%) and income (36%) compared to younger women (37% and 16%, respectively). Younger women were more likely to experience a less favorable disease outcome as evidenced by a higher proportion with histological grade 3 disease (44% vs. 26%, $p=0.02$), more intensive adjuvant therapy (both chemotherapy and radiotherapy: 37% vs. 25%, $p<0.01$) and having a larger tumor size (15mm vs. 12mm, $p=0.02$) compared to their older counterparts. Proportions of women who were married, level of health insurance and smoking behavior were similar irrespective of age. Similar numbers of lymph nodes were removed for both groups of women.

*Levels of physical activity*

**Paragraph Number 13** Proportions of women participating in < 3, 3 to 17.9 and 18+ MET-hours of weekly activity over the 12-month study period are shown in Table 2. Six months post-surgery, 45% of younger and 44% of older women reported the equivalent of 18 or more MET-hours of weekly activity. This remained essentially unchanged at 18 months (46% v 43%). The proportion of women classified as doing fewer than 3 MET-hours of activity per week decreased among the younger women (27% at 6 months to 14% at 18 months). A similar trend was observed among the older women, but to a lesser degree.

*Relationship between physical activity and health-related quality of life*

**Paragraph Number 14** Irrespective of activity levels, younger women reported lower overall HRQoL compared to older women (Figure 1). Clinically important

differences between younger and older women were observed among those engaging in less than 3 METS (+11 points), whereas differences were less extreme for those reporting 3-17.9 METS or 18+ METS of weekly activity on average (+5.8 and +7.6 points, respectively). Among younger women, those engaging in three or more MET-hours of weekly activity were significantly more likely to report a higher overall HRQoL at 18 months post-surgery compared to those engaging in fewer than three MET-hours per week (< 3 METS= 121.1, 95% CI: 116.9, 125.3; 3-17.9 METS=126.3, 95% CI: 123.4, 129.2; 18+ METS= 126.3, 95% CI: 122.8, 129.8; p=0.03). However the five-point difference observed in HRQoL did not attain the level defined as clinically important (eight points). In contrast, HRQoL was less influenced by activity levels in women aged 50 years or more (< 3 METS= 132.2, 95% CI: 128.2, 136.2; 3-17.9 METS= 132.1, 95% CI: 129.6, 134.7; 18+ METS= 133.9, 95% CI: 131.3, 136.5; p= 0.46).

**Paragraph Number 15** The relationship between intensity of activity and HRQoL was also assessed. Younger women who engaged in vigorous activity alone or in combination with moderate activity had similar mean HRQoL scores (125.6; 95% CI: 120.0, 131.1) when compared with the HRQoL reported by younger women engaging in moderate activity alone (128.8; 95% CI: 123.5, 133.8) at 18 months post-surgery. Intensity of activity was also irrelevant for older women, with those engaging in vigorous activity alone or in combination with moderate activity reporting mean HRQoL scores of 133.1 (95% CI: 128.1, 138.1), while those participating in moderate activity alone reported HRQoL levels of 134.4 (95% CI: 130.3, 138.6).

**Paragraph Number 16** For the younger women, physical activity levels also influenced HRQoL subscales (Table 3), with those engaging in fewer than 3 MET-hours of activity per week reporting reduced physical ($p=0.03$) and emotional ($p<0.01$) well-being. However, these differences did not meet levels defined as being clinically important. The association between activity level and additional breast cancer concerns reflected a more graded, dose-response relationship (mean difference between the highest and lowest activity groups of younger women = 2.8 points, $p=0.01$). Although not statistically significant, a similar trend was observed between the two active (3+ MET-hours) and the less active (< 3 MET-hours) groups for functional and social well-being.

**Paragraph Number 17** With the exception of physical well-being, older women reported higher well-being than younger women in each of the domains of HRQoL, with clinically important differences observed for social well-being (mean difference=+3.7) and additional breast cancer concerns (mean difference=+5.2) (Table 3). This was particularly evident among women engaging in < 3 MET-hours of weekly activity. The dimensions of HRQoL were less likely to be influenced by levels of physical activity among older women with no clinically important differences or trends observed.

*Characteristics influencing levels of physical activity*

**Paragraph Number 18** The two most active groups (3-17.9 and 18+ MET-hours/week) were combined and analyzed in a multivariable, binary logistic regression model to explore the characteristics of women engaging in the least amount of activity (< 3 MET hours/week) at 18 months post-surgery (Table 4). For each

additional year of age, the odds of participating in fewer than 3 MET-hours of weekly activity increased significantly by 7%. In addition, being overweight or obese, consistently rating personal health status as low and restricting use of the treated side each significantly increased the odds of engaging in fewer than 3 MET-hours of activity at least three-fold. Furthermore, lack of private health insurance and lack of advice relating to upper-body recovery also increased odds of being inactive twofold, although the latter was not statistically significant.

## Discussion

**Paragraph Number 19** Younger women who were physically active (engaging in 3 or more MET-hours of activity per week) from 6 to 18 months after surgery for invasive breast cancer reported better HRQoL at 18 months post-surgery compared to those who did very little or no activity. Statistically significant differences between levels of activity were observed for overall HRQoL, physical and emotional well-being, as well as for additional breast cancer concerns. For older women, the greatest difference observed in overall HRQoL was between those reporting 18+ MET-hours per week compared to those less active (< 18 MET-hours). However, differences between these groups were neither statistically significant nor clinically important. In part, this may be due to the fact that older women reported much higher levels of HRQoL than younger women, as also reported by others (38). The age-related differences in our study were most evident and clinically important among the least active women engaging in fewer than 3 MET-hours of weekly activity for social well-being, additional breast cancer concerns and overall HRQoL. Of note, even the most active younger women engaging in 18 or more MET-hours of weekly activity

reported poorer overall HRQoL, more additional breast cancer concerns, and reported clinically lower social well-being when compared to their older sedentary peers.

**Paragraph Number 20** Previous work has demonstrated the unique needs and concerns of younger women diagnosed with breast cancer. Dealing with the reproductive consequences of treatment (e.g. fertility and early menopause), limitations on lifestyle and career, and the lack of age-appropriate support have all been identified as concerns for younger women with breast cancer (7, 35). Poorer body image and more depressive symptoms have also been reported (2, 22, 38), all of which contribute to reduced HRQoL. Our results suggest that for younger women, participation in physical activity may act as a buffer to counteract declines in HRQoL, enabling them to be better equipped physically, functionally, socially and emotionally to cope with their diagnosis.

**Paragraph Number 21** While the benefits of physical activity with respect to HRQoL are less clear in the older cohort of breast cancer survivors, it may be especially important to these women in terms of reducing risk of or managing co-morbidities, such as diabetes and obesity. These conditions are prevalent in older populations in general (23) and even more prevalent among women with breast cancer because they represent risk factors for post-menopausal disease (20, 25). Moreover, the evidence from prospective trials that physical activity may improve survival and decrease risk of breast cancer recurrence has shown no variation in effect by age (18, 19). Three MET-hours of weekly physical activity (the equivalent of walking for approximately one hour at a moderate pace) was reported to benefit survival and reduce cancer recurrence (19). Similar levels of physical activity were associated with

improved HRQoL in our study. Together, this research suggests that more modest activity levels than typically recommended by Australian and U.S. physical activity guidelines may be beneficial to women with breast cancer. Therefore it seems plausible that exercise prescriptions during and immediately following breast cancer treatment could emphasize maintaining or returning to normal activities, at least in the first instance, followed by progressive increases in planned activity, working towards meeting general, national physical activity guidelines.

**Paragraph Number 22** The observation that similar HRQoL benefits were achieved by those who engaged only in moderate-intensity activity compared with those who participated in vigorous activity is also of potential value in designing future intervention programs. This suggests that a wide range of activities can be recommended to women during breast cancer recovery, with the focus being placed on some or any activity being more optimal than no activity. It should be noted, however, that intensity and duration of exercise may be more important when considering specific outcomes, like weight loss or cardiovascular health.

**Paragraph Number 23** The results of this study also argue for developing physical activity interventions for all age groups of women undergoing breast cancer treatment: younger women clearly show more benefit related to HRQoL associated with increased activity, while older women are less likely to increase their activity levels on their own (22% reported < 3 METS at 6 months on average and 19% at 18 months post-surgery). Several other characteristics also were identified as increasing one's risk of being inactive, including being overweight or obese, consistently reporting poor personal health, lacking private health insurance, and cautious use of

the treated side. The relationship between weight, health status, and physical activity levels have also been shown previously in the general population and in studies of other diseases (36, 37). The associations with lack of private health insurance and cautious use of the treated side provide further suggestions for at-risk groups who might benefit from targeted intervention. In particular, women who favor their treated arm may not realize that they are inadvertently reducing their overall levels of physical activity, and in addition, potentially increasing their risk of secondary lymphoedema (17). This highlights the importance of further education encouraging women to progressively return to normal use of the treated side following breast cancer treatment.

**Paragraph Number 24** The strengths of this work include the longitudinal nature of the study, assessing the natural progression of physical activity and HRQoL from 6 to 18 months following surgery for breast cancer. The population-based sample also suggests these findings are generalizable to the wider population of breast cancer survivors at least in South-East Queensland, Australia, but likely representative of other Westernized countries as well (14). The use of self-reported physical activity data does have some limitations with respect to recall and the potential for women to over-report their activity. We know that many of the activities reported by the women would not typically be classified as vigorous or even moderate activity, such as housework and gardening. However, there is no reason to suspect that the over-reporting differed by HRQoL score or by clinical or personal characteristics, therefore the associations reported are unlikely to be biased. Of note, participants in this study were not asked to report on mild-intensity activity. It is plausible that the collection of such information may provide additional insight into the relationship between HRQoL

and physical activity in older and younger women. Future research might consider the assessment of more modest levels of physical activity to determine its contribution to HRQoL.

**Paragraph Number 25** In summary, the results of this work demonstrate that participating in some activity is better than none for women following diagnosis and treatment for breast cancer. Although younger women appear to benefit more in terms of HRQoL, other studies suggest that similar levels of exercise reduce risk of cancer recurrence and increase overall survival equally among younger and older women with breast cancer (18). The intensity of the activity appears irrelevant with respect to HRQoL benefits, potentially removing a barrier to exercise participation for some women. Clinicians have an important role to play in encouraging their patients to be physically active during and following their breast cancer treatment. However, the importance of physical activity as a potential complementary therapy needs to be formally acknowledged by the medical profession before it can be integrated within standard clinical practice.

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FIGURE 1. Relationship between physical activity (MET-hours per week) between 6 and 18 months post-surgery and health-related quality of life (FACTB+4) at 18 months post-surgery for younger (< 50 years) and older (50+ years) women with breast cancer[a]

FACTB+4, Functional Assessment of Cancer Therapy – Breast; MET, Metabolic equivalent task (hours per week); HRQoL, health-related quality of life.

[a] Adjusted for age, baseline HRQoL, arm swelling, and upper-body function.

TABLE 1. Demographic, lifestyle and disease characteristics of the 287 participants at baseline (6 months post-surgery)

| Characteristic | Women < 50 yrs | | Women 50+ yrs | | |
|---|---|---|---|---|---|
| | n | % | n | % | p-value |
| Demographic | | | | | |
| Age | 94 | 32.8 | 193 | 67.2 | |
| Marital Status | | | | | |
| Married/in a relationship | 70 | 74.5 | 129 | 66.8 | 0.18 |
| Single/divorced/widowed | 24 | 25.5 | 64 | 33.2 | |
| Education | | | | | |
| High school or less | 35 | 37.2 | 123 | 63.7 | < 0.01 |
| More than high school | 59 | 62.8 | 70 | 36.3 | |
| Household Income | | | | | |
| ≥ $52,000 | 44 | 46.8 | 50 | 25.9 | < 0.01 |
| $26,000 to $51,999 | 30 | 31.9 | 43 | 22.3 | |
| < $26,000 | 15 | 16.0 | 69 | 35.8 | |
| Missing | 5 | 5.3 | 31 | 16.1 | |
| Private Health Insurance | | | | | |
| None | 33 | 35.1 | 52 | 26.9 | 0.32 |
| Hospital only[a] | 7 | 7.4 | 20 | 10.4 | |
| Hospital plus extras[b] | 54 | 57.4 | 121 | 62.7 | |
| Lifestyle | | | | | |
| Body Mass Index | | | | | |
| Under weight (<20 kg/m$^2$) | 5 | 5.3 | 4 | 2.1 | 0.06 |
| Healthy weight (20-24.9 kg/m$^2$) | 44 | 46.8 | 70 | 36.3 | |

| | | | | | |
|---|---|---|---|---|---|
| Over weight (25-29.9 kg/m$^2$) | 25 | 26.6 | 55 | 28.5 | |
| Obese (30+ kg/m$^2$) | 16 | 17.0 | 40 | 20.7 | |
| Missing | 4 | 4.3 | 24 | 12.4 | |
| Smoking | | | | | |
| Never Smoked | 52 | 55.3 | 120 | 62.2 | 0.49 |
| Past Smoker | 30 | 31.9 | 55 | 28.5 | |
| Current Smoker | 12 | 12.8 | 18 | 9.3 | |
| Disease | | | | | |
| Type of Surgery | | | | | |
| Complete local excision | 56 | 59.6 | 129 | 66.8 | 0.23 |
| Partial/full mastectomy | 38 | 40.4 | 64 | 33.2 | |
| Histological Grade | | | | | |
| Grade 1 | 22 | 23.4 | 54 | 28.0 | 0.02 |
| Grade 2 | 25 | 26.6 | 65 | 33.7 | |
| Grade 3 | 41 | 43.6 | 50 | 25.9 | |
| Unavailable | 6 | 6.4 | 24 | 12.4 | |
| Lymph Nodes Removed | | | | | |
| None | 14 | 14.9 | 24 | 12.4 | 0.60 |
| < 10 | 28 | 29.8 | 59 | 30.6 | |
| 10 – 19 | 42 | 44.7 | 79 | 40.9 | |
| 20 + | 10 | 10.6 | 31 | 16.1 | |
| Adjuvant Therapy | | | | | |
| None | 7 | 7.4 | 38 | 19.7 | < 0.01 |
| Radiotherapy only | 31 | 33.0 | 90 | 46.6 | |
| Chemotherapy only | 21 | 22.3 | 16 | 8.3 | |

| | | | | | |
|---|---|---|---|---|---|
| Radiotherapy & chemotherapy | 35 | 37.2 | 49 | 25.4 | |
| Hormone Therapy | | | | | |
| Yes | 32 | 34.0 | 88 | 45.6 | 0.06 |
| No | 62 | 66.0 | 105 | 54.4 | |
| | Med | Min, Max | Med | Min, Max | |
| Tumor Size (mm) | 15.0 | 1.0, 65.0 | 12.0 | 0.5, 140.0 | 0.02 |

[a] Hospital cover refers to insurance coverage for hospital in-patient procedures.

[b] Extras cover refers to insurance coverage related to ancillary health services, such as dental and optical.

TABLE 2. The proportions of younger and older breast cancer patients categorized according to MET-hours per week of total physical activity[a] from 6 to 18 months post-surgery

| | Months since surgery | | | | |
|---|---|---|---|---|---|
| MET-hours per week | 6 | 9 | 12 | 15 | 18 |
| | Younger women < 50 years % (n) | | | | |
| <3 | 26.6 (25) | 19.1 (17) | 14.8 (13) | 11.5 (10) | 13.5 (12) |
| 3 to <18 | 28.7 (27) | 38.2 (34) | 43.2 (38) | 44.8 (39) | 40.4 (36) |
| 18+ | 44.7 (42) | 42.7 (38) | 42.0 (37) | 43.7 (38) | 46.1 (41) |
| | Older women 50+ years % (n) | | | | |
| <3 | 22.3 (43) | 24.2 (46) | 20.1 (38) | 20.7 (38) | 19.1 (35) |
| 3 to <18 | 33.7 (65) | 26.8 (51) | 31.2 (59) | 30.4 (56) | 37.7 (69) |
| 18+ | 44.0 (85) | 48.9 (93) | 48.7 (92) | 48.9 (90) | 43.2 (79) |
| Total | 100.0 (287) | 100.0 (279) | 100.0 (277) | 100.0 (271) | 100.0 (272) |

MET, Metabolic equivalent task (hours per week).

[a] Total physical activity = vigorous + moderate-intensity activities.

TABLE 3. Relationship between levels of physical activity (MET-hours per week) between 6 and 18 months post-surgery and the dimensions of health-related quality of life at 18 months post-surgery for younger (< 50 years) and older (50+ years) women with breast cancer [a]

| | <3 METS | | 3- <18 METS | | 18+ METS | | |
|---|---|---|---|---|---|---|---|
| | Mean | (95% CI) | Mean | (95% CI) | Mean | (95% CI) | p-value |
| Physical Well-being | | | | | | | |
| Younger women < 50 years | 24.1 | (23.4, 24.8) | 25.0 | (24.4, 25.6) | 24.9 | (24.2, 25.6) | 0.03 |
| Older women 50 + years | 24.6 | (23.8, 25.4) | 24.8 | (24.4, 25.2) | 24.9 | (24.4, 25.4) | 0.74 |
| Functional Well-being | | | | | | | |
| Younger women < 50 years | 21.1 | (19.7, 22.6) | 22.1 | (21.1, 23.1) | 22.1 | (21.2, 23.0) | 0.41 |
| Older women 50 + years | 22.4 | (21.3, 23.5) | 22.7 | (22.0, 23.4) | 22.6 | (21.8, 23.4) | 0.81 |
| Emotional Well-being | | | | | | | |
| Younger women < 50 years | 18.0 | (16.8, 19.2) | 19.6 | (19.0, 20.2) | 19.1 | (18.3, 19.9) | 0.01 |
| Older women 50 + years | 19.7 | (18.8, 20.6) | 20.2 | (19.6, 20.8) | 20.4 | (19.9, 21.0) | 0.31 |
| Social Well-being | | | | | | | |
| Younger women < 50 years | 20.4 | (18.9, 21.9) | 21.2 | (20.2, 22.2) | 21.3 | (20.5, 22.1) | 0.40 |

| | <3 METS | | 3- <18 METS | | 18+ METS | | |
|---|---|---|---|---|---|---|---|
| | Mean | (95% CI) | Mean | (95% CI) | Mean | (95% CI) | p-value |
| Older women 50 + years | 24.1 | (22.9, 25.3) | 22.9 | (22.0, 23.8) | 23.5 | (22.7, 24.3) | 0.12 |
| Additional Concerns + Arm | | | | | | | |
| Younger women < 50 years | 36.7 | (35.2, 38.2) | 38.3 | (37.1, 39.5) | 39.5 | (38.1, 40.9) | 0.01 |
| Older women 50 + years | 41.9 | (40.8, 43.0) | 41.3 | (40.4, 42.2) | 41.6 | (40.7, 42.5) | 0.59 |

METS, Metabolic equivalent task (hours per week); CI, Confidence Interval.

[a] Results also adjusted for age, baseline quality of life and upper-body functioning. Additional concerns subscale also adjusted for upper-body swelling.

TABLE 4. Correlates associated with engaging in < 3 MET-hours of weekly physical activity at 18 months post-surgery

| | N | Crude OR | Adjusted OR[a] | Adjusted 95% CI[a] | p-value |
|---|---|---|---|---|---|
| Age (years) | 272 | 1.04 | 1.07 | (1.02, 1.13) | 0.01 |
| Health Insurance | | | | | |
| No | 72 | 2.20 | 2.66 | 1.08, 6.54 | 0.03 |
| Yes | 200 | 1.00 | 1.00 | ref | |
| Body Mass Index | | | | | |
| Missing[c] | 27 | 4.91 | 6.69 | 1.85, 24.21 | 0.01 |
| Obese | 53 | 3.42 | 4.85 | 1.64, 14.29 | |
| Overweight | 78 | 3.50 | 3.23 | 1.14, 9.16 | |
| Healthy | 114 | 1.00 | 1.00 | ref | |
| Health Rating[c] | | | | | |
| Low, stayed low | 23 | 4.34 | 3.98 | 1.11, 14.26 | 0.20 |
| Low, increased | 50 | 1.90 | 1.23 | 0.45, 3.44 | |
| High, decreased | 44 | 1.28 | 1.05 | 0.35, 3.15 | |
| High, stayed high | 155 | 1.00 | 1.00 | ref | |
| Upper-body Advice | | | | | |
| None | 39 | 1.63 | 2.19 | 0.69, 6.89 | 0.60 |
| Allied Health Professional | 46 | 1.14 | 1.31 | 0.43, 3.99 | |
| Medical Professional | 52 | 1.14 | 1.10 | 0.38, 3.19 | |
| Both | 135 | 1.00 | 1.00 | ref | |
| Use of Arms Equally | | | | | |
| No | 32 | 2.49 | 3.57 | 1.18, 10.77 | 0.02 |
| Yes | 240 | 1.00 | 1.00 | ref | |

OR, Odds ratio; CI, Confidence interval; MET, Metabolic equivalent task (hours per week).

[a] Model adjusted for all variables in the table as well as histological type, number of lymph nodes removed, surgery type, adjuvant therapy, baseline income, and baseline level of physical activity.

[b] 85% of those missing BMI data were women aged over 50 years.

[c] Health Rating refers to baseline status at six months post-surgery and the change between baseline and 18 months.