Prospective examination of accelerometer-assessed physical activity and associations with quality of life and fatigue in newly diagnosed breast cancer patients: results from the AMBER study

Jeff Vallance[1], Ruixuan Zhang[2], Christine Friedenreich[3], Qinggang Wang[3], Lin Yang[3], Charles Matthews[4], Margaret McNeely[5], Nicole Culos-Reed[6], Gordon Bell[7], Jessica McNeil[8], Leanne Dickau[3], & Kerry Courneya[7]

[1]Athabasca University
[2]University of Calgary
[3]Alberta Health Services
[4]US National Cancer Institute
[5]Faculty of Rehabilitation Medicine, University of Alberta
[6]University of Calgary
[7]Faculty of Kinesiology, Sport, and Recreation, University of Alberta
[8]University of North Carolina, Greensboro

The Alberta Moving Beyond Breast Cancer (AMBER) Study

- Prospective cohort study of stage I-IIIc breast cancer survivors.

- Examining the role of health and fitness in breast cancer survivorship.

- Assessments at baseline (time of diagnosis), 1 year post diagnosis, and 3 years after diagnosis.

  - Cardiorespiratory fitness
  - Upper and lower body strength
  - DEXA scan (body composition)
  - Lymphedema (perometer)

  - Blood draw
  - Accelerometry
  - General health questionnaire
  - Patient reported outcomes

- 10-year follow up for clinical outcomes (recurrence and mortality).

- Patients recruited out of the two largest cancer centres in Alberta, Canada (Edmonton and Calgary).

Background

- Most studies to date have used self-report physical activity measures, and cross-sectional designs.

- Relying on physical activity recall which leads to bias.

- Few studies have prospectively examined physical activity across the breast cancer trajectory and associations with health outcomes.

- We have previously reported the time 1 cross-sectional associations of physical activity and patient reported outcomes.

  - Vallance et al. *Cancer*, 2023; Vallance et al. *Psycho-Oncology*, 2023.

- In the AMBER study we have completed follow up measures at multiple timepoints after breast cancer diagnosis.

Study objectives

1. To elicit trajectories of accelerometer-assessed moderate-to-vigorous physical activity from diagnosis (T0) to one-year post diagnosis (T1).

2. To examine differences in health-related quality of life and fatigue at T1 across physical activity trajectories

Methods

- Within 90 days of surgery (Median=55):

    - Patients wore an ActiGraph GT3X+ accelerometer on their right hip for seven consecutive days.

    - Patients completed the SF-36 v.2 (physical and mental composite score) and the Fatigue Scale.

- ActiGraph data was analyzed using a hybrid machine learning method (R Sojourn package, Soj3x).

- Latent class trajectory analysis and growth mixture modelling (GMM) were conducted on the T0 and T1 physical activity data.

- Analysis of covariance examined differences in physical and mental composite scores, and fatigue across activity classes at T1.

Results

- Average age of patients was 55.4 years of age (SD=10.8).

- Most patients were diagnosed with stage II or III breast cancer (55%).

Variable	Baseline n=1528 n (%)	Participated at Year 1 n=1353[b] (%)
Activity Monitors		
ActiGraph	1457 (95.4)	86.1
activPAL	1441 (94.3)	82.0
Questionnaires		
Baseline Health	1528 (100)	--
Follow up	--	100
Diet History	1450 (94.9)	93.6
General Health	1459 (95.5)	94.3
Past Year Physical Activity	1457 (95.4)	94.2

- 1,157 participants had complete data at both timepoints (76% follow up).

Latent class trajectory analysis: spaghetti plot
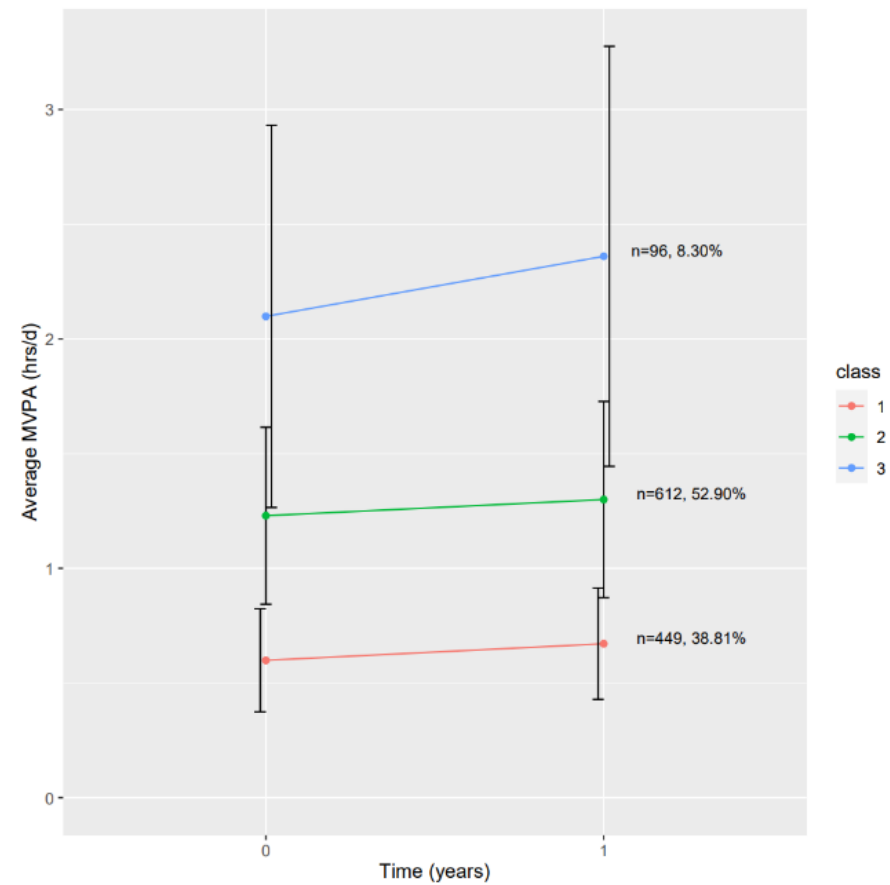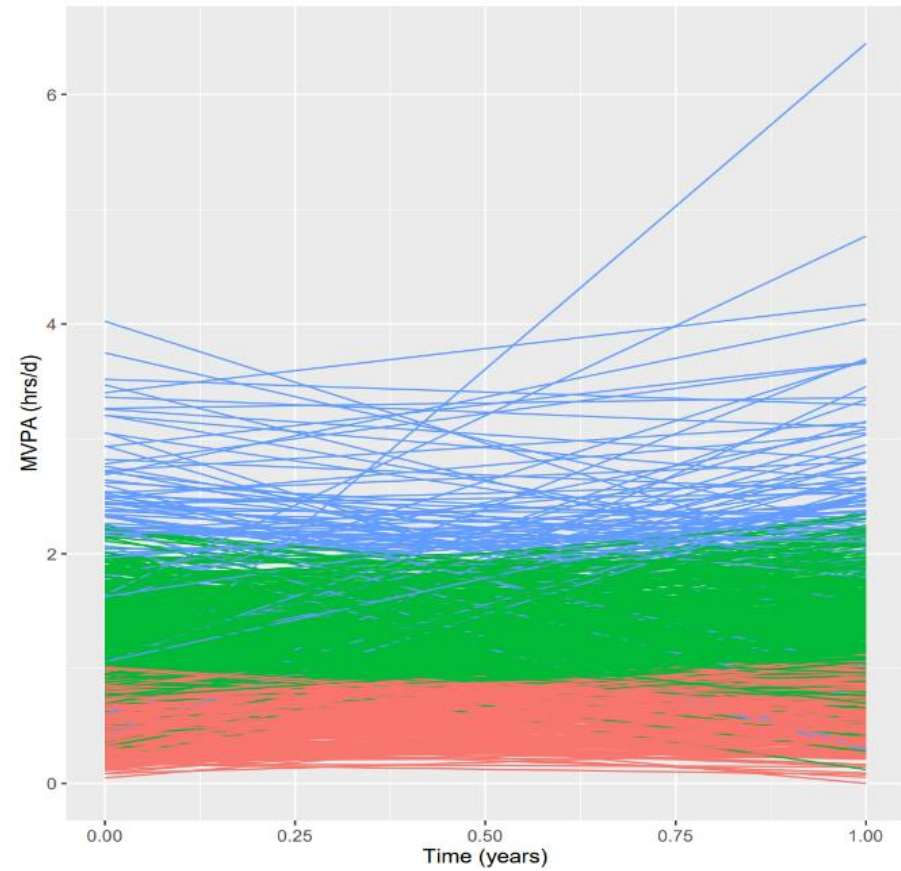
Differences in quality of life and fatigue

Table 1. Mean patient reported outcome (PRO) scores at T1 across physical activity trajectories

PRO variable	Low activity (Trajectory 1)	Moderate activity (Trajectory 2)	High activity (Trajectory 3)	Overall P
Physical composite score	48.6 (4.6)	**51.5** (4.4)**	**53.2** (4.2)**	**<0.001**
Mental composite score	51.4 (4.9)	52.3 (4.3)	52.3 (4.8)	0.196
Fatigue	39.3 (5.4)	**40.8** (5.2)**	**41.5** (5.2)**	**<0.001**

** $p < 0.005$.
Analysis of covariance models adjusted for relevant covariates.

Discussion

- In year 1 of a breast cancer diagnosis, more physical activity is better.

- Difference of 2.2 points in fatigue.

  – Met minimum clinically important difference (MCID) threshold.

- Difference of 4.6 points in PCS.

  – No firmly established MCIDs for PCS scores in the cancer context. Studies in other populations suggest a range from 2 to 7 points.

- The AMBER study is the largest to examine device-measured physical activity in breast cancer patients during the first year after diagnosis.

- Next steps are to examine the year 3 and 5 data, and associations with cancer recurrence and mortality at 10 yeas after diagnosis.

Thank you

Partner institutions:

The AMBER Study is a research project funded by the Canadian Institutes of Health Research

jeffv@athabascau.ca   www.amberstudy.com