



# Aerobic Fitness in Breast Cancer Survivors: Association Between Sub-maximal and Maximal Cardiopulmonary Exercise Testing

Burnett DM, Klemp JR, Aversman S, Greer C, Good M, Porter C, Fabian CJ, & Kluding P.  
University Kansas Medical Center, Kansas City



## Introduction

- Maximal oxygen uptake ( $\text{VO}_{2\text{ peak}}$ ) is a gold standard for peak aerobic fitness.
- $\text{VO}_{2\text{ peak}}$  has been used to assess risk for all-cause mortality,<sup>1</sup> cardiovascular disease (CVD),<sup>2</sup> and breast cancer occurrence.<sup>3</sup>
- Effort during a maximal test may vary in breast cancer patients throughout the continuum of care.
- Sub-maximal exercise testing can be more resilient to symptom fluctuations.
- Arthralgias in the breast cancer (BrCa) population may cause discomfort during maximal treadmill testing.

## Purpose

To determine associations between two different sub-maximal testing modalities with a maximal  $\text{VO}_{2\text{ peak}}$  treadmill test and assess peak aerobic fitness in breast cancer survivors.

## Methods

**Participants:** 30 female BrCa survivors who had undergone chemotherapy and/or left chest radiation. All participants had to be at least 3 months post-treatment (chemotherapy or radiation, but could be on anti-hormonal therapy), and have at least 2 CVD risk factors.

**Descriptive characteristics:** N= 30; mean +/-SD

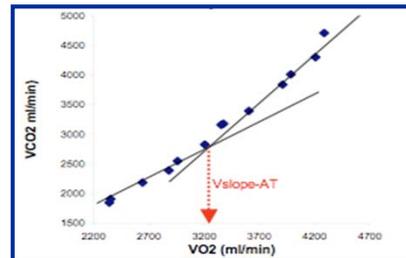
Age:	50.5 ± 5.6 years
Time since diagnosis:	58 ± 27 months
LVEF:	60.4 ± 4.9%
Weight:	172.2 ± 32.8 pounds
BMI:	28.9 ± 5.3 kg/m <sup>2</sup>
% Fat:	44.4 ± 7.7%

## Testing:

- We performed a single maximal cardiopulmonary exercise test (CPET) on a treadmill using indirect calorimetry, while analyzing maximal  $\text{VO}_{2\text{ peak}}$ .

## Methods (cont'd)

- Sub-maximal  $\text{VO}_2$  was assessed during the  $\text{VO}_{2\text{ peak}}$  treadmill test for comparison to the  $\text{VO}_{2\text{ peak}}$ .
- A second sub-maximal test on an ARC trainer was conducted for comparison to the treadmill maximal  $\text{VO}_{2\text{ peak}}$  values.
- Criteria for both sub-maximal  $\text{VO}_2$  tests was established by using the respiratory exchange ratio ( $\text{RER} \geq 1.0$ ) for determining the anaerobic threshold (AT).
- Confirmation of the AT was made upon visual assessment of 1) V-slope method, and 2) ventilatory equivalent technique.



V-slope method for confirming AT. Determined by the point where  $\text{VCO}_2$  production rises disproportionately to  $\text{O}_2$  consumption.<sup>4</sup>

## Data Analysis:

- Pearson's correlation coefficients were used to determine association between the gold standard  $\text{VO}_{2\text{ peak}}$  maximal test on the treadmill with the sub-maximal test on the treadmill and ARC trainer.

## Results

	$\text{VO}_2$	r value
Maximal Test:	25.4 ± 5.3 ml/kg/min	
Sub-maximal TM:	20.5 ± 4.3 ml/kg/min	.83; p= < 0.001
Sub-maximal ARC:	19.0 ± .26 ml/kg/min	.80; p= < 0.001

## Discussion

- Treadmill and ARC sub-maximal  $\text{VO}_2$  exercise tests showed a strong correlation with maximal  $\text{VO}_{2\text{ peak}}$ , indicating that sub-maximal testing can be a good measure of aerobic fitness in breast cancer survivors.
- Breast cancer survivors in this study had a marked decrease in  $\text{VO}_{2\text{ peak}}$ , putting them at a higher risk for all cause mortality, CVD, and breast cancer recurrence.
- No adverse events occurred during maximal or sub-maximal testing

## Future Direction for Clinical Implications

- Sub-maximal exercise testing may serve as a more objective and repeatable measure of exercise tolerance from diagnosis, during treatment, and until end of post treatment secondary to changing levels of fatigue and treatment tolerance.
- Sub-maximal testing can be more accessible in clinical settings and safer to perform than maximal testing in breast cancer patients.
- Cardiorespiratory exercise testing may be used as a risk stratification tool for breast cancer patients/survivors.

## References

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