

# Fitness Benefits in Cardiac Rehabilitation Between Sex and Education

## Introduction

- Rural environments are associated with lower SES—educational attainment is a prime example. SES is a prime predictor of Health.<sup>1</sup>
- Rural women have been shown to have even lower levels of education than males in the same environment.<sup>2,3</sup>
- The financial and social security benefits that are conferred by higher levels of education are less pronounced in women with equivalent levels of education as their male counterparts.<sup>4,5</sup>
- Cardiac rehabilitation (CR) is one area where sex differences in entrance fitness levels, and fitness benefits yielded in the secondary prevention program are disadvantageous for women.<sup>6</sup>
- Improving cardiovascular fitness is a primary instrumental goal of cardiac rehabilitation, and any discrepancies between populations in predictor variables should be accounted for when prescribing treatment.

William A. Middleton<sup>1,2</sup>, Patrick Savage<sup>4</sup>, Sherrie Khadanga<sup>4</sup>, Philip Ades<sup>1,4</sup>, Diann E. Gaalema<sup>1,2,3</sup>

## Abstract

Women yield fewer health benefits from financial, social, educational, and psychological variables associated with health. This is especially pronounced in women in rural environments, which are lower SES. Cardiovascular health may be an area in which SES impacts female health differently than men. Education, a proxy for SES, has been found an overall predictor of higher cardiovascular health and higher improvement in cardiovascular fitness across Phase II of Cardiac Rehabilitation (CR). We hypothesized that being female would be associated with lower fitness improvements over the duration of the UVMC Cardiac Rehabilitation program, and that this effect would be strongest in patients with low educational attainment, a factor associated with rurality. Consistent with previous literature, women improved their fitness by  $\text{VO}_2$  significantly less than men ( $2.56 \text{ v.s. } 3.54 \text{ mL/kg/min}$ ), however there was no significant interaction effect between sex and years of education completed.

## Methods

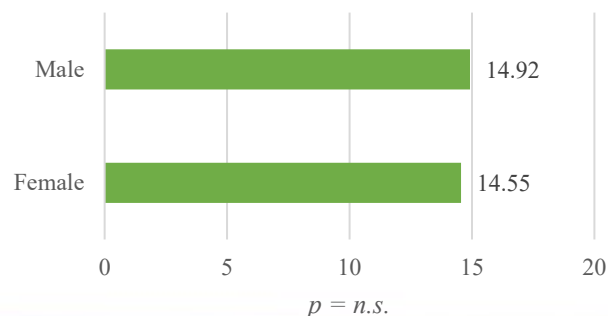
- ANOVA to detect main effects of gender and education on fitness yields measured by  $\text{VO}_2$  (maximal volume oxygen uptake in  $\text{mL/kg/min}$  during an exercise task).
- Examine sex differences in fitness improvement moderated by level of education through hierarchical multiple regression.

## Purpose

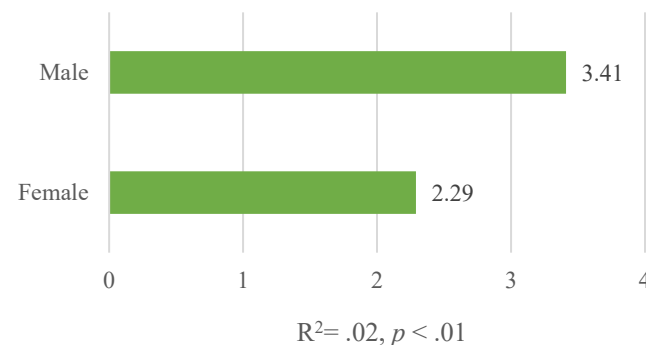
- Compare fitness improvement between men and women, and levels of education, in Cardiac Rehabilitation.
- Examine sex differences in fitness improvement moderated by level of education.

## Citations

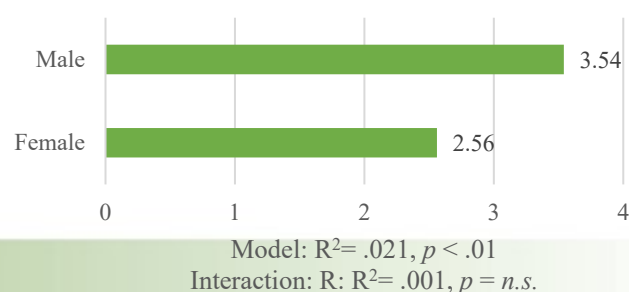
### Average Years of Education



### $\text{VO}_2$ Improvement



### $\text{VO}_2$ Improvement Accounting for Education



## Results

- Females improved  $\text{VO}_2$  by an average of 2.29 points [ $n=111$ ]. Male's improved significantly more [ $n=379$ ] in  $\text{VO}_2$  scores  $M = 3.41$ . There was a significant difference between sex in  $\text{VO}_2$  improvement, but not in education, or between education and improvement [ $R^2 = .02, p < .01$ ;  $R^2 = .003, p = n.s.$ ].
- Accounting for education, being female was associated with significantly lower levels of  $\text{VO}_2$  improvement, 1.09 points of less improvement ( $R^2 = .02, p < .01$ ). No main effects of education were found in this step of the model ( $t(489) = -.597, p = n.s.$ ).
- The interaction between sex and education did explain a significant amount of variance in fitness improvement above and beyond sex and education, ( $R^2\Delta = .01, p = n.s.$ ).

## Discussion

Consistent with prior research, women receive significantly lower fitness benefits from cardiac rehabilitation than men. However, no significant differences in level of education were found, and the interaction between education and sex did not account for variation in  $\text{VO}_2$  improvement.

These results show a moderately positive outlook for women with low SES. They demonstrate that although women are unfortunately less likely to receive the same fitness benefits in cardiac rehabilitation compared to men, lower education does not compound on that effect above and beyond gender alone.

Future research should examine other hallmarks of the sex differences found in rurality, such as income, access to insurance, and baseline fitness levels, against health yields from CR.