

# The Six Minute Walk Test in Healthy, Nulliparous Young Women

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# BACKGROUND

**Exercise testing assesses a patient's cardiorespiratory function and can risk-stratify** patients into operative and non-operative management groups. It is also useful as a morbidity assessment tool in patients with chronic disease (1). Functional walking tests, such as the Six Minute Walk Test (6MWT), are commonlyused exercise tests due to their ease, affordability, and little requirement for equipment (1). 6MWT reference values for older patients are well-characterised; however, establishing baseline data in young, healthy people has been relatively neglected.

As more children born with congenital conditions are living into adulthood and considering becoming pregnant (2), and with the increasing global prevalence of illnesses of pregnancy (such as preeclampsia), development of a 6MWT reference range for the healthy young female population is imperative.

# **AIMS & OBJECTIVES**

The aim was to investigate the average Six Minute Walk Distance, and the cardiopulmonary responses to exercise, of healthy, nulliparous, non-pregnant females using the Six Minute Walk Test. Using this subset of 6MWT data in combination with data collected from women in early-, mid- and late-pregnancy, the ultimate aim is to develop a predictive exercise test for preeclampsia.

These data will help to inform assessments of health standards and improve application and uptake of exercise testing as a functional assessment in this population.

### **METHODS**

The study received institutional ethics approval (RWH HREC project 15/23) and was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN: 12615000964516). Participant recruitment was principally from the Royal Women's Hospital and the University of Melbourne staff and student cohorts.

**Inclusion criteria were:** 

•Non-pregnant females aged 18-40 years

•Nulliparous (including women who had experienced a <12 weeks' gestation miscarriage)

•American Society of Anesthesiologists (ASA) Classification I or II, with no significant medical or surgical illnesses.

**Exclusion criteria included:** 

•Body Mass Index (BMI) >30 kg/m<sup>2</sup>

•Smoking

•Any pre-existing medical conditions limiting ability to exercise (such as joint, muscle, bone or neurological conditions)

•Diabetes, cardiovascular disease, or pelvic floor problems.

After initial demographic and anthropometric data were collected (full name, age, date of birth, height and weight), each subject underwent the 6MWT according to guidelines published by the National Heart Foundation of Australia (3) in a 30-metre indoor corridor situated at the Royal Women's Hospital, Parkville. The walk test was performed twice, and after each test, the participant's vital signs were measured.

Participants were asked four questions — two regarding expectation, and two regarding actual experience — using the Rating of Perceived Exertion (RPE) scale and the Modified **Borg Dyspnoea (MBD) scale after they completed the tests:** 

1.On a scale of one to fifteen (where one means no exertion at all and 15 means maximum exertion), how much exertion did you expect to feel by the end of the test? No expectation will be included as an answer option.

2.Using the scale from Question 1, which number best represents your level of effort? 3.On a scale of zero to ten (where zero means no difficulty breathing and ten is when your breathing difficulty is maximal), how much breathing difficulty did you expect to feel by the end of the test? No expectation will be included as an answer option. 4.Using the scale from Question 3, how much difficulty is your breathing causing you right now?

## **RESULTS**

For this study, ninety-one participants were recruited and consented. No participants chose to withdraw from the study. Of these 91 participants, one was excluded due to BMI >30 kg/m<sup>2</sup>, and the resulting data set used for statistical analysis comprised 90 women.

 Table 1 Participant characteristics

**Table 3 Post-exercise variables** 

Variable	Mean (Standard Deviation) or Range
Age	24.5 (3.4)
Body Mass Index (kg/m <sup>2</sup> )	23.1 (3.0)
Resting Heart Rate (HR) (bpm)	71.1 (11.0)
Reference Interval for Resting HR (bpm)	50 - 93
Resting Systolic Blood Pressure (mmHg)	112.4 (9.7)
Resting Diastolic Blood Pressure (mmHg)	73.9 (7.3)
Resting Blood Oxygen Saturation (%)	98.5 (1.0)
Resting Respiratory Rate (brpm)	14.6 (3.8)
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Table 2 Six Minute Walk Test outcomes		
Outcome	Mean (Standard Deviation) or Range	
Six Minute Walk Distance (m)	615.8 (72.9)	
Six Minute Walk Distance Reference Range (m)	473 – 759	
Average walking speed (km/hr)	6.2 (0.7)	

Variable	Mean (Standard Deviation) or Proportion
HR at one minute post-exercise (bpm)	82.4 (16.9)
Mean HR increase with exercise (bpm)	11.3 (11.2)
Time to recovery (HR within four beats of resting) (mins)	4.1 (3.6)
Proportion of women whose expectation of breathlessness was greater than experienced breathlessness	63%
Proportion of women whose expectation of exertion was greater than experienced exertion	36%

These results demonstrate the average anthropometric and cardiovascular profile of young, healthy, nulliparous women, and their average response to exercise. Fifty-five of 90 women (61%) recovered to their resting HR within five minutes. Eighteen of 90 (20%) took up to 10 minutes, and seven of 90 (8%) took up to 15 minutes to recover. Whilst participants took on average four minutes for their HR to return to resting values, ten of the 90 women (11%) had not recovered after 15 minutes of rest.

Furthermore, 17 of 90 (19%) and nine of 90 (10%) women had no expectations for their level of breathlessness or exertion respectively after the test. Of the women who did have expectations for their exercise test, 45 of 72 (63%) overestimated the level of breathlessness they would experience, and 29 of 80 (36%) anticipated greater exertion than they actually experienced.

### **CONCLUSIONS**

The Six Minute Walk Test is a safe, easy-to-administer exercise test which yields useful information about functional status. This research determined the average Six Minute Walk Distance of nulliparous young women to be 616 metres (reference range 473 – 759 m). Assessment of cardiorespiratory recovery patterns indicates that healthy young women return to their baseline heart rate within four minutes on average, and that the mean HR increase with this form of submaximal exercise is approximately 11 bpm. Breathlessness with exercise was overestimated by most women, and approximately one in three women overestimated the exertional effect of exercise.

This study is the first to use a younger and larger cohort (average age 25 years) than previously published, which is more representative of average pregnant women. The average 6MWT distance of 616 metres can be used by doctors, researchers and allied health specialists as a reference value for assessment of fitness prior to pregnancy.



**1.** Solway S, Brooks D, Lacasse Y, Thomas S. A Qualitative Systematic Overview of the **Measurement Properties of Functional Walk Tests Used in the Cardiorespiratory Domain.** Chest. 2001;119(1):256-70.

2. Lotstein DS, McPherson M, Strickland B, Newacheck PW. Transition planning for youth with special health care needs: results from the national survey of children with special health care needs. Pediatrics. 2005 2005/06//:1562+.

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