

UNIVERSITI TEKNOLOGI MARA

**FACTORS INFLUENCING
EXERCISE CAPACITY DURING
SUBMAXIMAL EXERCISE IN MALE
AND FEMALE ADULTS**

NUR SYAZNI BINTI ABD RAZAK

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Health Sciences
(Physiotherapy)

Faculty of Health Sciences

April 2021

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Nur Syazni binti Abd Razak
Student I.D. No. : 2017975779
Programme : Master of Health Science (Physiotherapy) – HS763
Faculty : Health Sciences
Thesis Title : Factors Influencing Exercise Capacity during
Submaximal Exercise in Male and Female Adults

Signature of Student

Date : April 2021

ABSTRACT

This study aimed to 1) compare the anthropometric, body composition, level of physical activity (PA), fatigue (rating of perceived exertion [RPE]) and aerobic fitness ($VO_2\max$) between males and females; 2) investigate the relationship between the anthropometric, body composition, PA, fatigue, and $VO_2\max$ in males and females; 3) determine factors that influence fatigue and $VO_2\max$ during submaximal exercise in males and females; 4) identify the ability of the interest independent variable in predicting $VO_2\max$, providing an estimate cut-off value that corresponds to the best trade-off between sensitivity and specificity of the possible predictive variable in males and females. A cross-sectional study was conducted among young adults aged 18 to 40 years old in a public university. The anthropometric (weight, height, body mass index [BMI], waist circumference [WC], waist-to-hip ratio [WHR], and waist-to-height ratio [WHtR]), body composition (fat and muscle mass percentages), level of PA, fatigue and $VO_2\max$ were measured. Height was measured by using a fixed stadiometer; weight, BMI, fat, and muscle mass percentages were calculated by using a bioimpedance analysis. A tape measure was used to measure the waist and hip circumferences and the International Physical Activity Questionnaire (IPAQ) was utilized to assess the PA. To assess fatigue and $VO_2\max$, a Borg's 6-20 scale and Astrand-Rhyming nomogram were used, respectively, during the cycle ergometer exercise test. Data were analysed via *t*-tests, Pearson's correlations, stepwise linear regression models, and receiver operating characteristic (ROC) analyses. The results showed that weight, height, WC, WHR, WHtR, fat percentage, muscle mass, and PA were significantly different between males and females (ALL, $p > 0.05$). In males, WC ($r=-0.571$), fat percentage ($r = -0.532$), weight ($r=-0.521$), muscle mass ($r = 0.516$), WHtR ($r=-0.516$), WHR ($r=-0.487$) and BMI ($r=-0.47$) were significantly correlated with $VO_2\max$ (all, $p<0.05$). Among females, fat percentage ($r = -0.601$), WC ($r=-0.581$), weight ($r=-0.571$), muscle mass ($r = 0.549$), WHtR ($r=-0.545$), BMI ($r=-0.545$), WHR ($r=-0.473$) and height ($r=-0.287$) were significantly correlated with $VO_2\max$ (all, $p<0.05$). Moreover, WC and fat percentage were the significant predictors of $VO_2\max$ in males and females, respectively. In sub-analyses, WC was demonstrated as a superior determinant to predict the $VO_2\max$ in both genders. The ROC analyses of WC showed 0.786 for males and 0.831 females. The ROC analyses also produced a new cut-off values of WC in prediction of cardiovascular disease risk which were 83.75 cm and 81.25 cm in males and females, respectively. As a conclusion, this study presented that the anthropometric, body composition, and PA were significantly different between males and females. The anthropometric and body composition were strongly correlated with aerobic fitness in both genders. WC was demonstrated to be a stronger predictor to predict $VO_2\max$ in both males and females. An awareness of the importance of monitoring WC among general population and health professionals should be addressed to combat the rising prevalence of cardiovascular diseases.

ACKNOWLEDGEMENT

Firstly, I would like to thank The Almighty God for His gift in pursuing my Maser degree and establishing me to make this thesis possible.

My huge gratitude and countless thanks to my supervisor, Associate Professor Dr. Maria Justine for her endless guidance, advice, and motivation to shape me into an independent researcher, able to conduct research, produce articles and thesis throughout my Master degree journey. I also would like to address my countless appreciation and gratitude to all lecturers of the Physiotherapy department who had given constructive criticism and support during my research.

I also would like to extend my countless thanks to the students and staff of UiTM Puncak Alam who were willing to participate in this study and those who either directly or indirectly involved in this study.

Finally, this thesis is dedicated to my employer and my beloved family for their endless motivation and support for me to finish this study. Alhamdulillah.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xi
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xv
CHAPTER ONE: INTRODUCTION	1
1.1 Introduction	1
1.2 Background of the Study	1
1.3 Factors Associated with Physical Activity	3
1.3.1 Demographic Factor	3
1.3.2 Socioeconomic Factor	4
1.3.3 Behavioural Factor	4
1.4 Consequences of Physical Inactivity	5
1.4.1 Effects on Anthropometric and Body Composition	5
1.4.2 Effects on Physical Fitness	5
1.4.3 The Burden of Non-Communicable Diseases on Individual Financial Problem and Malaysia's Economy	6
1.4.4 Relationship of Anthropometric, Body Composition and Fitness with Development of Non-communicable Diseases	6
1.5 Abdominal Obesity	7
1.6 The Problem Statement	10
1.7 The Research Objectives	12
1.8 The Research Hypotheses	13
1.9 Scope and Delimitation of the Study	13
1.10 Significance of Study	13