

**UNIVERSITI TEKNOLOGI MARA**

**HANDGRIP STRENGTH AND ITS  
ASSOCIATION WITH PHYSIOLOGICAL  
VARIABLES AND FAT FREE MASS INDEX  
AMONG CARDIAC PATIENTS**

**SITI NUR BAAIT BINTI MOHD SOKRAN**

Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Health Science**

November 2016

## ABSTRACT

Cardiac disease patients showed alterations in muscle strength, body composition and coronary function. This study focused on exploring the relationship between handgrip strength, Left ventricular ejection fraction (LVEF), body composition and myocardial oxygen consumption (MVO<sub>2</sub>) index among cardiac disease patients. This is a cross-sectional study involving 77 subjects and it was carried out in two phases among cardiac patients with surgical and conservative management. Subjects were recruited based on selection criteria as set by the study protocol. In the preliminary study, 27 patients who underwent cardiac surgery were subjected to handgrip strength and MVO<sub>2</sub> index pre and post surgery. Spearman-rank correlation, simple linear regression analysis and MANOVA were used to analyse the study results. In the main study, 50 cardiac patients recruited and handgrip strength measurement was conducted using Jamar hand dynamometer followed by measurement of body composition using hand-held BIA. Then, the subjects were assessed for MVO<sub>2</sub> index. The preliminary study results showed that there were significant interactions ( $p < .001$ ) for both handgrip strength with large effect sizes (dominant handgrip x MVO<sub>2</sub> index:  $\eta_p^2 = .44$ ; non-dominant handgrip x RPP:  $\eta_p^2 = .49$ ) with MVO<sub>2</sub> index pre and post-surgery. This signifies that handgrip strength had effects on MVO<sub>2</sub> index pre and post-surgery. The main study outcome showed relationship between bilateral handgrip strength with LVEF and MVO<sub>2</sub> index among cardiac patients. FFMI showed a negative relationship with dominant handgrip strength among male subjects ( $p = .0004$ ,  $p > .005$ ). Simple linear regression analysis demonstrated an interaction between non-dominant handgrip strength and LVEF ( $R^2 = .081$ ,  $p < 0.05$ ) with small effect size, both handgrip strength and MVO<sub>2</sub> index ( $R^2 = .334$ ,  $p < .001$ ) with small effect size. The study findings show that there is an interaction found between handgrip strength and MVO<sub>2</sub> index pre and post-surgery among cardiac surgical patients. There is an association found between handgrip strength with MVO<sub>2</sub> index and LVEF among cardiac patients. However, no relationship was found between handgrip strength and body composition. Hence, it might be inferred that handgrip strength could be used as a predictor to assess MVO<sub>2</sub> index among cardiac subjects.

## ACKNOWLEDGEMENTS

I would like to thank Allah s.w.t for his greatness then we would ever be able to complete this thesis to the fullest. I would like to express my deepest appreciation to all those who provided me a possibility to complete this thesis. A fullest gratitude to my supervisor Mr. Vikram Mohan who had spent much of his time stimulating suggestion and encouragements which helped me a lot to coordinate my project. He has been a great mentor and supervisor. Plus all the critics that builds me, what I am now. I really appreciate all the kindness and patience towards me.

Furthermore, my gratitude goes to my husband for his support and love throughout my journey. He has given me constant encouragement and has made many sacrifices. I would like to acknowledge my children as my motivator to continue my study even though there are many obstacles and challenges. My parents has been very supportive and giving me motivation to keep on going with my study.

Besides that, I would like to thank my co-supervisor Dato Dr Mohd Sulaiman for his effort and guidance I really appreciate the effort and assistance he had put in my project.

Besides that, I also would like to acknowledge KPJ Damansara Hospital for providing me resources to complete my project. Finally, I would like to acknowledge the management of KPJ University College for the support all the individuals that involve and sacrifice their time for my study. Without their generosity, this project would never have been completed.

## TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	ii
<b>AUTHOR'S DECLARATION</b>	iii
<b>ABSTRACT</b>	iv
<b>ACKNOWLEDGEMENT</b>	v
<b>TABLE OF CONTENT</b>	vi
<b>LIST OF TABLES</b>	x
<b>LIST OF FIGURES</b>	xi
<b>LIST OF ABBREVIATIONS</b>	xii
<b>CHAPTER ONE: INTRODUCTION</b>	
1.1 Background of Study	1
1.2 Problem Statement	6
1.3 Research Objectives	7
1.4 Research Hypothesis	8
1.5 Significance of Study	8
1.6 Assumptions of Study	9
1.7 Delimitations of Study	9
1.8 Definition of Terms	10
<b>CHAPTER TWO: LITERATURE REVIEW</b>	
2.0 Introduction of Cardiac Disease	14
2.1 Incidence and Prevalence of Cardiac Disease	15
2.2 Risk Factor of Cardiac Disease	16
2.3 Pathogenesis of Cardiovascular Disease	18

2.4	Problems Associated with Cardiac Disease	19
2.5	Medical Management of CVD	21
	2.5.1 Coronary Artery Bypass Grafting (CABG)	22
	2.5.2 On-pump versus Off-pump CABG	24
	2.5.3 Problems associated with cardiac surgery	25
2.6	Cardiac Disease and Skeletal Muscle Modification	27
2.7	Handgrip strength	30
	2.7.1 Methods of measuring handgrip strength	30
	2.7.2 Normative data for handgrip strength	32
	2.7.3 Handgrip strength among diseased population	34
2.8	Myocardial oxygen consumption (MVO <sub>2</sub> ) and skeletal muscle properties	35
2.9	Cardiac disease and left ventricular function	38
2.10	Cardiac disease and body composition	39
2.11	Functional Classification of Heart Failure	43
2.12	Summary	44

**CHAPTER THREE: HAND GRIP STRENGTH AND MYOCARDIAL OXYGEN CONSUMPTION INDEX AMONG CORONARY ARTERY BYPASS GRAFTING PATIENT**

3.0	Introduction	45
3.1	Methodology	
	3.1.1 Subjects	49
	3.1.2 Ethics	50
	3.1.3 Rate Pressure Product (RPP) Measurement	50
	3.1.4 Handgrip Strength Measurement	51
	3.1.5 Data Analysis	51
3.2	Result	54
3.3	Discussion	58