

**UNIVERSITI TEKNOLOGI MARA**

**AQUA EXERCISES AND *ADIPOQ*  
GENE POLYMORPHISM: IMPACTS  
ON THE METABOLIC AND  
OBESITY-RELATED TRAITS,  
PHYSICAL FITNESS, AND QUALITY  
OF LIFE AMONG OBESE WOMEN**

**MAISARAH SHARI**

**PhD**

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## 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 : Maisarah binti Shari

Student I.D. No. : 2013878838

Programme : Doctor of Philosophy (Sports Science and Recreation)– SR950

Faculty : Sports Science and Recreation

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Signature of Student :  .....

Date : January 2021

## ABSTRACT

Obesity is one of the major contributors to diseases and mortality. Weight loss significantly reverses the diseases related to obesity and prolonged life expectancy. Undoubtedly, regular physical exercise has succeeded in achieving the desired weight. Aqua-based exercise, also known as water-based exercise has been a safer and appropriate alternative approach for obese people. However, there is limited scientific evidence comparing the effectiveness between Aqua Zumba® Fitness and aqua jog in a weight loss program. Less has been studied on the impact of gene polymorphism and age factor on effects of aqua exercises in obese women. This study aimed to compare the effects of the 12-weeks Aqua Zumba® Fitness and aqua jog on the metabolic and obesity-related traits, physical fitness, and quality of life between collegiate and middle-aged obese women. The role of the Adiponectin (*ADIPOQ*) gene polymorphism on metabolic and obesity-related traits in response to aqua exercises among participants was also investigated. One hundred twenty previously sedentary obese women (BMI >30 kg/m<sup>2</sup>), aged 20-59 years old (collegiate, mean age=27 and middle-aged, mean age=45) were randomized to either Aqua Zumba® Fitness (AZ, n=40), aqua jog (AJ, n=40) or control group (C, n=40). Exercise groups were subjected to aqua exercise programs for 12-weeks, 3 times/week, 60 minutes/session, with the intensity of 50-75% of maximum heart rate. High density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride, glucose, abdominal circumference (AC), blood pressure, body fat mass (BFM), balance, flexibility, cardiorespiratory fitness (CRF), muscular strength, lean mass, and quality of life were measured at baseline (week-0) and post-exercise intervention (week-13). The participants were genotyped for *ADIPOQ-rs266729*, *ADIPOQ-rs17300539*, and *ADIPOQ-rs16861194*. The genotypes were correlated to the changes of selected metabolic and obesity-related traits except for *ADIPOQ-rs17300539*. Both AZ and AJ demonstrated significant changes ( $p < .05$ ) for most of the parameters except for LDL and BFM in the collegiate, and LDL and blood pressure in the middle-aged ( $p > .05$ ). However, AZ produced significant superior changes in the improvement of AC (in middle-age), upper and lower body strength (in both age) ( $p < .05$ ) compared to the AJ. Less prolific improvement in LDL (17% in collegiate, 12% in middle-aged), triglyceride (32% in collegiate, 22% in middle-aged), glucose (19% in collegiate, 14% in middle-aged), AC (13% in collegiate, 7% in middle-aged), blood pressure (systolic and diastolic: 9% in collegiate, 5% in middle-aged), BFM (16% in collegiate, 11% in middle-aged), and quality of life (mental health aspect: 30% in collegiate, 25% in middle-aged) were found in middle-aged. The participants with *ADIPOQ-rs266729* CC genotype showed a greater reduction in LDL compared to GC genotype ( $p = .03$ ) and *ADIPOQ-rs16861194* AA genotype showed a greater reduction in AC compared with AG genotype ( $p = .04$ ) following interventions. In conclusion, 12-weeks of AZ and AJ resulted in improvement in all health parameters in obese women and *ADIPOQ* gene polymorphism and ageing process is associated with the metabolic responses following aqua exercises. This study suggests that regular participation in the moderate intensity of aqua-based exercise can be an alternative training to reverse obesity pandemic, especially among collegiate obese females. Moreover, exercise educator should implement AZ since it offers a greater reduction in abdominal fat and improvement in muscular strength compared to AJ. Additionally, *ADIPOQ-rs266729* G and *ADIPOQ-rs16861194* G variants may be considered as a disadvantageous factor in the context of training-induced effects on metabolic and obesity-related traits.

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# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xiii</b>
<b>LIST OF SYMBOLS</b>	<b>xiv</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xv</b>
<b>CHAPTER ONE INTRODUCTION</b>	<b>1</b>
1.1 Research Background	1
1.2 Problem Statement	6
1.3 Purpose of Study	7
1.4 Objectives of Study	7
1.5 Hypotheses	8
1.6 Significance of Study	11
1.7 Delimitation of Study	12
1.8 Limitation of Study	13
1.9 Assumptions of Study	14
1.10 Operational Terms	14
1.10.1 Obese	14
1.10.2 Young Collegiate Female	14
1.10.3 Middle-aged Women	15
1.10.4 Aqua Jog	15
1.10.5 Aqua Zumba® Fitness	15
1.10.6 Metabolic and Obesity-related Traits	15
1.10.7 <i>ADIPOQ</i> Gene Polymorphisms	16
1.10.8 Physical Fitness	16