

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	iii
ENGLISH ABSTRACT	iv
THAI ABSTRACT	vi
TABLE OF CONTENTS	viii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF DIAGRAMS	xiv
ABBREVIATIONS	xv
CHAPTER 1 INTRODUCTION	1
Research questions and hypotheses	4
Purposes of the study	5
Advantages of the study	5
Operational definition	6
CHAPTER 2 LITERATURE REVIEWS	
The classification of exercise	7

Oxidative stress	8
Free radical	9
Short acute exercise and oxidative stress: effect of gender	10
The inflammatory processes and exercise	11
Antioxidant substances	11
N-acetylcysteine (NAC)	12
Side effects of N-acetylcysteine	12
Clinical application in NAC	12
CHAPTER 3 METHODS	
Participants	16
Chemicals & equipments	18
Independent and dependent variables	18
Procedures	19
Statistical analysis	26
Data collection location	27
CHAPTER 4 RESULTS	
Characteristics of subjects	28
Oxidative stress	28
Maximal running time	39

CHAPTER 5 DISCUSSION

Total antioxidant capacity (TAC) and Glutathione (GSH)	40
Nitrite	41
Malondialdehyde (MDA)	42
Interleukin-2 (IL-2)	42
N-acetylcysteine (NAC)	43
Physical performance and Running time	44
Conclusion	46
REFERENCES	47
APPENDICES	61
Appendix A Personal data collection form	62
Appendix B Consent form	65
Appendix C Information sheet	67
Appendix D Illustration of study	71
Appendix E Certificate of ethical clearance	75
CURRICULUM VITAE	76

LIST OF TABLES

Table	Page
1 Characteristics and Completed blood count test before study in both the control and NAC supplement groups	29
2 All oxidative stress parameters; total antioxidant capacity (TAC) (mmol Trolox/L), glutathioine (GSH) ($\mu\text{mol/g Hb}$), Nitrite (nmol/L), and malondialdehyde (MDA) ($\mu\text{mol/L}$) in the control group and NAC supplement group.	30
3 Target heart rate, Rate of perceived exertion (RPE), and Maximal running times between control and supplement groups	39

LIST OF FIGURES

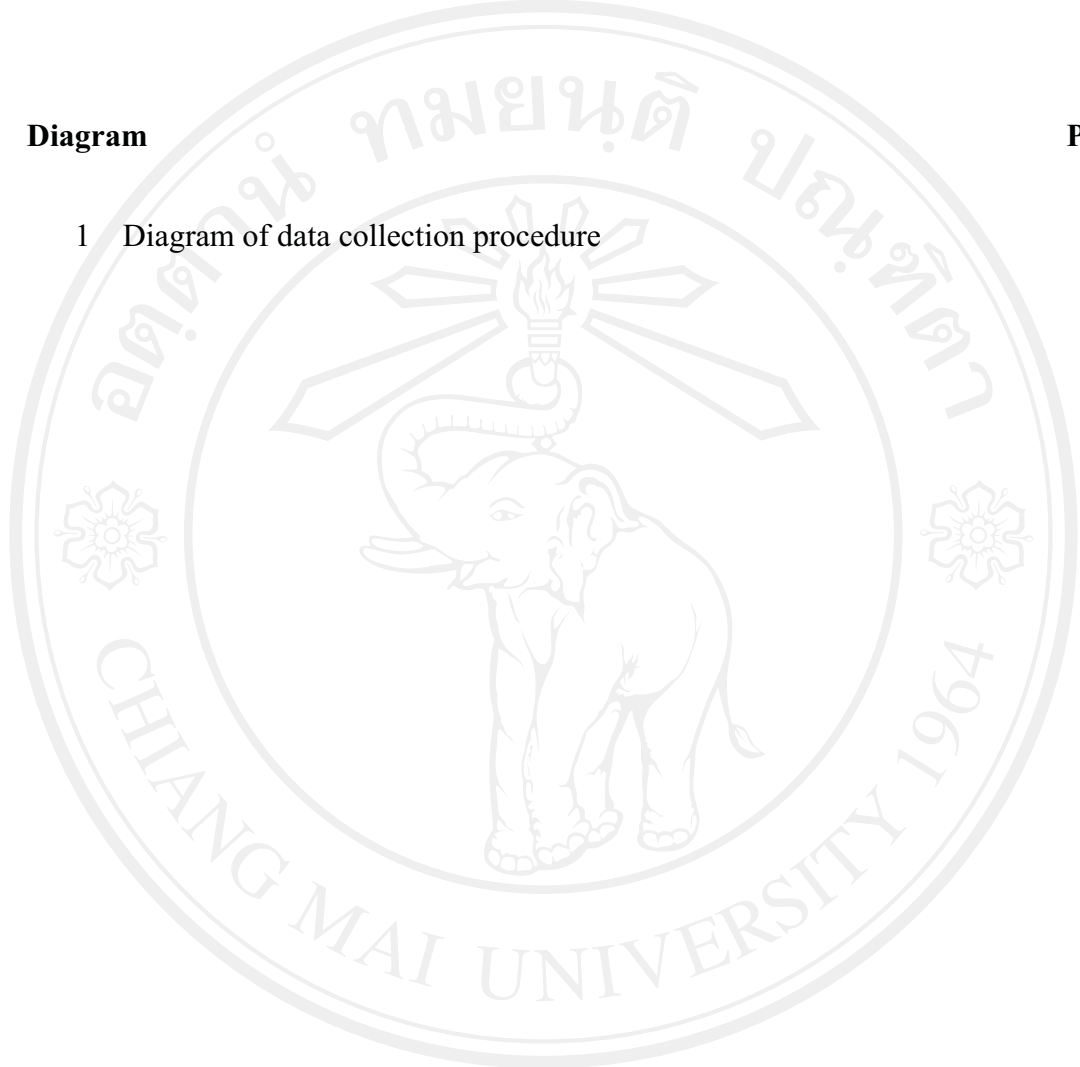
Figure	Page
1 The structure of N-acetylcysteine (NAC)	12
2 Image of the polar heart rate monitor	20
3 Fatigue value (Rate perceived exertion; RPE)	21
4 Plasma TAC (mmol Trolox/L) at pre exercise and post exercise test before day 0 and after 7 days (day 8) between the control group (n = 13) and supplement group taking NAC at 1,200 mg daily (n = 16)	31
5 Erythrocyte GSH ($\mu\text{mol/g Hb}$) at pre exercise and post-exercise test before day 0 and after 7 days (day 8) between the control group (n = 13) and supplement group taking NAC at 1,200 mg daily (n = 16)	31
6 Plasma Nitrite (nmol/L) at pre exercise and post-exercise test before day 0 and after 7 days (day 8) between the control group (n = 13) and supplement group taking NAC at 1,200 mg daily (n = 16)	32
7 Plasma MDA ($\mu\text{mol/L}$) at pre exercise and post-exercise test before day 0 and after 7 days (day 8) between the control group (n = 13) and supplement group taking NAC at 1,200 mg daily (n = 16)	32
8 Plasma interleukin-2 (pg/mL) at pre exercise and post-exercise test before day 0 and after 7 days (day 8) between the control group (n = 13) and supplement group taking NAC at 1,200 mg daily (n = 16)	33

LIST OF FIGURES

Figure		Page
9	Image of N-acetylcysteine drug	71
10	Image of Treadmill	72
11	Image of Mindray PM-50 Pulse Oximeter	72
12	Image of the Maximal running time testing	73
13	Image of UV-Visible Spectrophotometer	73
14	Image of Micro-plate reader EL 340	74
15	Image of Human IL-2 Immunoassay by ELISA kit test	74

LIST OF DIAGRAMS

Diagram	Page
1 Diagram of data collection procedure	26



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

ABBREVIATIONS

ABTs	2, 2-Azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)
ARDS	Acute respiratory distress syndrome
BMI	Body mass index
CBC	Complete blood count
CPK	Creatinine phosphokinase
COX-2	Cyclooxygenase-2
CVD	Cardiovascular disease
COPD	Chronic obstructive pulmonary disease
°C	Degree celsius
DNA	Deoxyribonucleic acid
ELISA	Enzyme linked immunosorbent assay
EDTA-Na ₂	Ethylenediaminetetra-acetic acid di-sodium salt
GSH-Px	Glutathione peroxidase
GSSG	Oxidized glutathione
GRx	Glutathione reductase

GST Glutathione-S-Transferase

GSH Glutathione

GLM General linear model

HNE 4-Hydroxynonenal

H₂O Water

H₂O₂ Hydrogen peroxide

HO₂[°] Perhydroxyl

Hb Hemoglobin

Hct Hemotocrit

ICU Intensive care unit

IL-6 Interleukin-6

IL-2 Interleukin-2

IL-8 Interleukin-8

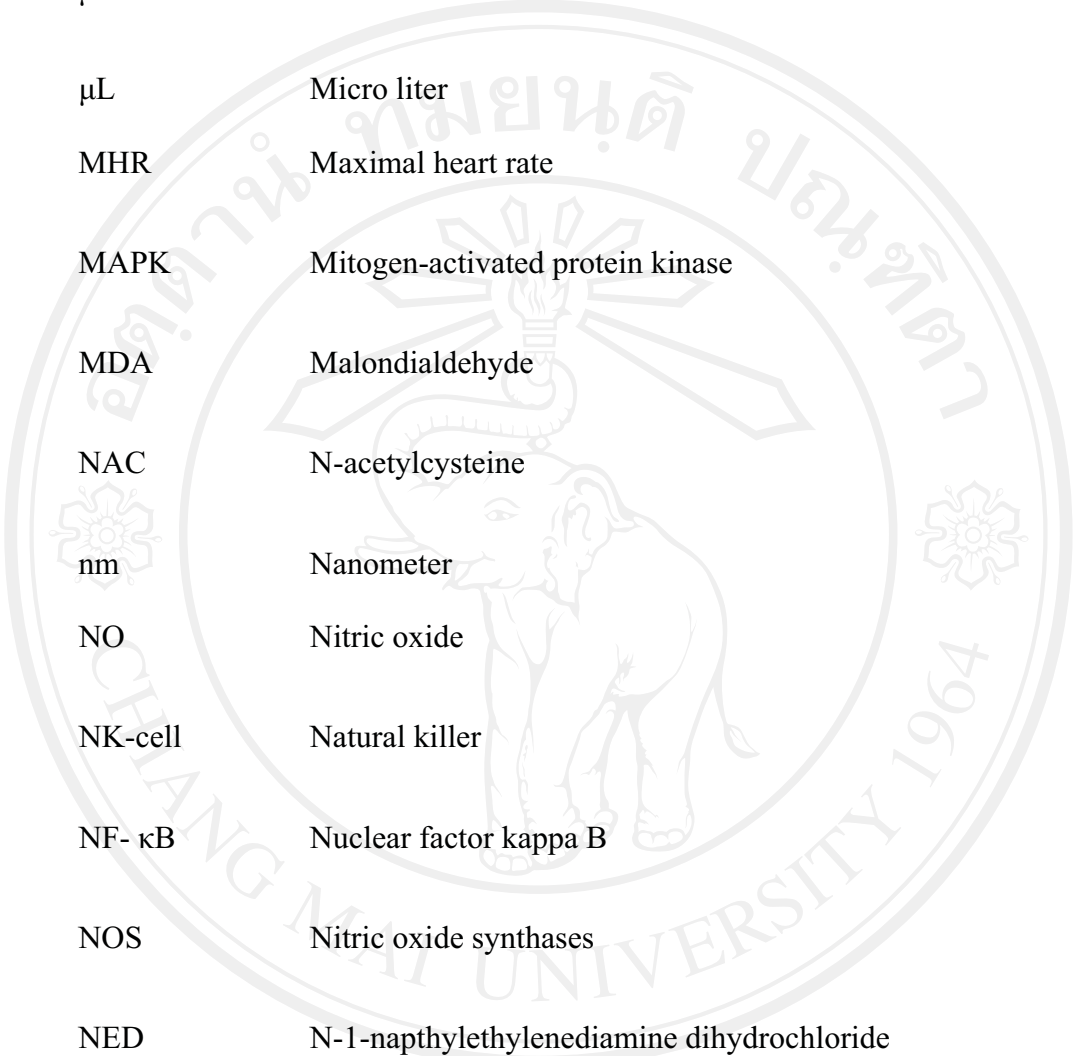
kg Kilogram

LDH Lactate dehydrogenase

m Meter

mg Milligram

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved



μM	Micro molar
μL	Micro liter
MHR	Maximal heart rate
MAPK	Mitogen-activated protein kinase
MDA	Malondialdehyde
NAC	N-acetylcysteine
nm	Nanometer
NO	Nitric oxide
NK-cell	Natural killer
NF- κ B	Nuclear factor kappa B
NOS	Nitric oxide synthases
NED	N-1-naphthylethylenediamine dihydrochloride
NaCl	Sodium chloride
O_2°	Superoxide
OH°	Hydroxyl
PSC	Peroxyl radical scavenging capacity
Plt	Platelet

%	Percent
RNS	Reactive nitrogen species
ROS	Reactive oxygen species
RO ^o	Peroxy
RA	Rheumatoid arthritis
RPE	Rate perceived exertion
RBC	Red blood cell
Sulfa	Sulfanilamide
SLE	Systemic lupus erythematosus
SOD	Superoxide dismutase
SE	Standard error of mean
TNF- α	Tumor necrotic factor- alpha
TBA	Thiobarbituric acid
TMP	Tetramethoxypropane
TAC	Total antioxidant capacity
WBC	White blood cell
yrs	Year