COMPARISON BETWEEN PUSH UP AND BENCH PRESS ON PHYSICAL PERFORMANCE AMONG SEDENTARY WOMEN

EDMUND AK BONNIE

2017968165

BACHELOR OF SPORTS SCIENCE (HONS)

FACULTY OF SPORTS SCIENCE AND RECREATION

UNIVERSITI TEKNOLOGI MARA SARAWAK

JANUARY 2020

ACKNOWLEDGEMENT

I would like to acknowledge in this special column to Almighty God especially his peace and faithfulness that I have been received which allowed me to come this far of my academic life. The completion of this Research Project took a great deal of concentrated effort and it is not possible without me with invaluable information, assessment feedback, views and comment. Without them, it seemed almost not possible for me to complete this project paper. Here I would like thank my beloved supervisor Miss Nur Khairunisa Binti Haji Abu Talip with her expertise, understanding, generous guide and support that made it possible for me to complete this project. I would like to extend my deepest appreciation to my beloved parent, Mr. Bonnie ak Mayon and Madam Naomie ak Pedam as well as my siblings and friends for their time and supports throughout my research project.

ABSTRACT

Push up (PU) and bench press (BP) were two exercise for strengthening upper body muscle. Push up and bench press exercise improves muscular strength (MS) and muscular endurance (ME) in exercise training. The purpose of this study was to compare the effects between push up and bench press exercise on muscular strength and muscular endurance among sedentary women in Universiti Teknologi MARA. 40 (n=40) sedentary women aged between 18 to 25 years old, been selected at UiTM Sarawak in the present study. A true experimental design was been conducted as participants will be doing pre-test before divided into two groups (PU group and BP group). After 6 weeks of training, participants done post-test to compare the effect of PU and BP on MS and ME. Present study exercise testing done using one-repetition max bench press (1RM BP) and one-minute push up (1Min PU) for pre and post-test. Participants trained four times per week for six weeks of training. The data then analysed by using the Statistical Package of Social Science SPSS 22.0. Mixed between within ANOVA was employed to compare the effects of two interventions following six weeks of training as well as to compare the effects between group (PU and BP group). The results show that there was a significant difference of MS and ME test between pre and post-test on PU group (p= .0001). The present study also shown a significant different of MS and ME test between pre and post-test on BP group (p= .0001). A significant different was also shown on MS and ME (p= .042) between two intervention groups.

Keywords: *Push up, bench press, muscular strength, muscular endurance, one-repetition max bench press and one-minute push up.*

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND SYMBOLS

Abbreviations

RT	Resistance Training
PU	Push Up
BP	Bench Press
1RM BP	1RM Bench Press
1Min PU	1Minute Push Up
UiTM	Universiti Teknologi MARA
MS	Muscular Strength
ME	Muscular Endurance

Symbols

F	Mean Square Regression
r	Reliability
n	Number of valid
SD	Standard deviation
M	Mean
p	Significant value
t	Size of the difference relative
kg	Kilogram
cm	centimetre

TABLE OF CONTENT

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDIES

A good program for resistance training (RT), athlete need to commit with three basic principles of exercise such as progressive overload, specificity and variation based on (William, 2002). In RT, the variables of training should be included in training. This may include the principle of intensity, volume (sets and reps) exercise selected, the order of the exercises, rest interval between set, velocity and contraction and frequency. RT can be combined with health-related fitness activities in physical activity due to requiring minimal equipment (Faigenbaum, 2013).

Push Up (PU) was an exercise that always been used in conditioning programme to develop the upper body strength. Nowadays, there were lots of PU challenge been created in order to promote health. For example, the 30 days PU challenge and the 50 PU challenge daily for a month. 30 days PU challenge was designed by a trainer and Instagram star Anna Victoria. Anna Victoria designed this challenge that aimed to promote upper body exercise for women. 50 PU challenge a day for a month designed by a trainer, Shaun Zetlin. She once published a book all about the variation of PU. Zetlin designed the challenge because classic PU comes close to a perfect exercise. Based on Zetlin, PU exercise challenged multiple muscle groups in the arms, chest, back and core to build overall functional strength. Apart from that, PU exercise always used for shoulder rehabilitation for dynamic joint stability training (Carver, 2003). Previous studies suggested that people were awarded about the importance of exercising in improving and maintaining health (Blair, 2004). Push-ups was a recommended upper body exercise that can be used to enhance fitness

(Lee, 2009). PU exercise was good for strengthening upper body and increase muscular strength (MS) and muscular endurance (ME) (Garcı´a-Masso, 2011). PU intensity was determined by the body weight (Blackard, 1999). PU has lots of benefits such as increasing functional strength or full body activation, muscle stretching for health and vitality, enhance cardiovascular system, improve posture and no cost for a full body workout. There were various types of PU such as the traditional PU for beginner, dynamic PU, diamond PU and plyometric PU.

For many years, athletes such as bodybuilder and power lifter used weight training for strength exercise programme (Barnett, 1995). Bench press (BP) was a common exercise used for developing upper body muscle that was pectoralis major (Wilson, 1989). There was different type of BP such as normal BP, incline BP and decline BP. BP was widely used for improve upper body muscle (Baechle, 2008; Fleck, 2004) and increase muscle strength (American College of Sports Medicine, 2009; Masso, 2011; Knapik, 2001). BP required equipment's such as plates and barbell. BP exercise was said to has advantages from BW exercise because it is easier to control the load or intensity (Blackard, 1999). Appropriate intensity of RT may promote higher levels of muscular activity (Andersen, 2006; Ratamess, 2012), which may improve muscle strength (Ratamess, 2012) and improve the athlete's performance such as weight lifter (Folland, 2007).

MS was a health-related component of physical fitness on the ability of the muscle to exert force (Wilmore, 1994). Study have found that MS can prevent chronic disease in daily living and exercise performance (Ekelund, 1988). MS can be improved by RT (Pollock, 2000); (Haskell, 2007). Previous study showed that MS can increase through RT activities (American Academy of Pediatrics, 1983). MS can be maintained and improve through physical activity (US Dept of Health and Human Services, 1996).

ME was a health-related component of physical fitness on the muscle's ability to continue to perform without fatigue (Wilmore, 1974). ME training was the maximal number of repetitions performed with a specific load (Mazzetti, 2000). Many studied shows that ME can improve by RT (DeLorme, 1945). In RT, low intensity but high repetition exercises produce the quality of ME (Tim Anderson, 1982). Physical activity can lead to improve and maintain ME (American Academy of Pediatrics, 1983). PU test was a common type of test to measure upper body ME (American College of Sports Medicine, 2006; The Cooper Institute for Aerobics Research, 1999; Hoffman, 2006; United States Army, 2012).

Sedentary people should involve in any physical activity without doing anything. Sedentary people can be described as low number of leisure activity, involve in physical activity less than 5 days a week and exercise less than 30 minutes in level of moderate intensity exercise (Jill, 2006). The physiologic research said sedentary mean sitting without being active for example limited movement of the arm or leg swinging (Owen, 2011). Sedentary was people lack of physical activity such as too much sitting and very little time to exercise (Owen, 2010; Owen, 2009; Bey, 2003). Most of sedentary people did not interested to go gym for exercise because of lack of time, busy working, lack of facility and equipment. PU exercise was suitable for sedentary people to promote in exercise because PU exercise did not require expensive equipment and can be performed anywhere.

1.2 PROBLEM STATEMENT

RT can be combined with health-related fitness activities in physical activity due to requiring minimal equipment (Faigenbaum, 2013). Widely, PU was claimed to be a suitable exercise for sedentary people used in physical conditioning programme because PU exercise was good for strengthening upper body, increase MS and ME (Kikuchi, 2017; Garcı´a-Masso, 2011).

Anna Victoria, state that nowadays many women go to the gym and only focusing on lower body. This situation influences more women went to gym only focus on lower body. Focusing more on lower body exercise decreasing upper body strength and endurance. Therefore, PU challenge hopefully would help in changing the mindset and balanced exercise routine and encourage women to involve in a total body workout. Based on the previous study, push exercise was easy learning process of exercise and there were many variations of PU exercise such as range of low intensity to high intensity (Kikuchi, 2017).

Other than that, PU was a great for upper body exercise plus help for shaping and defining abs, triceps, shoulders and torso (Chulvi, 2012; Azeem, 2015). PU was an advantage exercise because it effective, require no equipment, cost and safe time and the study supported by Matheson (2011), stated that PU exercise can be performed anywhere, practical for body lifestyle and require low budget. Apart from that, athlete who includes PU in workout programme able to reach fitness goals easier than others BW workout that depend on other method (Azeem, 2015).

Besides that, PU were the suitable and effective exercise for both men and women in strength training programme to improve performance and led to reduce risk of developing osteoporosis and increase testosterone levels (Soderberg, 2000; Sekendiz, 2010; Mosti, 2014; Azeem, 2015). PU can be performed without any

equipment and the intensity can be altered with several variations plus, making it suitable for almost every level of fitness (Kikuchi, 2017).

From the finding by June (2010), different type of RT had different time for adaptation especially for untrained subjects study shows that participant doing 10 PU or static upper body endurance exercise for 2 times per week can improve upper body ME. In other study, PU and BP training cause similar muscle strength gain. Besides that, PU and BP had been shown to elicit similar muscle activation patterns on electromyography. Recent study suggested that low-intensity strength training such as 30% 1RM induced muscle gain, if it was performed until failure (Naoki Kikuchi, 2017; Bell et al, 1991; Hakkinen et al, 2003).

Other than that, BP was an upper body exercise to build upper body muscle such as pectoralis major, biceps and triceps. Besides that, BP develop and improve upper body strength based on American College of Sports Medicine (2009); Masso (2011); Knapik, (2001). PU exercise and BP have similar target muscle plus athlete using both exercises to train MS and ME. The BP exercise requires equipment which is not available for everyone but similar exercise for training upper body and same target muscle were PU exercise (Topalidou, 2012).

According to Jill (2006), sedentary people defined as low number of leisure activity, involve in physical activity less than 5 days a week and exercise less than 30 minutes in level of moderate intensity exercise. PU exercise was good because PU it did not require expensive equipment and can be performed anywhere. King (2000) stated that inactive in physical activity because of fear of injury, safety concern, low of energy levels and lack of confident in physical abilities. Study show young girl lack of physical activity because of lack of physical education, failure of variety in physical education, negative experienced in physical activity and lacked of important of physical

activity in lifestyle. This can lead to face sedentary death syndrome disorder (heart disease, diabetes osteoporosis, depression and anxiety) because of lack of physical activity (Allison, 1999; Taylor, 1999; U.S. Department of Health and Human Services, 1996).

Apart from that, sedentary behaviour had developed quickly and become an important issue in public health. Study show that, home based programme on physical activity were effective and potential for cost saving so, PU exercise were recommended because it is very popular BW for gain strength between athletes and general population (Perri, 2002; Calatayud, 2014; Meldrano, 2012; Martin, 2016; Speranza, 2015; Pearson, 2011).

Nowadays, more studied on trained population compare to sedentary people. Other than that, no studies have investigated whether PU training induces muscle gain similar to that BP training. Besides that, BW training was selected the top 3 fitness trend in the past consecutive year of American College of Sports Medicine (Kikuchi 2017).

1.3 PURPOSE OF STUDY

1.3.1 The purpose of this study was to compare the effects between PU and BP exercise on MS and ME among sedentary women.

1.4 RESEARCH QUESTIONS

1.4.1 Was there any significant difference between PU and BP exercise on MS?

1.4.2 Was there any significant different between PU and BP exercise on ME?

1.5 RESEARCH OBJECTIVES

1.5.1 To compare the effect of PU and BP on MS.

1.5.2 To compare the effect of PU and BP on ME.

1.6 HYPOTHESES

1.6.1 **Null Hypothesis:** The null hypotheses (Ho) of this study were:

H_O1: There was no significant different between of MS test between pre and post-test on PU group.

H_O2: There was no significant different between of MS test between pre and post-test on BP group.

Ho3: There was no significant different between of ME test between pre and post-test on PU group.

H_O4: There was no significant different between of ME test between pre and post-test on BP group.

H_O5: There was no significant different between of MS test on PU group and BP group.

H_O6: There was no significant different between of ME test on PU group and BP group.

1.6.2 Alternate Hypotheses: The alternate hypotheses (Ha) of this study were:

H_a1: There was a significant different between of MS test between pre and post-test on PU group.

H_a2: There was a significant different between of MS test between pre and post-test on BP group.

H_a3: There was a significant different between of ME test between pre and post-test on PU group.

H_a4: There was a significant different between of ME test between pre and post-test on BP group.

H_a5: There was a significant different between of MS test on PU group and BP group.

H_a6: There was a significant different between of ME test on PU group and BP group.

1.7 SIGNIFICANCE OF THE STUDY

The purpose of this study was to compare the effects between PU and BP exercise MS and ME among sedentary women. Most people lack of exercise because of sedentary lifestyle, busy working and pack schedule. The results of this studied could encouraged sedentary people to increase participation in a single BW exercise for few times a week and gain benefits. So, the result of this study may help in encouraging sedentary people to a healthier lifestyle. Besides that, this study was to promote healthy lifestyle and providing alternatives exercises such as PU for sedentary people. For sport enthusiast, this study promotes the advantage of PU and BP exercise. Other than that, sport enthusiast can add more studies regarding on the advantage of BW exercise especially PU exercise. Last but not least, this study aimed for sport scientist to create awareness among athlete about advantage of BW. Other than that, create alternative exercise for training programme.

1.8 LIMITATION OF THE STUDY

1.8.1 Willingness

The willingness of participant on this research can be limited due to sedentary lifestyle among student and mostly sedentary people were lack of exercise. The participants consist of sedentary people and subject might be lost interested about this study. So, researcher need to attract the participant and explain the benefits of this study.

1.8.2 Commitment

The commitment of the participant to participate in this study could be limitation because every student will face busy timetable. Different participants had different schedule and participant might be drop out before the study finish. So, the researcher needs to plan properly the schedule of testing to make sure subject finished the research testing.

1.8.3 Injury

The injury of the participants could be limitation because injury can occur anytime and anywhere. So, the researcher must make sure that the participant follows the instruction and do proper way of exercise technique to avoid injury. Other than that, participant must be guide because consist of sedentary people.

1.9 DELIMITATION

1.9.1 Facility Testing

The tests were delimited to PU and BP testing. All of these tests can be done in Universiti Teknologi MARA, Samarahan because the facility or equipment of the test were available.

1.9.2 Subjects

The study will be conducted among sedentary students in UiTM Samarahan. The number of students participate in this study were 40 subjects.

The total of sedentary students was picked randomly among UiTM Samarahan. Subject was delimited to sedentary lifestyle and no injury history within last 6 month to participate in the present study.

1.10 DEFINITION OF TERM

1.10.1 Push Up

PU was a basic BW exercise that target upper body exercise such as pectoralis major, biceps and triceps (Beachle, 2000).

1.10.2 Bench Press

BP was a type of exercises that improve upper body (Fleck 2004) and improved MS (Baechle, 2008) used BP, barbell and plates.

1.10.3 Muscular Strength

MS was the ability of the muscle to exert force (Health, Fitness and Physical Activity, 2000). MS was the ability to produce maximal force against resistance exerted by a muscle group of muscle in a single maximal voluntary contraction (Knapik, 2003; Maffiuletti, 2007).

1.10.4 Muscular Endurance

ME was ability of a muscle or group of muscles to exert external forces repeatedly over a period of times (Knapik, 2003; Maffiuletti, 2007).

CHAPTER TWO

LITERATURE REVIEW

2.1 RESISTANCE TRAINING

RT was an exercise modality in which muscle groups were trained by repetitively lifting heavy weights (Pu, 2001). It is well recognized that RT can enhance muscular performance. Many studies had demonstrated improvements in strength and ME following RT (Anderson, 2013; Kearney, 2013). RT always performed using equipment such as a barbell and weight plates (Ebben, 2011). Resistance exercise training can improve health and fitness and MS (Pollock, 2000; Haskell, 2007). RT was good training for overweight and obese adults because to reduce body fat and increasing self-esteem and body image (McGuigan, 2006). RT had given significant increase in health performance for elderly, such as muscle force, endurance, body composition, bone quality, postural stability, fall prevention, and quality of life (American College of Sport Medicine, 1998; Cunningham, 1993).

2.2 PUSH UP

PU always been used to measure ME between men and women (Laughlin, 2007). PU exercise test also always been used for qualification of exercise training program that designed for youth, general fitness and military recruits (Ebben, 2011). The popular bodyweight (BW) exercise that always used by athlete and general population to improve strength exercise was PU (Calatayud, 2014; Meldrano, 2012; Martin, 2016; Speranza, 2015). Professional in conditioning always train athletes using PU for gain strength such as athletes in baseball (Hammer, 2009), boxing (Wallace,

1999) and martial arts (La Bounty, 2011). Load of PU exercise were limited by individual BW. However, PU exercise can be varied by such as unstable surfaces, suspension training device and specially designed PU equipment (Bret, 2012). There were many variations of PU exercise from easy to difficulty levels (Gouvali, 2005). PU been used by athletes as part of the dynamic warm-up as well as traditional weight training (Suprak, 2011). Other than that, PU also commonly been used for upper body rehabilitation especially for shoulder (Ludewig, 2004) and this was supported by (Carver, 2003) that claimed that PU exercises always used in shoulder rehabilitation, for facilitation of proprioceptive feedback mechanisms, muscle co-contraction and dynamic joint stability training.

2.3 BENCH PRESS

In order to increase MS in any part of muscle body, RT was the most effective way (Fleck, 1999). BP exercise usually used to measure upper body strength (Evan, 2010). BP exercise target upper body muscle such as pectoralis major, triceps, biceps and anterior deltoid, while the medial deltoid act as a stabilizer muscle (Kellis, 1998). In order to measure the individual maximal strength and defined the maximal weight that can be lifted with single repetition the one repetition maximum (1RM) test was one of the most valid tests (Mayhew et al, 2004; LeSuer et al, 1997; Amarante, 2013; Padulo, 2012). 1RM test were used in exercise or sport to define training loads for conditioning programme and exercise (Amarente et al, 2013; Arazi, 2013; Padulo, 2014). Even for elderly populations, 1RM test procedure is effective to measure the maximal strength (Amarante, 2013; Kemmler, 2006).

2.4 MUSCULAR STRENGTH

MS can increase performances in daily activities exercise as well as preventing chronic disease (Ekelund, 1988). RT can strengthen MS and improves health related fitness (Williams, 2007). MS can be measured based on human age. (Fleg,2005). Individual that lack of MS cannot performed various daily activities because functional activity determined by MS, flexibility, range of motion, physical fitness and body composition (Posner, 1995). Previous study shows that, strength can be maintained for 5 to 27 weeks depend on training among elderly (Fatouros, 2005). Heavy resistances training for example (repetition maximum resistance of six or less) would have the greatest effect on MS (Fleck, 1997). According to previous studied, multiple set programs that consist of three to six sets are ideal to increase muscle strength (Kraemer & Ratamess, 2004). The recommended number of repetitions for every exercise should be six sets or less (Campos, 2002). Previous studied based on Kikuchi (2017), method been used to train MS was participant performed 3 sets and 12 repetitions of BP exercise at 40% 1RM BP.

2.5 MUSCULAR ENDURANCE

Previous research suggested that weight training was an effective physical conditioning exercise to improve ME (Peterson, 1961). There also study supports that light resistance (repetition maximum resistance of 20 or more) would help on ME (Fleck, 1997). ME can be defined as ability of muscle to perform multiple contractions against a sub-maximal resistance and two to three sets per exercise have been shown to be most effective for enhancing ME (Baechle & Earle, 2008). Ten to twenty repetitions were recommended in order to improve ME (Ratamess, 2009). Based on the previous study, (Kikuchi, 2017), ME been training using PU exercise and performed

3 sets with 40% of 1RM BP. Other than that, three different types of PU been used (regular position, knees down position and knees down and raising hand position). Participants trained for twice session per week for 8-week training.

2.6 SEDENTARY PEOPLE

People who had spent more time on watch television with no physical activity can be categorized as a sedentary population (Gordon-Larsen, 1993). Sedentary lifestyle can lead to chronic disease such as obesity (Rennie, 2005). Sedentary population influenced by factor such as increase in technology, playing digital games and keep using computer (Kautiainen , 2005). Sedentary lifestyle and lack of aerobic fitness coupled with increase body fat and lead to coronary heart disease (Katzmarzyk, 2009). Future strategy to reduce sedentary adults was be active, avoid sitting more than two hours a day and stand up or move after 30 minutes of sitting or doing nothing should be done (Owen, 2011). Apart from that, it is recommended to change the sedentary time and increase the physical activity. Study shows that sedentary behaviour was influence by work, leisure time factors and family rules regarding diet behaviour (Pearson, 2011) and this study supported by Owen (2011), that show sedentary behaviour influence by individual characteristic (preference, enjoyment or barriers), workplace relationship and family demand. Moreover, previous studies show that sedentary lifestyle strongly influenced by environment quality such as lack of public transport or safe and no attractive option (Owen, 2011).

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

The present study aimed to measure the effects between PU and BP exercise on physical performance among sedentary women. The present chapter will discuss about the research design, population and sampling, research instruments, data collection procedures and data analysis used.

3.2 RESEARCH DESIGN

In the present study, sedentary students in Universiti Teknologi MARA, Samarahan was recruited as the participants. The participants consist of 40 women and was divided into two groups. PU intervention group performed traditional PU, while BP intervention group performed BP exercise for six weeks. The study aimed to measure the effects of PU and BP exercise towards ME and MS. MS measured by 1RM BP test and for ME measured by 1Min PU test. Present study employed a true experimental research design. The aim of this research study was to compare the effect between PU and BP exercise on physical performance among sedentary women. True experimental designed was group were randomly formed, but both groups were given a pre-test and post-test (based on Figure 1). Both groups used a training program that was set according to the intervention group (BP and PU) and conducted 4 session per week for a consecutive 6 weeks. The method was used in previous parallel study (Calatayud, 2015; Chulvi- Medrano, 2012).

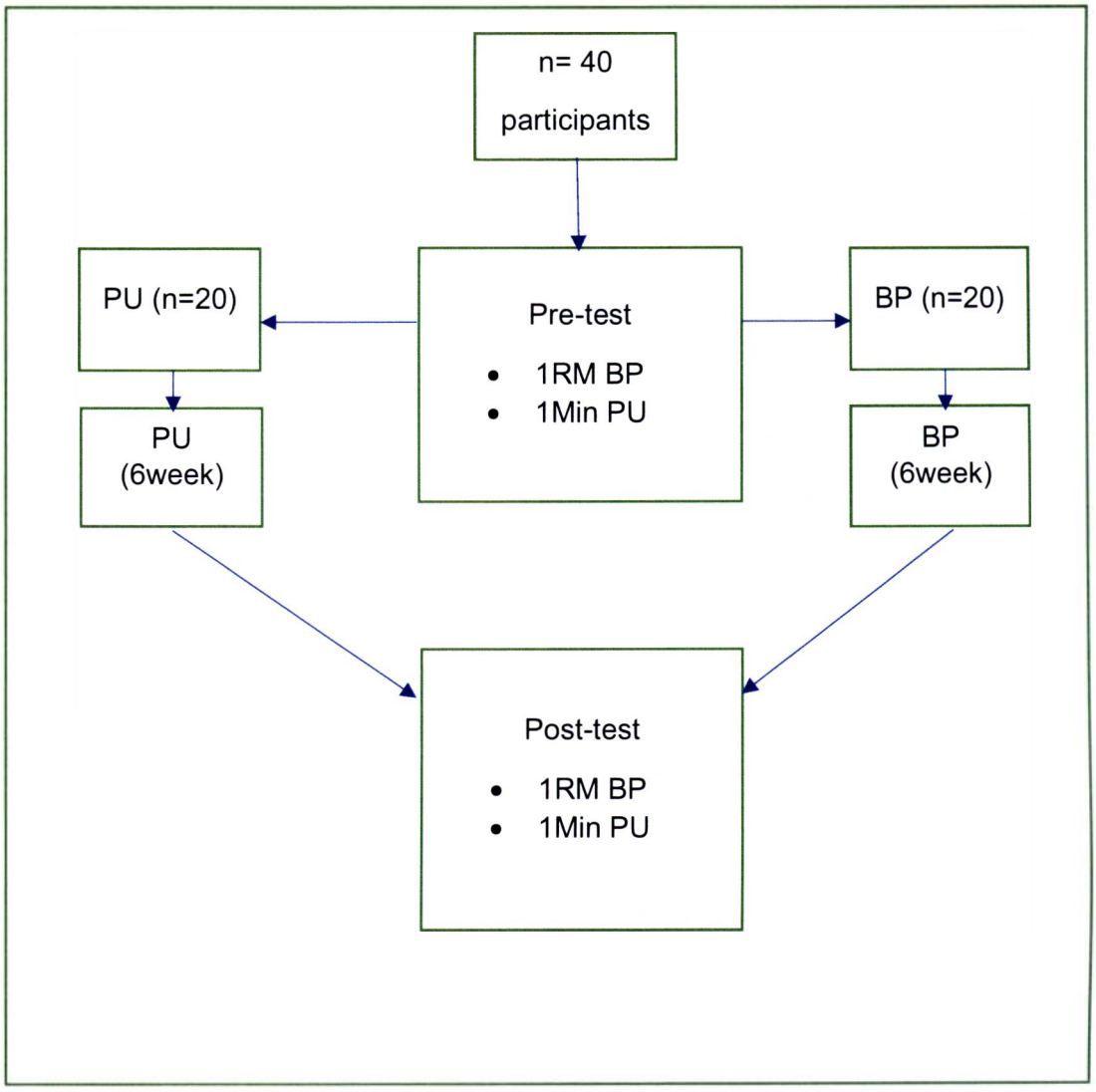

Figure 3.1: Research design for Pu and BP group.

3.3 POPULATION

The population involved sedentary female students with age range of 18 to 25 years old. The criteria of the participants include a good health condition and not active in physical activity. Total number of 40 participants will be divided into two groups and each group consist of 20 participants.

3.4 SAMPLING AND METHOD

3.4.1 Sampling

The sample of the study include a total of 40 participants used by parallel previous studies (Calatayud, 2015; Chulvi- Medrano, 2012). The participants were divided into two groups. PU group (n= 20) and BP group (n= 20). The participant must be inactive in physical activity (sedentary).

3.4.2 Sampling Technique

Sampling technique used for this study were sedentary from UiTM Sarawak branch. Total number of participants was (n=40) sedentary women.

3.5 INSTRUMENTATION

Subjects were measured for pre and post-test. MS were measured using 1RM BP test and ME were measured using 1Min PU test. The study involved a consecutive six weeks training programme with frequency of four times a week.

The participants been explained about the testing and objective of the study. This study consists of (n=40) sedentary women students in UiTM. Subjects were divided into two groups, PU intervention group (n= 20) and BP intervention group (n= 20). Participants completed the participant information sheets. Participants will be given two session for familiarization (Calatayud, 2015) to make sure the participants familiarized to the techniques.

3.5.1 PAR-Q and Consent Form

PAR-Q and consent form were completed by the participant to screen the health of the participant to any physical test of activity. This was important due to know the participant's health condition or level. Apart from that, consent form was to make sure either participants agree or not to participate in the study.

3.5.2 1RM Bench Press

In order to increase MS, RT was the most effective way (Fleck, 1999). R-value for 1RMBP was (r = 0.92). In order to measure the individual maximal strength, the one repetition maximum (1RM) test was one of the most valid tests (Mayhew et al, 2004; LeSuer et al, 1997; Amarante, 2013; Padulo, 2012). 1RM test were used in exercise or sport to define training loads for conditioning programme and exercise (Amarente et al, 2013; Arazi, 2013; Padulo, 2014).

Even for an elderly population, 1RM BP test procedure was effective to measure the maximal strength (Amarante, 2013; Kemmler, 2006). Study shows that, for inexperienced individual, one familiarisation session and one testing session in the range of 4-8 days could be enough to develop a maximal strength (Levinger et al, 2009). Below was the procedure in conducting 1RM BP test (Physical Fitness Assessment, 2009).

1. The participants warm up by completing a number of submaximal repetitions of the specific exercise that are used to determine the one repetition max.

2. For the warm-up, participants will be done 10 repetition with only the bar (3-4 minutes rest between sets).
3. To determine 1RM, participants performed within four trials with rest periods of 3-5 minutes between sets.
4. Select the initial weight that was within the participants perceived capacity (50-70% of capacity).
5. Resistance was progressively increased by (2.5- 20.0 kg) until the participants cannot lift with full range of motion or until failure. The final weight lifted successfully was recorded as the absolute 1-RM or multiple 1-RM.

Fitness Categories for Upper Body Strength for Women by Age				
BP Weight Ratio = weight pushed in lbs/ body weight in lbs				
		Age		
%		<20	20-29	30-39
99	Superior	>0.88	>1.01	>0.82
95		0.88	1.01	0.82
90	Excellent	0.83	0.90	0.76
85		0.81	0.83	0.72
80		0.77	0.80	0.70
75	Good	0.76	0.77	0.65
70		0.74	0.74	0.63
65		0.70	0.72	0.62
60		0.65	0.70	0.60
55	Fair	0.64	0.68	0.58
50		0.63	0.65	0.57
45		0.60	0.63	0.55
40		0.58	0.59	0.53
35	Poor	0.57	0.58	0.52
30		0.56	0.56	0.51
25		0.55	0.53	0.49
20		0.53	0.51	0.47
15	Very poor	0.52	0.50	0.45
10		0.50	0.48	0.42
5		0.41	0.44	0.39
1		<0.41	<0.44	<0.39
N		20	191	379

(Adapted from Physical Fitness Assessment and Norms for Adults and Law Enforcement, 2009)

Table 3.1: Norms for Upper Body Strength for Women.

3.5.3 1- Minute Push Up

The 1Min PU test required the participants to performed maximum number of PU with no rest (Canadian Society for Exercise Physiology, 2003) and used to measure the ME in upper body muscle. R-value for 1Min PU test was (r = 0.93). The PU procedure starts with down position with the chest touches the floor (Johnson, 1986), and angle of elbow 90 degree, then raises it to the up position. Individual must keep body straight to get accurate PU form (Ted, 2002). The procedure in conducted 1Min PU test was adapted from (Physical Fitness Assessment, 2009).

1. Participants will be using the traditional PU.
2. The position of legs was together with leg straight with no contact with mat.
3. Make sure back straight, hand shoulder width apart, head facing up.
4. The participants must raise the body by straightening the elbows and return to the down position until the chin touches the mat.
5. Make sure stomach did not touch the floor.
6. During the PU, participant's back was straight at all times and participants must PU to a straight arm position.
7. The maximal number of PU performed consecutively without rest was counted as the score.
8. The test was stopped when the participants strains forcibly or unable to maintain the appropriate technique within two repetitions.

Fitness Categories for the Push-Up by Age and Sex						
	Age Year					
Category	**18-29**		**30-39**		**40-49**	
Sex	**M**	**W**	**M**	**W**	**M**	**W**
Excellent	36	30	30	27	25	24
Very Good	35	29	29	26	24	23
	29	21	22	20	17	15
Good	28	20	21	19	16	14
	22	15	17	13	13	11
Fair	21	14	16	12	12	10
	17	10	12	8	10	5
Needs Improvement	16	9	11	7	9	4

(Adapted from ACSM, 2014)

Table 3.2: Norms for PU exercise.

3.5.4 PU Training Programme

<table>
<tr><th colspan="3">Week1-6</th></tr>
<tr><td colspan="3">Frequency: 4 days per week

Warm up (Dynamic stretching): 1 minute each
• Jumping jack
• High knee
• Half squat</td></tr>
<tr><td>No</td><td>Type of PU</td><td>No of Sets</td></tr>
<tr><td>1</td><td>Traditional PU</td><td>3</td></tr>
<tr><td colspan="3">• 12 Repetitions
• 1-minute rest between sets

Cool Down (static stretching)</td></tr>
</table>

Table 3.3: PU Training Programme for 6 weeks of intervention.

3.5.5 BP Training Programme

<table>
<tr><th colspan="3">Week 1-6</th></tr>
<tr><td colspan="3">Frequency: 4 days per week

Warm up (Dynamic stretching): 1 minute each

• Jumping jack
• High knee
• Half squat</td></tr>
<tr><td>No</td><td>Type of exercise</td><td>No of sets</td></tr>
<tr><td>1</td><td>BP</td><td>3</td></tr>
<tr><td colspan="3">• 12 Repetitions
• 1-minute rest between sets</td></tr>
<tr><td colspan="3">Cool Down (static stretching)</td></tr>
</table>

Table 3.4: BP Training Programme for 6 weeks of intervention.

3.6 DATA COLLECTION

Present study was an experimental study and the data was collected by comparing the effect of PU and BP exercise on MS and ME among sedentary women in UiTM. The study has been approved by UiTM and FSR Fitness Centre to be conducted. An approval by the organization was the permission so the participant was fully permitted to assign as the participant to study according to the place and time that has been chosen.

Informed consent was to determine the qualification of subject to participate in this study. All participants that involved in this study filled in the consent form and passed the Physical Activity Readiness Questionnaire (PAR-Q). After that, the participant was briefed on purpose of the study to improve participant's understanding regarding on this study.

Familiarization will be done between (n=40) sedentary women and the test procedure to enhance adaptation for the study. Informed consent was completed by the participants for the exercise testing.

Next, pre-test will be done before the participants being divided into groups. Pre-test consist of 1RM BP and 1Min PU test. After the pre-test done, participants will be divided equally into two group that was PU group (n=20) and BP group (n=20).

After been divided equally into two groups (PU and BP), participants trained based on the training programme given. PU group will be trained for PU exercise and BP group trained for BP exercise. Training programme consist of 3 sets, 12 repetitions and will be conducted four session per week for six weeks of training.

After 6 weeks of training done, data collection will be analysed using the Statistical Package of Social Science (SPSS) version 22.0 in all statistical evaluation.

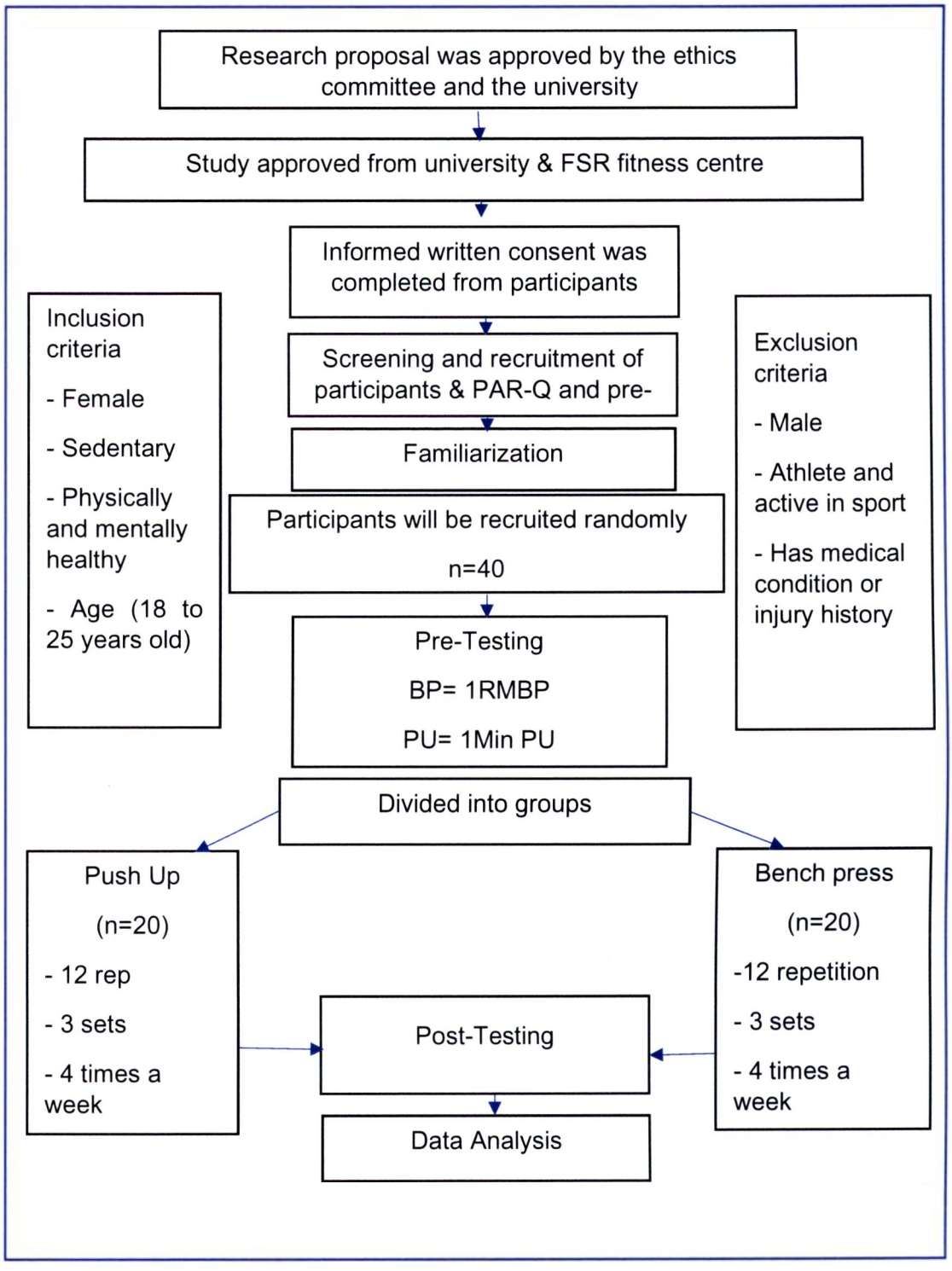

Figure 3.2: Data collection framework.

3.6.1 Research Framework

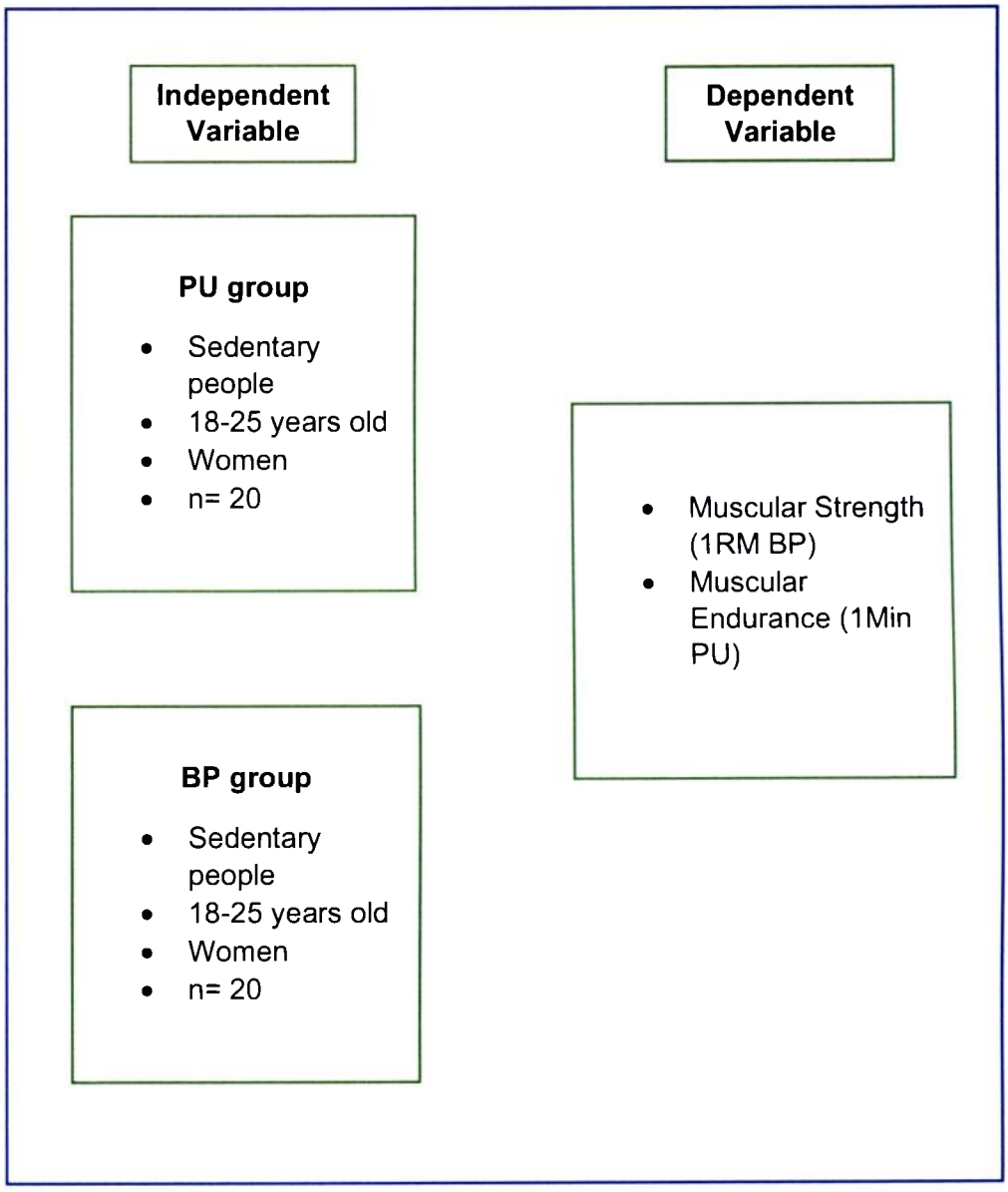

Figure 3.3: Research framework for the study.

3.7 DATA ANALYSIS

The data collected was analysed with Statistical Package of Social Science SPSS 22.0. Shapiro-Wilk was used to measure the normality of the test. Descriptive data was presented in mean (*M*) and standard deviation (*SD*). On the other hand, mixed between within ANOVA to compare the effect the effects of intervention following six weeks of training as well as to compare the effects between group (PU and BP group). For this study, researcher was used Paired Sample T-test to evaluate the mean for pre and post-test within groups.

CHAPTER 4

RESULTS

4.1 INTRODUCTION

The present study was carried out to compare effects of 6 weeks between BP intervention and PU intervention on MS and ME. MS was measured with the 1RM BP, while ME was measured with 1Min PU. The pre-test was conducted before the intervention was started, while the post-test was conducted after the six weeks training. The data analysis and results of the study was presented in the present chapter.

4.2 NORMALITY TEST

Shapiro-Wilk test was conducted to test the normality of the data. Data can be considered normal if the *p*-value was more than .05 ($p>.05$). The table above showed the tests of normality for pre and post-test of the two intervention groups which were BP group and PU group. Significant value for pre and post-test for MS was .580 and .098 respectively, which means distribution was normal. For pre and post-test for ME were .676 and .615, which was the data more than .05.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	***df***	***Sig.***	***Statistic***	***df***	***Sig.***
1RM (pre-test)	.122	40	.138	.977	40	.580
1RM (post-test)	.170	40	.005	.953	40	.098
1Min (pre-test)	.076	40	.200*	.980	40	.676
1Min (post-test)	.125	40	.114	.978	40	.615

Table 4.1: Normality for the pre-test and post-test for MS (1RM BP) and ME (1Min PU).

4.2.1 Normality Test for Age, Height and Weight

The table below showed normality test between age, height and weight. Shapiro-Walk test has been conducted to test the normality data. Data can be considered normal if the *p*-value was more than .05 ($p>.05$). Significant value for age was .0001 which mean distribution was normal. Significant value for weight was .172 and the mean distribution was not normal. Other than that, significant value for weight was .000 and the mean distribution was normal.

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Age	.226	40	.000	.836	40	.0001
Height	.129	40	.093	.960	40	.172
Weight	.176	40	.003	.869	40	.0001

Table 4.2: Normality for age, height and weight

4.3 DEMOGRAPHIC PROFILE

Table 4.3 shows the descriptive data of subjects including the mean and standard deviation. The mean age was 18.925 (*SD* = .973 years). While the mean height was 156.05 (*SD* = 5.243 cm). Mean for height was 57.37 (*SD*= 13.298 kg).

	n	***Mean***	***Std. Deviation***
Age (years)	40	18.925	.973
Height (cm)	40	156.05	5.243
Weight (kg)	40	57.37	13.298

Table 4.3: Descriptive data of the subjects.

4.4 DESCRIPTIVE STATISTIC

Table 4.4 shows the descriptive statistic for pre and post-test of MS test and ME test. For the PU group, the mean score of MS for pre-test was 42 (*SD* = 11.402) kg, while the mean of MS for post-test was 59.75 (*SD* = 13.905) kg. Meanwhile, for the BP group, the mean score of MS pre-test was 44.5 (*SD*= 9.583) kg, while, the mean was increase to 60.25 (*SD*= 10.447) kg at post-test.

On the other hand, the MS test of the PU group during pre-test was 28.45 (*SD*= 6.581) repetitions. After six weeks training, the mean score increases to 45.05 (*SD*= 6.589) repetitions. Mean for pre-test of the BP group was 29.95 (*SD*= 6.278) repetitions. After six weeks of BP intervention, the mean of MS test at post-test increases to 41.45 (*SD*= 6.203).

	Group	***M (Pre)***	***SD***	***M (Post)***	***SD***	***Total***	***n***
MS (1RM BP)	PU	42.00	11.402	59.75	13.905	17.75	20
	BP	44.50	9.583	60.25	10.447	15.75	20
ME (1Min PU)	PU	28.45	6.581	45.05	6.589	16.6	20
	BP	29.95	6.278	41.45	6.203	11.5	20

Table 4.4: Descriptive Statistic for pre and post-test on MS (1RM BP) and ME (1Min PU).

4.5 INFERENTIAL STATISTICS

H_O1: There was no significant difference of MS test between pre and post-test on PU group.

H_O2: There was no significant difference of MS test between pre and post-test on BP group.

H_O 3: There was no significant difference of ME test between pre and post-test on PU group.

H_O 4: There was no significant difference of ME test between pre and post-test on BP group.

4.5.1 Test Within Subjects for MS and ME

Table 4.5 shows a within and between subject design test was conducted to test the hypothesis. The result shows that there was a significant difference within the subject's BP test and ME test in pre and post-test for both PU group and BP group; $F = 111.089$, $p = .0001$ ($p<.05$). Thus, null hypothesis 1,2,3 and 4 were rejected.

Effect	***Wilk's Lambda***	***F***	***Df***	***Sig***
prepost	.097	111.089	3.000	.0001

*Significant level is at .05 ($p<.05$)

Table 4.5: The test within subjects for MS (1RM BP) and ME (1Min PU) within group.

A Paired Sample T-Test was conducted to evaluate the effect of PU and BP on MS test and ME test. For MS there was a statistically significant increase scores from pre-test (M = 43.25, SD = 10.473) to post-test (M = 60.00, SD = 12.142) with the mean difference were (M = -16.750, SD = 12.142), t (39) = p< .0005 (two-tailed). For ME, there was a statistically significant difference between pre-test (M = 29.20, SD = 6.394)) and post-test (M = 43.25, SD = 6.574) with the mean difference of -14.05 (SD= 6.574), t (39) = p< .0005 (two-tailed).

		Mean	***Mean diff***	***n***	***Std. Deviation***
MS (1RM BP)	Pre	43.25		40	10.473
	Post	60.00	**-16.750**	40	12.142
ME (1Min PU)	Pre	29.20		40	6.394
	Post	43.25	**-14.05**	40	6.574

Table 4.6: Paired samples statistics for MS (1RM BP) and ME (1Min PU) for both interventions.

Figure 4.1 showed the result of MS test within PU group and BP group for the pre and post-test. PU group showed improvement from pre-test (*M*= 42.00) to pre-test (*M*= 59.75) after six weeks of training. Apart from that, BP group showed improvement from pre-test (*M*= 44.5) to pre-test (*M*= 60.25) after six weeks of training.

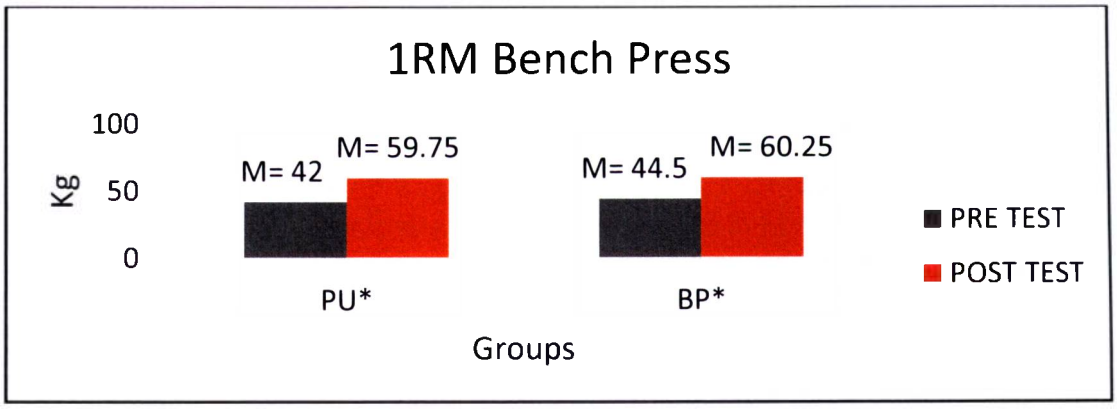

Figure 4.1: MS within two interventions.

Figure 4.2 showed the result of ME test within PU group and BP group for the pre and post-test. PU group showed improvement from pre-test (*M*= 28.45) to pre-test (*M*= 45.05) after six weeks of training. Apart from that, BP group showed improvement from pre-test (*M*= 29.95) to pre-test (*M*= 41.45) after six weeks of training.

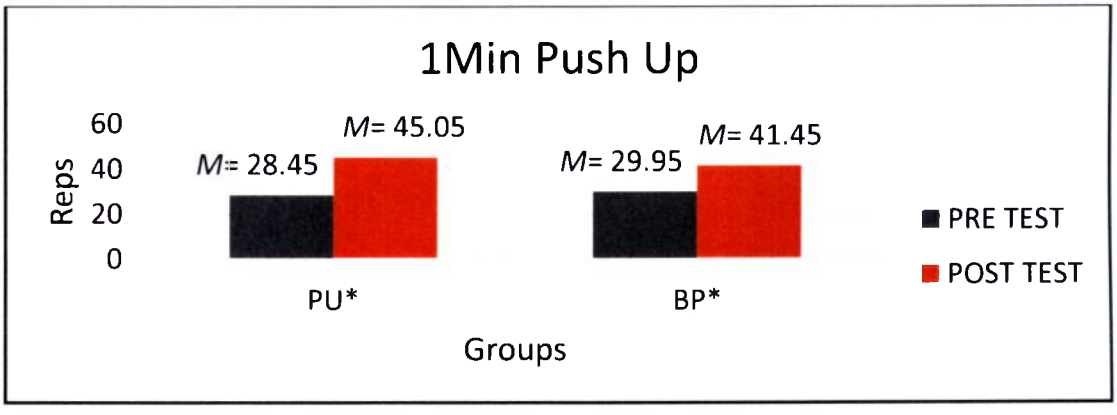

Figure 4.2: ME within two interventions.

4.5.2 Test Between Subjects for MS and ME

H_O 7: There was no significant difference in MS test on PU group and BP group.

H_O 8: There was no significant difference in ME test on PU group and BP group.

Table 4.7 shows a testing for null hypothesis 7 and 8. Based on the results above, there was a significant difference in MS test and ME test on PU group and BP group; $F = 3.023$, $p = .42$ ($p<0.05$). Therefore, the null hypothesis 7and 8 were rejected.

Effect	***Wilk's Lambda***	***F***	***Df***	***Sig***
prepost* Groups	.799	3.023	3.000	.042

*significant level is at .05 (p<.05)

Table 4.7: Test of between-subject's effects for MS (1RM BP) and ME (1Min PU) between groups.

	Group	M (Pre)	SD	M (Post)	SD	Total	n
MS (1RM BP)	PU	42.00	11.402	59.75	13.905	17.75	20
	BP	44.50	9.583	60.25	10.447	15.75	20
ME (1Min PU)	PU	28.45	6.581	45.05	6.589	16.6	20
	BP	29.95	6.278	41.45	6.203	11.5	20

Table 4.9: Pre and post-test between two interventions after six weeks of training

Figure 4.3 showed the effects between two interventions on MS and ME after six weeks of training. The results showed that in MS test, PU intervention (42.26%) improved more than BP intervention (35.4%). For ME test, PU intervention (58.35%) also improved more than BP intervention (38.4%) after six weeks of training.

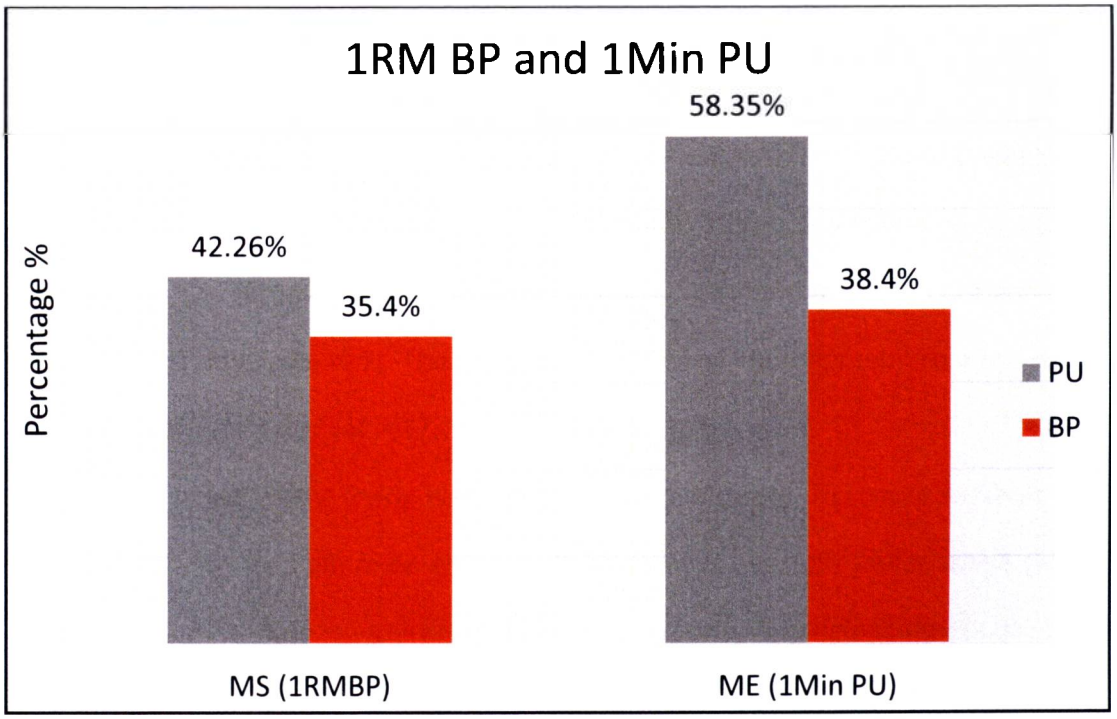

Figure 4.3: Effect of PU and BP interventions on MS and ME.

CHAPTER 5

DISCUSSION

5.1 INTRODUCTION

The purpose of the study was to compare the effect between PU exercise and BP exercise on MS and ME. MS and ME testing consist of 1RM BP and 1Min PU. This study wants to compare which exercise improve more on MS and ME. This chapter consists of the discussion, findings of present results, conclusion and recommendation for future results.

5.2 EFFECTS OF 6 WEEKS PU GROUP ON MS

In the present study, there was a significant effect (p = .0001) of 6 weeks PU between pre-test (M = 42.00) and post-test (M = 59.75) on MS test. The result was improved by 17.75kg (42.26%). There was a significant improvement in pre and post-test were noticed (Table 4.4). This study shows a lot of improvement from pre-test to post-test with the total of (M = 17.75) (Table 4.4).

The reason why there was an improvement were PU were suitable and effective exercise for both male and female to improve strength performance (Miller, 2018). PU exercise require low no of time to get stability and balancing of both hand between PU and BP group. So, low no of time for familiarization help people especially sedentary to focus on the target muscle which develop and improve muscle strength. Proper PU was claimed as the best exercise that can develop strength and power for

upper body, besides it may promote balance and stability for several muscles such as pectoralis major and deltoid (Shah, 2012).

Besides that, PU exercise intensity determined by BW and requires no equipment. So, PU was suitable for sedentary people. PU exercise was a better exercise for improving MS because target upper body strength with low no of risking injury (Contreras, 2012). PU exercise should be practice among sedentary people to train upper body strength because previous studies show the PU exercise was a common practical way to enhance upper body fitness with no use of gym equipment and only BW (Ebben, 2011). Other than that, PU exercise similar to the BP exercise that actives pectoralis major, triceps and anterior deltoid (Topalidou, 2012).

5.3 EFFECT OF 6 WEEKS BP GROUP ON MS

Besides that, BP exercise also significantly improved of 6 weeks training (p = .0001) and pre-test (M = 44.50) and post-test (M = 60.25) on MS test. The result was improved by 15.75kg (35.40%). This study shows a lot of improvement from pre-test to post-test with the total of (M = 15.75) (Table 4.4). From the result of the present study, the finding shows there was a significant improvement in 6 weeks for pre and post-test for PU group and BP group. Other than that, previous studied shows that BP exercise had significant improved for 1 RM BP exercise p = .001 and pre-test (M = 57.70) and post-test (M = 69.95) (Calatayud, 2015). For the 1 to 2 weeks, BP group still in a process of adaptation and decided to use zero bar to gain strength and balancing. After week 2, subject able to adapt and push the bar with the loads and keep increasing based on 40% of 1RM BP test. Six weeks of BP training enough to increase muscle strength for sedentary people because based on previous study, using BP exercise in workout program increase the upper body strength in junior athletes over a 6-week period (Drinkwater, 2005).

5.4 PUSH UP GROUP ON ME

For 6 weeks PU training, there was a significant effect (p = .0001) on ME test. Pre-test (M = 28.45) and post-test (M = 45.05). The result was improved by 16.6kg (58.35%). In the present study shows there was a significant improvement from pre-test to post-test with the total of (M = 16.6) based on (Table 4.4). PU was a basic exercise in BW training. PU requires no equipment and portable to do it everywhere. For sedentary people, it is not a problem to do PU in daily exercise. Based on The World's Best Push Up Workouts articles, published on June 2012, claimed that PU exercise can be practice to perform in high repetitions. For sedentary people, PU can be a good practice by doing perfect technique in lower no of repetition on the first week. Keep on practice and increase repetition every week improve technique of PU and increase ME in training. PU intervention group familiarized with PU throughout the six weeks training, thus it helps in 1Min PU test. PU exercise improves ME of the upper body and was widely used by conditioning professionals to trains athletes in sports (Contreras, 2012).

5.5 BENCH PRESS GROUP ON ME

There was a significant effect (p = .0001) of 6 weeks BP between pre-test (M = 29.95) and post-test (M = 41.45) on ME. The result was improved by 11.5kg (38.40%). There was a significant improvement in pre and post-test (M= 11.5) based on (Table 4.4). BP exercise can improve ME. Present study show that 6 weeks of BP training can improve ME test among sedentary people. Previous studied showed that the BP exercise strengthening upper body muscle to develop MS and ME (Calatayud, 2015). Other than that, traditional exercise (BP) program can increase the strength or endurance of a particular muscle or muscle group (Weiss, 2010). This study shows that single exercise of 12 repetitions and 3 sets with approximately 15 minutes in six weeks training probably create enough overload to sedentary women (principle of overload) which resulted in improving ME.

5.6 COMPARISON OF PU EXERCISE AND BP EXERCISE ON MS

In the present study, the result showed that PU group shows more improvement as compared to BP group. From the result (Table 4.9), it showed that the mean and standard deviation for PU group for pre and post-test for MS test were (M = 59.75, SD = 13.905). The result was improved by 16.75kg (42.26%) based on (Figure 4.3). While for BP group, the mean and standard deviation for MS test were (M = 60.25, SD = 10.447). The result was improved by 15.75kg (35.40%) based on (Figure 4.3). The result showed PU group improves more on MS test than BP group (M= 17.75). The reason why PU improves more compare to BP because based on researcher's observations, within six weeks of training, PU intervention group shown that PU training required less time to adapt to the exercise, thus faster in developing the stability and balance of both hand in performing PU as compared to BP intervention. Therefore, as the PU intervention group required lesser time for familiarization, this help the participants to focus on the target muscle throughout the training program which develop and improve muscle strength faster than BP intervention.

PU exercise target same upper body muscle similar to BP exercise. Present studied shows that both groups have significantly improved for MS test within 6 weeks of training. Both groups develop and increase MS and previous writing shows BP and PU have shown similar muscle activation and similar muscle gains when both exercises been performed at the same intensity and speed (Kikuchi, 2017). Present study shows that single exercise of 12 repetitions, 3 sets of PU exercise with approximately 15 minutes in 6 weeks training probably create enough overload to the sedentary women in improving MS. Based on previous study, Calatayud (2015), PU was BW exercise that always used for strengthening upper body to asses maximal MS.

5.7 COMPARISON OF PU EXERCISE AND BP EXERCISE ON ME

In the present study, the result showed that PU group shows more improvement compare to BP group. From the result (Table 4.9), it showed that the mean and standard deviation for PU group for pre and post-test for ME test were (*M* = 45.05, *SD* = 6.589). The result was improved by 14.05kg (58.35%) based on (Figure 4.3). While for BP group, the mean and standard deviation for ME test were (*M* = 41.45, *SD* = 6.203). The result was improved by 11.5kg (38.40%) based on (Figure 4.3). The result showed PU group improves more on ME than BP group (*M*= 16.6). For PU group, subject have low no of familiarization than BP group. The reason why PU improves more compare to BP because PU was more specific technique on ME test. Practical application of PU training develops and improves ME. PU group takes short time of period to focus on target muscle to improve ME. Previous writing shows PU and BP have similar muscle gains and muscle activation (Kikuchi, 2017). With the number of 12 repetition for PU training, enough for sedentary to develop ME. Based on previous writing, ten to twenty repetitions have used successfully used to improve ME (Ratamess, 2009). PU intervention group familiarized with PU throughout the 6 weeks training, thus it helps in ME test. Contreras (2012), suggested that PU widely used by the conditioning professionals in training their athletes to improves upper body ME.

5.8 CONCLUSION

As a conclusion, the six weeks training of PU and BP exercise does significantly effects MS and ME. There was a significant difference within PU and BP group on MS and ME test (p = .000). Both groups had significantly improved during pre and post-testing on MS and ME. Six weeks of training for PU and bench press can be applied to improve MS and ME among sedentary people. In the previous studies, a significant increases in MS were observed in the BP group from (M = 60.0, SD = 12.1 kg) to (M = 65.0, SD = 12.1 kg, $p < 0.01$) and in the PU group from (M = 61.1, SD = 12.2 kg) to (M = 64.2, SD = 12.5 kg, $p < 0.01$) (Kikuchi, 2017). The findings in this study shows there was a significant improvement in MS and ME from 6 weeks training for PU and BP exercise. In the previous studied, PU and BP exercise at 40% of 1RM over 8 weeks were similarly effective for increasing muscle strength (Kikuchi, 2017). Thus, six weeks training of PU and BP were enough to improve MS and ME for sedentary people based on the results (Table 4.4).

On the other hand, there was a significant difference between PU and BP group on MS and ME test (p = .042). In MS test, PU group improves more compare to BP group. Present study shows results show that in order to improve MS, PU exercise was a suitable exercise to develop MS. Trainer or teacher may include PU exercise in training programme to develop and increase MS in physical performance.

PU group on the other hand significantly improve on ME test, as compared to BP group. The result of present study shows that PU is a good intervention to develop ME in physical performance. PU exercise had similar technique and specific on ME test. PU intervention group experienced a six weeks of PU program (in which they were training specifically on PU technique), thus this may help specifically improving the ME test. In order to develop or improves ME (specifically on ME test), PU should

be considered as the training programme. Moreover, PU exercise was BW exercise which makes it convenience and effective exercise.

Present studies showed that there was a significant difference within and between group of PU and BP on MS and ME. Both groups shown a significant improve during pre and post-test of MS test and ME test. Strength and endurance in the upper body muscles was a good indication of overall fitness (Shah, 2012). So, PU and BP should be practise among sedentary people. This study can be concluded that PU and BP can improved MS and ME. Both exercises can be conducted for sedentary people. Besides that, both exercises can be concluded for sedentary people to adapt, gain and improve MS and ME.

There were few suggestions from the researcher especially develop MS and ME using basic exercise especially for sedentary people. For sedentary people, start with basic exercise such as PU and adapt with the exercise first before increased the intensity to BP exercise. Trainer and teacher must include PU exercise for every training programme for build MS and ME. A relationship between similar muscle activation and similar muscle strength adaptations has been assumed for years in studies (Calatayud, 2015). Besides that, intensity and repetition were important for better improvement and prevent injuries especially for sedentary people with minimum knowledge of exercise.

PU exercise must be practice among sedentary people because PU was portable and easy to conduct before move to another exercise such as BP exercise. Based on this study, six weeks training enough to increase MS and ME on sedentary people. Thus, should not be a problem to develop or improve MS and ME without going to the gym.

5.9 PRACTICAL APPLICATION

This study concludes that single PU and BP exercise intervention that consist of 12 repetition, 3 sets for 4 times a week for 6 weeks of training can improve MS and ME among sedentary population. In order to improves specifically on ME test, specific training of PU can be used. Training specifically using the exercise probably develop better ME and exercise techniques. Meanwhile, in order to improve MS test, PU exercise can be used for improved upper body strength. Other than that, training specifically using BP equipment was recommended to improve on MS and BP techniques.

5.10 RECOMMENDATION

There were many ways of exercise that can improve MS and ME. There were few suggestions from the researcher especially develop MS and ME. There were many types of variation PU to use to develop MS and ME such as wall PU, knee PU and PU with elastic band. Other than that, different kind of surface and hand position influence the intensity and results of MS and ME.

Besides that, intensity and repetition were important for better improvement. Different number of sets and repetition influence the results. Next researcher can increase the number of set and repetition to compare whether there was a significant different between the PU group and BP group. Other than that, rest interval also can influence the subject results. Increase or decrease the number of rest interval can be done and compare whether can be applied in training programme to increase athlete performance.

Apart from that, it is recommended to use different population on comparing PU and BP such as between male and female, athletes or non-athletes.

REFERENCES

American College of Sports Medicine (2006). ACSM's Guidelines for Exercise Testing and Prescription, 7th ed. *Lippincott, Williams & Wilkins, Baltimore, MD.*

American College of Sports Medicine. (2009). American College of Sports Medicine position stand. Progression models in resistance training for healthy adults. *Medicine and science in sports and exercise*, *41*(3), 687.

Andersen, L. L., Magnusson, S. P., Nielsen, M., Haleem, J., Poulsen, K., & Aagaard, P. (2006). Neuromuscular activation in conventional therapeutic exercises and heavy resistance exercises: implications for rehabilitation. *Physical therapy*, *86*(5), 683-697.

Arazi, H., & Asadi, A. (2013). El test d'una repetició màxima incrementa els índexs sèrics. *Apunts: Medicina de l'esport*, *48*(178), 49-54.

Bar-On, M. E., Broughton, D. D., Buttross, S., Corrigan, S., Gedissman, A., De Rivas, M. R. G., ... & Hogan, M. (2001). Children, adolescents, and television. *Pediatrics*, *107*(2), 423-426.

Barnett C, Kippers V, Turner P. (1995). Effects of variations of the bench press exercise on the EMG activity of five shoulder muscles. *J Strength Cond Res*, 9(4): 222-227.

Bianco, A., Filingeri, D., Paoli, A., & Palma, A. (2015). One repetitions maximum bench press performance: A new approach for its evaluation in inexperienced males and females: A pilot study. *Journal of Bodywork and Movement Therapies*, 19(2), 362-369.

Blackard, DO, Jensen, RL, and Ebben, WP. (1995). Use of EMG analysis in challenging kinetic chain terminology. *Med Sci Sports Exerc* 31: 443– 448.

Calatayud, J., Borreani, S., Colado, J. C., Martin, F., Tella, V., & Andersen, L. L. (2015). Bench Press and Push-up at Comparable Levels of Muscle Activity Results in Similar Strength Gains. *Journal of Strength and Conditioning Research*,29(1), 246-253.

Campos, G. E., Luecke, T. J., Wendeln, H. K., Toma, K., Hagerman, F. C., Murray, T. F., ... & Staron, R. S. (2002). Muscular adaptations in response to three different resistance-training regimens: specificity of repetition maximum training zones. *European journal of applied physiology*, *88*(1-2), 50-60.

Chulvi-Medrano, I., Martínez-Ballester, E., & Masiá-Tortosa, L. (2012). COMPARISON OF THE EFFECTS OF AN EIGHT-WEEK PUSH-UP PROGRAM USING STABLE VERSUS UNSTABLE SURFACES. *International journal of sports physical therapy*, *7*(6), 586.

Contreras, B., Schoenfeld, B., Mike, J., Tiryaki-Sonmez, G., Cronin, J., & Vaino, E. (2012). The Biomechanics of the Push-up: Implications for resistance training programs. *Strength & Conditioning Journal*, *34*(5), 41-46.

Contreras, B., Schoenfeld, B., Mike, J., Tiryaki-Sonmez, G., Cronin, J., & Vaino, E. (2012). The Biomechanics of the Push-up. *Strength and Conditioning Journal*,34(5), 41-46.

DeLorme, T. L. (1948). Technics of progressive resistance exercise. *Arch Phys Med*, *29*, 263-273.

Do Nascimento, M. A., Januário, R. S. B., Gerage, A. M., Mayhew, J. L., Pina, F. L. C., & Cyrino, E. S. (2013). Familiarization and reliability of one repetition maximum strength testing in older women. *The Journal of Strength & Conditioning Research*, *27*(6), 1636-1642.

Ebben, W. P., Wurm, B., Vanderzanden, T. L., Spadavecchia, M. L., Durocher, J. J., Bickham, C. T., & Petushek, E. J. (2011). Kinetic Analysis of Several Variations of Push-Ups. *Journal of Strength and Conditioning Research*,25(10), 2891-2894.

Ekeland U, Brage S, Froberg K, et al. (2006). TV viewing and physical activity are independently associated with metabolic risk in children: *the European Youth Heart Study. PLoS Med* ;3:2449 –56.

Evan E. Schick, Jared W. Coburn, Lee E. Brown, Daniel A. Judelson, Andy V. Khamoui, Tai T. Tran, And Brandon P. Uribe (2010) A comparison muscle activation between a smith machine and free weight bench press. *Journal of Strength and Conditioning Research.*

Faigenbaum AD. (2007). Resistance training for children and adolescents—are there health outcomes? *Am J Lifestyle Med.* 1:190-200.

Fatouros, I.G., A. Kambas, I. Katrabasas, K. Nikolaidis, A. Chatzinikolaou, D. Leontsini, And K. Taxildaris. (2005). Strength training and detraining effects on muscular strength, mobility, and joint range of motion of inactive older men are intensity dependent. Br. *J. Sports Med*. 39:776–780.

Feigenbaum, M. S., & Pollock, M. L. (1999). Prescription of resistance training for health and disease. *Medicine & Science in Sports & Exercise*, *31*(1), 38-45.

Fleck, S. J., & Kraemer, W. (2014). *Designing resistance training programs, 4E*. Human Kinetics.

Folland, J. P., & Williams, A. G. (2007). Morphological and neurological contributions to increased strength. *Sports medicine*, *37*(2), 145-168.

Galvao, D. A., Nosaka, K., Taaffe, D. R., Spry, N., Kristjanson, L. J., McGuigan, M. R., ... & Newton, R. U. (2006). Resistance training and reduction of treatment side effects in prostate cancer patients. *Medicine & Science in Sports & Exercise*, *38*(12), 2045-2052.

García-Massó, X., Colado, J. C., González, L. M., Salvá, P., Alves, J., Tella, V., & Triplett, N. T. (2011). Myoelectric activation and kinetics of different plyometric push-up exercises. *The Journal of Strength & Conditioning Research*, *25*(7), 2040-2047.

Gouvali, M. K., & Boudolos, K. (2005). Dynamic and electromyographical analysis in variants of push-up exercise. *The Journal of Strength & Conditioning Research*, *19*(1), 146-151.

Gorely, T., Biddle, S. J., Marshall, S. J., & Cameron, N. (2009). The prevalence of leisure time sedentary behaviour and physical activity in adolescent boys: an ecological momentary assessment approach. *International Journal of Pediatric Obesity*, *4*(4), 289-298.

J.R. Hoffman, R.U. Newton, J. Potteiger, M.H. Stone, N.A. Ratamess, & T. Triplette-Mcbride. (2002) American College of Sports Medicine position stand. Progression models in resistance training for healthy adults. *Med. Sci. Sports Exerc.* 34: 364–380.

Jill A. Bennett, Kerii Winters-Stone, Lilian M. Nail & Jennifer Scherer. (2006). Definitions of Sedentory in Physical-Activity-Intervention Trials: A Summary of the Literature. *Journal of Aging and Physical Activity*, 14, 456-477.

Katzmarzyk, P. T., Church, T. S., Craig, C. L., & Bouchard, C. (2009). Sitting time and mortality from all causes, cardiovascular disease, and cancer. *Medicine & Science in Sports & Exercise*, *41*(5), 998-1005.

Kellis, E., & BALTZOPOULOS, V. (1998). Muscle activation differences between eccentric and concentric isokinetic exercise. *Medicine & Science in Sports & Exercise*, *30*(11), 1616-1623.

Kemmler, W. K., Lauber, D., Wassermann, A., & Mayhew, J. L. (2006). Predicting maximal strength in trained postmenopausal woman. *The Journal of Strength & Conditioning Research*, *20*(4), 838-842.

Kikuchi, N., & Nakazato, K. (2017). Low-load bench press and push-up induce similar muscle hypertrophy and strength gain. *Journal of Exercise Science & Fitness*,15(1), 37-42.

King, A. C., Castro, C., Wilcox, S., Eyler, A. A., Sallis, J. F., & Brownson, R. C. (2000). Personal and environmental factors associated with physical inactivity among different racial–ethnic groups of US middle-aged and older-aged women. *Health psychology*, *19*(4), 354.

Knapik, J. J., Sharp, M. A., Canham-Chervak, M. I. C. H. E. L. L. E., Hauret, K. E. I. T. H., Patton, J. F., & Jones, B. H. (2001). Risk factors for training-related injuries among men and women in basic combat training. *Medicine & Science in Sports & Exercise*, *33*(6), 946-954.

Kraemer, W. J., & Ratamess, N. A. (2004). Fundamentals of resistance training: progression and exercise prescription. *Medicine & Science in Sports & Exercise*, *36*(4), 674-688.

La Bounty, P., Campbell, B. I., Galvan, E., Cooke, M., & Antonio, J. (2011). Strength and conditioning considerations for mixed martial arts. *Strength & Conditioning Journal*, *33*(1), 56-67.

Lee, M., Gandevia, S. C., & Carroll, T. J. (2009). Short-term strength training does not change cortical voluntary activation. *Medicine & Science in Sports & Exercise*, *41*(7), 1452-1460.

LeSuer, D. A., McCormick, J. H., Mayhew, J. L., Wasserstein, R. L., & Arnold, M. D. (1997). The accuracy of prediction equations for estimating 1-RM performance in the bench press, squat, and deadlift. *The Journal of Strength & Conditioning Research*, *11*(4), 211-213.

Levinger, I., Goodman, C., Hare, D. L., Jerums, G., Toia, D., & Selig, S. (2009). The reliability of the 1RM strength test for untrained middle-aged individuals. *Journal of science and medicine in sport*, *12*(2), 310-316.

Ludewig, P. M., Hoff, M. S., Osowski, E. E., Meschke, S. A., & Rundquist, P. J. (2004). Relative balance of serratus anterior and upper trapezius muscle activity during push-up exercises. *The American journal of sports medicine*, *32*(2), 484-493.

Mazzetti, S. A., Kraemer, W. J., VOLEK, J. S., DUNCAN, N. D., RATAMESS, N. A., GÓMEZ, A. L., ... & FLECK, S. J. (2000). The influence of direct supervision of resistance training on strength performance. *Medicine & Science in Sports & Exercise*, *32*(6), 1175-1184.

Nelson, M. E., Rejeski, W. J., Blair, S. N., Duncan, P. W., Judge, J. O., King, A. C., ... & Castaneda-Sceppa, C. (2007). Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*(9), 1094.

Owen, N., Leslie, E., Salmon, J., & Fotheringham, M. J. (2000). Environmental determinants of physical activity and sedentary behavior. *Exerc Sport Sci Rev*, *28*(4), 153-158.

Owen, N., Bauman, A., & Brown, W. (2009). Too much sitting: a novel and important predictor of chronic disease risk?. *British journal of sports medicine*, *43*(2), 81-83.

Padulo, J., Mignogna, P., Mignardi, S., Tonni, F., & D'ottavio, S. (2012). Effect of different pushing speeds on bench press. *International journal of sports medicine*, *33*(05), 376-380.

Pollock, M. L., Franklin, B. A., Balady, G. J., Chaitman, B. L., Fleg, J. L., Fletcher, B., ... & Bazzarre, T. (2000). Resistance exercise in individuals with and without cardiovascular disease: benefits, rationale, safety, and prescription an advisory from the committee on exercise, rehabilitation, and prevention, council on clinical cardiology, American Heart Association. *Circulation*, *101*(7), 828-833.

Ratamess, N. A., Chiarello, C. M., Sacco, A. J., Hoffman, J. R., Faigenbaum, A. D., Ross, R. E., & Kang, J. (2012). The effects of rest interval length on acute bench press performance: The influence of gender and muscle strength. *The Journal of Strength & Conditioning Research*, *26*(7), 1817-1826.

Suprak, D. N., Dawes, J., & Stephenson, M. D. (2011). The effect of position on the percentage of body mass supported during traditional and modified push-up variants. *The Journal of Strength & Conditioning Research*, *25*(2), 497-503.

Topalidou, A., Georgina, D., Eirini-Erofili, K., John, A., Evaggelos, B., & Aristomenis, S. (2012). Biomechanical evaluation of the push-up exercise of the upper extremities from various starting points. *Journal of Physical Education and Sport*, *12*(1), 71-80.

Uhl, T. L., Carver, T. J., Mattacola, C. G., Mair, S. D., & Nitz, A. J. (2003). Shoulder musculature activation during upper extremity weight-bearing exercise. *Journal of Orthopaedic & Sports Physical Therapy*, *33*(3), 109-117.

Williams, A. G., Dhamrait, S. S., Wootton, P. T., Day, S. H., Hawe, E., Payne, J. R., ... & Montgomery, H. E. (2004). Bradykinin receptor gene variant and human physical performance. *Journal of applied physiology*, *96*(3), 938-942.

Wilmore, J. H. (1974). Alterations in strength, body composition and anthropometric measurements consequent to a 10-week weight training program. *Medicine and Science in Sports*, *6*(2), 133-138.

Wilson, G. J., Elliott, B. C., & Kerr, G. K. (1989). Bar path and force profile characteristics for maximal and submaximal loads in the bench press. *Journal of Applied Biomechanics*, *5*(4), 390-402.

Wise, J. B., Posner, A. E., & Walker, G. L. (2004). Verbal messages strengthen bench press efficacy. *Journal of strength and conditioning research*, *18*(1), 26-29.

APPENDICES

APPENDIX A

Application for Research Ethics Approval

UNIVERSITI TEKNOLOGI MARA

FACULTY OF SPORTS SCIENCE AND RECREATION
UNIVERSITI TEKNOLOGI MARA SARAWAK

Application form for Ethics Approval

Ethics Committee of Research Project

Part A : Details of Research Project

Title of Research Project	:	**A Comparison between Push up and Bench Press on Physical Performance among Sedentary Women**
Name of Student	:	**Edmund ak Bonnie**
Matric no.	:	**2017968165**
Programme	:	**Bachelor of Sports Science (Hons.)**

Supervisor Approval of Research Project:

/	Agree to grant the Research Ethics Approval for the said study. Submission to the ethics committee is required.
	Agree to grant the Research Ethics Approval for the said study with minor amendments. Resubmission to the supervisor is required.
	Disagree to grant the Research Ethics approval for the said study. Resubmission to the ethic committee is required.

NUR KHAIRUNISA BT HJ ABU TALIP
Pensyarah
Fakulti Sains Sukan & Rekreasi
Universiti Teknologi MARA Cawangan Sarawak
Name of Supervisor and stamp

Signature

27/6/2019
Date

Ethics Committee Approval of Research Project:

/	Agree to grant the Research Ethics Approval for the said study.
	Agree to grant the Research Ethics Approval for the said study with minor amendments and without resubmission.
	Disagree to grant the Research Ethics approval for the said study. Resubmission to the ethic committee is required.

Signature

PATRICIA PAWA PITIL
PENSYARAH
Fakulti Sains Sukan & Rekreasi
Universiti Teknologi Mara Samarahan
Sarawak
Chairperson of the Ethics Committee

30/7/19
Date

APPENDIX B

Project Protocol

BAHAGIAN B: ProtokolProjek*Part B : Project Protocol*

1. **LatarBelakang:** *Background*
(Keterangan ringkas tentang masalah yang dikaji dan penyemakan literatur untuk menyokong keterangan tentang masalah yang dikaji.

Push up is an exercise that always been used in conditioning programme to develop upper body strength. Many studies confirm that people nowadays are aware about the importance of exercising which can improve and maintain their health (Blair, 2004). Push-ups is a recommended upper body exercise that can be used to enhance fitness (Lee, 2008). Push up exercise is good for strengthening upper body and increase muscular strength and muscular endurance (Garcı´a-Masso, 2011). Push up exercise target various type of muscles such as pectoralis major, deltoid, biceps and triceps. Push up exercise can be performed anywhere, practical for body lifestyle and require low budget (Matheson, 2001).

Bench press is a common exercise used for developing upper body muscle that is pectoralis major (Wilson, 1989). There is different type of bench press such as normal bench press, incline bench press and decline bench press. Bench press is exercise for improve upper body muscle (Baechle, 2008; Fleck, 2004) and increase muscle strength (American College of Sports Medicine, 2009); (Masso, 2011); (Knapik, 2001). Bench press usually required expensive equipment such as load and barbell. But bench press exercise had advantages from bodyweight exercise because possible for control the load or intensity (low, moderate and high) (Blackard, 1999).

Muscular strength is a health-related component of physical fitness on the ability of the muscle to exert force (Wilmore, 1994). Study have found that muscular strength can prevent chronic disease in daily living and exercise performance (Ekelund LG, 1988). Muscular strength can be improving by resistance training in health related and fitness (Pollock, 2000); (Haskell, 2007).

Muscular endurance is a health-related component of physical fitness on the muscle's ability to continue to perform without fatigue (Wilmore, 1994). Muscular endurance training is the maximal number of repetitions performed with a specific load (Mazzetti, 2000). Push up test is a common type of test to measure upper body muscular endurance (American College of Sports Medicine, 2010; The Cooper Institute for Aerobics Research, 1999; Hoffman J, 2006; United States Army, 2012).

Rujukan:*Reference*

- Bianco, A., Filingeri, D., Paoli, A., & Palma, A. (2015). One repetitions maximum bench press performance: A new approach for its evaluation in inexperienced males and females: A pilot study. Journal of Bodywork and Movement Therapies, 19(2), 362-369
- Calatayud, J., Borreani, S., Colado, J. C., Martin, F., Tella, V., & Andersen, L. L. (2015). Bench Press and Push-up at Comparable Levels of Muscle Activity Results in Similar Strength Gains. Journal of Strength and Conditioning Research,29(1), 246-253.
- Contreras, B., Schoenfeld, B., Mike, J., Tiryaki-Sonmez, G., Cronin, J., & Vaino, E. (2012). The Biomechanics of the Push-up. Strength and Conditioning Journal,34(5), 41-46.
- Ebben, W. P., Wurm, B., Vanderzanden, T. L., Spadavecchia, M. L., Durocher, J. J., Bickham, C. T., & Petushek, E. J. (2011). Kinetic Analysis of Several Variations of Push-Ups. Journal of Strength and Conditioning Research,25(10), 2891-2894.

2.	**ObjektifdanJustifikasiProjekPenyelidikanDijalankan:** *Objectives and Justifications for the Project to be carried out :* • To compare the effect of push up and bench press on muscular strength. • To compare the effect of push up and bench press on muscular endurance.
3.	**Faedah yang Dijangka:** *Expected Benefits :* Significance of study • The purpose of this study is to compare between push up and bench press exercise on physical performance. • Physical performance consists of muscular strength and muscular endurance. • Push up and bench press is type of exercise that target upper body muscle.
4.	**JangkamasaProjek:** *Timeframe of the Project :* 6 to 8 weeks
5.	**Lokasi Projek Penyelidikan dijalankan:** *Location where the Project will be carried out :* FSR Fitness Centre
6.	**Keterangan bagaimana hasil kajian akan digunakan:** *Explain how the results will be used :* To determine that push up exercise can improve muscular strength and muscular endurance same as bench press results.
7.	**Kaedah Penyelidikan: (Sila terangkan perkara-perkara berikut)** *Experimental : (Please explain the following)*
7.1	**Rekabentuk kajian, metodologi yang diguna:** *Experimental design and methodology :* 1. Muscular strength • 1RM Bench press 2. Muscular endurance • One-minute push up

7.2 **Saiz sampel, kriteria pemilihan:**
Sample size and selection criteria :

n= 40 subjects will be selected by using non-probality sampling technique

7.3 **Pembahagian kumpulan ujian dan kontrol; dan ciri-ciri kohort atau sampel dan jenis kontrol:**
Division of test and control groups, cohort properties or samples, and type of control :

Inclusion and exclusion criteria

Inclusion	Exclusion
•Female •Sedentary •Physically and mentally healthy •Age (18-25 years old)	•Male •Athlete and active in sport •Has medical condition or injury history •Age 25 years and above

7.4 **Pemprosesan data dan penganalisaan statistik:**
Data processing and statistical analysis :

The data collection will be analysed using the Statistical Package of Social Science (SPSS) version 22.0 in all statistical evaluation.

Repeated measure ANOVA (mixed between within subjects' analysis) will be used to compare between push up and bench press on muscular strength and muscular endurance.

[Silalampirkancontohlembaranmaklumatsubjekdanborangpersetujuansubjek]
Please attach examples of Subject Information Sheet and Subject Consent Form

Bahagian C: Pengesahan persetujuan menjalankan projek penyelidikan
Part C : Agreement to conduct the research project

Mesti dipenuhi dan ditandatangani oleh semua ahli kumpulan penyelidikan
Must be completed and signed by all members of the research group

1. **Penyelia projek (Pensyarah)**

Nama: *Name*	Nur Khairunisa Binti Haji Abu Talip	
Jawatan/ kepakaran: *Position/ Specialisation*	Supervisor	
Jabatan *Affiliation*	Fakulti Sains Sukan & Rekreasi	
No. Tel	014-5950978	Handphone Email
Tandatangan: *Signature*		Tarikh*Date*

2. Penyelidik*(Pelajar)*

Nama: *Name*	Edmund ak Bonnie	
Jawatan/ kepakaran: *Position/ Specialisation*		
Jabatan *Affiliation*		
No. Tel	-	Handphone: 018-2108066 Email: edmundbonnie@gmail.com
Tandatangan: *Signature*		Tarikh*Date* 20 . 1 . 2020

APPENDIX C

Training Programme

PU Training Programme

Week 1-6

Frequency: 4 days per week

Monday

Warm up (Dynamic stretching): 1 minute each

- Jumping jack
- High knee
- Half squat

No	Type of PU	No of Sets
1	**Traditional PU**	3

- 12 Repetitions
- 1-minute rest between sets

Cool Down (static stretching)

BP Training Programme

<table>
<tr><th colspan="3">Week 1-6</th></tr>
<tr><td colspan="3">Frequency: 4 days per week

Warm up (Dynamic stretching): 1 minute each
• Jumping jack
• High knee
• Half squat</td></tr>
<tr><td>No</td><td>Type of exercise</td><td>No of sets</td></tr>
<tr><td>1</td><td>BP</td><td>3</td></tr>
<tr><td colspan="3">• 12 Repetitions
• 1-minute rest between sets</td></tr>
<tr><td colspan="3">Cool Down (static stretching)</td></tr>
</table>

APPENDIX D

Score Sheet

1RM BENCH PRESS SCORESHEET

NAME:

AGE:

HEIGHT:

WEIGHT:

PHONE NUMBER:

1RM BENCH PRESS		
TRIAL 1	TRIAL 2	TRIAL 3

Fitness Categories for Upper Body Strength for Women by Age				
Bench Press Weight Ratio = weight pushed in lbs/ body weight in lbs				
WOMEN				
Age				
%		<20	20-29	30-39
99	Superior	>0.88	>1.01	>0.82
95		0.88	1.01	0.82
90	Excellent	0.83	0.90	0.76
85		0.81	0.83	0.72
80		0.77	0.80	0.70
75	Good	0.76	0.77	0.65
70		0.74	0.74	0.63
65		0.70	0.72	0.62
60		0.65	0.70	0.60
55	Fair	0.64	0.68	0.58
50		0.63	0.65	0.57
45		0.60	0.63	0.55
40		0.58	0.59	0.53
35	Poor	0.57	0.58	0.52
30		0.56	0.56	0.51
25		0.55	0.53	0.49
20		0.53	0.51	0.47
15	Very poor	0.52	0.50	0.45
10		0.50	0.48	0.42
5		0.41	0.44	0.39
1		<0.41	<0.44	<0.39
N		20	191	379

(Adapted from Physical Fitness Assessment and Norms for Adults and Law Enforcement, 2009)

ONE MINUTE PUSH UP SCORESHEET

NAME:

AGE:

HEIGHT:

WEIGHT:

PHONE NUMBER:

ONE MINUTE PUSH UP		
TRIAL 1	TRIAL 2	TRIAL 3

Fitness Categories for the Push-Up by Age and Sex				
Age Year				
Category	20-29		30-39	
Sex	M	W	M	W
Excellent	36	30	30	27
Very Good	35 29	29 21	29 22	26 20
Good	28 22	20 15	21 17	19 13
Fair	21 17	14 10	16 12	12 8
Needs Improvement	16	9	11	7

(Adapted from ACSM, 2014)

APPENDIX E

Consent Form and Physical and Readiness Questionnaire (PARQ)

Participants Information Sheet

A Comparison Between Push Up and Bench Press on Physical Performance among Sedentary Women

Introduction of Study

Purpose of Study

Study Procedure

Participation in Study

Your participation in this study is entirely voluntary. You may refuse to take part in the study or you may withdraw yourself from participation in the study at any time without penalty.

Benefit of Study

Information obtained from this study will benefit the researchers, Government of Malaysia, doctors and individuals for the advancement of knowledge and practice of medicine in future.

If you have any question about this study or your rights, please contact the investigator, Edmund ak Bonnie at telephone number 018-2108066

Confidentiality

Your information will be kept confidential by the investigators and will not be made public unless disclosure is required by law. By signing this consent form, you will authorize the review of records, analysis and use of the data arising from this study.

Consent Form

To become a subject in the research, you or your legal guardian is advised to sign this Consent Form.

I herewith confirm that I have met the requirement of age and am capable of acting on behalf of myself /* as a legal guardian as follows:

1. I understand the nature and scope of the research being undertaken.
2. I have read and understood all the terms and conditions of my participation in the research.
3. All my questions relating to this research and my participation therein have been answered to my satisfaction.
4. I voluntarily agree to take part in this research, to follow the study procedures and to provide all necessary information to the investigators as requested.
5. I may at any time choose to withdraw from this research without giving reasons.
6. I have received a copy of the Participants Information Sheet and Consent Form.
7. Except for damages resulting from negligent or malicious conduct of the researcher(s), I hereby release and discharge UiTM and all participating researchers from all liability associated with, arising out of, or related to my participation and agree to hold them harmless from any harm or loss that may be incurred by me due to my participation in the research.

	Name & IC no	Signature	Date
Participant			
Parents/Guardian			
Researcher	Edmund ak Bonnie		

SOAL-SELIDIK KESEDIAAN AKTIVITI FIZIKAL
PHYSICAL ACTIVITY READINESS QUESTIONNAIRE (PAR-Q)

Sila baca soalan di bawah dengan teliti dan jawab dengan jujur: YA atau TIDAK
Read the question below carefully and answer honestly: YES or NO

	Ya *Yes*	**Tidak** *No*
1. **Pernahkah doktor mengatakan bahawa anda mempunyai masalahjantung dan hanya boleh melakukan aktiviti atas saranan doktor?** *Have your doctor said that you have heart problems and can only do exercises recommended by your doctor?*		
2. **Adakah anda berasa sakit di bahagian dada apabila melakukan aktiviti fizikal?** *Do you feel pain in the chest area when doing any physical activity?*		
3. Dalam tempoh sebulan yang lalu, pernahkah anda mengalami sakit dada ketika tidak melakukan sebarang aktiviti fizikal? *Since last month, did you have any pain in the chest area even when not doing any physical activity?*		
4. Adakah anda hilang keseimbangan disebabkan pening atau pernahkah anda pengsan? *Have you ever fainted before?*		
5. Adakah anda mempunyai masalah tulang atau sendi yang boleh menjadi lebih kritikal dengan perubahan aktiviti fizikal anda? *Do you have any bone or joint injuries which can become more severe when you change your exercise routine?*		
6. Adakah doctor anda sedang mempreskripsi sebarang jenis dadah (contohnya, pil air) untuk tekanan darah atau keadaan jantung anda? *Is your doctor advises you to take drugs for high blood pressure and heart failure?*		
7. Adakah anda mempunyai lain-lain sebab untuk tidak melakukan aktiviti fizikal? *Do you know any reason that causes you unable to play sports?*		

• **Sekiranya anda menjawab Ya untuk satu lebih soalan, dapatkan nasihat dari doktor sebelum menjalani kajian ini.** If you answer Yes on one or all the questions, seek advice from your doctor before proceeding into this study.
• **Sekiranya anda menjawab Tidak bagi semua soalan, anda boleh terus menjalani kajian ini.** If you answer No to all questions, you may proceed with the study.
• **Sekiranya anda berasa kurang sihat, sila tangguh sehingga anda sembuh sebelum meneruskan dengan kajian ini.** If you are feeling not well today, please hold until you recover before proceed with this study.

APPENDIX F

Approval Letter

Bahagian Hal Ehwal Akademik & Antarabangsa

Universiti Teknologi MARA (UiTM) Cawangan Sarawak
Jalan Meranek, 94300 KOTA SAMARAHAN
Tel : +6082 - 677 200 / Fax : +6082 - 677 300 (Kampus Samarahan)
Tel : +6082 - 678 200 / Fax : +6082 - 678 110 (Kampus Samarahan 2)
http://sarawak.uitm.edu.my

UNIVERSITI TEKNOLOGI MARA

Surat Kami : 100-UiTMKS (HEA&A. 30/7)
Tarikh : 16 Mei 2019

KEPADA SESIAPA YANG BERKENAAN

Tuan/Puan

Sila rujuk lampiran untuk senarai nama pelajar yang terlibat.

Sukacita sekiranya pihak tuan/puan dapat membantu dan memberi kerjasama kepada pelajar di atas dari Program **Sarjana Muda Sains Sukan (Kep)(SR243)** untuk membuat satu kertas projek bagi kursus **SRT606 (Research Methodology In Sport And Behavioural Sciences).**

Maklumat-maklumat daripada jabatan/agensi/syarikat tuan/puan amatlah diperlukan bagi melengkapkan kertas projek tersebut. Semua maklumat yang tuan/puan berikan adalah untuk tujuan akademik sahaja.

Sila hubungi Penyelia Projek, **Cik Patricia Pawa Pitil** ditalian **0135633605** sekiranya pihak tuan/puan ingin mendapatkan maklumat lanjut berkaitan perkara di atas.

Kerjasama daripada pihak tuan/puan kami dahului dengan ucapan ribuan terima kasih.

Sekian.

Yang benar

NOR HAYATI ABDULLAH
Pegawai Eksekutif
Bahagian Hal Ehwal Akademik & Antarabangsa
bp Rektor

/lm

APPENDIX G

(Ethical Issues Questionnaire)

PART D: ETHICAL ISSUES QUESTIONNAIRE

Principal Researcher :		
Faculty :	Sports Science and Recreation	
Project Title :		
Contact No:		Signature:
Email :		

The following questionnaire is to help alert you to the major types of ethical issues in your research. Please answer ALL questions.

If you tick 'Yes' to any of the questions, please include a brief description here and provide full details and all necessary justifications in your proposal. Please also explain and justify other ethical issues where applicable.

	SUBJECTS' PROFILE	No	Yes	Brief description
1	Please indicate your sample size and age groups.			
2	Are any of these subjects from a particularly vulnerable group? (*e.g. young children, mentally challenged etc.)*			
3	Are any of these subjects from a minority/ culturally identifiable/ disadvantaged group? *(e.g. Orang Asli etc.)*			
4	Are any of these subjects in constant requirement of / is highly dependent on medical care?			
5	Are any of these subjects unable to give or are incapable of giving consent? (*i.e. consent will be obtained indirectly from a legal guardian etc.)*			
6	Are the subjects given any form of payment/ incentive to participate?			