



Faculty of Cognitive Sciences and Human Development

**A STUDY ON THE EFFECT OF DIFFERENT TYPE OF EXERCISE
AND FORMS OF RECOVERY ON STUDENTS' SELECTIVE
ATTENTION PERFORMANCE**

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**A STUDY ON THE EFFECT OF DIFFERENT TYPE OF EXERCISE AND FORMS
OF RECOVERY ON STUDENTS' SELECTIVE ATTENTION PERFORMANCE**

ANIS NATASHA BINTI KATIS

This project is submitted
in partial fulfilment of the requirements for a
Bachelor of Psychology with Honours

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ABSTRACT

This study aimed to discover the effect of different type of exercise and forms of recovery on selective attention performance among UNIMAS students whose age level is similar. The research on young adults is neglected when research on attention is primarily focused on children with ADHD even though some research suggests that some components of cognitive function; attention, may begin to deteriorate in early adulthood. Physical inactivity also has been considered a global pandemic that causes multiple diseases besides Malaysia has the highest prevalence of obesity among adults in South East Asia. Hence, this thesis focuses only on young adults regarding their selective attention based on the different types of exercise and forms of recovery. The quantitative approach with a 2×2 factorial between-subject design was done at the Fitness Gym, UNIMAS which included 40 participants and takes 4 days in total. The experiment of the Stroop task for selective attention was implemented and presented online using the PsyToolkit platform and the total reaction time was referred to as the measurement. By using the two-way ANOVA, it indicates that the interaction of those independent variables described that it depends on the exercise that someone wanted to do; which means different exercises required different recovery to maximize or increase the efficiency of selective attention performance. It is hoped that this finding can educate people on a better understanding of how certain exercise benefits cognition besides valuable for the sports and health department to develop policies and programs that focus on improving students' health and physical status.

Keywords: Type of Exercise, Forms of Recovery, Young Adult, Selective Attention, Stroop Task

ABSTRAK

Kajian ini bertujuan untuk mengkaji kesan perbezaan jenis senaman dan bentuk pemulihan terhadap prestasi perhatian terpilih dalam kalangan pelajar UNIMAS yang serupa daripada segi umur. Penyelidikan terhadap remaja dewasa telah diabaikan apabila penyelidikan banyak tertumpu pada kanak-kanak ADHD walaupun beberapa penyelidikan berpendapat bahawa komponen fungsi kognitif; perhatian boleh mula berkurang seawal dewasa. Ketidakaktifan fizikal juga dianggap sebagai pandemik global yang menyebabkan pelbagai penyakit selain Malaysia mempunyai kelaziman obesiti tertinggi dalam kalangan orang dewasa di Asia Tenggara. Oleh itu, tesis ini hanya memberi tumpuan terhadap remaja dewasa berkenaan perhatian terpilih mereka berdasarkan perbezaan jenis senaman dan bentuk pemulihan. Kaedah kuantitatif 2x2 faktorial antara subjek telah dilakukan di Fitness Gym, UNIMAS dengan 40 bilangan peserta dan mengambil masa selama 4 hari secara keseluruhan. Eksperimen Tugas Stroop untuk perhatian terpilih telah digunakan secara maya dengan menggunakan platform PsyToolkit dan jumlah reaksi masa dirujuk sebagai pengukur. Dengan menggunakan ANOVA dua hala, keputusan menunjukkan interaksi antara pemboleh ubah bergantung kepada senaman yang ingin dilakukan, bermaksud lain senaman memerlukan lain pemulihan untuk meningkatkan kecekapan prestasi perhatian terpilih. Hasil kajian ini dapat mendidik pelajar terhadap pemahaman yang lebih baik tentang bagaimana sesetengah senaman memberi manfaat terhadap kognitif di samping membantu bahagian sukan dan kesihatan dalam membina polisi dan program yang tertumpu pada penambahbaikan kesihatan pelajar dan status fizikal mereka.

Kata kunci: Jenis senaman, Bentuk pemulihan, Remaja dewasa, Perhatian terpilih, Tugas Stroop

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter is about the introduction on what the researcher will study for the project. This chapter includes the background of the study, problem statement, conceptual framework, the research objective, research question, research hypotheses, the significant of the study as well as the definition of terms used.

1.1 Background of Study

It is almost 2 years since COVID19 invaded the whole world. This invisible enemies of human, coronavirus is killing us when virus is transmitted through droplets or come directly into contact with the eyes, nose, or mouth and primarily affects those who are in close proximity to one another. Hence, World Health Organization declared a pandemic on 11 March 2020 meanwhile federal government of Malaysia imposed a lockdown known as Movement Control Order on 18 March 2020. During this pandemic, all sectors has been closed except for the essential services and workers need to work from home. Not only working adults has affected from this pandemic but more than 94% of the world's student population also have impacted since the closures of schools, institutions and other learning spaces (Pokhrel & Chhetri, 2021). In this case, students have to go back home or being quarantine at college until next semester break. Unfortunately, wherever the students are during those pandemic situation, there will be no physical classes until further notice but their daily routine remain the same way. Students still need to go through learning unit with lecturers, attend curriculum activities or any seminar from faculty, and updating individual or work assignment as well as communicate with friends through Internet only. When there is no physical classes, hence leads to decrease in the need

for exercise or outdoor activities because of the indoor environmental dominate due to home restriction that contribute to the recent research that the COVID-19 pandemic quarantine had varied degrees of impact on most students' academic performance (Mahdy, 2020).

According to Robinson (2021), Many studies have shown that physical activity has an impact on people's daily lives and mental health. As a result, physical education studies or fitness events such as marathons, sports days, or sports talks are held all over the world, from preschool to kindergarten to colleges, in order to promote student health and learning efficiency. Unfortunately, finding techniques to enhance health and study or work efficiency is difficult: researchers must consider a number of potentially interrelated aspects, including sex, age, environment, and living conditions, as well as evaluate historical data and investigate useful technology. People are gradually paying more attention to their own health and personal growth in order to realize their full potential and improve their efficiency in terms of job and learning, as a new illness has spread unexpectedly and destroyed human quality of life. In addition, the advancement of mobile devices has had an impact on people's lives. This is because healthy lifestyle can be monitored using a high-tech wearables watch that come with sensors which reliably collect data such as heart rate, ECG reading as well as hours of sleep and are now extensively used with a variety of functions depending on the brand. As a result, it is now possible to examine human activities more readily and accurately. People have become closer as a result of the development of mobile technologies that use the Internet. The world is narrowing, and practically everyone can now communicate via a mobile phone or a smart watch. As a result, for both objective and subjective causes, people have become more sedentary.

The help of emerging technology such as smart watch that have sensors to collect and record information about daily activity, it would be easy to do physical exercise such as cycling, walking, swimming and others. This is because physical activity plays an important part

especially during young adulthood as it is one of the most fundamental human needs to maintain our body health which later can contribute to healthy mind. Encouraging healthy habits in children and teenagers is crucial for their development while growing up. Childhood lifestyles are more likely to be carried over into adulthood besides some modifications may be more difficult to implement as a person matures. Gordon Larsen et al (2007) stated that there is solid evidence that physical activity benefits children and teenagers by improving their health through metabolic and cardiovascular health biomarkers, bone health, cardio respiratory and muscular fitness as well as cardio respiratory and muscular fitness.

Inject the thrilling of different protocols of exercise such as the type of exercise; aerobic, flexibility, strength, balancing, hours of exercise as well as post-exercise recovery among young adult who still study in bachelor degree because it is crucial for them to take physical exercise as a daily or weekly routine in order to improve attention performance especially in selective attention which they need to process the directing consciousness towards related stimuli while avoiding unrelated ones in the environment for prolonged use and it is significantly reduce the risk of developing attention disorder in later adulthood. Undergraduate students really needs to aware the importance of exercise because it relates to their central organ in nervous system, brain. A young adulthood stage is a developmental stage that everyone experiences which generally defined as when a person is at his or her 18 to 25 years old. This is a critical phase where many psychological and biological changes in life occur. According to Elizabeth Millard (2020), those who exercised consistently during young adults functioned much better on endurance and strength than those who choose to ignore doing exercise throughout adolescence stage.

In young adulthood which a person has more energy to do heavy exercise such as walking in moderate to high intensity for 30 minutes, it shows that it will generate new hormones such as dopamine, serotonin, endorphins that play vital roles in emotions, thinking, attention, concentration, block out distractions and focus on the task at hand (Abu Bakar, 2018). The release of hormones provide an environment for the growth of brain cells and expansion of the brain's network of blood vessels. According to Woon and Zakaria (2019), the prevalence of adult Attention Deficit Hyperactive Disorder was 15.8% and the persistence rate was 63% in Malaysian forensic mental hospital. For the selective attention, distraction has surpassed drunk driving as the leading contributory factor in Malaysia. A split-second break in focus while reading a text or answering a phone call can end in a fatal crash. (New Straits Time, 2016). Any age group can face this kind of situation however those who consistently do exercise may reduce the effects of less concentration besides aging because the activation of the machinery necessary for DNA repair contrary with a person who physical inactive will lead causes of cardiovascular diseases, diabetes, obesity (Seegert, 2021).

Malaysia has the highest rate of adult obesity in South East Asia, with 50.1 percent of our adult population being overweight, 30.4% or obese 19.7% in 2019 findings ("Obesity in Malaysia", 2021). This statement showed that Malaysian people especially adults loves to eat yet did not focusing on living a healthy lifestyle or exercise to burn out the calories. If there is so, human's attention may slowly reduce and have an impact towards lives because there is a report stated that physical exercise has beneficial effects on cognition and attention as well. Therefore, this study will focus on the effect of different type of exercise and form of recovery on students' selective attention performance.

1.2 Problem Statement

The coronavirus disease 2019 (COVID-19) pandemic had a significant negative influence on global economic and social life. It is indeed had a negative impact on people's overall health and quality of life. Physical inactivity has been considered a global pandemic since 2012, having 28 percent of the worldwide people, or 1.4 billion people, being physically inactive (Kohl., 2012). Physical inactivity is one of the primary causes of cardiovascular disease, diabetes, obesity, and early mortality around the world, therefore this scenario is quite concerning (Guthold, Stevens, Riley & Bull, 2018; Moker, Bateman & Kraus, 2018; Siordia, 2020). As Malaysia has the highest prevalence of obesity among adults in South East Asia, this could happen because people are lacking of knowledge as well as awareness about the benefits of physical activity or exercise towards a healthy lifestyle. As a consequence, if the population's physical activity levels begin to deteriorate throughout this period of physical barriers, public health departments will face an even harder task, as this condition could significantly affect the pandemic scenario even further, as diabetes, obesity, hypertension, and other comorbidities related to physical inactivity can deteriorate the COVID-19 prognosis (Siordia, 2020). Existing exercise knowledge taught in high school during Pendidikan Jasmani dan Kesehatan or course mates who active in sports may help students to improve their exercise habits and influence their attitudes towards better and healthy mind. Moreover, undergraduate student really need to sharpen their knowledge for the effect of exercise on cognition or in this study, selective attention since there is very rare and only little to see sports course as an elective course in university.

For decades, researchers have been interested in the association between physical activity and cognition (Kallo & Rassovsky, 2017). Despite the fact that there is a significant association between aerobic exercise and cognition in children aged 7 to 16, no research on the relationship between aerobic exercise and cognitive performance in university students has been published (Palmer et al., 2013). This shows that it is significantly less study research has been considered the effects of different type of exercise and form of recovery on young adults' selective attention performance compared with plentiful publications on exercise intensity level for cognitive performance.

One of the difficulties that students face in both physical and online lectures is sustaining their attention on the subject. The online learning environment hosts both synchronous and asynchronous sessions. Synchronous meetings are held in online classrooms provided by most universities using tools like Zoom or Microsoft Teams. Professors may need a video broadcast so that students can provide feedback on the study tool's shortcomings, as well as any arguments or questions they may have. (Deng & Wu, 2018b). Nevertheless, this statement would not change anything to the students attention performance if there is no action taken. According to several studies, exercise and fitness can increase cognitive function such as attention in children, young adults and older adults (Budde et al., 2012). But in spite of that, there are limited studies on physical activity or exercise topics especially in Asia, specifically in Malaysia.

According to the Centers for Disease Control and Prevention (2016), 6.1 million (9.4%) children have been diagnosed with ADHD at some point in their lives. There are no more latest numbers available, but they are likely to be higher. The data is actually astounding, despite the fact that it is six years old. Apparently children are being over diagnosed with ADHD when, in truth, they are not getting enough physical activity (Steeves, 2014). However, research on

young adult is neglected when research on attention is mostly focus on children with ADHD even though some research suggests that some components of cognitive function, such as attention, may begin to deteriorate in early adulthood (Loprinzi & Kane, 2015). Consequently, the lack of research on different type of exercise and forms of recovery on selective attention among young adult in the country lead to this research study. The findings will be explained further in chapter 4.

1.3 Research Objectives

1.3.1 General Objective

The main objective of this study are (a) to investigate the difference in selective attention performance of different type of exercise, (b) to examine the difference in selective attention performance of different forms of post-exercise recovery, c) to test whether different exercise and post-exercise recovery type have an interaction effect on selective attention performance.

1.3.2 Specific Objectives

1. To investigate a significant difference in selective attention performance of aerobic and strength exercise
2. To determine a significant difference in selective attention performance of active and passive post-exercise recovery
3. To investigate the interaction effect between aerobic-strength exercise and active-passive post-exercise recovery on selective attention performance

1.4 Research Questions

1. Are there any significant differences in selective attention performance of aerobic and strength exercise?

2. Are there any significant differences in selective attention performance of active and passive post-exercise recovery?
3. Are there an interaction effect between aerobic-strength exercise and active-passive post-exercise recovery on selective attention performance?

1.5 Research Hypotheses

The null hypotheses for the research questions are:

H0 question 1: There is no significant difference in selective attention performance of aerobic and strength exercise

H0 question 2: There is no significant differences in selective attention performance of active and passive post-exercise recovery

H0 question 3: The effect of exercise type on selective attention performance does not depend on the effect of the post exercise recovery type, hence no interaction effect

1.6 Conceptual Framework

The goal of attaining an understanding of the effect of different type of exercise and forms of recovery has been achieved through a development of this conceptual framework that guided the study until does not deviate from the original. For this research, there are two independent variables with two levels each. The first independent variable is type of exercise, that contains aerobic and strength exercise while second independent variable is forms of recovery that is made up of active and passive recovery. The dependent variable for this study is selective attention performance have on pre-university and undergraduate students of University Malaysia Sarawak.

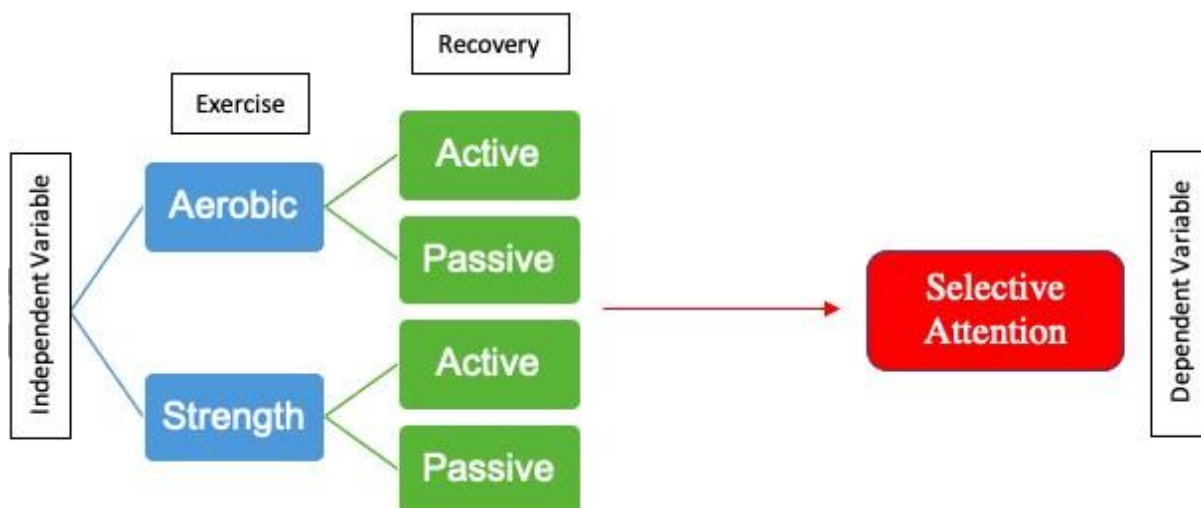


Figure 1: Conceptual Framework

1.7 Significance of Study

Given the limited studies and research in this area in Malaysia, and due to the highest prevalence of obesity among adults in South East Asia, more research is required in this area. By exploring various type of exercise together with the right match of recovery type, it will enhances awareness of its seriousness as well as interest in sports at university, especially among young adult students. They also will be able to grasp better understanding on how certain exercise benefits to cognition after completing this study which will make them spend more time on physical activity than online digital such as games, lives on social media and so on. The data gathered from those participants, young adult students in UNIMAS will add a knowledge with empirical evidence to existing knowledge of the current state of exercise to the researcher. Besides, the results will be valuable for sports and health department to develop policies and programs that focus on improving students' health and physical status. Malaysian or outsider practitioners would benefit from this study as well because they can use as a reference for future studies.

1.8 Definition of Terms

1.8.1 Exercise

Conceptual Definition: Exercise is the training of the body to improve its function by increasing the heart rate beyond resting levels and enhance its fitness which it is an important part of preserving physical and mental health (Blair, 2021). There are 4 main types of exercise; aerobic, strength, balancing and flexibility

Operational Definition:

Aerobic exercise: Row for 30 minutes using a rowing machine that has been program to “10” setting which allows the most airflow to get the highest resistance which indicate moderate intensity level.

Strength exercise: A set of five exercises for 9 minutes total time of exercise with 1 minute intervals in between.

1.8.2 Post-exercise recovery

Conceptual Definition: It is an actions carried out immediately after exercise and encompasses a series of post-exercise steps that are necessary for any exercise programme, regardless level of fitness, sort of physical activity, or intensity of exercise. Stretching, warming up, consuming certain drinks or foods, as well as therapeutic acts, are all examples of recovery

Operational Definition:

Active recovery:

Aerobic exercise – Row for 30 minutes using a rowing machine that has been program to “5” setting which permits little airflow and minimizes resistance which indicate low intensity level.

Strength exercise – One lap around a track

Passive recovery: Proprioceptive Neuromuscular Facilitation (PNF) stretching in count of 10 for each stretch and side.

1.8.3 Selective Attention

Conceptual Definition: The process of directing consciousness towards related stimuli while avoiding unrelated ones in the environment (Mcleod, 2018)

Operational Definition: Selective attention performance was implemented and presented through Stroop Task on online platform, Psytoolkit using this URL link: https://www.psychtoolkit.org/lessons/experiment_stroop.html

1.9 Summary

This chapter shows on the importance of the study conducted which is exercise and post-exercise recovery on attention besides the benefits that future researcher or readers will get after read this chapter especially on the empirical and practical area that was explained. It also briefly describe the variables used for the research and the role to get the finding of study. Research objectives, questions as well as hypothesis were mentioned in this chapter for further discussion on the next chapter to embark an idea to the researcher about this study

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter discuss a clearly explanation about the overall research topic and the depth of the information to be presented; it often also explains the types of sources that will be used. Instead, it provides the reader with the background information needed before moving into further study or research. In this study, the chapter describes a research study by the scientific views to see the extent of the problem of not practicing a good physical activity habits that has connection with cognition specifically attention. This research is important in order to support concerns about the good impact of practicing physical activity as habits among pre-university and undergraduate students. This chapter will be discuss about the review of issues related to topic besides the benefits and the theory or mode and past similar findings.

2.1 Exercise

Exercise is the practice of conditioning one's physique in order to increase one's function by increasing the heart rate beyond resting levels and enhance its fitness which it is an important part of preserving physical and mental health (Blair, 2021). Exercise involves engaging in physical activity. The terms *exercise* and *physical activity* are often used interchangeably since exercise involves engaging in physical activity. According to Blair (2021), physical activity refers to any energy expenditure caused by body movements through the skeletal muscles; it encompasses the entire spectrum of activity from extremely low resting levels to maximal exertion, with exercise being a component of physical activity. Exercise is distinguished by the fact that it is a systematic activity that is expressly designed to improve

and maintain physical fitness. Physical conditioning is the process of adapting the body and its various systems to an exercise regimen in order to improve physical fitness (Blair, 2021).

There are many components in exercise to consider whenever someone plan to start his or her journey for healthy lifestyle. Types of exercise, intensity level and duration time are the several main components that need someone to emphasize more. Most people tend to focus on one type of exercise since one would be enough for them. However, according to studies, it is critical to engage in all four types of exercise: endurance, strength, balance, and flexibility, each of which has distinct advantages. But, The sorts of exercise that are most beneficial to someone may differ from person to person. Some experts may advise clients to follow a planned program that includes both cardio and weight training (Johnson, 2021). Cardiovascular exercises, such as cycling, swimming and jogging raise the heart rate for the duration of the workout, which causes the body to sweat. Non-cardiovascular exercises, such as weight training, tai chi, and yoga, stimulate the body but do not consistently raise the heart and breathing rate or make the person sweat (Johnson, 2021). Doing one kind can increase an individual's ability to do the others, and diversity reduces the danger of harm (Abarcar, 2021).

In exercise, it is not just about what type of movement and how much movement someone can do but it is also about how intensely the movement that an individual did and how hard their heart is working when exercise. The rate of energy expenditure required to complete the activity to achieve the intended performance (aerobic activity) or the resultant force generated during resistance exercise is referred to as intensity. In general, intensity is divided into three levels: low, moderate, and high, which is frequently referred to as "vigorous." Furthermore, there are two methods for determining intensity levels: the "conversation test" or measuring heart rate. Unfortunately, it might be difficult to determine which type of activity belongs in which intensity bucket (Asp, 2021). However, the correlation between exercise

intensity and number of hours worked, as well as the number of training sessions, could influence the acute response to exercise and later chronic adaptations (Hawley et al., 2014). The duration of exercise is depends on an individual goals. If someone wants to stay fit and healthy for longer time, he or she can strive for more minutes or hours in a week than his or her usual duration. Nevertheless, The World Health Organization's (WHO) 2020 guidelines on physical activity and sedentary behavior propose 150 to 300 minutes of moderate-intensity exercise each week, or 21 to 43 minutes per day or for vigorous-intensity aerobic exercise, 75 to 150 minutes per week for able-bodied adults. This suggestion is in line with a report from another source, which suggests doing 30–40 minutes of moderate-intensity exercise four to five days a week (Johnson, 2021).

2.1.1 Type of exercise

2.1.1.1 Aerobic exercise

Endurance activities, often referred to as aerobic exercise that just demand a few abilities and can be easily adapted to match different levels of physical fitness level meanwhile persons who exercise regularly, they tend to perform at a higher intensity (“Principles of Exercise Prescription”, 2016). Aerobic exercise can increase breathing and heart rates since it improve the health of heart, lungs, body composition and cardiorespiratory fitness (Watson, 2021). In addition to the aerobic exercise that known with a tough physical activities compare to others, it is enough to have about 75 minutes of exercise a week as stated by Watson. Brisk walking or jogging, yard labour such as mowing and raking, as well as dancing, swimming, bicycling, climbing stairs or hills, and playing tennis or basketball, are all good ways to increase endurance.

2.1.1.2 Strength exercise

Strength exercise focus on muscular strength which can help an individual to stay independent besides make their everyday activities feel easier when have a strong muscle. Muscular-strengthening exercises allow muscles to do more work than they are used to, which is known as overloading. The exercise counts if it involves a moderate to high level of intensity and works all of the body's major muscle groups: the legs, hips, back, chest, abdomen, shoulders, and arms. Resistance exercise, such as weight training, is a well-known example of muscle-strengthening exercise (“Principles of Exercise Prescription”, 2016). According to Abarcar (2021), by keeping muscles strong, it can help with balance and prevent falls and fall related injuries such as slipping on a toilet floor when holding a laundry bag. Some people choose to use weights, resistance bands in order to help improve their strength.

2.1.2 Exercise and cognition

Exercise is a type of physical activity that has an influence on a variety of cells, tissues, and organs, causing a chain of physiological reactions (Egan & Zierath, 2013; Hawley, Hargreaves, Joyner, & Zierath, 2014). Exercise has been demonstrated to impact chemical pathways linked with synapse activity underlying learning and memory, which is not surprising given the brain's exceptional flexibility for modifying its structures in response to external pressures (Gomez, Pinilla & Hillman, 2013). Exercise affects the brain in many ways. It increases blood flow before heart rate, which therefore the amount of oxygen that goes to the brain increase. This then boosts neural connectivity and stimulates nerve cell growth in the hippocampus. The hippocampus is a brain structure that is embedded in the medial temporal lobe of each cerebral cortex and function as to regulates motivation and emotion (Pieterse, n.d.). Exercise improves brain plasticity by encouraging the formation of new connections between

cells in several crucial cortical areas of the brain, as well as assisting the production of hormones that offer a favorable environment for the growth of brain cells.

According to Jon Johnson (2021), regular physical activity or exercise benefits the body and brain in various ways, including strengthening the bones and muscles, improving cognitive abilities, boosting mood and lowering the risk of type 2 diabetes, metabolic syndrome and cancers. There is one research, exercisers had a third fewer occurrences of unsettling, unpleasant, or unwelcome thoughts, and were 21% less likely to act rashly (Mantica, 2019). The effects of the various level of exercise intensity on cognition are significant; some data shows that exercise intensity has a differentiated influence on cognition. Lower-intensity exercise, for example, has been shown to be more beneficial in terms of brain preservation and repair than high intensity exercise, which can result in considerably bigger rises in catecholamine levels. (Loprinzi & Kane, 2015). Vigorous exercise, on the other hand, has been proven to alter a variety of neural processes. These types of exercises help to promote brain development and growth.

2.2 Post-Exercise Recovery

Post-exercise recovery happens after the end of exercise and consists of a series of postexercise stages that are necessary for every exercise regimen, despite of fitness level, kind of physical activity, or exercise intensity. In addition to that, it has to do with the elimination of metabolic waste, the replenishment of energy stores, and the start of tissue repair. Recovery can be such as stretching, warming down, consume certain drinks or food specialty, as well as therapeutic actions. There are two types of recovery, active and passive. Active recovery or known as active rest is a kind of movement that is less intense than regular exercise which cognitively engaged. An active recovery day consists of light workouts that are no more than 60 to 70% of one's maximal effort (low to moderate intensity). The common training practice

of active recovery, using low intensity of exercise meanwhile passive recovery require no movement at all. These are frequently used in the time between repetitive exercise bouts and subsequent training sessions in order to increase muscle metabolism repair and speed performance recovery.

According to a review published in April 2021 in the International Journal of Sports Physiology and Performance, people who are new to exercise may require extra recovery time to heal their muscles and replenish their energy stores. Active recuperation, according to Rivadeneyra, is low-intensity exercise that improves blood flow and tissue repair without putting the body under more stress meanwhile passive recovery requires no movement at all and helpful if fatigue level is high to allow muscles time to repair themselves. When do a strength training, people build a new muscle, hence active recovery such as foam rolling that self-massage tender and tight areas can help prevent myofascial adhesions from forming in order to improve circulation, increase range of motion, and promote quicker recovery times (Tadeo, 2021). When body tissues, such as muscles and bones, as well as the heart and lungs, recover, they become slightly fitter than before. When rest afterwards, a biochemical repair and synthesis process allows muscle tissue to rebuild and replenish needed nutrients as well as mend damaged tissue. Thus muscle become both larger and stronger (Zickl, 2021). Research suggests inadequate rest and recuperation have been linked to poor immune function, neurological abnormalities, hormone imbalances, and depression (Fetters, 2021).

2.3 Attention

Attention is a cognitive process that allows us to choose and concentrate on relevant stimuli (“Attention cognitive domains”, 2016). Specifically, our ability to actively process specific information in the environment while tuning out other details. In addition to that, there are several types of attention, endurance include (Gitelman, 2003) :

1. Divided attention (focus on different objects and tasks at the same time)
2. Sustained attention (ability to maintain focus over time)
3. Alternating attention (focus activity stops so attention can be directed to another stimulus)
4. Selective attention (ability to focus on a single object or task)

As an human being, in our everyday routines, we utilize attention for a variety of tasks. We use various sorts of attention from the moment we get up to the moment we go to bed. Individuals with poor attention may forget what they are doing and instead toss the spoon in the garbage and place the empty bottle in the refrigerator. When we drive, we virtually always use all of our attentional sub-processes, which is an example of situational attention in everyday life. We must be awake (arousal), able to focus our attention on the stimuli on the street (focused attention), pay more attention for long periods of time (sustained attention), avoid being distracted by irrelevant stimuli (selective attention), be able to change our focus from one lane to another, to the mirror, and back to your lane (alternating attention), and perform all of the actions required for driving, such as using the pedals, turning, and so on (divided attention) (“Attention cognitive domains”, 2016). However, attention, as defined in the study of Cicekci and Sadik (2019), is the state of mental awareness and focus.

2.3.1 Exercise and attention

Many studies have shown exercise and physical activity as a key to increase attention, concentration, decision making and learning for children, teens, and adults (Nerney, 2019). This happens when exercise sparks real and positive changes in the brain which activates the attention system, which includes executive activities including sequencing, working memory, prioritising, inhibiting, and maintaining focus (Rodgers, 2020). Several research of young people (Dupuy et al., 2015; Wang et al., 2015), children (Niederer et al., 2011), and older adults

(Tsai et al., 2016) found strong positive associations between aerobic fitness and attention. This statement supported by the large group of German teenagers where they did 10 minutes of playful coordination skills, like bouncing two balls at the same time showed improvement on their attention (Martynoga, 2016).

During exercise such as walk, run, or do a set of jumping jacks or push-ups, the brain is releasing all these feel-good important chemicals called neurotransmitters that originate from within human brain system. They act as messenger molecules molecule in the brain that allows certain nerve cells to communicate with one another which help with human cognition abilities (Watson, 2021). They are essential in our complex neural system (Pieterse, n.d.):

Serotonin	Helps regulate mood, social behaviour, appetite and digestion, sleep, and memory.
Dopamine	Responsible for movement, pleasure, attention, mood, and motivation.
Endorphins	Reduces the perception of pain and triggers a positive feeling in the body.
Norepinephrine	Important for attentiveness, emotions, sleeping, dreaming, and learning.

Table 1: Role of hormones

Amishi Jha, a professor of Psychology from the University of Miami, researched the brain's attention systems and has discovered that there are particular exercises we may take to improve our capacity to focus. This condition also imply with the neurotransmitter which differences in type of exercise may cause the brain to respond differently to it, such as dopamine and norepinephrine. Both of these brain chemicals play vital roles in thinking and attention (Johnson, 2021). The endorphins produced by the body during exercise can help with concentration besides prioritize the functions of the brain, by allowing to block out distractions and focus on the task at hand. These brain chemicals affect focus and attention immediately

after do a physical activity, which are in inadequate supply in ADHD sufferers. Increased dopamine levels improve the attention system's ability to be regular and consistent, which has a number of beneficial consequences (Rodgers, 2020). In this way, exercise operates in a similar way to ADHD drugs like Ritalin and Adderall, which enhance dopamine and norepinephrine levels (Robinson, 2021).

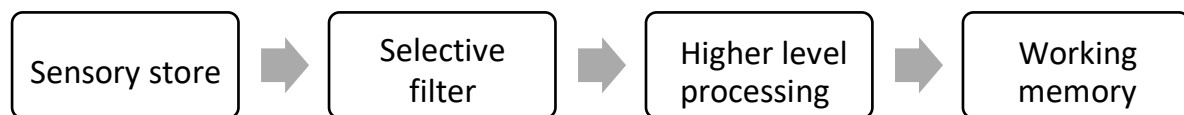
A person do not have to be a marathon runner to reap the benefits of exercise; simply walking for 30 minutes four times a week would sufficient. Regarding this research area, previous studies have shown that there appears to be a link between aerobic activity, both acute and chronic, and attention, which appears to be linked to one or more fitness components (Niederer et al., 2011). The major benefits from a bigger hippocampus would be improved attention and memory, increased brain activity, increased cognitive function, enhanced mood and being able to cope with stress (Pieterse, n.d.). Continuous aerobic activities of moderate intensity (60–80 percent of maximal heart rate) and short duration (20–30 minutes) improved attention in people of all ages (Fernandes M. de Sousa et al., 2019). Surprisingly, studies have shown that aerobic exercise improves performance on a number of cognitive tasks requiring attention, such as sustained and selective attention (Chang et al., 2012). In fact, aerobic exercise of moderate intensity cycling, running, swimming or walking briskly appear to improve several indices of attention. The effects of this also seem to last several hours after being physically active (Pieterse, n.d.), and even active people have a higher level of attention development (Fernandes M. de Sousa et al., 2019). However, how different exercise modalities and fitness levels will successfully improve attention in various age groups is yet unknown.

2.4 Related Theories or Model

2.4.1 Selective Attention Theory

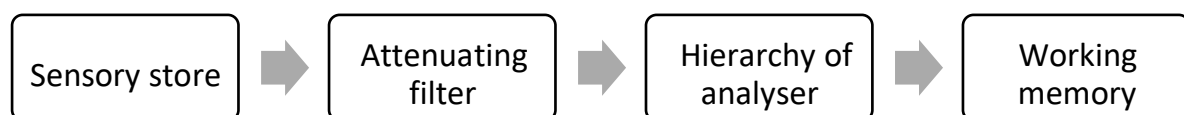
Selective attention refers to the abilities of an individual to choose and focus on related stimuli for further processing, either early or late in the process, while suppressing unnecessary or distracting information in the environment. Externally, as in extraneous auditory or visual stimuli in the surroundings, or inwardly, as in distracting thoughts or habitual responses that stand in the way of completing the task at hand, conflicting reports might arise.

i. Broadbent's Filter Model



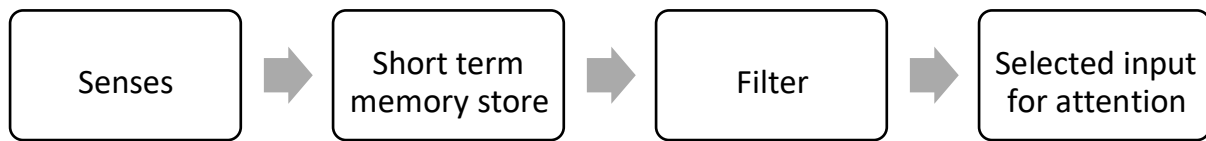
Donald Broadbent's filter model was one of the first theories of attention. He proposed that our capacity to process information is limited, and that we choose which information to process early in the perceptual process. To do so, use a filter to choose which information to pay attention to. Certain stimuli are then allowed to pass via selected filters for further processing, while others are refused.

ii. Treisman Attenuation Theory



Instead of a filter, Treisman claimed that attention operates using an attenuator that recognizes a stimulus based on physical qualities or meaning. Participants were still able to recognize the contents of an unattended message, suggesting that they were able to understand both the attended and unattended messages' meanings.

iii. Memory Selection Models



Broadbent's model was inadequate, and attention was not simply reliant on the physical qualities of a stimulus. The cocktail party effect is a good example of this. Assume that Ali is at a party with his buddies, and he is paying attention to what they are saying. Suddenly, Ali's name mentioned by a bunch of people around. Despite the fact that he were not paying attention to the talk, a previously unnoticed stimulus drew his attention based on its meaning rather than its physical features. Both attended and unattended messages go through the first filter, according to the memory selection theory of attention, and are then categorized in a second stage depending on the real meaning of the message's contents.

2.5 Empirical evidence

Exercise is associated with alterations in cognition, specifically attention, according to increasing data over the last decade (Fernandes M. de Sousa et al., 2019). Teenagers with higher levels of physical fitness were found to have better developed selective attention and concentration abilities (Reigal et al., 2020). Over the course of a school year, a major randomized controlled study in the United States looked at the impact of regular after-school sports classes. Of course, the kids became stronger and their executive control increased. They improved their ability to ignore distractions, multitask, and store and manipulate knowledge in their heads (Martynoga, 2016). Exercise and fitness have been shown to increase cognitive performance, specifically attention, in children (Hillman, Kamijo, & Scudder, 2011), young adults (Budde et al., 2012), and adults (Hillman, Kamijo, & Scudder, 2011), and older adults

(Liu-Ambrose et al., 2010). However, to reap the benefits of physical activity, it is important that people get regular exercise (Johnson, 2021).

2.6 Summary

This chapter has been focusing on the perspectives of other researchers, as well as findings from previous researcher to be able to produce a more significant and concrete research. This chapter presented a literature review that discuss on the issues related to topic, theory or mode and past similar findings. The researcher really make used of other researchers' work in order to enhance this findings for future.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Chapter 3 of this study is devoted to the methodology. It describes the methodology design to investigate an interaction effect between different type of exercise and forms of recovery on young adult UNIMAS students' selective attention performance. The chapter has been divided into seven parts that consists of research design, population sample and sampling, instruments, pilot study, data collection, data analysis and summary.

3.1 Research Design

This research, in its essence, is quantitative approach with 2×2 factorial design, a kind of experimental design that allows researcher to investigate the effects of two independent variables on a single dependent variable. For this study, both independent variable has two levels each. These kind of experimental design creates the circumstances for the comparisons needed to validate the experiment's hypotheses, as well as allowing the researcher to make a coherent interpretation of the study's findings through statistical analysis of the data.

	Active	Passive
Aerobic	Selective Attention	Selective Attention
Strength	Selective Attention	Selective Attention

Table 2: 2x2 factorial design

Independent Variable 1: Type of exercise

- Levels: Aerobic, Strength

Independent Variable 2: Type of Recovery

- Levels: Active, Passive

Main effects:

1. Main effect of different exercises on selective attention performance:

1.1. Mean selective attention performance of participants that perform an aerobic exercise

1.2. Mean selective attention performance of participants that perform a strength exercise

2. Main effect of different types of recovery on selective attention performance:

2.1. Mean selective attention performance of participants that fulfilled an active recovery

2.2. Mean selective attention performance of participants that finished a passive exercise

Interaction effects:

1. Does the effect of exercise on selective attention performance depend on the forms of recovery?
2. Does the effect of recovery on selective attention performance depend on the chosen type of exercise?

3.2 Population and Sample

Population refers to the potential respondents in a study while sample refers to a particular group from a population in a study (Bacon-Shone,2015). The population for this study was Pre-university and undergraduate students of Universiti Malaysia Sarawak (UNIMAS). However, only 40 students whose age is around 18 to 25 years old were chosen as a sample. In this study, the sampling used is a non-probability convenience sampling approach at UNIMAS. The sample chosen was whomever that are available at the time, and interested to join, the used of volunteers.

3.3 Instruments

Research instruments are the tools used to gather data from respondent based on research topic, it can be a survey or a questionnaire or anything that will be used throughout the study. Hence, for this study, the setting held at Fitness Gym UNIMAS for 4 days consecutively but the time was constant, from 1400 to 1600 hours and it was a group exercise for the participants involved. There were several experiment tools that has been used in this study such as rowing machine, yoga mat and pulse oximeter. For the rowing machine, it is used for aerobic exercise that has been program to moderate intensity meanwhile low intensity program setting for active recovery after aerobic exercise. Some participants from the strength exercise brought their own yoga mat that helpful to support them from laying down straight

away to the gym floor. The pulse oximeter is used to estimate the heart rate at rest and during exercise besides measure a participants' blood oxygen levels to get the reading of SpO2 level.

	Aerobic
Exercise	Rowing machine: “10” setting for medium intensity
Active recovery	Rowing machine: “5” setting for low intensity

Table 3: Instruments used for experiment

Experiments of Stroop Task for selective attention was implemented and presented online using the PsyToolkit platform and the total reaction time was referred to as the measurement (Stoet, 2010, 2017). The participants can access the task through https://www.psychtoolkit.org/lessons/experiment_stroop.html. The questionnaires survey through Google Form is used in this study in order to collect data that include informed consent, demographic profile, and one inventory, Physical Activity Readiness Question. The questionnaires was divided into three section which consist of Section A, Section B, and Section C based on the inventories used and the language for this questionnaire is English as it is easy, understandable and international language.

3.3.1 Instrument Structure

3.3.1.1 Section A: Informed consent

In this section, the researcher explained about the research project to the participants on what they are about to do, what the results are going to be used, the right to withdraw, in short, the summary of what is about to happen in a study. The participants data were analyzed anonymously and not have any adverse consequences on them.

3.3.1.2 Section B: Demographic Profile

In this section, the researcher recorded about respondent background. It covered about gender, age, year of study, program of study, faculty and on average, respondent spend their time on physical activity for each week.

3.3.1.3 Section C: Physical Activity Readiness Questionnaire (PAR-Q)

The Physical Activity Readiness Questionnaire (PAR-Q) is a simple self-screening tool that instructors and trainers frequently use to determine whether exercising is safe or dangerous based on an individual's medical records, symptoms, and comorbidities. All of the questions are designed to aid in the detection of any potential exercise-related damage (Warburton, 2011). While the PAR-Q is not a comprehensive health history, the questions are designed to elicit cardiac, circulatory, balance, medical, emotional, and joint issues that may make exercise difficult, if not dangerous, for some persons. The PAR-Q consists of only seven yes or no questions, making it quick and simple to complete.

Sections	Component Research question	Number of items
A: Informed consent	Purpose of research, researcher's profile, engaged time, offer to withdraw, assurance for the results, harm and benefits, emergency contact	8 items in one page
B: Demographic information	Gender, age, race, faculty, year of study undergraduate/postgraduate, study program, on average, respondent spend their time on physical activity for a month	9 items: 9 multiple choice questions

C: Physical activity readiness	General health questions, follow-up questions, participant declaration	3 items: 7 main questions with several follow up questions
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Table 4: Components of research questionnaire

3.3.2 Procedures

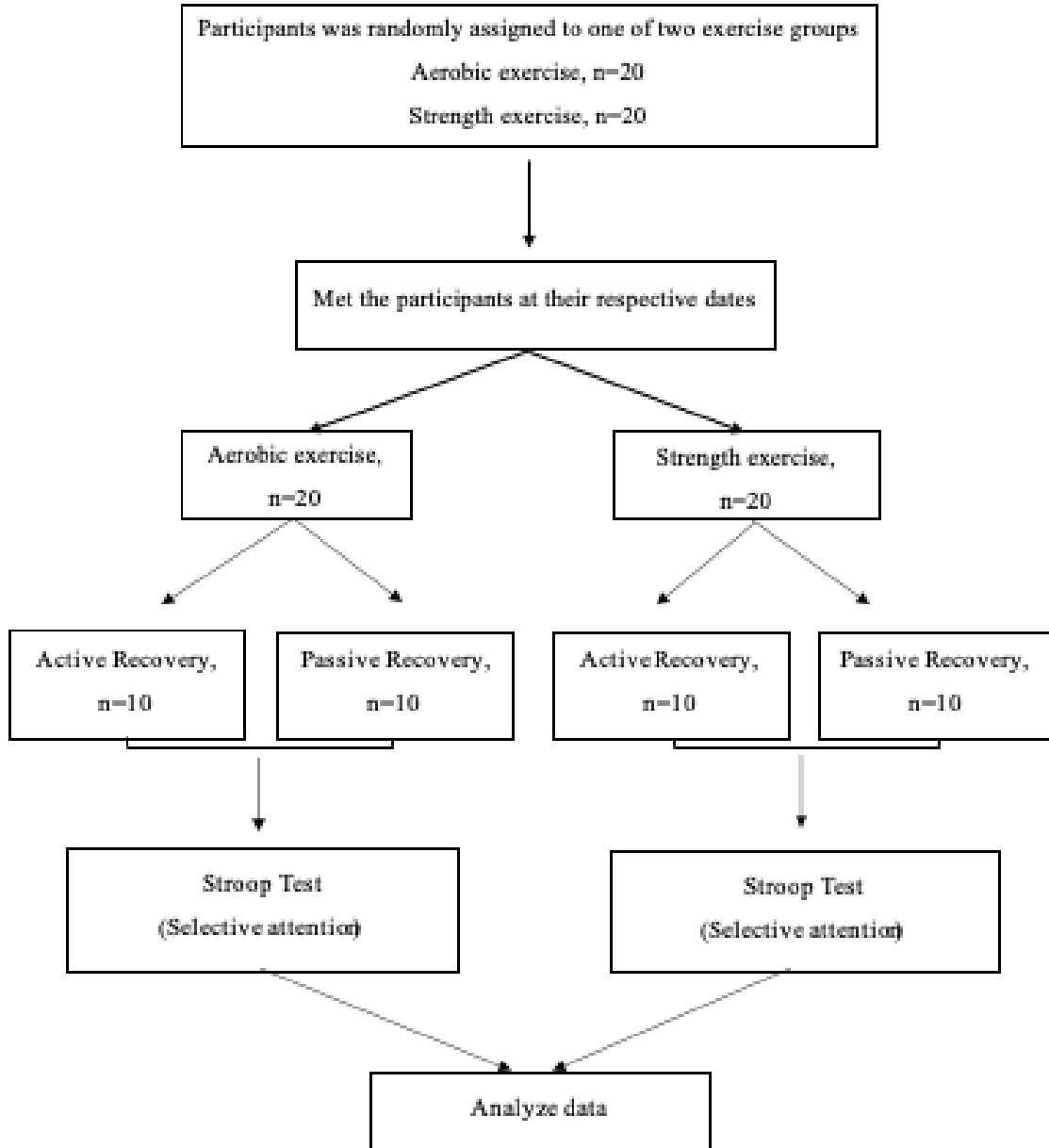
Data is collected through the experiments and research questionnaire. The participants were informed in the consent that all data collected in the research project will be analyzed anonymously and would not have any adverse consequences on them. The researcher provided the online questionnaire in the form of Google form. Then, the researcher distributed the URL link that linking to Google form to the UNIMAS students through an application called as WhatsApp, Telegram and Instagram. The researcher spared for a month to look for the participants, after a month, the researcher contacted all the eligible participants which is 40 students for the WhatsApp group invitation.

3.4 Pilot Study

The Stroop test, established in 1935 by J. Stroop and employed as an interference control test, has historically been the most extensively utilized (Killikelly & Szücs, 2010). Reliabilities of 0.73-0.86 were reported for the Golden (1975) version of the test, however the interval was not reported. Franzen et al. (1987) reported reliabilities of 0.67-0.83 for the Golden version in 62 healthy individuals tested 1-2 weeks apart. This shows that the internal consistency is quite good for Cronbach alpha. According to You Kim (2004), Stroop Test has an excellent validity and reliability when they found the internal consistency were 0.78 of Cronbach alphas to evaluate frontal lobe function in elderly with low educational level of older people.

3.5 Data Collection Procedures

Diagram below shows the flow of the experiment that was done in 4 days consecutively.



3.5.1 Aerobic exercise

The participants were randomly assigned to one of the two groups, aerobic exercise and strength exercise for 20 participants each. Participants wore a full set of sports attire through out an experiment hours, which is a maximum of 2 hours. The researcher calculate Target Heart

Rate (THR) range of a 20 participants in an aerobic exercise to fulfil the requirements of constant variable, exercise intensity. The heart is a built-in system which make up cardiovascular system that measures exercise intensity. As a result, the heart rate will rise in direct proportion to the level of exertion. In this study, the researcher applied a moderate-intensity exercise which means, a participants' THR should be between 50% to 70% of maximum heart rate, where maximum heart rate dependent on a person's age. As a result, 220 beats per minute (bpm) minus age can be used to determine a person's maximal heart rate. In this study, participants age is 18 to 25 years old, then the target heart rate would be around 100bpm-140bpm.

$$\text{Maximum effective heart rate} = 220 - (\text{age})$$

Participants have their targeted heart rate using the heart rate monitor by settings the rowing machine for moderate intensity that vary the heart rate to target range. Participants is not required to wear fitness or watch trackers however if they wants to, it is just to save their personal report on that day. However, there is an applications at Google Play store or Apple store such as Nike Run Club and Strava that participants can download from their own phone to track the heart rate or whole report of exercise by clicking the starts button before do the exercise.

3.5.2 Strength exercise

For the strength exercise, there is no need for intensity since it did not involve weight lifting. The researcher administered and trained one staff at Fitness Gym for 2 days in order to monitor the participants with strength exercise and active recovery for strength exercise regimen. The trained staff served as a role model to all subjects in strength exercise, specifically circuit training and followed him. This basic strength exercise can be done with yoga mat or

without, depends on someone preference but a towel is a must to wipe the sweat. There were a total of 5 moves of strength exercise in circuit training that a participants had performed. These five difference exercises work on a specific group of muscles when performed individually, but when performed in 30 seconds intervals, they form a full, whole-body workout. The researcher set a timer to do these five exercises to two small groups that consists of 5 people in each group. 20 participants performed each exercise as vigorously as they can for one minute, then took a 30 seconds timeout before continuing on to the next exercise, where the cycle of the exercises remain same until the last five exercise.

Duration: 1 minute each for exercise and 30 seconds interval in between exercise

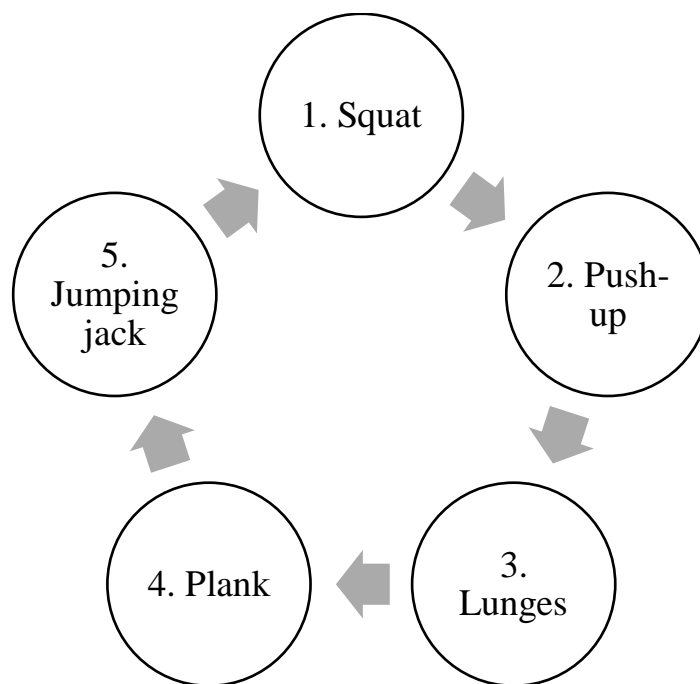


Figure 2: Methodology of experiment

3.5.3 Post exercise recovery

Participants for each exercise was randomly assigned to two groups of recovery, active and passive equally. For the aerobic exercise, active recovery occurred when 30 minutes of rowing machine has been program to low-intensity exercise which made the participants more easy to row due to the slow airflow compare to before the recovery process. Active recovery for strength exercise, the participants slow jog one lap about 400m around track right after the exercise. However, for the passive recovery, the participants did a PNF stretching that involved head, hands and legs which covered for one minute in total completing the stretching, this condition apply to both exercises.

3.5.4 Selective Attention

An experimenter from University of Essex, Gijsbert Stoet has developed an online selective attention test, Stroop Task at Google engine through *psykittoolkit.org* web. The Stroop effect occur when people complete the Stroop task, and it is among the most well-known studies in cognitive psychology. Instead of just naming like in the original study, participants in this Stroop Task are required to click buttons. They should just look at colour words such as green, red, or blue, and the aim is to name the colour of the ink used to print the words while completely ignoring the meaning of the words. At the end of the task, every participation in this Stroop Task, received feedback on total reaction times. The Stroop effect is calculated by taking the total time to answer the online Stroop Test for each stimuli. The total reaction time divided by number of stimuli was used to calculate average time for each word. If any error was left uncorrected, twice the average response time per item was added to a subject's total reaction time for every uncorrected error.

3.6 Data Analysis Procedures

Quantitative research approach used in this study deals with variables for quantification and interpretation to obtain the findings. It includes the application and study of numerical data to address research questions using particular statistical techniques (Apuke, Oberiri, 2017). Therefore, a program called Statistical Package for Social Science (SPSS) version 25.0 is the method used to analyze the data. There were two types of analytical statistics used; descriptive and inferential statistics. The statistical tests that conducted is two-way ANOVA to test the existence of interaction effect between those independent variables (types of exercise and forms of recovery) on the dependent variable (selective attention performance).

3.6.1 Descriptive Data Analysis

Descriptive statistics is used for summarize collected data into frequency or percentage as well as to measures mode, median and mean or variability such as standard deviation and variances (Patel, 2009). Section B which is demographic profile in questionnaires has been analyzed using descriptive statistics in order to get the percentage and frequency of respondents background.

3.6.2 Inferential Data Analysis

Inferential statistics refers to assumption towards population using specific statistical hypothesis test (Sutanapong & Louangrath, 2015). In this study, the researcher used inferential statistical to investigate the effect of different type of exercise and forms of recovery on students' selective attention performance. There were two independent variables with two levels each, hence the researcher use a two-way ANOVA with 2x2 factorial design to formally test whether or not there is an interaction effect between different exercise and recovery type on selective attention performance whereas total reaction times of Stroop Task will be used to analyse it.

3.7 Summary

This chapter explain the method used in order to collect, handle and analyzed data for the study. By this part, the study is useful because the researcher explained and analysed detail about different type of exercise and forms of recovery and the interaction of it on selective attention performance among the sample. It shows that the research procedure and process are important to ensure the study is acceptable.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Introduction

This chapter showed the data finding and discussion of the study based on the hypothesis mention in chapter 1. The data collected through the experimental procedures that mentioned in Chapter 3 are tabulated. The discussions regarding the results obtained from data analysis will be compared with literature review in chapter 2 to strengthen the study.

4.1 Demographic Data

4.1.1 Gender of Participants

Table 4.1.1: *Frequency and Percentage of Participants' Gender*

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	29	72.5	72.5	72.5
	Female	11	27.5	27.5	100.0
	Total	40	100.0	100.0	

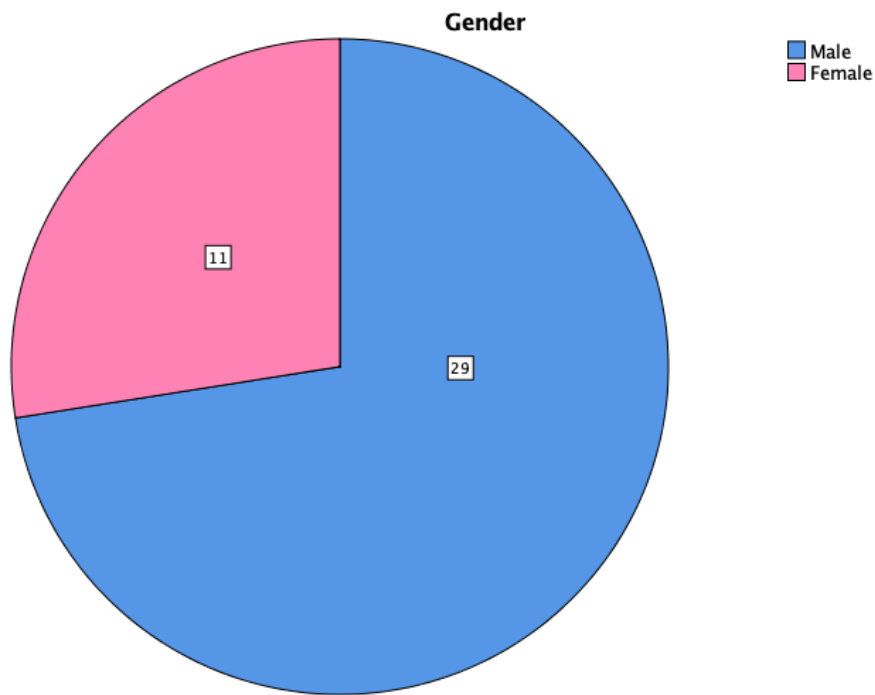


Figure 4.1.1 Pie Chart of Participants' Gender

Table 4.1.1 and *Figure 4.1.1* indicated the frequency and percentage of participants who participated in this study according to their gender. There was a total of 40 participants took part in this study as what the researcher wants. Since the study is not gender-related, there was no equal distribution between male and female participants. They were 29 male and 11 female participants had a total of 72.5% and 27.5% respectively.

4.1.2 Age of Participants

Table 4.1.2 *Frequency and Percentage of Participants' Age*

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19	4	10.0	10.0	10.0
	20	1	2.5	2.5	12.5
	21	4	10.0	10.0	22.5
	22	17	42.5	42.5	65.0
	23	13	32.5	32.5	97.5
	24	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

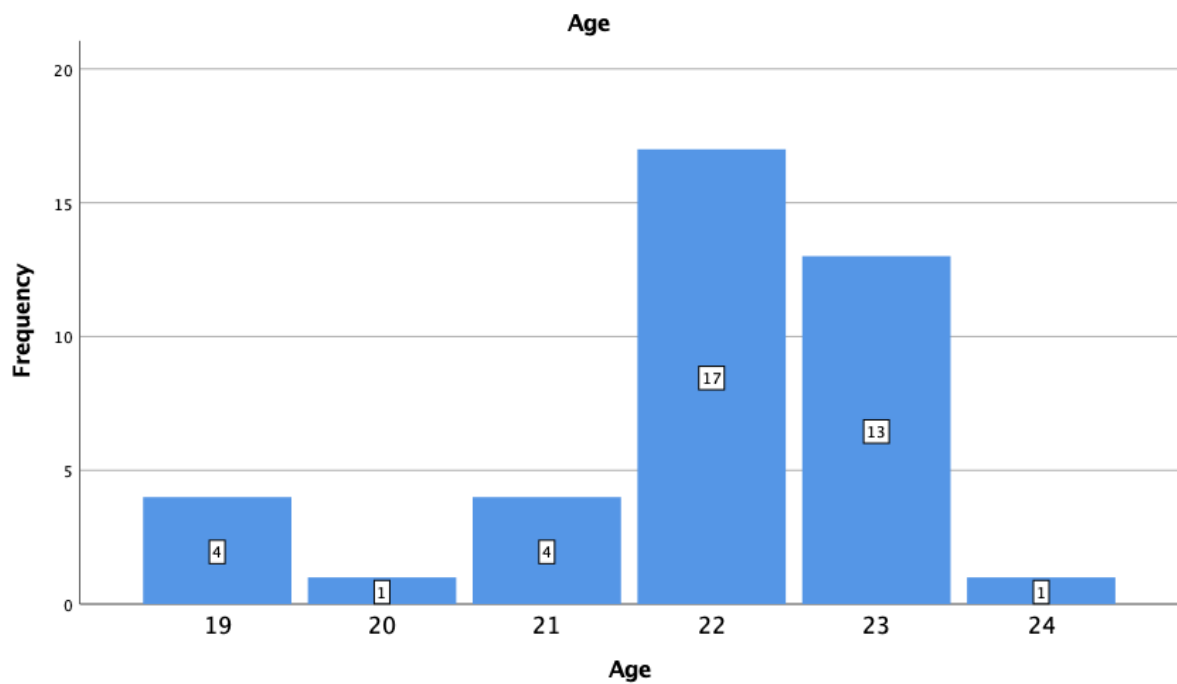


Figure 4.1.2 *Bar Chart of Participants' Age*

Table 4.1.2 and Figure 4.1.2 showed the distribution of the participants based on age. The age of participants ranged from 19 to 24 years old, with the majority participants are 22 years old, which is 17 (42.5%) out of 40 participants, followed by 23 years old which consists of 13 participants (32.5%), 19 and 21 years old who shared the same number of 4 participants (10%) respectively and the least number of participant is 20 and 24 years old which consists of 1 participant (2.5%) only.

4.1.3 Faculty of Participants

Table 4.1.3: *Frequency and Percentage of Participants' Faculty*

		Faculty			Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	FACA	6	15.0	15.0	15.0
	FCSHD	13	32.5	32.5	47.5
	FEB	2	5.0	5.0	52.5
	FMHS	3	7.5	7.5	60.0
	FRST	8	20.0	20.0	80.0
	FSSH	4	10.0	10.0	90.0
	Pre-University	4	10.0	10.0	100.0
	Total	40	100.0	100.0	

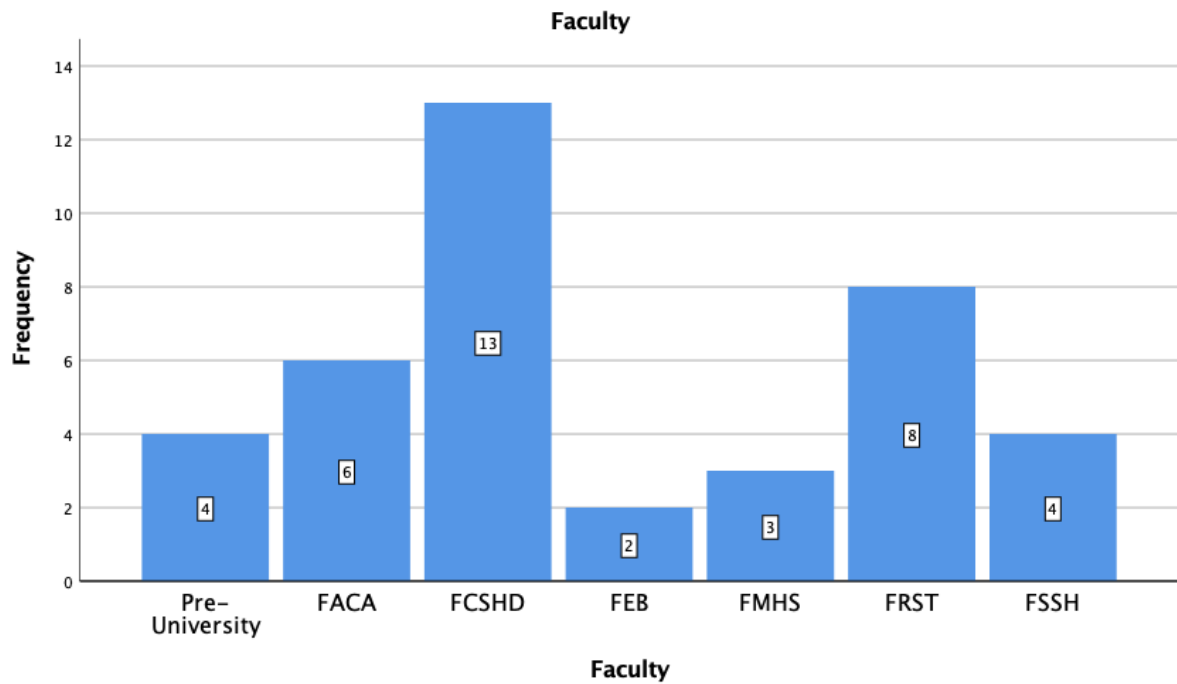


Figure 4.1.3 Bar Chart of Participants' Faculty

Table 4.1.3 and *Figure 4.1.3* indicated the frequency and percentage of participants who participated in this study according to their faculty. The researcher managed to collect 7 faculties as a participants which the majority was from Faculty of Cognitive Sciences and Human Development, 13 participants out of 40 (32.5%). There were 4 participants (10%) from the Pre-University which among the foundation students. The least number of participants is from Faculty Economics and Business which consist of 2 participants (5%) only.

4.1.4 Average Time on Physical Activity of Participants

Table 4.1.4: *Frequency and Percentage of Participants' Average Time on Physical Activity*

		Average Time on Physical Activity			Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	10-14 hours	3	7.5	7.5	7.5
	5-9 hours	8	20.0	20.0	27.5
	Less than 5 hours	7	17.5	17.5	45.0
	More than 19 hours	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

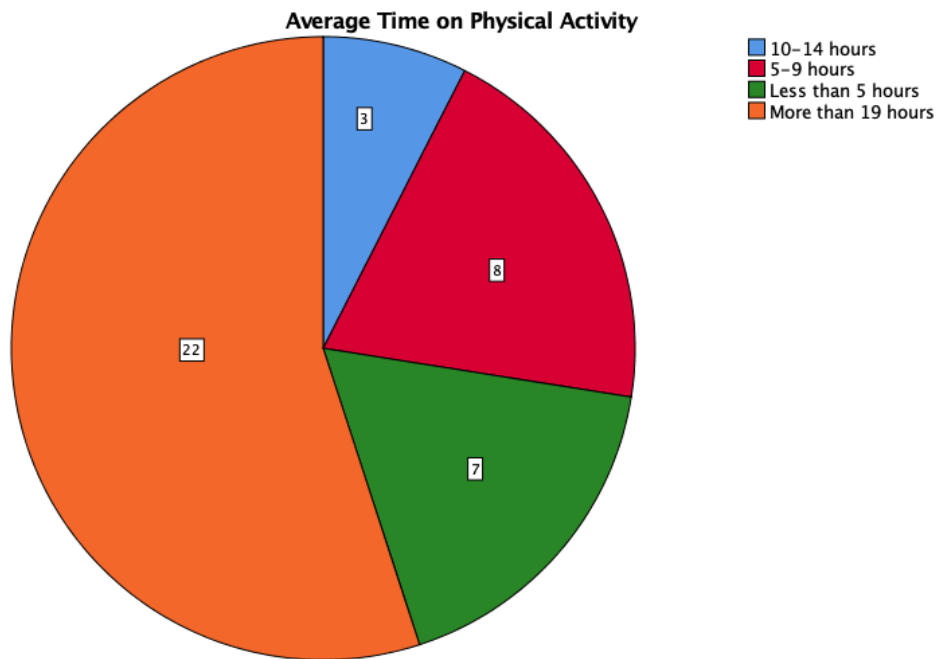


Figure 4.1.4 Pie Chart of Participants' Average Time on Physical Activity

Table 4.1.2 and Figure 4.1.2 showed the distribution of the participants based on their average time spent on physical activity. Since the study is about exercise, the researcher took the duration of time to look at the participants' fitness only for the study purposes. The majority or more than half of the participants, 22 (55%) spent more than 19 hours in a week for the physical activity followed by 5-9 hours which consist of 8 participants (20%), less than 5 hours with 7 participants (17.5%) and the least number of participant is the one who did a 10-14 hours physical activity in a week which consist of 3 participants (7.5%) only.

4.2 Inferential Data (Main Findings)

4.2.1 Results of 2x2 Two-Way ANOVA Test

Table 4.2.1(a): *Levene's test for equality of variances between types of exercise and forms of recovery in selective attention performance based on total number of correct recalled*

Levene's Test of Equality of Error Variances^{a,b}

		Levene Statistic	df1	df2	Sig.
Selective attention performance	Based on Mean	2.703	3	36	.060
	Based on Median	.809	3	36	.497
	Based on Median and with adjusted df	.809	3	12.105	.513
	Based on trimmed mean	1.667	3	36	.191

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Time taken

b. Design: Intercept + Exercise + Recovery + Exercise * Recovery

A 2x2 two-way ANOVA test was run to identify if there was an interaction effect between those independent variables (types of exercise and forms of recovery) on the dependent variable (selective attention performance). Levene's test for equality of variances was first identified while analysing the two-way ANOVA as it decides the researcher to read on the data under condition whether variances homogeneous or not homogenous. From the Test of Homogeneity of Variances table, $p\text{-value}=0.060 > 0.05$, therefore Levene's test does not reject the assumption of equal variances; variances are homogeneous which needed further discussion for ANOVA results.

Table 4.2.1 (b) 2x2 *Two-way ANOVA* results

Tests of Between-Subjects Effects

Dependent Variable: Selective attention performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7342.700 ^a	3	2447.567	2.214	.103
Intercept	318622.500	1	318622.500	288.181	.000
Exercise	756.900	1	756.900	.685	.413
Recovery	1612.900	1	1612.900	1.459	.235
Exercise * Recovery	4972.900	1	4972.900	4.498	.041
Error	39802.800	36	1105.633		
Total	365768.000	40			
Corrected Total	47145.500	39			

a. R Squared = .156 (Adjusted R Squared = .085)

Table 4.2.1 (b) illustrated the results of 2x2 two-way ANOVA when the variances are homogenous around the mean for each set of data for all the groups. The main effect of exercise; aerobic and strength on selective attention performance was not statistically significant difference; $F(1,40) = 0.685$, $p = 0.413 > 0.05$. The main effect of recovery; active and passive on selective attention performance was also not statistically significant difference; $F(1,40) = 1.459$, $p = 0.235 > 0.05$. There was a statistically significant interaction between the effects of type of exercise and form of recovery on selective attention performance, $F(1, 40) = 4.498$, $p = 0.041 < 0.05$. Based on the table, the exercise and recovery has no apparent effect on selective attention performance but there is an interaction for both the exercise and recovery.

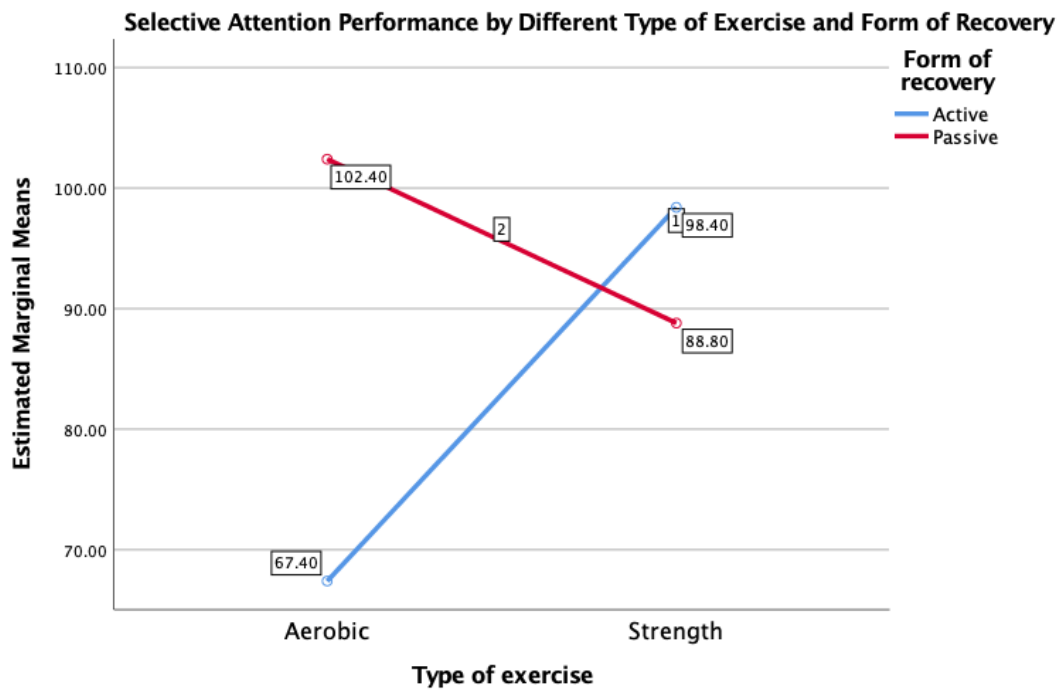


Figure 4.2.1 (a) Plot graph of 2x2 Two-way ANOVA results

Based on the graph, the two lines are not parallel at all but they cross, which indicates that there is no overall effect of either exercise or recovery, but there is a crossover interaction; an interaction effect between them. The crossover interactions explained that aerobic exercise works better than strength exercise in selective attention performance when paired with an active recovery. But, strength exercise works better than aerobic exercise in selective attention performance when participants paired it with a passive recovery after exercise.

4.2.1.1 Discussion

Results tabulated in Table 4.2.1 (b) and Figure 4.2.1 suggested that there was a crossover interaction effect between those variables. According to Abu Bakar, aerobic exercise in moderate to high intensity will generate new hormones which later provide an environment for the growth of brain cells and expansion of the brain's network of blood vessel (2018). This is supported when do an active recovery which believed to promotes blood flow through blood vessels as well as decrease in blood pressure (Seladi-Schulman, 2018). Similar to this finding, a study done by Sanabria, Morales, Luque, Gálvez, Huertas and Lupiañez (2011) which also did an aerobic exercise on a cicloergometer for 20 minutes resulted in responded faster in the post-exercise session, meaning here active recovery which did after the exercise than in the rest session. Inhibition of response was significantly better on the postexercise session.

According to Tadeo, when do a strength exercise, people build a new muscle especially when do a high intensity level (2021). Once new muscle build, it will improve circulation, increase range of motion, and promote quicker recovery times which no need to go through a tough recovery process such as active and it only applies to passive recovery. Hence, by doing a passive recovery such as PNF stretching that has been found to increase range of motion, it allows the new muscle tissue to rebuild and replenish needed nutrients as well as mend damaged tissue by its own (Zickl, 2021). It is supported by the Vaughan, Wallis, Polit, Steele, Shum, and Morris (2014) when they did a strength (2 sets, 6–8 repetitions) fitness. The intervention group who just sat after the exercise performed better than the controls, when adjusted for baseline, in the Stroop test (selective attention).

CHAPTER FIVE

LIMITATION, IMPLICATION, RECOMMENDATION AND CONCLUSION

5.0 Introduction

This chapter focuses on a summary of the study, the limitation of study that impacted or influenced the interpretation of the findings from the study, the implications of findings and the recommendation that can be amended in future research.

5.1 Limitations of study

Several limitations were identified in the process of completing this study, some of which influenced the interpretation of the findings. The first limitation that has been recognized is the targeted population in this study. It is only focused to pre-university and undergraduate students of UNIMAS which unable to generalise to a larger population or other stages of human development since the 40 sample taken is among young adult whose age is in range of 18 to 25 years old even though using the convenience sampling method. It is because the settings of this study is at Fitness Gym, UNIMAS and the age of participants influenced the findings regarding the exercise since older age is associated with an increase in the oxygen cost of exercise that can distract the constant exercise intensity in the study when measured the reading of SpO2 level using oximeter (Woo, Derleth, Stratton & Levy, 2006).

The next limitation is about the setting itself, Fitness Gym where the experiment was conducted has an open-air nature, hence, participants' performance on the Stroop test may be affected by environmental distractions like the nearby construction and cleaning operations brought on by the KESUMAS event. The setting in which the data collection is done is comfortable for the participants, however, it is still unclear whether or not the environment has

an impact on some of the participants' performance because the conditions vary depending on the participant on the consecutive days.

The other limitation that was found is the independent variables used, types of exercise and forms of recovery only. These two were the only variables that the researcher focused on for this project. However, in fact, to say that exercise benefits cognitive needs to consider the duration of exercise per session, frequency of exercise in a week and intensity level aside from the types and recovery. Hence, by ignoring the other three factors, the results of this project may be limited to two factors only that specifically for attention whereas other research that will use all factors may have different findings on different cognition. The application of this study is limited as well as the generalization of results towards types of exercise and recovery may be different.

Participants involved in this study comes from a variety background in terms of the fitness. Most of the participants were not an athlete or an active person in sport, which limits their movement in doing the right techniques especially during passive recovery that includes 3 body parts in PNF stretching. Although the participants are doing great by completing all the exercise within the time frame throughout the study, it is still unknown that whether some of the participants used the right technique such as stretch all their muscles in passive recovery because the muscle metabolism will repair and speed performance recovery which influenced attention.

5.2 Implications of study

The implication of study can be seen in the dimension of knowledge and research methodology as well. This study contribute in knowledge when the participants grasp better understanding on how certain exercise benefits to cognition after completing this study which will make them spend more time on physical activity than online digital such as games, go lives on social media and so on. This study also help in awareness of the importance of exercise especially among young adult students at university by exploring various type of exercise together with the right match of recovery type. The implications towards research methodology is noticeable when study added a knowledge with empirical evidence to existing knowledge of the current state of exercise and the barriers of skipping physical activity. The results were valuable for sports and health department to develop policies and programs that focus on improving students' health and physical status. This study can be used as guidance for future research as it is conducted according to the research standards.

5.3 Recommendations

There are several recommendations that were provided based on the discussion of the limitations of this study in order for future researchers who wished to conduct a similar study to gain some insights and ideas regarding this topic. This study was able to gather 40 pre-university and undergraduate students from different faculties in UNIMAS, Sarawak. It will prove beneficial for future studies to have a greater sample size than what this study had utilized in order to obtain higher statistical power which is more suitable and accurate to be used to generalize the population. This study's sample size were comprised of randomly selected students whose aged 19 to 25 years old from the UNIMAS and it is advised that should future studies conduct a study regarding selective attention in the work setting, a more controlled participant pool should be considered with a target size based on age so that future researchers

can include the workers' age as age may be one of the factors in affecting an individual's selective attention performance or to test whether their age affects any other variable of the researchers' choosing.

The other recommendation is that the data collection process should involve a proper settings specifically closed space or high rise gymnasium with less distractions in which the researcher and the participants are placed within a specific room to ensure the controlled variables can be handled in a decent way and extract those external factors which may influence the final data. It is believed that several factors in the Fitness Gym affect the selective attention performance of the participants. Thus, the limitations of space of the settings such as open-air until distracts the participants can be avoided through choose a proper closed space to ensure the entire experiment to be conducted smoothly and clearly.

It is also recommended for the future researchers to makes a variety exercise variables as some previous studies identified such intensity level and duration time taken in every session are depending on the nature of the variables. Besides, according to studies, it is critical to engage in all four types of exercise: endurance, strength, balance, and flexibility, each of which has distinct advantages on cognitive functions. With these consideration, it is essential to involve different kinds of tasks in order to generate a comprehensive finding with higher validity, reliability and accuracy.

The presented findings can be applied in practice for investigating participants demographic profiles and how it affects the given variables. Once the given variables are identified, it may be feasible to determine in a particular profile their selective attention performance which may be concluded as one of the variables that may lead to some effects either positively or negatively for future research.

5.4 Conclusion

This study discerned the effects of different types of exercise and forms of recovery towards the selective attention performance among pre-university and undergraduate students whose aged is 19 to 25 years old. As prevalence of overweight and obesity among adults in Malaysia increased to 54.2% in 2020 from 50.1% in 2019, the young generations are slowly coping to an activity or exercise that can trigger their sweat glands when the body temperature rises before the internal cooling process occur to burn the calories. Being that said, the fun, excitement and benefits of exercise can be achieved in numerous ways such as try new exercise, build own workout group exercise that has a setting goals. However, by only focusing on only one variables such as the type of exercise like endurance when did a group exercise, found out to do not give a fully benefits towards attention of some people (“Exercise Improve Health and Physical Ability”, 2021). Besides, the type of exercise and forms of recovery is not the only factor that is affected in selective attention but also the intensity and duration as well. In the rise of prevalence obesity in Malaysia, several problem arose that lead to this research. Despite of the several limitations in conducting this study, all research objectives, questions, and hypotheses have been answered. Based on the findings, it shows that if engaged with aerobic exercise, the best way to recovered is through active recovery plan. Conversely, if engaged with strength exercise, the best way to recovered is through passive plan.

In conclusion, the interaction described that it depends on the exercise that someone wanted to do; means different exercise required different recovery to maximise or increase the efficiency of selective attention performance. Any types of exercise or recovery is beneficial to selective attention performance but what matter is the pairing of those variables. It was quite interesting and mesmerising to study about sports and cognition which not many researcher interested on it unless the researcher is an active person in sports or have passion about it.

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APPENDIX A

RAW SPSS OUTPUTS

```
GET
  FILE='/Users/anisnatasha/Desktop/FYP2.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
UNIANOVA Time_taken BY Exercise Recovery
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=Exercise Recovery(TUKEY)
  /PLOT=PROFILE(Exercise*Recovery) TYPE=LINE ERRORBAR=NO
MEANREFERENCE=NO YAXIS=AUTO
  /EMMEANS=TABLES(Exercise) COMPARE ADJ(LSD)
  /EMMEANS=TABLES(Recovery) COMPARE ADJ(LSD)
  /EMMEANS=TABLES(Exercise*Recovery)
  /PRINT DESCRIPTIVE HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Exercise Recovery Exercise*Recovery.
```

Univariate Analysis of Variance

[DataSet1] /Users/anisnatasha/Desktop/FYP2.sav

Between-Subjects Factors			
		Value	
		Label	N
Type of exercise	1	Aerobic	20
	2	Strength	20
Type of post-exercise recovery	1	Active	20
	2	Passive	20

Descriptive Statistics

Dependent Variable: Time_taken

Type of exercise	Type of post-exercise recovery	Std.		N
		Mean	Deviation	
Aerobic	Active	67.4000	10.88526	10
	Passive	102.4000	17.76513	10
	Total	84.9000	22.97802	20
Strength	Active	98.4000	24.95418	10
	Passive	88.8000	58.01494	10
	Total	93.6000	43.74375	20
Total	Active	82.9000	24.57620	20
	Passive	95.6000	42.33749	20
	Total	89.2500	34.76865	40

Levene's Test of Equality of Error Variances^{a,b}

		Levene	df1	df2	Sig.
		Statistic			
Time_take	Based on Mean	2.703	3	36	.060
n	Based on Median	.809	3	36	.497
	Based on Median and with adjusted df	.809	3	12.105	.513
	Based on trimmed mean	1.667	3	36	.191

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Time_taken

b. Design: Intercept + Exercise + Recovery + Exercise * Recovery

Tests of Between-Subjects Effects

Dependent Variable: Time_taken

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7342.700 ^a	3	2447.567	2.214	.103
Intercept	318622.500	1	318622.500	288.181	.000
Exercise	756.900	1	756.900	.685	.413
Recovery	1612.900	1	1612.900	1.459	.235

Exercise *	4972.900	1	4972.900	4.498	.041
Recovery					
Error	39802.800	36	1105.633		
Total	365768.000	40			
Corrected Total	47145.500	39			

a. R Squared = .156 (Adjusted R Squared = .085)

Estimated Marginal Means

1. Type of exercise

Estimates

Dependent Variable: Time_taken

Type of exercise	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Aerobic	84.900	7.435	69.821	99.979
Strength	93.600	7.435	78.521	108.679

Pairwise Comparisons

Dependent Variable: Time_taken

(I) Type of exercise	(J) Type of exercise	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
Aerobic	Strength	-8.700	10.515	.413	-30.025	12.625
Strength	Aerobic	8.700	10.515	.413	-12.625	30.025

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: Time_taken

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	756.900	1	756.900	.685	.413
Error	39802.800	36	1105.633		

The F tests the effect of Type of exercise. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. Type of post-exercise recovery

Estimates

Dependent Variable: Time_taken

Type of post-exercise recovery	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Active	82.900	7.435	67.821	97.979
Passive	95.600	7.435	80.521	110.679

Pairwise Comparisons

Dependent Variable: Time_taken

(I) Type of post-exercise recovery	(J) Type of post-exercise recovery	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
Active	Passive	-12.700	10.515	.235	-34.025	8.625
Passive	Active	12.700	10.515	.235	-8.625	34.025

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: Time_taken

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	1612.900	1	1612.900	1.459	.235
Error	39802.800	36	1105.633		

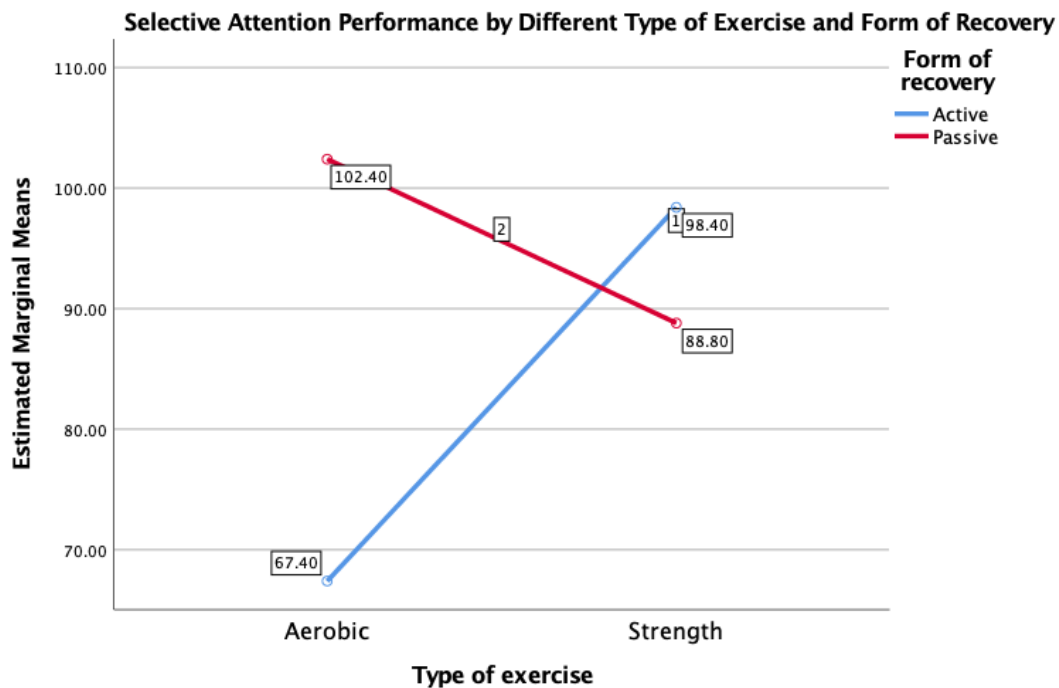
The F tests the effect of Type of post-exercise recovery. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Type of exercise * Type of post-exercise recovery

Dependent Variable: Time_taken

Type of exercise	Type of post-exercise recovery	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Aerobic	Active	67.400	10.515	46.075	88.725
	Passive	102.400	10.515	81.075	123.725
Strength	Active	98.400	10.515	77.075	119.725
	Passive	88.800	10.515	67.475	110.125

Profile Plots



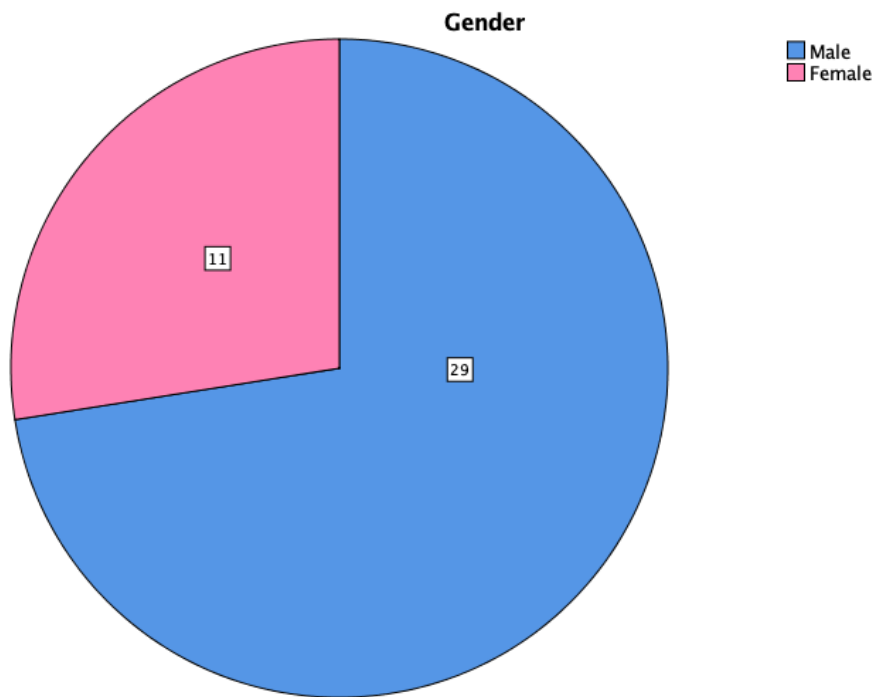
Frequencies

Statistics

Gender_new

N	Valid	40
	Missing	0

Gender					
		Freque ncy	Percent	Valid Percent	Cumulative Percent
Valid	Male	29	72.5	72.5	72.5
	Female	11	27.5	27.5	100.0
Total		40	100.0	100.0	



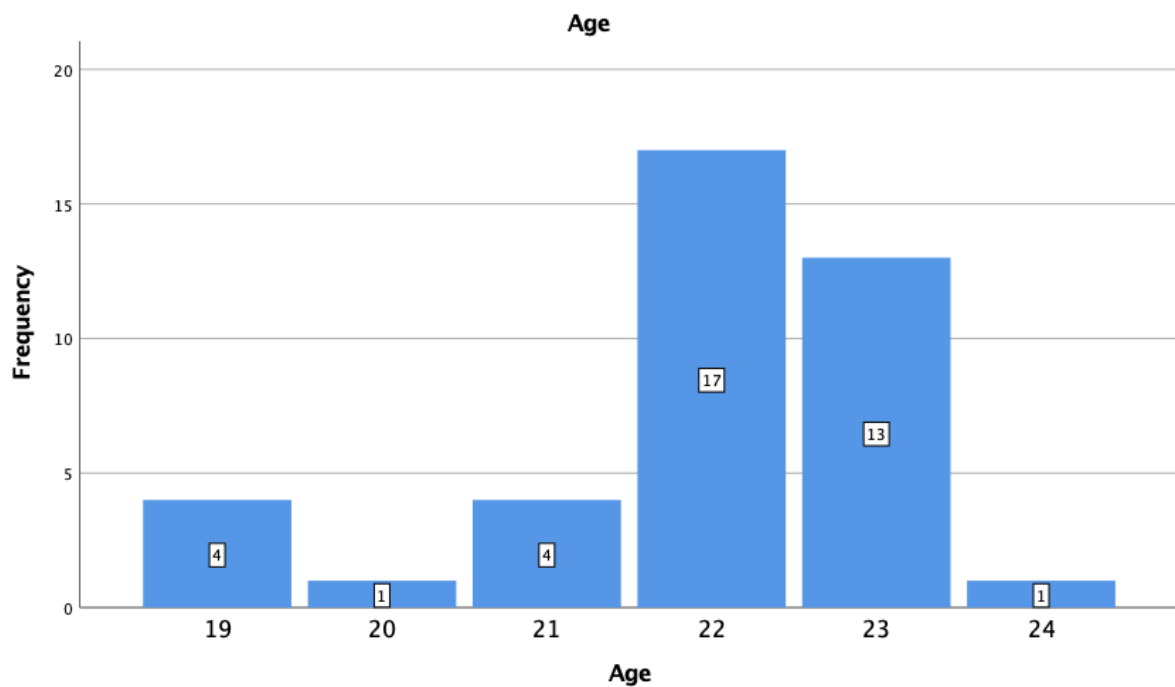
Frequencies

Statistics

Age

N	Valid	40
	Missing	0

Age					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	19	4	10.0	10.0	10.0
	20	1	2.5	2.5	12.5
	21	4	10.0	10.0	22.5
	22	17	42.5	42.5	65.0
	23	13	32.5	32.5	97.5
	24	1	2.5	2.5	100.0
Total	40	100.0	100.0		



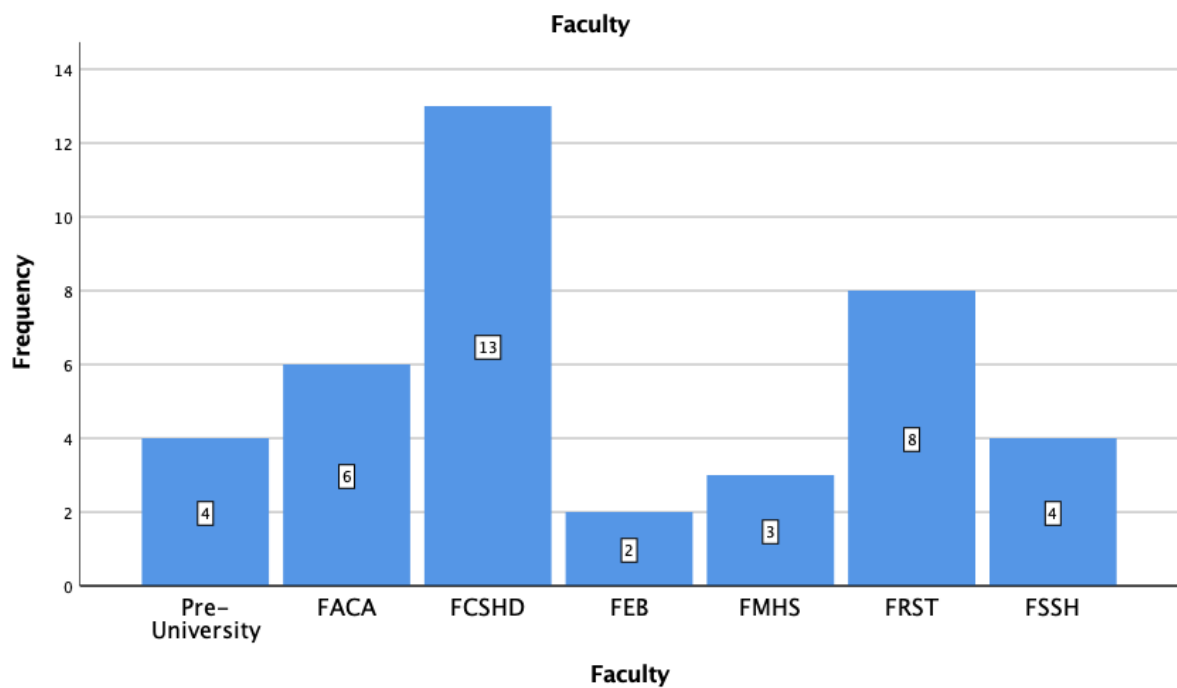
Frequencies

Statistics

Faculty

N	Valid	40
	Missing	0

		Faculty			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FACA	6	15.0	15.0	15.0
	FCSHD	13	32.5	32.5	47.5
	FEB	2	5.0	5.0	52.5
	FMHS	3	7.5	7.5	60.0
	FRST	8	20.0	20.0	80.0
	FSSH	4	10.0	10.0	90.0
	Pre-University	4	10.0	10.0	100.0
	Total	40	100.0	100.0	



Frequencies

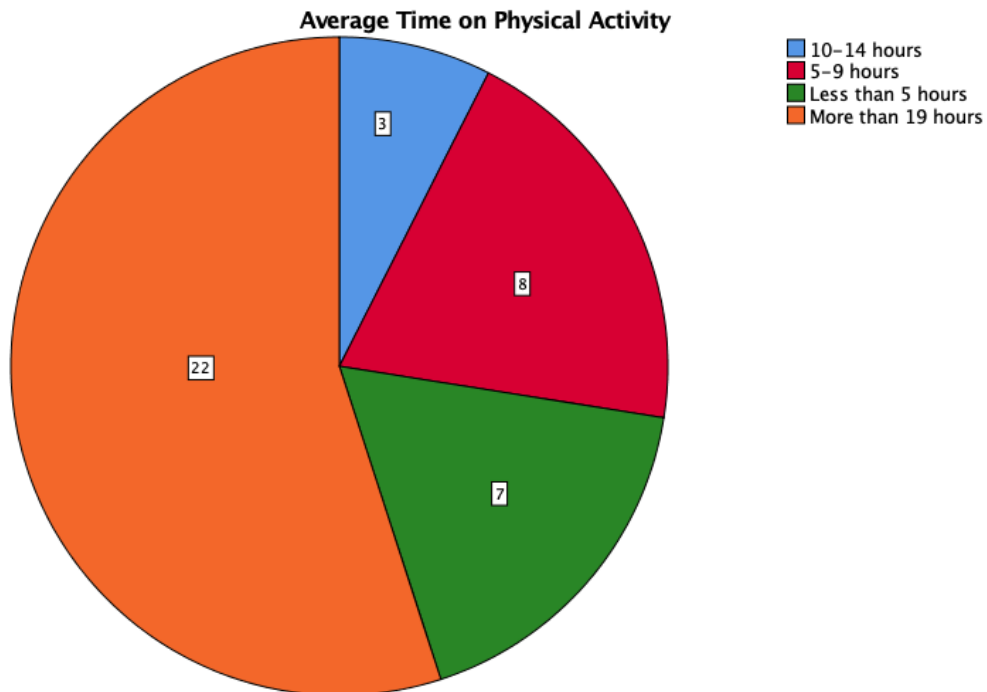
Statistics

Average_time_on_physical_activity

N	Valid	40
	Missing	0

Average Time on Physical Activity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10-14 hours	3	7.5	7.5	7.5
	5-9 hours	8	20.0	20.0	27.5
	Less than 5 hours	7	17.5	17.5	45.0
	More than 19 hours	22	55.0	55.0	100.0
	Total	40	100.0	100.0	



APPENDIX B

MATERIALS

1. Memorandum

Fakulti Sains Kognitif dan Pembangunan Manusia UNIMAS

UNIVERSITI MALAYSIA SARAWAK 94300 Kota Samarahan

MEMORANDUM

Kepada : Haji Zambari bin Hj. Baijuri Arena Tun Tuanku Haji Bujang

Daripada : Penyelaras Program Psikologi

Tarikh : 27 Mei 2022

Perkara : Permohonan Penggunaan Fitness Gym Untuk Menjalankan Kajian Bagi

Projek Tahun Akhir

Dengan segala hormatnya perkara di atas dirujuk.

Pelajar Anis Natasha binti Katis (72117) adalah pelajar Program Psikologi, Fakulti Sains Kognitif dan Pembangunan Manusia, Universiti Malaysia Sarawak (UNIMAS). Beliau sedang menjalankan kajian untuk menyiapkan Projek Tahun Akhir bagi memenuhi syarat bergraduasi program tersebut. Maklumat lanjut tentang pelajar dan kajian adalah seperti berikut:

Tarikh : 31/5 (Selasa), 3/6 (Jumaat), 8/6 (Rabu), 9/6 (Khamis), 10/6 (Jumaat)

Masa : 2.00 - 4.00 petang

Tempat: Fitness Gym, Stadium UNIMAS

Sehubungan itu, sukacita kiranya pihak tuan/puan dapat memberikan kerjasama kepada pelajar berkenaan untuk menjalankan kajian di tempat tersebut. Segala peralatan dan maklumat yang diperolehi akan hanya digunakan untuk tujuan akademik semata-mata dan dijamin akan kerahsiaannya. Untuk maklumat lanjut, pihak tuan boleh menghubungi:

Dr Lee Jun Choi

Penyelaras Program Psikologi



s.k – Penolong Pendaftar Kanan, FSKPM

2. Consent Form

Section A: Informed Consent

Assalamualaikum, Salam Sejahtera and Salam UNIMASKu Sayang. I am Anis Natasha binti Katis, a third-year student in bachelor's degree of Psychology with honors from University Malaysia Sarawak. I am currently conducting a research study for my Final Year Project entitled "THE EFFECT OF DIFFERENT TYPE OF EXERCISE AND FORMS OF RECOVERY ON STUDENTS' SELECTIVE ATTENTION PERFORMANCE".

Purpose

The purpose of this study is to determine the difference in selective attention performance of different type of exercise and forms of recovery besides to test whether different exercise and post-exercise recovery type have an interaction effect on selective attention performance. These results may be used to better understand how certain exercise such as aerobic and strength benefits to human's cognition.

Aerobic exercise: Rowing machine

Strength exercise: Circuit training

Recovery: Track and field

Selective attention: Online attention test

Call for Participation

40 possible candidates will be selected among athletes in Pre-University and undergraduate students of Universiti Malaysia Sarawak (UNIMAS) aged 18 to 25 years old. The study will be held from 11 April to 27 May at Fitness Gym UNIMAS, thus, you must be able to attend the study in campus and be in a good health condition. The session will take approximately 2 hours of your time.

The research will be held from 2.00pm-4.00pm ONLY since the researcher needs to constant the time for all the participants. On most days, at what date you are available to attend?

- 31/5 Tuesday
- 3/6 Friday
- 8/6 Wednesday
- 9/6 Thursday

Benefits

People who participate in this study may have a better understanding of certain exercise such as aerobic and strength that benefits to human's cognition. These data will also contribute to add a knowledge with empirical evidence to existing knowledge of the current state of exercise to the researcher. Besides, the results will be valuable for sports and health department to develop policies and programs that focus on improving students' health and physical status. Malaysian or outsider practitioners would benefit from this study as well because they can use as a reference for future studies. In addition, the responses of different demographic background are currently unknown and by assisting with this project you are contributing the field of knowledge on this topic.

Risks and discomforts

There is a possibility of a minimal level of risk involved if you agree to participate in this study. The risk may include muscle soreness and possible injury. Proper form, technique and

breathing must be followed to avoid injury. No other medical treatment or financial compensation for injury from participation in this research project is available.

Privacy and confidentiality

Your data and information collected in this study will only be use for academic purpose and will be kept anonymous. The data and information will be kept private and is strictly confidential to others.

Voluntary participation

Taking part in this research study is entirely up to you. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. You will be informed of any new, relevant information that may affect your health or willingness to continue your study participation

Rewards

Participation in the complete study will received either a food or cash voucher worth RM15.

Contact Information

Selected candidate will be contacted through a specific WhatsApp group. If you have any questions or concerns about this research, you may contact the researcher through:

Email: 72117@siswa.unimas.my

Phone number: 0128878643 / <https://wa.me/60128878643>

Consent Statement

By clicking the 'next' button, I acknowledge and agree that:

1. I have read this consent form and will give my full commitment on this study as far as I can.
2. I voluntarily agree to participate in this study.
3. I understand that a copy of this consent will be provided to me for future reference.

4. I authorize the use of my records, any observations, and findings found during the course of this study for education, publication and/or presentation.

Section B: Demographic Profile

Gender

Male

Female

Phone Number

Age

Year of study

Pre-university

Year 1

Year 2

Year 3

Year 4

Faculty

Pre-University

Faculty Of Computer Science And Information Technology

Faculty Of Economics And Business

Faculty Of Engineering Faculty Of Applied And Creative Arts

- Faculty Of Cognitive Sciences And Human Development
- Faculty Of Medicine And Health Sciences
- Faculty Of Resource Science And Technology
- Faculty Of Social Sciences & Humanities
- Faculty Of Built Environment o Faculty Of Language And Communication

On average, how many hours do you spend your time on physical activity each week?

- Less than 5 hours
- 5-9 hours
- 10-14 hours
- 15-19 hours
- More than 19 hours

Section C: Physical Activity Readiness Questionnaire

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

Please read the 7 questions below carefully and answer each one honestly:		YES	NO
1.	Has your doctor ever said that you have a heart condition • OR high blood pressure • ?		
2.	Do you feel pain in your chest during your daily activities OR when you do a physical activity?		
3.	Have you ever been diagnosed with another chronic medical condition? PLEASE LIST CONDITION(S) HERE: _____		
4.	Do you lose your balance because of dizziness OR have lost consciousness in the last 12 months?		
5.	Do you currently have 9or have had within the past 12 month) a bone, joint, or soft tissue problem that could be made worse by becoming more physically active? PLEASE LIST CONDITION(S) HERE: _____		
6.	Are you currently taking prescribed medications for a chronic medical condition? PLEASE LIST CONDITION(S) AND MEDICATIONS HERE: _____		
7.	Has your doctor ever said that you should only do medically supervised physical activity?		

INSTRUMENTS

1. Oximeter



2. Rowing Machine



3. Printed A4 paper

