

**THE EFFECTS OF DAILY GRATITUDE
WRITING AND SELF-PACED HIGH INTENSITY
INTERVAL TRAINING ON REGULATING
EMOTIONAL DISTRESS, SUSTAINED
ATTENTION AND HEDONIC PERCEPTION
AMONG STUDENTS IN UNIVERSITI SAINS
MALAYSIA, HEALTH CAMPUS**

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MALAYSIA, HEALTH CAMPUS**

by

KAVITHA A/P SIVAPRAGASAM

Thesis submitted in fulfilment of the requirements

for the degree of

Exercise and Sport Science

June 2021

CERTIFICATE

This is to certify that the dissertation entitled THE EFFECTS OF DAILY GRATITUDE WRITING AND SELF-PACED HIGH INTENSITY INTERVAL TRAINING ON REGULATING EMOTIONAL DISTRESS, SUSTAINED ATTENTION AND HEDONIC PERCEPTION AMONG STUDENTS IN UNIVERSITI SAINS MALAYSIA, HEALTH CAMPUS is the bona fide record of research work done by Ms. KAVITHA A/P SIVAPRAGASAM during the period from July 2020 till June 2021 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Health Science (Honours) (Exercise and Sport Science).

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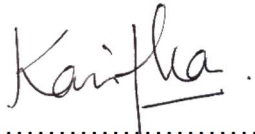
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DECLARATION

I, Kavitha a/p Sivapragasam hereby declare that the work in this thesis is my own except for quotations and references which have been duly acknowledged throughout this document. The instruments and scales administered have been obtained with consent and attached in the appendix section for further reference.



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LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
C	Control
DASS	Depression, Anxiety and Stress Scale
DVT	Digit Vigilance Test
FS	Feeling Scale
GW	Gratitude Writing
GW-HIIT	Gratitude Writing – High Intensity Interval Training
HIIT	High Intensity Interval Training
HREC	Human Research Ethics Committee
PA	Physical Activity
USM	Universiti Sains Malaysia
WHO	World Health Organization

**KESAN PENULISAN KESYUKURAN HARIAN DAN LATIHAN INTERVAL
INTENSITI TINGGI KENDIRI TERHADAP REGULASI TEKANAN EMOSI,
PERHATIAN BERTERUSAN DAN PERSEPSI HEDONIK DI ATAS
MAHASISWA/SISWI DI UNIVERSITI SAINS MALAYSIA, KAMPUS
KESIHATAN**

ABSTRAK

Kajian keratan rentas pada 2017 mendapati lebih daripada 80% daripada 287 remaja Malaysia mengalami kemurungan, tekanan atau kegelisahan dan pelajar universiti dikenal pasti sebagai kumpulan berisiko tinggi untuk menghadapi cabaran kesihatan mental tersebut. Peralihan fasa yang dihadapi oleh golongan remaja menyebabkan kekurangan strategi untuk mengatasi tekanan. Walau bagaimanapun, pakar psikologi positif telah mengetengahkan potensi pelaksanaan aktiviti fizikal dan tingkah laku meluahkan kesyukuran terhadap pengurusan masalah psikologikal. Oleh itu, kajian ini bertujuan untuk mengetahui kesan penulisan kesyukuran setiap hari dan latihan interval intensiti tinggi (HIIT) terhadap regulasi tekanan emosi, perhatian berterusan dan persepsi hedonik dalam kalangan 46 pelajar di Universiti Sains Malaysia, kampus kesihatan. Teori penentuan sendiri dan teori '*Broaden-and-Build*' terhadap emosi positif telah memberi sumbangan yang signifikan kepada pembangunan kajian ini. Aplikasi RESET – sebuah aplikasi mudah alih diperkenalkan sebagai jurnal kesyukuran manakala data kuantitatif telah diperolehi melalui pentadbiran soal selidik pra-pasca Skala-21 Kemurungan, Kegelisahan dan Tekanan (DASS-21), Skala Borg untuk Kadar Persepsi Usaha (RPE), Skala Perasaan, dan Ujian Kewaspadaan Digital

(DVT). Setelah selesai kajian selama 8 minggu, hasil analisis data telah menunjukkan bahawa terdapat perbezaan di antara intervensi pra-pasca untuk skor DASS-21 dan RPE dalam empat kumpulan eksperimen tetapi hasilnya adalah tidak signifikan ($p > .050$). Walau bagaimanapun, terdapat penurunan yang signifikan terhadap kesalahan yang dibuat dalam DVT ($F(1,42) = 17.057, p = .000$) manakala terdapat peningkatan yang signifikan dalam skor Skala Perasaan terhadap jurnal kesyukuran dalam kalangan subjek ($F(2,40) = 3.879, p = .029$). Secara keseluruhannya, dengan adanya kajian baru ini, hasilnya dapat berfungsi sebagai landasan untuk melonjakkan pelaksanaan kajian pada masa depan sebagai satu usaha demi mengintegrasikan aktiviti fizikal dan teknik intervensi psikologi positif terhadap pengurusan dan pemeliharaan aspek psikologikal yang berkesan dalam kalangan belia Malaysia.

**THE EFFECTS OF DAILY GRATITUDE WRITING AND SELF-PACED
HIGH INTENSITY INTERVAL TRAINING ON REGULATING
EMOTIONAL DISTRESS, SUSTAINED ATTENTION AND HEDONIC
PERCEPTION AMONG STUDENTS IN UNIVERSITI SAINS MALAYSIA,
HEALTH CAMPUS**

ABSTRACT

A 2017's cross-sectional study found that more than 80% of 287 Malaysian adolescents were either, depressed, stressed or experiencing anxiety with university students have being identified as the higher risk group for developing those mental health challenges. Due to the transitional phase adolescents face, there has been inadequate coping strategies towards stress. However, positive psychology has highlighted the potential impact that physical activities and the act of expressing gratitude has towards managing psychological challenges. Hence, this study aims to determine the effects of daily gratitude writing and self-paced high intensity interval (HIIT) training towards regulating emotional distress, sustained attention and hedonic perception among 46 students in Universiti Sains Malaysia, Health Campus. The self-determination theory and the 'Broaden-and-Build' theory of positive emotions contributed significantly to the development of this study. The RESET app – a mobile application was introduced as a gratitude journaling tool while quantitative data was obtained through the administration of a pre-post-Depression, Anxiety and Stress Scale-21 Questionnaire (DASS-21), Borg's Scale for Rate of Perceived Exertion (RPE), Feeling Scale, and the Digital Vigilance Test (DVT). Upon completing the 8-

week study, the results showed that there were differences between the pre-post intervention for DASS-21 and RPE scores within the 4 experimental groups but the results were not significant ($p > .050$). However, there was a significant decrease in errors made in the DVT ($F(1,42) = 17.057, p = .000$) while there was a significant increase in the Feeling Scale scores for gratitude journaling within participants ($F(2,40) = 3.879, p = .029$). Due to the study's novelty, the results serve as a launch pad for future works in the efforts of integrating physical activities and positive psychology interventions towards effective psychological management and nurturing among the Malaysian youth.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Mental health has been a reoccurring topic for the past several years. It has been said that after heart disease, depression would be the second leading cause of disease burden by the year 2020 (Moussavi *et al.*, 2007). Studies have shown that adolescents and women are at higher risk of experiencing mental health disorders as compared to others (Albert, 2015 & Thapar *et al.*, 2013). In Malaysia, a cross-sectional study of 287 adolescents by Mohammadzadeh *et al.*,(2017), stated that 85.2% were depressed, 80.1% had anxiety, and 84.7% were experiencing stressed. Unmanaged or untreated mental health disorders could lead to life-threatening action such as suicide (Islam *et al.*, 2018).

In the context of adolescents, especially university-going students are at the higher rank of depression, anxiety and stress compared to other age groups. This is due to the amount of pressure and stress one has to endure in university life (Ganesan *et al.*, 2018). From academic pressure to social and personal stress, students indeed experience high amounts of stress that causes a ripple effect to experiencing depression and anxiety which leads to suicidal acts (Radeef and Faisal 2015). Every university student experience the transitional period from being a high school student to a tertiary student. Hence, the external pressure during this transitional period is crucial for proper management. Many adolescents at this phase have inadequate coping mechanisms, which may be the cause from little experience, towards the stress and pressure of adapting to a whole new independent life (Elkalmi *et al.*, 2019).

Since the increase of mental health cases, many interventions have taken rise in order to prevent and treat these disorders. Pharmacological treatments were one of the first steps of interventions introduced to the public (Louie, 2014). Unfortunately, due to the increasing cost of manufacturing, purchasing and the extensive number of clinical visits, many have deviated to alternative treatments such as non-pharmacological treatments (Louie, 2014). Positive psychology has received an interest among researchers for its easy implementation and its positive effects in treating mental health disorders (Guo *et al.*, 2017). Langer *et al.*, (2017) stated that mindfulness, which is one of the many techniques in positive psychology, has shown to reduce cognitive impairment related to attention, working memory, and social cognition while increasing psychological well-being.

Besides positive psychology, studies on the physical activity and its benefit in addressing mental health disorders have also gained traction among researchers. Physical activity has shown promising results in elevating positive emotions and allows self-expressing of emotions in the depressive community (Paluska and Schwenk, 2000 & Currier *et al.*, 2020). A systematic review by Donnelly *et al.*,(2016) states that physical activity interventions also showed positive benefits on cognitive functioning of children. This finding can also be supported with other studies by Kato *et al.*, (2018), which stated that physical activities not only increase the level of oxyhaemoglobin in the frontal cortices; high levels of oxyhaemoglobin in these areas has resulted to positive emotions (Yeung *et al.*,2021) but most importantly, enhances the cognitive advantages (Kato *et al.*, 2018).

1.2 Problem Statement

Mental health issues are becoming a dominant topic worldwide. Depression, anxiety, and stress are the three key indicators of mental health because it may lead to negative effects such as impaired normal functioning, either cognitively or physically and burnout (Manap *et al.* n.d). Further studies have shown that poor mental health leads to many life- threatening diseases such as cardiovascular disease deaths, deaths from external causes or even cancer deaths, which was only associated with psychological distress at higher levels (Teh *et al.*, 2015).

In 2017, World Health Organization (WHO) documented an estimate of 300 million people are currently living with depression from their year-long campaign ‘Depression: Let’s Talk’ (World Health Organization, 2017). These data showed an increment of 18% in 10 years from 2005 to 2015. The National Health and Morbidity Survey 2015 (Malaysia), stated that the prevalence of mental health issues increased from 10.7% in 1996 to 29.2% in 2015. As for adolescents group in Malaysia, one out of every five adolescents experiences depression, in which two out of five are anxious and one out of 10 are stressed (National Health and Morbidity Survey , 2018).

Adolescents are identified as the highest ranked group to experience mental health issues (Elkalmi *et al.*,2019). This is because of the changing environments one will experience as they transition from childhood to adulthood and from high school to tertiary education (Elkalmi *et al.*,2019). With the rising concerns of mental health issues worldwide, many interventions and steps were initiated to combat this issue. Although pharmacological and non-pharmacological treatments were introduced, the acceptance

and accessibility within the community were not always widespread. The reason is because of some issues such as the expensive price of anti-depressive drugs and commitment for longer treatment period (Farah *et al.*, 2016). This has led many people to seek alternative treatments that are both cost-saving and easy to administer (Louie, 2014).

Alternative interventions including positive psychology methods and physical activities (Currier *et al.*, 2020) are currently becoming accepted worldwide because it has shown positive results to overcome the mental health prevalence. However, there are still not many studies conducted to understand the combined roles of positive psychology and physical activity to help individuals with mental and emotional distress, especially among university students. Hence, this study will examine the combined effects of the positive psychology approach using a daily gratitude writing and physical activity program using a self-paced high intensity interval training to regulate emotional distress, sustained attention and hedonic perceptions among university students.

1.3 Study Objective

1.3.1 General Objective

To determine the effects of daily gratitude writing and self-paced high intensity interval training in regulating emotional distress, sustained attention and hedonic perceptions among students in Universiti Sains Malaysia, Health Campus.

1.3.2 Specific Objective

- i. To compare the effects between daily gratitude writing and self-paced high intensity interval training in regulating emotional distress among students in Universiti Sains Malaysia, Health Campus.
- ii. To examine the effects of daily gratitude writing and self-paced high intensity interval training in regulating sustained attention among students in Universiti Sains Malaysia, Health Campus.
- iii. To examine the effects of daily gratitude writing and self-paced high intensity interval training in regulating hedonic perception among students in Universiti Sains Malaysia, Health Campus.
- iv. To identify the differences of effects between daily gratitude writing and self-paced high intensity interval training among students in Universiti Sains Malaysia, Health Campus.

1.4 Study Hypothesis

H_{A1} : There is a significant difference in daily gratitude writing and self-paced high intensity interval training in regulating emotional distress among students in Universiti Sains Malaysia, Health Campus.

H_{A2} : There is a significant difference in daily gratitude writing and self-paced high intensity interval training in regulating sustained attention among students in Universiti Sains Malaysia, Health Campus.

H_{A3} : There is a significant difference in daily gratitude writing and self-paced high intensity interval training in regulating hedonic perception among students in Universiti Sains Malaysia, Health Campus.

H_{A4} : There is a significant difference of effects between daily gratitude writing and self-paced high intensity interval training among students in Universiti Sains Malaysia, Health Campus.

1.5 Significance of Study

This research study will be able to provide an understanding towards the effects of daily gratitude writing as a mental health tool and self-paced high intensity interval training as a physical tool to emotional distress and hedonic perception while improving sustained attention. The findings from this study could be used to combat mental health issues that are currently increasing locally and globally among university students. This study could also open doors to a deeper understanding of multiple ways in reducing depression, anxiety and stress among today's youth. With the new-found knowledge on the impact of gratitude writing with the combination of any physical activity, more lives can be saved.

1.6 Conceptual/Operational Definition

- Gratitude** : An emotion produced from noticing and appreciating the benefits that one has received (Wood *et al.*, 2010).
- Depression** : A mood disorder, with symptoms such as sadness, fatigue, loss of interest, and loss of appetite (Doktorchik *et al.*, 2019).
- Anxiety** : Perceived physical/psychological threat to one's personal domain (Beck and Clark , 1988).
- Stress** : An emotional disturbance caused by stressors in life (Ganesan *et al.*, 2018).
- Self-Paced** : The ability to accurately pace oneself in an exercise bout (Lander *et al.*, 2009). High Intensity Interval Training (HIIT) is a type of training involving repeated bouts of high intensity effort followed by varied recovery times (American College of Sports Medicine, 2014).
- High Intensity Interval Training** : Initiating behaviours that enhance positive experiences and behaviours that decrease negative experiences (Kaczmarek, 2017).

1.7 Conceptual Framework

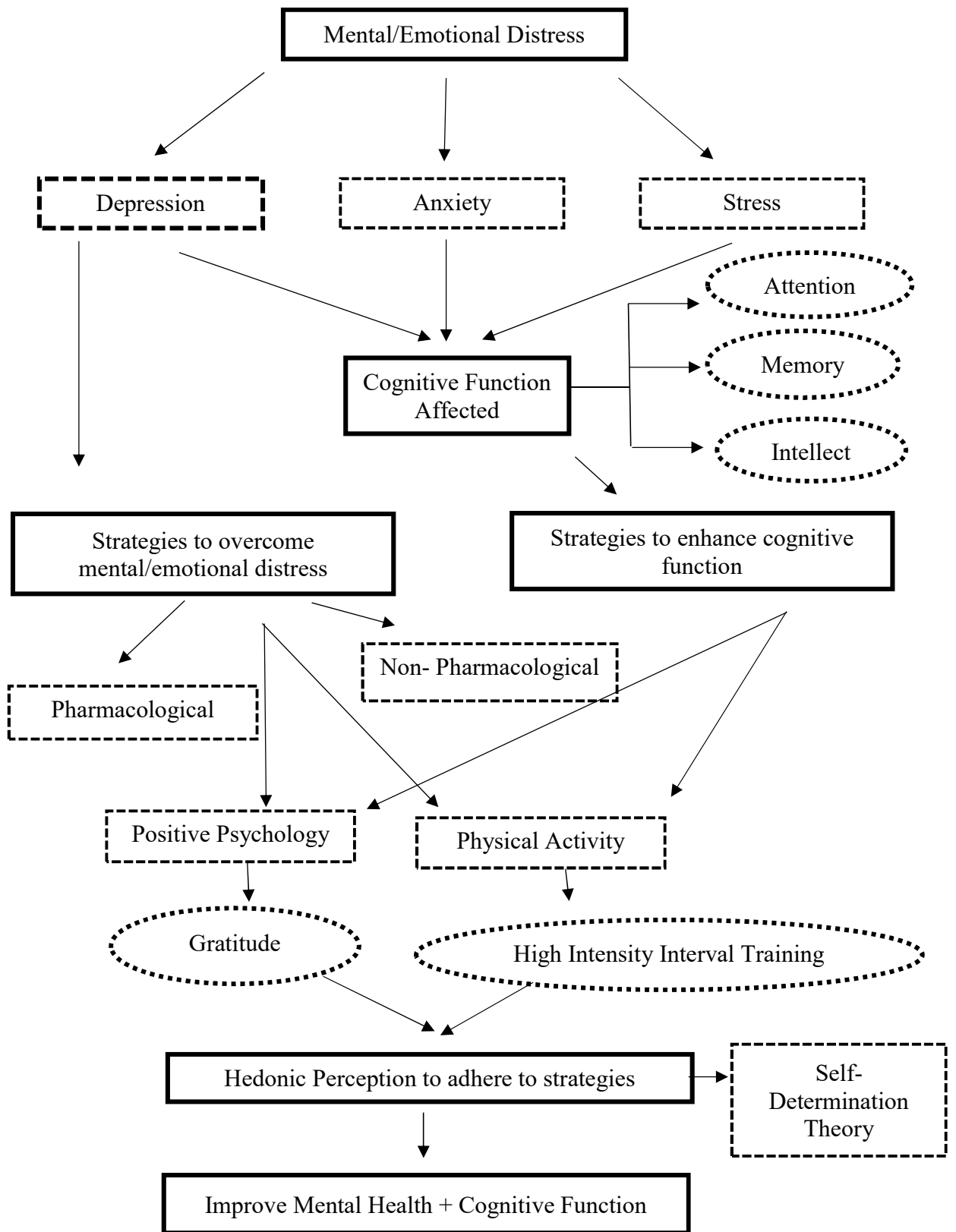


Figure 1.1 The Conceptual Framework

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Depression is one of the most commonly known mental disorder today. From a global scale, it has been estimated that more than 264 million individuals of all ages are suffering from depression (World Health Organization, 2020). Depression, at its worst, can lead to suicide (World Health Organization, 2020). Suicide currently stands as the second leading cause of death among 15 to 29 years of age worldwide with nearly 800,000 lives lost every year (World Health Organization, 2020). These figures are based on documented cases but there could be many more undocumented cases which could bring the total loss of life to suicide higher than 800,000.

86 million individuals are impacted by depression in ASEAN countries (The Economic Times, 2019). In specific, six individuals are attempting suicide every hour in Thailand and the youngest in age to commit suicide was just 10 years old (The Asean Post, 2019). In Myanmar, it was reported that the highest suicide rate were among those aged 25 to 40 and this was often due to ignorance towards mental health issues. Professionals and experts in Cambodia have identified the two major groups that would be at higher risk in attempting suicides are adolescents and women (The Asean Post, 2019). These two major groups have been found to be highly exposed to abuse and traumatic events that increases their instability of mental health and leading to suicidal attempts.

As being reported by Bernama (2019), Malaysia has made its way into international papers on the suicidal act of a teen which was based on a polling system on Instagram. Accordingly, it was reported that the teen suffered from depression and optioned out to her followers to vote on living or dying, and other similar cases started appearing in the following months. The National Health and Morbidity Survey 2017 on adolescents' mental health discovered that 6.9% of youth have attempted suicide at least once in the past 12 months and 10% actually considered on attempting suicide in the past 12 months (Institute for Public Health, 2017). A recent newspaper article in September 2019, stated that suicide rates among teenagers aged 13 to 17 is on an upward trend, with thoughts of suicide rising from 7.9% in 2012 to 10% in 2017 (Chua, 2019).

In the context of university students in Malaysia, a 20 year old student jumped off from a building because she could not cope with the stress and pressure in attaining excellent results in her tertiary studies (Sani , 2018). Moreover, numerous studies worldwide and locally have shown that university students do experience depression (Shi *et al.*, 2016), anxiety and incredibly high amounts of stress (Ganesan *et al.*, 2018). This is often due to the transition from high school environment to a much more independent and competitive environment in universities (Elkalmi *et al.*, 2019 & Islam *et al.*, 2018). A few examples of stressors occurred among university students are financial status, academic pressure and peer pressure. Malaysian university students are not exempted to the fact that they too experience this transition and lack of coping mechanism towards stress, which leads to mental health issues.

2.1 An Overview of Health

Health. The term '*health*' has gone through several re-enhancements in its definition throughout the years. WHO first defined health in 1948 as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (Felman, 2017). According to the Cambridge Dictionary (2020), the definition of health was further simplified to a condition of the body and the degree to which it is free from illness or the state of well-being.

Attaining good health and well-being does not rely solely on one component but on several components such as physical health, emotional/mental health, cognitive health, spiritual health, cultural health and also social health (Mark , 2019). The balance of every component is important to obtain an optimum well-being. Unfortunately, many individuals experience unbalanced state among these components especially in the area of emotional/mental health. Unstable emotional/mental health causes emotional distress, which leads to negative consequences on other psychosociological components such as cognitive function and social health.

2.1.1 Emotional Distress

Emotional distress can be termed as mental distress or mental harm. It influences learning capabilities and are commonly linked to poorer cognitive functioning and academic performance (Moghadam and Hashim , 2020). In specific, the term '*emotional distress*' brings resonance to several common mental health issues such as depression, anxiety and stress.

According to Lovibond and Lovibond (1995), depression refers to the loss of self-esteem and decreased in enjoyment in an activity once enjoyed. It is also related to low perceived ability for an individual in achieving significant life goals. Stress is a state of persistent arousal and tension with a minimum threshold to become upset or even frustrated (Lovibond and Lovibond, 1995). Ganesan *et al.*, (2018) proposed that stress is also an emotional disturbance caused by various stressors in life. If no action is taken to overcome stress, it will increase the probability for depression, anxiety and also burnout (Arvidsdotter *et al.*, 2016). As for anxiety, Beck and Clark (1988) mentioned that anxiety involves a theme of perceived physical/psychological threat to one's personal domain such as a perception of uncontrollability and unpredictability over potential events that may or may not happen.

South Asia represents an estimate of one-fifth of the world's mental health cases (Ogbo *et al.*, 2018). In Malaysia, a survey conducted by the National Health and Morbidity Survey in 2015 has discovered that the prevalence of mental health problems among adults had increased from 10.7% in 1996, to 11.2% in 2006, to 29.2% in 2015 (Manap *et al.*, 2019). Considering the cases that occurs among university students in Malaysia, it is indicated that the prevalence of moderate to extremely high levels of depression increased from 13.9% to 29.3%, anxiety from 51.5% to 55% and stress from 12.9% to 21.6% (Radeef and Faisal , 2015). Another study conducted by Islam *et al.*, (2018) reported that among 1,023 university students in Malaysia, approximately 30% of respondents were experiencing depression, with 4.4% suffered severe depression.

In order to lower the prevalence of depression, Boiler *et al.*, (2013) stated that psychological interventions can be implemented such as cognitive behavioural therapy, problem-solving therapy, and interpersonal therapy. According to Ganesan *et al.*, (2018), appropriate and effective coping strategies may buffer the negative effects of stress on the physical and mental health of an individual. One of the psychological interventions is by using positive psychology. Researchers have found that applying positive psychology aided in lowering the symptoms of mental and emotional distress (Chih, 2015, Boiler *et al.*, 2013). Several studies have also shown that physical activity could diminish or lessen the symptoms of mental distress (Paluska & Schwenk, 2000 , Dunn *et al.*, 2001) by producing anti-depressant effects.

2.1.2 Cognitive Function

According to Donnelly *et al.*,(2016), cognitive function is a set of mental processes that contribute to perception, memory, intellect and action. Cognitive functioning is a crucial element in youth development (Biddle *et al.*, 2019). Based on a study conducted by McCarthy *et al.*,(2016), adolescents with major depressive disorder would experience a negative impact on their cognitive functions (Priyamvada *et al.*, 2015) such as verbal memory, sustained attention and working memory. In addition, emotional distress acts as a critical barrier in learning and often associated with poorer cognitive functioning (Moghadam and Hashim , 2020).

Attention is a crucial component in information processing (Griffin *et al.*, 1986). Sustained attention or also known as vigilance is an ability of observers to maintain their focus of attention and remain alert to stimuli over a prolonged period (Hancock and Warm , 1989). A study by Politis *et al.*, (2004) discovered that individuals with depression experience higher attention deficit than individuals without depression. Individuals with depression tend to display chronic self-focusing leading to negative affects, negative internal attributions and lowered self-esteem (Smith and Greenberg , 1981).

2.1.3 Hedonic Perception

The Self-Determination theory can be referred to understand hedonic perception. It is a theory of human personality and concerns on the motivation with regards on how individuals react to and depend on the social environment. Self-Determination Theory has three components of psychological needs including autonomy, competence and relatedness/connection (Legault, 2017). These three components are essential in facilitating optimal functioning of growth, integration and personal well-being (Ryan and Deci , 2000).

This theory emphasises on the aspects of intrinsic and extrinsic motivations that develops into self-determination. According to Brooks *et al.*,(2017), in order to facilitate motivation and adherence to physical activity, individuals need to meet the basic psychological needs, which are autonomy, competence and relatedness. Intrinsic motivation acts as a driving force towards completing a task given. Hashim *et al.*,(2012) stated that intrinsic motivation is produced when an individual portrays inherent pleasure and interest in an activity.

A higher motivation has much more likelihood to lead towards positive adaptive outcome such as increased behavioural engagement.

Hedonic Perception, derived from the term '*Hedonism*' means the act of seeking pleasure and reward while avoiding pain and negative effects on oneself (Legault, 2017). If individuals experience negative effects such as pain and discomfort when executing a task, there is a high probability that they will avoid pursuing the task. Hedonic perception produces affective responses, which in general is a psychological state of an individual that is not limited to emotions and moods in any given situation (Haile *et al.*,2014). Pleasure and displeasure are two common measures of affective responses. A study has shown that affective responses act as a determinant for adoption and maintenance of physical activity behaviour too (Williams, 2008). If an individual experiences pain and negative effect that results to displeasure, the likelihood of adoption for physical activity is lesser.

2.2 Strategies to Overcome Emotional Distress and Improve Cognitive Function

In recent years, many steps have been taken to combat mental health issues. Negative mental health issues can affect important functions that are essential to humans such as cognition (Bishwajit *et al.*, 2017) and physical functioning. Guo *et al.*, (2017) found that depression negatively affects a student's mood, behaviour, thought processes and also their perception. This would lead to a decrease in productivity, feeling of lethargy, psychomotor alterations and also sleep disturbance.

Many developments of pharmacological and non-pharmacological methods have helped in overcoming these mental health issues (Ogbo *et al.*, 2018). Due to the increasing cost in purchasing and manufacturing the medication prolonged use of medication, and repetitive clinical appointments these issues have negatively impacted the pharmacological and non-pharmacological market (Louie, 2014). Thus, many patients seek alternative treatment in order to overcome their mental health problems.

Alternative interventions lies under the umbrella of positive psychology, for example, gratitude writing, gratitude visits, and positive affirmations. The focus has also been directed on the effects of physical activity towards regulating mental and emotional distress. Studies have also shown that physical activity can increase well-being, improve cognitive functioning and decreased depression and anxiety (Currier *et al.*, 2020).

2.2.1 Positive Psychology

According to Seligman (2002), positive psychology aims to catalyse a psychological change from a preoccupation only by repairing the worst things in life to gain the best qualities in life. The main goal of positive psychology is '*happiness*' which incorporates three elements consisting of positive emotions, engagement and meaning in life. First, positive emotions such as pride (Santos *et al.*, 2013), satisfaction, gratitude, trust, confidence, and hope overcome negative emotions along with their harmful effects on physiology (Fredrickson and Branigan, 2005). These emotions which are the fundamental aspects of positive psychology, plays an important role in the process of treatment and prevention against the development of emotional distress (Santos *et al.*, 2013).

Second, the element of engagement is about obtaining involvement and assimilation in work, close relationships, leisure, and constructing an engaged life (Guo *et al.*, 2017). Thirdly, positive psychology refers to the meaning of life involving the psychological strength (Vela *et al.*, 2016). This element encourages individuals in using their strengths to serve something greater than their ability, thus enhancing their satisfaction and well-being (Lyubomirsky *et al.*, 2005).

Positive psychology interventions such as counting kindness, practising kindness, expressing gratitude (Gander *et al.*, 2016) and harnessing personal strengths have been widely used nowadays in treatment and prevention of mental health disorders such as depression. Positive psychology encompasses a variety of techniques to encourage people in identifying and further enhancing their own inner positive emotions, experiences and character traits (Harvard Health Publishing, 2008). This strategy creates a positive coping capability that could reduce depression and also their relapse frequency (Shi *et al.*, 2016).

Numerous studies have shown that positive psychology does have positive effects on mental and emotional distress (Chakhssi *et al.*, 2018; Boiler *et al.*, 2013). For example, Antoine *et al.*, (2018) conducted a study on the effectiveness of positive psychology interventions and found there were significant decreament in the depressive symptoms in the intervention group. A systematic review and meta-analysis study by Chakhssi *et al.*, (2018) indicated that positive psychology is not only focusing on creating positive emotions and increasing well-being, it also is effective in reducing distress.

2.2.1.1 Gratitude

Wood *et al.*, (2010) described gratitude as an emotion produced from noticing and appreciating the benefits that one has received. A study showed that gratitude significantly predicted low depression and anxiety symptoms in the general population (Petrocchi and Couyoumdjian, 2016). Gratitude is associated with making positive attributions that could help to protect individuals from becoming stressed or depressed (Chih, 2015). According to Armenta *et al.*,(2017), positive emotions enhance an individual's thought-action repertoires, which relates to the Broaden-and-Build Theory of Positive Emotions, explained below.

The Broaden-and-Build Theory of Positive Emotions was first proposed by Barbara L. Fredrickson in 1998 which explains how positive emotions, including joy and contentment could potentially broaden people's momentary thought-action repertoire and also increase their personal resources (Fredrickson, 2004). When individuals experiences joy, they tend to widen the thought-action that creates the urge to play, explore and push limits in terms of social and physical aspects. In addition, when experiencing contentment, the emotion urges an individual to take time and savour their current life circumstances which is similar to identifying and expressing gratitude in one's life. Instilling positive emotions in individuals will provide benefits in enlarging the cognitive context by increasing dopamine levels in the brain.

Gratitude also has been theorised to be able to broaden one's cognition and behaviour. It has also led to numerous positive emotional and social outcomes such as elevated feelings of relatedness and greater perceived social support (Fredrickson, 2004). Experiences of positive emotions can transform one to become more creative, knowledgeable, resilient and also healthy. It also creates a self-sustaining system that propels us towards optimal functioning and improved well-being. The broadening effect on an individual's thought-repertoire when it is driven in positive emotions, will aid in loosening up the after effects of negative emotions.

According to Fredrickson (2004), it was also stated that by using gratitude to surface positive emotions after a cardiovascular activity, it speeds up recovery time between bouts of exercise. Another study on gratitude and high cardiovascular activity conducted by Emmons and McCullough (2003), showed that students who practiced gratitude displayed lesser physical pain, higher progress towards their goals, becoming more optimistic and capable in conducting more physical exercise. McCraty *et al.*, (1995) stated that individuals who practiced appreciation had a change in thought, resulting in more beneficial regulation and control of stress and hypertension.

2.2.2 Physical Activity

Physical activity is the bodily movement caused by muscle action that increases the expenditure of energy (Rogers *et al.*, 2018). Paluska and Schwenk

(2000) stated that physical activity is positively associated with overall well-being of an individual. In the context of emotional and mental distress, physical activities have been shown to produce anti-depressant effects that create a protective effect from the development of depression and anxiety symptoms (Baker *et al.*, 2011 & Richardson *et al.*, 2005).

Another study conducted by Roxana Dev *et al.*,(2016) stated that those who can regulate emotional states are much healthier due to the fact that they can precisely identify and appraise emotional states while possessing the ability to know suitable timing and reasons to express their feelings while affectively regulate their mood states. According to Hashim *et al.*,(2012), physical activity also plays a significant moderating role in the relationship between emotional distress and academic performance too. Recently, physical exercises have also been identified as effective management strategies in cognitive impairment within the general population (Quigley *et al.*, 2019 & Cox *et al.*,2016 & Espeland *et al.*, 2016)). Based on systematic reviews conducted by Chang *et al.*,(2012) and Kelly *et al.*,(2014) , there were also a well-defined link between regular physical activity and cognitive preservation.

The above findings can be further supported by a study by Kato *et al.*, 2018) which stated that exercise increases the level of oxyhaemoglobin in the frontel cortex region and also enhances cognitive functioning. When it comes to designing an intervention that is physical activity based, duration of the physical activity plays an important factor in adding benefits to mental health. Hence, according to Currier, *et al* (2020), 20 to 150 minutes in a week can generate

benefits to one's mental health. This aspect is crucial in developing hedonic perceptions (pleasurable response) towards the activity and results in adherence to the intervention. Donnelly *et al.*, (2016) stated that routine exercises alter specific brain structures and functions with changes to cognitive performance.

2.2.2.1 Self-Paced High Intensity Interval Training

Aerobic Exercises has been established as a key component of health promotion and disease prevention (Koplan *et al.*, 1982). High Intensity Interval Training (HIIT) is known as a form of aerobic exercise that involves alternating relatively short intervals of fast movement or effort that matches with 85% max heart rate with periods of active recovery or complete rest (Leahy, et al., 2020). Many studies have identified HIIT as an effective method to reduce cardiovascular health risks and the overall weight of obese adolescents (García-Hermoso, et al., 2016). HIIT has also shown to reduce distress and anxiety among patients with depression or schizophrenia within the first 15 minutes upon exercise completion (Hsiu, Pang, Chieh, Ming, & Yen, 2016).

To test the affective responses and adherence to the exercise routine, the pace and intensity are self-selected. Williams (2008) discovered that when individuals were asked to self-select their exercise intensity, the majority intended to choose the intensity that would result in a positive affective response. This helps in ensuring adherence and compliance to the activity. Another study by Ekkekakis and Lind (2006)

stated that a pre-fixed intensity resulted in diminishing enjoyment and intrinsic motivation for physical activity and reduced adherence.

It has been stated by Ekkekakis *et al.*,(2011) that even though a prescription may be effective and safe to be followed but the acceptance by the people is low, it's public-health relevance can be questioned. There have been many studies that surfaced in the context of affective responses in exercises and adherence which led to researchers agreeing to prescription of exercise should not only revolve around the concept of effectiveness and safety but also taking in consideration of the pleasure and displeasure one experiences while doing the exercise.

Self-paced or self-selected intensity on exercises by individuals themselves have improved the experiences by increasing perceived autonomy which is one of the components of hedonism and also pleasure. This also increases individuals' chances of adhering and repeating the activity. Studies have also shown that pleasurable responses are much higher in self-selected intensities rather than imposed intensities though the imposed intensity is the same as the actual self-selected pace or a little higher pace (Elsangedy *et al.*, 2016).

CHAPTER 3

METHODOLOGY

3.1 Study Design

The study design that was selected for this study is a quasi-experimental study involving four groups: Control Group (C), Gratitude Writing Group (GW), High Intensity Interval Training Group (HIIT) and the Combination of Gratitude Writing and High Intensity Interval Training Group (GW-HIIT).

3.2 Study Location

The research was conducted virtually in the participants' location either in their homes or hostels.

3.3 Target Population

The target population for this study were current students of Universiti Sains Malaysia, Health Campus.

3.4 Selection Criteria

3.4.1 Inclusion Criteria

Inclusion criteria: Participants must be an undergraduate or postgraduate student studying in Universiti Sains Malaysia, Health Campus. In addition, they must score within the range of moderate to high score in the Depression, Anxiety and Stress -21 (DASS-21) Scale Screening Survey, physically healthy, exercise more than 3 times a week and free of injuries.

3.4.2 Exclusion Criteria

Exclusion criteria: Participants with disabilities (mental or physical), being under prescribed medications, have history of depression, anxiety and stress, infectious disease, and influence of intoxication.

3.5 Sampling Method

The participants were selected based on a non-probability sampling from Universiti Sains Malaysia, Health Campus. A convenient sampling method was conducted due to the convenience of the study location with the use of an-e-poster and word of mouth. Those who were interested had contacted the Principal Investigator for further screening and evaluation of eligibility.

3.6 Sample Size Calculation

To calculate the sample size for this study, G*Power software Version 3.1.9.4 was used. F-test was selected and the statistical test chosen for this study was ANOVA: repeated measures within-between interactions. The power of the study was set to 80%, 95% confidence interval and effect size of F was at 0.25. The calculated sample size was 40. Addition of a 20% dropout rate was also included and the final total sample size was 48. If there were any drop out at the middle of the intervention, none will be replaced as long as the standard limit of 40 initial participants was met.