

**THE EFFECT OF BRAIN BREAKS ON
PARTICIPATION MOTIVES, ATTITUDES,
COGNITIVE FUNCTION AND PHYSICAL
ACTIVITY BEHAVIOUR AMONG TRAINEE
TEACHERS IN KUCHING, SARAWAK**

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by

TING PEI YI

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for the degree of
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LIST OF ABBREVIATIONS

APAS	Attitude towards Physical Activity Scale
DVT	Digit Vigilance Test
IPGKBL	Institut Pendidikan Guru Kampus Batu Lintang
IPGKTAR	Institut Pendidikan Guru Kampus Tun Abdul Razak
MAHK	Malaysia Active Healthy Report Card
MoE	Ministry of Education
NCD	Non-communicable Diseases
PALMS	Physical Activity and Leisure Motivation Scale
SDT	Self-Determination Theory
SPSS	Statistical Package for Social Science
USM	Universiti Sains Malaysia
WHO	World Health Organization

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**KESAN BRAIN BREAKS TERHADAP MOTIF PENYERTAAN, SIKAP,
FUNGSI KOGNITIF DAN TINGKAH LAKU AKTIVITI FIZIKAL DALAM
KALANGAN GURU PELATIH DI KUCHING SARAWAK**

ABSTRAK

Brain-breaks merupakan aktiviti rehat minda jangka masa pendek yang direka untuk merangsang kesihatan dan motivasi seseorang. Tujuan kajian ini adalah untuk (1) mengkaji kesan *brain-breaks* terhadap motif penyertaan, sikap dan fungsi kognitif dalam kalangan guru pelatih Sarawak (Kajian 1) dan (2) mengkaji tingkah laku aktiviti fizikal dalam kalangan guru pelatih Sarawak (Kajian 2). Untuk Kajian 1, *brain-breaks* telah dilaksanakan dua kali sehari dan lima kali seminggu selama dua belas minggu. Peserta terdiri daripada empat puluh lapan orang guru pelatih (24 lelaki dan 24 perempuan) yang berumur lapan belas dan sembilan belas tahun. Peserta telah dibahagikan secara rawak kepada kumpulan intervensi ($n = 24$) dan kumpulan kawalan ($n = 24$). *Physical Activity and Leisure Motivation Scale* (PALMS), *Attitude towards Physical Activity Scale* (APAS), alat elektronik MUSE dan Mesin Penimbang Komposisi Badan Tanita BC-541 telah digunakan dalam kajian ini. Manakala, ANOVA faktorial campuran telah digunakan untuk menganalisis data. Bagi Kajian 2, sebanyak dua belas orang guru pelatih telah direkrut dari kedua-dua Institut Pendidikan Guru. Mereka telah dibahagikan secara rawak kepada dua kumpulan (padanan jantung) iaitu kumpulan kawalan ($n = 6$) dan kumpulan intervensi ($n = 6$). Mi Band 4 telah digunakan untuk mengesan aktiviti fizikal peserta. Analisis deskriptif, kaedah kualitatif pertanyaan dan temu duga telah digunakan dalam Kajian 2. Untuk Kajian 1, ANOVA faktorial campuran untuk pembolehubah APAS telah mendedahkan kesan masa yang signifikan untuk keberkesanan diri, $F(1, 46) = 7.20$,

nilai $p\text{-value}(\eta^2) = .010 (.135)$. ANOVA faktorial campuran untuk pembolehubah PALMS mendedahkan kesan masa yang signifikan untuk; pertandingan/ego, $F(1, 46) = 10.82$, $p\text{-value}(\eta^2) = .002 (.019)$; jangkakan daripada orang lain, $F(1, 46) = 11.05$, $p\text{-value}(\eta^2) = .002 (.204)$ dan keseronokan, $F(1, 46) = 6.64$, $p\text{-value}(\eta^2) = .013 (.130)$. Di samping itu, keseronokan, $F(1, 46) = 6.64$, $p\text{-value}(\eta^2) = .013 (.130)$ juga signifikan untuk kesan kumpulan. ANOVA faktorial campuran untuk pembolehubah komposisi badan antropometri menunjukkan kesan masa yang signifikan untuk peratusan lemak badan, $F(1, 46) = 5.46$, $p\text{-nilai}(\eta^2) = .024 (.106)$; serta kesan interaksi yang signifikan untuk jisim otot, $F(1, 46) = 5.80$, $p\text{-value}(\eta^2) = .020 (.112)$; jisim tulang, $F(1, 46) = 6.66$, $p\text{-value}(\eta^2) = .013 (.127)$ dan kadar metabolisme basal $F(1, 46) = 7.15$, $p\text{-value}(\eta^2) = .010 (.135)$. Bagi Kajian 2, peserta juga memberi maklum balas yang positif bagi ketiga-tiga soalan terbuka. Maklum balas positif yang dipaparkan oleh para peserta telah menunjukkan bahawa *brain-breaks* boleh meningkatkan tahap motivasi dan tumpuan mereka serta meningkatkan proses pembelajaran. Kesimpulannya, keputusan menunjukkan bahawa *brain-breaks* berkesan untuk meningkatkan motivasi dan sikap terhadap aktiviti fizikal; peningkatan aktiviti fizikal dari semasa ke semasa. Oleh itu, penggunaan *brain-breaks* perlu disyorkan supaya ia boleh diterapkan pada peringkat pengajian tinggi di Malaysia.

**THE EFFECT OF BRAIN BREAKS ON PARTICIPATION MOTIVES,
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BEHAVIOUR AMONG TRAINEE TEACHERS IN SARAWAK**

ABSTRACT

Brain-breaks are short mental physical breaks incorporated periodically and can help to stimulate one's health and motivation. The purposes of the study are to (1) examine the effect of brain-breaks on participation motives, attitudes and cognitive functions among the Sarawak's trainee teachers (study one). In addition, this study also aims to (2) examine the effect of brain-breaks on physical activity behaviours among the Sarawak's trainee teachers (study two). During study one, the brain-breaks were conducted twice a day, and five times a week for a duration of 12 weeks. The participants comprised of 48 trainee teachers (24 males and 24 females) aged 18 and 19 years old randomly divided into intervention ($n = 24$) and control group ($n = 24$). The Physical Activity and Leisure Motivation Scale (PALMS), Attitude towards Physical Activity Scale (APAS), MUSE headband and the BC-541 Tanita Inner Scan Body Composition Monitor were utilised. Independent t -test and mixed factorial ANOVA were used to analyse the data. During study two, a total of 12 trainee teachers were recruited from both Institute of Teacher Campuses. They were randomly assigned into two groups (gender matched) which were the control group ($n = 6$) and intervention group ($n = 6$). The Mi Band 4 was used to access the participants' physical activity through brain-breaks. Descriptive analysis, qualitative method of enquiry and interview were conducted at the end of the study. For study one, mixed factorial ANOVA for APAS variables revealed significant time effect for self-efficacy, $F(1, 46) = 7.20$, p -value (η^2) = .010 (.135). The mixed factorial ANOVA for PALMS variables

revealed significant time effect for; competition/ego, $F(1, 46) = 10.82$, p -value (η^2) = .002 (.019); other's expectations, $F(1, 46) = 11.05$, p -value (η^2) = .002 (.204) and enjoyment, $F(1, 46) = 6.64$, p -value (η^2) = .013 (.130). In addition, enjoyment, $F(1, 46) = 6.64$, p -value (η^2) = .013 (.130) was also significant for group effect. Mixed factorial ANOVA for anthropometric body composition variables showed significant time effect for body fat percentage, $F(1, 46) = 5.46$, p -value (η^2) = .024 (.106); together with significant interaction effect for muscle mass, $F(1, 46) = 5.80$, p -value (η^2) = .020 (.112); bone mass $F(1, 46) = 6.66$, p -value (η^2) = .013 (.127) and basal metabolic rate $F(1, 46) = 7.15$, p -value (η^2) = .010 (.135). For study 2, participants had also showed positive responses for the three-open ended questions. The positive phrases revealed by the participants showed that brain-breaks increased their level of motivation and focus as well as improved their learning progress. The results revealed that brain-breaks were successful in improving the motivation and attitudes towards physical activity; increased real time physical activity behaviour. Thus, brain-breaks should be recommended to be used throughout the higher education campuses in Malaysia.

CHAPTER 1

INTRODUCTION

This chapter presents an overview of the background of the study, operational definitions, problem statement and study rationale, research questions, study objectives, conceptual framework and significance of the study.

1.1 Background of the study

Physical activity is defined as bodily movement that is produced by the contraction of skeletal muscles and that substantially. (Casperse et al., 1985). Performing physical activity on a regular basis will help to improve overall health and fitness, helps in cognitive development as well as decrease the risk of various non-communicable chronic diseases. According to the Malaysian Health Minister, Datuk Seri Dr Dzulkefly Ahmad (2019), about 33 percent of Malaysian citizens are at least overweight while 19 percent of the population were obese and hence resulting Malaysia as the most obese country in Asia. A recent data indicates that 60 percent of the world's population fails to meet the World Health Organization (WHO) recommendation that adults should practice in a minimum of 30 minutes of moderate or vigorous physical activity every day. Research also proved that physical activity may improve student's cognitive abilities, attitudes as well as subsequent academic performance (Uzunoz et al., 2017). In order to increase the involvement of young adults in physical activity, intervention is needed.

According to Poobalan et al. (2012), levels of physical activity are low among adolescents aged within 18 to 25 years old, which consequently are vulnerable to weight gain. This transition is oftentimes accompanied by unhealthy behavioural changes or sedentary behaviours. For example, spending time on computer/ game consoles,

whether for work/ study or pleasure, watching television or sitting in class all day. Their results also revealed that many did not commence any new sport after moving to university in spite of being active at school. Pope et al. (2017) also found that the percentage of college students who were overweight or obese had risen from 23% to 41% during freshman to senior year. A study conducted by Wengreen and Moncur (2009) showed that 23% of participants gained more than 5% of their body weight during their first year in college as well as being less physically active during their first year of college, compared to their high school years. Additionally, these sedentary behaviours have been a catalyst to increased physical inactivity among college students and as a result increases the risk of obesity, chronic disease, and early death (Stapp & Prior, 2018; Lynch & Owen, 2015).

Regarding this issue, the environment in schools and institutions of higher learning have integrated technology into their systems to enhance the learning and teaching which have also incorporate the promotion of physical activity as part of the millennium culture. Teachers or lecturers who will guide the youngsters should be prepared with an intervention which may promote physical activity to facilitate a paradigm shift towards a healthier generation. Studies have shown that short physical activity breaks between lessons can improve one's cognitive and concentrations (Willis, 2016). Brain-breaks physical activity Solutions by HopSports is one of the effective strategies which may help young adults to achieve the mentioned goals. Brain-breaks is an exercise video that helps to promote health and wellness. The short activities are usually limited to three or five minutes and work best when they incorporate physical activities (Cox, 2019). The brain-breaks program has provided a platform not only to motivate them to be physically active but also help them to learn new motor skills, coordination, dance, movements of highly integrated functional muscles groups in

movement activity, language, art, music and different cultures (Chin, et al., 2013). Combination of some level of physical movement in brain-breaks tends to be an effective way to stimulate neurological pathways and help both hemispheres of brain to work together. Previous research also indicated that brain-breaks may also improve one's concentration and help to meditate their minds.

1.2 Operational definitions

1.2.1 Brain-breaks

Brain-breaks can be operationally defined as brief pauses or interruptions in a cognitive task, during which an individual engages in a different type of activity that aims to reduce mental fatigue and improve focus. These breaks typically involve physical movement or relaxation exercises and can range from a few seconds to several minutes. These breaks are web-based structured physical activity that stimulates student's health and learning as well as to help students to learn new motor skills, language, art, music, and different cultures (Chin et al., 2013). These videos include martial arts, functional fitness, cardio, jump fit, pilates, various sport skills, training tools and global activities.

1.2.2 Physical Activity and Leisure Motivation Scale (PALMS)

The operational definition of the Physical Activity Leisure and Motivation Scale is a questionnaire that measures an individual's motivation for engaging in physical activity and their likelihood of participating in leisure activities (Morris & Rogers, 2004). The scale also assesses the frequency, intensity, duration, and type of an individual's physical activity during leisure time. Furthermore, the scale includes questions related to sedentary time and assesses an individual's household and occupational activity levels. The scale is a validated instrument that utilises a Likert-

type response format, with higher scores indicating greater motivation for physical activity and engagement in leisure-time physical activity.

1.2.3 Attitudes toward Physical Activity Scale (APAS)

An operational definition of the Attitude Toward Physical Activity Scale (APAS) refers to a tool used in research that measures an individual's favorable or unfavorable evaluative judgment about engaging in physical activity (Mok et al., 2015). The scale typically consists of a series of Likert-type items that assess an individual's beliefs, feelings, and intentions regarding physical activity.

1.2.4 Cognitive functions

Cognitive function is a broad word that refers to mental processes involved in the development of knowledge, interpretation of information, and thinking. Cognitive functions encompass the fields of perception, memory, learning, attention, decision making, and linguistic abilities (Kiely, 2014). An operational definition of cognitive functions may include the specific measurable actions or behaviours that are indicative of each process.

1.2.5 Physical activity

Physical activity is a key component of a healthy lifestyle. To define physical activity operationally, one might describe it as any bodily movement that results in energy expenditure above resting levels, including activities such as walking, running, cycling, swimming, dancing and strength training (Caspersen et al., 1985).

1.2.6 Trainee teachers

The operational definition of trainee teachers typically involves individuals who are enrolled in formal education and training programs that prepare them for a career as an educator.

1.3 Problem Statement and study rationale

Based on a systematic review of trajectories of physical activity (Lounassalo et al., 2019; Popeska et al., 2018; Mechelen & Kemper, 1995), there have been a growing trend of physical inactivity levels that rises with age as physical inactivity starts to decline progressively around the age of school entry. In addition, physical inactivity showed a gradual decline around 13 to 14 years of age in the frequency of physical activity and sport participation through considerable physical activity do occur during youth but reduced considerably during adulthood based on large population studies (Telama & Yang, 2000; Telama et al., 2007; Riddoch & Boreham, 1995).

The 2016 Active Healthy Kids, Malaysia Active Healthy Kids (MAHK) Report Card showed that the majority of Malaysian children and adolescents have low levels of PA, active commuting and high levels of screen time. The percentage of overweight/obese individuals increased with age due to low to moderate physical activity based on the National Health and Morbidity Survey 2019 among Malaysian adult (Sharif et al., 2016; Chan et al., 2017).

The advancement in age has resulted in four-fifths of adolescents, and one-third of adults do not meet the public health physical activity recommendations (Hallal et al., 2012; Meyers et al., 2013). These findings were also consistent with studies in Malaysia related to reduction in physical activity related to age during adolescence as the adolescents were focusing on academic activities and achievements such as pressure to perform well in high school/college and university entrance examinations (Mohammadi et al., 2019). Furthermore, Han et al. (2017) showed a high proportion of college students were in sedentary stages regardless of physical activity levels whereby there were also differences between male and female students for avoiding sedentary

behaviours in the TTM stage distributions. Kwan et al. (2012) study showed a decline in physical activity during young adults' transition into early adulthood with a steep decline when entering the university as the decline in sports participation and physical inactivity re relatively universal even though physical education curriculum differs in different countries.

Even though the national philosophy of education is to produce individually who are intellectually, spiritually, emotionally and physically balanced, it doesn't seem to be factored in the health of the trainee teachers. This is due to the hectic and tiring lifestyle training schedule of trainee teachers has taken a toll on their health of them. Due to the demand placed upon them in campuses may influence and change the trainee teachers' levels of PA. In addition, the lack of motivating and educating on the values of physical activity has prevented the practice of activity being included in their daily word schedule in schools and when they reached adulthood (Rosales-Ricardo et al., 2017). Presently, there is no reviews on PA, attitudes, and participation motives on the Malaysian teacher education campus context as most studies were from the western perspectives, this study will provide a need from a multicultural country to understand and identify the physical activity behaviour, attitudes, and motives for physical activity among trainee teachers utilising brain-breaks as a form of physical activity intervention. The utilisation of the brain-breaks self-determination approach can help explain the changes among the trainee teachers' physical activity behaviour, attitudes, and participation motives towards physical activity the education campus-settings.

With the linkage of physical inactivity with obesity and non-communicable diseases (NCD) on the rise in Malaysia for the past decades (NHMS, 2019) limited research had been done to examine the physical activity among the trainee teachers in

Malaysia who would be the one who can advocate physical activity in the schools in the long run. This is because teachers represent the role model for their students and can motivate them to reduce the risk of obesity and NCD) by having active lifestyle in the future. Studies have shown that physical activity patterns develop relatively early in life which can be influenced by a number of factors such as social, environment and attitudes (Tam et al., 2016).

As educators who have to play an important role in modelling healthy behaviours and become advocates for physical activity not only in the institute classrooms by experiencing and valuing the benefits of physical activity but also incorporating brain-breaks into their teaching in schools which can have important implications to the school children in schools.

1.4 Research questions

1. Are there any significant difference in the effect of brain-breaks in participation motives and attitudes among the trainee teachers in Sarawak?
2. Are there any significant difference in the cognitive functions among the trainee teachers in Sarawak?
3. What are the physical activity behaviours and experience of using brain-breaks on trainee teachers in Sarawak?

1.5 Study Objectives

1.5.1 General objective

1. To examine the effect of brain-breaks on participation motives, attitudes, cognitive functions, and physical activity behaviour among the trainee teachers in Sarawak.

1.5.2 Specific objectives

1. To examine the effect of brain-breaks on participation motives and attitudes among the Sarawak's trainee teachers.
2. To examine the effect of brain-breaks on cognitive functions among the Sarawak's trainee teachers.
3. To examine the effect of brain-breaks on physical activity behaviours among the Sarawak's trainee teachers.

1.6 Conceptual framework

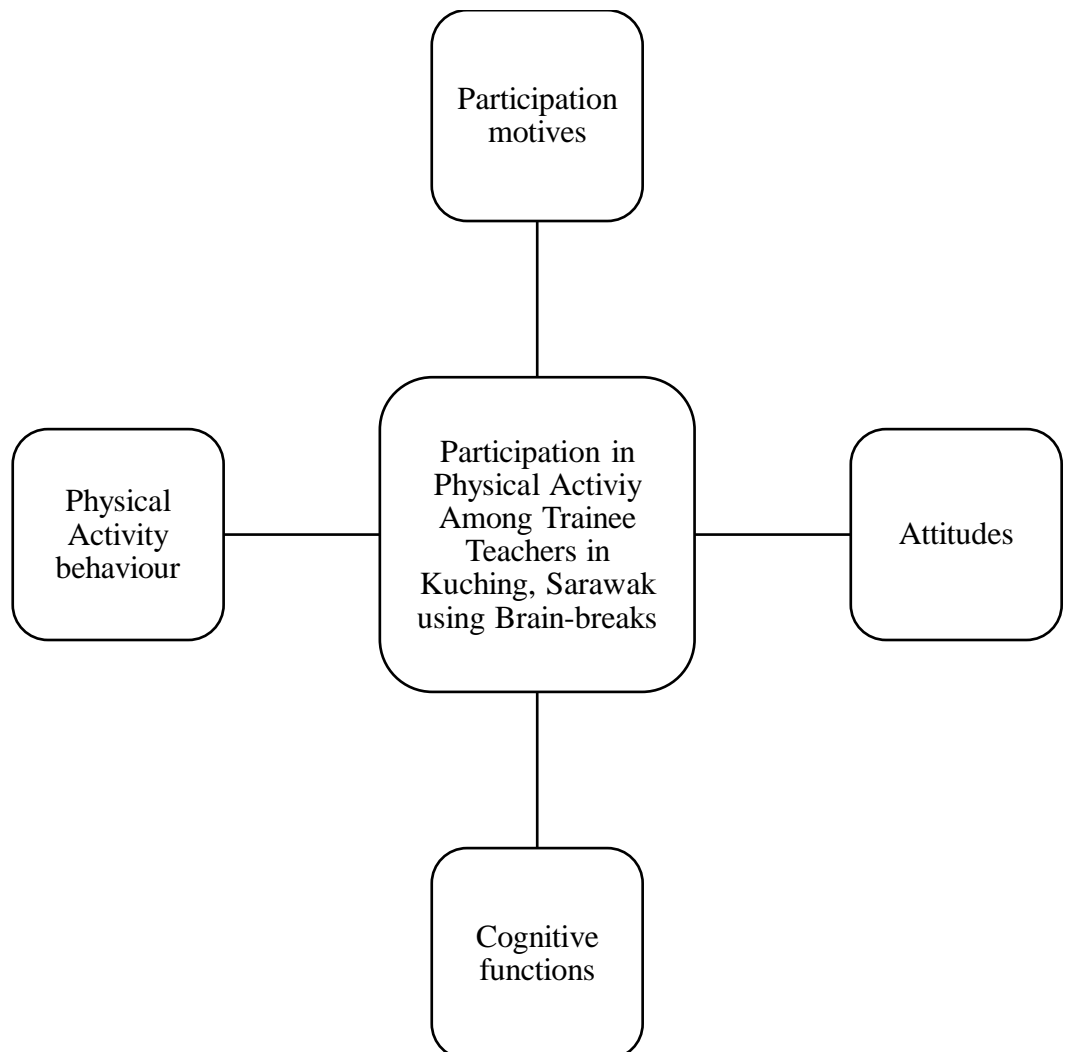


Figure 1.1 Conceptual Framework

1.7 Significance of the study

Individuals of all ages are becoming increasingly sedentary and are not meeting the requirements for their level of physical exercise (Park et al., 2020). This behaviour has become a common behaviour seen among university students in lecture theatres and classrooms as well as after class lifestyle. In early adulthood, high levels of sedentary behaviour have been linked to poor cardiometabolic and mental health while in adults, high levels of sedentary behaviour have been linked to various chronic diseases including diabetes and cardiovascular diseases (Bull et al, 2020). The typical behaviour of students attending classes is to simply sit and listen to a lecture, which means that once students arrive and take their seats, their behaviour becomes sedentary, and there is very little to no PA. This is true despite the fact that there is an uptick in increased physical activity during the college years. Changing this physical-inactivity norm can be accomplished through pedagogy which is by incorporate physical activity into their sedentary class schedule.

The most recent studies on school-based physical exercise programs have showed a positive improvement in students' cognitive abilities and attitudes, as well as in their academic performance and behaviour; very few studies have found any negative effects (Mura et al., 2015). Study done by Hidrus et al. (2020) also shows that brain-breaks can indeed potentially serve as an effective intervention for encouraging patients with type 2 diabetes to engage in PA.

As an educator, it is common to become preoccupied with tasks of assisting students in learning their subject matter that they forget they are working with living, breathing humans who have feelings, personalities, limited amounts of energy, and attention spans. Due to the fact that a significant amount of time is spent on cognitive

tasks throughout the school day, educators are becoming increasingly interested in the correlation between engaging in physical activity and improving cognitive abilities (Sibley & Etnier, 2003). In addition, we were only able to locate a small amount of published information among universities which had effectively adopted brain-breaks in order to increase their level of physical activity and reduce sedentary behaviours. In this context, there is a need for additional study on the implementation of brain-breaks to support the initiatives of policymakers to implement more physical activity programs during the training schedule of the trainee teachers.

CHAPTER 2

LITERATURE REVIEW

This chapter presents an overview of studies on the brain-breaks, self-determination theory, participation motivation, attitude and cognitive functions towards physical activity and literature pertinent to the present study.

2.1 Physical activity among college students

According to the World Health Organization (2022), physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity includes any activities that involve movement which was performed at any intensity. The domains of physical fitness may represent either health or skill-related. As we are all aware, the lack of physical activity is associated with a range of negative health outcomes whereby being physically active may improve physical and mental health. In 2015, the National Health and Morbidity Survey, 2015 reported that 17.5% of the >18-year-old Malaysian population (3.5 million in total) had been diagnosed with diabetes. Over the past three decades, the number of people with diabetes mellitus has climbed more than doubled globally (Chen et al., 2012). Besides that, Malaysia's current obesity rate among adults aged 18 years and older is 19.7 per cent. (National Health and Morbidity Survey, 2019). This means the national adult obesity rate is expected to more than double in about 12 years. Malaysia is also set to experience a "very high" annual increase in both adult and child obesity rates in the coming years (World Obesity Federation, 2023).

Despite the known benefits of physical activity and serious implications of various chronic diseases, research has shown that there is a significant decline in physical activity participation and susceptible to the negative effects of sedentary

behaviour (Liu et al, 2018). A study which was carried out by the Centres for Disease Control and Prevention (2015) involved 223 undergraduate students where the report shows that the level of physical activity levels declined during the transition from high school college years; 65% of the students engaged in regular vigorous physical activity and 26% in regular moderate physical activity during high school. Upon follow-up however, there are only 38% of the students participated in regular vigorous and 20% in moderate physical activity. According to the findings of the National Health and Morbidity Survey, one in four Malaysian individuals aged 16 and over did not exercise (National Health and Morbidity Survey, 2019). Furthermore, the Institute for Public Health (IPH) found that 39% of those adults were students. According to the results of the NHMS: Malaysian Adult Nutrition Survey (MANS) conducted in 2014, 36.9% of Malaysians between the ages of 18 and 59 do not engage in any form of physical activity. Most of the population (74% of the day) spends time on sedentary habits, such as sleeping or lying down (Poh et al., 2010). This is a concerning statistic given the numerous health risks of an inactive lifestyle.

The decline of physical activity among college students can be related to a variety of factors. As students transition from high school to college, they gain greater autonomy relative to their daily lives. Epidemiological findings have reported a decrease in physical activity as autonomy increases throughout middle and high school (Fedewa & Ahn, 2011). During the beginning semester of university, students tend to require a greater amount of time and efforts as they become accustomed to new environment. Hence, they find that their lives become more competitive, and they are required to have a prompt response to the difficult periods in their life without a family (Anuar et al., 2021). Besides, a longitudinal study of college students also demonstrated

that mediators like self-efficacy and perceived benefits can cause lower level of involvement in physical activity (Van Dyck et al., 2015).

Physical inactivity levels are rising in developing countries and Malaysia is of no exceptional. Hence, this is an excellent chance for all college students to evaluate the lifestyle they are now leading and it is vital to explore new strategies in order to drive behaviour change to perpetuate physical activity participation among college students.

2.2 Brain-breaks

Brain-breaks which are brought forward by HopSports (2014) are referred to short mental and physical breaks incorporated in intervals during classroom instructions. According to Chin et al. (2013), brain-breaks can stimulate student's health and learning for the classroom setting to motivate students to enhance their theoretical lessons, learn new motor skills, language, art, music and different cultures. Studies have also shown that short bouts of physical activity benefitted academics, focus and enjoyment and increase physical activity (Donnelly & Lambourne, 2011; Rasberry et al., 2011; Watson et al., 2017). Furthermore, brain-breaks had shown to maintain primary school students' motives in participating in physical activity (Rizal et al., 2019). With the increasing inadequacies of physical activity among Malaysian which had led to more than half of the children and adolescents possessing high levels of sedentary behaviour (Lee et al., 2014). In addition, individuals who were physically inactive during adolescence are more likely to be in active as adults. College-aged students also engage in a greater amount of sedentary behaviours as they encounter a transitional period of life where many begin making independent lifestyles choices for the first time as they transition from secondary schools to institute of higher education such as

universities, institutes and colleges (Bray & Born, 2004; Clemente et al., 2016; Stapp & Prior, 2018). A study by Ferrer and Laughlin (2017) surveyed college student opinions on the influence of breaks during lectures. The researcher found that some students thought breaks were juvenile and others thought they were disruptive to the flow of class. On the other hand, many students described breaks as a opportunity keep their mind awake, relax, regain focus, and to keep the class fun. Brain-breaks consist of different intensities, movements and frequencies of exercise. Each brain-breaks seek to increase health-related fitness such as cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition through physical exercise that ranges from low to vigorous intensity (Kuan et al., 2019).

To apply brain-breaks on adults, only moderate to vigorous exercise activities will be selected during the study. Therefore, when we see the increase of physical activity among primary school level children, we would like to examine weather if there is any significant effect on trainee teachers. Recently, brain-breaks have been used in Malaysians with Type-2 Diabetes Mellitus (Hidrus et al., 2020). The result shows that the amount of physical activity increased in the experimental group while it decreased in the control group. Therefore, brain-breaks can be considered as an effective intervention for motivating adults in improving their amount of physical activity. Furthermore, the Global Community Health (GHC) is exploring the usage of brain-breaks on adult population with 11 countries. Malaysia is also selected as one of the countries to implement brain-breaks among adults. A study conducted by Howie et al. (2015) revealed that students who were given a 5-minute exercise break revealed there was no discernible difference in post-test math scores. However, students performed higher in math scores after taking 10 to 20-minute exercise breaks. By taking brain-breaks, college students tended to reduce mind wandering, have greater learning, better

note-taking and relax during summative assessments (Szpunar et al., 2013). Morton (2016) stated that brain-breaks encourage high school students to engage frequently in History and English classes. This is because the breaks provided an opportunity for them to concentrate more and participate actively as the movement during brain-breaks makes them feel comfortable and relaxed. This is supported by Maddox (2019) indicated that 10-minute brain-breaks are beneficial to enhance attention, focus, calm, relieve stress and increase the level of enjoyment among 10th-grade students even though there was no significant effect on the student's test scores from the pre-test to the post-test.

According to the findings of various pieces of research, the human brain is an extremely complex organ that functions best when it is kept active. According to Rizo (2018), Neurotransmitters are brain molecules that convey messages from one nerve cell to the next across spaces between the cells called synapses." These message carriers are essential to preserving one's composure, one's ability to pay attention, and one's capacity to form new memories. There is a finite amount of neurotransmitters available at each synapse, and those neurotransmitters can be depleted in as little as ten minutes if the same kind of learning activity is maintained (Willis, 2016). It is possible for the brain to become overloaded. Brain overload, or in other words information overload is when the human brain is in a state of constant distraction which can lead to disengagement, a lack of achievement, and a loss of drive. According to the findings of studies that analysed brain scans, our brains do not genuinely rest when we take pauses or breaks. Instead, it is operating in the default mode, which is a situation in which the brain is working on various activities that are essential to learning, such as making sense of complicated information, consolidating memories, and identifying fresh connections (Terada, 2020). While the brain is in what we call "default mode," it is still operating,

but it is doing it using a different area of the brain than when it is actively engaged in learning. It is absolutely crucial for us to make use of this "default mode" in order for us to be able to store memories and information, reflect on events from the past, and think critically about what the future may hold for us (Terada, 2018).

In this matter, brain-breaks may play a vital role in helping trainee teachers to decompress from the demanding packed training schedule that they do daily. By taking breaks during lessons and throughout the lectures, attention-challenged trainee teachers may succeed in doing their assignment more quickly than they would if it were expected to be finished in one long, arduous time period (Budak & Reeves, 2015). According to Riley et al. (2021), brain-breaks that involve physical movement such as jumping and dancing in the classroom stimulate brain power. Incorporating these brief movement breaks might be able to ensure that trainee teachers obtain the exercise they require all day to stay alert and prepared for their lectures. Amongst trainee teachers, brain-breaks are particularly important as they provide an opportunity to reduce stress and mental exhaustion which may be experienced during intense training schedule. Additionally, incorporating brain-breaks into their future classrooms will equip these trainee teachers with the necessary skills and knowledge to create a positive and productive learning environment for their future students. Therefore, it is imperative for trainee teachers to acknowledge the importance of brain-breaks and implement them regularly in their classroom to ensure successful learning outcomes. Furthermore, the implementation of brain-breaks also helps to foster social-emotional learning by providing opportunities for students to engage in collaborative and interactive activities that promote teamwork and social skills. This is especially important in today's world where students' mental health and well-being are becoming increasingly important concerns.

In conclusion, trainee teachers should be given the opportunity to understand and appreciate the significance of incorporating brain-breaks in their daily lifestyle. By recognizing the potential benefits of brain-breaks, trainee teachers can improve their own well-being and better prepare themselves to create a positive learning environment for their future students. They should also be vigilant in monitoring and evaluating the effectiveness of brain-breaks to ensure that they are adding value to classroom instruction. Future research should also explore the most effective types and durations of brain-breaks for different age groups and subject areas. This will contribute to the development of evidence-based guidelines for using brain-breaks among different age groups.

2.3 Participation Motives in Physical Activity

Motivation was defined as the "the energy and direction of activity" (Deci & Ryan, 1985). The direction property of motivation represents the unique level of people's personal interest in one task in comparison to other tasks that are competing for their attention, while the energy property of motivation illustrates the proportion of effort that is set aside in each activity (Deci & Ryan, 1980; 1985). People are varied in terms of their levels of energy and motivation (which determines the direction of their conduct) (Deci, 1980; Deci & Ryan, 1985). For instance, the physical activity motivation of a person who practices yoga is probably not the same as the physical activity motivation of a football player who memorize complex attack and defence patterns and keeping themselves in peak physical and mental shape in order to be able to provide a perfect performance on the field As a consequence of this, it is worthwhile to investigate the factors that stimulate and maintain people's motivation.

Several strategies can be adopted to increase one's motivation and enhance PA. One effective strategy is to incorporate physical activity into daily routines. This can include taking the stairs instead of the elevator or going for a walk during lunch breaks. Another strategy is to find enjoyable forms of physical activity that align with individual preferences and interests. Furthermore, setting achievable goals and tracking progress can also increase motivation in physical activity among adults. By setting specific, measurable, attainable, relevant, and time-bound goals and regularly tracking progress towards them can help individuals to stay motivated and committed to regular physical activity. In addition, adopting a positive mindset and focusing on the numerous benefits of physical activity such as improved health, increased energy levels, better sleep quality and reduced stress levels can also enhance motivation in adults to engage in regular physical activity.

The field of sport psychology has seen the development of a number of different theoretical frameworks over the years, such as the Need for Achievement Theory (Atkinson, 1964), the Attribution Theory (Weiner, 1979; 1985), the Theory of Competence Motivation (Harter, 1978), the Theory of Goal Setting (Locke & Latham, 1990), and the Self-Efficacy Theory (Bandura, 1977, 1986). On the other hand, within the realm of sports and physical activity, there's a theoretical framework known as Self-Determination Theory (SDT) that have served as the foundation for a large amount of research that was conducted more recently on the topic of motivation. It is important to note that Ryan and Deci (2000) asserted that SDT was recognised as a requisite framework of motivation that facilitate our understanding of motivational behaviour along with relevant affective and cognitive results in the physical activity. For example, individuals who are intrinsically motivated to participate in physical activity are motivate by factors such as mastery, enjoyment, skill development and challenge

(Frederick & Ryan, 1993; Kilpatrick et al., 2005), whereas individual who are extrinsically motivated to participate in physical activity are motivated by factors such as appearance, rewards and improved health (Federick & Ryan, 1993; Kilpatrick et al., 2005). As a result, an understanding of the reasons individuals participate in physical activity is vital given the significant role it plays in determining whether or not individuals will engage and stay active in participating physical activity programmes.

Various methods have been adopted by researchers to establish standardized instruments to investigate and study the factors of individual's participation motives in physical activity (Rogers et al., 2008). One such tool that has been widely used among researchers to measure the participation motives in physical activity is the Recreational Exercise Motivation Measure (REEM), developed by Rogers and Morris (2003). Even though REEM has been applied successfully in research, it has raised a concern that the length of the scale might cause inconvenience in sports and physical activity contexts. As a matter of fact, boredom and impatience caused by the length of the scale might affect the answers given by the participants. In order to overcome these shortcomings, Morris and Rogers (2004) proposed that it would be fruitful to develop a shorter version of REEM based on a combination of empirical and theoretical factors which the structure and length would be more appropriate to administer and quicker to complete than the original version. Hence, the 40-item measure, Physical Activity and Leisure Motivation Scale (PALMS), was created. The item consists of 8 separate factors which includes psychological condition, physical condition, appearance others' expectations, affiliation, mastery, enjoyment and competition/ ego. A recent study by De la Cruz et al. (2022) translated PALMS into Spanish and validated it with 596 participants (343 males and 253 females), aged 18 to 53 years. The validation of the Spanish PALMS demonstrated that it is a valid and reliable measurement instrument for the examination

of the factors that motivate the public to participate in sports and other forms of PA. Besides that, As for children, Hu et al. (2015) had shortened the scale to 28 items which comprising of seven factors, removing others' expectation and reducing the least strong item from each motive factor to produce a shorter scale suitable for younger people namely PALMS-Y. The scale was later translated and validated using the confirmatory factor analysis (CFA) into the Malay language (PALMS-Y-M), and the results indicate sound validity and reliability (Kueh et al., 2017).

Past studies have used the PALMS-Y-M (Hajar et al., 2019) to identify the motives for physical activity among Malaysian children, while using brain-breaks as a means of physical activity intervention. The result has shown that brain-breaks had effectively avoid losses in reasons of engagement in physical activity. Furthermore, PALMS-Y-M has shown evidence that it is an effective scale to measure motives towards physical activity, primarily enjoyment, competition, appearance and psychological condition. Research by Ting et al. (2021) has also use PALMS to examine the participation motives towards physical activity among trainee teachers. Therefore, this study attempts to identify the motives for physical activity, particularly among the trainee teachers in Sarawak while using brain-breaks as a mean of physical activity intervention.

2.3.1 Self-determination Theory

Self-determination theory (SDT) developed by Deci & Ryan (1985) is a theory of motivation that aims to explain individuals' goal directed behaviours. The theory proposes that human motivation is driven by three innate needs which are autonomy (deCharms, 1968; Deci, 1975), competence (Harter, 1978; White, 1963) and relatedness (Baumeister & Leary, 1995; Reis, 1994). Autonomy refers to the need for individuals to be in control of their own lives, while competence pertains to the desire to master

new skills and challenges and relatedness involves the need to connect with others and feel a sense of belongingness. SDT posits that when these three needs are met, individuals are more likely to experience intrinsic motivation- the drive to pursue an activity for its own sake, rather than for any external rewards or pressures. This can lead an individual to experience greater sense of well-being, satisfaction, and engagement with life.

Numerous studies have tested and validated the tenets of self-determination theory, highlighting the widespread applicability of the framework across various domains, including education, healthcare, sports and exercise, work, and personal relationships. For example, a study by Jang et al. (2010) found that students who felt autonomous in their learning environment were more likely to engage in deep learning, were more likely to have higher levels of self-reported academic achievement and greater motivation for their studies. Similarly, another study by La Guardia et al. (2000) demonstrated that promoting autonomy in health care settings led to more positive patient outcomes and increased patient satisfaction with the care they received. These findings suggest that the principles of SDT can be utilised to create better learning and healthcare environments where individuals can flourish.

Within the physical education context, this theory has been successfully applied to improve students' motivation towards participating in physical activities. Many studies have demonstrated that SDT-based interventions in physical education settings led to better exercise adherence, increased intrinsic motivation levels and improved academic performance. For instance, a study by Standage et al. (2006) investigated the effects of an SDT-based intervention on British secondary school students' intrinsic motivation towards physical education classes. The intervention group received feedback from their coaches highlighting positive aspects of their performance, setting

personal goals, and enabling choice in sport activities. Results showed that the SDT-based intervention group demonstrated significantly higher levels of intrinsic motivation, enjoyment, and attitudes towards physical education classes than the control group. Similarly, a study conducted by Wang and Li (2015) investigated the effects of an SDT-based program on Chinese middle school students' physical activity levels and psychological well-being. The program focused on providing students with choices for physical activities, setting achievable goals and developing intrinsic motivation. Results showed that students who underwent the SDT-based program reported higher levels of physical activity engagement, autonomous motivation, and psychological well-being than those in the control group. These findings suggest that SDT-based interventions can be effective tools in promoting physical activity engagement, motivation, and well-being in students.

Overall, the self-determination theory provides a valuable perspective on one's motivation and has important implications for creating environments that support individuals' needs for autonomy, competence, and relatedness where it can be used to promote behavioural change among students in physical education settings. In conclusion, it can be argued that the self-determination theory offers a promising approach for educators to foster students' motivation, engagement, and well-being through the provision of choice, feedback, and goal setting. Further research is required to investigate the generalizability of these findings across various populations, cultures, and settings. Moreover, research that explores the underlying mechanisms and processes of SDT-based interventions in physical education settings would be valuable for understanding how they work and for improving their effectiveness.

2.4 Attitudes towards Physical Activity

Physical activity has become an increasingly important aspect of public health due to its positive outcomes on mental and physical well-being. Attitude development starts at an early age. At this point, people may have different attitudes towards various aspects of life. As attitude is influential in most activities, a better understanding of how it impacts perceptions and feelings may offer precious information especially to educators, parents, and coaches. Attitude is one of the most crucial predictor variables in relation to behavioural intentions regarding physical activity. The attitudes of one's towards physical activity is how an individual perceive in their approaches in engaging in physical activity. For example: a student may have strong beliefs that participation in physical activity may increase their level of fitness. This salient belief will determine the student's attitude towards physical activity. If one's salient belief about the attitude object is positive, then favourable attitude ensues. Several studies have been carried out to examine individual's attitudes towards physical activity in different populations.

Studies investigating student's attitude towards physical activity can provide valuable information about what they feel, think, and know about physical activity. A study by Lee and Russell (2003) stated that individual attitudes towards physical activity are influenced by several factors such as perceived benefits, preferences, social support, personal preferences, and impediments to engage in physical activity. Another study by Rhodes and Kates (2015) revealed that attitude towards physical activity is also influenced by self-efficacy, the belief in one's ability to perform physical activity, as well as previous experiences and enjoyment of physical activity. Furthermore, a systematic review by Bauman et al. (2012) found that positive attitudes towards physical activity were associated with higher levels of actual physical activity participation. Similarly, a study by Sallis et al. (2000) reported that environmental

factors such as having access to parks and recreation facilities and the availability of walkways and bike paths can also influence individual's attitudes towards physical activity. In addition, a study by Dewar et al. (2013) found that attitudes towards physical activity can be positively influenced through interventions such as goal setting, social support, and self-monitoring. The more positive an individual's attitude towards physical activity (positive automatic evaluations towards physical activity), the more he/she will be physically active. In theory, attitudes are expected to be connected with physical activity behaviour (Gawronski & Bodenhausen, 2006). According to Davison et al. (2002), the goals and attitudes towards physical activity were frequently mediated by gender and age groups. Male tended to demonstrate more positive attitudes that were more demanding and had a higher level of intensity while female on the other hand were more likely to exhibit positive views that put an emphasis on aesthetic activities such as dancing, gymnastic and aerobics. In terms of age, study had found out that older students are more likely to be physically inactive and their participation in physical activity tend to decrease (Lounassalo et al., 2019).

One such tool that were often used among researchers to measure the attitudes for participating physical activity is the Attitudes toward Physical Activity Scale (APAS). APAS was based on Welk's (1999) youth physical activity promotion model (YDAPA) and it has been utilised in various countries, including those mentioned by Emeljanovas et al. (2018), Glapa et al. (2018), Kuan et al. (2019), Popeska et al. (2018), and Uzunoz et al. (2017) to assess the attitudes of school children towards PA. Specifically, the scale measures their personal estimation of physical fitness, self-efficacy, goal orientation, interest in physical activity, self-awareness of the importance and benefits of physical activity, and its contribution to health and holistic development. The psychometric properties of the scale were disclosed by Mok et al. (2015) through a