



PASSION AND EXERCISE MAINTENANCE, THE MEDIATING ROLE OF FLOW,  
RUMINATION AND MINDFULNESS AMONG LEISURE-TIME RUNNERS IN  
GUANGZHOU CITY, CHINA

LIJUAN YANG

A Dissertation Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
DOCTOR OF PHILOSOPHY IN COUNSELING PSYCHOLOGY

Graduate School of Human Sciences  
ASSUMPTION UNIVERSITY OF THAILAND

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**Title: “PASSION AND EXERCISE MAINTENANCE , THE MEDIATING ROLE OF FLOW, RUMINATION AND MINDFULNESS AMONG LEISURE-TIME RUNNERS IN GUANGZHOU CITY, CHINA”**

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## ABSTRACT

I.D. No.: 6219543

Key Words: Dispositional flow, scale adaptation, leisure-time running, construct validity, exercise maintenance, mindfulness, Mindful Sport Performance Enhancement

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People regularly give up exercise for various reasons, such as boredom and fatigue. Flow experience could be a motivator to predict future exercise behavior. The major aim of this study was to promote exercise behavior by first investigating the factors influencing exercise maintenance (passion, dispositional flow, dispositional mindfulness, and rumination) and then evaluating an intervention enhancing dispositional flow. Therefore, this study was divided into three independent sequential studies. Study I examined the psychometric properties of a translated instrument measuring dispositional flow, the Dispositional Flow Scale–2 (DFS-2); and the other four instruments used in Study II: The Chinese version of the Mindful Attention Awareness Scale (MAAS); the Chinese Version of the Ruminative Responses Scale (RRS); the Chinese Version of the Sports Passion Scale (SPS); and the Chinese version of URICA-E2). Study II investigated the theoretical framework of factors influencing exercise maintenance



using the SEM approach. Study III evaluated the acceptance and effectiveness of a revised four-week Mindful Sport Performance Enhancement (MPSE) intervention utilizing a mixed-method approach. Results from Study I provided adequate evidence to support the Chinese DFS-2 as a reliable instrument for evaluating dispositional flow in Chinese leisure-time runners. The internal consistency of the scale was found to be excellent ( $\alpha = .95$ ). The SEM results of Study II provided evidence for the mediating effect that dispositional flow and dispositional mindfulness have on harmonious passion and exercise maintenance in Chinese leisure-time runners ( $N = 534$ ). The outcomes of study III demonstrated strong evidence of the acceptance and effectiveness of enhancing dispositional flow in Chinese leisure-time runners. After four weeks of the revised MSPE training, 41 runners showed a significant increase in dispositional flow ( $d = 0.53$ , 95% CI for  $d = (0.30, 0.75)$ ). The qualitative results also offered explanations for the intervention's acceptance and effectiveness. We contributed to the field of exercise psychology and the science of health through the present study. The findings from Study II provided strong evidence of the mechanism for maintaining exercise behavior. The findings from Study III provided an effective intervention to enhance dispositional flow. Exercisers (such as leisure-time runners) could enhance their dispositional flow by practicing mindfulness.

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## CHAPTER I

### INTRODUCTION

#### Background of the Study

Exercise can be Panacea; it can convey the demands of the soul and soma. Taking part in exercise is more productive than merely being physically active (Rösel et al., 2022). According to World Health Organization's (2020) suggestion, adults should participate in more than 150 minutes of moderate-intensity or at least 75 minutes of intense physical activity each week. Exercise can improve the following health outcomes in adults: reduce mortality from all causes, reduce cardiovascular deaths (including strokes), reduce the incidence of site-specific cancers, reduce the incidence of type-2 diabetes, and improve mental health (including reduced symptoms of anxiety and depression), improve cognitive function, and improve sleeping patterns; the measure of adiposity might be improved as well (World Health Organization, 2020). Although the abundant evidence of the positive impact of physical activity on general health is clear, and known by most of the population, nevertheless, one out of every four adults do not meet these criteria (World Health Organization, 2010). Indeed, lying on a couch feels much easier than sweating through workout training, especially running. Lacking motivation and feeling bored may be common -obstacles, according to Taylor (1995).

Maintaining exercise behavior, as for some people, just like controlling weight has become a lifetime effort. Exercise routines are frequently dropped, and are more the norm than the exception in certain groups, with up to 50% dropout in some populations (Stetson et al., 2005). Exercise is often done by non-athletes during their spare time, or when they are not

preoccupied with their everyday lives. People's experiences with physical activity and exercise, on the other hand, may differ considerably. For some individuals, exercising is a difficult job that requires a significant amount of effort since it might cause pain and fatigue for them.

On the other hand, exercise is a way of life for some individuals since they are pleasurable and enjoyable leisure activities. Every day, millions of people participate in exercises, and many of them have a strong passion for it. It is something unique, something they respect, and something they are enthusiastic about (Vallerand & Verner-Filion, 2020). However, passion for physical activity might not always result in adaptive effects in the long term (Vallerand & Verner-Filion, 2020).

Encouraging individuals to take part in physical activity has received a lot of attention in the exercise psychology field. Nevertheless, the overwhelming bulk of research in this field has concentrated on the effective exercise-initiated stage, very little effectiveness has been shown in looking for interventions to encourage long-term physical activity (Fontaine, Conn & Clauw, 2011). Most of these treatments are grounded in social cognitive models (i.e., social cognitive theory; Bandura, 1989), reasoned action methods (i.e., theory of planned behavior; Head & Noar, 2014), or stage models of readiness (i.e., the transtheoretical model; Prochaska & Velicer, 1997). The groundwork for interventions in these models is built on the reduction of obstacles to physical activity and the development of abilities to manage behavior. While these strategies are effective in certain areas, their moderate effectiveness in changing behaviors suggests that they have lots of potential for further advancement (Prestwich et al., 2014). For example, Luszczynska and Sutton (2006) argue that the social cognition theory cannot explain why a behavior that was

previously maintained is afterwards abandoned. Nonetheless, interventions based on social cognitive theory could be effective in the initiate stage, but not for exercise maintaining stage (Luszczynska & Sutton, 2006).

The Affective–Reflective Theory of physical inactivity and exercise (ART; Brand & Ekkekakis, 2018) proposes a positive change in core emotional valence during exercise as the key component to predict future exercise. People who experience pleasure, contentment, and satisfaction in exercise settings engage more often and for longer lengths of time, according to Amnesi (2010). Physical activity, like many other health habits, is largely reliant on successful self-regulation, and research suggests that emotional reactions to an activity may be a crucial component of exercise control (Kwan and Bryan, 2010). One of the optimal feelings, flow experience, according to Csikszentmihalyi et al. (2005), is a strong motivator serving the positive emotional valence: “When people are completely immersed in an activity, they tend to find the activity pleasurable and intrinsically rewarding.” Because rewarding activities are more likely to be repeated, the experience of easily completing a task is likely to have a significant positive impact on motivation. Individuals find increasing difficulties when the action is repeated, resulting in increased skill development, competence, and performance (Wong & Csikszentmihalyi, 1991). In other words, the pleasant experience quality of flow has an impact on desire to repeat the activity.

Physical motion, such as that seen in many sports, is especially effective in inducing flow experience (Dietrich & Stoll, 2010). The metabolic stress that the brain experiences during prolonged bodily motion causes a cascading ripple effect throughout the brain that facilitates the

inhibition of mental processes in the explicit system. When the exclusion of the same processes from phenomenal consciousness must be achieved solely by the muscle of focused attention, as in golf, meditation, or playing a musical instrument, this eliminates metacognitive processes about the task more readily than when the exclusion of the same processes from phenomenal consciousness must be achieved solely by the muscle of focused attention (Dietrich & Stoll, 2010; Dietrich, 2006). In other words, a strong physiological mechanism aids the individual in avoiding distractions, allowing the implicit system to easily manage the job. It's possible that this extra mechanism explains why flow experiences are common in sports and exercise settings (Dietrich & Stoll, 2010).

The psychology of peak experience (flow experience) in sport has been connected to instructions like "live in the here and now" and "concentrate on the current moment" (Ravizza, 2002). Mindfulness is another phenomenon with similar characteristics to flow. Mindfulness and flow are linked because they both aim to achieve an optimum and pleasant mental state in which one is completely immersed in the present moment (Sheldon, Prentice & Halusic, 2014). Studies indicate individuals with a high mindfulness level are clearly more open to new challenges as they have a more flexible mindset (Kee & Wang, 2008). The way one sees difficulty is more essential than the actual challenge given in order to experience flow (Jackson & Eklund, 2004). Being adaptable in one's mindset enables one to be less constrained in one's assessment of abilities and difficulties. This may result in a more positive impression of the balance between challenge and ability, allowing flow to occur (Kee & Wang, 2008). Meanwhile, those that are attentive are more likely to be cognizant of their objectives while performing movements

because they have improved self-regulation of attention. This is suggested by a higher flow temperament with defined objectives (Kee & Wang, 2008). The link between concentration and mindfulness is unsurprising, given that the flow state of concentration refers to the ability to concentrate on the job at hand (Jackson & Eklund, 2004). According to research, including mindfulness-based practice into sports and exercise may help promote flow during physical exertion (Kee & Wang, 2008).

There is also a connection between the kind of passion and flow experience, according to research. Individuals with a more harmoniously passionate involvement, are more likely to experience flow. Individuals who have a more obsessive passion, on the other hand, have trouble with flow as they will ruminate about their passionate activities (Carpentier, Mageau & Vallerand, 2012). Some studies show harmonious passion is associated with more pleasant feelings and greater satisfaction in activity engagement (Stenseng et al., 2015; Carpentier, Mageau & Vallerand, 2012). Obsessive passion, on the other hand, is linked to negative consequences such as shame and guilt (Vallerand et al., 2003), as well as a greater risk of burnout (Schellenberg et al., 2013), poorer self-esteem (Stenseng & Dalskau, 2010), rumination (Carpentier, Mageau & Vallerand, 2012) and more intrapersonal conflict (Stenseng, Rise & Kraft, 2011).

### **Statement of the Problem**

Exercise maintenance has received less attention and understanding than exercise in the initiate stage (Fingerhut, 2012). According to the Transtheoretical Model (TTM) of behavior change, individuals in the action and maintenance stages have already perceived the pros of exercise (Wilcox, 2002). In another study, it has been discovered that there are yet more factors



associated with exercise adherence that are not included in the TTM (Wilcox, 2002). These additional factors (e.g., intrinsic, and extrinsic motivation) may be the core component in guiding research in order to establish the difference between the action and maintenance phases that is currently lacking, and thus enhance health promotion program design in the future.

Social cognitive theories, which have a long history of use in exercise intervention research, have outlived their usefulness (Linde et al., 2016). Efforts to understand who will and will not maintain exercise have shifted to examining the emotional determinants of behavior (Conner & Norman, 2015). People are more inclined to participate in pleasurable activities and avoid unpleasant ones. More positive emotional reactions to acute bouts of exercise predict both greater intentions for future exercise and higher rates of exercise involvement up to a year later (Kwan & Bryan, 2010). Therefore, optimal experience during exercise may be the key component to adherence exercise behaviors in maintenance stages.

Passion, according to the Dualistic Model of Passion (DMP; Vallerand, 2015), is a strong tendency toward an activity that individuals like, find significant, and to which they devote time and energy. Despite academics' growing interest in researching passion (Curran et al., 2015), there is currently a dearth of research on the factors that contribute to the development and maintenance of a passion for an activity (Bouizegarene et al., 2018), especially in exercise settings. Meanwhile, the DMP proposed harmonious passion should lead to positive emotional consequences both during and after activity participation, as well as when the passionate activity is not available. On the other hand, obsessive passion is harmful to such emotional consequences since individuals will experience ruminative thoughts during the passionate activity (Carpenier

et al., 2012).

Flow is defined as a psychological experience in which the individual feels concurrently cognitively efficient, driven, and joyful (Moneta & Csikszentmihalyi 1996). As a result, flow has a positive valence and is linked with pleasant emotions. Flow is also linked to greater training motivation, according to Schüler & Brunner (2009). In this regard, flow is the best experience for motivating individuals to run (Engeser, Schiepe-Tiska & Peifer, 2021).

So far, the mechanism underlying two types of passion, dispositional flow and exercise maintenance is not clear. Only one study investigated the different impacts of the two types of passion on flow experiences, rumination, and well-being (Carpentier, Mageau & Vallerand, 2012). Therefore, more investigations are necessary in order to test flow experience, which serves as a key emotional determinant in maintaining exercise behaviors under the Affective–Reflective Theory of physical inactivity and exercise (ART; Brand & Ekkekakis, 2018).

Leisure-time running has become a prominent exercise activity incorporated in municipal and national health programs, due to its cheap entry fees and widespread availability. According to previous research, flow experience seems to be more referenced occurring in endurance running (Dietrich, 2003). The central components of the flow experience, as well as other altered states of consciousness, can be explained by prefrontal cortex processing reductions (Dietrich, 2003). Abstract thinking, self-reflective consciousness, and working memory are lost (phenomenological subtraction), resulting in states of diminished functions (happens in running). Because of a shared mechanism of hypo-frontality, both states are thought to be linked to flow (i.e., reduced frontal activity and executive functioning, Dietrich, 2003).

However, previous studies were only focusing on investigating mindfulness intervention enhancing sport performance (e.g., Kaufman, 2008). So far, only a latest study investigated the effectiveness of an eight-week mindfulness-based intervention enhancing state flow and running economy under different attentional concentration training in runners (Hill et al., 2020). Therefore, it was necessary to investigate the acceptance and effectiveness of a four-week mindfulness-based intervention and how it could enhance dispositional flow in leisure-time runners.

### **Purpose of the Study**

As discussed previously, this study investigated dispositional flow as an emotional determinant for maintaining exercise behaviors by testing the relationship between two types of passion (harmonious passion and obsessive passion), dispositional mindfulness, and rumination, and their impacts on dispositional flow towards exercise maintenance. In this study, leisure-time running was chosen as the objective, because running has remained a potent motivator, with low-cost, friendly, and easy to access alternatives that have made a significant impact in the previous decade (Hindley, 2020). Despite the Coronavirus (Covid-19) pandemic, running in the UK showed no significant changes (Sport England, 2020).

The reason to target on the city due to three major reasons. First, the city of Guangzhou is the third largest in China. In 2020, it had a population of more than 13 million people (Wang et al., 2021). Since the 2010 Asian Games, Guangzhou's running facilities have improved. Moreover, the Guangzhou Marathon is one of the biggest events in China. Therefore, the proposed framework had been studied in leisure-time running population in China, Guangzhou

City. More specifically, a) the direct effect of harmonious passion and obsessive passion on exercise maintenance; b) the indirect effect of harmonious passion on exercise maintenance as mediated by dispositional flow; c) the indirect effect of harmonious passion on exercise maintenance as mediated by dispositional mindfulness; d) the indirect effect of obsessive passion on exercise maintenance as mediated by rumination; e) the indirect effect of harmonious passion on dispositional flow as mediated by dispositional mindfulness; f) the indirect effect of dispositional mindfulness on exercise maintenance as mediated by dispositional flow. This study also aimed to investigate how mindfulness-based intervention enhances dispositional flow in leisure-time runners.

Therefore, the proposed study was divided into three distinct but connected studies (hence referred to as Study I, Study II, and Study III), each with its own aim and methodology, to achieve their goals. In Study I, a cross-cultural study method was conducted for developing a scale for assessing dispositional flow in the Chinese language. The original scale was translated into Chinese and its psychometric properties were tested. The psychometric properties of all the assessment tools were tested as well.

Study II was designed to test the relationships between harmonious passion, obsessive passion, dispositional flow, dispositional mindfulness, rumination, and exercise maintenance by using the structural equation modeling (SEM) method.

Study III was a mixed-method study, with both quantitative and qualitative design to investigate the acceptance and effectiveness of the 4-week revised Mindful Sport Performance Enhancement (MSPE) intervention to enhance dispositional flow in leisure-time runners.

## **Significance of the Study**

This study was significant for three aspects base on the purpose of study in previous discussions.

First, it is anticipated that this study could provide a well-structured base with good psychometric properties tools (the Chinese version of Dispositional Flow Scale-2) for researchers for future flow studies.

Second, through this investigation, a more comprehensive explanation of how to maintain exercise behaviors were provided for the maintenance of healthy behaviors (e.g., leisure-time running). Specifically, enhancing the individual's dispositional flow to promote participation in long-term running. The proposed model had three primary goals: (1) to improve understanding of the mechanism of the dispositional flow experience in maintaining exercise behaviors; (2) to offer a new paradigm for exercise maintenance research by introducing dispositional flow to the exercise settings; and (3) to serve as a basis for future exercise maintenance intervention studies which is mindfulness-based intervention enhance dispositional flow experience during exercise (e.g., leisure-time running).

Third, it is anticipated that through the mixed-method study, an effective mindfulness-based intervention enhancing dispositional flow could be adopted to promote health related behaviors (e.g., leisure-time running) for future intervention studies.

## **Operational Definitions of Terms**

### *Exercise Maintenance*

Exercise was defined as “a subset of physical activity that is planned, organized, and

repeated with the development or maintenance of physical fitness as a final or intermediate goal” (Caspersen et al., 1985). The operational definition of exercise maintenance in this study used the one from Marcus and colleagues (1992): Individuals in the maintenance stage had been exercising on a regular basis for at least six months.

#### *Leisure-time Runners*

The individual takes part in running, lasting at least 20 minutes for three or more times a week of vigorous physical activity (running) by the U.S. Department of Health and Human Services (USDHHS, 1990). Unless otherwise specified, the terms “running” and “runners” refer to “leisure-time running” and “leisure-time runners” in this study.

#### *Passion*

Passion has been described as “a strong tendency toward an activity that individuals like, find significant, and to which they devote time and energy” (Vallerand et al., 2003). In this study, passion in running was measured by the Sports Passion Scale (SPS; Vallerand et al., 2003). The higher the item score, the higher the degree of specific type of passion (Harmonious Passion, or Obsessive Passion), accordingly.

#### *Harmonious Passion (HP)*

Harmonious Passion, which occurs when an individual freely chooses to engage in the activity without attaching certain contingencies to it (Vallerand et al., 2003). People with HP anticipate no extra benefit from participating in the activity other than the pleasure derived from the action itself (Vallerand et al., 2003).

#### *Obsessive Passion (OP)*



Obsessive passion occurs when an individual experiences internal pressures while engaging in a loved activity. People with OP always associate their favorite activity with specific outcomes, such as social recognition and increased self-esteem, and feel pushed and driven to participate in it (Vallerand et al., 2003).

### *Dispositional Flow*

Flow is an optimal experience of being that is intrinsically rewarding (Csikszentmihalyi, 1990). People are fully engaged in the work at hand, they have a high level of activation with positive affect, and they perform at their best (Csikszentmihalyi, 1990). It depicts an optimum psychological state in which the person feels concurrently cognitively effective, driven, and pleased (Moneta & Csikszentmihalyi, 1996). In this study, dispositional flow was measured by the DFS-2 (Jackson & Eklund, 2004) which reflects the individual's general propensity to experience flow on any given day. The higher the total score, the more likely a person is to be experiencing flow.

### *Dispositional Mindfulness*

Mindfulness was defined by the presence or absence of attention to and awareness of what is happening in the present moment rather than by the presence or absence of acceptance, trust, empathy, or the several others that have been connected with mindfulness, according to Brown and Ryan (2003). In this study, dispositional mindfulness was measured by the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The higher the total score represents a higher level of tendency mindfulness.

### *Rumination*

Rumination is a pattern of repeated, unpleasant, and uncontrolled thinking. Unlike worry, rumination is centered on a theme. Because rumination results from a lack of progress toward a goal, ruminative thoughts often include themes related to that lack of progress. Rumination has several negative implications, including an increase in the accessibility of goal-oriented ideas and the preservation of unpleasant mood (Segerstrom et al., 2003). In this study, Rumination was measured by the Ruminative Responses Scale (RRS; Segerstrom et al., 2000). The higher the total score of RRS indicates a higher level of rumination.



## **CHAPTER II**

### **LITERATURE REVIEW**

The objective of this chapter is to review the literature on the factors that influencing exercise maintenance in this study. The current study aims to investigate whether harmonious passion has direct and indirect impacts on the exercise maintenance of long-distance running exercisers, which is mediated by dispositional flow and mindfulness. This study will also investigate the indirect effect of obsessive passion on exercise maintenance as mediated by rumination, the indirect effect of harmonious passion on dispositional flow as mediated by dispositional mindfulness, and the indirect effect of dispositional mindfulness on exercise maintenance as mediated by dispositional flow. The chapter will start with an introduction of the outcome variable of this study, which is exercise maintenance. A theory (The Affective–Reflective Theory of physical inactivity and exercise, ART; Brand & Ekkekakis, 2018) will be proposed as the fundamental theory in this study after the comparison with other existence theories. The ART theory will provide the evidence of connecting exercise maintenance to flow experience. Then, a theoretical flow model will be presented and the relevant variables will be reviewed in the following parts of the chapter. The hypotheses and the conceptual framework will be included in this chapter after all the reviews.

## 1. Exercise Maintenance

Regular physical exercise is linked with a variety of fitness and health advantages and reduces the risk of all-cause death by about 30% in adults (Warburton, et al., 2010). Numerous of empirical evidence suggest it could improve well-being (Petosa & Holtz, 2013; Rowland, 2001), lower the risk of chronic illness (Petosa & Holtz, 2013). Research indicates it also has mental benefits (Petosa & Holtz, 2013). Physical exercise promotes mental health by strengthening the body's resistance to physical and mental stress (Salmon, 2001). There are evidence that active individuals have greater mental health than sedentary ones (Morgan, 1997) since it is more linked to positive emotions (Salmon, 2001). For example, results from Meta-analyses (Calfas & Taylor, 1994) showed that intense exercise improves self-esteem statistically significantly. Exercise, especially Aerobic exercise seems to boost self-esteem more than other types of exercises (Gruber, 1986). Empirical evidence also prove exercise could reduce trait and state anxiety (Long & Van Stavel, 1995) wherein aerobic exercises and longer training periods could reduce anxiety significantly (Long & Van Stavel, 1995). Additionally, exercise could reduce depression symptoms, according to previous studies (Calfas & Taylor, 1994). In short, all the previous researches suggest that exercise has mental and emotional benefits as well (Yeh et al., 2017).

### 1.1 Physical Activity (PA) and Exercise

In the definition of physical activity, body movement generated by skeletal muscles that result in an increase in energy expenditure is included. Kilojoules (kJ) and kilocalories (kcal) are the units of measurement for the amount of energy needed to complete a task (kcal). The

quantity of muscle mass used to produce physiological motions, as well as the intensity, length, and frequency of muscular contractions, are all factors that influence physical activity (Caspersen, Powell & Christenson, 1985). Exercise is defined as “a subset of physical activity that is planned, organized, and repeated with the development or maintenance of physical fitness as a final or intermediate goal” (Caspersen, Powell & Christenson, 1985).

$$\text{Kcal}_{\text{exercise}} + \text{Kcal}_{\text{nonexercised}} = \text{Kcal}_{\text{total daily physical activity}}$$

Above is the relationship between PA and exercise (Caspersen, Powell & Christenson, 1985) in kilocalories consumption. In this equation, kilocalories spend in total daily physical activity equal the kilocalories spend in exercising activities and no exercising activities.

Exercise may be done in a variety of ways. Exercising at less than 60% of one's maximum heart rate (220 minus age) is considered mild exercise. Activity that takes 3–6 times more energy than rest is termed moderate. Moderate exercise includes stair climbing, swimming, and cycling. A person must sweat or breathe hard for at least 20 minutes to be considered vigorous (USDHHS, 1996). Vigorous activities include running, aerobics, swimming, and dancing.

Exercise can also be classified into five categories (Wilcox, 2002): isometric exercise (tightening muscles against an immovable object, generating muscular contraction without whole-body movement; Feist & Brannon, 1988); isotonic exercises (involve muscle contraction and joint movement. i.e., weight lifting; Wilcox, 2002); isokinetic exercise (includes raising and returning to the starting position, often utilizes Nautilus machines; Feist & Brannon 1988); anaerobic exercise (does not consume an increased quantity of oxygen; Feist & Brannon 1988);

aerobic exercise (opposite of anaerobic exercise which is intensity and duration; Feist & Brannon 1988).

### *1.1.1 Endurance exercise*

Endurance exercise is one of the forms of exercise category. The term "endurance performance" refers to performance during whole-body, a dynamic exercise that requires sustained effort and lasts 75 seconds or more (McCormick, Meijen & Marcora , 2015). The term "endurance" often refers to single or combined running, cycling, and swimming events (for example, marathons), although other endurance sports such as rowing, cross-country skiing, and speed skating may also be included. More than 70 events matched the criteria of endurance performance based on a visual examination of the performance timings from the London 2012 Summer Olympics (<http://www.olympic.org/sports>).

The study on endurance performance in sport psychology may be classified into muscular endurance and cardiorespiratory endurance (Brick, MacIntyre & Campbell, 2014). Muscular endurance exercises such as sit-ups often engage just one muscle or muscle group (Kenney, Wilmore & Costill, 2015). In contrast, cardiorespiratory (aerobic) endurance refers to the capacity of the whole body to do sustained, vigorous activity involving vast muscle groups (Kenney, Wilmore & Costill, 2015). This study concentrates on aerobic endurance since it is representative of the whole-body endurance activities that individuals do recreationally and competitively. Aerobic endurance is mainly reliant on energy generated from aerobic which is opposed to anaerobic metabolism. Although the aerobic energy system generates a significant quantity of energy through the burning of carbohydrates and lipids, it does so at a slower pace

than the anaerobic energy system (Gastin, 2001). The aerobic energy system's relative contribution rises with the length of maximum-effort activity, and Gastin (2001) calculated that the aerobic energy system's relative contribution usually predominates after 75 seconds of maximum-effort exercise.

In this study, we only focus on long-distance running, one of the cardiorespiratory endurance exercise behaviors. In the latest combination study, Peng (2021) interviewed 150 Chinese running exercisers in a community sample, 69.33% of running exercisers reported more than 5 kilometers running which belongs to the cardiorespiratory endurance exercise category. 50 individuals reported unequivocally that they would add periodic variable-speed running based on slow running to train their motor coordination and explosive power to a degree. The number of individuals who utilize variable speed jogging on a regular basis was 63, and the general content was slow pace as the main material, with variable speed interspersed appropriately. The majority of these individuals stated they would switch to variable speed running in the half marathon to test their explosive power and endurance. They also utilized variable pace running for the final 100 meters sprint stage. In addition, 17 people reported using speed shifting on occasion, seeing it as a form of entertainment and challenge, and only using it for a small portion of their workout.

### *1.1.2 Definition of Maintenance*

According to Marcus et al. (2000), effective maintenance of PA occurs when formerly sedentary people continue to exercise consistently over a period of time. On the other side, effective maintenance of PA occurs when formerly sedentary people who raised their physical



activity level on their own continue to do so consistently for a length of time. The term “Maintenance” includes either of these two operational definitions in this review. Maintenance may be seen as a continuous process marked by changes in PA behavior over time. Individual behavioral development is thought to be reliant on unique factors that vary in the start and maintenance processes (Burton et al., 1999).

### *1.2 Predictors of Exercise Maintenance*

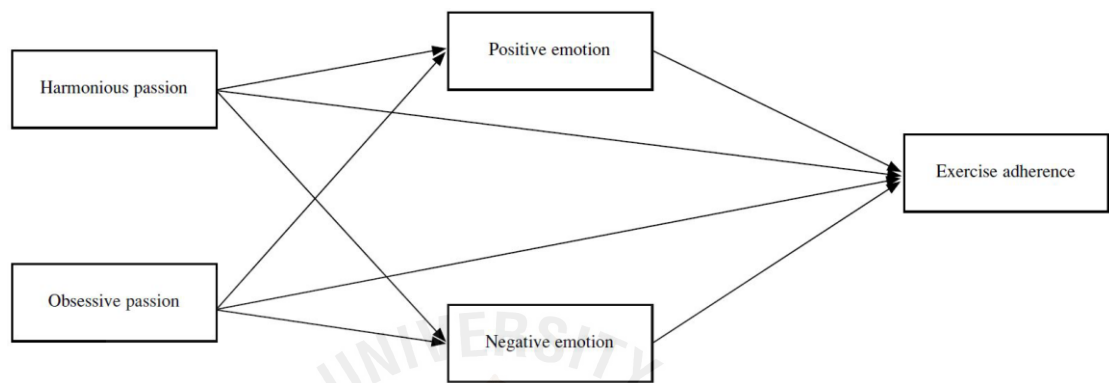
First, research towards athletes suggests passion is their motivation to exercise, which may be one of the numerous variables affecting their exercise behaviors, among many other predictors (Schiphof-Godart & Hettinga, 2017). Passion for their sport may be the motivating factor that provides these athletes with the necessary energy and desire to train, as well as their readiness to tolerate discomfort (Curran et al., 2015) and pain (Mauger, 2014) for the purpose of sporting performance (Vallerand et al., 2007). To perform best in cyclic medium and long-distance exercise, athletes must accurately assess their physiological capacity and manage their training and racing (Foster et al., 2003; Abbiss & Laursen, 2008). Passion may be a significant element in understanding their subsequent exercise behavior, both inside a race and throughout the competitive season, resulting from complex interactions between variables either boosting or decreasing their desire to exercise (Vallerand et al., 2008; Curran et al., 2015).

Bum (2019) conducted a study among 245 exercisers in seven sports centers in Korea. After analyzing the data in SEM, he discovered harmonious passion may improve exercise adherence behaviors (the estimate of direct effect between harmonious passion and exercise adherence is .166,  $p < .01$ ) while obsessive passion had the opposite impact (the estimate of direct

effect between obsessive passion and exercise adherence is - .228,  $p < .01$ , see Figure 2-1.).

**Figure 2-1**

*The SEM Model of Exercise Adherence*



*Note.* Adapted from Bum (2019).

The measuring instrument Bum (2019) used in his study to measure exercise-adherence behaviors was verified by M. L. Kim (2009) in Korea which consisted of a single factor with four items (e.g., “I wish to continue to participate.”).

Another significant predictor is affect. Apparently, engaging in endurance exercise (like long-distance running), lack of motivation, boredom, and discomfort due to duration may be the most common psychological limitations, according to Taylor (1995). In a study using long-term community exercisers sample, Stetson et al. (2005) identified five major high-risk situations that causing exercise lapse or relapse: weather ( $\kappa = .86$ ), time of day ( $\kappa = .75$ ), social context ( $\kappa = .92$ ), physical state (fatigue,  $\kappa = .85$ ), and mood ( $\kappa = .75$ ).

With regard to affective experience, Rhodes and his colleagues (2009) analyzed 34 PA intervention trials and found that affective judgments (Affective judgments are assessments of

the overall pleasure/displeasure, enjoyment, and emotional states that may be anticipated from engaging in physical exercise; Lowe, Eves & Carroll, 2002) were a significant predictor of PA behavior in 85% of the cases in a meta-analysis review. They urge that theories used to predict leisure-time physical activity should be updated to incorporate an affect component as an independent predictor based on this data and speculation (Rhodes, Fiala & Conner, 2009).

### *1.3 Theoretical Approaches*

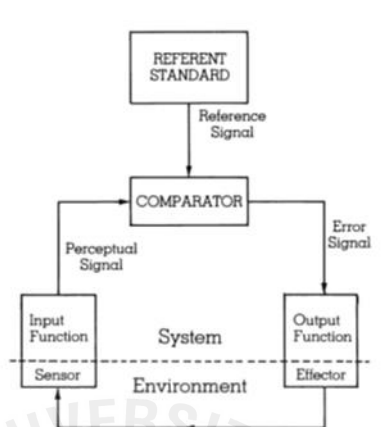
When seen through the eyes of inactive people, starting and maintaining physical exercise, despite its long-term health advantages, is frequently intrinsically stressful. Physical exercise is frequently stressful and unpleasant, particularly for newcomers, with discomfort, stiffness, soreness, poorly perceived self-efficacy, and other negative characteristics (Ulmer, Stetson & Salmon, 2010). “I don't feel like exercising” encapsulates many people's pre-activities mental state when it comes to becoming physically healthy. The advantages of physical exercise, on the other hand, are not sustained without ongoing and regular involvement. Eliminating or significantly decreasing physical exercise may result in the loss of early health benefits (Mujika & Padilla, 2000). Numerous empirical researches have shown that a significant proportion of exercise programs participants drop out within the first six months (Dishman & Buckworth, 1996). While significant progress has been made in understanding what motivates people to begin participating in physical activity, very little study has been conducted on how to sustain involvement in physical activity (Mâsse et al., 2011). Therefore, promoting exercise maintenance continues to be a significant and challenging task for health educators (Petosa & Holtz, 2013). Factors such as time constraints, inclement weather, self-consciousness, and

boredom are often mentioned as impediments to physical exercise adherence (Petosa & Holtz, 2013).

Several phase (e.g., Schwarzer, 2008) and stage (e.g., Weinstein, 1988) and self-regulatory-based models (e.g., Bandura, 1997; Hall & Fong, 2007) theories suggest in the initiation and maintenance stages are influenced by variety of variables. Majority of them recognize a motivational and a post-intentional phase. Furthermore, after a behavior has been started, action control and planning skills are thought to be important in self-regulatory processes that may affect behavior maintenance (Amireault, Godin & Vézina-Im, 2013; Hagger, 2010).

### *1.3.1 Traditional Theoretical Models*

Carver and Scheier's (1982) first build up a self-regulation model based on the control theory which later on is referenced in most theories on behavior maintenance and action control. Action control is depicted in this model as a 'feedback loop' (see Figure 2-2.) in which the observed behavioral results are evaluated in relation to previously stated intentions. A basic feedback loop in which the sensor detects an input and sends a signal to the comparator, where it is compared to the standard. If there is a disparity, an error signal is created, and the system uses the effector to take action to lessen the difference. This perceiving, comparing, and the acting procedure is continued until the disparity disappears (Klein, 1989). The development of positive intentions is therefore one of the conditions for successful self-regulation and behavior maintenance.

**Figure 2-2***Simple Feedback Loop*

*Note.* Adapted from Klein (1989).

Nevertheless, researchers argue that intentions are insufficient to ensure behavior persistence (e.g., Sniehotta, 2009). The difference between intentions and actual behavior exemplifies this point (Sheeran, 2002). The gap between intention and behavior is mostly produced by people who have strong intentions to adopt the target behavior (e.g., exercising) but fail to act (Sniehotta, 2009). It is believed to be a self-regulatory failure (Hagger, 2010). As a result, there must be some other factors to align their behavioral performance with their stated intentions when required (e.g., self-efficacy; Hall & Fong, 2007).

The social cognitive theory (SCT; Bandura, 1998), the theory of planned behavior (TPB; Ajzen, 1991), the trans-theoretical model (TTM; Prochaska & Velicer, 1997), and self-determination theory (SDT; Deci et al., 1994) are current mainstream theories utilized for physical activity adherence (Chen et al., 2021).

Personal cognitive factors, physical and social environment, and behavioral factors are all regulated by reciprocal determinations between them according to the SCT theory (Bandura,

2004). Goals, perceived self-efficacy, outcome expectations, facilitators, and obstacles make up the core set of psychosocial determinants. The self-efficacy construct, according to Bandura (2004), is a major predictor of behavior start and persistence. The importance of the self-efficacy construct as a direct and indirect predictor of physical activity maintenance has been shown in many empirical investigations (White, Wójcicki & McAuley, 2012). When investigating the SCT, however, the existing published research utilized different constructs. Some research omitted key SCT components (e.g., objectives or expected outcomes), whereas others added constructs not suggested by the SCT (e.g., emotional stress or health status). Therefore, it is failed to have stable reliabilities since a range of tools was utilized to test the constructs of social cognition theory (Allen, 2004).

Likewise, for the last three decades, the Theory of Planned Behaviour (TPB; Ajzen, 1985), which is an extension of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975), has dominated research on health-related behavior. Attitude, subjective norms, and perceived behavioral control are the three fundamental components of the Theory of Planned Behaviour (TPB; Ajzen, 1991), and these three components work in concert to influence personal physical activity intentions and behaviors (Ajzen, 1991). Activity is a result of a person's intention to a behavior, which indicates a desire to perform a behavior and is the most proximal predictor of behavior, according to the TPB (Jekauc et al., 2015). Attitude, subjective norm, and perceived behavioral control are believed to define intention. The TPB's applicability to explain physical activity intentions and behavior is supported by a large body of empirical data (Hagger, Chatzisarantis & Biddle, 2002).

Sniehotta and his colleagues (2014) argued that the major issue with the TPB isn't that it doesn't explain enough variation in behavior. The fundamental issue is that some of the theory's propositions are demonstrably untrue. The TPB's mediation assumptions, in particular, are contradicted by facts (Sniehotta, Pesseau & Araújo-Soares, 2014). For example, beliefs, rather than intentions, are often shown to predict behavior (Sniehotta, Pesseau & Araújo-Soares, 2014). More importantly, the TPB appears to be most predictive among the young, fit, and affluent, as well as when predicting self-reported behavior over a short period of time (McEachan et al., 2011), which is less compatible with populations where behavior change theory is most needed (McEachan et al., 2011).

Moreover, TPB makes no distinction between choices about action start and maintenance (Sheeran, Conner & Norman, 2001). Several types of research in the general adult population have tested the TPB in the process of maintaining physical activity behavior, with conflicting results for predicting physical activity maintenance (Armitage, 2005). For example, Armitage (2005) found that only perceived behavioral control, not behavioral intention, was predictive of fitness center attendance in a sample of 94 adult participants who were tracked weekly for 12 weeks.

The TTM (The Transtheoretical Model; Prochaska & Velicer, 1997) has more focused on the various perspective of behavioral change, the degrees, and the urge to change (Prochaska & Velicer, 1997). Since its inception in the early 1980s (Prochaska & DiClemente, 1984), TTM has been used in health behaviors' area and has become one of the most frequently used program design models in health promotion (Spencer et al., 2006). The stages of change, processes of



change, decisional balance, self-efficacy, and temptation to not exercise are all components of the TTM that have been applied to physical activity. The stage of change refers to an individual's preparedness to participate in regular physical activity. Someone in pre-contemplation does not exercise and does not intend to begin during the next six months. A contemplator does not exercise but plans to begin during the next six months. A person in preparation intends to begin exercising within the next month and has made some first measures in that direction. Someone who is currently exercising has been doing so for less than six months. A person in maintenance has exercised for at least six months. Five behavioral and five cognitive methods are used by individuals as they go from pre-contemplation to maintenance (Marcus et al., 1992). Behavioral processes include the employment of a support partner or the administration of incentives (Spencer et al., 2006). Cognitive processes refer to, such as self-reflection. Decisional balancing refers to the process of evaluating the benefits of adopting and/or increasing exercise against the drawbacks, or expenses (Marcus et al., 1994). As the advantages outweigh the disadvantages, a person will go from contemplation to preparation and action. Self-efficacy refers to a person's level of confidence in her or his ability to exercise consistently in TTM (Marcus et al., 1994). The temptation to stop exercising refers to the frequency and urgency with which obstacles to exercise may arise (Hausenblas et al., 2001).

However, the legitimacy of the presence of real phases of behavior change has been a source of contention (Spencer et al., 2006). Sutton (2000) proposed three conditions that must be met in order for a real stage theory to be valid: the stages must not overlap, there must be evident distinctions between participants in each stage, and players must advance through each

stage in the sequence. Cross-sectional study methods have also been questioned for validating the existence of phases since they cannot give evidence of changes over time within a person (Weinstein, Rothman, & Sutton, 1998). At least one exercise-specific research has been published since the publication of these two studies, using a longitudinal study design to evaluate a stage of change measure (Plotnikoff et al., 2001), providing partial support for the applicability of stage of change to exercise. Moreover, in line with TPB, most of the TTM studies focused on White, middle-class, female populations, evidence on the applicability of TTM constructs to a range of people in diverse situations, was unclear (Spencer et al., 2006).

SDT (Self-determination of Theory, Deci & Ryan, 2000) is a comprehensive and developing macro-theory of human personality and motivated behavior. It is derived from a humanistic viewpoint and is therefore primarily focused on need fulfillment, self-actualization, and the achievement of human potential (Deci & Ryan, 2000). To begin, SDT differentiates between internal and extrinsic motivations that influence one's conduct. Intrinsic motivation is described as engaging in an activity for the sake of intrinsic pleasures. When an individual is intrinsically driven, they experience emotions of pleasure, skill development, personal achievement, and excitement (Teixeira et al., 2012). Recreational sport and exercise may undoubtedly be done for the related pleasure or the challenge of engaging in an activity to varying degrees (Teixeira et al., 2012). Extrinsic motivation, in contrast to intrinsic motivation, refers to engaging in an activity for instrumental reasons or to achieving a goal unrelated to the action itself (Deci & Ryan, 2000). Extrinsically driven individuals, for example, participate in an activity in order to get a physical or social benefit or to avoid social rejection. However, SDT

conceptualizes extrinsic motivation in qualitatively distinct ways that vary in terms of their relative autonomy (Teixeira et al., 2012). Within SDT, the controlled extrinsic incentive is anticipated to sometimes govern (or motivate) short-term behavior, but not to maintain it over time (Deci & Ryan, 1985).

SDT defines recognized and integrated types of behavioral control as those in which one's behaviors are self-endorsed as a result of their personal worth. Exercising is an example of doing something because one appreciates the outcomes and wants to preserve good health (Ryan & Patrick, 2009). Thus, in SDT, these various motivational styles are viewed as a continuum ranging from non-autonomous to fully autonomous modes of behavioral control (Teixeira et al., 2012).

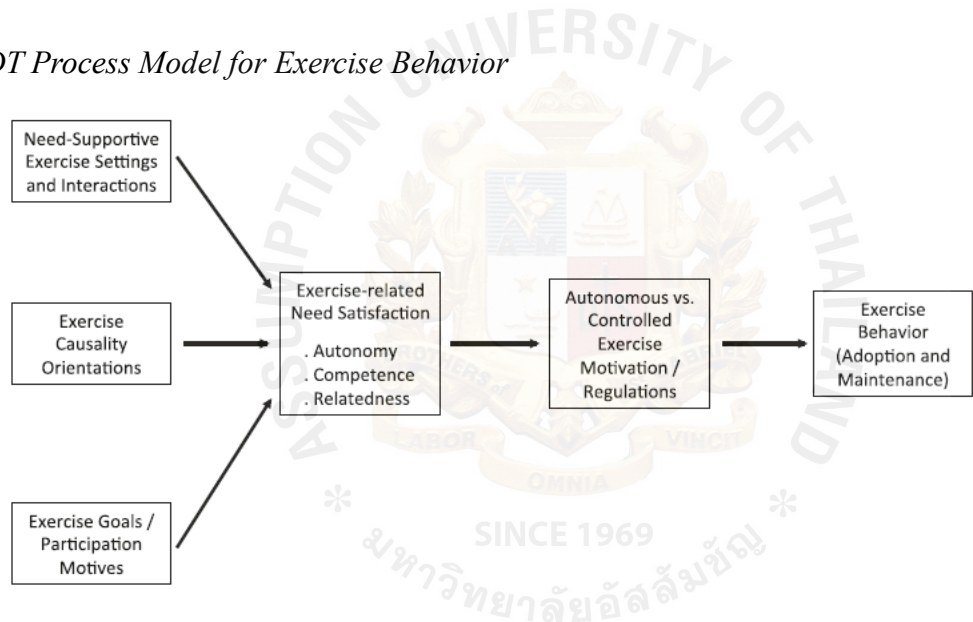
Aspects of SDT that are particularly psychological needs to PA treatments include autonomy, competence, and relatedness (Deci & Ryan, 2008), all of which are seen as necessary for psychological health and the development of internal drive. Satisfying these fundamental needs leads to psychological well-being (Ryan & Deci, 2002).

Sports and exercise may be more or less beneficial to the fulfillment of psychological requirements (Wilson et al, 2006). For instance, perceptions of competence lead to one's success or failure at difficult physical activities or in response to criticism from a fitness instructor. Perceptions of connection with others (other participants in a fitness class) may change the attitude significantly depending on the interpersonal context. In exercise contexts, feelings of autonomy vary according to communication methods. According to SDT, need fulfillment in any context is strongly related to the social milieu's characteristics, specifically whether

significant others support their needs for autonomy, relatedness, and competence (Teixeira et al., 2012). Figure 2-3. shows a generic model of SDT and exercise, highlighting the important elements and theoretical connections. This graph depicts the five sets of factors included as exercise predictors, as well as their predicted connections. The SDT model for exercise assumes that a significant portion of the variance in exercise associated with SDT variables can be explained via indirect or mediating mechanisms.

**Figure 2-3**

*SDT Process Model for Exercise Behavior*



*Note.* Adapted from Teixeira et al. (2012).

Individual variations in the formation and enactment of motivation throughout the lifetime are believed to be mainly explained by the notion of need support (Deci & Ryan, 2000). Interventions that improve participants' basic needs fulfillment are a key element in SDT, particularly in exercise and sports settings (Silva et al., 2010). Another component is participation motivations in which are the goals individuals hope to achieve by participating in the activity (Segar et al., 2006). People have dispositional inclinations, referred to as causality

orientations (Deci & Ryan, 1985), according to SDT, which explain how individuals preferentially orient towards their surroundings, resulting in distinct motivational and behavioral patterns.

In a systematic review, Teixeira and his colleagues (2012) discovered in the later stages of change, external regulation seems to be negatively related to exercise among the males' sample, but not in females'. It is indicated males who are more active may be more resistant to societal demands to exercise. They also discovered that the relationship between introjection and exercise reveals some evidence for a gender difference (Teixeira et al., 2012). Introjection tends to be more favorably connected with exercise among females, but there is a negative or no connection among males, particularly in the maintenance stage of change, when such effects emerge.

In the context of the physical activity maintenance process, the PAMT (Physical Activity Maintenance Theory; Nigg et al., 2008) may be viewed as development and definition of the SCT. The PAMT, which was initially created as a theoretical framework for supporting physical activity maintenance treatments, received much less attention. Physical activity start and maintenance have distinct determinants, according to Nigg et al. (2008), who focused only on physical activity maintenance. Self-motivation and self-efficacy were considered as important drivers and mediators of physical activity maintenance goal formulation. Goal-setting, according to this idea, is task-oriented and linked to behavior via satisfaction, achievement, and commitment to objectives. Self-motivation is a persistent propensity to carry out behavioral objectives regardless of beliefs about reinforcement history, capacity, or control. Self-efficacy,

according to Bandura (1997), is the belief in one's own personal ability to execute a specific activity, while Nigg et al. (2008) distinguished between the barrier and relapse self-efficacy. Although there is meant to be a reciprocal connection between the three factors, each variable has a direct and distinct impact on physical activity maintenance. Furthermore, Nigg et al. (2008) believe that a supportive environment has a favorable effect on goal setting, self-motivation, self-efficacy, and physical activity maintenance, whereas life stress has a negative impact.

In a comparison study, Jekauc and his colleagues (2015) examined the predictive power among TPB, SCT, and PAMT. The best predictive power was found in SCT, followed by PAMT and TPB. Life stress is the only significant predictor in the PAMT, suggesting that individuals with high levels of life stress are more likely to be dropped out of exercise. All other predictors of exercise maintenance, such as goal planning, self-motivation, and self-efficacy, were not significant (Jekauc et al., 2015).

All of the above are united by a fundamental characteristic that derives from cognitivism (Chen et al., 2021). In particular, they all address the need of imagining alternative outcomes (behaviors or goals) in physical activity (PA) change (Brand & Ekkekakis, 2018). Emotional constructions are either disregarded or subjugated to cognitive devices, and the possibility that emotional constructs may function as motivating forces outside of cognitivism is dismissed (Brand & Ekkekakis, 2018). For example, the SCT can only account for around 20% of the variation in PA maintenance on average (Jekauc et al., 2015). Rhodes and his colleagues (2009) analyzed 34 PA intervention trials and found that emotional constructions were a significant predictor of PA behavior in 85% of the cases.



Emotional constructions have been noticed as a potential contributor to motivational processes that drive exercise and physical activity by exercise psychology authors since the discipline's inception. However, the idea that emotional constructs can contribute to motivational processes that drive exercise and physical activity gained traction slowly as evidence accumulated over time from a diverse array of sources (Ekkekakis, Zenko & Vazou, 2021). As a matter of fact, People participate in diverse kinds and quantities of exercise throughout their lifetimes, accumulating memories that are naturally "tagged" with pleasurable or unpleasant emotional valence and do not register in memory purely as "cold" declarative engrams (e.g., what, where, when). Following a series of supposedly varied events of exercise, the idea of "exercise" takes on a summative emotional valence. When the person meets the conceptual category "exercise" (e.g., hears or thinks about it), this summative pleasure or dissatisfaction is immediately engaged. Furthermore, this activated balance, as well as the accompanying action inclination to approach pleasantly balanced tasks and avoid unpleasantly valanced behaviors, impacts any later evaluations, judgments, and behavioral choices related to exercise or physical activity (Ekkekakis, Zenko & Vazou, 2021).

### *1.3.2 The Dual Process Theory-based models*

Dual-process theories, as articulated in cognitive and social psychology, imply that human behavior is determined by two information-processing systems which based on the levels of automaticity or reflectiveness of actions (Brand & Ekkekakis, 2018). One (implicit) is seen to be quick and automatic, requiring little cognitive resources and effort, while the other (explicit) is thought to be slower and more introspective, with more control over thoughts and actions



(Evans & Stanovich, 2013). An external stimulus or an internal stimulus may activate physical activity- and inactivity-related associations in a state of physical inactivity. Learned physical activity/inactivity-pleasure and displeasure connections that leave traces in the associative memory network are used to recall these automatic associations (Brand & Ekkekakis, 2018). The reflective system employs an explicit decision-making process including the use of cognitive resources. The ability of an individual to self-regulate determines whether automatic or reflective processing takes precedence in influencing a particular action (Brand & Ekkekakis, 2018).

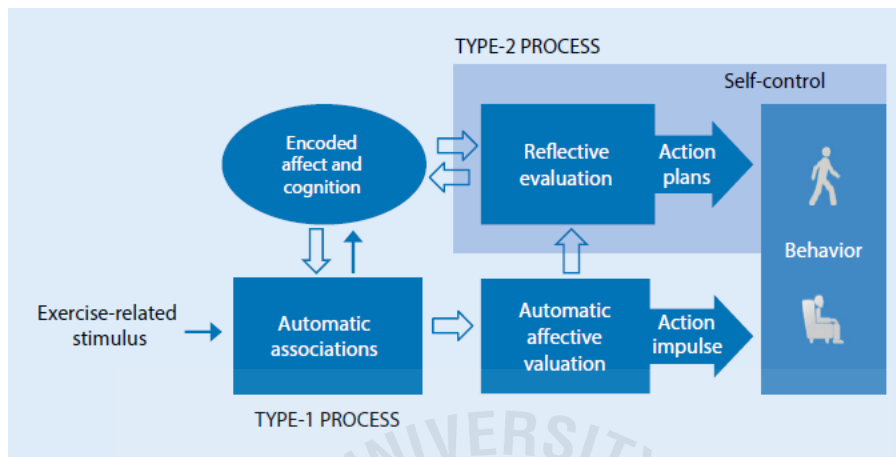
Recently, huge research interest in developing models based on Dual-process theories and different models have emphasized different aspects of its process. For example, the Associative-propositional Processes in evaluation (APE; Gawronski & Bodenhausen, 2006) model emphasized the adoption of exclusively to those mental processes and assess the implicit-explicit terminology. The Reflective-Impulsive Model (RIM; Strack & Deutsch, 2004) focuses on the connections with social conduct, referring to reflections and impulses as the processes that underpin such activity. Although the RIM and the APE model shares certain key assumptions, there are significant discrepancies between these two models (Brand & Ekkekakis, 2018). For example, the RIM assumes that the two processes process separately but simultaneously (Brand & Ekkekakis, 2018).

### *1.3.3 The Affective–Reflective Theory of Physical Inactivity and Exercise*

Humans tend to seek enjoyment and avoid discomforts (Rozin, 1999). This should not be interpreted as suggesting that the pursuit of enjoyments and avoiding discomforts is the only

and final basis of the human drive (Ekkekakis & Dafermos, 2012). However, hedonistic theories differ significantly from most current theories in the study of exercise motivation, which are based on a cognitive core and assert that, given enough information, individuals will inevitably make the rational decision to change their behavior and will be motivated to do so (Brand & Ekkekakis, 2018). In line with it, Brand & Ekkekakis (2018) proposed that negative core emotional valence during exercise reflects this difficulty, particularly in sedentary, low-active, or obese people (Ekkekakis et al., 2016). Affective–Reflective Theory of Physical Inactivity and Exercise (ART; Brand and Ekkekakis, 2018) brings a new dimension to theoretical accounts of exercise motivation by positing that core affective valence can have a significant impact on deliberative reasoning regarding physical activity engagement and effort. It further proposes that core affective valence can have an impact on behavior through behavioral entrainment in certain circumstances.

The Affective–Reflective Theory of physical inactivity and exercise (ART; Brand & Ekkekakis, 2018) is a dual-process theory that focuses on the effects of instantaneous emotional assessments on exercise-related behaviors and decisions (see Figure 2-4.).

**Figure 2-4***ART Model for Exercise Behavior*

*Note.* Adapted from Brand & Ekkekakis (2018).

The ART model assumes that stimuli trigger automatic associations, resulting in an automated affective valuation of exercise (Type-1 Process, see Figure 2-4). If the automatic affective valuation is positive to the stimulation, it will lead to repeated exercise-related emotional experiences mediated by cognitive appraisals (e.g., pride). In other words, the automatic affective valuation is the basis for a controlled, reflective evaluation (Type-2 Process, see Figure 2-4), which can follow if self-control resources are available. The reflective evaluation draws on propositions about exercise and physical inactivity derived from previous experience and mental stimulation. The automatic affective valuation is connected to an action impulse (repeat or avoid), whereas the controlled response can result in action plans (Deci and Ryan, 1985).

In other words, the ART explains people's acute emotional reactions to exercise on how such experiences might impact future exercise behavior (Ekkekakis et al., 2013). Specifically, the majority of people experience unpleasantness during exercise, which may have a significant

detrimental impact on future exercise participation. The ART explains habitual physical inactivity and exercise avoidance as learned behaviors that arise from a spontaneous negative emotional value of exercise, which acts as an influential restraining factor. Ekkekakis and colleagues (2013) suggested interventions should concentrate on limiting unpleasant experiences while exercising and facilitating consistently pleasurable experiences throughout exercising.

Affective reactions to exercise, particularly core affective valence reported at various exercise intensities, as well as the connection between these affective responses and future exercising, have gotten a lot of attention in recent years. Research indicates that a positive change in core emotional valence during exercise is consistently connected to future activity (with modest to medium effect sizes), while post-exercise affect is unrelated to future behavior (Brand & Ekkekakis, 2018). Several types of research have looked at self-reported emotional reactions to exercise and show that negative affect during exercise is linked to avoidance of exercise, particularly in sedentary populations (Ekkekakis & Dafermos, 2012; Rhodes & Kates, 2015). One prospective longitudinal research (Antoniewicz & Brand, 2016), in which higher favorable automatic assessments predicted objectively measured attendance at an exercise course.

Two types of processes are thought to have separate evolutionary origins and neuroanatomical foundations but are psychologically linked (Bickel et al., 2007). Firstly, learned exercise-pleasure and exercise-displeasure pairs, as well as associated propositions, are used to recall instinctive connections. When an association is activated, it leaves traces in the associative network (Strack & Deutsch, 2004). Then, the automatic affective valuation informs type-2

processing whether self-control resources are accessible. This portion of the interaction defines the ART as a default-interventionist model (Brand & Ekkekakis, 2018), in which the automatic emotional valuation is the default-reaction on which the slower, regulated response is based. The automatic emotional appraisal may either be disregarded as a foundation for the reflective assessment or it can affect the controlled process that follows. The resultant feedback loop is necessary for learning. Action plans and action impulses may arise independently of one another (Brand & Ekkekakis, 2018). They may be concordant or discrepant. When self-regulatory resources are few, the action urge will win out (Englert, 2016).

In at least three respects, the ART varies from other dual-process models currently utilized to study exercise behaviors. First of all, it emphasizes on affect and automaticity (Brand & Ekkekakis, 2018). When individuals experience a good or bad feelings, they are said to be experiencing core affective valence. This includes feelings of free-floating pleasure and dissatisfaction, along with pleasant and unpleasant moods and emotions. Core affective valence is felt continuously, but the type and intensity of the feeling may change over time (Ekkekakis, 2013). Moreover, it provides a psychological explanation of exercise that is clearly related to positive and negative affect that occurs during physical activity (Ekkekakis, 2003). Finally, it may explain why people retain their current level of physical inactivity without thinking about it. This is critical because the behavioral phenomena of sedentary living have presented a theoretical challenge to exercise psychology (Biddle & Gorely, 2014).

The premise of a potential approach-avoidance conflict distinguishes ART from other exercise motivation theories (Brand & Ekkekakis, 2018). Theories like the theory of planned

behavior, social cognitive theory, and self-determination theory give excellent explanations of the factors that drive people to choose the alternative activity (exercise), but they leave out the possible restraining influences. The explanation for why people begin physically active, according to these theories, is similar to the explanation for why physically inactive people may maintain their physical inactivity, namely that their motivation to change is insufficient. This is what the ART of physical inactivity and exercise adds: even if the result of the controlled reflection is a plan to go for a bike ride, the inactive person may not have changed his or her behavior and actually carried out the plan because automatically generated restraining action impulse resulting from the automated valuation.

From what has been discussed above, the ART of physical inactivity and exercise may be the best fit than other theories for explaining exercise behaviors under dual-process theory (Brand & Ekkekakis, 2018). Therefore, the ART will be the fundamental theory in this study to establish a conceptual framework for investigating the mechanism of exercise maintenance.

#### *1.3.3.1 Flow Experience in Exercise: An Automatic Affective Valuation*

The ART assumes that experience, feelings, and thoughts connected with exercise influence whether someone would be willing to undergo physical strain similar to that previously experienced during exercise. If the affect valuation (Type-1 Process) is positive, it will present a driving force and thus make it more likely that the person will change his or her current state of physical inactivity (Brand & Ekkekakis, 2018). The ART proposes an "Affective Valuation" process, which is characterized as "the tacit assignment of valence in an associative pairing" of exercise or PA occurrences with the pleasurable or unpleasant affective experiences that result

from these episodes (Brand & Ekkekakis, 2018).

Repeated experiencing pleasure or displeasure in the context of exercise or physical activity (ranging from somatic pain versus exhilaration to complex, cognitively driven emotions, e.g., pride or shame) form an automatic affective valuation (Type-1 Process), namely a tacit assignment of a plus or minus sign to these concepts (Ekkekakis & Brand, 2019). Since pleasure and dissatisfaction are integrally related to impulses to approach or avoid, the later recollection of the notions of exercise or physical activity is thought to immediately remember the associated pleasure or discomfort, as well as the predisposition to approach or avoid them (Ekkekakis & Brand, 2019). Due to the valence associated with these notions being retrieved in an instinctive, quick, and efficient way, the resulting pleasure or unhappiness will "color" or "tint" the slower, reflective processing (Type-2 Process) that follows, impacting any deliberate decision-making and behavioral plans (Ekkekakis & Brand, 2019).

Flow experience, as described by Csikszentmihalyi & Csikszentmihalyi (1990): "The condition in which individuals are so completely absorbed in an activity that nothing else appears to matter; the experience itself is so delightful that people would do it even at tremendous expense, for the pure pleasure of doing it." Flow's "autotelic " is sometimes considered a component of flow (Engeser, Schiepe-Tiska & Peifer, 2021). Individuals attempt to experience flow by engaging in the activities again and again (Schüler & Engeser, 2009), and it is an autotelic or intrinsically satisfying experience in this regard. The flow construct explains why humans take action even when there are no external rewards. As a rewarding experience, flow experiences are enjoyable and lead to positive affect (Landhäußer & Keller, 2012). Smolej-Fritz



and her colleague (2007) conducted a survey of music students and measured dispositional flow in musical activities. They proved a positive correlation between dispositional flow and general positive affect.

Since flow experiences enable people to enter a pleasant mood state, it is possible that they will also encourage top-down processing processes (Landhäußer & Keller, 2012). It is important to note that a significant amount of research indicates that positive affect influences cognitive processing styles in such a way that heuristic processing strategies (based on general knowledge structures) dominate individuals' information processing and judgments (Huntsinger et al. 2010). When people are in a positive affect after experiencing flow, this kind of experience will have an indirect influence on their processing styles in such a way that people who have experienced flow are more likely to depend on top-down processing methods than those who have not experienced flow (Landhäußer & Keller, 2012).

As discussed above, this study will investigate exercise maintenance under The Affective–Reflective Theory of physical inactivity and exercise. Especially, flow experience serves as a key emotional determinant in maintaining exercise behaviors under the ART theory.

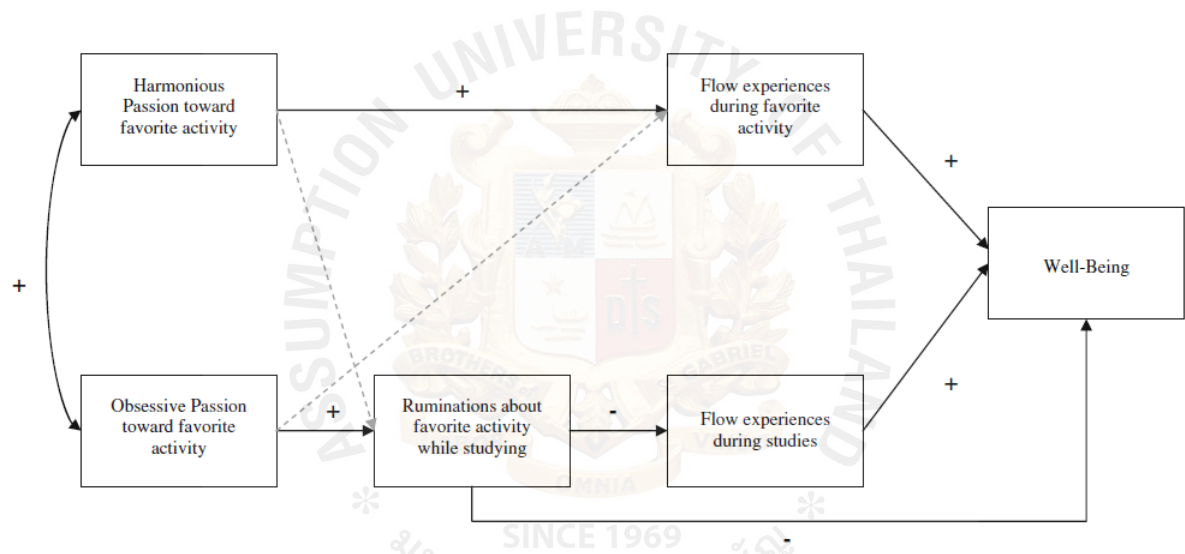
#### *1.3.3.2 The Theoretical Model*

Carpentier, Mageau & Vallerand (2012) examined the psychological processes that underpin the varied effects of two kinds of passion on well-being. Passion, ruminations, flow experiences, and well-being were all examined as part of a theoretical model (see Figure 2-5.). According to their findings, the more individuals who have a harmonious passion, the more likely they are to experience flow in their preferred activity, which predicts greater well-being.

Obsessive passion did not seem to be correlated with the flow in the preferred activity. In contrast, the more obsessive a person's passion is, the more likely they are to ruminate about it while doing anything else, which did not seem to be the case for individuals who have a harmonious passion. These ruminations have a negative relationship with flow experiences in the other activity. These ruminations have a negative relationship with flow experiences in the other activity.

Figure 2-5

The SEM Model of Passion and Well-being



Note. Ruminations and flow experiences have mediating effect between passion and well-being. (Adapted from Carpentier et al., 2012).

Their finding backs up Csikszentmihalyi's (1975) statement that flow is the consequence of complete immersion in one's activities. Flow has therefore been suggested to be hampered by dispositional and environmental variables that distract individuals from task involvement, such as ruminations (Nakamura & Csikszentmihalyi 2009).

1.4 Measurement of Exercise Maintenance

The Leisure Time Exercise Questionnaire (LTEQ; Godin & Shepherd, 1985) was used

to evaluate the individuals' weekly exercise habits. During a typical week, respondents indicated how often they participate in severe, moderate, and mild levels of physical exercise for durations of 15 minutes or more. Higher LTEQ scores suggest that you exercise more often. The LTEQ has excellent 2-week test-retest reliability ( $r = .74$ ), according to Godin & Shepherd (1985). The LTEQ's eight-week test-retest reliability in the present research was satisfactory ( $r = .17$ ,  $p = .01$ ).

The Physical Exercise Stages of Change Questionnaire (PASCQ; Marcus et al., 1992) has shown validity in classifying people's readiness to engage in physical activity. It asks participants to respond “yes” or “no” to four questions about their physical activity involvement. Participants were classified into one of five phases based on their answers, which were utilized in a scoring system (pre-contemplation, contemplation, preparation, action, and maintenance). Individuals who were categorized as being in the pre-contemplation stage were inactive and had no plans to become active in the next six months. Individuals in the contemplation stage were sedentary but planned to begin exercising within the next six months. Individuals in the preparation stage exercised on occasion but not consistently, while those in the action stage exercised on a regular basis but for less than 6 months. Individuals in the maintenance stage had been exercising on a regular basis for at least six months.

University of Rhode Island Change Assessment- Continuous Measure (URICA-E2; Cancer Prevention Research Center 2007; Reed, 1995) is a 32-item self-report continuous scale that measures four stages of change based on the TTM (The Transtheoretical Model; Prochaska & Velicer, 1997). The URICA-E2 is being developed to employ a continuous scale to capture the structure of phases of change for exercise behaviors, which seem to be adaptive for

explaining smoking and eating habits as well (Reed 1995).

## **2. Predictor: Passion**

A lot of individuals are enthralled by their occupation or hobbies, by things, or even by their interpersonal connections (Vallerand, 2010). It seems they are fully attracted by this unseen force that motivate them to pursue their interest. Passion has been described as “a strong tendency toward an activity that individuals like, find significant, and in which they devote time and energy” (Vallerand et al., 2003). Vallerand & Verner-Filion (2020) summarized seven elements of passion as follows: a) It is directed toward a particular activity rather than a broad enthusiasm for anything and everything. There is a unique bond that exists between a person and a certain activity. As a result, one may have a strong desire to engage in one specific kind of sport but not others. Furthermore, passion may be felt for a specific activity, an item, a philosophy, or even a person or team. b) Passion implies a deep and abiding affection for the action. Even if you do something frequently, it doesn't mean is passion. c) It is the high regard for the activity and its perceived importance and significance. A person's passion is often listed as one of the most significant characteristics or elements of their existence. d) Passion is a motivational, not emotional, concept. A passion is something that is lasting and not transient-like feelings. It also drives individuals toward the cherished item or activity. e) Passion generates great amounts of mental energy, effort, and perseverance. f) Passion develops when actions are absorbed as one's identity. This passion activity represents an aspect of his/her. g) Passion is dualistic and may lead to adaptive or maladaptive consequences. There are two kinds of passion, one more adaptable (harmonious) than the other (obsessive).

Passion is so inextricably linked to people's lives, studies have been performed in a range of real-life situations, including employment (Iyortsuun et al., 2020), sports (Frontini et al., 2021), music (Isabirye, 2021), relationships (Beaudoin et al., 2020), and others, examining a variety of activities, occupations (Caudroit et al., 2011), participants, and performance (Boone, Andries & Clarysse, 2020). Moreover, a large number of researches also investigate passion in behavioral addiction areas, such as digital gaming (Johnson et al., 2021), online shopping addiction (Wang & Yang, 2008), Facebook addiction (Mylonopoulos, & Theoharakis, 2021), and gambling (Lee et al., 2014).

### *2.1 Dualistic Model of Passion (DMP)*

DMP argues that individuals participate in different activities throughout their lives to fulfill their fundamental psychological needs of autonomy (a feeling of personal initiative), competence (positive environmental interaction), and relatedness (connection with others). After some trial and error, most individuals develop a predilection for certain hobbies, particularly those that are pleasant and meet the aforementioned requirements. Among these activities, only a handful will be deemed pleasant, significant, and reflective of the individual. These are passionate activities (Vallerand & Verner-Filion, 2020).

DMP identifies three critical phases in the development of both kinds of passion (Vallerand, 2015). To begin, a person chooses one of the many activities accessible to him or her and engages in it. Then, the individual must learn to appreciate the selected activity. Finally, one of two things happens: the valued action gets absorbed in one's identity. This is the most crucial stage since it decides whether the individual's passion will be regulated (OP) or autonomous

(HP).

Obsessive passion (OP), which occurs when an individual experiences internal pressures while engaging in a beloved activity. People have OP always associates their favorite activity with specific outcomes, such as social recognition and increased self-esteem, and feels pushed and driven to participate in it. The opposite one is harmonious passion (HP), which occurs when an individual freely chooses to engage in the activity without attaching certain contingencies to it (Vallerand et al., 2003). People have HP anticipate no extra benefit from participating in the activity other than the pleasure derived from the action itself (Vallerand et al., 2003).

#### *2.1.1 Harmonious and Obsessive Passion: Its Foundations*

The assessment of that activity comes before the internalization of the action towards individual identity (development of passion). According to Vallerand and colleagues (2003), a person will place a higher value on an activity to which he or she has dedicated themselves, even more so if their basic psychological needs (BPNs) are met. According to self-determination theory (SDT; Deci & Ryan, 1985), people engage in a variety of activities throughout their lives in order to satisfy their needs for autonomy, competence, and relatedness.

The type of internalization that occurs during the passion process, according to Deci and Ryan's (1985) self-determination theory (SDT), determines the type of passion (HP or OP) that a person will develop (Vallerand, 2010). Individuals are naturally inclined to internalize activities' rules, but they become less effective at doing it when their basic psychological needs for competence, autonomy, and a sense of belonging are not met. Moreover, extrinsic factors may also have a significant influence on motivational regulations. Fundamental psychological

needs are more likely to be met when the social environment is seen to be autonomy-supportive, whereas self-determined motivation is hindered when the social context is regarded as dominating (Mageau et al., 2009). SDT describes three kinds of motivational regulation: extrinsic, intrinsic, and motivation. Among the kinds of extrinsic motivation are those that are regulated and autonomous. From external regulation to integrated regulation, these kinds of extrinsic motivation vary in that people feel a growing feeling of choice in performing the action, and are considered to constitute a continuum of relative self-determination (Ryan & Deci, 2007).

Harmonious passion arises from a self-directed absorption of the action (Vallerand & Verner-Filion, 2020). Autonomous internalization happens when people voluntarily accept an activity as significant to them without any conditions. The intrinsic and integrative inclinations of the self (Ryan & Deci, 2017) create a motivating drive to participate in the action freely, engendering a feeling of choice and personal endorsement. When harmonic passion is at work, people don't feel compelled to do something, but rather choose to do it (Vallerand & Verner-Filion, 2020). This kind of enthusiasm is in tune with the person's identity and existence. With harmonious passion, the genuine integrating self (Deci & Ryan, 2000) is completely accessible. These processes enable the individual to engage in their passion with confidence, flexibility, and an openness to experience the environment without defensiveness (Hodgins & Knee, 2002; Vallerand & Verner-Filion, 2020) and to be completely present (Vallerand & Verner-Filion, 2020). Therefore, individuals with a harmonious passion should be able to completely concentrate on the job at hand and experience good results both during and after task engagement. Those with a harmonic passion should also be able to adjust effectively when deprived of their



passion and concentrate their attention and energy on other life responsibilities (Vallerand & Verner-Filion, 2020).

People with harmonious passion have control over the action and is adaptable in their approach (Vallerand & Verner-Filion, 2020). They could easily make a choice to get into or not into the passionate activities. For example, when faced with the choice of playing basketball with friends or staying at home preparing for the coming test, people have HP could easily make a balanced decision between his/her love for basketball and focus on studying for the exam. There is a large chance that he or she may choose not to play on a particular day or perhaps stop playing altogether if he/she feel it has become a constant negative influence in his/her study. That is a demonstration of how harmonious passion is at work, this conduct of the passionate action is adaptable.

The opposite side of the coin is the obsessive passion which is the consequence of the activity's-controlled absorption into one's identity. Such an internalization process causes not only the activity representation to become part of the person's identity, but also the activity's values and regulations to be partially internalized, or even worse, completely internalized outside the integrating self (Ryan & Deci, 2017; Vallerand & Verner-Filion, 2020), which results in a phenomenological experience of relative lack of control. Therefore, internally regulating self-processes (Hodgins & Knee, 2002) are at work, rather than integrative and adaptive self-processes. A controlled internalization is caused by a interpersonal pressure, usually, because certain contingencies (Mageau, Carpentier, & Vallerand, 2011; Vallerand & Verner-Filion, 2020) are associated with the activity, such as self-esteem or acceptance or (Mageau, Carpentier &

Vallerand, 2011; Vallerand & Verner-Filion, 2020), or just because of the uncontrollable sense of excitement from the activities.

People who have an obsessive passion may therefore find themselves with an overwhelming need to participate in the activity that they see as essential and pleasant (Vallerand & Verner-Filion, 2020). They can't help but participate in the enthralling action. As the individual is controlled by emotion, it must be allowed to take its course. As a result, individuals are more likely to experience conflict between their passionate activity and other areas of their lives (Vallerand & Verner-Filion, 2020), which may lead to negative emotional, cognitive (rumination), and behavioral repercussions both during and after the activity. Back to the example of previous discussion, if his/her primary interest is obsessive in character, he/she may be unable to refuse the offer to play with his/her friends that night before the exam day. During the basketball game, he/she may be angry with himself/herself for not preparing for the exam instead of playing. As a result, he/she may have difficulty concentrating on playing basketball and may not experience positive affect and flow during that time. He/she may in a ruminated situation by worrying about the exam or blaming himself/herself.

Obsessive passion, as shown above, leads to people displaying rigid perseverance toward the action, as they can't help but participate in the passionate activity. It may provide some advantages at the beginning stage, for example, having a better performance at the activity, but it will eventually milk them dry. According to the circumstance and the kind of work at hand, obsessive passion's lack of flexibility may lead to less-than-optimal performance within the limits of the passionate activity, such as a lack of inventiveness.

It is convinced that such a strict commitment to the passionate activity may cause conflict with other areas of one's life while the person is engaged in it, as well as dissatisfaction and rumination about the activity when one is unable to engage in it (Vallerand & Verner-Filion, 2020). Back to the previous example, even if that boy/girl manages to say no to his/her friends, he/she still suffers ruminations of missing the chance to play with friends instead of concentrating on the study.

### *2.1.2 Factors Influencing the Development of Passion*

Once a passion has been established, social influences may influence its further growth. Studies in organizational area, emphasizes the importance of organizational and interpersonal factors in such a process (Vallerand, 2010), such as, organizational support (employees' perceptions of how much their employer appreciates their efforts and cares about their well-being are referred to as organizational support, Eisenberger et al., 1986). Organizational support would therefore be similar to autonomy support given by the organization to the person. As a result, it is possible to predict that companies that respect their workers' labor and make a real effort to offer them a healthy, comfortable working environment in which their opinions are valued generate circumstances that should foster harmonious passion (Houlihan et al., 2009).

Organizational culture also plays an important role in passion development. According to Cameron and Quinn (2011), two distinct kinds of cultures, clan culture (Encourages good connections and care for individual workers) and market cultures (encourages intragroup competition rather than collaboration), were considered to be important. A clan culture is anticipated to foster harmonious passion, while a market culture is predicted to enable obsessive

passion.

According to the DMP, autonomous support should also aid in the ongoing growth of harmonious passion after it has been established (Vallerand, 2010). Controlling conduct, on the other hand, should aid in the ongoing growth of obsessive passion after it has been ignited (Vallerand, 2010). Thus, autonomy support was the main variable that distinguished HP from OP in one study with children at the intermediate level of expertise (Mageau et al., 2009) and a study with young adults (Mageau et al., 2009). HP, in particular, received more autonomous support from their instructors and coaches in both studies than obsessive passionate people. These findings were reproduced with a separate sample of expert music performance students (Bonneville-Roussy & Vallerand, 2009) and with high-level athletes whose coaches indicated autonomy-support behaviors (Donahue, Rip & Vallerand, 2009).

Vallerand & Verner-Filion (2020) point out that personality might be another predictor of passion development. Study looked at how one's personality influences which activities they choose, how passionate they get about them, and what kind of passion they acquire for them. For instance, perfectionism (Verner-Filion & Vallerand, 2016). Vallerand et al., (2006) proposed that harmonious passion to play sports is linked to high levels of sports value and an autonomous personality orientation, whereas obsessive passion to play sports is tied to high levels of sports valuation and a controlled personality orientation.

Another personal element that seems to be important in passion development is the individual's values. People have intrinsic values are naturally pleasurable to seek because they are congruent with one's psychological requirements of competence, autonomy, and relatedness.

Self-acceptance, connection, and a sense of belonging are all essential intrinsic qualities. Extrinsic values, on the other hand, indicate the relative significance of social praise and rewards. They usually represent a means to another goal. Extrinsic values include financial prosperity, image, and popularity (Kasser, 2002).

In one investigation conducted by Grenier and his colleagues (2009), 100 participants had been answered a questionnaire to evaluate their passion for collecting and their values. All of them have over 22 years of collecting stones and stamps. The results confirmed the assumption that values are an essential personal element that helps to promote or sustain a dominating kind of passion that has been present in the individual for many years.

However, some study has shown that some personality traits, such as the Big 5, are only tangentially linked to harmonious and obsessive passion (Balon, Lecoq & Rimé, 2013). It might be because such studies have only utilized the NEO scale's short form (Vallerand & Verner-Filion, 2020). Vallerand & Verner-Filion (2020) suggested that studies utilizing the whole scale, including the important aspects, may provide a different picture, in which certain facets better predict who gets passionate about a particular activity and what kind of passion they have (harmonious or obsessive passion).

### *2.1.3 Harmonious and Obsessive Passion: Are They Two sides of The Coin?*

The first thing that needs to be solved out is, are they relative with each other? Or are they just the opposite sides of the coin? The answer to this question is yes, they are correlative since they are just different kinds of passions. The relationship of these two passions conceptions has been empirically supported by research by Vallerand et al. (2003) and other researchers.

The results of partial correlations indicated that both passions are positively associated with the passion criteria, such as: activity valuation, time and energy spent on the activity, and measures of the activity being perceived as a passion (Vallerand et al., 2003). For the majority of the studies, the results are in line with the DMP model which these two passions are positively related in various passion activities. In a study that aimed to verify DMP model to explain being a sports (football) fan (Vallerand et al., 2008), researchers reported a positive relationship between these two passions ( $r=.60$ ).

Furthermore, while both types of passion have been shown to be related to one's identity (Vallerand et al., 2003), obsessive passion has been found to be more strongly related to both identity and conflict with other activities in other parts of life than harmonious passion (Vallerand et al., 2003). Basically, these results support the notion that both passions is true "passions," as each represents the passion construct definition. Finally, additional research has shown that OP leads to behavioral addiction and highly risky behavior (e.g., injury in dancers, Akehurst & Oliver, 2014; or cycling on ice in the winter, Vallerand et al., 2003; or gambling, Lee et al., 2014).

Nevertheless, there some studies indicated negative relation between HP and OP, for instant, in a digital gaming study, Wang et al. (2008) discovered a negative correlation ( $r=-.61$ ) between HP and OP. Their explanation to this was that gamers who aren't "addicted" to the game (HP gamers) are more likely to be members of guilds (groups of massively multiplayer online role-playing game players sharing the same goal of mutual cooperation) that emphasize social interaction (a self-determine activity). Players with greater addictive tendencies (like OP gamers)



are more likely to join “raid” guilds, where game objectives are set by the guild leader or senior members rather than by the player themselves. It's conceivable that HP gamers feel more accomplished because they set their own game objectives, as opposed to OP gamers who have game goals set for them by others.

#### *2.1.4 Can Obsessive Passion Be Transformed into Harmonious Passion?*

If the activity is already passionate, it is significant enough to be absorbed into one's personality. Thus, according to the DMP, replacing the regulated by the autonomous internalization process is one method to induce changes from an obsessive to a harmonious one (Vallerand, 2010). This may be accomplished by having the person consider the many ways in which the activity aligns with their intrinsic values (Kasser, 2002) or by identifying the several autonomous reasons why the activity is important to them. A similar problem is decreasing or eliminating an obsessive passion for an activity that has become permanently bad for the individual. This may be the case, for example, with pathological gamblers (Philippe & Vallerand, 2007). Because of the unpleasant character of the activity for these people and its bad impact on their lives, it may be preferable to eliminate the passion rather than transform it into something more harmonious. According to the DMP, this may be accomplished by weakening the valuation process, which is the primary means of internalization (Vallerand, 2010). As an example, in accordance with the above, this might be accomplished by having people identify as many reasons as possible as to why the activity is no longer essential to them, and to expand on these reasons (Vallerand, 2010). Individuals may also go into more detail about why the activity clashes with elements of their identity. Alternatively, according to Plymire (2004), it may be



beneficial to encourage people who are having difficulties with a particular activity, such as compulsive gambling, to develop a positive passion for hobbies that have much fewer negative consequences.

According to Lalande et al. (2017), owing to obsessive passion is caused by a lack of demand fulfillment outside of the passionate activity, developing a love for a second activity may help decrease obsessive sports passion and improve well-being (Schellenberg & Bailis, 2015).

## *2.2 Passion and Cognitive Processes*

Harmonious passion, according to the DMP, should promote adaptive cognitive processes, while obsessive passion should not, or at least less so (Vallerand, 2010). This is because when a person has a harmonious passion, integrative self-processes are at work, allowing them to completely engage in the passionate activity with an openness that promotes attentive attention, focus, and flow (Vallerand, 2010). When OP is engaged, the situation is different because ego-invested processes are involved (Hodgins & Knee, 2002). Individuals with such processes have one eye on the work and the other on external factors like the results and other participants, resulting in a protective orientation that only allows a partial engagement in the activity. As a result, the process should be characterized by a lack of complete attention, focus, and flow (Vallerand, 2010). The result of empirical studies in line with this hypothesis and this fundamental premise has been supported by research in a variety of settings and activities to date. According to a study involving soccer referees, harmonious passion correlates more strongly with focus than obsessive passion when officiating (Philippe et al., 2009). On

game days, soccer fans in England (Vallerand et al., 2008) showed that their intense enthusiasm for the game hindered them from fully concentrating on other daily activities. In a study, participants were asked to complete the Passion Scale as well as identify to what degree they usually feel high levels of attention when engaging in the passionate activity (Vallerand et al., 2003). A similar approach was employed in a gambling study (Mageau et al., 2005) and sport refereeing research (Mageau et al., 2005). Overall, the results indicate that harmonious passion aids attention, while obsessive passion hinders it both during the activity and while waiting to participate in the passionate activity.

Another significant cognitive notion for sport and exercise is flow, which refers to a positive cognitive state that individuals feel when they get fully absorbed in the action (Csikszentmihalyi, 1978). Flow (Csikszentmihalyi, 1978) is another cognitive notion of interest in passion studies. Flow is a desirable experience that individuals get when they are fully engaged in an activity (Csikszentmihalyi & Csikszentmihaly, 1990). Theoretically, harmonious passion should be conducive to focusing on the task at hand and, as a result, to experiencing flow, because it allows the individual to enter the passionate activity with a secure sense of self-esteem, flexibility, and an openness to experience the world in a mindful manner (Vallerand, 2010). Internally controlling instead of integrative self-processes are at work in OP, which leads to the engagement in the activity with a fragile and contingent sense of self-esteem (Kernis, 2003), and eventually becoming defensive rather than open to experience (Kernis, 2003). This is not a good condition to be in if you want to be in a flow state.

According to the results from Vallerand and colleagues (2003) with a significant number

of sport and exercise participants and a study conducted by Philippe and colleagues with soccer referees, a positive link between HP and flow was found. However, this was not the case with OP. Many investigations have confirmed these results in various situations (Vallerand, 2015).

Vallerand and his colleagues (2003) asked individuals engaged in a range of activities to complete the flow scale and the Passion Scale. On the other hand, harmonious passion promotes the feeling of flow, while obsessive passion does not. These findings have been confirmed in several studies, including one with 90 French soccer (Philippe et al., 2009) and another with employees in various occupations (Forest et al., 2009). Philippe and his colleagues (2009) found that refereeing with a harmonic passion was linked to positive emotions and flow during games. On the other hand, obsessive passion for officiating was unrelated to pleasant feelings or flow but was strongly linked to negative emotional experiences during games. Moreover, referees with a prominent harmonious passion made better decisions than those with an obsessive passion.

More study has also been done on rumination, which is a negative type of cognition. Rumination is described as repeated conscious thoughts on a certain topic or item in the absence of urgent external pressures to do so (Martin & Tesser, 1996). Although ruminating on an issue may have some limited benefits, it usually has negative consequences since it hinders individuals from completely focusing on other problems (Kashdan & Roberts, 2007). Obsessive passion has been shown to be positively linked with rumination in a variety of studies, while harmonious passion is not. Curran et al. (2015), for example, found that obsessive passion for a particular activity, including those including sports participation as a player, referee, or spectator, had a somewhat favorable impact on rumination in their meta-analysis. Harmonious passion, on the

other hand, had no impact on ruminating. As a result, the two kinds of passion are linked to cognitive functioning in distinct ways. HP, on the one hand, contributes to the most adaptable processes. OP, however, is linked to less adaptive cognitive processes.

### *2.3 Self-Regulatory Processes and Passion*

Passion may also have an impact on the quality of self-regulating processes in sports and exercise, as well as the outcomes. Overall, according to the DMP, harmonious passion allows people to access adaptive self-processes, while excessive passion does not, and may even allow people to access maladaptive self-processes. Motivation is the initial self-regulatory mechanism. Curran et al. (2011) found that HP positively predicted a self-determined motivation measure, which, in turn, adversely predicted athletes' burnout, in a study of top junior soccer players. As has been shown in previous burnout studies, harmonious passion may prevent athletes from burnout (Vallerand et al. 2003). On the other hand, obsessive passion was not linked to burnout or the motivation index. The connection between the two kinds of passion and each particular type of motivation suggested by self-determination theory may be more complex than the results from the Curran et al. (2011) research, according to a recent meta-analysis (Curran et al., 2015).

HP is positively correlated with intrinsic motivation and identified regulation (Vallerand, 2008), less with introjected regulation, unrelated to external regulation, and negatively related to motivation, according to aggregate correlations from several studies (e.g., Hodgins & Knee, 2002; Niemiec, Ryan & Brown, 2008). Vallerand and Verner-Filion (2020) pointed out that OP is unrelated to intrinsic motivation, weakly but positively linked to identifiable regulation, but significantly and positively connected to introjected and external regulation, as well as weakly

but positively related to motivation.

Other studies have looked at ways to manage stress while participating in physical exercise. For example, Lucidi et al. (2016) found that harmonious passion was associated with lower stress levels in marathon runners. Obsessive passion, on the other hand, was shown to be positively linked to stress. Surprisingly, these effects were achieved when training frequency was controlled. These findings indicate that the quality of participation in the activity is more important than the amount of participation in predicting stress in runners. These results were substantially reproduced in athletes with pre-competition cognitive distress (Verner-Filion et al., 2014).

It's possible that the aforementioned disparity between passion and stress is related to the usage of coping techniques (Vallerand & Verner-Filion, 2020). Harmonious passion should be more likely to be linked with the adoption of an adaptive, approach-oriented coping mechanisms since it involves an open, nondefensive, and attentive involvement in sports. Obsessive passion, on the other hand, is the result of a protective and ego-centered involvement in the action. Because there is so much at risk with obsessive passion, avoidance-oriented coping techniques are more likely to be used (Vallerand & Verner-Filion, 2020).

In athletics, these ideas have lately gained empirical support. Schellenberg et al., (2013) found that harmonious passion was linked to task-oriented coping, while obsessive passion was linked to disengagement coping in a study involving volleyball players. Over a three-month period, task-oriented coping predicted improvements in objective progress and reductions in burnout. For disengagement coping, the opposite trend was found. Verner-Filion et al., (2014)

conducted two investigations with athletes from diverse sports and used two different coping measures to replicate the results of Schellenberg et al (2013). Finally, during the 2012–2013 NHL lockout, the aforementioned results on the approach character of coping promoted by harmonious passion and the avoidance viewpoint of obsessive passion were essentially reproduced in another research with hockey fans (Schellenberg et al., 2013). To deal with not being able to watch hockey due to the NHL lockout, excessively enthusiastic fans were shown to be more prone to engage in maladaptive coping strategies such as drug misuse.

#### *2.4 Passion for Running*

Passion refers to a strong attachment to self-described activities that individuals value and to which they devote a significant amount of time and effort (Vallerand et al, 2003). This bond is believed to form in a dualistic way, depending on how the activity is integrated into the self-concept (Vallerand, 2008). When the reasons for participating in sports are personally supported and completely incorporated into one's self idea, harmonious passion emerges (Mageau et al., 2009). When an individual chooses to engage in a sport entirely on their own will, without any feeling of duty, they are identified with HP.

Vallerand (2012) suggested that HP would lead to a desire to exercise, which is associated with improved focus and pleasant emotions. These kinds of positive emotions have been related to the development of optimal experience during sports, as athletes may utilize and regulate their emotions to lead them toward optimal performance (Baron et al., 2009) and intelligently evaluate their choices (Curran et al., 2015). Harmonious passion also helps athletes prioritize long-term advantages above short-term profits (Curran et al., 2015) and shields them from negative



distractions, unrealistic objectives, and tension during training (Curran et al., 2015).

Obsessive passion, on the other hand, emerges when sports involvement is governed by internal factors such as the need to affirm or defend one's self-worth, and is only partly integrated into one's self-concept (Mageau et al., 2009). When an individual feels forced or obliged to participate in sport, they have obsessive passion. Depending on the kind of passion that motivates people to participate in sports, a variety of cognitive, emotional, and behavioral variations may be expected. Such distinctions reflect the different sources of behavior, which are agentic and volitional in harmonious passion but ego-invested self-structures in obsessive passion (Vallerand, 2008).

Obsessive passion may seem to be helpful on the surface, but it almost always has negative consequences, both in the short and long term (Curran et al., 2015). This kind of passion is linked to negative affect, tension, anxiety, and feelings of guilt during exercise due to its obsessive character (Curran et al., 2015). Given the difficult challenge of balancing training and competition loads over a season (Bridekirk et al., 2016), obsessive passion is anticipated to be especially detrimental. In obsessive individuals, this poor decision-making about exercise activity may lead to overuse injuries, overtraining syndrome, and burnout (Curran et al., 2015).

Dealing with unpleasant emotions while still focusing on the task is intellectually and emotionally draining during running, thus obsessive passion reduces runners' capacity to concentrate and achieve a state of "flow" (Bridekirk et al., 2016). Furthermore, it impairs endurance performance by generating exaggerated sensations of effort or incorrect assessments of the runner's capabilities (Bridekirk et al., 2016). A strong preoccupation with their activity



may therefore make them unable to sensibly control their efforts (Bridekirk et al., 2016), leading to hazardous, all-out pacing tactics and an unwillingness to accept the loss (Bridekirk et al., 2016). Obsessive runners may also ignore the limitations of their physical and mental capabilities for the sake of a quick win (Curran et al., 2015), ignoring logical and "safe" choices that might avoid accidents, overtraining, and overuse injuries (Rip, Fortin & Vallerand, 2006).

In all, harmonious passion has been shown to be positively linked with life satisfaction, positive affect, and vitality in sports research. Obsessive passion, on the other hand, is linked to inflexible perseverance, life conflict, physical injuries, and avoidant tendencies (Vallerand, 2012). These results are consistent with other studies in this field, which indicate that HP is likely to be adaptive for individuals, while OP may lead to detrimental effects (Curran et al., 2013).

### *2.5 Measurement of Passion*

The Passion Scale was developed to assess DMP (Marsh et al., 2013). The scale has two six-item subscales that measure HP and OP for a specific activity. It also includes a set of five (time, liking, value, passion, identity), single-item criteria used as correlates to determine whether the participants' involvement in the activity can be classified as a passion. For an instant, how much time spent on the activity, love for the activity, value activity, perceived it as a passion, and perceived it as a part of one's identity. All questions are graded on a seven-point Likert scale (1=complete disagreement; 7=complete agreement).

Through exploratory and confirmatory factor analyses, studies have supported the factor structure of the Passion Scale (Vallerand, 2015). Internal consistency, predictive, discriminant, and external validity have all been shown for the Passion Scale (Vallerand, 2010, 2015).

Furthermore, both HP and OP scores have shown strong correlations with the passion criteria of activity valuation and loving, time and energy expenditure for the activity, and measures of the activity being perceived as a passion, implying that the definition of passion can be supported (Vallerand et al., 2003).

Later studies shift the attention to shorter versions of the scale. Vallerand et al. (2006) proposed a test with just six questions, Vallerand et al. (2008) devised an eight-item scale, and Cid et al. (2014) proposed an eight-item test for Portuguese athletes. Vallerand (2010) presented a new version of the Passion Scale that included 12 items in two factors with some minor changes. However, when connecting measurement errors between two items in the HP factor and two items in the OP factor, these versions of the PS only exhibited an adequate data fit. This may imply that the shorter versions are preferable for assessing these variables.

Hair et al. (2014) suggested four items scale. It is applicable when the models are complicated and exhibits construct validity issues associated with higher numbers of items, this approach is typical in scale validation (Monteiro et al., 2018). The Passion Scale founder has utilized this approach effectively in a number of studies as well (Vallerand & Miquelon, 2007; Vallerand et al., 2006; Vallerand, et al., 2008). According to these researches above, the shorter versions may be a better option than the complete version.

The Passion Scale has also been proven to be helpful as a predictor of outcomes or as a mediator in studies (Marsh et al., 2013). HP promotes more adaptive outcomes on a number of intrapersonal outcomes (e.g., positive affect, flow; Vallerand, 2015), whereas OP contributed to negative affect and correlated positively with performance (Marsh et al., 2013). People with HP

describe a pattern of desire to learn and grow in their activities, with minimal activity conflicts and high life satisfaction. Individuals with OP, on the other hand, are restricted to impoverished functioning due to nonintegrated self-regulation, negative emotion, and additive activity. Relationships between passion and intrapersonal outcomes are stable, similar to the Passion Scale's age and sex invariance (Marsh et al., 2013). Females have a higher life satisfaction-harmonious passion connection, whereas in the workplace, senior employees have a stronger burnout-obsessive passion relationship (Curran et al., 2015).

Parastatidou et al. (2012) examined the psychometric property of the Passion Scale scores (Vallerand et al., 2003) in the context of exercise. Two samples of Greek exercise participants provided self-report data. The Passion Scale and the self-determination theory variables of perceived autonomy support by the exercise instructors, psychological needs, and exercise regulations were collected from Sample 1 ( $n = 217$ ). The Passion Scale and exercise enjoyment, as well as the frequency of exercising, were collected from Sample 2 ( $n = 299$ ). The two-factor structure of the Passion Scale was tested by CFA. Factor discriminant validity, internal consistency, and convergent validity were also shown to be valid.

### **3. Mediator: Flow**

Csikszentmihalyi (1975) proposed the concept of flow, which he continuously improved in subsequent researches, eventually transforming it into a systematic theory. According to Csikszentmihalyi (1975), flow occurs when people are engaged in an activity that is so pleasurable that everything else becomes irrelevant. People are willing to pay a high price to repeatedly enter that optimal experience. People are in a state of balance between anxiety and

relaxation during this experience, which is also dependent on the match between their skills and the perceived challenges they face. Additionally, flow has been portrayed as the ultimate self-fulfilling experience — one that exists solely for the sake of its own existence. Even while climbers and basketball players were included in Csikszentmihalyi's initial study (1975), it was not until 1992 that the first empirical studies that explicitly incorporated flow research into sport were published (Jackson, 1992, Jackson & Roberts, 1992). After that, numerous studies have shown a favorable correlation between flow and a number of subjective performance measures across a broad spectrum of individual and team sports (Stavrou et al., 2007; Soulliard et al., 2019). Flow has been associated with both general athletic performance and peak experience (Swann et al., 2016).

### *3.1 The Concept of Flow*

Flow is an optimal experience of being that is intrinsically rewarding (Csikszentmihalyi & Csikszentmihalyi, 1990). People are fully engaged in the work at hand, they have a high level of activation and positive affect, and they perform at their best (Csikszentmihalyi & Csikszentmihalyi, 1990). It depicts an optimum psychological state in which the person feels concurrently cognitively effective, driven, and pleased, according to Moneta and Csikszentmihalyi (1996)'s descriptions.

Given how desirable this state is, thinking about ways to improve flow is a worthwhile research topic. The flow state is viewed as a complicated, multi-faceted phenomenon. It is characterized by a high degree of concentration on the task at hand, according to Csikszentmihalyi and his colleagues (2005); all attention is focused on the activity, and irrelevant

stimuli or thoughts are temporarily blinded out of consciousness. There is no longer a distinction between the ego and the activity. When one's action and awareness come together, it's called synergy. People suffer from a lack of self-consciousness in the sense that they are not aware of their own existence (e.g., no concerns or fears). They have a strong sensation of control over their activity while they are in a flow state. In addition, there is frequently an altered perception of time; time appears to move faster. Finally, people love the activity and see it as intrinsically fulfilling. What they're doing appears to be worthwhile in and of itself (experience becomes autotelic). In a nutshell, flow is the ideal psychological state which attracts people.

### *3.2 The Characteristics of Flow*

#### *3.2.1 Autotelic Experience*

The character of autotelic is often considered as a component of flow (Engeser et al., 2021). Individuals try to achieve flow on a regular basis because it is extremely gratifying. The motivation comes from participating in an activity that is an autotelic gratifying experience (Schüler & Engeser, 2009). The flow construct explains why humans do things even when there are no apparent external benefits, which helps us understand the human motivation (Engeser et al., 2021). In addition, the rewarding nature of flow experiences has several ramifications and consequences, suggesting that flow has generally positive impacts on the individual (Csikszentmihalyi 1997).

#### *3.2.2 Optimal Experience*

Csikszentmihalyi & LeFevre (1989) named flow “optimal experience” as such because it is characterized by the “simultaneous occurrence of cognitive efficiency, motivation, and joy”

(Moneta & Csikszentmihalyi, 1996). The sensation of pleasure, therefore, is correlated with a sense of enjoyment. Further research has demonstrated that low preconditions (the balance of skills and challenge) promote engagement and pleasure. Keller and Bless (2008) suggested that individuals who played Tetris in an adaptive version expressed more enjoyment and involvement in the game than individuals who did not meet a match between skills and challenges. This is true for both the knowledge (Keller et al., 2011) and arithmetic (Keller et al., 2011) tasks.

### *3.2.3 Intrinsically-rewarding Nature*

Flow has been characterized as enjoyable by people who experience it from the first conversations with artists, doctors, basketball players, and others (Csikszentmihalyi, 1975). Several characteristics seem to play a role in the intrinsically-rewarding of flow (Engeser et al., 2021). The first one, especially in the context of physical exercises is feelings of efficacy (Abuhamdeh, 2021). Given the typical ideal levels of challenge associated with flow activities, chances to practice one's skills (e.g., I am good at running!) are particularly high during flow. As a result, feelings of effectiveness are expected to be strong during flow, which may explain why people experience a "sense of control" during flow (Abuhamdeh, 2021).

The intense attentional engagement that is so typical of flow is another trait that is likely to contribute to its pleasant, intrinsically-rewarding nature. The intensive allocation of attentional resources to the task at hand allows the features of the activity that elicit interest to be experienced more fully and enjoyable than other activities (Abuhamdeh & Csikszentmihalyi, 2012).

Aside from putting specific aspects of the activity into sharper focus, the high attentional engagement that is a key element of flow may also reward by diverting attention away from the



self. Attention focused towards the self, according to certain theorists (Baumeister, 1991), is usually linked with an unpleasant experience. This has mainly been borne out by empirical results (Fejfar & Hoyle, 2000). Thus, turning one's focus away from oneself (ego) and onto a work should be linked with a relatively pleasant experience, allowing oneself to be temporarily free of the weight of selfhood (Baumeister, 1991).

Finally, the intense attentional engagement of flow may be pleasant in and of itself, regardless of the things brought within or outside of consciousness. The pleasure of being engaged in activity would seem to provide survival benefits, since it has been linked to improved performance (e.g., running faster) and skill development (Engeser & Rheinberg, 2008). It's possible that the experience of high attentional participation is inherently gratifying in and of itself, regardless of the aspects of engagement that are brought into or out of attentional focus. It's been argued that concentrated attention is intrinsically-rewarding since it eliminates the cognitive load of alertness and the need to evaluate alternative action options (Bruya, 2010).

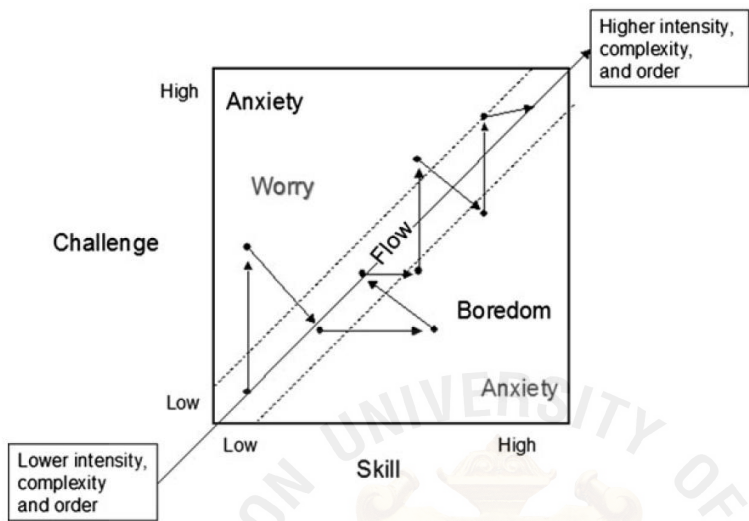
### 3.3 *The Development of Flow Theory*

Csikszentmihalyi (1975) proposed that flow is the optimal mental state, which has been confirmed in subsequent studies spanning the workplace, sports, and exercise, among other areas. However, the primary issue that needs to be resolved urgently in further research in this area is how to accurately capture the characteristics of flow state. However, the original research discovered that "a match between abilities and perceived difficulties" may result in a fluency mental state. As a result, Csikszentmihalyi (1975) focused his research on the balance of skills and challenges and developed the first model of flow state (see Figure 2-6.).



**Figure 2-6**

*The First Model of the Flow State*



*Note.* Adapted from Csikszentmihalyi (1975, 2000).

As is shown in Figure 2-8., this model divides the universe of experience into three distinct states: flow, anxiety, and boredom (Moneta, 2021). When the level of challenge is too high and the skill is too low, people will be in a state of anxiety; If the level of skill is too high and the challenge is too low, it can lead to boredom. Only when the skill meets the challenge, flow emerges.

The significance of challenge and skill balance for the development of flow state is clearly summarized in this initial model. This approach, however, has a number of catastrophic flaws (Moneta, 2021). Firstly, the variables in this model are difficult to compare across individuals, even at various stages of the same one, making it difficult to evaluate personality traits. For example, perceived difficulty interpreting challenges may differ depending on the learning environment. It is a highly volatile variable that is influenced by both internal and

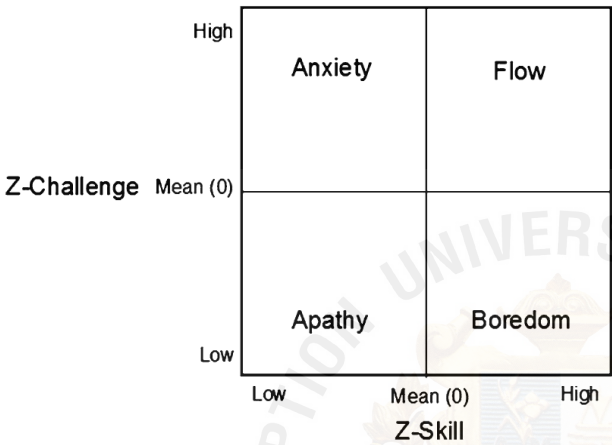
external influences. As a result, an activity that one person finds difficult may not be demanding to another (Strati, Schmidt & Maier, 2017). Even when given the same degree of ability, people's perceptions of difficulty vary over time or in various circumstances. Secondly, does flow necessarily occur if there is a perfect match between skill and challenge when a person participates in an activity, as the model suggests? No, that is not the case. In a previous study, Moneta (2012) investigated 367 workers in the UK from a wide range of occupations. Flow was reported by slightly more than one-third of the participants in a work activity, and fewer than one-third of the participants had the most typical flow experience in a work activity (Moneta, 2012). They found workplace flow was predicted by intrinsic motivation only if the work allowed for enough creative expression (Moneta, 2012). Therefore, this first flow model can only approximately describe how a balance of ability and difficulty leads to the development of the flow.

Csikszentmihalyi (1982) developed the Quadrant Model to further elucidate the balance of challenge and skill, as well as the psychological state of flow (see Figure 2-7.). Csikszentmihalyi (1982) attempts to introduce apathy into the original approach by developing this new one. This is to say, a lack of challenge and skill causes people to develop apathy toward their tasks. When participants engaged in a high-skill, low-challenge activity, their attitude toward the task shifted from apathy to boredom, the opposite of the first model. Additionally, the QM model demonstrates unequivocally that the emergence of flow is closely related to high-skill and high-challenge situations, which mitigates the earlier model's downside. Nonetheless, the QM model describes the balance of skills and challenges macroscopically and regards the

situation as static and unchanging. As a result, it cannot be used to study the emergence of process psychology in dynamic environments.

**Figure 2-7**

*The Quadrant Model of the Flow State*

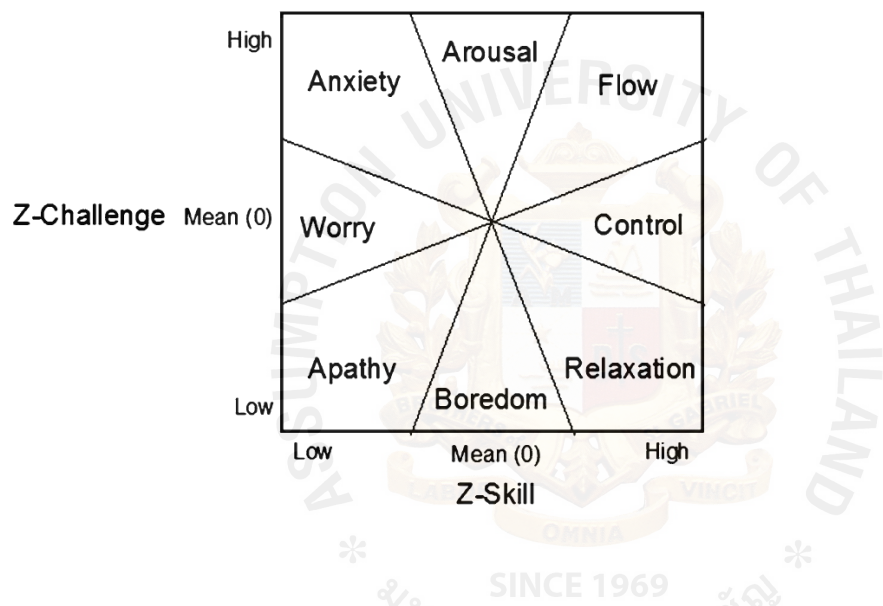


*Note.* Adapted from Csikszentmihalyi & LeFevre (1989).

Massimini and Colleagues (Massimini & Carli 1988; Massimini, Csikszentmihalyi & Carli, 1987) proposed the Experience Fluctuation Model as a more accurate and realistic flow classification system (see Figure 2-8.; Massimini & Carli 1988; Massimini, Csikszentmihalyi & Carli, 1987). The EFM model categorizes experience into eight major states contained within 45° zones denoted by arc-shaped sectors. Both axis variables are normalized to a value of 0 (the weak mean). The scope of each region is represented by a percentage of skills and challenges, and the model center represents the district domain average in terms of skills and challenges, which is the area where the flow occurs. When the skill exceeds the mean and the challenge equals the mean, people are said to be in a state of control in this situation. In comparison to the Quadrant Model, this model is more detailed (Moneta, 2012) and quantifies the various emotions

felt by people in various regions based on the ratio of skills and challenges to the mean value. Additionally, the model dynamically depicts changes in skills and challenges, as well as the accompanying emotional changes, which has significant theoretical implications for controlling the emergence of flow state.

**Figure 2-8**  
*The Experience Fluctuation Model of the Flow State*



*Note.* Adapted from Massimini et al. (1987).

The channel model, although more comprehensive than the quadrant model, has two major flaws. Firstly, operationalizing flow-conducive situations with ‘above average’ levels of challenge and skill is problematic (Moneta, 2012). This operationalization assumes that participants could evaluate the difficulties and capabilities they encounter while doing a particular activity against a common standard of measurement. Secondly, the channel model shares the same limitation with the quadrant model which could not evaluate the implicit assumptions behind the categorization. In general, this is because both models used indirect flow

measurement as a high-challenge or high-skill condition. The flow channel's advantage over the other channels was generally understood as being attributable to the equal ratio of perceived difficulties to perceived abilities. Researchers failed to find a constant result to explain the balance of difficulties and skills (Moneta, 2012).

Recognizing the limitations of those classification systems, the researchers shift their focus to a regression model approach. Moneta and Csikszentmihalyi (1996) propose the cross-product model as a regression model for an extension of the additive model:

$$\text{Experience} = \beta_0 + \beta_1 \text{CHALL} + \beta_2 \text{SKILL} + \beta_3 \text{DIFF}$$

The variable DIFF in the cross-product model represents the absolute difference between challenges and abilities (CHALL: the perceived challenges; SKILL: the perceived skills; DIFF = |CHALL — SKILL|). The coefficient  $\beta_3$  denotes the effect of challenge and skill inequality on experience. The model is fully consistent with the flow theory when all the following conditions are satisfied: (a)  $\beta_1 > 0$ , (b)  $\beta_2 > 0$ , and (c)  $\beta_3 > 0$ . This implies that both difficulty and skill have a linearly positive effect on the experience.

The regression approach's primary advantage is the precise empirical results it produced, which the previous models could not achieve goal (Moneta, 2012). Many facets of subjective experiences—such as concentration, interest in the activity, enjoyment of the activity, or happiness—are predicted by challenge and skill independently as well as by their relative balance (Moneta & Csikszentmihalyi, 1996). For some facets (e.g., involvement), the optimal ratio was about 1:1, while others (e.g., concentration) were biased towards higher levels of challenge, and still others (e.g., happiness) were biased towards higher levels of skill, according

to the regression coefficients (Moneta & Csikszentmihalyi, 1996). Besides, in achievement settings, the model fit better and was more consistent with theoretical predictions than in non-achievement situations (Moneta, 2012). Thus, the theory seems more relevant when accomplishment objectives and opportunities are prominent (Moneta, 2012). Additionally, the impacts of challenge, skill, and their balance varied among people (Moneta & Csikszentmihalyi, 1999) which seems to be completely relevant only to certain persons. Finally, the link between challenge, skill, and balance and personality traits (Moneta, 2004), and situational variables (Csikszentmihalyi, Abuhamdeh & Nakamura, 2005) confirmed the basic assumptions of flow theory.

While the regression approaches are an improvement over the previous models, they share three major flaws. Firstly, some investigated facets of experience are not clearly linked to the flow construct and therefore cannot be considered to be the indicators of flow. For example, variables like 'wish to engage the activity' have never been associated with flow. Psychometric methods have never been employed to assess their validities (Ellis, Voelkl & Morris, 1994). Secondly, it is critical since only one item to measure challenge and skill (Moneta, 2012). Finally, the operational definitions of challenge in these models have limitations. According to Engeser & Rheinberg (2007) suggestion, the perceived difficulty level should be considered. For example, a simple job may be tough for a beginner, but easy for an expert. The perceived difficulty may be important when accomplishment motivation is taken into consideration (Engeser & Rheinberg, 2008). Individuals with higher success motivation choose activities of medium difficulty, where difficulty and ability are matched. Some with lower motivation prefer

tasks of low difficulty, where skill outweighs the difficulty.

### *3.4 Factors Influencing Flow*

#### *3.4.1 Intrinsic Motivation and Flow*

Deci and Ryan (1985) proposed that people who feel more in control of their actions are more likely to be intrinsically motivated, and that there are associations between flow and intrinsic motivation in the field of motivation. Flow is considered to be intrinsically motivated. In flow, the primary motivation is the action itself, which is regarded as pleasant. Csikszentmihalyi (1975) conceived flow to explain why individuals undertake particular things, and hence why they are intrinsically driven. This view argues that intrinsic drive is a result of flow experiences rather than a condition of being (Mills & Fullagar, 2008).

#### *3.4.2 Flow and Personality Traits*

Csikszentmihalyi and Csikszentmihalyi (1992) hypothesized that certain types of individuals are more likely than others to experience flow. Although the term 'autotelic personality' has been used to refer to the proclivity for flow, as Jackson and Eklund (2002) point out, there is no consensus on what an autotelic personality is. In one of the reviews, Jackson & Kimiecik (2008) proposed that the autotelic personality reflects individuals who act for their own sake (intrinsically motivated) rather than for external purposes. Despite this lack of clarity, Jackson & Kimiecik (2008) reviewed the evidence for several factors associated with the frequency of flow experiences, including a desire for challenge, superior concentration skills, high perceived ability, low competitive trait anxiety, and intrinsic motivation. They emphasize the importance of additional research in order to gain a better understanding of the relationships



between personality characteristics and flow.

### *3.5 Flow and Positive Affect*

It is intuitively reasonable to expect that a pleasant event like the flow experience would result in positive affect and happiness. Even when the previous affect was controlled (Schüler, 2007), the flow experience showed positive correlations with positive affect (Landhäußer & Keller, 2012). Fritz and Avsec (2007) discovered a link between flow experience and positive affect in musical activities. Studies on the relationship between skill–demand compatibility and pleasant affect reveal a similar trend. The ESM consistently showed significant correlations between being in the bottom quadrant or octant and positive affect (Shernoff et al. 2003).

### *3.6 Flow and Motivation and Self-regulation Theory*

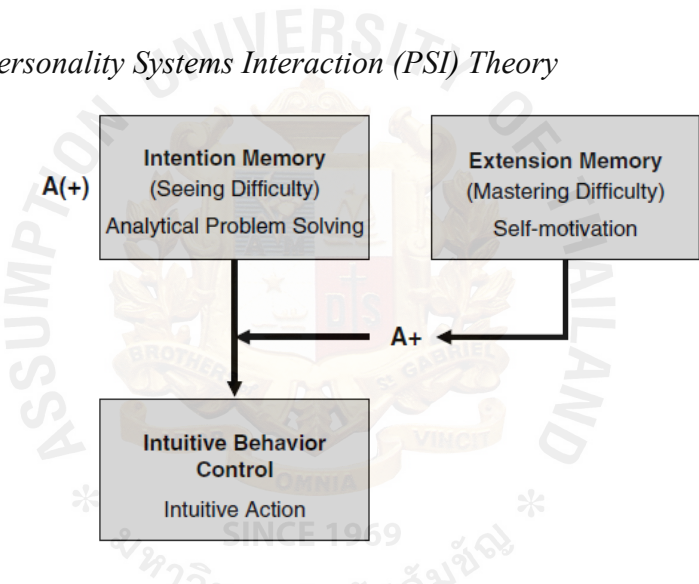
Affective and cognitive macrosystems, such as the dynamic processes that underpin human mental functioning, are the focus of PSI theory (Personality Systems Interaction Theory, PSI Theory; Kuhl, 2000). Other theories of motivation and self-regulation only emphasize cognitive or emotional content, such as beliefs regarding the controllability of desirable occurrences or actions needed to achieve objectives (Bandura, 1986; Peterson et al., 1993; Kuhl, 2000). Or, feelings towards the task's difficulty or pleasure with one's own performance (Boekaerts, 1996; Kuhl, 2000). The PSI theory demonstrates how rigid cognitive and self-regulatory styles may result from biased emotion activation in connection to important cognitive systems (Kuhl, 2000). It provides an understanding of how emotional bias affects cognition and self-regulation opens up possibilities for changing personal styles via new training and treatment objectives (Kuhl, 2000). Other content-based theories, on the other hand, only focus on the

changes in content such as controllability beliefs and the kinds of objectives seeking (Kuhl, 2000). Altering cognitive and self-regulatory processes, for example, through changing how a person controls emotion, according to PSI theory (Kuhl, 2000).

Baumann (2021) proposed achievement flow (flow experiences in achievement contexts; Baumann, 2021) could be defined as a seamless transition from intentions to action that occurs as a result of positive affect within the framework of PSI theory (See Figure 2-9.).

**Figure 2-9**

*The Role of Flow in Personality Systems Interaction (PSI) Theory*



*Note.* Individuals will take actions when “Seeing Difficulty” is balanced with “Mastering Difficulty” (the same condition of flow emerging). Adapted from Baumann (2021).

According to PSI theory, extended memory involvement in action control is required to retain confidence in one's capacity to accomplish difficult tasks and self-generate positive affect (see Figure. 2-13.). Extension memory is a much larger network of central executive processes than intention memory (Baumann, 2021). It follows connectionist principles and is aided by intuitive-holistic information processing (Baumann, 2021). This approach provides a summary of expanded semantic fields (Rotenberg, 1993), as well as the integrated self-representations

(Kuhl, 2000). The implicit self may be thought of as the self-related portion of extended memory (Greenwald & Banaji, 1995). Evidence indicates the self is a powerful source of self-regulation (Rothermund & Meiniger, 2004), operating instinctively and outside of people's conscious awareness (Koole & Coenen, 2007). For example, action orientation is the capacity to engage the implicit self in order to control affect in difficult circumstances (Jostmann & Koole, 2007). Baumann (2021) argued even if people do not participate in conscious self-reflection during flow experiences, the self may be quite active on an unconscious level. The self is more active in autotelic personalities, according to Baumann & Scheffer (2011). When compared to those without achievement flow experience, people with achievement flow experience showed a much lower propensity to mistake unappealing assignments with self-selected objectives. To put it another way, they have greater self-access and do not impose societal expectations on them.

Baumann (2021) also proposed that accessing extended association networks of action options generated from autobiographical memory may be the foundation of a feeling of control and confidence in the mastery of difficulty inherent in flow experience (Nakamura & Csikszentmihalyi, 2009). Extension memory is also the foundation for detecting semantic coherence and establishing coherent, motive-congruent objectives, according to Baumann and colleagues (2005). Thus, the perception of coherent, noncontradictory demands, which is a defining component of flow (Csikszentmihalyi, 2000), might be a consequence of both the activity and the individual's information processing style. Individuals may fulfill numerous restrictions concurrently and integrate even conflicting needs thanks to the parallel-holistic information processing structure of extension memory and the broad nature of its associative

networks (Baumann, 2021).

### *3.7 Flow in Sports Settings*

Due to the correlation between flow and peak performance, flow is highly desirable for athletes (Swann, 2016). This is especially relevant to highly-skilled athletes, who face extraordinarily slim margins between success and failure in competition (Nicholls, Polman & Holt, 2005). In the sport of golf, for example, flow experiences have been linked to peak performances (Nicholls, Polman & Holt, 2005).

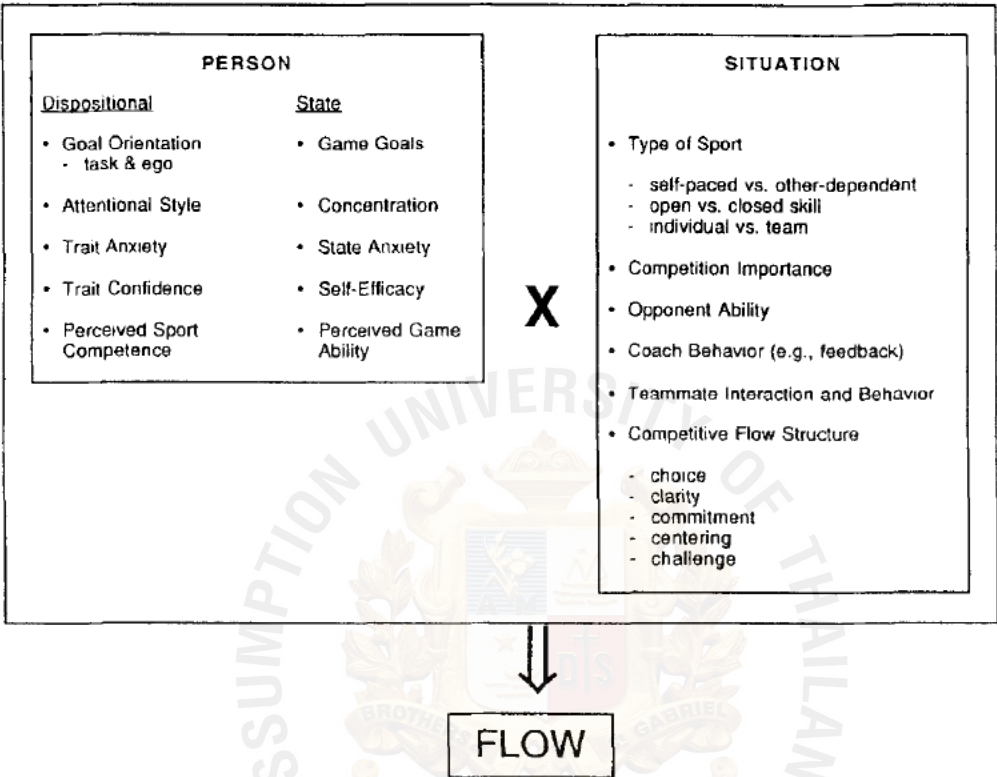
Along with the balance between skill-challenge, flow is defined by eight additional dimensions. a) When the athlete loses awareness of themselves as distinct from their action and develops a sense of oneness with the activity, action-awareness merging occurs. b) Clear goals occur when objectives are well defined and the athlete has a strong sense of direction. c) Unambiguous feedback refers to immediate and specific feedback received from the activity that informs the athlete of their success in completing their set goal. d) Concentration on the task at hand occurs when the athlete devotes their full attention to the task at hand and is the most obvious indicator of a flow state. e) Flow provides the athlete with a sense of control, without the athlete attempting to exert any control. f) Self-consciousness loss occurs when concern for one's self vanishes during the flow state. g) Time transformation occurs when the athlete's perception of time changes, either by speeding up or slowing down. h) Autotelic experience is the final dimension of flow, which has been described as an intrinsically pleasurable state (Nicholls, Polman & Holt, 2005).

According to Kimiecik and Stein (1992)'s Person Situation Flow Framework (see Figure

2-10.), the key to athletes experiencing flow is the interaction between specific athlete characteristics (such as attention types, etc.) and state psychological elements (such as state anxiety, etc.) and other changing elements in sports situations (such as competition events, etc.). Jackson and her colleagues (1998) divide flow states into trait and state flow on this basis. Trait flow (or dispositional flow) refers to an individual's general proclivity to experience flow, whereas state flow refers to an individual's flow experience in a particular situation (Jackson et al., 1998). As a distinct psychological state, flow should be matched to the situational state; that is, the environment in which an individual finds himself or herself determines whether or not flow experience occurs, and flow experience varies between individuals, exhibiting general tendencies. Individuals with a high dispositional flow are more likely than those with a low dispositional flow to experience flow in a variety of situations. The more similar the situation, the stronger the correlation between trait and state flow. Jackson and Marsh (1996) discovered that, due to the relative importance of various flow characteristics in different contexts, the integration of movement awareness and clear goals is a good indicator of dispositional flow, whereas the loss of self-awareness is a good indicator of state flow.

Figure 2-10

Person Situation Flow Framework



Note. Person (dispositional and state) and situation factors underlying the flow experience in sport (Adapted from Kimiecik and Stein 1992).

Additionally, athletes, coaches, practitioners (such as sport psychologists), and researchers all benefit from the concept of flow (Swann, 2016). Flow has also been examined in a variety of activities, including rock climbing (Nakano, Fukashiro, & Yoshioka, 2020), marathon running (Schüler & Brunner, 2009), basketball (Coterón et al., 2013), and others.

3.8 Flow in Exercise Settings

Flow has received much greater attention in sports settings to far, with the minimal study on flow in exercise or leisure physical activity settings. Given the beneficial results linked with

athletes experiencing flow in sport, further research into flow in connection to exercise is needed. Grove and Lewis (1996) made the first attempt by looking into hypnotic susceptibility and flow-like experiences during circuit training. They discovered that individuals with a high hypnotic sensitivity had more flow-like experiences as they progressed from early to late exercise (Grove & Lewis, 1996).

Csikszentmihalyi (1991) proposes that behavior is sustained when there are clear objectives, feedback on performance is readily self-assessed, and one's skill level is adequate to match the physical activity's challenge. Owing to its typically involves a mix of difficulty and competence, clear objectives, and quick feedback on performance, it may be easier to experience flow in exercise settings. Individuals' enjoyment of exercises and leisure activities has been explained using flow theory (Ersöz & Eklund, 2017). Flow is an emotional state in which people participate in activities as a means to an end rather than as a means to achieve an external goal. Individuals are more likely to have flow experience in autonomously conducted interactions, according to Ersöz & Eklund (2017). As a consequence, it seems that more self-determination in exercise that results in flow may be a key component in exercise maintenance (Ersöz & Eklund, 2017).

Existing research suggests that flow experiences have the potential to promote long-term exercise engagement in non-athletes, according to Jackman and colleagues (2019), based on findings linking flow to positive mental outcomes such as a sense of accomplishment, increased intrinsic motivation, and positive emotions after exercising (Jackman et al., 2019). Flow in physical activity is related to greater levels of pleasure while performing the activity, which may



lead to more exercise involvement in order to reproduce these positive emotions (Franco et al., 2017).

Elbe et al., (2010) investigated whether inactive individuals (in comparison to active individuals) can experience flow during an exercise intervention and whether there are differences in their experiences depending on the type of intervention. Additionally, they examined whether experiencing flow is associated with physiological improvements during the exercise intervention. In their 12- to 16-week interventions design, it consisted of six randomized intervention groups (in the primary prevention sense) wherein two female and four male groups engaged in continuous running, football, interval running, and strength training. The findings indicate that regardless of whether the intervention was a team or individual sport, all six randomized exercise intervention groups experience relatively high levels of flow. There were differences in the perceptions of flow, worry, and exertion, as well as physiological improvements, between the different types of sport and the two genders, with the male football group scoring highest on physiological improvement and lowest on worry (Elbe et al., 2010).

In a recreational setting, Stein et al., (1995) investigated three psychological antecedents of flow in sports. They assessed goals, competence, and confidence, as well as flow, in three separate studies involving tennis players, basketball players in college, and amateur golfers. In the first study, participants rated flow characteristics on a scale, whereas in the second and third studies, flow was measured using the experienced sampling method. Students in flow reported higher levels of enjoyment, satisfaction, concentration, and control in the "learning environment" (basketball class) than students in boredom, apathy, or anxiety. In a more

competitive environment (tennis and golf), athletes experiencing flow or boredom had a higher quality of experience than those experiencing apathy or anxiety. They concluded from these findings that contextual differences contribute to an athlete's perception of an optimal situation.

Karageorghis et al., (2000) discovered positive associations between flow and postexercise feelings of revitalization, tranquility, and positive engagement in a large study of aerobic dance exercise participants. They concluded that flow may promote physical activity adherence by eliciting positive postexercise feelings. In line with previous findings, Schüller & Brunner (2009) discovered flow during marathon running has been found to favorably impact future running motivation. Their results supported their hypothesis that flow is a reward for running, leading to a desire to participate again.

### *3.9 Does Flow Experience Could be Cultivated or Enhanced?*

According to the previous discussion, flow experience as an optimal experience served as a rewarding mechanism. Could it be cultivated in order to enhance specific behaviors? A significant application of the rewarding characteristics of flow is in the digital game design area. Some of the basic concepts in game design incorporate the concepts of flow theory. Dynamic Difficulty Adjustment (DDA) is a game design feature that distinguish with the old, optional difficulty system (Hunicke & Chapman, 2004). Rather than setting the difficulty level prior to the game beginning, the difficulty is based on how well the player performs. This way, the game controls itself to ensure that players are challenged while not upsetting them. In one study, Chen (2007) designed a game to showcase this feature, which incorporated a DDA system without participants knowing. Players reported that time seemed to fly by while into the game. The fact

is, by conducting DDA in designing games, players reporting game time distortions are quite common. Data obtained from gamers in video games like Wood & Griffiths (2007) and can also shed light on this matter. 99% of the gaming sample reported experiencing time loss while playing video games. 17% has this occur on occasion, 49% has it happen frequently, and 33% has it occur constantly. Losing track of time is often one of the best indicators of having flow-like experiences (Csíkszentmihályi, 1991).

According to research, some variables may affect how athletes have flow experience in sports, and a significant proportion of top and collegiate players believe flow can be controlled (Russell, 2001). Russell (2001) identified traits that may help people achieve a condition of flow. Elevated concussions were among them: confidence, positive thinking, adequate concentration, optimum precompetitive arousal, and strong intrinsic drive are all important. Jackson et al. (1998), on the other hand, found that anxiety and perceived athletic ability diminished the potential to experience flow.

Grove and Lewis (1996) conducted a study to explore hypnotic susceptibility and flow-like experiences during circuit training. They discovered that individuals with a high hypnotic sensitivity had more flow-like experiences as they progressed from early to late exercise. Those who had previously completed more than 6 months of circuit training reported more flow-like experiences than those who had completed less than 6 months of circuit training. They suggested the more experienced circuit trainers' familiarity with the exercise aided their achievement of flow-like states by either being less anxious or feeling more competently, confidently, and control, or both. It's also conceivable that repeated exposure to the activity decreased the

requirement for conscious attention to the task's mechanics and enabled absorption or dissociation from the environment.

### *3.10 Measurement of Flow*

Previous researchers identified and utilized three major measuring techniques in flow state research: a) the Experience Sampling Method, b) the Flow Questionnaire; and c) the standardized scales of the componential approach (Moneta, 2020).

#### *3.10.1 The Experience Sampling Method (ESM)*

Csikszentmihalyi and other researchers began studying daily experience with the quantitatively based Experience Sampling Method after Csikszentmihalyi's qualitative description of flow (ESM, Csikszentmihalyi, Larson & Prescott, 1977). ESM is a psychological technique for examining what people engage, feel, and think in their daily lives. It entails asking individuals to provide systematic self-reports at random times during a typical week's waking hours. A collection of these self-reports from a random sample of people creates an archive of daily experience. Scientist, especially those who study human behaviors have huge interesting in investigating how do people pass their time? How do they typically feel when engaged in a specific type of activity? How does the daily psychological state of male and female, adolescents and adults, disturbed and normal samples differ? To address such questions, the University of Chicago developed a methodology years ago. The Experience Sampling Method is based on self-reports completed by respondents at random times throughout the week, whenever an electronic pager, or beeper, transmits a signal (Csikszentmihalyi & Larson, 1987). This approach enables estimations of the amount of time people spend thinking about and doing various activities. As a

result, it provides a real-time quantitative measure of psychological state. Additionally, the method enables a qualitative assessment of the information processing system's state by asking respondents to rate their emotions, motivations, and cognitive efficiency on a variety of rating scales.

The goal of the Experience Sampling Method is to collect self-reports for a representative sample of life events. To achieve this goal, participants are given electronic pagers, which alert them on a random basis. The signal serves as a reminder to complete a self-report questionnaire on their current experience. Participants could be driving a car, eating dinner, or sitting in front of the television. If possible, they are to finish a report when the pager goes off. Larson & Csikszentmihalyi (2014) provide an example, stating that in a typical week, the schedule specifies one signal at a random time within each two-hour block of time between 8 a.m. and 10 p.m. Or, extending the schedule on weekends and delivering fewer signals per day over a longer period are examples of variations. The only requirements are that the set of signals be representative and that the signals come without warning to the person receiving them.

Participants respond to questions on their objective situation and subjective state at the time they receive each random signal. Questions concerning the objective scenario included where participants were, what they were doing, and who they were with, according to the purpose of the research (Savin-Williams & Demo, 1983).

Here is an example of this application is in one study, Savin-Williams and Demo (1983) requested each participant to carry a paging device (beeper) that signaled the teenager six to eight times daily during the waking hours on a random (except during school hours) schedule.

The participant reacted to each sound by filling out a Beep Sheet (see Figure 2-11.).

Figure 2-11

Beep Sheet

Beep Sheet

Date:

AS YOU WERE BEEPED. . . .

Where were you?

What things were you doing?

What were you thinking about?

Wish you were doing something else? What?

Who were you with? Give the number, age, sex, and relationship (parents, sister, friend, acquaintance, stranger, etc.) of those present.

Time is passing (circle appropriate dot):

Fast O o . . o O Slow

How would you describe yourself at the moment beeped? Circle as many words below as are appropriate.

inhibited

clear

consistent

tense

confident

unprepared

belonging

weak

safe

spontaneous

happy

relaxed

free

sluggish

lonely

powerful

empty

ashamed

proud

secure

skilled

productive

unloved

useless

growing

overwhelmed

affectionate

depressed

needed

frustrated

left behind

exposed

fussy

loved

bored

unsure

on time

in control

conforming

manipulated

Other feelings about yourself:

Note. An example of Beep Sheet, adapted from Savin-Williams & Demo (1983).

Larson & Csikszentmihalyi (2014) stated that it is too early to judge the Experience Sampling Method (ESM). They believed its value for a psychometric measure is yet unknown. However, it seems to overcome previous research methods' shortcomings. Unlike conventional paper-and-pencil or interview techniques, it gets instant information on the current circumstances of their life. The ESM technique, unlike other psychometric procedures, utilizes established psychometric know-how within the ecologically valid settings of people's everyday



experience (Larson & Csikszentmihalyi, 2014). Moreover, unlike most conventional self-report techniques, it gets repeated measures over time (Larson & Csikszentmihalyi, 2014).

Nevertheless, at least four major methodological issues remain when utilizing ESM to measure flow experience (Larson & Csikszentmihalyi, 2014). First, who is willing to engage in this kind of study? Are there self-selection biases that exclude large categories of people? Second, what aspects of people's lives are overlooked by sampling? Subtle aspects of individuals' life are hidden? Third, how does the method affect the phenomenon being measured? Will people's flow experience be influenced by this method? Such as interruption by this method. Fourth, how well do ESM results match up with other research methods? Do ESM results match other traditional measurements, for example, physical trace data?

### *3.10.2 The Flow Questionnaire*

Csikszentmihalyi (1975) conducted interviews with people from various jobs, resulting in a plethora of literary accounts of the flow experience in different fields. The first flow measurement, the Flow Questionnaire (FQ; Csikszentmihalyi & Csikszentmihalyi, 1988), was created by selecting and condensing some of the most insightful and unambiguous explanations of flow. The FQ presents concepts of flow and asks respondents to identify them, explain the circumstances and activities in which they have flow experience, and evaluate their subjective experience.

The FQ provides a single, unambiguous definition of flow that can be used to estimate the prevalence of flow as a single construct, allowing researchers to investigate differences in prevalence across genders, age groups, occupations, and cultures (Moneta, 2012). The FQ



directly captures the characteristics of flow, such as “I don't see myself as separate from what I'm doing (merging of action and awareness). However, the FQ does not allow for the measurement of flow intensity or level in particular activities. Additionally, The FQ makes it difficult to determine how perceived activity difficulties, perceived skill levels in the activity, and the ratio of the two factors affect the occurrence of the flow state. Since participants are asked to identify their average difficulty and skill levels in the greatest flow-conducive activity, they are not necessarily reporting challenge and skill levels when they are in the flow state. As a result, the FQ is not a proper approach to assess flow (Moneta, 2012).

### *3.10.3 The standardized Scales of The Componential Approach*

According to the flow model of Csikszentmihalyi (1975), the balance between challenge and skill determines the occurrence of flow. Examining the balance of challenge and skill is thus an important basis for determining the occurrence of flow. Jackson & Marsh (1996) and Jackson & Csikszentmihalyi (1999) purposed nine components of the characteristics of flow, which are: balance of challenge and skill, unity of knowledge and action, clear goal, clear feedback, concentration, sense of control, loss of self-consciousness, loss of sense of time and self-goal.

a) Balance. To begin, the balance between challenge and skill refers to the relationship between the individual's perceived situational challenge in an activity and the skill possessed by the individual in a state of fluency. In other words, the individual's skill level must be above average in order to meet the requirements of situational challenges.

b) When an individual is in flow state, his or her attention is highly focused on an activity he or she is engaged in, and he or she can automatically avoid information that is irrelevant to

that activity. His or her consciousness and behavior are highly unified, and his or her actions are characterized by automation.

c) When individuals are in a flow state, they have a clear understanding of the goals and take actions around them, regardless of whether the goals are determined in advance or in activities.

d) Clear feedback refers to the timely and clear feedback that individuals receive from their actions while in a flow state of mind in order to understand how to successfully achieve their goals.

e) Concentration means that the individual's spirit is completely focused on the work he is doing when he is in a state of flow.

f) Sense of control refers to the feeling of action control achieved by individuals who do not make subjective attempts in their activities while in a flow mental state.

g) Loss of self-awareness occurs when an individual is completely immersed in the activity at hand and becomes a part of the action, and is unable to be aware of the consciousness that is unrelated to the activity.

h) The term "loss of sense of time" refers to when an individual loses his or her normal sense of time while in a state of flow, i.e., when time seems to speed up, slow down, or even stop.

i) Self-established goals are those set by individuals to meet their own needs while they are in a state of flow. However, the goal is not to seek material rewards, but to gain more enjoyment from the activity.

As described by Jackson & Eklund (2004), flow is a state, a general trait (the tendency to experience flow often and strongly across various circumstances), and a specific trait (the tendency to experience flow frequently and intensely in a specific activity). Jackson and colleagues (1996) developed the Flow State Scale (FSS) and Dispositional Flow Scale (DFS) as alternative self-report instruments to assess flow experiences in PA to provide a measurement that can be easily applied in PA settings. The FSS and DFS measure all nine flow dimensions. The FSS was developed to measure flow in a specific activity, and data is gathered soon after the activity. The DFS is a dispositional measure of flow that is used to determine how often people feel flow while engaging in an activity. Initial studies of the FSS and DFS's psychometric characteristics revealed that both instruments had acceptable levels of factorial validity (Marsh & Jackson, 1999) and reliability (Jackson et al., 1998). The DFS was also shown to have good reliability (Middleton et al., 2004). Vlachopoulos and his colleagues (2000) investigated the FSS's factorial validity in aerobic exercise participants and found it to be reliable.

However, some studies found that the validity of any FSS factor structure was not tenable to their population after testing three alternative measurement models using confirmatory factor analysis (CFA). Certain items in those two scales were deemed problematic from a conceptual and statistical standpoint (Vlachopoulos, Karageorghis, & Terry, 2000), therefore, Jackson and Eklund (2002) updated both instruments by replacing the problematic items and revising new flow scales: the Flow State Scale-2 (FSS-2). The FSS-2, according to Jackson and Eklund (2002), may be used to assess a range of physical activities, both competitive and noncompetitive. Later, in addition to the Flow State Scale-2, they revised and validated the Dispositional Flow Scale-

2, which assesses flow intensity as a general or domain-specific trait. Both scales share the same items while the state scale asks participants to think about their recent activity, and the trait one asks them to think about their general experience. Researches suggested both the state and trait scales have good psychometric properties (Jackson & Eklund, 2004). These two scales are currently the only multidimensional measures of flow with acceptable psychometric characteristics that the authors are aware of and that can be employed without interrupting performance (Jackson & Eklund, 2002).

A few research have looked at the validity of flow scales with Chinese samples. Although both of the Flow State Scale (FSS) and Dispositional Flow Scale (DFS) has been translated into Chinese for use with Chinese athletes in some study (e.g., Liu et al., 2012; Chen et al., 2003), the factor structure of the translated instrument has not been established. Instead of replacing the low factor-loading items with new ones, these studies all simply chose to delete them. Particularly, Chen et al. (2003) claimed that their translated version of the FSS-2 was suitable for their Chinese samples, however, their CFA findings did not back up their claims (e.g., some poor goodness-of-fit indices). Liu et al. (2012) admitted that the original scales were disrupted because of item deletion, despite the fact that the final Chinese set of 33 items replicated moderately strong psychometric properties obtained with the original instruments.

#### **4. Mediator: Mindfulness**

Mindfulness and flow state are comparable in that they both promote attention control, emotional regulation, and body awareness (Chen et al., 2019). Since mindfulness is focused on moment-to-moment experiences, it has the potential to enhance attention regulation, emotional

regulation, and body awareness (Chen et al., 2019). The fundamental notion of mindfulness is the nonjudgmental awareness of one's concerns, emotions, or ideas, rather than attempting to control or repress these feelings or thoughts. In the Buddhist tradition of meditation, mindfulness training is a method for increasing concentration. It is an attention-focused approach that has its roots in the Buddhist contemplative tradition (Chen et al., 2019).

Kabat-Zinn (1990)'s initial conceptual model of mindfulness was based on the transactional stress model, which stressed the necessity of assessment in deciding whether or not particular situations are stressors. Mindfulness, according to this paradigm, promotes present-moment awareness, correct assessment, and responsive coping in situations that would otherwise evoke a habitual, unconscious stress responses. Mindfulness has been described as promoting effective self-regulation through a cognitive shift toward correct assessments and away from an automatic reaction in more contemporary conceptualizations (Shapiro et al., 2006). Kabat-Zinn's approach is in line with scientific data indicating that people who practice mindfulness and acceptance have more cognitive and behavioral flexibility (Shapiro et al., 2006). Increased mental states achieved via mindfulness may be especially beneficial for athletes and their athletic performance, since they are comparable to what has been described as "the zone" (Cooper, 1998), which is characterized by intense focus, relaxation, and union of body and mind (Kabat-Zinn et al., 1985).

#### *4.1 The Criterion of Mindfulness*

Mindfulness is a complicated concept does not have a generally accepted practical definition (Barajas & Garra, 2014). Mindfulness is defined as the capacity of being in the present

moment with a non-judgmental attitude (Kabat-Zinn, 1990). In addition to attention and awareness of the present moment, Bishop et al. (2004) argue that acceptance is an important component of mindfulness. Mindfulness, according to Cardaciotto and colleagues (2008), is a two-dimensional construct consisting of awareness of one's experience and concurrent acceptance of that experience, with the two components theoretically and empirically distinct. Brown and Ryan (2004) argued that, although the concepts are linked, “acceptance” does not offer a qualitative benefit over the single component of “attention and awareness of the present,” based on convergent, discriminant, and criterion validity tests with large samples.

Brown and colleagues (2007) proposed mindfulness as having several overlapping characteristics: (a) a clear or bare awareness free of thought-related barriers, (b) a flexible awareness and attentiveness, (c) an objective view of reality, and (d) a present-centered consciousness. Along the same lines, greater degrees of dispositional mindfulness has been found to operate with less ego-involvement, making them more likely to have stable high self-esteem and to be more genuine in their functioning (Heppner et al., 2008). Dispositional mindfulness refers to a person's proclivity to be aware, or to concentrate nonjudgmentally on the present moment (Dijkstra & Barelds, 2011). Other studies show mindfulness could enhance positive affect (Orzech et al., 2009) and well-being (Brown & Ryan, 2003). Meditation or mindfulness-based training may improve mindfulness levels (Baer et al., 2008).

#### *4.2 Mindfulness Training Enhance Attention Control*

The focus on the present moment in mindfulness practice may improve the ability to maintain attention, switch attention, and inhibit elaborative thinking (Bishop et al., 2004).



### *Sustained attention.*

Sustained attention, also known as vigilance, is the ability to notice unpredictable events throughout time (Sarter, Givens & Bruno, 2001). Selective and divided attention, and the general cognitive processes (e.g., learning, memorizing), are all based on it (Posner, 1994). Deficits in this ability have been linked to some psychological disorders such as ADHD, schizophrenia (Lawrence et al., 2003). As previously stated, mindfulness training may improve sustained attention capabilities (Chambers, Lo & Allen, 2008).

### *Attention switching*

A subset of executive functions, attention switching refers to the process of "moving back and forth between different activities, processes, or mental sets" (Miyake et al. 2000). There are at least two complementary processes involved in this sophisticated cognitive ability: suppression of previously engaged task-set characteristics that interfere with the present task and reconfiguration or retrieval of a new task set from long-term memory (Vandierendonck, Liefoghe & Verbruggen, 2010).

Attention control is related to mindfulness. First, effective attention switching provides flexibility for cognitive function, which is essential for the attentive observation of ongoing. During mindfulness meditation, switching attention is required even more frequently. As for beginners, switching attention is required even more frequently owing to they are trained to become aware of their mind wandering and return their attention to their breath or another object, according to Holas and Jankowski (2013). The induction and maintenance of the mindfulness state are therefore made easier using effective switching attention techniques. In the meantime,



the metacognitive model of mindfulness (Jankowski & Holas, 2014) states that a regular practice of mindfulness increases one's overall level of executive functions, which includes switching attention, much as the practice of self-control enhances one's overall degree of self-regulation (e.g., Hui et al. 2009).

Evidence suggests that executive attention has improved significantly after mindfulness training (Jha, et al. 2007; Wenk-Sormaz, 2005). Hodgins and Adair (2010) examined the capacity of adult meditators and nonmeditators to change views. The challenge consisted of three sketches. Depending on the participant's viewpoint, each artwork might be viewed as a duck or a rabbit. Instructed to quickly identify the first picture, participants viewed the artwork again, changing viewpoint to identify the second image. Meditators recognized the first picture quicker than non-meditators. The second viewing of the picture had no effect on response speeds, but meditators recognized more alternative viewpoints than non-meditators.

Jankowski and Holas (2020) conducted an experimental study to investigate different conditions (brief mindfulness training, worry induction, and free mind-wandering) in a switching task. Their findings indicate that people in a stressful situation may not decrease the switching cost in the post-test; nevertheless, their response times were generally quicker than in control circumstances, independent of probe type (switch vs. no-switch). This finding suggests that mindfulness meditation, even if short, has a particularly positive impact on cognitive performance.

#### *4.3 Mindfulness in Exercise Settings*

Long-distance running, like rowing, is a repetitious activity in which boredom, tiredness,

discomfort, and negative thoughts may hinder optimum performance (De Petrillo et al., 2009). It has been suggested that long-distance runners should learn to run utilizing their mind-body connection in order to effectively cope with repetition, boredom, weariness, and discomfort (De Petrillo et al., 2009). For example, the ultra-marathoner Dreyer (2009) stated how concentration and non-distractibility, allowing ideas flow in and out of the head, listening to the breath, feeling the body, and proper postures are all important for optimum running performance. It's fascinating that these are all aspects of mindfulness meditation training (De Petrillo et al., 2009).

The findings from Cox et al. (2016) showed mindful exercise experiences may lead to adaptive changes in exercise motivation. Their findings are in line with Brown and Ryan's (2003) findings, which show a link between mindfulness and more internalized motivation controls in everyday tasks. Mindfulness of the body predicted the more physically relevant health/fitness reasons, while mindfulness of the mind predicted the more mentally relevant mood/enjoyment reasons, which is conceptually congruent (Cox et al., 2016).

#### *4.4 Measurement of Mindfulness*

So far, the research interesting towards mindfulness has been on self-report measurements of mindfulness. The majority of them assess mindfulness as a trait-like (e.g., the Mindful Attention Awareness Scale, Brown & Ryan, 2003; Freiburg Mindfulness Inventory, Walach et al., 2006; the Five Facet Mindfulness Questionnaire, Baer et al., 2008; the Philadelphia Mindfulness Scale, Cardaciotto et al., 2008; Cognitive and Affective Mindfulness Scale, Feldman et al., 2007) and state-like (e.g., the Toronto Mindfulness Scale, Lau et al., 2006; The State-MAAS, Brown & Ryan, 2003; The State Mindfulness Scale, Tanay & Bernstein, 2013) of

everyday activity.

Despite the increasing interest in the concept of mindfulness, there are still questions about how to evaluate it (Grossman, 2011). Some instruments, operationalize mindfulness as a unidimensional construct, while others see it as a two- or multifactorial structure, reflecting a key aspect of the philosophical dispute around mindfulness. According to Grossman (2008), the reason for lacking agreement on the concept of mindfulness is some researchers are unfamiliar with the theoretical foundations of mindfulness. The majority of founders of the scales seem to agree—explicitly or implicitly—that mindfulness is made up of two different components (Sauer et al., 2013). The first one is present, which is defined as an attentional focus on the current moment, while the second one is acceptance, with a non-judgmental, opening, and accepting attitude (Bishop et al. 2004). Some scales (i.e., TMS, PHLMS) explicitly adopted two dimensions, while others use additional subfactors that may be attributed to the two latent components presence and acceptance, which denote both cognition and emotion components of mindfulness (Sauer et al. 2011). Several fMRI studies offer not just psychometric but also experimental support for the validity of the two-factor mindfulness structure (Sauer et al. 2011).

Baer and colleagues (2004) developed the Kentucky Inventory of Mindfulness Skills (KIMS). The KIMS aims to incorporate mindfulness skills as some common mindfulness-based interventions like MBSR (Kabat-Zinn 1990), MCT (Segal, Williams, & Teasdale, 2002), ACT (Hayes et al. 1999), and DBT (Linehan 1993). The scale has four dimensions: observe, describe, act with awareness, and non-reactive attitude. Later, Höfling et al. (2011) revised it to a short version of the scale (Höfling et al. 2011).

The Five Facet Mindfulness Questionnaire (FFMQ, Baer et al., 2006) is a 39-item self-report questionnaire that is increasingly being utilized in psychology research in general and process-outcome work on MBCT and MBSR in particular. It was created via component analyses with the goal of finding the most important aspects of mindfulness by combining questions from five measures (non-reactivity, observing, awareness, describing; and non-judging), theoretically derived mindfulness measures that were available at the time. The scores of five measures could be added together to provide a total score that represents a global assessment of mindfulness. Studies indicate that mindfulness, as assessed by the FFMQ pre-and post-treatment, is a mediator of therapeutic improvement (McManus et al., 2012). The English version of the FFMQ shows acceptable reliability, convergent and discriminant validity, and incremental validity in the prediction of psychological symptoms, according to preliminary psychometric studies (Baer et al., 2006). However, some few psychometric assessments that exist to validate the FFMQ's factor structure raise serious concerns about the structure's usefulness in clinical mindfulness research (Baer et al., 2008). Although a five-factor structure developed during the creation of the FFMQ, Baer et al. (2008) showed that a four-factor hierarchical structure gave the best match for the data in students' sample, community sample.

The Mindful Attention Awareness Scale (MAAS, Brown & Ryan, 2003) is a 15-item trait mindfulness self-report questionnaire with a 6-point Likert-scale answer style (1='almost often' to 6='almost never'). The mean of answers to all questions is used to generate a total score, with a higher score indicating a better degree of mindfulness. Since MAAS focuses on attention/awareness in the current moment, it failed to assess a nonjudgmental attitude (Bergomi

Tschacher & Kupper, 2013). Its items, on the other hand, are founded on the premise that mindless states are more frequent (Brown & Ryan, 2003), which implies that the instrument may serve as an indirect evaluation of self-criticism (Bergomi Tschacher & Kupper, 2013). Over a 4-week period, convergent data indicates excellent internal dependability and acceptable exterior reliability. Tests of the scale's convergent validity, which included comparing it to a variety of other mindfulness measures, revealed positive correlations ranging from weak to moderate (Baer et al., 2006). Positive correlations with measures of positive affect as well as negative correlations with stress, rumination all supported its construct validity (Baer et al. 2006). The MAAS scores of experienced meditators were considerably higher than those of novices (Cordon & Finney, 2008). One research discovered a link between physical activity and dispositional mindfulness as assessed by the MAAS (Kang et al., 2017).

The Philadelphia Mindfulness Scale (PHLMS; Cardaciotto et al., 2008) is a two-factor (acceptance and awareness), trait measurement of mindfulness. The PHLMS shares the same mindfulness concept with Baer and colleagues (2004) and has been utilized and referenced in a number of applications, and it has been validated using student and clinical samples (Morgan et al., 2020). The PHLMS defines acceptance as an active orienting to the present moment while awareness a constant observation of the entirety of one's experiences (Cardaciotto et al., 2008). Nevertheless, increasing awareness of internal experience, especially negative one, has been linked to poor consequences in certain cases, such as excessive attention on physical sensations in rumination (Ingram, 1990), and persistent negative emotions (Mor & Winquist, 2002).

The State-MAAS is a five-item scale based on the MAAS (dispositional, Brown & Ryan,

2003). The State-MAAS assess the expression of mindful attention and awareness of everyday activities in the recent or present past. The questions in the State-MAAS are evaluated on a 7-point Likert scale and relate to a recent, short period of time (the last day or hour) or the current instant (Brown & Ryan, 2003). Researches showed it has psychometric properties, however, the State-MAAS failed to assess state awareness in all situations, but rather in everyday activities. It failed to assess awareness during mindfulness meditation. Moreover, the State-MAAS only could assess one's mindful attention and awareness of daily activities, and could not simply paying attention to and being aware of one's bodily and mental qualia (Tanay & Bernstein, 2013). As a result, the State-MAAS may not fully represent the concept and reality of state mindfulness, and therefore lack content validity (Tanay & Bernstein, 2013).

The Toronto Mindfulness Scale (TMS, Lau et al., 2006) has 13 items that are evaluated on a 5-point Likert scale and reflect two distinct variables, Curiosity and Decentering. The TMS adopted the conceptual foundation from Kabat-Zinn (1990) 's work and is only able to measure decentering as a proximal effect of mindfulness and not as a fundamental facet of mindfulness (Tanay & Bernstein, 2013). In fact, many models of mindfulness and major Buddhist texts indicate that mindful attention and awareness are different from and distinct from decentering. In contrast to the State-MAAS, it lacks content validity by simply focusing on curiosity (Bishop et al., 2004). It focuses on ideas and emotions, and not on important physical elements of experience that might be addressed to attentively (Kabat-Zinn, 1990). The TMS has shown a strong ability to measure psychometrics and has been used to measure state mindfulness throughout a variety of activities (Erisman & Roemer, 2010).



The State Mindfulness Scale (SMS; Tanay & Bernstein, 2013) was developed to overcome those limitations of current state measures, such as measuring bodily sensations mindfulness. Tanay and Bernstein (2013) defined mindfulness as both the self-regulation of attention to the present and an attitude of openness, acceptance, and inquiry, drawing on both traditional and modern perspectives. As a result, the SMS was created to contain both the objects of mindfulness (physical and mental occurrences) as well as mindfulness characteristics. Both levels of mindfulness were designed to be completely incorporated into each of their scale's mindfulness items. Tanay and Bernstein (2013) also proposed a higher-order two-factor structure representing mental and physical or bodily experience mindfulness, as well as a global, higher-order component reflecting global state mindfulness, and suggested utilizing the mental and body subscales or the overall scale score.

In sports settings, athletes must actively cope with or coexist with both internal (e.g., disruptive thoughts and emotions) and external stimuli (environmental) in this setting, all while concentrating on current performance (Zhang et al., 2017). Cox et al. (2016) revised the State Mindfulness Scale (Tanay & Bernstein, 2013) and presented valid evidence for the measure in a physical exercise setting (the SMS for Physical Activity, SMSPA; Cox et al., 2016). It is a state awareness measurement during physical exercise that takes the least amount of time to complete and presented data to back up the inferences and actions that may be made from the scale's results. When responding to how much they experienced each of the things using a response scale ranging from 0 (not at all) to 4 (very), participants were asked to reflect about the activity they had just done (very much). Each subscale's items are summed, and higher scores indicate



more awareness. It contains two dimensions that indicate awareness of mind and body. The questions on the SMS-PA seem to be compatible with mindfulness's conceptual foundations (Bishop et al., 2004) and suitable for application in physical activity contexts. Construct validity was shown by strong relationships with relevant contextual variables and significant group differences by activity mode and skill level in mindful-based physical activity (Cox et al., 2016). Their findings confirmed the beneficial impact of state mindfulness in physical activity motivation, as well as the possibility of cultivating state mindfulness via a more deliberate focus on being aware during physical exercise (Cox et al., 2016).

## **5. Mediator: Rumination**

Rumination is defined as a sensation of being forced or driven to concentrate on one's emotions, a tendency to focus repetitively on the origins and consequences of one's misery, and a perceived incapacity to mend moods (McFarland et al., 2007). The propensity to ruminate over a bad event, according to Watkins (2008), may impede an individual's recovery from the unfavorable experience. Anxiety and rumination, when it comes to exercise, may make it difficult for people to stick to their workout routines. This may happen because when individuals begin to notice and interpret ordinary body sensations adversely, they may get worried and ruminate, focusing their attention on the sensations and the unpleasant emotions that accompany them (Brown, 2011).

Coffey and colleagues (2010) factor analyzed various mindfulness-related self-report measures in order to come up with a two-component solution, consisting of present-centered attention and acceptance of events, in an effort to explain what mindfulness is and what its

processes are. Furthermore, the findings suggested that rumination and negative emotion control may play a role in understanding mindfulness-related health outcomes (Coffey, Hartman & Fredrickson, 2010).

Rumination is characterized by extremely self-focused and repeated unpleasant thoughts that are unstoppable (Josefsson et al., 2017). Increased ruminating has been linked to psychological discomfort, sadness, anxiety, and concern (Nolen-Hoeksema, 2000). Furthermore, it has been shown that rumination reductions influence the relationships between dispositional mindfulness and psychological distress reductions as well as improved well-being (Coffey, Hartman & Fredrickson, 2010; Jain et al. 2007).

Rumination is unpleasant thinking about oneself, emotions, personal problems, and distressing events that is repeated, protracted, and recurring (Watkins, 2008). According to Response Styles Theory (Nolen-Hoeksema, 1991), depressive rumination is defined as repeated thinking about the symptoms, causes, situations, meanings, implications, and consequences of sad mood and discomfort. Rumination has been linked to the development and maintenance of depression (Nolen-Hoeksema, et al., 2008).

### 5.1 Rumination and Psychopathology

Rumination has been shown in experimental researches to have negative causal consequences on mood and mood-related cognition, and that if it occurs chronically, it would inevitably lead to emotional problems (Nolen-Hoeksema, Wisco & Lyubomirsky, 2008). In experimental studies, rumination could exacerbate and prolong existing emotional states (i.e., sadness, anger, anxiety, and depression; Nolen-Hoeksema, Wisco & Lyubomirsky, 2008). They

are always could be observed in individuals who are already in a bad mood (e.g., depressed or anxious), with rumination worsening the individual's existing negative mood (Watkins & Roberts, 2020). If the person has already felt down, ruminating about the past, present, and future can only make him/her feel worse (Rimes & Watkins, 2005). Induced rumination also delays emotional recovery from past failures (Watkins, 2004) and increases negative emotional response to future stressful events (Watkins, Moberly & Moulds, 2008). Rumination also exacerbates analog PTSD symptoms and delays emotional recovery from distress (Zetsche, Ehring & Ehlers, 2009).

The mechanism underlying is rumination increases self-focus and amplifies the vicious repetitive cycle between negative mood and negative cognition, wherein one increases the likelihood of the other (Ciesla & Roberts, 2007). Negative thoughts (including rumination) and unpleasant moods create an emotional cascade in susceptible people, where ruminating may lead to an extremely negative impact (Watkins & Roberts, 2020). Distracting impulsive behaviors (i.e., drink, or drugs), may be used to escape from these unpleasant emotions (Selby, Anestis & Joiner, 2008).

Evidence also suggests rumination impairs problem-solving (Lyubomirsky et al., 1999) by making people more gloomy, more abstract, and less able to access particular information (Watkins & Moulds, 2005). It also reduces the desire to the individual in pleasurable activities (Watkins & Roberts, 2020). In both cross-sectional (Bishop, Ameral & Palm Reed, 2018) and prospective studies (Dickson, Ciesla & Reilly, 2012), rumination is linked to greater uncertainty, decreased confidence in plans, and higher avoidance.

Rumination affects attention and executive function (Watkins & Brown, 2002). It is a kind of internal and frequently abstract preoccupation that may make the individual less attentive and receptive to contextual cues and occurrences in the environment around them (Watkins, 2008). They may be unable to adjust to changes in the environment or benefit from corrective learning that disproves negative beliefs (Reilly et al., 2019).

Moreover, rumination may increase unpleasant feelings and leave unaddressed personal issues that might lead to chronic stress and emotional illnesses (Watkins & Roberts, 2020). The relationship between stressful life experiences and subsequent anxiety and depression is also seen in prospective research (McLaughlin & Nolen-Hoeksema, 2012). At a follow-up study, rumination predicted greater emotional abuse and victimization from peers (McLaughlin & Nolen-Hoeksema, 2012). Rumination predicted relationship problems and more submissive interpersonal approaches in depressed individuals (Pearson et al., 2010).

It is not unexpected that depressed rumination leads to the development, maintenance, and recurrence of many mental illnesses. This was initially shown in large longitudinal studies where ruminating predicted the development of severe depressive episodes and symptoms in non-depressed and depressed people (Nolen-Hoeksema, Wisco & Lyubomirsky, 2008). Subsequent research linked ruminating to anxiety problems, drug and alcohol addiction, and eating disorders (Nolen-Hoeksema & Watkins, 2011). Rumination predicted subsequent substance abuse, eating disorders (Nolen-Hoeksema, et al., 2007), alcohol abuse (Caselli et al., 2010), and PTSD (Ehring et al., 2008). Anxiety and depression symptoms are associated with rumination, suggesting that it is not just an epiphenomenon of heightened psychopathology

(McLaughlin & Nolen-Hoeksema, 2011).

The detrimental effects of rumination may also hinder patients' recovery from psychiatric illnesses and treatment response (Watkins & Roberts, 2020). Impairment in attention, problem-solving, and instrumental action may impair a client's capacity to absorb ideas or evidence discussed in psychological treatment, or to execute and profit from behavioral programs, thereby interfering with therapy (Watkins & Roberts, 2020). There is increasing evidence that greater rumination at the onset of treatment predicts worse results for depression (Schmaling et al., 2002). Banerjee and colleagues (2018) suggested those who tend to ruminate or worry may find it difficult to calm down during mindfulness practice, increasing their discomfort and leading to a belief that mindfulness is useless, leading to a drop-out (Crane & Williams, 2010). Despondent ruminating and anxious concerns are linked with metacognitive views regarding the roles and implications of such thought (Wells & Matthews, 1996). Rumination and anxiety may also promote positive attitudes about ruminating and worrying. If individuals think that ruminating and worrying fix problems or prevent events from happening, they may not believe that letting go of unpleasant ideas would help them disengage from the MBI.

## *5.2 Developmental Processes of Rumination*

Trait rumination is linked to environmental and biological variables (Chen & Li, 2013). Rumination is found to have both environmental and heritable features wherein to be moderately heritable (20–41 percent of variance) in several twin studies (i.e., Chen & Li, 2013; Johnson et al., 2014). Rumination also shares genetic variability with depression, indicating it may be an endophenotype signaling hereditary risk for depression (Chen & Li, 2013).

People with a history of mental illness, interpersonal stress, socioeconomic disadvantage, life transitions, bullying or abuse are more likely to ruminate (Fritz et al., 2018). Adults (McLaughlin & Nolen-Hoeksema, 2012) were only partly mediated by stressful life experiences (McLaughlin & Hatzenbuehler, 2009). Thus, rumination seems to be the last common route for many distal risk factors for emotional disorders, suggesting its importance for study and intervention. Anxiety about threats, helplessness, and turning inward to examine issues abstractly and passively (Spasojevic & Alloy, 2002) are proximal risk factors for rumination (Sarin & Nolen-Hoeksema, 2010).

There is emerging evidence that certain patterns of brain activity and genetic polymorphisms are linked to rumination, suggesting that these biological substrates may play a role in rumination susceptibility. However, caution is advised since the direction of causation has yet to be determined: biological changes may be caused by or as a result of rumination, or they could be linked to a shared third factor (Watkins & Roberts, 2020).

Siegle and colleagues (2006) found that persistent amygdala activity was linked to self-reported rumination. Other research emphasizes the role of the amygdala and related limbic areas in the long-term processing of unpleasant emotional information. For example, Siegle and colleagues (2002) discovered that in depressive people, self-reported rumination ratings were linked to higher and persistent amygdala activation for negative phrases. In a healthy control study, self-reported ruminating was similarly linked to amygdala activity during the up-regulation of negative affect, suggesting that a greater propensity to ruminate, even in nondepressed people, exacerbates the brain processing of negative information (Ray et al., 2005).



As a result, the relationship between amygdala responsiveness and emotional activation seems to be an important component of the neuronal network that underpins rumination.

Rumination is expected to engage the same brain areas that have been linked to self-representation. In addition to limbic structures, the medial prefrontal cortex (MPFC) has been linked to the contents of self-representation: self-reflection (Johnson et al., 2006), self-referential processing (also been shown to activate a network of areas including the MPFC, frontal cortex, posterior cingulate, hippocampus, and Para hippocampus in autobiographical memory, Howe & Courage, 1997; Svoboda, et al., 2006; Schmitz & Johnson, 2006), and self-relevance of sensory evaluations (Fossati et al., 2003). Dysregulation of the MPFC, as well as adjacent regions like the rostral anterior cingulate gyrus (rACC), has been implicated in the onset and recurrence of depression (Lemogne et al., 2009). In short, the MPFC's role in regulating autobiographical or self-referential information, along with hyperactivity in limbic structures like the amygdala and hippocampus, may contribute to depressed people's ruminative self-focus (Cooney et al., 2010).

### *5.3 Rumination and Behavioral Avoidance*

Rumination may not be a dysfunctional behavior in and of itself, but it may be a high-cost avoidance behavior (Goldiamond & Dyrud, 1968) that leads to the loss of potentially reinforcing and motive satisfying activities, which may lead to a loss of positive reinforcement (Brockmeyer et al., 2015).

### *5.4 Interventions*

Rumination is associated with repetitive negative thoughts, and CBT is recommended to decrease rumination by challenging negative ideas and increasing rewarding behaviors (Watkins



& Roberts, 2020). The majority of the CBT studies did not include rumination as an outcome variable, therefore, make it impossible to evaluate the potential effectiveness of CBT in decreasing ruminating. There is evidence that CBT may not be helpful in decreasing rumination in depression (Jones et al., 2008), while other studies have shown a favorable impact (Jones et al., 2008). A number of treatments have been developed to specifically target rumination, including approaches based on research linking cognitive biases and executive function (Watkins & Roberts, 2020).

Rumination-focused CBT (RFCBT) is conceptualized by two major characteristics of rumination: a) an acquired habit that develops over time via repetition and negative reinforcement; b) beneficial and harmful processing patterns (Watkins, 2015). RFCBT is based on the basic concepts and methods of CBT for depression by adding significant new aspects. First, RFCBT uses the functional-analytic and contextual methodology established in Behavioral Activation (Dimidjian et al., 2011). Rumination is examined for its antecedents and effects, potential roles, and strategies to eliminate or replace it. An antecedent stimulus to rumination is identified, controlled exposure to these cues is controlled, and alternative beneficial responses are regularly practiced in order to counter-condition a more helpful habit. Individuals will be shifted from unconstructive abstract processing to constructive concrete processing via RFCBT (Watkins & Roberts, 2020). Using functional analysis, practitioners may identify useful vs unhelpful ways of thinking about problems. This includes recollections of being fully immersed in an activity (e.g., 'flow' experiences) and feelings of heightened compassion for self or others (Watkins & Roberts, 2020).

Mindfulness-based CBT (MBCT) is another therapy that has been proposed to decrease ruminating (Watkins & Roberts, 2020). MBCT is a psychosocial group-based relapse prevention treatment that combines meditational practice within the context of CBT concepts to improve depression resistance (Segal, Williams, & Teasdale, 2002). Mindfulness practice is a crucial component, in which participants learn through experience to keep their focus on their breath, thoughts, and emotions, and to retain such events in awareness in a nonjudgmental and welcoming manner. Individuals with these mindfulness abilities may be able to create alternate reactions to unpleasant thoughts and emotions, allowing them to break free from rumination patterns. For those who have had three or more bouts of depression, MBCT has been shown to be an effective relapse prevention therapy (Piet & Hougaard, 2011). In experimental analog studies (Feldman, Greeson & Senville, 2010) and trials of MBCT for patients with a history of recurrent major depression (Geschwind et al., 2011) and treatment-as-usual (van Aalderen et al., 2012), mindfulness approaches reduce rumination, with the reduction of depressive symptoms mediated by decreased rumination (van Aalderen et al., 2012).

### *5.5 Measurement of Rumination*

Multiple researchers have noticed that ruminative thought may take several forms, and they have attempted to uncover consistent distinctions in ruminative thinking (Cann et al., 2011). Ruminative thoughts triggered by an unbearable life event includes a variety of different types of recurrent thinking; these can include intrusive and often unwanted thoughts, such as those commonly associated with rumination as a symptom of distress, but they can also include more controlled thoughts focused on making sense of the cause, problem-solving (Watkins, 2008).

The Ruminative Responses Scale (RRS) is a self-report measure proposed by Nolen-Hoeksema and Morrow (1991) in their paper on ruminative responses to the 1989 Loma Prieta earthquake. Although the RRS has the advantage of concentrating on conceptualization rather than social expression, significant concerns may be raised about its application as a measure of individual variations in sorrow rumination. It may come as a surprise that such concerns have been raised, but it's worth noting that none of the previously mentioned research focused only on the RRS's features (Conway et al., 2000). The validity of the RRS has been questioned on both conceptual and empirical grounds (Conway et al., 2000). According to an assessment of the RRS's content, it seems to overlap with the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980). Moreover, parallel effects have been found in different research based on one or the other measure, the question of overlap between the RRS and the ATQ is significant (Conway et al., 2000). Automatic negative thoughts, as reflected in elevated ATQ scores, may mediate the impact of negative life events on depression (Kwon & Oei, 1992), just as rumination, as reflected in elevated RRS scores, may mediate the impact of such events on depression (Kwon & Oei, 1992). Conway et al., (2000) suggested that based on the empirical results the RRS and the ATQ indicate they are similar.

Conway et al., (2000) developed a measure (the Rumination on Sadness Scale, RSS) of individual variations in ruminating in light of those limitations of RRS. The RSS is a 13-item self-report questionnaire with one dimension. The items were developed on a conceptual level, with the goal of addressing the following aspects of rumination: (a) the intensity and repetitive nature of ruminative thoughts, (b) barely stopping ruminative thoughts, (c) the exclusion of

thoughts other than those related to sadness, (d) efforts at a causal explanation of one's suffering, as well as the conviction that such endeavors are helpful, (e) attestation of one's distress. Items are preceded by the stem “When I am sad, depressed, or feel blue...” on the RSS. On a 5-point scale ranging from 1 (not at all) to 5 (very), respondents indicate how much each item matches their feelings about sorrow (very much).

Eisma et al. (2014) proposed depressive rumination and grief rumination are two kinds of ruminative thought that have been shown to involve depression development and maintenance (Nolen-Hoeksema, 2001). Based on this classification, they developed and verified an English version of the Utrecht Grief Rumination Scale (UGRS), a self-report scale that measures grief-related ruminative thinking. They examined UGRS's psychometric property with CFA, and the result revealed that a five-factor model with five linked components (Reactions, Injustice, Counterfactuals, Meaning, and Relationships) offered the greatest fit.

According to Cann et al. (2011), there are two kinds of rumination: Intrusive and deliberate rumination. Intrusive rumination is when unwanted thoughts about an incident invade the mind without permission. Deliberate rumination, on the other hand, is a conscious effort to comprehend events and their consequences. Based on these classifications, Cann and colleagues (2011) developed the Event-related Rumination Inventory (ERRI) to assess specific event-related rumination by adding post-event processes information in the items. It is believed to monitor cognitive processes after a major life experience (Cann et al., 2011). The ERRI could be used to assess both current levels and changes over time of these two rumination styles (Cann et al., 2011).

Furthermore, Watkins (2008) defined rumination as repetitive thinking and differentiated two kinds of rumination. One is abstract-analytic rumination, which focuses on analyzing the higher-level origins, interpretations, and consequences of self-experience, which is counterproductive. The other one is concrete-experiential, which is more adaptive than abstract-analytic rumination. It is focusing on lower-level features of how self-experience evolves that are exact, contextual, and tangible on a moment-by-moment basis. The Cambridge Exeter Ruminative Thinking Scale (CERTs; Barnard et al. 2007) was created to assess both abstract-analytic and concrete-experiential rumination.

## **6. Relationship between Predictor and Outcome Variable: Passion and Exercise**

### **Maintenance**

#### *6.1 Harmonious Passion and Exercise Maintenance*

Persistence is one of the key outcomes linked with the Dualistic Model of Passion (Vallerand, 2010). Harmonious passion has been linked to lower dropout rates and higher levels of engagement in the activity (Bonneville-Roussy & Vallerand, 2017; Aujla et al., 2015), and also higher levels of psychological well-being (Vallerand et al., 2008). They are flexible in their devotion and able to balance their chosen activity with other essential life areas (Vallerand et al., 2003). Aujla and colleagues (2014) investigated 800 young dancers and discovered that a higher level of harmonious passion was statistically related to training adherence. Their results indicated that young dancers having harmonious passion could maximize their abilities without forsaking all other interests for the sake of their dancing activities. Their findings are in line with DMP since people have harmonious passion, the activity is nearly always seen as pleasant, and

the benefits they get from it exceed the occasional negative effects.

Bonneville-Roussy et al., (2013) conducted a study that is the first one looking into the connections between passion and perseverance in higher musical education. After analyzing 296 samples by using path analysis, they verified their hypothesis that music students with HP get more favorable outcomes, leading to higher levels of perseverance. Expert musicians with HP are more likely to establish mastery objectives and have better subjective well-being than obsessively passionate musicians. For the HP type, music is nearly always pleasant, and the benefits far exceed the drawbacks. This finding is in line with the vast research on motivational variables like self-efficacy and intrinsic motivation, which are significant predictors of student persistence (Bouffard et al., 2005). Conversely, obsessive passion was never linked to persistence in this study. Their findings support prior studies linking just harmonious passion (not obsessive passion) to long-term activity participation (Bonneville-Roussy, Lavigne & Vallerand, 2011; Vallerand et al., 2007). To those OP students who do not want to continue in music or who drop out of music programs, perseverance may be too demanding for the benefits it provides (Hallam, 1998). OP music students may suffer negative effects linked to anxiety and self-doubt and in greater proportion than harmonious passionate students, and therefore drop out at a higher rate (Papageorgi, Hallam & Welch, 2007). They suggested music students on these very difficult educational routes may benefit from teaching in an autonomy-supportive manner and encouraging harmonious passion, which may enable them to persevere in a healthy and positive manner toward their desired profession.

There is only one study investigate in exercise settings was conducted by Bum (2019)



among 245 exercisers in seven sports centers in Korea. After analyzing the data in SEM, he discovered harmonious passion may improve exercise adherence behaviors while obsessive passion had the opposite impact. The measuring instrument Bum (2019) used in his study to measure exercise-adherence behaviors was verified by M. L. Kim (2009) in Korea which consisted of a single factor with four items (e.g., “I wish to continue to participate.”).

## 6.2 *Obsessive Passion and Exercise Maintenance*

Obsessive passion has been proved to be linked to negative emotions such as shame and anxiety, as well as negative behaviors such as aggression (Donahue, Rip & Vallerand, 2009); pathological engagement (Vallerand et al., 2003); conflict with significant others (Vallerand, et al., 2008); and reduced quality of relationships outside of the passionate activity (Philippe et al., 2010). Therefore, it is not hard to understand why obsessive passion has been linked to hazardous training (i.e., cycling in bad weather conditions; Vallerand et al., 2003) and injury in the quest of performance (Rip, Fortin & Vallerand, 2006). Recently, some researchers turned to investigate exercise dependence which is “A desire for leisure-time physical activity, leading in uncontrolled excessive exercise behavior, manifesting in physiological symptoms (Hausenblas & Symons Downs, 2002)”. DSM-V (American Psychiatric Association, 2013) includes a category called "Behavioral Addiction.", however, only gambling addiction and internet addiction are included in this category of behavioral addictions. Exercise addiction remains undiagnosed in the DSM-V. Indeed, it sounds like OP and inflexible perseverance are similar to the kind of behaviors linked with addiction and dependence (Vallerand et al., 2003). Obsessive passion, given its nature, is linked to inflexible perseverance, life conflict, physical illness, and avoidant tendencies



(Vallerand, 2012).

Parastatidou et al. (2014) investigated obsessive passion as a mediator between introjected regulation and exercise dependency symptoms among 549 regular Greek exercisers. The results offered cross-sectional evidence for obsessive passion as a mediator between introjected regulation and exercise dependency symptoms which seems that the effects of introjected regulation on exercise dependency symptoms were mostly conveyed via OP.

## **7. Relationship between Predictor and Mediators: Passion, Flow, Mindfulness and**

### **Rumination**

#### *7.1 Passion and Flow*

##### *7.1.1 Harmonious Passion and Flow*

Harmonious passion is positively related to task focus and other components of flow (i.e., perceived control, balance between challenge and skill, and absence of self-consciousness) during activity engagement, according to previous researches, whereas obsessive passion is unrelated to these positive outcomes (Philippe et al. 2009; Forest et al. 2011; Mageau et al. 2005; Vallerand et al. 2003).

Harmonious passion also has been found to be positively linked with factors associated with engagement, such as task concentration (Vallerand et al., 2003). Individuals having harmonious passion is considered associating with an adaptive accomplishment process that is defined by focus and positive motivation when engaged in a task (Vallerand et al., 2003). Nevertheless, HP not just has a lot in common with flow (Vallerand et al., 2003), but also showed a tendency of behavioral persistence. A study that involved 124 Norwegian sports students

showed a connection between perceived competence and dispositional flow ( $r = .63$ ; Halvari et al., 2009). This result may be linked to a student's perseverance in his or her preferred activity, as research shows that harmonious passion is positively correlated with it, which is a requirement for competence development (Miquelon & Vallerand, 2006). Physical activity involvement is supposed to be adaptive in nature among harmonious passionate students, as research indicates a positive correlation between it and flexible task involvement, flow, positive emotions, subjective well-being, and concentration, and a negative correlation with shame and negative emotions (Vallerand et al., 2006).

#### *7.1.2 Obsessive Passion and Flow*

Carpentier and colleagues (2012) proposed harmonious passion is positively related to task focus and other components of flow during activity engagement, whereas obsessive passion is unrelated to these positive outcomes (Forest et al. 2011). It is believed that flow experiences in one's passionate activity may explain the beneficial connection between harmonious passion and well-being (Cantor & Sanderson 1999; Csikszentmihalyi 1999; Eisenberger et al. 2005; Kubovy 1999).

#### *7.2 Passion and Mindfulness*

Despite the fact that an individual's ability for mindfulness varies, it's been suggested that everyone has an inherent potential for mindfulness (Kabat-Zinn, 2003). However, personality or dispositional factors may have an impact on one's ability to be attentive. Passion may be one of these factors, according to the Dualistic Model of Passion (Vallerand et al., 2003). Indeed, participating in a flexible, open, and non-defensive manner in an activity that one is

enthusiastic about on a daily basis should be one method to promote mindfulness (Vallerand, 2015). Individual may fully participate in the activity while yet maintaining control when they have HP. Despite the fact that the passionate activity occupied a large portion of their identity, it is consistent with other key parts of their identity and aspects of their lives. It is important to note that HP is influenced by the genuine integrating self (Deci & Ryan, 2000). Individuals may participate in the passionate activity with a secure feeling of self-worth and in a flexible, open, non-defensive (Hodgins & Knee, 2002) and aware manner as a result of this process (Brown & Ryan, 2003).

An Individual with OP have an overwhelming desire to participate in the activity, which they often lose control over. The passionate activity has a dominant position in their identity, and it is in conflict with other important self-components and elements of their existence. With this kind of passion, internally controlled and non-authentic self-processes are at play, and as a result, individuals participate in the passionate activity with a contingent sense of self-esteem and in a protective, closed, and unmindful way (St-Louis, Carbonneau & Vallerand, 2016).

St-Louis and colleagues (2016) provided evidence in favor of one of the DMP's key features (Vallerand et al., 2003). According to the DMP, HP enables access to adaptive self-processes such as mindfulness, while OP restricts such access. This study was the first to test this hypothesis experimentally, and results from three investigations backed up the assumptions. Passion enables access to one's inherent mindful ability, making it a key predictor of mindfulness. St-Louis and colleagues (2018) examined passion as a determinant of mindfulness, and results revealed that Harmonious Passion is positively and predicted mindfulness.

### 7.3 *Passion and Rumination*

Vallerand and his colleagues (2003) suggested two kinds of passions, which they differentiated based on the degree to which the passionate action has been integrated into the person's self-concept. It is caused by a controlled absorption of the activity into the person's identity that leads to obsessive passion. As soon as the thought of the passionate activity crosses their minds, individuals who are obsessed with it feel compelled to participate in it. They are compelled to participate in the activity either as a result of intrapersonal and/or interpersonal pressures and contingencies that are associated with the activity, such as social acceptance or self-esteem (Mageau, Carpentier & Vallerand, 2011), or as a result of an uncontrollable sense of excitement derived from participation in the activity (Mageau, Carpentier & Vallerand, 2011). Finally, the passionate activity becomes overly important in the person's identity and causes conflict with other aspects of the person's identity or with other activities in the person's life (Séguin-Lévesque et al., 2003).

Obsessive passion has been found to be positively associated with feelings of guilt and negative emotions both during and after engagement in the passionate activity (Mageau et al., 2005), negative affect, and rumination when prevented from engaging in the passionate activity (Ratelle et al., 2004), depression (Rousseau & Vallerand, 2008).

### 7.4. *Obsessive Passion, Rumination, and Flow*

It is convincing that harmonious passion is positively related to task focus and other components of flow during activity engagement, while obsessive passion is not (Forest et al. 2011). When individuals are prohibited from participating in their activity, obsessive passion is

connected to distractions (Vallerand et al. 2003) and ruminative thoughts (Ratelle et al. 2004), while harmonious passion is independent of these factors. In the absence of urgent external demands, ruminative thoughts are characterized as conscious thoughts on a specific topic that repeats (Martin & Tesser, 1996). Individual's present worries and unmet objectives are believed to be reflected in these repeated, unintended, off-task thoughts (Martin & Tesser 1996). Ruminations are therefore a reflection of an individual's proclivity to continue pursuing objectives until they are either met or abandoned (Carver & Scheier, 1981). Furthermore, according to Carver (1996), the information accessible in awareness is what is most valued at the time. As a result, the substance of ruminative thoughts may be regarded more significant than whatever the individual is doing right now.

It should come as no surprise that people with higher levels of obsessive passion feel internal pressure to engage in their favorite activity (Vallerand et al. 2003), rigidly persist in activity engagement (Vallerand et al. 2003), and value their favorite activity above all others (Ratelle et al. 2011). People with a more harmonious passion, on the other hand, value their many life domains equally and are more flexible in their activity involvement, thus they are less likely to obsess about their passionate activity when engaged in other activities. People with OP for their preferred activities should be stopped from experiencing flow when they participate in other activities because ruminative thoughts about their favorite activity distract them from the present moment (Carpentier, Mageau & Vallerand, 2012). Flow has therefore been suggested to be hampered by dispositional and state variables that divert individuals from task engagement, such as ruminations (Carpentier, Mageau & Vallerand, 2012).

Carpentier and colleagues (2012) examined the psychological processes that underpin the varied effects of two kinds of passion on well-being. Passion, ruminations, flow experiences, and well-being were all examined as part of a theoretical model. According to their findings, the more individuals who have a harmonious passion, the more likely they are to experience flow in their preferred activity, which predicts greater well-being. Obsessive passion did not seem to be correlated with flow in the preferred activity. In contrast, the more obsessive a person's passion is, the more likely they are to ruminate about it while doing anything else, which did not seem to be the case for individuals who have a harmonious passion. These ruminations have a negative relationship with flow experiences in the other activity. The finding is in line with Csikszentmihalyi's (1975, 1982) statement that flow is the consequence of complete immersion in one's activities. Flow has therefore been suggested to be hampered by dispositional and environmental variables that distract individuals from task involvement, such as ruminations (Nakamura & Csikszentmihalyi 2002).

## **8. Relationship between Mediators and Outcome Variable: Flow, Mindfulness,**

### **Rumination and Exercise Maintenance**

#### *8.1 Flow and Exercise Maintenance*

Flow experience may be essential in competitive sport in enabling an optimum subjective psychological state including enjoyments, intrinsic drive, and perseverance, in addition to being related to peak performance (Jackson, 1999). According to Csikszentmihalyi and Seligman (2000), the pleasure derived from pushing oneself to new boundaries contributes to personal development and happiness. Flow may improve the quality of sports experience by giving

importance to the present moment (Nakamura & Csikszentmihalyi, 2009).

Flow theory was developed in an attempt to explain why people continuously engage in self-serving behaviors (Petosa & Holtz, 2013). The flow experience, it is believed, lays the groundwork for long-term behavioral adherence (Petosa & Holtz, 2013). This foundation is based on incentives obtained directly from the desired behavior's practice. Motivation is inversely related to the degree to which the goal action generates a flow state (Petosa & Holtz, 2013). According to the previous discussion about the intrinsically-rewarding nature of flow, flow experiences may be motivating and can aid in sticking to specific kinds of activities (Abuhamdeh, 2021). Nakamura & Csikszentmihalyi (2014) proposed flow is a state of mind in which awareness is organized harmoniously and focused on the task at hand as flow is defined as a state of complete absorption in the execution of an activity. Flow occurs when a person's attention is so fully concentrated on the task at hand that awareness of self and surroundings is diminished, resulting in a decrease in self-conscious cognitions. Time perception is often changed, exercisers might experience time lost and possibly alleviate boredom perceptions from engaging in PA (Petosa & Holtz, 2013). In other instances, time may seem to be speeding up during PA.

Petosa & Holtz (2013) conducted a study among 445 young adults (age range from 19 to 29) for 4 weeks, they discovered the Flow of Exercise Assessment Scale (FEAS) scores was reported linking with activity days, as anticipated by flow theory. There was a stronger correlation between FEAS score in the Maintenance stage than the action stage (Petosa & Holtz, 2013). These findings suggest that the FEAS may predict exercise adherence among young



people. They also suggested flow may be a good way to keep people motivated to exercise (Petosa & Holtz, 2013).

Kim and Lee (2008) examined the connections between motivation, flow, and learning persistence in 199 individuals participating in water sports. They found that flow had a substantial impact on the persistence of involvement intentions.

## *8.2 Mindfulness and Exercise Maintenance*

Individuals who are mindful are more likely to participate in and sustain healthy habits, according to research (Roberts & Danoff-Burg, 2010). Evidence shows that self-regulation of thoughts and emotions, which are associated with behavior change, persuaded aware people to alter their behavior more readily than those with weaker mindfulness abilities (Levesque & Brown, 2007). PA self-regulation and result expectancies were favorably associated with dispositional mindfulness, whereas perceived personal obstacles to PA were negatively correlated, according to a study conducted by Grinnell et al. (2011). In a cross-sectional study, Ruffault et al., (2016) discovered high levels of self-reported mindfulness were linked with increased intrinsic motivation and physical activity, which corroborates previous research (Brown & Ryan, 2003).

Additionally, through a mix of present-moment sharpness and an accepting, nonjudgmental attitude, 'being mindful' may be a potentially helpful way of managing exercise-related difficulties (Ulmer et al., 2010). In the context of long-distance running, accomplished endurance athletes report experiencing mindful-like states, focusing primarily on present-moment physical and physiological sensations while attending to, but not becoming overly

invested in that accompany such experiences (Salmon, Hanneman & Harwood, 2010). It's possible that a similar pattern of nonjudgmental, present-focused awareness is at work in other potentially stressful situations, including exercise start and maintenance (Ulmer et al., 2010).

According to an investigation conducted by Ulmer and colleagues (2010), YMCA exercisers who are effective at maintaining exercise had greater mindfulness and acceptance ratings, as well as lower suppression levels. Additionally, in an exploratory randomized controlled study, Tapper et al. (2009), discovered that mindfulness treatments improve physical activity behavior. Moreover, in a systematic review, Schneider and colleagues (2019) proposed people with higher dispositional mindfulness, or those who learn to cultivate it, are better able to translate PA intentions into behavior, are intrinsically motivated to engage in PA, accept negative feelings that are likely to occur during exercise (e.g., fatigue), and enjoy the exercise experience.

### *8.3 Rumination and Exercise Maintenance*

Rumination, which consists of nagging and persistent thoughts about an unfulfilled goal, is another component that contributes to goal perseverance (Martin & Tesser 1996). "People may make terrible predictions about the emotional effect of failing to achieve the objectives to which they are committed because they believe failure would undermine their self-worth" (Pomerantz, Saxon, & Oishi, 2000). As a result, it seems that part of the content of a pursuer's rumination is concerned with the repercussions of not achieving the key relationship objectively. Rumination tends to grow in intensity with time, and it lasts until the unfulfilled objective is either abandoned or achieved (Cupach et al., 2011). Rumination, like connecting, emphasizes

the significance of achieving one's goals. When goal accomplishment seems to be the only way to escape rumination, relationship seekers increase their efforts to obtain the relational objective they so badly pursue (Cupach et al., 2000; Pomerantz, Saxon & Oishi, 2000).

Researches show individual have ruminations as a reaction to the roadblock, normally, they feel hopeless (Geiger & Kwon, 2010). They are unlikely to come up with a different way to accomplish their objective or have the motivation to keep thinking in a goal-oriented manner. Instead, they will prone to engage in the kind of passive thinking that has been identified as a depress genic component of rumination in earlier research.

#### *8.4 Mindfulness, Flow and Exercise maintenance*

According to one of the cluster analytic studies with student-athlete samples conducted by Kee & Wang (2008), those who are more attentive are more likely to experience flow states. When compared to the low mindfulness cluster, five out of nine flow dispositions were shown to be substantially greater in the high mindfulness cluster. At the same time, individuals who were most attentive during their athletic activities tended to use emotional regulation, goal planning. Individuals in the high mindfulness group are more likely to take on new tasks than those in low mindfulness clusters. The explanation they provide was the high mindfulness group did better at the challenge–skill balance owing to they had a more flexible mindset. The way one sees difficulty is more essential than the actual challenge given in order to have flow experience (Jackson & Eklund, 2004). Being adaptable in one's mindset enables one to be less constrained in one's assessment of abilities and difficulties. This may result in a more positive impression of the balance between challenge and ability, allowing flow to emerging.

## 9. Relationship Among Mediators: Flow, Mindfulness and Rumination

### 9.1 Mindfulness and Rumination

Ruminative thinking is in opposition to attentive nonreactivity since it is linked with a lack of acceptance (Liverant et al., 2011), as well as lingering on previous stresses (Watkins, 2004). It is also in conflict with the practice of attentive nonjudgment. A stronger detrimental effect on negative affect seems to be linked with rumination associated with evaluative brooding (Moberly & Watkins, 2008) and negative cognition (Ciesla & Roberts, 2007) than with other types of rumination. At the end of the day, rumination is associated with a higher level of behavioral perseveration, a desire to avoid problems, and an unwillingness to engage in pleasant activities that individuals know would improve their mood (Whitmer & Banich, 2007; Lyubomirsky & Nolen-Hoeksema, 1993). In sum, rumination promotes a propensity to get trapped in inactivity and a lack of conscious action with awareness, which is detrimental (Ciesla et al., 2012).

Researches suggested that the benefits of mindfulness could decrease ruminative thinking because of this mismatch between mindfulness and rumination. Multiple treatment trials, for example, have shown that mindfulness-based intervention decreases rumination, which explains the effectiveness of these treatments (Jain et al., 2007; Ramel et al., 2004; Shapiro et al., 2008). Although the treatments employed in these researches are likely to promote many aspects of mindfulness, there was a focus on developing nonjudgmental awareness and open acceptance of experience in these investigations. Nonjudgment, behaving with awareness, and nonreactivity are the FFMQ scales that these abilities relate to. Furthermore, cross-sectional

studies indicate that reduced ruminative thinking mediates the link between attentive attention and depression (Marks et al., 2010).

Hatchard and colleagues (2017) found lower social anxiety, sadness, rumination, and state anxiety, as well as increased self-esteem among MBSR participants. Post-MBSR, breath-focused concentration lowered unpleasant feeling ratings relative to counting trials. Visual attention, including the inferior and superior parietal lobules, cuneus, precuneus, and middle occipital gyrus, and memory, including the parahippocampal gyrus, showed enhanced brain activity post-MBSR. Changes in brain activity reduced SAD symptoms. Following MBSR, the right amygdala deactivated significantly before the signal to shift attention to the breath, but not the counting condition, which may indicate a reduced emotional reaction to negative self-beliefs.

## 9.2 Mindfulness and Flow

These two states appear to be very different. Mindfulness entails developing a conscious observer and attempting to sustain reflective awareness of each moment. Flow, on the other hand, entails losing one's inner observer in a changed state of consciousness in which the present instant becomes a continuous stream of activity (Sheldon, Prentice & Halusic, 2015). However, the results from related studies provide opposite evidence. For example, Bernier et al., (2009) investigated flow experiences in ten top swimmers using qualitative research. The swimmers reported being especially aware of and accepting of their physical feelings during flow experience.

The ability to widen or narrow attention, non-interference of evaluation or judgment with sensory experience, orientation to the present, and aware transitions between focus of

attention, such as between attention on the inner self and the outer world, are all characteristics of mindfulness (Brown, Ryan & Creswell, 2007; Schutte & Malouff, 2011). According to Dane (2011), while both states (mindfulness and flow) are strong in temporal orientation (present-moment focus), attentive states have a wider attentional breadth (e.g., monitoring all experiences), whereas flow states have a narrower attentional focus (e.g., focusing only on the activity for that moment). Additionally, Mindful attention to the present moment is a purposeless act associated with temporary suspension of one's ego and interpretation of experiences (Brown & Ryan, 2003; Shapiro, et al., 2006). When someone is attentive, he or she observes the developing moment without judgment and without attaching personal values to it. This allows the user to let go of their own ego (Game, 2001) as well as other self-conscious ideas. As a result, cognitive inhibition has been linked to self-regulation of attention toward the current moment (Bishop et al., 2004).

Mindfulness has been shown to enhance flow in sports, according to a growing body of research (Cathcart et al., 2014). Studies by Bernier and colleagues (2009), and Schwanhauser (2009) both reported increased flow and sports performance following mindfulness training. In a community sample of archers and golfers receiving mindfulness training, Kaufman et al. (2009) reported improved confidence and flow, while De Petrillo et al. (2009) reported decreased worry and perfectionism among long-distance runners receiving mindfulness training. Gardner and Moore (2006) found that athletes who used mindfulness methods to increase non-judgmental awareness and acceptance of cognitions, emotions, and sensations enhanced their performance in two case studies. Aherne and colleagues (2011) found improvements in flow experience after mindfulness training in university student-athlete in a randomized controlled study. It is



convincing individual's ability to have flow experience is related to mindfulness, wherein improving one's capacity to be aware will also improve the ability to emerge flow (Thienot et al., 2014).

In a cluster study which was conducted by Kee & Wang (2008), comparing the high mindfulness cluster to the low mindfulness cluster, the high mindfulness cluster scored substantially higher in dispositional flow of challenge–skill balance and clarity of objectives, as well as concentration, feeling of control, and loss of self-consciousness scores. Individuals who have a higher proclivity to be more attentive are also more prone to experience flow (Kee & Wang, 2008). It is convinced that the adoption of mental skills is associated with greater frequency of flow experiences (Jackson et al., 2001), the observed connection between mindfulness and mental skill adoption is of particular significance. When comparing the high mindfulness cluster to the low mindfulness cluster, it was shown that five out of nine flow dispositions were substantially greater in the high mindfulness cluster (Kee & Wang, 2008). It is obvious that individuals who were most attentive are more likely to use techniques such as attentional control, emotional management, goal planning, and self-talk during their athletic activities (Kee & Wang, 2008). In addition, clear objectives, focus, feeling of control, and lack of self-consciousness are related to mindfulness. According to Bishop et al. (2004), one of the two components of mindfulness is the ability to regulate one's attention. Those four components are all linked to the ability to regulate one's attention. Those that are aware are more likely to be cognizant of their objectives while they are performing movements because they have improved self-regulation of attention (Kee & Wang, 2008). This is supported by a higher flow disposition



in the presence of defined objectives. The link between concentration and mindfulness has the same idea that the flow disposition of concentration is associated with the ability to maintain attention on the activity at hand (Jackson & Eklund, 2004). Bishop and colleagues (2004) suggested that mindful athletes have a greater feeling of control since mindfulness is directly linked to the ability to regulate one's attention. Ryan and Brown (2003) also found that those who are more attentive tend to have higher self-esteem and are less influenced by intrusions. Kee & Wang (2008) suggested it is the explanation why more attentive athletes are more likely to experience a lack of self-consciousness than their less mindful counterparts. When it comes to experiencing flow, it may have something to do with the purposelessness of mindfulness (Brown & Ryan, 2003) mentioned earlier. This is because flow is characterized by the inhibition of cognition (Bishop et al., 2004) and a sense of unselfconsciousness towards the task at hand, both of which are conducive to flow (Jackson & Eklund, 2004).

Clark (2002) looked at the effect of self-regulated attention control (mindfulness) on the amount of time spent in flow in a non-athlete population. His research looked at how a mindfulness training protocol affected everyday flow experiences among graduate students. As part of the study methodology, the participants were taught mindfulness meditation and attention management techniques based on the works of Kabat-Zinn and Nideffer, respectively (Clark, 2002). The participants' flow experience in their everyday lives was assessed using the experience sampling technique (ESM) before and after the training procedure. Three of the six participants reported treatment benefits, indicating that mindfulness training may aid some people in improving the amount of time they spend in flow throughout the day. Some people

seemed to gain more than others from the mindfulness training that was recommended.

### *9.3 Rumination and Flow*

As previously discussed, flow is the consequence of complete absorption in one's activities (Csikszentmihalyi, 1982). Flow has therefore been suggested to be hampered by dispositional and environmental variables that distract individuals from task involvement, such as ruminations (Nakamura and Csikszentmihalyi 2002).

A fMRI study was conducted by Ulrich and colleagues (2016) aimed to verify the hypothesis that the DRN causes the MPFC and/or AMY to become less active. Their results indicated that the DRN (is the source of strong serotonergic projections that have been shown to lower MPFC and AMY activity; Hahn et.al., 2012) may be the catalyst for the flow experience. This is corroborated by research demonstrating that selective serotonin reuptake medications reduce MPFC hyperactivity while also reducing depressing symptoms of negatively balanced rumination (van de Ven et al., 2013). Reduced MPFC activity under flow may represent a key neurophysiological characteristic underpinning the lack of ruminative thoughts (Csikszentmihalyi, 1990), which is primarily driven by the DRN, as demonstrated in their resting state research.

## **10. The Mindfulness-based Interventions Maintain Exercise Behaviors**

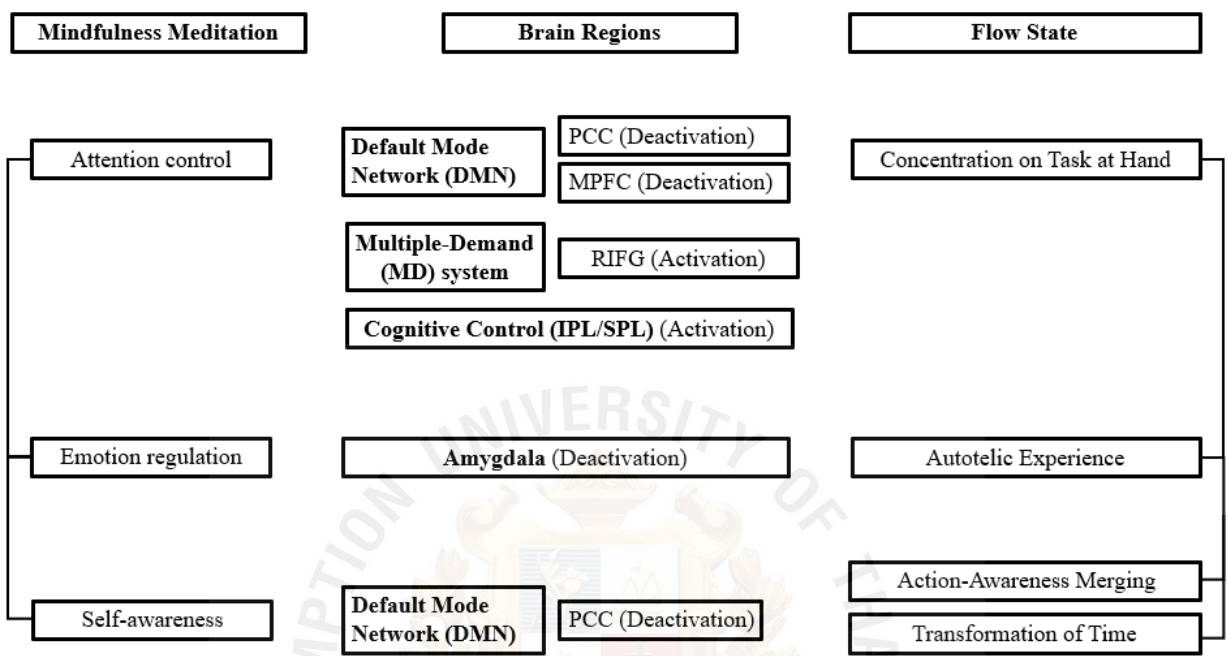
### *10.1 A neuroscience Framework for Explaining the Effectiveness Mindfulness-based Interventions Enhance Flow Experience.*

A neuroscience framework (see Figure 2-12) is established to incorporate four brains regions to provide evidence of the effectivity of mindfulness-based intervention enhancing flow

experience: a) Default Mode Network (DMN); b) Amygdala (AMY); c) Multiple-Demand (MD) system; d) Cognitive Control (IPL/SPL). Researches show that during mindfulness and flow state, these four brain regions show consistent activities which indicates that both minds states share similar neuroscience foundations (e.g., Ulrich et al., 2014; Ulrich, Keller & Grön, 2016). This neuroscience framework aims to provide evidence for mindfulness-based intervention enhancing flow experience in the neuroscience perspective. Since Ulrich et al., (2014) inferred those changes in neural activity in these brain areas represent psychological processes related to flow: higher outcome probability coding (putamen), a deeper feeling of cognitive control (IFG), reduced self-referential processing (MPFC), and lower negative arousal (AMY), these four brain regions (DMN; AMY; MD system; IPL/SPL) will be discussed in these two mind states according to Ulrich et al., (2014)'s works.

Figure 2-12

*A Neuroscience Framework for Incorporating Mindfulness Meditation and Flow State.*



Note. a) Default Mode Network (DMN); b) Amygdala (AMY); c) Multiple-Demand (MD) system; d) Cognitive Control (IPL/SPL) are the four major regions show consistently activation or deactivation in these two mind states.

10.1.1 The Deactivation of DMN in Mindfulness Meditation and Flow State

The goal of mindfulness meditation is to develop a non-judgmental awareness of the internal and external stimuli that are present in the moment (Kabat-Zinn, 2003). Research show it has an impact on self-referential processing, given that the main goal of practicing mindfulness is to realize the absence of any essential 'self' via direct experience (Berkovich-Ohana, Glicksohn & Goldstein, 2012). A group of regions known as the Default Mode Network (DMN) has been credited with self-referential processing. The DMN, which includes the medial prefrontal cortex (mPFC), the medial temporal lobe, the posterior lateral cortices, the anterior and posterior

cingulated cortex (ACC, PCC), and the precuneus, has been shown to be active when people are engaged in internal processing and to deactivate when their attention is drawn to external stimuli (Raichle et al., 2001).

According to the proposed framework, DMN is responsible for attention control and self-awareness in the mindful state, which is the same as in the flow state (task at hand, action-awareness merging, and transformation of time). More specifically, the posterior cingulate cortex (PCC) and medial prefrontal cortex (MPFC) deactivates in both states.

#### *10.1.1.1 The Deactivation of PCC in Mindfulness Meditation and Flow State*

The PCC is part of the posteromedial cortex, which also contains the precuneus and retrosplenial cortex, and is located in the medial region of the inferior parietal lobe (Parvizi et al., 2006). As a key component of the default mode network (DMN) (Buckner et al., 2008), evidence suggests that the PCC is more directly involved in controlling attention focus (Hahn et al., 2007), possibly by balancing internally and externally focused cognition (Leech et al., 2011). Furthermore, the PCC's activity fluctuates with arousal level, and its connections with other brain networks may be crucial for conscious consciousness (Vogt & Laureys, 2005).

Attention can be thought of as a spectrum that ranges from narrow to broad (Eriksen & Yeh, 1985). In the case of visual processing, for example, one could choose to concentrate only on a single visual event or to allow a variety of inputs from throughout the visual field to reach an awareness. (Andrews-Hanna et al., 2010). A flexible attentional focus may be used to a variety of sensory modalities, as well as internal and external thinking. The PCC, Leech & Sharp (2014) argued, is involved in 'tuning' the focus of attention. Symptoms that are consistent with a failure

to regulate the breadth of attention can be found in many of the clinical diseases linked with PCC anomalies. Integrative difficulties are seen in autism, various types of dementia, depression, and schizophrenia may be related to rigid attention (Leech & Sharp, 2014).

In one of the experiment designs, Garrison et al. (2013) found that both meditators and non-meditators reported a significant connection between their subjective experience and the feedback graph, with “less blue” indicating focused attention and “increased red” indicating mind wandering and/or self-referential processing.

Taylor et al., (2011) conducted an fMRI study to examine both a mindful and non-mindful state of awareness among twelve experienced (over 1000 hours of practice) and ten novice meditators. Results show across all emotional categories, experienced meditators had lower activity in the right medial prefrontal brain and right posterior cingulate cortex during the Mindful condition than novices. The higher deactivation in these two critical DMN areas found in experienced meditators (compared to novices) is consistent with other results (Brefczynski-Lewis et al., 2007). Brefczynski-Lewis and colleagues (2007) also discovered a negative correlation between the number of hours of meditation experience and activation in DMN regions (MPFC and PCC) in response to emotional and non-emotional sounds during a state of concentration meditation (compared to a baseline state of rest) in long-term meditation practitioners.

During the reassessment and passive watching of unpleasant emotional images, depressed people failed to deactivate many DMN regions, according to another brain imaging research (Sheline et al., 2009). The greater interference from internally produced thoughts and

rumination processes was regarded as the cause of this result. Mindfulness meditation has been found to decrease the incidence of ruminative thoughts in remitted depressive patients, which supports this theory (Ramel et al., 2004). Thus, the greater mindfulness-induced deactivation of the MPFC and PCC observed here in experienced meditators compared to beginners may reflect an adaptive process in which present-moment awareness is enhanced and information in the environment is processed with less distractibility and interference from self-referent thought or rumination in individuals with long-term meditation experience.

Ulrich et al. (2016) 's findings indicate a consistency with the characteristics of flow. The reduction of DMN activity is formerly thought to represent one of the distinguishing characteristics of flow, namely, a decrease in self-reflection (Csikszentmihalyi, 1990; Peifer, 2012). In this study, they investigated 23 participants to detect flow state by conducting a typical fMRI block design. The results show when compared to control circumstances, the MPFC, PCC, lateral temporoparietal, and medial temporal regions, including the amygdala, were less active during the flow condition.

Meditation methods targeted at diverting attention away from self-referential processing were linked to lower PCC activity in experienced meditators, along with the MPFC (Farb et al., 2007; Brewer et al., 2011). Furthermore, a recent fMRI research of experienced meditators using real-time neurofeedback found that reductions in PCC activity are related to subjective feelings of undistracted awareness (concentration), easy doing, and satisfaction (Garrison et al., 2013). Since intense attention on the work at hand and subjective sensations of effortless participation are defining features of experiencing flow, this is in excellent accord with the current finding of



reduced PCC activity during flow.

#### *10.1.1 The Deactivation of MPFC in Mindfulness Meditation and Flow State*

Taylor et al., (2011)'s finding suggests that mindfulness is linked with reduced activity in the right MPFC in experienced meditators compared to novices, which supports one of their studies (Farb et al., 2007). This decreased activity in the right MPFC is in line with the results of Brentsen and colleagues (2010) as well, who found that this cortical area is deactivated during prolonged meditation. Their results were also consistent with Kross and colleagues' (2009) investigation of the connection between brain function and emotional state acceptance. Participants' MPFC and subgenual ACC activations were reduced when they were asked to recall a negative autobiographical experience and accept their emotional states. Participants' activity in these areas rose when they were instructed to 'ruminate' on their emotional states. (Taylor et al., 2011). The reason for the higher MPFC deactivation seen in experienced meditation practitioners as compared to beginners during the Mindful condition may indicate better acceptance of emotional experiences as well as disengagement of appraisal and thought-related processes. Mindfulness meditation is described as accepting sensations, emotions, and ideas rather than trying to control or alter them (Bishop et al., 2004). Grant and colleagues (2011) observed a similar pattern of MPFC deactivation for meditators during pain perception, an essentially emotional event.

Ulrich and his colleagues (2016) found out expert meditators' PCC activity dropped along with their MPFC activity (see Figure 2-16.; Farb et al., 2007; Brewer et al., 2011). Decreases in PCC activity has also been related to subjective feelings of undistracted awareness

(concentration), sense of control in fMRI research (Garrison et al., 2013). In fact, intense focus on the task at hand and subjective sensations of easy participation are distinguishing features of experiencing flow.

#### *10.1.2 The Deactivation of Amygdala in Mindfulness Meditation and Flow State*

The amygdala is involved in emotion regulation (Phelps & LeDoux, 2005; Buhle et al., 2014). Kral et al., (2018) assessed amygdala activation during an automatic emotion control task in long-term meditators and meditation-naïve participants. A RCT was conducted in a study with meditation-naïve participants completed either an 8-week MBSR intervention or a validated, active control condition (MacCoon et al., 2012). The long-term meditators practiced daily sitting meditation for at least 30 minutes for at least three years. Practitioners developed continuous awareness to experience without trying to control the focus of attention (Lutz et al., 2015). The results of this RCT indicated an association with decreased right amygdala activation in response to unpleasant vs neutral images. Their findings showed the consistency with the theory that training in mindfulness meditation would reduce sensitivity to emotional stimuli (Lutz et al., 2015).

In another study, Creswell et al., (2007) found when compared to the gender labeling control task, dispositional mindfulness was related with higher broad prefrontal cortex activation and lower bilateral amygdala activity during affect labeling after adjusting for various individual differences variables. Moreover, Taylor and colleagues (2011) found long-term mindfulness meditation leads to emotional stability by increasing acceptance of emotional experiences and improved present-moment awareness, rather than evoking control over low-level affective

cerebral systems from higher-order cortical brain areas.

Self-referential processing has been demonstrated to link with dissatisfaction (Brewer et al., 2011), negative affectivity (Lemogne et al., 2011), and attribution of bad feelings to oneself (Lemogne et al., 2012). Ulrich and colleagues (2016) explained the U-shaped amygdala reaction. Since the amygdala gets serotonergic inputs (Celada et al., 2013), its U-shaped response pattern shows it obtains the most appropriate serotonergic innervation during flow, while boredom and overload cannot. Given the amygdala's function in emotional arousal (Colibazzi et al., 2010; McReynolds & McIntyre, 2012), this "optimal" innervation may condition flow positivity.

### *10.1.3 The Activation of Multiple-Demand (MD) system in Mindfulness Meditation and Flow State*

Multiple-Demand (MD) system is characterized by similar brain activity across a wide range of activities (Crittenden & Duncan, 2014; Duncan, 2010). It includes parts of the IFG, and the IPL/SPL (Ulrich, Keller & Grön, 2016). MD system has been linked to fluid intelligence and has been shown to be important in the structuring of mental control for goal-oriented activity (Crittenden & Duncan, 2014; Duncan, 2010).

Considering mindfulness meditation practice entails attention refining, the flexible activation and disengagement of metacognitive functions, and the balancing of arousal and laxity, MD system are expected to be involved (Malinowski & Shalamanova, 2017). Attentional brain networks (e.g., MD system) will be enhanced when attentional concentration and stability improvements. The balancing of alertness levels will affect brain networks (e.g., MD system) involved with alertness and arousal, and the dynamic engagement of cognitive processes will

lead to improved functioning of the brain networks (e.g., MD system), according to Malinowski and Shalamanova (2017). Because the effort needed to engage in mindfulness meditation reduces with experience, the emphasis may move away from brain network training, which improves cognitive processes, and toward brain state training, which refines meditation states (Malinowski & Shalamanova, 2017).

Most brain areas that exhibit greater activity during flow than under control circumstances closely resemble the MD system (Ulrich, Keller & Grön, 2016). The MD system may split the issue at hand into smaller sub-parts that may be addressed separately while processing a cognitive activity (Duncan, 2010). In one of their studies, Ulrich and his colleagues (2016) proposed this general functional characteristic may explain why the activation of the MD system was highest during flow but not during overload: According to the performance data, during flow, participants in their study were much more successful in performing the required sequential arithmetic operations to arrive at a correct solution, implying that the magnitude of activity in MD brain regions may be better explained by the product of task difficulty and successful performance, rather than simply task difficulty. Flow experiences have also been recorded in a range of activities, including playing Tetris on a computer (Keller & Bless, 2008; Harmat et al., 2015) and completing knowledge questions (Keller et al., 2011).

As part of the MD system, the right inferior frontal gyrus (RIFG) is thought to have a role in attentional switching (Dove et al., 2000; Hampshire & Owen, 2006). Taren et al., (2017) conduct a 3 day of intensive mindfulness meditation or relaxation training RCT study. Thirty-five individuals with high levels of psychological distress took part in the study and had a

resting-state fMRI scan before and after the intervention. Results indicated there are increasing activity in RIFG following mindfulness training relative to the relaxation control.

According to the results from Ulrich and his colleagues (2014), activation of these areas was understood to contribute to experience flow by coding higher outcome likelihood (basal ganglia) and a richer sense of cognitive control (IFG). In another fMRI study conducted by Ulrich and his colleagues (2016), the BOLD imaging replicated their previous findings (Ulrich et al., 2014) of invU-shaped neural activation in the IFG during flow experience.

#### *10.1.4 The Activation of IPL and SPL in Mindfulness Meditation and Flow State*

In an fMRI study, Goldin & Gross (2010) examined MBSR-related alterations in brain-behavior markers of emotional reactivity and control of negative self-beliefs in thirty patients with social anxiety disorder. They discover the brain areas involved in visual attention (i.e., inferior and superior parietal lobules) have higher BOLD responses post-MBSR compared to pre-MBSR.

In line with the fMRI study conducted by Ulrich and his colleagues (2016), the BOLD imaging replicated their previous findings (Ulrich et al., 2014) of invU-shaped neural activation in the IPL/SPL during flow state.

### *10.2 Interventions in Sports and Exercise Settings*

#### *10.2.1 Traditional psychological skills training*

Traditional psychological skills training unutilized in sport settings such as self-talk, goal planning, and visualization, which are based on cognitive-behavioral methods, have traditionally been used in the area of sport psychology (Gustafsson et al., 2017). Despite widespread support

for psychological skills training, there is still worry that athletes will have difficulties implementing it effectively (Birrer, Röthlin & Morgan, 2012). Furthermore, until a recent meta-analysis suggested that PST may benefit endurance athletes (McCormick, Meijen, & Marcora, 2015), the usefulness of psychological techniques for endurance performance has gotten little attention.

Content-focused treatments offer methods for altering the nature or frequency of inner experience directly. For instance, athletes may employ progressive muscular relaxation to alleviate what is seen as troublesome anxiety (Greenspan & Feltz, 1989), or they may use positive self-talk to boost their confidence (Hatzigeorgiadis, et al., 2011).

#### *10.2.2 Psychological Skills Training (PST)*

PST, which consists of goal planning, arousal control, mental imagery, and positive self-talk, has been shown to increase performance (Thelwell & Greenlees, 2003). It is convinced that PST generates motivation, maximizes task-related arousal, enables skillful movement, and prevents the formation of negative cognitive states (Thelwell & Greenlees, 2003).

PST has been shown to be beneficial in stressful environmental and competitive circumstances. According to Barwood et al. (2006), PST may aid in the conscious control of the high respiratory urge induced by cold water immersion. This indicates that PST may be adjusted to mitigate the adverse effects of the temperature environment. Barwood and colleagues (2008) investigated PST for exercise performance in the heat and measured the psychological component of exercising in the heat. They found that a 4-day PST package would substantially improve the distance traveled (8% on average) during 90 minutes of exercise in the heat by



allowing participants to endure greater deep-body temperatures and accompanying tiredness feelings better.

Studies on improving endurance performance have included self-talk, visualization, goal planning, and relaxation methods. Individuals doing sit-ups and athletes running 1600m time trials (Hamilton, Hamilton & Zderic, 2007) have all benefited from combining these psychological strategies (Patrick & Hrycaiko, 1998). Blanchfield et al., (2014) found that cyclists who used motivational self-talk reported less fatigue and improved endurance performance by 18%. These self-regulation strategies have also been studied in non-competition and simulated competitive gymnasium triathlon tasks (Thelwell & Greenlees, 2003; Thelwell & Greenlees, 2001). Based on Taylor's (1995) suggestions for endurance-based activities, Thelwell & Greenlees (2001) established a framework for the intervention which tried to justify the inclusion of mental abilities within the task-specific package. Thelwell & Greenlees (2003) investigated the effectiveness of a mental skills training package among non-athletes' performances in gymnasium triathlons. This mental skill package was focused on improving these elements of psychological functioning, with Taylor suggesting that the psychological priority for endurance-related activities be motivation, boredom management, and pain control. They incorporated goal setting on two accounts. Firstly, according to previous researches (Filby, et al., 1999), goal-setting methods may improve emotions and perceptions of control by combining process, performance, and end objectives, which can help motivate people. Adopting such a strategy, rather than relying on outcome performance measurements, may help athletes' feedback systems throughout an event (Stevinson & Biddle, 1998). Furthermore, the introduction of a multiple goal



approach is intended to complement the other components of the intervention by allowing the athlete to direct attention toward controllable performance factors via proper concentration through relaxation, visualization, and self-talk. Secondly, SMART objectives (Locke & Latham, 1990) that are precise, measurable, achievable, realistic, and time-phased may be used to motivate people.

Relaxation techniques were added in their PST framework since performers need to be at their peak arousal level before, as well as during, performance (Hanin, 2000). Taylor (1995) suggests that relaxing techniques may help athletes perform better by allowing them to focus on the task at hand (Landers & Boutcher, 1998). Specifically, as tiredness sets in, relaxing techniques may help the athlete retain attention on physiological sensations like breathing patterns and muscular tension, as well as task-relevant thinking like running stride, pace, and objectives (Thelwell & Greenlees, 2003).

They also include self-talk and imagery in the package (Hardy et al., 2001). Arousal are necessary for the endurance athlete before to and throughout a performance in order to maintain adequate motivation and concentrate on task-relevant resources for each phase of the event (Bull, 1989). Second, mastery self-talk is important to permit adequate attention on process objectives and motor coordination throughout a performance, rather than task-irrelevant variables such as discomfort, tiredness, or boredom (Hardy et al., 2001). Their findings add to the body of data in the literature, indicating that mental skill packages may be effective for non-athletes in endurance sports settings (Thelwell & Greenlees, 2003).

### *10.3 Mindfulness-based Interventions*

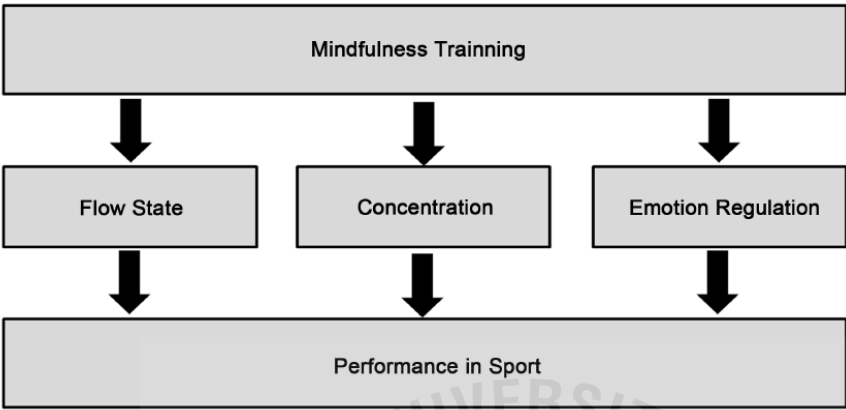
Mindfulness-based interventions (MBIs) are a collection of mind-body practices aimed at improving a state of mindful awareness characterized by present-centred nonjudgmental attention to experience free of cognitive-emotional abstractions and preoccupations (Kabat-Zinn, 2003). The earliest attempt to integrate mindfulness training in world-class marathon runners showed efficacy by using techniques coping with fatigue sensations and the thought processes they experienced during the competition (Morgan & Pollock, 1977).

#### *10.3.1 Mindfulness Interventions and Sports Performance*

The first mindfulness intervention in sports settings began in 1980 (Kabat-Zinn et al., 1985). Before the beginning of the century, only a few applications of mindfulness and meditation were documented. Following years of application growth in clinical psychology and psychotherapy (Chiesa & Serretti, 2010), there has been an increase in interest in mindfulness-based interventions in sports. This interest resulted in the creation two mindfulness-based intervention programs tailored to sports: the Mindfulness-Acceptance and Commitment approach (Gardner & Moore, 2004) and the Mindfulness Sport Enhancement Program (see Figure 2-13.; Kaufman et al., 2009). There was evidence that the mindfulness-based intervention is more effective than PST in resolving athletes' emotion control problems (e.g., Josefsson et al., 2019; Corbally, Wilkinson & Fothergill, 2020).

**Figure 2-13**

*Mindfulness-based Training Enhances Sports' Performances*



*Note.* Adapted from Jekauc et al. (2016).

There has been some study done on the effect of mindfulness on endurance performance. Gardner and Moore (2004) found that 16 weeks of mindfulness training improved competitive performance, reduced sport-related anxiety, and increased readiness to tolerate unpleasant internal states in a swimmer. They also found the linking from mindfulness to flow experience (Csikszentmihalyi, 2000).

*10.3.2 Mindfulness Interventions and Flow Experience*

Having a high level of mindfulness is linked with having a higher frequency of the main flow characteristics of challenge–skill balance, clearly defined objectives, concentration, merging of action and awareness, and loss of self-consciousness—than having a low level of mindfulness (Kee & Wang, 2008). According to the findings of Cathcart et al. (2014), athletes who have a high degree of dispositional mindfulness are more likely to experience flow than their counterparts. According to previous discussions, mindfulness could enhance flow experience. Intervention studies designed to enhance mindfulness offer more information on the

causal relationship between mindfulness training and flow (Scott-Hamilton et al., 2016).

### *10.3.3 Mindfulness Interventions and Exercise Settings*

Mindfulness has been shown to improve readiness to endure negative feelings and acceptance of pain or distress (Arch & Craske, 2006), which may aid people in coping with unpleasant sensations associated with increases in exercise intensity (Gillman & Bryan, 2020). Cross-sectional studies have shown preliminary evidence that mindfulness practice is linked to increased physical activity (Strowger et al., 2018), and meta-analytic research indicates that mindfulness has small-to-moderate impacts on boosting physical activity in obesity treatments (Ruffault et al., 2017). Mindfulness-based interventions, such as Acceptance and Commitment Therapy (ACT), have also been shown to improve exercise behavior (Hayes et al., 2006). In a latest randomized experiment conducted by Gillman & Bryan (2020), after two weeks of follow-up after the intervention, they found practicing mindfulness while exercise could help people enhance good affect and reduce negative affect, which motivate people to keep exercising.

#### *10.3.3.1 Attentional Focus and Exercise*

Researches regarding the connection between mindfulness and improved exercise experience began on attentional concentration during exercise (Gillman & Bryan, 2020). Morgan & Pollock (1977) who examined distance runners, were the first to characterize attentional concentration during exercise. They identified two attentional focus strategies. One is the association, in which the runner focuses attention on bodily sensations, usually associated with performance. The other is dissociation, in which the runner actively and purposefully blocks out sensations associated with physical effort. While top athletes gain from associative

techniques, nonelite or leisure exercisers benefit from dissociating during exercise, according to research in this field.

The distracted exercise was linked to better exercise adherence, more pleasure, and less boredom, decreased effort perceptions, and more sensations of calm and positive emotion shifting (Brick et al., 2014), as well as lower ratings of perceived exertion and enhanced positive affect (Lind et al., 2009).

#### *10.3.3.2 The Mindfulness-Acceptance-Commitment (MAC)*

The MAC approach to sports performance enhancement was developed by Gardner and Moore (2004). Except for its efficacy in terms of performance enhancement (e.g., Wolanin, 2005), MAC also considered might improve flow experience in athletes owing to its efficacy on developing a mindful, nonjudgmental, present-moment attention (Gardner & Moore, 2004). It meets the characteristics of flow, which is often addressed in the sport psychology literature (Csikszentmihalyi, 1991), in that both concepts emphasize present-moment, non-conscious focus on a specific activity. Consequently, given that athletes' ability to experience a state of flow is often viewed as essential, the MAC method might be a particularly useful strategy for achieving flow state (Gardner & Moore, 2004).

The first step of the MAC protocol addresses the importance of understanding and collaborative participation in this intervention. For instance, there will be a discussion of self-regulating towards performance or a comparison of best and worst personal performances, or a discussion of the contradiction between "efforts to control" internal experiences such as thoughts, emotions, and bodily sensations from a self-regulating perspective (Gardner & Moore, 2004).

Athletes acquire the ability to identify exterior occurrences associated with performance difficulties and their connection to interior experiences and subsequent behavioral choices throughout this initial phase of the MAC procedure (Gardner & Moore, 2004).

The second step of the MAC protocol is the critical component since it introduces the idea of mindfulness through self-management of attentional processes. Mindfulness will be coached in a methodical manner to increase awareness of internal events and to foster nonjudgmental, present-moment attentiveness. In order to achieve this goal, efforts will be emphasized on developing the ability to recognize and release unpleasant or painful thoughts or feelings, as well as a "willingness" to simply experience these experiences without judgment or avoidance. Athletes learn and practice both general and sport-specific mindfulness exercises in-session, at home, and during practice and competition. Additionally, athletes develop an awareness of the difference between these abilities and more prevalent habits of ignoring internal sensations or ruminating about them in this part (Gardner & Moore, 2004).

This section of the protocol focuses on the difference between objectives and values. Athletes will be led to the discussion towards how to pursue worthwhile endeavors in both athletics and other significant life areas. The overall goal of this stage is to improve effective action in service of personal values (Gardner & Moore, 2004).

Following this investigation, athletes are introduced to the idea of cognitive defusion, which is proposed by Gardner & Moore (2004). It is a process of decoupling actions and behavioral choices from internal rules and experiences and committing to action in the service of personal values (Gardner & Moore, 2004).

Athletes' capacity to identify the link between ideas, emotions, and action will be further developed in this stage of the MAC protocol. The idea of rule-governed conduct will be constantly explained and debated in this section, with an emphasis on building an awareness of and capacity for decentering from and disconnecting previously automatic linkages between thoughts, emotions, and behavioral choices. The internal dialogue will be examined and addressed in relation to one's conduct, particularly as it pertains to athletic performance. The concept of cognitive defusion is expanded upon, and attempts to defuse thoughts from actions are maintained. The task of this stage is emphasized on the acceptance of occurrences and related ideas and feelings, as opposed to attempts for control and minimization with attendant negative effects. These ideas are entwined with earlier talks of athletic performance self-regulation and mindfulness (Gardner & Moore, 2004).

The last component of the MAC protocol focuses on applying mindfulness and acceptance into a daily sports and daily life. The development of in vivo experiences enables athletes to use and practice the methods previously given (Gardner & Moore, 2004).

#### *10.3.3.3 Mindfulness-integrated Cognitive Behavior Therapy Program (MiCBT)*

MiCBT is an eight-week mindfulness protocol which have been shown to enhance dispositional mindfulness as well as other psychological and physical advantages (Cayoun, 2011). It contains a weekly workshop that focuses on sharing mindfulness-meditation material and discussing home-meditation (Cayoun, 2011). Each week's information focuses on fundamental mindfulness and meditation ideas, problems encountered when meditating, and methods for improving commitment to practice and ease of meditation at home and in workshops.



The MiCBT program supplied CDs for the home-meditation sessions. A gradual body scan meditation and awareness of breath are included on the CDs. Weekly bodily feeling interception forms were required as part of MiCBT instruction (Cayoun, 2011). These forms are designed to let participants reflect on their bodily experiences and track their mindfulness development. Participants are instructed to meditate for 30 minutes each day at home and record their progress in a notebook provided.

#### *10.3.3.4 Mindful Sport Performance Enhancement (MPSE)*

MSPE is conceptualized to extend MBSR and MBCT to athletes by incorporating mindfulness-building exercises from those approaches (Kaufman et al., 2009). It includes breathing exercise, sitting meditation and the body scan. It also adapts a walking meditation to the fundamental movements involved in the sport of focus. As with MAC, MSPE places a premium on the development of mindfulness skills and, through them, acceptance. In contrast to MAC, MSPE does not emphasize values, value-driven conduct, or commitment (Kaufman et al., 2009). MSPE is considered to influence flow states, athletic performance, and the psychological variables believed to affect it (Kaufman et al., 2009).

Although the duration of the original MSPE program from Kabat-Zinn (1985) and Segal et al. (2002)'s are 8 weeks long, Kaufman and colleagues (2009) argued that it is more realistic to reduce it into a 4-week program with slightly longer (2.5–3 hours) sessions. They found some significant changes in dispositional mindfulness (Kaufman et al., 2009) among the archers and golfers in a newly structured 4-week MSPE program. In addition, in an RCT study, Jain et al. (2007) found that compared to a control group, a one-month mindfulness meditation training

program decreased distress and enhanced positive mood states in students. Moreover, the results from Kaufman et al., (2009)'s investigation also indicate a significant change in the athletes' state of flow.

De Petrillo et al. (2009) conducted a study to see how Mindful Sport Performance Enhancement (MSPE) affected long-distance runners. Twenty-five recreational long-distance runners were randomly assigned to either the 4-week intervention or a waiting-list control group. Compared to the control group, the MSPE group exhibited a significant improvement in state mindfulness and trait awareness, as well as reductions in sport-related anxieties, personal standards perfectionism, and parental criticism. MSPE may be a beneficial mental training strategy for enhancing mindfulness, sport-related concern, and characteristics of perfectionism in long-distance runners, according to their findings (De Petrillo et al., 2009).

### **The Current Study**

This review has provided a theoretical overview of exercise maintenance and The Affective–Reflective Theory of physical inactivity and exercise. Factors (harmonious passion, obsessive passion, dispositional flow, dispositional mindfulness, rumination) influencing exercise maintenance have also been discussed. Flow experience, as the affective factor in maintaining exercise behaviors, is proposed, and mindfulness-based intervention enhances the dispositional flow to achieve maintaining exercise behaviors as recommended. The missing pieces in the exercise behaviors area is that no study has directly proved the whole model which it is proposed in this study. Moreover, how the mindfulness-based intervention enhances dispositional flow in exercise settings.

This study aims to investigate flow experience as the emotional determinant in maintaining exercise behaviors by testing the relationship between passion, mindfulness, rumination and their impacts on flow experience towards exercise maintenance among long distance running exercisers. This study also aims to investigate mindfulness-based intervention enhance dispositional flow. As such, the proposed dissertation study has three primary aims, and research questions, along with hypotheses:

1. Specific Aim 1: To test the psychometric properties of Dispositional Flow Scale-2 (DFS-2) for Chinese population.
2. Specific Aim 2: To test the structural model in order to verify the relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time runners.
3. Specific Aim 3: To test mindfulness-based intervention which is developed for this study, could significantly enhance dispositional flow in Chinese leisure-time runners.

### **Research Questions**

The following research questions are addressed based on the literature review and the theoretical theory and model used in this study:

Research Question 1: What are the psychometric properties of Dispositional Flow Scale-2 (DFS-2) for Chinese population?

Research Question 2: To what extent the prediction model can explain the structural relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time

runners?

Research Question 3: Did the four-week revised MSPE can significantly enhance dispositional flow in Chinese leisure-time runners.

## Research Hypotheses

The following research hypotheses are addressed based on the literature review, the theoretical model, and the research questions in this study:

Hypothesis 1 (H1): The prediction model can explain the structural relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time runners.

Hypothesis 1.1 (H1.1): Harmonious passion directly and positively influences exercise maintenance in Chinese leisure-time runners.

Hypothesis 1.2 (H1.2): Obsessive passion directly and negatively influences exercise maintenance in Chinese leisure-time runners.

Hypothesis 1.3 (H1.3): Harmonious passion indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional flow.

Hypothesis 1.4 (H1.4): Harmonious passion indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional mindfulness.

Hypothesis 1.5 (H1.5): Obsessive passion indirectly and negatively influences exercise maintenance in Chinese leisure-time runners by being mediated by

rumination.

Hypothesis 1.6 (H1.6): Harmonious passion indirectly and positively influences dispositional flow in Chinese leisure-time runners by being mediated by dispositional mindfulness.

Hypothesis 1.7 (H1.7): Dispositional mindfulness indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional flow.

Hypothesis 1.8 (H1.8): Harmonious passion is related with obsessive passion in Chinese leisure-time runners.

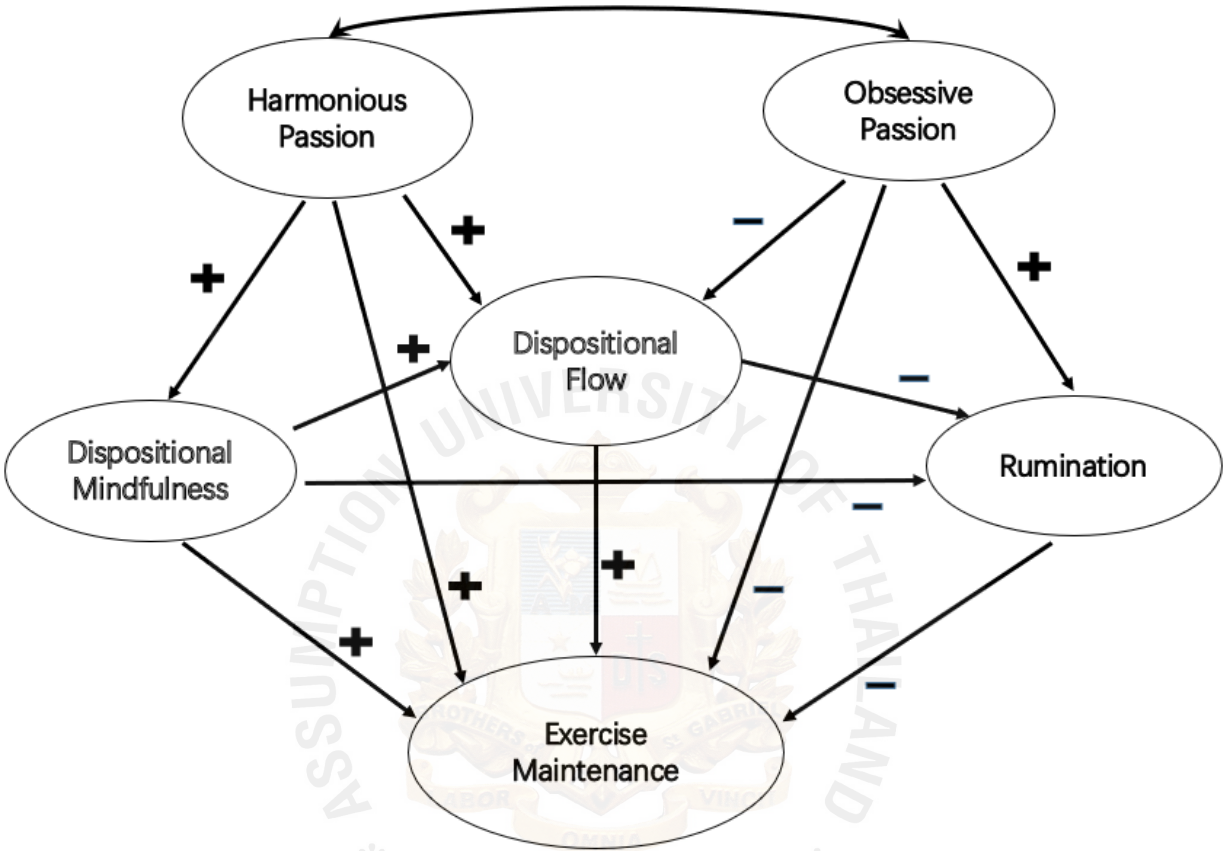
Hypothesis 2 (H2): A four-week revised Mindful Sport Performance Enhancement (MSPE) intervention could significantly enhance dispositional flow in Chinese leisure-time runners.

### **Conceptual Framework**

The following Figure 2.14. depicts a model for study II based on the hypotheses. It shows the possible direct impacts of two types of passion on exercise maintenance, and the mediators: dispositional mindfulness and dispositional flow.

Figure 2-14

*The Proposed Conceptual Framework for Study II*

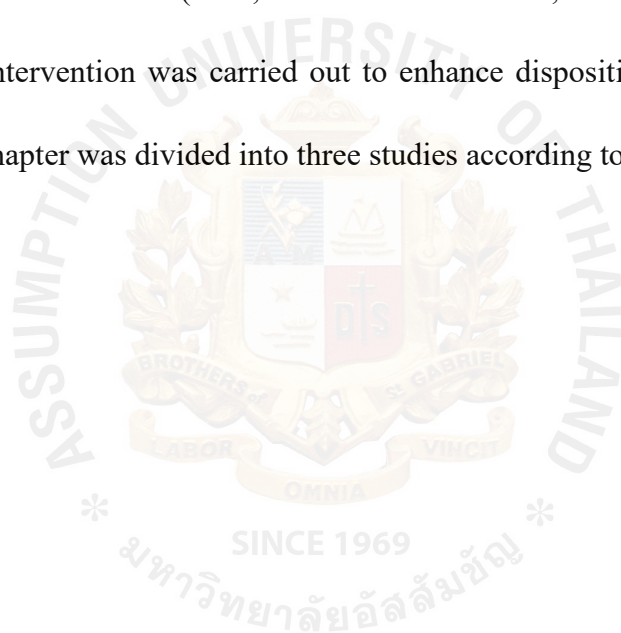


*Note.* A fully identified mediation model showing the possible direct and indirect impact of passion on exercise maintenance mediated by dispositional flow, dispositional mindfulness, and rumination.

### CHAPTER III

#### RESEARCH METHODOLOGY

The aim of the present study was to investigate the psychological processes of exercise maintenance in leisure-time runners in Guangzhou city, China. Therefore, three studies have been carried out to achieve this aim. The first two studies aimed to investigate the model proposed by Carpentier, Mageau & Vallerand (2012) and the Affective–Reflective Theory of physical inactivity and exercise (ART; Brand & Ekkekakis, 2018). In the last study, a mindfulness-based intervention was carried out to enhance dispositional flow in leisure-time runners. Thus, this chapter was divided into three studies according to this objective.





## Study I

### 1. Research Design for Study I

The aim of Study I was to assess the psychometric properties of the instruments to be used in this study. Specifically, assessing the reliabilities and validities of all the five instruments. Four of them are standardized questionnaires with their original forms being written in Chinese, however, there is one instrument measuring dispositional flow that hasn't been translated into the Chinese language properly, according to the previous literature view. Therefore, the original English version scale was translated into Chinese using the Brislin (1976)'s translation model for the cross-cultural study method.

### 2. Participants of the Study I

Chinese participants were recruited from community running groups. Convenience sample technique was used in this recruiting process. Participation were voluntary and informed consent (see Appendix C, D) were obtained from each participant. Chinese participants should run for 20 minutes three to four times a week for vigorous physical activity (USDHHS, 1990).

A rule of thumb for CFA (Confirmatory Factor Analysis)/SEM (Structural Equation Modeling) is the ratio of cases to free parameters, or N: q ("N" represents ratio of cases while "q" represents statistical estimates). N:q is usually used for minimum recommendations, while 10:1 to 20:1 is a widely recommended ratio for maximum recommendations (Kyriazos, 2018; Schumacker & Lomax, 2015; Jackson, 2003). Therefore, the minimum recommended respondents should be 150 (N: q = 10 :1). Particularly, Jackson (2003) compared four sample sizes (N=50, 100, 200, 400 and 800) to see how changing sample size in relation to the number

of estimated parameters affected a confirmatory factor analysis solution. He pointed out that there has no simple figure that can represent the expression "large enough." But based on one of his results from the indicator reliability in his study, the standard deviation of the factor correlations in the sample size  $N=400$  was almost three times smaller than in the sample size  $N=50$  (Jackson, 2003).

Therefore, the total sample 920 were considered in this study. Particularly, 386 of them were used to test the psychometric properties of the Chinese version of Dispositional Flow Scale-2 (DFS-2) by conducting exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In the confirmatory factor analysis (CFA), the remaining 534 participants (which is more than 400) contributed to testing the psychometric properties of all five instruments.

### *2.1. Sample 1*

The first group of samples was taken for the purpose of identifying the items from The Chinese Version of Dispositional Flow Scale-2 (DFS-2). After submitting the informed consent, a total of 386 Chinese leisure-time runners filled out the surveys (Demographic Questionnaire and the Chinese DFS-2). The demographic variable information as showed in Table 1.

### *2.2 Sample 2*

The second group of samples was for the CFA in Study I and the SEM analyses in Study II. A total of 534 Chinese running exercisers filled out the surveys (Demographic Questionnaire; the Chinese DFS-2; the Chinese version of University of Rhode Island Change Assessment-Continuous Measure (URICA-E2); the Chinese Version of Sports Passion Scale (SPS); the Chinese Version of Dispositional Flow Scale-2 (DFS-2); the Chinese version of Mindful

Attention Awareness Scale (MAAS); and the Chinese Version of Ruminative Responses Scale (RRS)), after submitting the informed consent. The demographic variable information as showed in Table 1.

**Table 1**  
*Demographic Variables for sample 1 and sample 2*

	Sample 1 N (%)	Sample 2 N (%)
<b>Total</b>	386	534
<b>Age</b>		
18-29	89(23.1)	106(19.8)
30-39	118(30.6)	208(39.1)
40-49	82(21.2)	119(22.2)
50-59	73(18.9)	84(15.7)
>60	24(6.2)	17(3.2)
<b>Gender</b>		
Male	197(51.0)	296(55.5)
Female	189(49.0)	238(44.5)
<b>Education</b>		
≤12	125(32.4)	106(19.8)
>12(College degree or higher)	261(67.6)	428(80.2)

**3. Research Instruments for Study I**

Demographics information were gathered in the questionnaires, such as weight, height, educational level, and age (see Appendix H, I).

*Exercise Maintenance*

University of Rhode Island Change Assessment- Continuous Measure (URICA-E2; Cancer Prevention Research Center 2007; Reed, 1995) is a 32-item self-report continuous scale that measures four stages of change based on the TTM (The Transtheoretical Model; Prochaska & Velicer, 1997). The Chinese version of the URICA-E2 (Zhen, 2013; Chen et al., 2019; (See Appendix Q, R) show good internal consistency reliability with the Cronbach coefficient of each subscale being between .804 to .935. The total 8-item (4 from the action subscale, and 4 from the maintenance subscale) was adopted based on the criteria of study to measure running maintenance. Items was rated on a 6-point Likert scale ranging from 1 (Not Agree at All) to 6 (Very Strongly Agree). A definition of leisure-running was be presented before the items in this study: "Running means using the large muscle groups which is done for at least 20 minutes, and is performed at a level that causes the breathing rate to be heavy and the heart to beat faster" (Stevens, 2016). Then, runners were asked to select the one that closely describes their running level (e.g., "I have managed to keep running regularly through the last 6 months").

#### *Dispositional Flow Scale-2 (DFS-2)*

The DFS-2 is a questionnaire consisting of 36 questions that evaluates a person's likelihood of experiencing flow states when engaged in a wide range of activities (Jackson & Eklund, 2004; See Appendix J). While filling out a questionnaire on a specific activity (e.g., running), runners were asked to recall how they felt during previous participation in running (e.g., "The challenge and my skills are at an equally high level. "). The questionnaire has a 5-point Likert-type response format, with answers ranging from 1 to 5, with 1 representing "Never" and 5 representing "Always." The DFS-2 assesses challenge–skill balancing (Factor 1), action–

awareness merging (Factor 2), clear goals (Factor 3), unambiguous feedback (Factor 4), concentration on the task (Factor 5), sense of control (Factor 6), loss of self-consciousness (Factor 7), temporal transformation (Factor 8), and autotelic experience (Factor 9), to name a few.

By putting all the scores together, the total points for the flow score can be computed, which reflects the individual's general propensity to experience flow on any given day. The higher an individual's overall score, the greater the likelihood that they are experiencing flow states. Based on the data presented, Jackson and Eklund (2004) indicate that DFS-2 is a suitable method for evaluating flow dispositions. According to previous studies using the DFS-2, the internal consistency of the instrument was reported ranging between .81 and .90 (Jackson & Eklund, 2002). Another study using cross-validation on the DFS-2 with 574 people reported reliability estimates ranging from 0.78 to 0.86 (Jackson & Eklund, 2002). DFS-2 is deemed to have good construct validity and may be regarded as a trustworthy and a valid tool for studying dispositional flow in this study, based on the results reported from the previous studies (Jackson & Eklund, 2004).

#### *The Chinese Version of Sports Passion Scale (SPS)*

This study used Chiung-Huang Li, Li-Kang Chi & Han-Ni Peng (2007) translated version from the scale which was developed by Vallerand (2003) (See Appendix O, P). It measures the passion of the movements of respondents, with a total of 12 items for the scale using the 7-point Likert scale score (e.g., "Sports have become an indispensable part of my life."). The higher the item score, the higher the degree of passion. The Chinese version of the scale

contains two dimensions, harmonious passion (six items) and obsessive passion (six items), which have been verified to have good structural validity, content validity and internal consistency reliability (Chiung-Huang Li, Li-Kang Chi & Han-Ni Peng, 2007). Specifically, the internal consistency Cronbach coefficient of each subscale was 0.84 (harmonious passion subscale) and 0.88 (obsessive passion subscale), and the convergent validity ( $\lambda = .48 \sim .82$ ,  $t = 6.96 \sim 14.31$ ,  $p < .05$ ) are within the acceptable range.

*The Chinese version of Mindful Attention Awareness Scale (MAAS)*

The Chinese version of MAAS was revised by Chen et al. (2012) (See Appendix K, L). The MAAS scale is a single dimension scale consisting of 15 items that can measure individuals' attention awareness in their daily lives (e.g., "I find myself not paying attention to things. "). The higher the total score represents a higher level of tendency mindfulness. The questionnaire used a six-point Likert scale on a scale of 1 to 6 with higher scores indicating greater mindfulness (MacKillop & Anderson, 2007). For the Chinese version of MAAS, the revised internal consistency coefficient was .890, and the retest reliability was .870 which indicates the Chinese version of MAAS has good psychometric indicators and is suitable for domestic use.

*The Chinese Version of Ruminative Responses Scale (RRS)*

This study uses Han Xiu and Yang Hongfei (2009)'s translation version from the scale which was developed by Segerstrom et al. (2000) (See Appendix M, N). In their study, the Chinese version of Ruminant Reflective Response Scale revised is used to verify its applicability in a student group (Han Xiu, Yang Hongfei, 2009). They removed depression-related items to create a new scale of 10 items (e.g., "I often think why am I like this. "). It includes two subscales

of ruminative brooding (Item 1, 3, 6, 7, 8) and ruminative reflection (Item 2, 4, 5, 9, 10), using the Likert1-4 score. The higher the total score indicates a higher level of rumination. Its Cronbach's coefficient was 0.90 for the total reliability of the scale, among which Cronbach's coefficient was 0.72 for ruminative brooding and Cronbach's coefficient was 0.68 for ruminative reflection. In total, this scale is reliable and valid (Han Xiu, Yang Hongfei, 2009).

#### **4. Instrument Translation Procedure**

In Study I, the English version of the DFS-2 was translated into Chinese using a series of translation procedures (Brislin, 1976). To begin, two Chinese doctoral students of counseling psychology translated the English version of the DFS-2 into Chinese separately. They are proficient in both languages and in their third year at the university. One of them is the author of this study. The initial version was created by combining these two translations and then discussing the semantic problems that existed in each of these translations. For instance, it is possible that the term "perform" would not be correctly understood in Chinese; thus, the translation was modified to "body activity." One translator took the phrase "the feeling of the performance" to mean "the emotion that the action produces," and thus rendered the phrase "The way time passes seems to be different from normal" as "Time passed by differently than usual." It was determined that neither of these translations adequately conveyed the meaning of the original survey question asked in English, and throughout the process of review, it was decided that the interpretations provided by another translator should be used for both items.

Then, a back-translation was obtained from a Chinese university professor who has years of experiences in English learning and teaching via email. The similarities and differences



between the translated questionnaire and the original questionnaire were then compared by two native English speakers independently. One of these native English speakers is a university teacher with experience in sports psychology, and the other one was a former university English teacher with forty-four years teaching experiences. For instance, the phrase “I clearly know what I am doing (我很清楚我在干什么).” has different meaning as “I know clearly what I want to accomplish (我很清楚我想达到一个怎样的状态).”. Because of this, "want to do" was translated as "desire," so that it could be understood more precisely in Chinese context.

A total of seven people participated in the focus group meeting, which lasted for around thirty minutes. All the 36 items were discussed by all the focus group members. One of them is an amateur marathon runner who has a master's degree in applied psychology in China. Two of them are doctoral students in counseling psychology. The rest (four members) all have master's degrees in applied psychology. According to Cortés et al. (2007), the goal of the group discussion was to identify items that were either ambiguous or might be construed in a variety of ways owing to the variations in cultures. After each component of the rating scale, there was a question that asked, "Can you repeat it in your own words?" The following coding categories were written down by the researcher in order to evaluate the group members' level of understanding for each item: 1 means that it is clear, while 0 means that it is not obvious.

A preliminary test was carried out in the form of an online survey with a limited sample size ( $N = 26$ ). The purpose of the pretest was to determine whether the leisure-time runners understood the material. Following each item was a question that asked, "Was it tough to reply to (0 = not difficult, 1 = difficult)? If that's the case, could you jot down the reasons why you

found the question so challenging to answer? After receiving comments from the focus group and the preliminary test, the final translated version was ready for tested.

**Table 2**

*The results from two procedures*

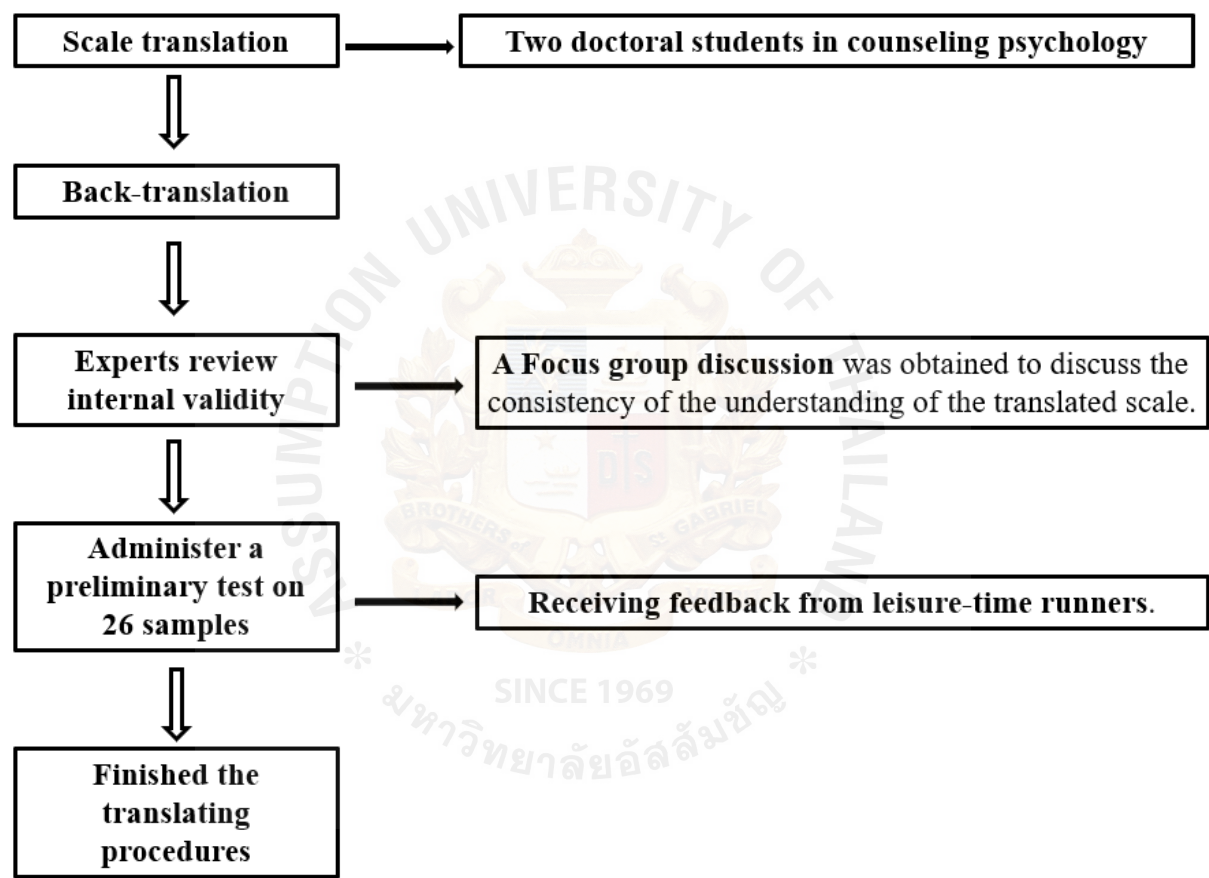
Items	Focus group N=7	Preliminary sample N=26	Modified decision
1	1.00	1.00	-
2	1.00	1.00	-
3	1.00	1.00	-
4	1.00	1.00	-
5	1.00	1.00	-
6	1.00	1.00	-
7	.86	1.00	-
8	.71	.88	Deleted "流逝"
9	1.00	.77	Replaced "非常" by "很"
10	1.00	1.00	-
11	.71	1.00	-
12	1.00	1.00	-
13	1.00	.96	-
14	1.00	1.00	-
15	1.00	1.00	-
16	.86	1.00	-
17	.86	.85	-
18	1.00	.81	-
19	1.00	.92	Replaced "动作" by "完成动作"
20	1.00	1.00	-
21	1.00	1.00	-
22	1.00	1.00	-
23	1.00	1.00	-
24	1.00	1.00	-
25	1.00	.96	-
26	1.00	.96	-
27	1.00	.88	-
28	1.00	.96	-
29	1.00	1.00	-
30	1.00	1.00	-
31	1.00	1.00	-
32	1.00	1.00	-
33	1.00	1.00	-
34	1.00	1.00	-
35	1.00	.96	-

36	.71	.77	Replaced "十分有益" by "最好的奖励".
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*Note.* Rating of approval based on the preliminary test and the focus group.

**Figure 3-1**

*Instrument Translation Procedure*



*Note.* Instrument translation procedure in study I.

### 5. Data Collection Procedure for Study I

The current study was conducted only after receiving approval from the Dean of the Graduate School of Human Sciences of Assumption University and the Examination Committee. Participants were recruited online due to the Covid-19 pandemic. The study was described as an

investigation in terms of factors influencing exercise maintenance. All the procedures and informed consent were presented in the first page of the survey. Once the participants reviewed them, which they pressed an 'agree' button, they were directed to the set of questionnaires about exercise maintenance. The five questionnaires were completed in the same order by all participants: Demographics; Exercise Maintenance; The Chinese Version of Sports Passion Scale (SPS); The Chinese Version of Dispositional Flow Scale-2 (DFS-2); The Chinese version of Mindful Attention Awareness Scale (MAAS) and The Chinese Version of Ruminative Responses Scale (RRS).

This data-collecting process were designed to protect the privacy and anonymity of all participants through informed consent and keeping all files on a password protected computer. This research is exempt from the requirements of the Protection of Human Subjects as it was conducted with participants aged 18 or older, which was not involve the collection of sensitive information, deception, use of specialized cases such as pregnancy or prisoners, and was generally free of foreseeable risk to the participants. This included minimizing the risk to the participants through a research design intentionally planned to not cause harm to any participant. In all, this study followed the principles of the Belmont Report (1979).

## **6. Data Analysis for Study I**

The data analysis was divided into four major stages according to the objectives of the Study I. The first three stages were for the examination of the validity and reliability of the Chinese DFS-2. The final stage was for the examination of the other four scales that were used in Study II: The Chinese version of the URICA-E2; the Chinese Version of Sports Passion Scale

(SPS); the Chinese version of Mindful Attention Awareness Scale (MAAS); and the Chinese Version of Ruminative Responses Scale (RRS).

First, a test with 386 Chinese samples was conducted employing items that included the original 36-items. In order to investigate and evaluate the structure of the translated versions, two separate analyses were carried out in sequential order. To begin, an exploratory factor analysis (EFA) was carried out in the R program (version 4.1.2; R Core Team, 2020) in order to investigate the structure of the Chinese version of DFS-2. In addition, items that were based on the nine-structure of flow were investigated. Before doing EFA, the value of KMO was analyzed with the use of the 'psych' R package, which was used to determine whether the sample was enough. In most cases, a KMO index of .60 was regarded to be the minimum figure that could be deemed acceptable for a good factor analysis (Tabachnick, Fidell & Ullman, 2007). To establish the number of factors, both a scree test (from the R package 'psych') and a parallel analysis (also from the R package 'psych') were carried out. The eigenvalues larger than one was performed using the 'stats' R package. In the end, a promax rotation was used to guarantee that the factor solution was more accurate while still permitting overlap in variance (Procci et al., 2012). The general rule of thumb in item identification dictates that the minimum loading should be .32, which corresponds to about 10 percent of overlapping variation with the variations of the other items in that factor (Costello & Osborne, 2005). Strong loading shall be deemed any loading that is larger than .50 of the total (Costello & Osborne, 2005). Items in the EFA whose factor loadings (the 'Stats' package in R, the factanal function, and the promax rotation) were found to be lower than .32 were thus eliminated from this step (Costello &

Osborne, 2005).

Second, a CFA was performed in the R to evaluate the construct validity of the Chinese DFS-2. The 'Lavaan' R package was utilized (Rosseel, 2012) in the examination. It was determined, via the examination of correlation matrices and the application of CFA with maximum likelihood estimation (ML estimation, Kawabata, Mallett, and Jackson, 2008), if the Chinese version model was a good match for the data that was observed. The metrics for each latent variable were determined by first setting their respective variances to 1.0. The correlations between the variables were not constrained in any way, and the 'Lavaan' R package was used to calculate both the standardized values and the fit indices. All the variables were considered.

Under the ML methodology, Hu and Bentler (1998) suggested that researchers should use a two-index presentation style in their work. When evaluating the model, it is expected to make use of SRMR in addition to at least one of the following indices: TLI, BL89, CFI, or RMSEA. This is the bare minimum. They placed a lot of emphasis on the fact that SRMR is the most sensitive fit indices for the basic model identification. Among the fit indices, SRMR is the one that is most prone to being affected by too intricate model misspecification. It is important to highlight that the SRMR is less susceptible to influence from sample size and dispersion than other indices are (Hu & Bentler, 1998). Other indices, such as TLI, BL89, CFI, and RMSEA, all have a small sensitivity to identify basic models, but they are particularly prone to misspecification of complex models (Hu & Bentler, 1998). For the purpose of determining how well the model fits the data, Hu and Bentler (1998) suggested using a cutoff value for TLI (BL89, or CFI) that is close to .95, in combination with a cutoff value for SRMR that is close

to.09. To be more precise, combinatorial rules with RMSEA  $>.05$  and SRMR  $>.06$  have a high sensitivity to identify models with misspecified factor covariance.

*Construct validity.* In order to conduct an analysis of construct validity, convergent validity, discriminant validity, and CFA examinations were used. In order to evaluate the construct validity, the CFA was carried out on the sample  $N = 534$  by using ML estimation in R with the 'Lavaan' package. The metrics for each latent variable were determined by first setting their respective variances to 1.0. An investigation into the latent constructs of the Chinese DFS-2 was carried out. The examination of factor loadings, the average variance extracted (AVE), and composite reliability (CR) served as the basis for the assessment of convergent validity (Chin et al., 2018). In order to determine whether there is convergent validity, the factor loadings of each item should be sufficiently high (higher than 0.5). The AVE and CR were calculated by the 'Lavaan' R package. For the purpose of determining the convergent validity, values for AVE that were larger than .50 and values for CR that were greater than .60 were used (Chin et al., 2018).

Comparing the values of the average variance extracted (AVE) and shared variance (SV, the square of the correlation coefficient) as well as the correlation coefficient across components was used to assess the discriminant validity of the test. A degree of discriminant validity that was acceptable was indicated by AVE values that were higher than SV values (Chin et al., 2018). It was determined that there was insufficient discriminant validity when the correlation coefficient between components was more than .85 (Chin et al., 2018).

In the third stage, further evaluations of the Chinese DFS-2 were conducted such as



internal consistency, and item analysis.

*Internal consistency.* In order to measure the instrument's internal consistency, a Cronbach's alpha was computed for both individual items and factors, in addition to the whole scale. For the purpose of determining whether the scale has internal consistency, a Cronbach's coefficient value of more than .70 was employed as the qualifying value (Kawabata, Mallett & Jackson, 2008).

*Item analysis.* In addition to that, item analysis was used in order to ascertain whether the scale was adequate (Kline, P., 2013). When estimating the dependability of the item scores, corrected item-total correlations were used. The coefficient increases when there is a stronger connection between the items and the total (Zijlmans et al., 2019). When the value is less than .30, the item is considered unsuitable (Kline, 2013).

The final stage of data analysis was evaluating the reliability and validity of the other four scales: the Chinese version of the URICA-E2; the Chinese Version of Sports Passion Scale (SPS); the Chinese version of Mindful Attention Awareness Scale (MAAS); and the Chinese Version of Ruminative Responses Scale (RRS). Internal consistency and construct validity were assessed with 534 Chinese samples in R software (R 4.1.2; R Core Team, 2020) using the package 'Lavaan'. Cronbach's coefficient greater than .70 was used in this step as the criterion for internal consistency (Kawabata, Mallett & Jackson, 2008). Before conducting CFA, the value of KMO was examined by using R package 'psych' to measure sampling adequacy. A KMO index of .60 was generally considered to be the lowest acceptable value for a satisfactory factor analysis (Tabachnick, Fidell & Ullman, 2007). A scree test (R package 'psych') and Parallel

analysis (R package ‘psych’) were conducted to determine the number of factors.  $GFI \geq .90$ ,  $RMSEA < .08$ ,  $CFI \geq .90$ ,  $TLI \geq .90$ , and  $IFI \geq .90$  (see Table 3) were used to evaluate if the structure of the instrument was consistent with the observed data (Yaşlıoğlu & Yaşlıoğlu, 2020).

**Table 3**

*The criterion of the Goodness-of-Fit indices for CFA*

Indices	Acceptance Level
$\chi^2/df$	<5.00
Goodness of Fit Index (GFI)	>0.90
Root Mean Square Error of Approximation (RMSEA)	<0.05
Comparative Fit Index (CFI)	$\geq 0.9$
Tucker-Lewis Index (TLI)	$\geq 0.9$
Incremental Fix Index (IFI)	$\geq 0.9$

## Study II

### 1. Research Design for Study II

The objective of Study II was to investigate the direct and indirect effects of the harmonious passion and obsessive passion on Chinese leisure-time runners' exercise maintenance. The hypothesized model was examined by conducting Structural Equation Modeling (SEM). It was hypothesized that harmonious passion and obsessive passion have direct and indirect effects on the Chinese long-distance runners' criterion variables, which is mediated by dispositional flow, dispositional mindfulness and rumination.

### 2. Participants of Study II

Chinese participants were recruited from community running groups, and convenience sample technique were used in this recruiting process. Participation were voluntary and informed consent (see Appendix C, D) were obtained from each participant. To meet the inclusion criteria in the present study, the Chinese participants should take part in running at least 20 minutes for three or more times a week of vigorous physical activity (running) as specified by U.S. Department of Health and Human Services (USDHHS, 1990).

A rule of thumb for CFA (Confirmatory Factor Analysis)/SEM (Structural Equation Modeling) is the ratio of cases to free parameters, or N: q ("N" represents ratio of cases while "q" represents statistical estimates). N: q is usually used for minimum recommendations, while 10:1 to 20:1 is a widely recommended ratio for maximum recommendations (Kyriazos, 2018; Schumacker & Lomax, 2015; Jackson, 2003). Therefore, the minimum recommended respondents should be 150 (N: q= 10 :1). Particularly, Jackson (2003) compared four sample

sizes (N=50, 100, 200, 400 and 800) to see how changing sample size in relation to the number of estimated parameters affected a confirmatory factor analysis solution. He pointed out that there has no simple figure that can represent the expression "large enough." But based on one of his results from the indicator reliability in his study, the standard deviation of the factor correlations in the sample size N=400 was almost three times smaller than in the sample size N=50 (Jackson, 2003). Therefore, a total sample of 534 (which is more than 150) was considered in this study.

3. Research Instruments for Study II

Five instruments were employed in study II as follows: The Chinese version of the URICA-E2, The Chinese Version of Dispositional Flow Scale-2 (DFS-2), The Chinese Version of Sports Passion Scale (SPS), The Chinese version of Mindful Attention Awareness Scale (MAAS), and The Chinese Version of Ruminative Responses Scale (RRS).

Table 4

*Descriptive statistics and internal consistency of each scale*

Scales/Subscales	Mean	S.D.	Skewness	Kurtosis	Min.	Max.	Cronbach's alpha
The Chinese DFS-2	4.03	.03	-0.12	0.28	2	5	.95
The Chinese HP Subscale	3.57	.04	0.58	0.22	1	6	.97
The Chinese RRS	2.31	.03	1.15	0.78	1	4	.92
The Chinese MAAS	4.03	.05	-1.18	0.70	1	6	.94
The Chinese OP Subscale	2.59	.04	0.88	2.61	1	6	.96
The Chinese URICA-E2	4.71	.03	-0.99	1.27	2	6	.87

#### **4. Data Collection Procedure for Study II**

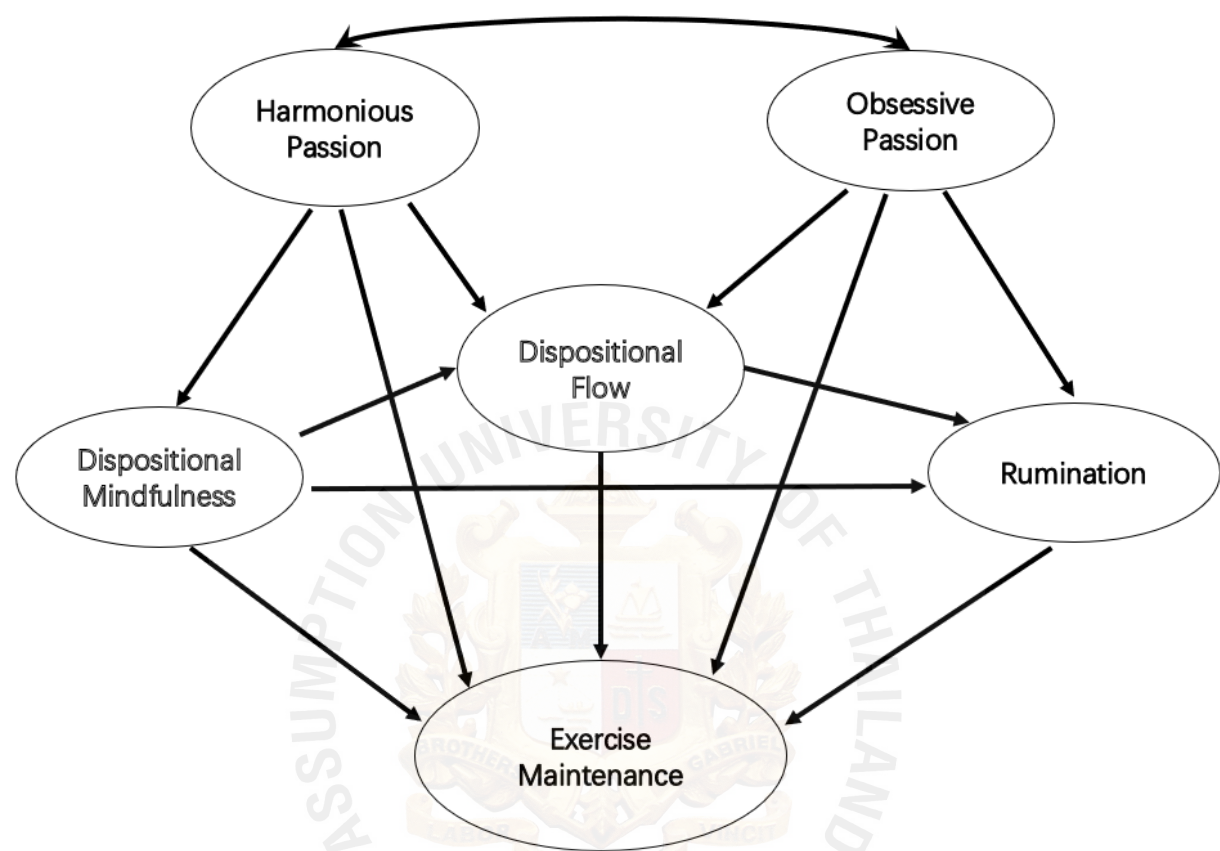
The same data collection technique was used in study I wherein the data from 534 participants were collected in this study.

#### **5. Data Analysis for Study II**

Study II was designed to testify the mechanism among harmonious passion, obsessive passion, dispositional flow, dispositional mindfulness, rumination and exercise maintenance by using Structural Equation Modeling (SEM). The hypothesized model and eight hypothesized were tested via the SEM approach (see Figure 3-2). The goodness-of-fit indices were examined by using SEM. This method helps for a direct comparison of the proposed models' goodness-of-fit indices to evaluate which model gives the best explanation of the hypothesized direct, indirect effects considering models' exogenous, mediator and criterion variables. The model testing in this study was conducted in R 4.1.2 using package 'Lavaan'.

Figure 3-2

*The Hypothesized Model of Study II*



*Note.* A fully identified mediation model showing the possible direct and indirect impact of passion on exercise maintenance mediated by dispositional flow, dispositional mindfulness, and rumination.

This study followed the three major steps proposed by Kline (2015) in estimating the model. Before it, the validity and reliability of the instruments were tested in study I. Cronbach's coefficient greater than .70 was used in this step as the criterion for internal consistency (Kawabata, Mallett & Jackson, 2008). Two levels of fit indices were adopted to evaluate the

model fit (see Table). A revised model was proposed according to three major reasons based on the SEM result of the hypothesized model. All the eight hypotheses were tested in study II.

### *Goodness-of-fit Indices*

Model fit were assessed in two dimensions of classification of fit indices from SEM : a) sample based fit indices, e.g., the likelihood ratio test statistic (McDonald, 1989); b) absolute and relative fit indices.

Absolute fit indices include the Root Mean Square Error of Approximation (RMSEA, Steiger & Lind, 1980), the Root-Mean-Square Residual (RMR, Afthanorhan, 2013) were adopted in evaluating the model fit. The smaller values of RMSEA indicate a better fit (Steiger & Lind, 1980). A lower value of RMR indicates perfect fit (Afthanorhan, 2013). Relative fit indices include Comparative Fit Index (CFI, Bentler, 1990); Tucker-Lewis index (TLI with higher values indicates a better fit; Tucker and Lewis, 1973); Comparative fit index (CFI range from 0 to 1 wherein higher values indicate a better fit. Bentler, 1990) were adopted in evaluating the model fit.

### *The Mediation Effect of Dispositional Flow*

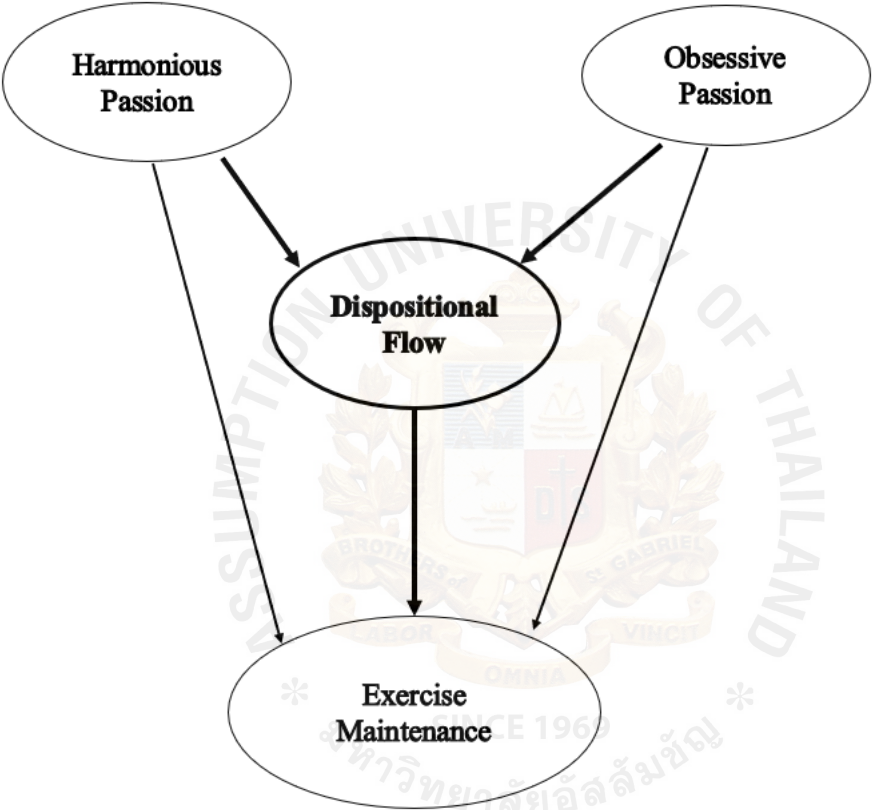
The mediation effect of dispositional flow on the link between harmonious passion, obsessive passion and exercise maintenance (see Figure 3-3); dispositional mindfulness and exercise maintenance (see Figure 3-4) were investigated respectively. The direct and indirect effects' significance were evaluated, and partial mediation effect were established if both the direct and indirect effects were significant, while the complete mediation effect were established if just the indirect impact was significant. Sobel, product distribution, bootstrapping, and Monte



Carlo techniques were used to evaluate the significance of the indirect effects (Preacher & Selig, 2012).

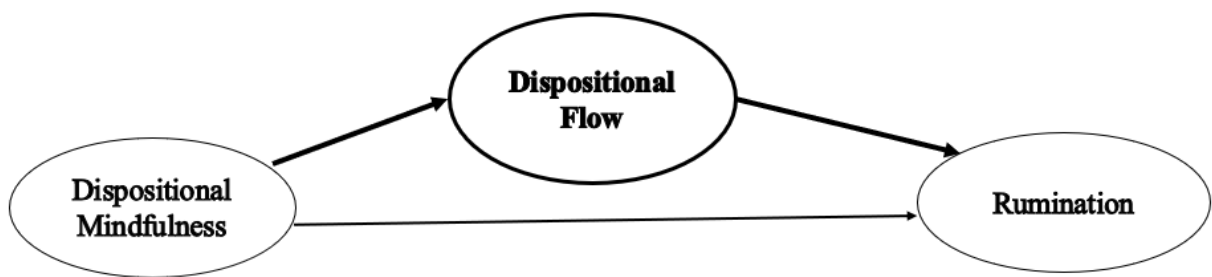
**Figure 3-3**

*Dispositional Flow Mediates the Relationship Between HP, OP and Exercise Maintenance*



**Figure 3-4**

*Dispositional Flow Mediates the Relationship Between Dispositional Mindfulness and Rumination*

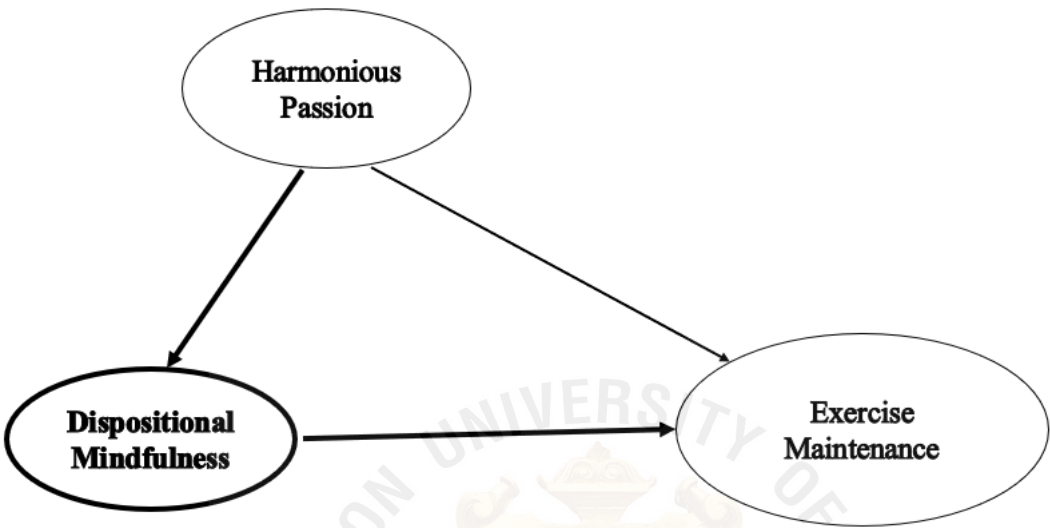


*The Mediation Effect of Dispositional Mindfulness*

The mediation effect of dispositional mindfulness on the link between harmonious passion and exercise maintenance (see Figure 3-5) was investigated. The direct and indirect effects' significance were evaluated, and partial mediation effect were established if both the direct and indirect effects were significant, while the complete mediation effect were established if just the indirect impact was significant. Sobel, product distribution, bootstrapping, and Monte Carlo techniques were used to evaluate the significance of the indirect effects (Preacher & Selig, 2012).

**Figure 3-5**

*Dispositional Mindfulness Mediates the Relationship Between HP and Exercise Maintenance*

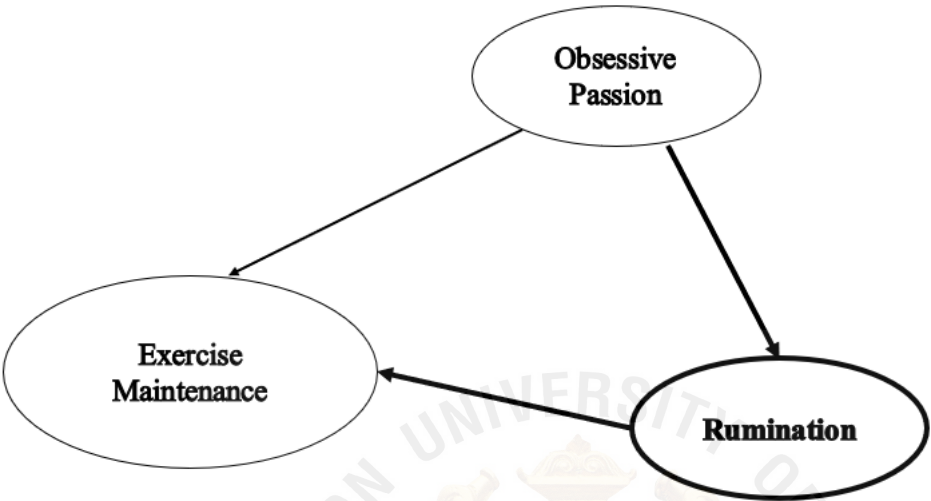


*The Mediation Effect of Rumination*

The mediation effect of rumination on the link between obsessive passion and exercise maintenance (see Figure 3-6) was investigated. The direct and indirect effects' significance were evaluated, and partial mediation effect were established if both the direct and indirect effects were significant, while the complete mediation effect were established if just the indirect impact was significant. Sobel, product distribution, bootstrapping, and Monte Carlo techniques were used to evaluate the significance of the indirect effects (Preacher & Selig, 2012).

Figure 3-6

*Rumination Mediates the Relationship Between OP and Exercise Maintenance*



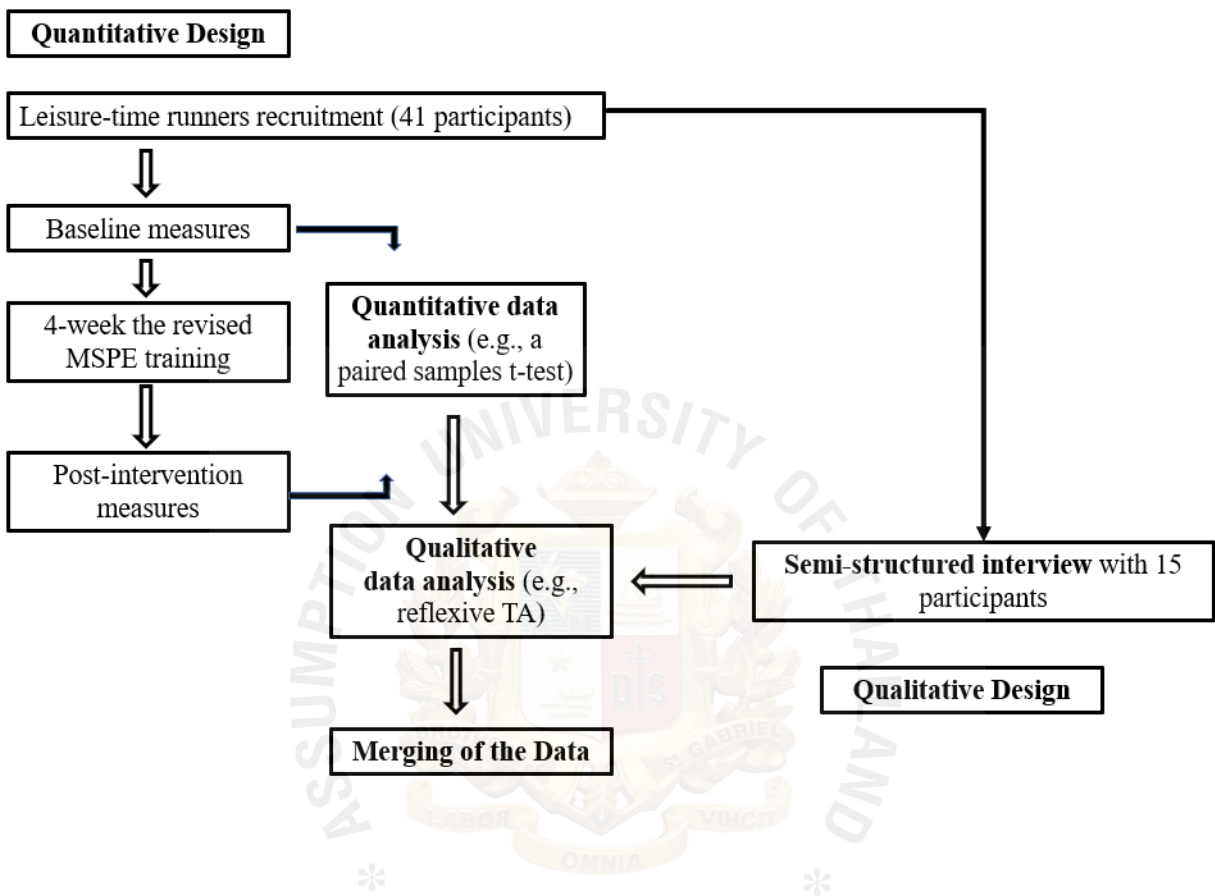
## Study III

### Overview of Study III

Study III is a mixed methods study which included quantitative and qualitative methods to answer a series of exploratory questions about the acceptability and effectiveness of a newly structured mindfulness-based intervention for enhanced dispositional flow in Chinese leisure-time runners. In this mixed methods study, an explanatory sequential design approach was employed combining the collection and analysis of quantitative and qualitative data within a traditional design (see the Figure 3-7). According to Creswell & Clark (2018), the explanatory sequential design includes are two separate interactive stages that make up the explanatory sequential design. Quantitative data are first gathered and analyzed in this approach. The gathering and analysis of qualitative data is conducted after the first phase in order to clarify or build upon the quantitative findings. The quantitative phase's findings will be used to inform the study's following qualitative phase. Overall, the main goal this approach is to employ a qualitative design to explain preliminary quantitative findings (Creswell & Clark, 2018).

Figure 3-7

*The Process in the Mixed-method Study*



*Note.* Major steps in conducting the explanatory sequential design in study III.

Seven aspects should be considered when conducting a mixed methods study, according to Schoonenboom and Johnson (2017): a) objective of the study; b) theoretical drive; c) timing; d) point of integration; e) typological vs. emergent design; f) planned vs. emergent design, and g) complexity. The aim of this study was to answer the following questions: (1) Did the four-week revised Mindful Sport Performance Enhancement (MSPE) enhance dispositional flow in Chinese leisure-time runners? (2) If it did, how did this four-week revised Mindful Sport Performance Enhancement (MSPE) enhance dispositional flow in Chinese leisure-time runners?

As for the overall theoretical drive, quantitative design is the core of the study while qualitative data was supplemental to the quantitative data. In terms of timing, the quantitative data was collecting first, followed by the qualitative data, and both were obtained independently. The results were merged in the discussion chapter. This study used a planned approach, and a simple design in terms of the complexity (Schoonenboom & Johnson, 2017).

## **1. Quantitative Design**

For the quantitative methods, a quasi-experimental design with single-group, pretest and posttest methods was employed. This design was conducted to examine the effect of the 4-week revised mindfulness intervention (Mindful Sport Performance Enhancement, MSPE) on the dependent variable (dispositional flow). There were two phases in this study: (1) baseline and (2) intervention. It is typical to include a baseline phase before introducing the intervention phases in a single group design to investigate the impacts over time and as a point of comparison (Gast & Ledford, 2014).

### *Participants*

This research was conducted in Guangzhou City in the southeast of China. The population of potential participants were comprised of leisure-time runners from various backgrounds. They were recruited from different running groups in Guangzhou, China. Participants were voluntary and informed consent (see Appendix A, B, E, F) were obtained from each participant. Participants should take part in running at least 20 minutes for three or more times a week of vigorous physical activity (running), as specified by the U.S. Department of Health and Human Services (USDHHS, 1990).



Convenience sampling was employed, owing to the voluntary nature of involvement and the difficulty of random sampling (Kandola et al., 2014). Forty-five was the minimum sample size, as calculated by G\*Power 3.1.9.2 (Faul et al., 2009) with 95% power. The researcher made the announcement of a mindfulness workshop for community runners in Guangzhou, China, by sending an email along with a cover letter to several community running groups. Some of them (N = 46) responded to the email and indicated that they were interested in attending the program. They got another email with further information on the workshop, as well as a request for their informed consent. The number of 41 out of 46 have finished all four sessions and endpoint measurements. 14.6% of the participants were between the ages of 18 and 29 years old; 48.8% of the participants were between the ages of 30 and 39 years old; 34.2 % of the participants were between the ages of 40 and 49 years old; and 2.4% of the participants were between the ages of 50 and 59 years old.

### *Setting*

This study was conducted using Zoom, a simple and dependable cloud platform for video conferencing and conversations (Archibald, et al., 2019). Traditional approaches, such as in-person interviews and focus groups, can also be replicated, supplemented, and improved upon using this kind of online methods (Braun, Clarke, & Gray, 2017). All sessions were taken place in a dedicated, quiet room at the participants' homes. Limited illumination was suggested, such as lights and natural sunshine. The sessions were conducted via Zoom in a specified, quiet place with restricted illumination by the facilitator.

## *Materials*

The outcome variable of this study was dispositional flow. Three out of five materials were used to measure this variable in the study was discussed below, exit questionnaire and demographics information were gathered in the questionnaires, such as weight, height, educational level and age. The Chinese Dispositional Flow Scale-2 (C-DFS-2) was measured dispositional flow. The rest of the two materials were part of the intervention components: Daily mindfulness log and flow experience log were used to record the experience of daily practicing.

**Demographics information.** It included weight, height, educational level and age (see Appendix H, I).

**The Chinese Dispositional Flow Scale-2 (C-DFS-2).** Study III adopted the Chinese DFS-2 from study I.

**Exit Questionnaire.** This measure, is a modified version of Reaction To Treatment Questionnaire (RTO: Heimberg et al., 1990) which was created for this study. The 5 rating items (see Table 26) and 6 open-ending question (e.g., What did you like most about this mindfulness training workshop? see Appendix W, X) invited participants to provide feedback to this MSPE workshop. The 5-item was rating on a 6-point, Likert-type scale ranging from 1 ("Not Logical/ Not at all Successful/ Not at all Recommend ") to 5 ("Very Logical/ Very Successful/ Definitely Recommend "). The final 6 questions asked participants to give their open-ended responses to what they liked most about the workshop and their recommendations for improving the workshop. For the scoring of these 6 open-ended questions, a coding manual (see Appendix T) was used, and the rating was done by the researcher. Participants only were invited to answer it after the

MSPE training.

**Daily Mindfulness Log.** Adapted from Segal et al.'s (2002) Homework Record Form, this measure (see Appendix U) asked participants to provide data on their mindfulness meditation practice between workshop sessions. Participants were record a daily log of whether they exercised mindfulness techniques and for how long, as well as any observations they make that they want to share at the next session. According to Hindman and his colleagues (2019), the use of records of both formal and informal mindfulness practice may be beneficial in mindfulness intervention study.

**Flow Experience Log.** This measure, is a revision of Experience-Sampling Form (ESF) from Larson & Csikszentmihalyi (2014) which was created specifically for this study to measure flow experience in running (see Appendix V). The date, lasting time, and the length of the running were included in this log. Respondents were asked to rank the level of perceived challenges and skills level. This log also encouraged them to write down how they felt about the running.

### *Procedure*

This was a single-group, uncontrolled trial, with data collection in two phases (baseline and intervention). Due to the COVID-19 situation, it was decided to recruit participants and collect data online for this study.

**Leisure-time Runners' Recruitment.** Target runners were recruited from different community running groups in Guangzhou, China. A cover letter (see Appendix A, B) announcing a mindfulness workshop for leisure-time runners were sent via email by the

researcher.

**Baseline Assessment.** When target runners replied with interest in attending the training, they received an email providing additional details about the workshop days and times, as well as an informed consent form (see Appendix E, F) along with a set of questionnaires. The questionnaires included demographic questions and the Chinese Version of Dispositional Flow Scale-2 (DFS-2). Its aim was to assess baseline level of dispositional flow.

All participants received a reminder email a few days before their first workshop session. Specially, at the beginning of the initial meeting, the facilitator asked all the participants whether they were acquainted with the term "flow." The facilitator used other phrases like 'flowing,' being in 'the zone,' or being in 'the groove,' which have previously been used interchangeably with flow (Jackson & Csikszentmihalyi, 1999). The participants were then asked to give an example from their past experiences.

Then, in the following 4 weeks, they received the revised 4-weeks MSPE protocol (see Appendix G). Between sessions, they were asked to practice their mindfulness skills and to monitor their progress in a mindfulness log (see Appendix U). Additionally, they were asked to monitor and record their flow experience during running in a flow experience log (see Appendix V). At the end of the last workshop session, all participants were asked to fill out the same measures they did at registration (except the demographic questions), with the addition of exit questionnaire (see Appendix W, X). Final sets of mindfulness and flow logs were distributed via email.

### *Mindfulness Training*

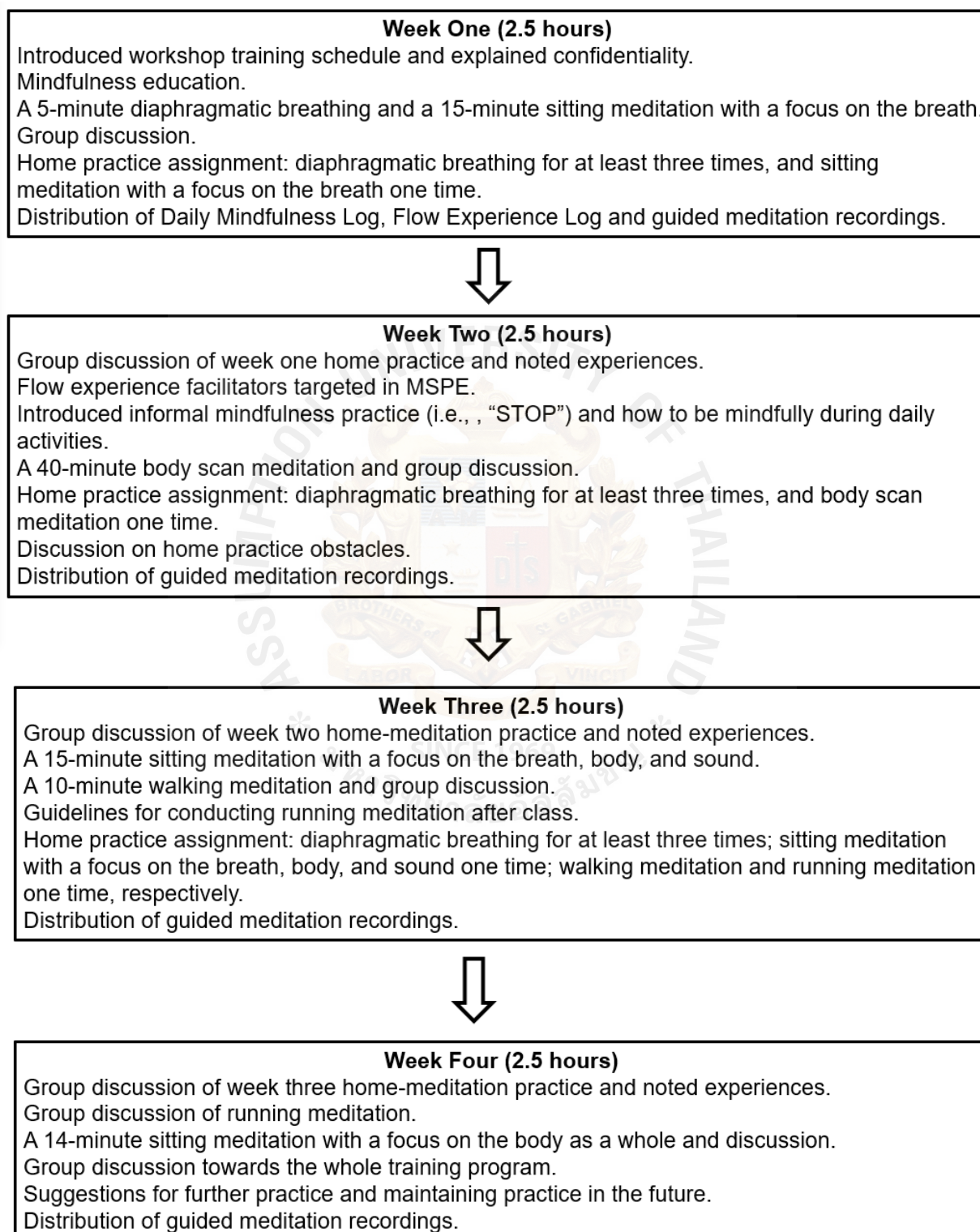
A revised manual (see the Appendix G, Figure 3-8) was developed for the MSPE, which integrates and adapts elements of Kabat-Zinn's (2009) Mindfulness-Based Stress Reduction and Segal et al.'s (2002) Mindfulness-Based Cognitive Therapy. The first session (2.5 hours) involved an explanation of the workshop's rationale and the applicability of this training to exercise settings. Breathing exercise and sitting meditation were taught to the participants and a homework meditation audio recording were sent to them via email after the first session. The 2.5-hour second session included the 45-minute body scan. Homework meditation audio recording for the meditation was sent to them via email after the session. In the third session (2.5 hours), sitting and walking meditations were taught to the participants; applying walking meditation into their running was especially encouraged. Homework meditation audio recordings for these two meditations and running meditation were sent to them via email after the session as well. The 2.5-hour final session included practicing a sitting meditation, as well as suggestions for the continued development of mindfulness skills.

### *Researcher's reflective journaling*

The researcher kept a reflective journal during the four weeks sessions. It documented her encounters with the participants in the group sessions. Mulhall (2003) observed that writing immediately after an occurrence guarantees that information is not lost to memory. The reflective journal was kept to offer as much information about the research as possible to assure the study's reliability. Any modifications made throughout the study were documented in the reflective journal. During the reflective writing phase, participants were not present.

**Figure 3-8**

*A 4-week revised protocol of the Mindful Sport Performance Enhancement*





### *Data Collection*

Even though this is a mixed methods study, the quantitative findings highlight the importance of the results. Although essential, the qualitative findings were utilized to provide explanation to the quantitative findings. As a result, choices on data collection were made based on Creswell & Plano Clark's (2018) guidelines, keeping the sequence and purpose in mind. The samples involved the same participants with two different sample sizes for the sampling choice. The quantitative sample has a higher number of participants than the qualitative sample.

### *Data Analysis*

The whole procedure of data collecting was carried out online. At the beginning of the study, participants filled out two questionnaires: one was a demographic questionnaire, and the other was the Chinese DFS-2. Following the conclusion of the last session, the participants were given a second chance to complete the Chinese DFS-2 as well as an extra exit questionnaire.

All statistical studies were carried out using the R software. The computation of the descriptive statistics was carried out using the 'psych' package. The paired sample t-test was used so that we could investigate the mean difference that existed between the two different time periods (endpoint and baseline). Cohen's  $d$  and Hedges's  $g$  were used in conjunction with the 'effsize' package in order to compute the standardized mean difference (SMD). SMDs of 0 represent no impacts, 0.3 represents medium effects, and 0.8 represents substantial effects, respectively (Lin & Aloe, 2021).

## **2. Qualitative Design**

Following the completion of the intervention, there were a total of 15 interviews with a



semi-structured format explaining the quantitative results and providing a comprehensive and in-depth analysis of the acceptability and effectiveness of the intervention. Therefore, the research questions were developed according to these aims, which are as follows: RQ (Research Question) 3-1: How did the four-week revised MSPE accepted by the leisure-time runners? RQ (Research Question) 3-2: How did the four-week revised MSPE demonstrate effectiveness?

There are three common approaches in terms of interview formats: unstructured, semi-structured, and structured (Easwaramoorthy & Zarinpoush, 2006). Semi-structured interview approach has been chosen as the data source for this qualitative design because it could provide the greatest flexibility for the interviewer (O'Keeffe et al., 2016). The in-depth structured interview method and planned themes are combined in a semi-structured interview, allowing interviewees to freely speak about any other issues (Roberts, 2020). The semi-structured interview was suggested as a good data-gathering technique for qualitative design (Bradshaw, Atkinson & Doody, 2017).

### *Participants*

The participants for the quantitative and qualitative databases were the same; however, each database has a different sample size. Although the discrepancy in sample numbers may create concerns about how the data sets will be mixed, it allows for a more comprehensive analysis and qualitative exploration while also bolstering the study's quantitative inquiry (Creswell, 2014). Furthermore, since this study aimed to synthesize the findings into one whole image, having various sample sizes will not be a problem. Morell and Tan (2009) used the same mixed methods design and reached the same conclusion. For their quantitative sample set,

Morell and Tan, 2009 utilized 230 primary children, and for their qualitative sample set, they used 34 of the same pupils. Therefore, the decision of a smaller sample size in the qualitative design was made.

The researcher (author of this dissertation) announced the recruitment of semi-structured interviews in the first session of the intervention. After finishing all the intervention sessions, the researcher wrote to 16 participants asking about their willingness to participate in the semi-structured interview. This selection was based on their representation (e.g., gender) and their frequency of participations. A number of 15 participants replied to the email (see Table 5).

**Table 5**  
*Demographic information of interview participants*

No.	ID	Frequency of participation	Age	Gender
1	T41	4	19	Female
2	T61	4	37	Female
3	T3	4	28	Male
4	T2	4	40	Male
5	T26	4	43	Female
6	T58	4	41	Male
7	T42	4	43	Female
8	T38	4	36	Male
9	T10	4	41	Female
10	T16	4	47	Female

No.	ID	Frequency of participation	Age	Gender
11	T45	4	47	Male
12	T47	4	41	Male
13	T33	4	29	Female
14	T12	4	38	Male
15	T39	4	40	Male

*Semi-structured Interview Procedures*

The author of this dissertation was the interviewer in all the 15 interviews. Since all of the 15 interviews were carried out via Zoom, interviews had been scheduled at a time and place that were both secure and quiet. In order to minimize interview bias, interviewer wore casual clothing, and maintain a professional tone and background (Cypress, 2018).

Before the start of the interview, participants were asked for their permission to record it using Zoom. They were also told that their presence was completely voluntary and that they had the choice to decline to answer questions or end the interview at any time. To examine the effectiveness of the redesigned MSPE intervention and determine whether it is acceptable to participants, a list for interviews (see Appendix O) was prepared.

Each interview included three major parts. The first one was an introduction, reassuring participants about the interview procedure. The second part was asking questions from the interview topic list. Specifically, they were encouraged to share which aspects they enjoyed the most and found most helpful and which aspects they found the most difficult and least beneficial. They have also been encouraged to record their experiences in the flow during running, both before and after they attended the workshop. Other questions that were asked and answered

reflected any changes that may have occurred due to attending the workshop, the experiences gained through attending the group sessions, and the anticipation of future practice. Finally, they were invited to give any further suggestions they had that may make this training more beneficial to them. The last part of the interview was closing questions.

Throughout the interviews, the interviewer showed genuine care and interest in the interviewees. As a result, it was critical to listen to and reflect on what the interviewees were saying (Dilley, 2000). The average duration of interviews was 33 minutes (see Table 28). A semi-structured interview was an appropriate data collecting strategy since it enabled participants to talk freely within the boundaries of the study subject and questions while still providing the informative depth required to answer the research questions. Following the interview, interviewees were given a chance to contribute any further information.

#### *Data Collection*

**Verbatim Recordings.** Due to the advantages such as convenience, efficiency, cost-effectiveness, and flexibility, online approaches may be more appealing to study participants than in-person interviews (Horrell, Stephens & Breheny, 2015). Zoom, like other VoIP (Voice over Internet Protocol, VoIP) technologies (e.g., Skype), allows users to connect with geographically distant persons in real-time by the computer, tablet, or mobile device (Archibald et al., 2019). Unlike many other VoIP technologies, Zoom, on the other hand, has several extra advantages that increase its potential research usefulness (Archibald et al., 2019). Zoom's capacity to securely record and retain sessions without needing third-party software is a significant feature (Archibald et al., 2019). This feature is crucial in studies where extremely

sensitive data must be protected (Archibald et al., 2019). All essential security features are user-specific identification, real-time meeting encryption, and the option to backup recordings to online distant server networks, which may later be shared securely for collaboration (Zoom Video Communications Inc., 2016). Therefore, all the interviews were recorded by Zoom and created verbatim transcriptions of them afterward. Later, the transcripts were sent back to interviewees via email for confirmation.

**Interview notes.** The interview notes included the interviewees' nonverbal cues and post-interview reflection. Merriam and Tisdell (2016) suggested using interview notes to guarantee a study's objectivity. The interview notes included details of the interviewees' nonverbal behaviors. Therefore, the nonverbal aspects of communication, such as body language, facial expression, and emotions had been written down by the author of this dissertation as interview notes. These nonverbal cues were helpful in the later coding process since they were natural and can enhance interviewees' spoken cues.

### *Data Analyses*

The aim of the data analysis for the qualitative design was to explain the acceptance and effectiveness of the four-week revised MSPE intervention. Two research questions guided the data analysis process:

QR2-1: How does the four-week revised MSPE accepted by the participants?

QR2-2: how does the four-week revised MSPE demonstrate effectiveness?

To get the qualitative data ready for analysis, all the semi-structured interview recordings were transcribed. The participants' identities were taken out of the transcripts and substituted

with provided pseudonyms to sanitize the data. All the transcripts then uploaded into NVivo Release 1.2 for further analysis. This method of data analysis was directed by a reflexive thematic analysis, also known as a reflexive TA (Braun & Clarke, 2022). Within this methodology, the generation of themes from codes was broken down into the following six processes (Braun & Clarke, 2022). First, in order to get familiar with the transcripts, two researchers went through the whole collection of them and read each one many times. Second, preliminary codes were devised based on the collected data. According to Braun and Clarke, the coding process is more of an interpretation than a straightforward identification, and it is heavily influenced by the subjectivity of the researcher (Braun & Clarke, 2022). As a direct consequence of this, the original codes underwent modifications all the way through the coding process. Third, the codes were categorized and arranged according to the possible topics they represented. In the fourth step, the prospective themes were examined, and their development was adjusted such that it included the same set of codes. Fifth, names and definitions were given to the topics. In the end, a written report of the findings was compiled and given to a third researcher for evaluation.

**Step 1. Reading and making notes.** The first step was reading the transcript or listening to the recordings a few times carefully to get fresh insights (Braun & Clarke, 2022). The video recordings for the semi-structured interviews were transcribed into word documents. Observations and reflections were written down regarding the interview notes, as well as any other potentially significant ideas and remarks (Braun & Clarke, 2022). They were concentrated on content (what is really being discussed), language usage (e.g., metaphors, and repetitions), context, and early interpretive remarks (Braun & Clarke, 2022). Some personal reflection

remarks were also be created (e.g., the connection with the participant).

**Step 2. Generated initial codes.** According to Babchuk (2019), a code is a section of data to which meaning has been attributed. After reading the interview transcripts several times, initial codes were written down. Those initial codes were examined closely. Due to their repetition or the fact that they used various words to convey the same notion, several of the initial codes were combined and eliminated. There was consistent reference made to the research questions to verify that the codes were pertinent to the research questions. Codes that were not pertinent to the research questions were removed from consideration. Reading through the transcripts and manually marking the codes allowed for the generation of the initial codes.

**Step 3. Grouping themes.** The next step was establishing links between codes, grouping them together based on conceptual similarities, and labeling them (Braun & Clarke, 2022). Although the main categories for the code structure were based on the research questions, the subcategories were derived from the data. There was no previously saved version of the code. The procedure consisted of doing the code structure three times during the process to increase pattern detection while the coding was being done. The researcher used their reflective journal to keep track of the memorization.

**Step 4. Write up the result.** This generally entails going over the final table and putting down the themes one by one (Braun & Clarke, 2022). Each theme was discussed and illustrated by excerpts from the interviews, followed by the researcher's analytic remarks. The table of themes were transformed into a convincing narrative to explain the key experiential items discovered throughout the analytical process (Braun & Clarke, 2022). Themes were written with



the interviewees' words to preserve the voice of the participants' personal experience while allowing the emic viewpoint to be presented (Braun & Clarke, 2022). In a word, the result was presented with both the participant's narrative of his or her experience in his or her own words and the researcher's interpretive comments.

### **Overview of The Chapter**

The aims of the present study were investigating the psychological processes of exercise maintenance, and the effectiveness of the MSPE intervention enhancing dispositional flow in leisure-time runners in Guanzhou city, China. To achieve these goals, three studies were conducted.

In Study I, 386 participants were invited to answer a series of questionnaires to test the psychometric properties of a translated scale (Chinese version of Dispositional Flow Scale-2), and other four scales (the Chinese MAAS; the Chinese RRS; the Chinese SPS; the Chinese URICA-E2) for study II.

In Study II, data from 534 participants were used to test the relationships between harmonious passion, obsessive passion, dispositional flow, dispositional mindfulness, rumination, and exercise maintenance by using the structural equation modeling (SEM) method.

Study III was a mixed-method study. In the quantitative component, a trial with a single group design was adopted. In order to determine whether there was a difference before and after the intervention, a paired sample t-test was carried out. Within the qualitative component of the study, a series of semi-structured interviews were carried out with the purpose of gathering evidence to support and explain the quantitative conclusion. Because of this, the quantitative

findings in this study have a superior interpretation, while the qualitative findings were used to provide a comprehensive and in-depth analysis of the acceptability and effectiveness of the intervention. Consequently, the quantitative findings in this study have a superior interpretation. The same individuals participated in each of the strands, but the sample sizes were different for each one. The sample size for the quantitative component is much higher than that of the qualitative component.



## CHAPTER IV

### RESULT

This study aimed to investigate flow experience as the emotional determinant in maintaining exercise behaviors by testing the relationship between passion, mindfulness, rumination, and their impacts on flow experience towards exercise maintenance among leisure-time runners. This study also aimed to investigate mindfulness-based intervention enhancing dispositional flow among runners. The findings and analysis of three related studies—Study 1(The DFS-2 adaptation), Study 2 (model testing), and Study 3(mixed-method study)—are presented in this chapter. The following are the main aims for each study in the current research:

Study 1: To test the psychometric properties of Dispositional Flow Scale-2 (DFS-2) and the other four scales on Chinese leisure-time runners.

Study 2: To test the structural model in order to verify the relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time runners.

Study 3: To test the four-week revised MSPE, which was developed for this study, could significantly enhance dispositional flow in Chinese leisure-time runners.

## Study I

### Study I (Psychometric Properties of the DFS-2)

Study I aimed to assess the psychometric properties of the instruments to be used in study I, study II, and study III. Specifically, assessing the reliabilities and validities of all the five instruments. Four are standardized questionnaires with their original forms written in Chinese. This study aimed to examine the psychometric properties of the Chinese DFS-2 to provide a quality tool that can be used in cross-cultural studies and in studies with Chinese leisure-time runners.

#### 1. The Adaptation and Psychometric Properties of the DFS-2

First, the results from the Kaiser–Meyer–Olkin statistic ( $KMO = .94$ ,  $p < .001$ ) and Bartlett's test of sphericity indicated the data from the initial Chinese version was appropriate to undertake factor analysis. Then, a Maximum-likelihood factor analysis (MLA) was carried out on 36 items. According to the results of parallel analysis (see Figure 4-2), nine factors were in line with the scree plot (nine data points above the break, see Figure 4-1). An eigenvalue larger than one was found for nine different factors.

Figure 4-1

*The scree plot of the Chinese DFS-2*

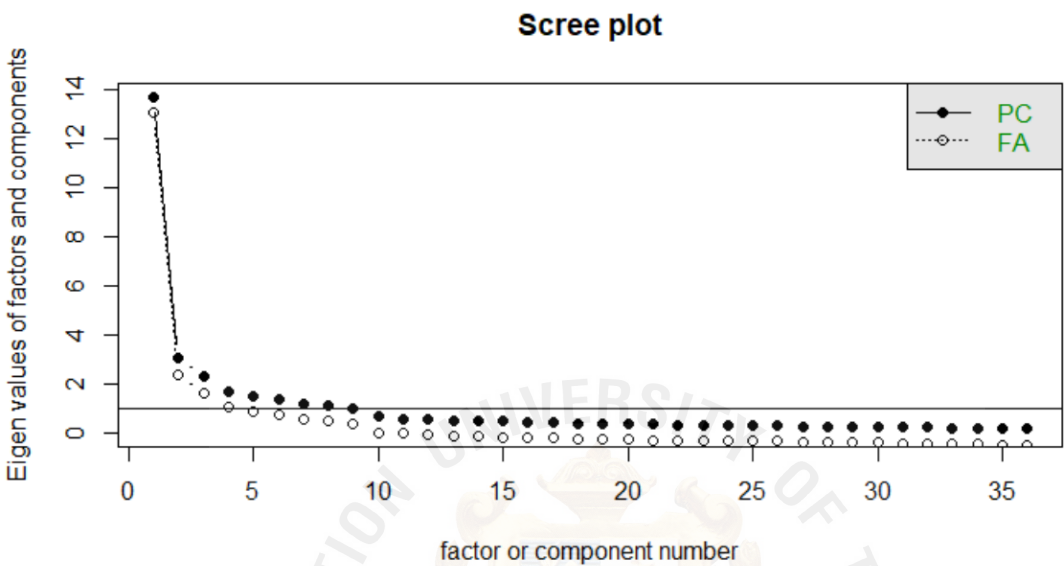
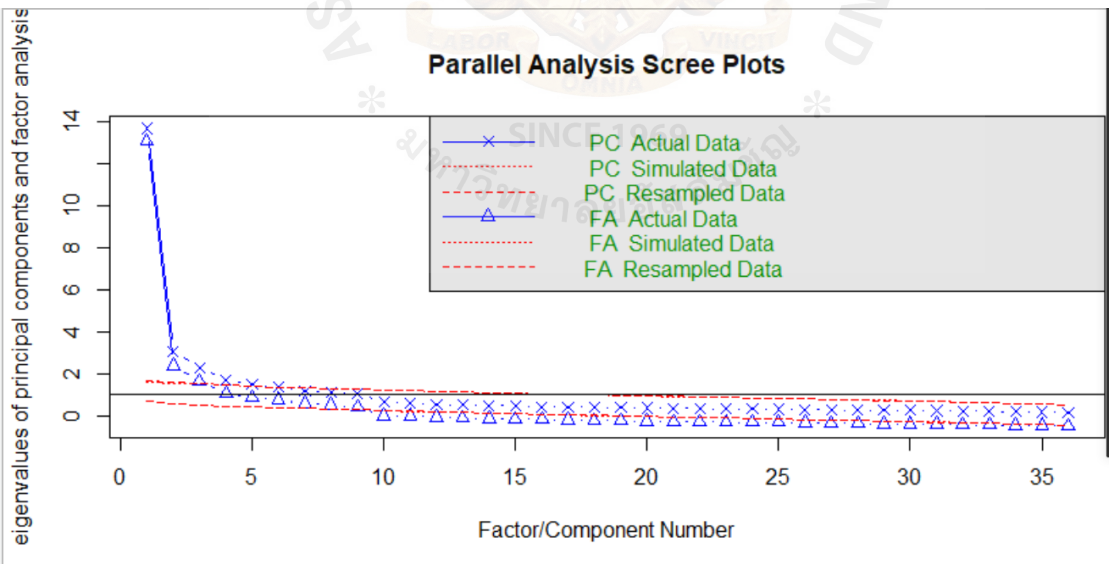


Figure 4-2

*The result of the parallel analysis*



Second, according to the findings of the EFA, 35 out of 36 items were a good match for the 9-factor framework (see Table 6). There was just one item (Item 36, “The experience is extremely rewarding”) that overlapped two factors, which had low factor loadings.

Considered during the translation process, both the focus group discussion (2 out of 7 participants) and pre-test feedback (6 out of 26 participants) had a high rate of confusion in terms of comprehending Item 36. some pre-test comments suggested Item 36 having an ambiguous meaning. Moreover, the result from EFA (factor loadings less than .32) confirmed this finding. If Item 36 were removed from Factor 9, the overall reliability of Factor 9 would go from .819 to .882, which was a significant increase. As a result of these concerns, Item 36 was eliminated from the final version.

All the corrected item-total correlations were found to be positive and higher than .30: Factor 1 .593–.637; Factor 2 .564–.641; Factor 3 .503–.586; Factor 4 .540–.584; Factor 5 .630–.698; Factor 6 .633–.638; Factor 7 .452–.622; Factor 8 .478–.615 and Factor 2 .575–.600. All the 35 items were in the same dimensions as the original scale. Considering these findings, the final version with 35 items were prepared for the subsequent stage of analysis.

Third, a CFA was carried out on the final version (a total of 35 items) on sample 2 (N = 534). The results of the Goodness-of-fit indices as showed in Table 7.

**Table 6**

*EFA factor loadings for 36 items*

[illegible]



Factor / Item	1 ( $\alpha$ :.909) <sup>a</sup>	2 ( $\alpha$ :.862) <sup>a</sup>	3 ( $\alpha$ :.876) <sup>a</sup>	4 ( $\alpha$ :.901) <sup>a</sup>	5 ( $\alpha$ :.884) <sup>a</sup>	6 ( $\alpha$ :.873) <sup>a</sup>	7 ( $\alpha$ :.858) <sup>a</sup>	8 ( $\alpha$ :.885) <sup>a</sup>	9 ( $\alpha$ :.819) <sup>a</sup>
27									.944
36							.293		.228

*Construct validity.* CFA was performed on 534 leisure-time runners. The results of the Goodness-of-fit indices as showed in Table 8.

The criteria for model adequacy were satisfied when both the RMSEA value ( $.04 < .05$ ) and the SRMR value ( $.04 < .06$ ) were satisfied (according to the two-index presenting strategy, Hu & Bentler, 1998). All the standardized factor loadings for the final version were positive and significant ( $p < .001$ ), with a range from .663 to .876 for the highest value. There was only one item has loading that was below .70 (Item 25), and the rest items loading all higher than .70.

### Table 7

*CFA Factor loadings and  $R^2$  of 35 items ( $N = 534$ )*

[illegible]

Factor / Item description	1	2	3	4	5	6	7	8	9	R <sup>2</sup>
4				.776						.602
13				.842						.709
22				.869						.756
31				.810						.656
<b>Factor5</b>										
5					.750					.563
14					.781					.610
23					.800					.640
32					.818					.670
<b>Factor6</b>										
6						.824				.679
15						.829				.688
24						.821				.674
33						.817				.668
<b>Factor7</b>										
7							.715			.512
16							.783			.613
25							.663			.439
34							.815			.665
<b>Factor8</b>										
8								.774		.599
17								.816		.665
26								.833		.693
35								.765		.585
<b>Factor9</b>										
9									.796	.633
18									.828	.686
27									.876	.767

The results from the convergent validity and discriminant validity test are as follows: 1) each of the nine factors had CR values that were greater than .60 (see Table 9); 2) each of the nine factors had AVE values were larger than .50 (see Table 9); 3) a substantial association between the latent variables and the items that correspond to them was revealed by the high factor loadings, which were all greater than .60; 4) the AVE values of all factors were higher

than their respective SV values; 5) the correlation coefficient between factors ranged from .351 to .639 on average, and none of them had a value higher than .85. These results suggested that the final version scale has a satisfactory convergent and discriminant validity.

**Table 8**

*Model Fit Indices of the Chinese DFS-2 (N = 534)*

$\chi^2$	<i>df</i>	SRMR	BL89	TLI	CFI	RMSEA (95% CI)
1075.520	524	.040	.954	.947	.953	.044 ( . 041 - . 048)

*Internal consistency.* The Cronbach’  $\alpha$  coefficients of the final version was .95 > .90, which indicated an excellent internal consistency. Every factor all had a Cronbach alpha value that was greater than .70 (see Table 9).

*Item Analysis.* All the corrected item-total correlations were positive and above .30: Factor 1 .618–.673; Factor 2 .518–.555; Factor 3 .491–.588; Factor 4 .527–.598; Factor 5 .612–.686; Factor 6 .573–.590; Factor 7 .426–.622; Factor 8 .450–.620; and Factor 9 .568–.641.

Table 9

Convergent validity and discriminant validity test in sample N=534

Factors	Cronbach's alpha	AVE	CR	SV by factor								
				1	2	3	4	5	6	7	8	9
1	.917	.738	.918	1								
2	.851	.590	.852	.323	1							
3	.863	.613	.863	.287	.304	1						
4	.894	.683	.896	.247	.256	.123	1					
5	.867	.621	.868	.356	.336	.320	.408	1				
6	.893	.677	.894	.257	.231	.231	.185	.327	1			
7	.833	.558	.834	.166	.156	.215	.258	.393	.253	1		
8	.874	.636	.874	.141	.137	.137	.133	.231	.149	.376	1	
9	.871	.697	.873	.339	.169	.267	.230	.300	.283	.296	.296	1

Note. The values of SV were the square of correlation coefficient between factors.

Table 10

*Correlations between the Chinese DFS-2 factors*

Factors	1	2	3	4	5	6	7	8	9
1. Balance	1								
2. Merging	.568	1							
3. Goals	.536	.550	1						
4. Feedback	.497	.506	.350	1					
5. Concentration	.597	.579	.565	.638	1				
6. Control	.507	.481	.480	.430	.572	1			
7. Consciousness	.407	.395	.463	.508	.627	.503	1		
8. Time	.377	.370	.370	.366	.481	.386	.613	1	
9. Autotelic	.582	.411	.517	.479	.547	.532	.545	.546	1

2. The Psychometric Properties of the other four scales

The validity and reliability of the following four scales were tested in sample 2 (N=534): the Chinese version of the URICA-E2; the Chinese Version of Sports Passion Scale (SPS); the Chinese version of Mindful Attention Awareness Scale (MAAS); and the Chinese Version of Ruminative Responses Scale (RRS).

2.1 The Chinese version of the URICA-E2

An MLA was performed on the Chinese URICA-E2 with a total of 8 items. A test of the Kaiser–Meyer–Olkin statistic and Bartlett's test of sphericity revealed it was appropriate to undertake factor analysis prior to completing MLA (KMO =.91; Bartlett's test,  $p < .001$ ). Parallel analysis suggests the number of factors was 1 which show the consistency with scree plot (one data points above the break). The Chinese URICA-E2 was valid and fitted the observed data.

The Cronbach's coefficient of the Chinese URICA-E2 was .872 (see Table 13); the model fit indices of the Chinese URICA-E2 were satisfactory (see Table 12).

**Table 11**

*Descriptive statistics of the Chinese URICA-E2*

Item	Mean	SD score	Skewness	Kurtosis
Q48	4.50	.883	-.665	.637
Q49	4.54	.880	-.557	.385
Q50	4.63	.804	-.593	.288
Q51	4.45	.871	-.454	-.148
Q52	4.44	.826	-.364	-.364
Q53	4.39	.887	-.268	-.163
Q54	4.52	.880	-.240	-.528
Q55	4.40	.845	-.173	.274

**Table 12**

*Model Fit Indices of the Chinese URICA-E2*

$\chi^2$	df	$\chi^2/df$	GFI	IFI	TLI	CFI	RMSEA
84.031	20	4.202	.963	.960	.944	.960	.077

Table 13

*CFA Factor loadings and R-squared (R<sup>2</sup>) of 8 items (N=534)*

Factor / Item description	1 ( $\alpha$ :.872) <sup>a</sup>	R <sup>2</sup>
Q48	.675	.455
Q49	.697	.486
Q50	.603	.363
Q51	.674	.454
Q52	.698	.487
Q53	.696	.484
Q54	.698	.487
Q55	.685	.469

*2.2 The Chinese Version of Sports Passion Scale (SPS)*

An MLA was performed on the Chinese SPS with a total of 12 items. A test of the Kaiser–Meyer–Olkin statistic and Bartlett's test of sphericity revealed it was appropriate to undertake factor analysis prior to completing MLA (KMO =.95; Bartlett's test,  $p < .001$ ). Parallel analysis suggests the number of factors was 2 which show the consistency with scree plot (two data points above the break). The Chinese SPS was valid and fitted the observed data. The Cronbach's coefficient of the harmonious passion subscale was .968 (see Table 16); the Cronbach's coefficient of the obsessive passion subscale was .959 (see Table 16); the model fit indices of the Chinese SPS were satisfactory (see Table 15).



Table 14

*Descriptive statistics of the Chinese SPS*

Item	Mean	SD score	Skewness	Kurtosis
Q36	3.63	1.090	-.152	.332
Q37	3.57	1.098	-.078	.349
Q38	3.61	1.006	.050	.464
Q39	3.55	1.056	.121	.665
Q40	3.58	1.045	.062	.459
Q41	3.59	1.000	.062	.482
Q42	2.64	1.126	.504	.414
Q43	2.71	1.033	.192	.788
Q44	2.67	.999	.640	1.143
Q45	2.59	.976	.760	1.776
Q46	2.64	1.011	.263	.392
Q47	2.58	1.084	.431	.420

Table 15

*Model Fit Indices of the Chinese SPS*

$\chi^2$	df	$\chi^2/df$	GFI	IFI	TLI	CFI	RMSEA
230.977	53	4.358	.932	.976	.970	.976	.079

Table 16

CFA Factor loadings and R-squared ( $R^2$ ) of 12 items ( $N=534$ )

Factor / Item description	1 ( $\alpha$ :.968) <sup>a</sup>	2 ( $\alpha$ :.959) <sup>a</sup>	$R^2$
<b>1. Harmonious Passion</b>			
Q36	.852		.726
Q37	.931		.867
Q38	.899		.808
Q39	.930		.864
Q40	.879		.773
Q41	.856		.732
<b>2. Obsessive Passion</b>			
Q42		.900	.810
Q43		.891	.794
Q44		.878	.771
Q45		.907	.822
Q46		.901	.811
Q47		.885	.784

2.3 The Chinese version of Mindful Attention Awareness Scale (MAAS)

An MLA was performed on the Chinese MAAS with a total of 15 items. A test of the Kaiser–Meyer–Olkin statistic and Bartlett's test of sphericity revealed it was appropriate to undertake factor analysis prior to completing MLA ( $KMO = .96$ ; Bartlett's test,  $p < .001$ ). Parallel analysis suggests the number of factors was 1 which show the consistency with scree plot (one data points above the break). The Chinese MAAS was valid and fitted the observed data. The

Cronbach's coefficient of the Chinese MAAS was .939 (see Table 19); the model fit indices of the Chinese MAAS were satisfactory (see Table 18).

**Table 17**

*Descriptive statistics of the Chinese MAAS*

Item	Mean	SD score	Skewness	Kurtosis
Q56	3.62	1.375	-.262	-.853
Q57	4.21	1.468	-.585	-.531
Q58	4.03	1.406	-.427	-.490
Q59	3.97	1.350	-.600	-.216
Q60	3.88	1.299	-.428	-.283
Q61	3.76	1.406	-.300	-.600
Q62	4.14	1.483	-.416	-.664
Q63	3.97	1.430	-.518	-.405
Q64	4.05	1.402	-.677	-.154
Q65	4.31	1.404	-.724	-.227
Q66	4.01	1.484	-.362	-.838
Q67	4.05	1.481	-.403	-.771
Q68	3.77	1.414	-.216	-.775
Q69	4.18	1.463	-.574	-.540
Q70	4.28	1.453	-.696	-.332

Table 18

Model Fit Indices of the Chinese MAAS

$\chi^2$	$df$	$\chi^2/df$	GFI	IFI	TLI	CFI	RMSEA
375.632	90	4.174	.913	.937	.926	.937	.071

Table 19

CFA Factor loadings and R-squared ( $R^2$ ) of 15 items ( $N=534$ )

Factor / Item description	1 ( $\alpha: .939$ ) <sup>a</sup>	$R^2$
Q56	.636	.404
Q57	.722	.522
Q58	.613	.376
Q59	.681	.464
Q60	.681	.464
Q61	.599	.359
Q62	.764	.584
Q63	.779	.606
Q64	.774	.599
Q65	.764	.584
Q66	.689	.475
Q67	.762	.580
Q68	.718	.516
Q69	.758	.575
Q70	.710	.505

2.4 The Chinese Version of Ruminative Responses Scale (RRS)

An MLA was performed on the Chinese RRS with a total of 10 items. A test of the Kaiser–Meyer–Olkin statistic and Bartlett's test of sphericity revealed it was appropriate to undertake factor analysis prior to completing MLA (KMO =.93; Bartlett's test,  $p < .001$ ). Parallel analysis suggests the number of factors was 2 which show the consistency with scree plot (two data points above the break). The Chinese RRS was valid and fitted the observed data. The Cronbach's coefficient of the ruminative brooding subscale was .926 (see Table 22); the Cronbach's coefficient of the ruminative reflection subscale was .916 (see Table 22); the model fit indices of the Chinese RRS were satisfactory (see Table 21).

Table 20

Descriptive statistics of the Chinese RRS

Item	Mean	SD score	Skewness	Kurtosis
Q71	2.32	.952	.689	.422
Q72	2.19	.830	.536	.193
Q73	2.31	.854	.247	-.529
Q74	2.16	.790	.939	1.602
Q75	2.08	.791	.878	1.028
Q76	2.25	.837	.379	-.340
Q77	2.24	.875	.388	-.473
Q78	2.16	.830	.420	-.184
Q79	2.06	.874	.896	.919
Q80	2.15	.810	.650	.726

Table 21

Model Fit Indices of the Chinese RRS

$\chi^2$	<i>df</i>	$\chi^2/df$	GFI	IFI	TLI	CFI	RMSEA
126.516	34	3.721	.955	.978	.971	.978	.079

Table 22

CFA Factor loadings and R-squared ( $R^2$ ) of 10 items ( $N=534$ )

Factor / Item description	1 ( $\alpha$ :.926) <sup>a</sup>	2 ( $\alpha$ :.916) <sup>a</sup>	$R^2$
<b>1. Ruminative Brooding</b>			
Q71	.822		.676
Q73	.882		.778
Q76	.858		.735
Q77	.833		.694
Q78	.843		.711
<b>2. Ruminative Reflection</b>			
Q72		.795	.632
Q74		.775	.600
Q75		.897	.804
Q79		.858	.736
Q80		.817	.667

## Study II (Model Testing)

The aim of Study II was to investigate the direct and indirect effects of the harmonious passion and obsessive passion on Chinese leisure-time runners' exercise maintenance. The hypothesized model was examined by conducting SEM. It was hypothesized that harmonious passion and obsessive passion have direct and indirect effects on the Chinese long-distance runners' criterion variables, which is mediated by dispositional flow, dispositional mindfulness, and rumination. A revised model was proposed according to the observed data.

### 1. Model evaluation and modification

All the instruments in study II were valid and fitted the observed data, according to the results from study I (see Table 23). All the correlations between variables were significant (see Table 24). The SEM was performed in the 95% bootstrap confidence intervals from 5000 bootstrap replicates. The hypothesized model converged after 28 iterations with  $\chi^2(2, N= 534) = 10.771, p = .005$  (see Table 25). The standardized estimate of the regression path between obsessive passion and exercise maintenance was not significant (see Figure 4-3); all other standardized estimates were significant ( $p < .001$ ). The non-significant path was removed to produce a more parsimonious model for three major reasons. First, the  $\chi^2/df = 5.385$  was larger than 5.0, which indicated not adequate model fit. Second, the RMSEA = .91 was exceed the criterion of less than .80. Third, the direct effect of obsessive passion on exercise maintenance was not significant.



Table 23

*The Psychometrics Properties of the Instruments in Study II*

Scales/Subscales	$\chi^2/df$	GFI	IFI	TLI	CFI	RMSEA	Cronbach's alpha
The Chinese DFS-2	2.05	.90	.95	.95	.95	.04	.95
The Chinese HP Subscale	4.35	.93	.98	.97	.98	.08	.97
The Chinese RRS	3.72	.96	.98	.97	.98	.08	.92
The Chinese MAAS	4.17	.91	.94	.93	.94	.07	.94
The Chinese OP Subscale	4.35	.93	.98	.97	.98	.08	.96
The Chinese URICA-E2	4.20	.96	.96	.94	.96	.08	.87

Table 24

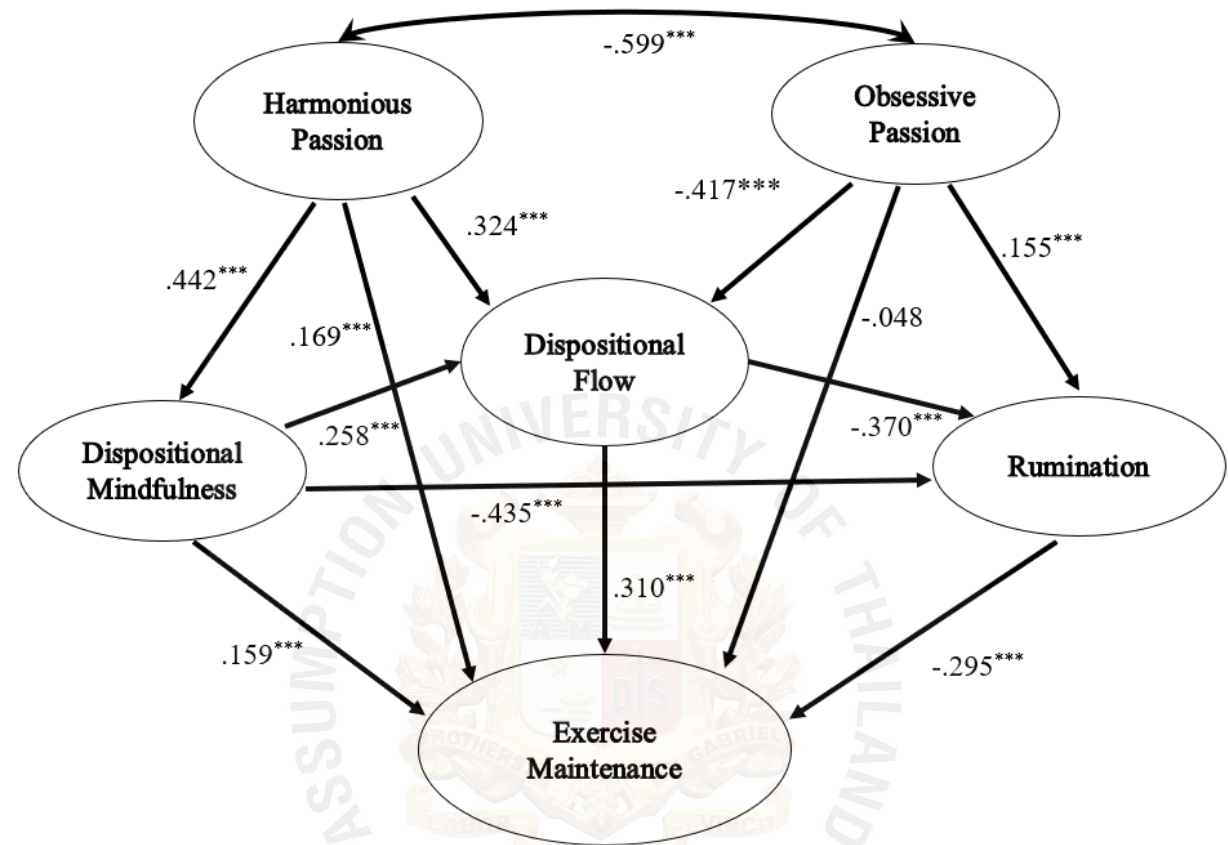
*Correlations Matrix for Study II Variables (N=534)*

	1	2	3	4	5	6
1. Dispositional mindfulness	1					
2. Dispositional flow	.547	1				
3. Rumination	-.686	-.710	1			
4. Exercise maintenance	.622	.754	-.738	1		
5. Harmonious passion	.442	.681	-.516	.630	1	
6. Obsessive passion	-.363	-.697	.565	-.589	-.599	1

*Note.*  $p < .001$

Figure 4-3

*The Standardized Estimates of the Hypothesized Model*



Note.  $***p < .001$

Next, a revised model converged after 26 iterations with  $\chi^2(3, N = 534) = 12.524, p = .006$ . All of the standardized coefficients were significant ( $p < .001$ ), and all of the factor loadings were in the expected direction. Since all the model fit indices were satisfactory (see Table 25), the revised model was considered to have acceptable model fit. This model had significant regression paths between harmonious passion and dispositional mindfulness, between harmonious passion and dispositional flow, between obsessive passion and rumination and between harmonious passion and exercise maintenance (see Figure 4-4).

Table 25

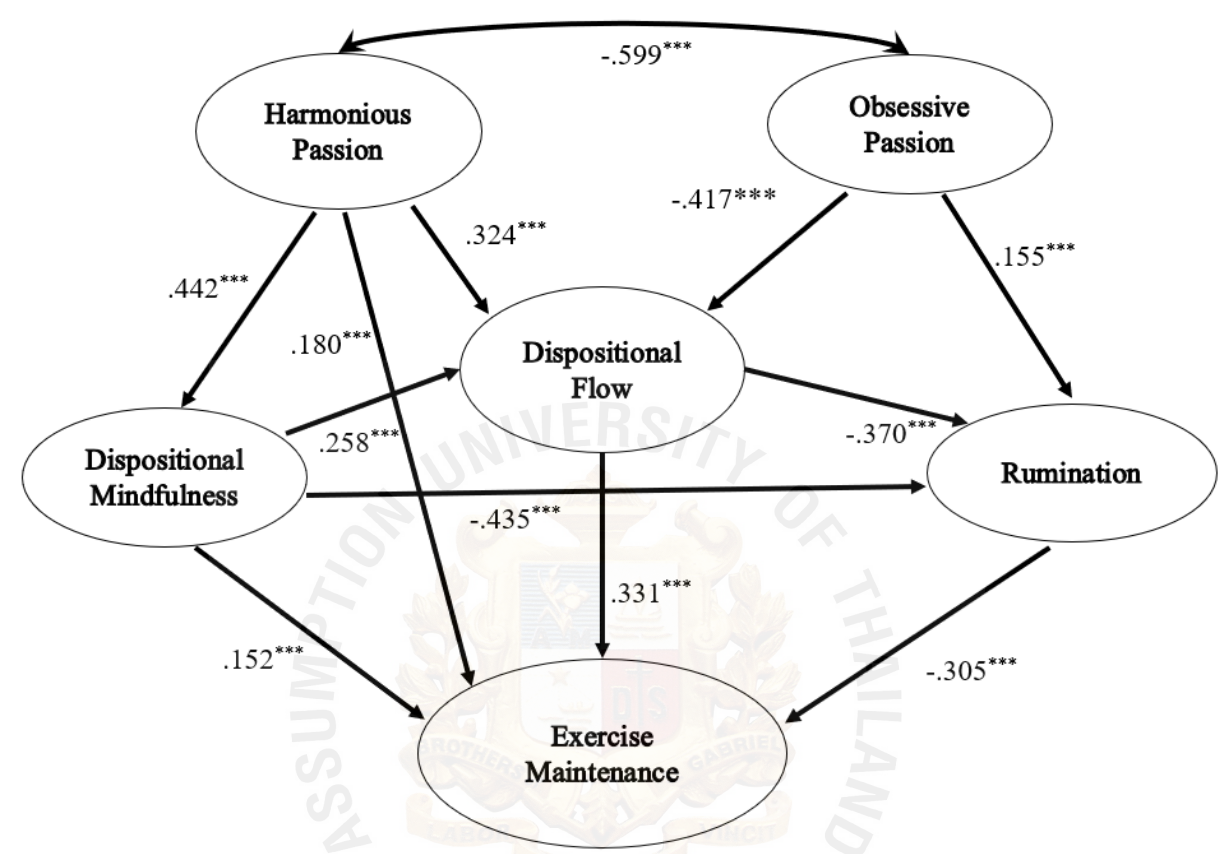
Model Fit Indices for Two Models Tested in SEM

Indices	Acceptance Level	Hypothesized Model	Revised Model
Absolute Fit Indices			
$\chi^2/df$	< 5.0	5.385	4.175
GFI	> .90	.993	.992
AGFI	> .90	.930	.946
RMSEA	< .08	.091	.077
RMR	< .08	.030	.031
Incremental Fit Indices			
TLI	> .90	.968	.977
CFI	> .90	.996	.995
RFI	> .90	.961	.970
NFI	> .90	.995	.994

Note. *df* = degree of freedom; GFI = Good of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMSEA = Root Mean Square Error of approximation; RMR = Root Mean Square Residual; TLI = Toker Lewis Index; CFI = Comparative Fit Index; RFI = Relative Fit Index; NFI = Normed Fit Index (Afthanorhan, 2013).

Figure 4-4

*The Standardized Estimates of the Revised Model*



Note. \*\*\* $p < .001$

Table 26

*Standard Effects of Passion (Predictors) on Exercise Maintenance via Dispositional Mindfulness, Dispositional Flow and Rumination (Hypothesized Mediators)*

	$\beta$	SE	<i>p</i>
<b>Indirect Effects</b>			
Harmonious passion -> Dispositional mindfulness -> Dispositional flow -> Exercise maintenance	.038	.006	0.000
Harmonious passion -> Dispositional mindfulness -> Rumination -> Exercise maintenance	.059	.008	0.000
Harmonious passion -> Dispositional flow -> Rumination -> Exercise maintenance	.037	.006	0.000
Harmonious passion -> Dispositional mindfulness -> Dispositional flow -> Rumination-> Exercise maintenance	.013	.002	0.000
Harmonious passion -> Dispositional mindfulness-> Exercise maintenance	.067	.015	0.002
Harmonious passion -> Dispositional flow -> Exercise maintenance	.107	.012	0.000
Obsessive passion -> Rumination -> Exercise maintenance	-.047	.010	0.001
Obsessive passion -> Dispositional flow -> Exercise maintenance	-.138	.014	0.000
Obsessive passion -> Dispositional flow -> Rumination -> Exercise maintenance	-.047	.008	0.000
<b>Total Effect</b>	.381	.046	0.000

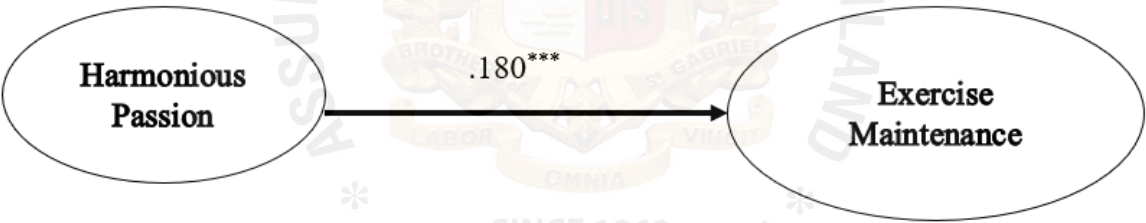
2. Hypothesis Testing

2.1 Harmonious Passion Directly and Positively Influences Exercise Maintenance in Chinese Leisure-time Runners.

In Hypothesis 1.1, it was predicted that harmonious passion directly and positively influences exercise maintenance in Chinese leisure-time runners. A positive and significant association between harmonious passion and exercise maintenance was found ( $\beta = .180, p < .001$ ), which suggested that harmonious passion positively impacts exercise maintenance (see Figure 4-5). The study hypothesis (H1.1) was accepted.

Figure 4-5

*The Standardized Estimates of Harmonious Passion and Exercise Maintenance*



Note. \*\*\* $p < .001$

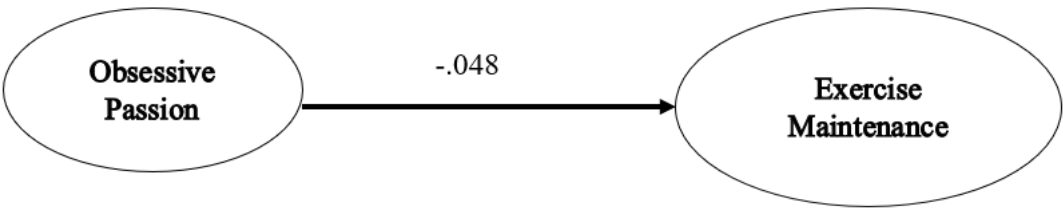
2.2 Obsessive Passion Directly and Negatively Influences Exercise Maintenance in Chinese Leisure-time Runners

In Hypothesis 1.2, it was predicted that obsessive passion directly and negatively influences exercise maintenance in Chinese leisure-time runners. However, the relationship between obsessive passion and exercise maintenance was not significant ( $\beta = -.048, p = .179 > .001$ ), according to the result from the hypothesized model (see Figure 4-3). The

negatively impacts on exercise maintenance was not significant. Therefore, the study hypothesis (H1.2) was rejected.

**Figure 4-6**

*The Standardized Estimates of Obsessive Passion and Exercise Maintenance*



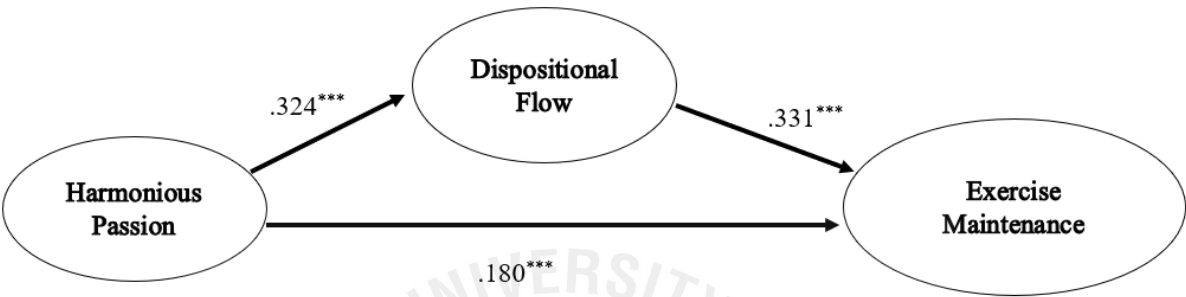
*2.3 Harmonious Passion Indirectly and Positively Influences Exercise Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Flow*

In Hypothesis 1.3, it was predicted that harmonious passion indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional flow. Harmonious passion has a significant and positive impact on dispositional flow ( $\beta = .324, p < .001$ ). Dispositional flow has a significant and positive impact on exercise maintenance ( $\beta = .331, p < .001$ ). The indirect effect of harmonious passion on exercise maintenance through dispositional flow was observed to be .107 ( $p < .001$ ), which is 28.08% of the total effect ( $\beta = -.381, p < .001$ ). This suggested that harmonious passion, dispositional flow, and exercise maintenance share a strong relationship (see Figure 4-7). Thus, the study hypothesis (H1.3) was accepted.



**Figure 4-7**

*The Standardized Estimates of Harmonious Passion, Dispositional Flow and Exercise Maintenance*



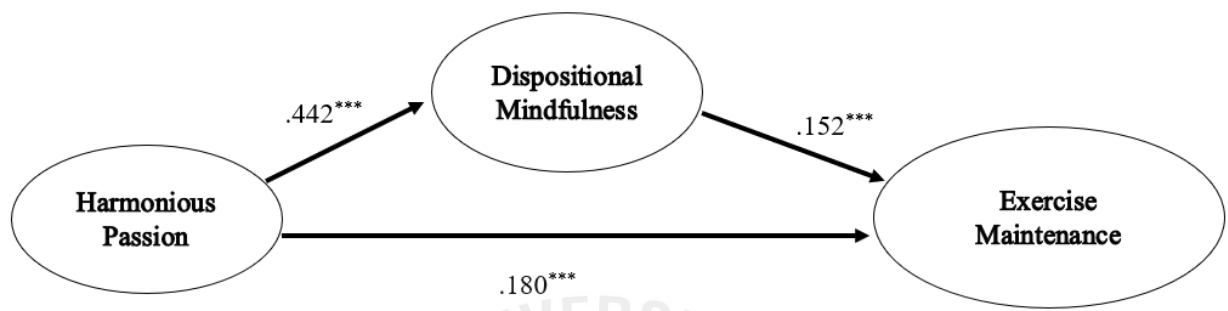
*Note.* \*\*\* $p < .001$

*2.4 Harmonious Passion Indirectly and Positively Influences Exercise Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Mindfulness*

In Hypothesis 1.4, it was predicted that harmonious passion indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional mindfulness. Harmonious passion has a significant and positive impact on dispositional mindfulness ( $\beta = .442, p < .001$ ). Dispositional mindfulness has a significant and positive impact on exercise maintenance ( $\beta = .152, p < .001$ ). The indirect effect of harmonious passion on exercise maintenance through dispositional mindfulness was observed to be .067 ( $p = .002$ ), which is 17.59% of the total effect ( $\beta = -.381, p < .001$ ). This suggested that harmonious passion, dispositional mindfulness, and exercise maintenance have a mediating relationship (see Figure 4-8). Thus, the study hypothesis (H1.4) was accepted.

**Figure 4-8**

*The Standardized Estimates of Harmonious Passion, Dispositional Mindfulness and Exercise Maintenance*



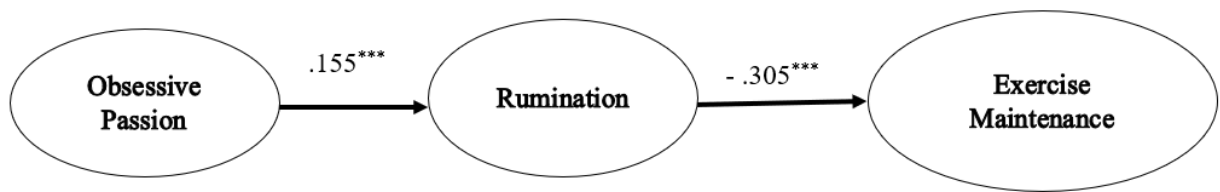
*Note.* \*\*\* $p < .001$

*2.5 Obsessive Passion Indirectly and Negatively Influences Exercise Maintenance in Chinese Leisure-time Runners by Being Mediated by Rumination*

In Hypothesis 1.5, it was predicted that obsessive passion indirectly and negatively influences exercise maintenance in Chinese leisure-time runners by being mediated by rumination. However, since the negative relationship between obsessive passion and exercise maintenance was not significant ( $\beta = -.048, p = .179 > .001$ ), there is no mediation effect found. Nevertheless, there were significant relationships (see Figure 4-9) were found between obsessive passion and rumination ( $\beta = .155, p < .001$ ) and rumination and exercise maintenance ( $\beta = .305, p < .001$ ). The indirect effect of obsessive passion on exercise maintenance through rumination was observed to be .047 ( $p = .001$ ), which is 12.34% of the total effect ( $\beta = -.381, p < .001$ ). Thus, the study hypothesis (H1.5) was rejected.

Figure 4-9

*The Standardized Estimates of Obsessive Passion, Rumination and Exercise Maintenance*



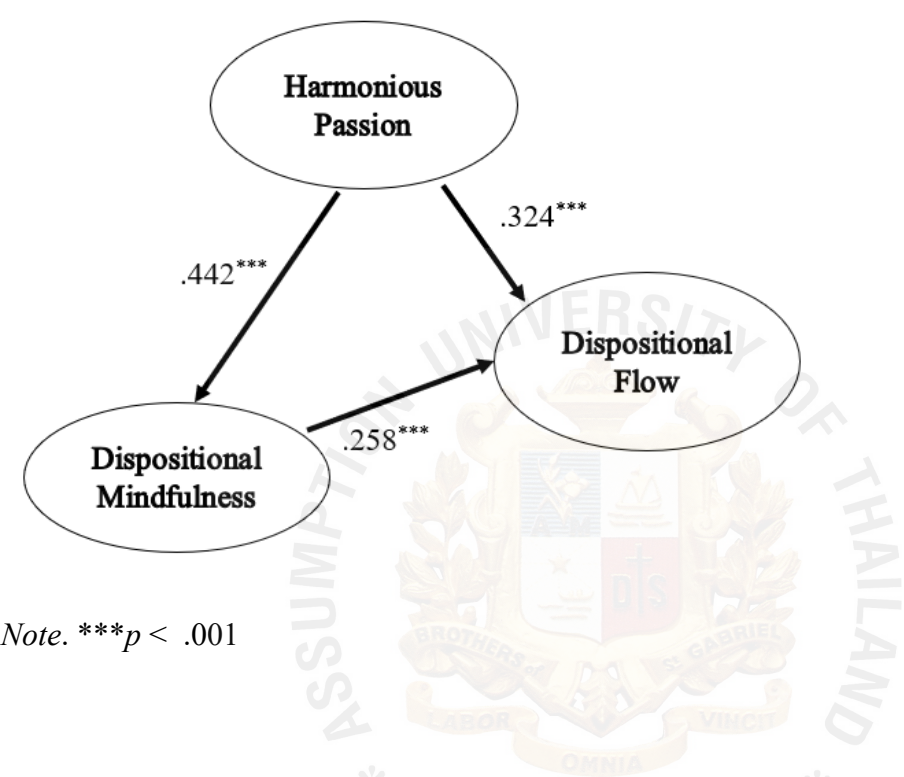
*Note.* \*\*\* $p < .001$

*2.6 Harmonious Passion Indirectly and Positively Influences Dispositional Flow in Chinese Leisure-time Runners by Being Mediated by Dispositional Mindfulness*

In Hypothesis 1.6, it was predicted that harmonious passion indirectly and positively influences dispositional flow in Chinese leisure-time runners by being mediated by dispositional mindfulness. Harmonious passion has a significant and positive impact on dispositional mindfulness ( $\beta = .442, p < .001$ ). Dispositional mindfulness has a significant and positive impact on dispositional flow ( $\beta = .258, p < .001$ ). This suggested that harmonious passion, dispositional mindfulness, and dispositional flow have a mediating relationship (see Figure 4-10). Thus, the study hypothesis (H1.6) was accepted.

**Figure 4-10**

*The Standardized Estimates of Harmonious Passion, Dispositional Mindfulness and Dispositional Flow*



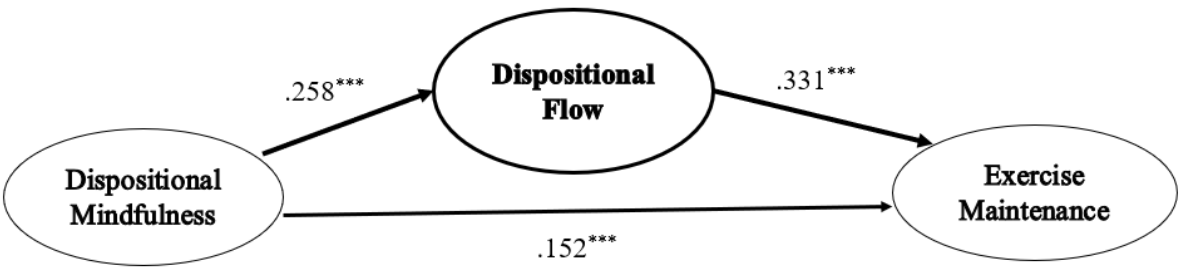
*Note.* \*\*\* $p < .001$

*2.7 Dispositional Mindfulness Indirectly and Positively Influences Exercise Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Flow*

In Hypothesis 1.7, it was predicted that dispositional mindfulness indirectly and positively influences exercise maintenance in Chinese leisure-time runners by being mediated by dispositional flow. Dispositional mindfulness has a significant and positive impact on dispositional flow ( $\beta = .258, p < .001$ ). Dispositional flow has a significant and positive impact on exercise maintenance ( $\beta = .331, p < .001$ ). This suggested that dispositional mindfulness, dispositional flow, and exercise maintenance have a mediating relationship (see Figure 4-11). Thus, the study hypothesis (H1.7) was accepted.

**Figure 4-11**

*The Standardized Estimates of Dispositional Mindfulness, Dispositional Flow and Exercise Maintenance*



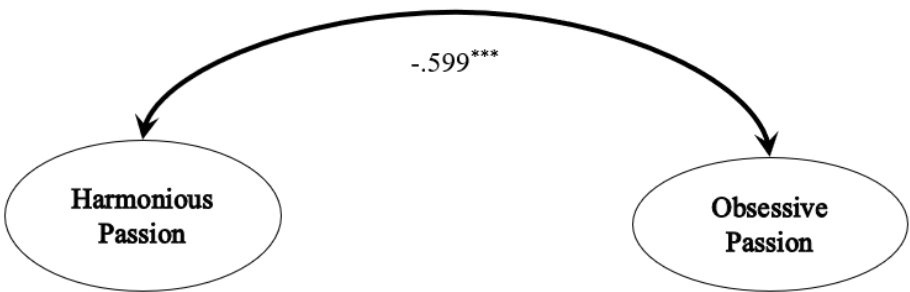
*Note.* \*\*\* $p < .001$

*2.8 Harmonious Passion is Related with Obsessive Passion in Chinese Leisure-time Runners*

In Hypothesis 1.8, it was predicted that harmonious passion is related with obsessive passion in Chinese leisure-time runners. Significant correlation was found between harmonious passion and obsessive passion ( $\beta = .599, p < .001$ ). This suggested that harmonious passion and obsessive passion have a correlation relationship. Thus, the study hypothesis (H1.8) was accepted.

**Figure 4-12**

*The Correlation Between Harmonious Passion and Obsessive Passion*



*Note.* \*\*\* $p < .001$

### Study III

Study III was a mixed-method study that examined the acceptance and effectiveness of the four-week revised MSPE intervention. A paired sample t-test was carried out in the quantitative design to examine the effect. In the qualitative design, a series of semi-structured interviews were carried out to gather evidence to support and explain the quantitative findings. Because of this, the quantitative findings in this study have a superior interpretation, while the qualitative findings were used to provide a comprehensive and in-depth analysis of the acceptability and effectiveness of the intervention. Consequently, the quantitative findings in this study have a superior interpretation. The same individuals participated in each design, but the sample sizes differed. The sample size for the quantitative component is much larger than that of the qualitative design.

#### 1. Quantitative Design

##### 1.1 Effect of Interventions

There was a significant increase across time in overall dispositional flow measured by the Chinese DFS-2 (Statistic Paired-T = 4.88,  $p < .001$ ). The mean of the baseline was 4.21 (SD = .64), and the mean of the endpoint was 4.54 (SD = .62). The difference of mean was .33 (95% CI for the mean difference was (.19, .47)). After four weeks of the MSPE intervention, it was discovered that the effect size was medium ( $d = 0.53$ , 95% CI for  $d = (0.30, 0.75)$ ;  $g = 0.52$ , CI for  $g = (0.29, 0.74)$ ).

##### *Exit questionnaire.*

A satisfied remark was indicated by the mean of five questions on the exit questionnaire,

which ranged from 4.83 to 5.44. The 4-week updated MSPE intervention was appreciated by the participants (see Table 27).

**Table 27**

*The Descriptive Results of the Exit Questionnaire (N= 41)*

Item	Mean	SD
1 How logical did this workshop seem to you?	5.44	.673
2 How confident are you that this workshop was successful in enhancing flow experience in your running?	4.83	.998
3 How confident would you be in recommending this workshop to a friend who also is a leisure-time runners?	5.37	.767
4 How successful do you feel this workshop was successful in enhancing flow experience in your other activities?	5.22	.909
5 In general, how satisfied are you with your flow experience after completing this workshop?	5.24	.860

**2. Qualitative Design**

The purpose of this qualitative design was to provide an in-depth explanation of the quantitative result. Therefore, an individual semi-structured interview approach was carried out with 15 participants from the quantitative design to answer the following two research questions:

RQ (Research Question)3-1: How did the four-week revised MSPE accepted by the participants?

RQ (Research Question) 3-2: How did the four-week revised MSPE demonstrate effectiveness?

**2.1 Descriptive Information of Interviews**

Due to the COVID 19 and social distancing guidelines, all the 15 interviews were carried out via ZOOM meeting. Since all the interviews were carried out using a video camera, the view was restricted due to the restricted field of view of the camera, which reduced the amount of



information that could be recorded on the interview notes form. Table 28 displays the duration of each interview and the words in the transcripts.

**Table 28**

*Interview Duration*

Participant Research ID	Interview Time (min)	Words
T41	29	7815
T61	20	4313
T3	75	16582
T2	20	4302
T26	61	14222
T58	27	5144
T42	34	7169
T38	25	5346
T10	30	6340
T16	28	6386
T45	25	5712
T47	18	3849
T33	50	13664
T12	22	4594
T39	27	5326
Average time /Total words	33	110764

The average interview time was 33 minutes. The interviewer (author of this dissertation) noted that the less active participants in the previous intervention sessions had fewer responses to questions, resulting in shorter interview times. The interviewer also noted that some

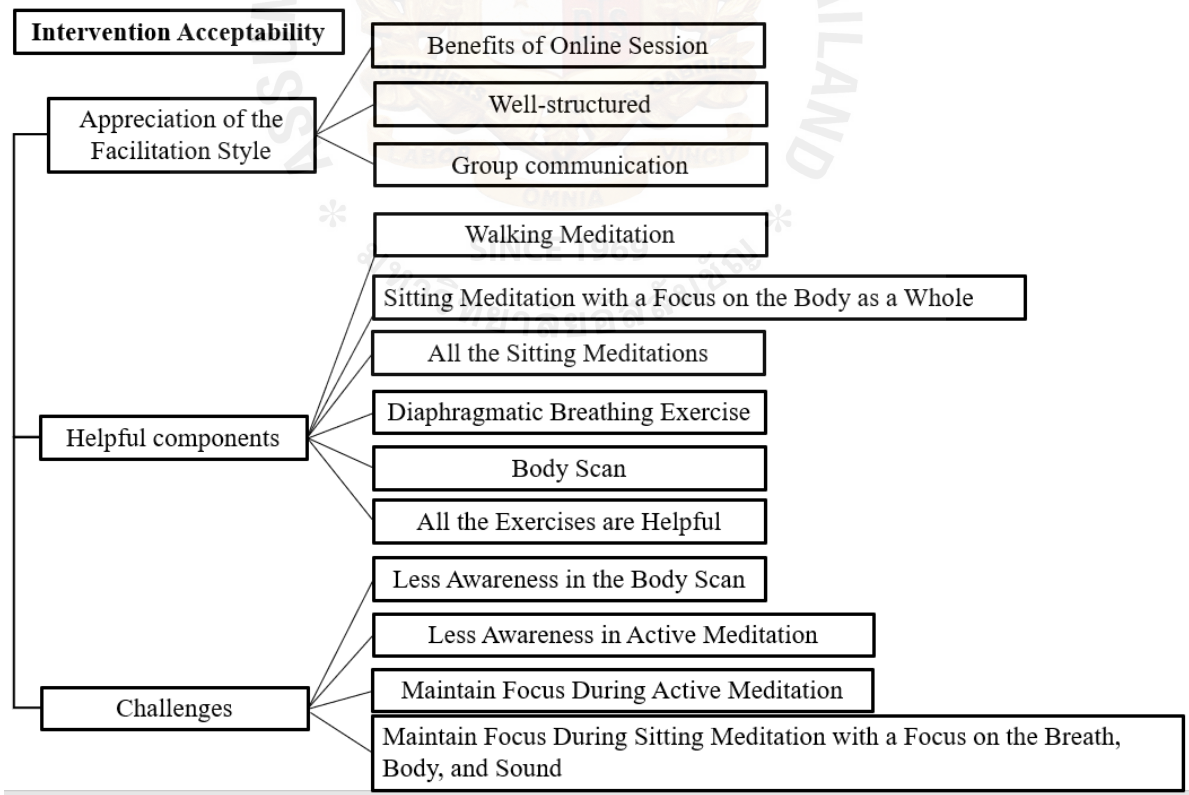
interviewees with a strict schedule tended to end the conversation earlier. The interview times for T61, T2, T47, and T12 were less than 25 minutes and were supposed to last between 25 and 45 minutes. The duration of these participants' interviews was constrained since they were unable to provide replies to some questions.

2.2 Intervention acceptability

RQ 3-1 focused on how did the four-week revised MSPE accepted by the participants. To address this research question, data from 15 semi-structured individual interviews were analyzed. The themes were developed from the data that was gathered (see Figure 4-13).

Figure 4-13

The Thematic Map for the RQ3-1



**Theme 1: Appreciation of the facilitation style.** Theme 1 focus on the participants perception of the intervention. The categories included 1) benefits of the online session, 2) the structure of the sessions, and 3) communications with other group members. Following is an in-depth discussion of each category.

*Benefits of the online session.* There were five codes in this category. These were a) broke down the boundaries, b) gather different people from different places, c) avoid distraction from other group members, d) allowed us to choose a comfortable place, and e) no need to be concerned about social image. These codes were found in 2 documents. Participant T26 echoed this attitude in the following statement,

There's no need for face-to-face sessions. I think, after all, it is still an independent personal experience, which requires us to abandon the influence of others as much as possible. Yes, because there is no one around, sometimes we could even turn off the camera. We were completed independently during the training...If we sit together, I will be concerned about the people around me. I may be curious about what others are doing and how they think. It's easier to be disturbed...If we are in online group sessions, we can choose an environment where we feel comfortable. We are more in control of the environment. We even can mute it to get focused... We don't need to maintain our social image. I can be very relaxed during the mindfulness meditation...Especially since we are all strangers to each other in such an environment, some of them may like this, while others may have difficulty focusing in front of strangers. Online sessions could avoid these distractions (T26, female).

*Well-structured.* There were four codes in this category. These were a) after attending the workshop, I learned what mindful is, what is the purpose of doing it, and how to practice mindfulness, b) I learned the method and technique from this workshop, c) it is well-structured,

and the training is reasonable, and d) This training helped me to understand more about flow experience and how to approach it. These codes were found in 5 documents. Participants T42, T61, T33, and T10 echoed this attitude in the following statement,

I think it's well-structured for me. I have learned a lot from this workshop (T42, female).

After attending this workshop, I learned that we can be mindful or approach mindful through some daily practice (T61, female).

After attending your workshop, I learned what is the feeling of "being in the zone is." I also learned how to approach it...This four-week training helped me to understand more clearly what flow experience is, and what I need to do to achieve it. I found it extremely useful (T33, female).

After the workshop, I know what and how to be mindful. With the techniques I learned from the workshop; I can continue to practice mindfulness in the future (T10, female).

*Group communication.* There were six codes in this category. These were a) these sharing experiences helped me with the training, b) the communications in the group were pretty good, harmonious, and active, c) I felt the vibration when listening to others' experience, d) they were actively thinking about the exercises we had done in class which had a mutually reinforcing effect on the group members, e) having a group speed up learning time, and f) Everyone in the group talked freely and communicated with each other. This atmosphere helped me to open up. These codes were found in 8 documents. Participants T61, T2, and T26 echoed this attitude in the following statement,

I like to communicate with the group leader and other group members. I think

sharing my own experiences or listening to the group members' sharing is crucial. These sharing experiences or guidance helped me do better in the next exercise...I think one of the best things was that when boys and girls were together, sharing their experiences after finishing meditation in the class, they provided different angles or aspects of it. There is quite a kind of chemistry because boys and girls have different emotional reactions or feelings about the experiences, sometimes they were very different, so I think this was a wonderful experience...Sometimes when I was listening to the sharing, I felt the vibration. I remember in a session with a girl in my group, the feelings she shared were close to mine. I like the vibration we have in the group. So, everything is good and harmonious. So, I like our group. The atmosphere is excellent (T61, female).

There were experiences I didn't have, and then I heard from my group mates, which reminded me to pay attention to it next time. I like my group mates since they have their own unique experiences. Maybe we come from different backgrounds and varied experiences (T2, male).

As beginners like us, having a group speed up learning time. We could share our experiences which is a better way to approach them in a teaching and learning situation. If we share our experiences, we could learn from each other's experiences (T26, female).

**Theme 2: Helpful components.** Theme 2 focus on the preference of participants in terms of the intervention. The categories included 1) walking meditation, 2) sitting meditation with a focus on the body as a whole, 3) all the sitting meditations, 4) Diaphragmatic Breathing exercise, 5) Body Scan, and 6) all of the exercises are helpful. Following is an in-depth discussion of each category.

*Walking meditation.* There were two codes in this category. These were a) it helps me to

adjust my walking posture by correcting the imbalance between my legs, and b) more aware during walking. These codes were found in 1 document. Participant T42 echoed this attitude in the following statement,

I can correct my walking posture by practicing mindfulness. By gaining awareness through the training, especially the walking meditation, I noticed the difference between my two legs. One is better, and another one is weaker. Before the workshop, I had never paid much attention to the contact point between my leg and the ground. Right now, I notice it, and I can use it to adjust my walking posture (T42, female).

*Sitting Meditation with a focus on the Body as a Whole.* There was one code in this category. It was as follows: I felt calm, focused, or relaxed when paying attention to the rhythm of my breathing. This code was found in 2 documents.

*All the sitting meditations.* There were two codes in this category. These were a) I felt more comfortable in this relaxing state, and b) it was easier to get into the relaxing state. These codes were found in 3 documents.

*Diaphragmatic Breathing exercise.* There were five codes in this category. These were a) helped me calm down, b) enjoy being in the state with total concentration, c) more familiar with them, d) improved my lung function and increased lung capacity, and e) it's more accessible, and I can practice it anytime and anywhere. These codes were found in 6 documents. Participants T26 and T45 echoed this attitude in the following statement,

My favorite part was the diaphragmatic breathing and the body scan. I experienced more in these two meditations and enjoy being in the state with total concentration...I am more into the procedures of diaphragmatic breathing and the body scan in the first two sessions. I felt more comfortable with following the

instructions of the meditations. Maybe I was more familiar with them, and I used to practice them before I slept. I have more experience practicing them (T26, female).

I think it was the diaphragmatic breathing we learned in the first session. Because it was more accessible, I could practice it anytime and anywhere. As I said, when I took a nap at noon or had trouble sleeping at night, I can practice it (T45, male).

*Body Scan.* There were six codes in this category. These were a) well-designed, detailed and systematically, b) straightforward and easy to follow, c) I like this kind of challenge, d) it keeps me focusing on my body, especially during running, e) more relaxed after the body scan, and f) learn the sensory of the change from different parts of the body. These codes were found in 6 documents. Participant T39 echoed this attitude in the following statement,

It should be the body scan. I have a wonderful experience with full awareness of myself and scanning every part of my body, from feet to hands. I seldom paid attention to my body before, and this exercise requires more awareness of the subtle sensations of my body (T39, male).

*All of the exercises are helpful.* There were two codes in this category. These were a) this training is a process that gradually develops the ability to be mindful, and b) It is progressing. These codes were found in 9 documents. Participants T2, T58, T45 and T47 echoed this attitude in the following statement,

I think all of them are helpful. Breathing exercises, the body scan, and all the exercises we have done in class are all helpful, whether sitting or running. Sometimes I might not be aware of it. With enough practice, I am sure I could establish the connection (T2, male).

It seems that all of them are helpful. I haven't found any parts that are not helpful



at the moment (T58, male).

I think all of them are helpful. It just requires time to practice before you gain something (T45, male).

They are all helpful, even the running meditation, especially for running. I will keep practicing them...None is dispensable. This training is a process that gradually develops the ability to be mindful. It is progressing from sitting to walking, then to running. I found each stage helpful (T47, male).

**Theme 3: Challenges.** Theme 3 focus on the challenges that the participants encountered during the intervention training. The categories included 1) less awareness in the Body Scan, 2) less awareness in active meditation, 3) maintaining focus during active meditation, and 4) maintain focused in sitting meditation with a focus on the breath, body, and sound. Following is an in-depth discussion of each category.

*Less awareness in the Body Scan.* There were two codes in this category. These were a) could not connect with parts of my body, and b) less relaxed. These codes were found in 2 documents.

*Less awareness in the active meditation.* There were two codes in this category. These were a) difficult in connecting certain parts of my body, and b) feelings gone before noticed as all of these things happened in a second. These codes were found in 3 documents.

*Maintaining focus during active meditation.* There were two codes in this category. These were a) very hard to get into concentrate, b) difficulty focusing on breathing, c) could not focus on many spots at the same time, and d) distracted by the outside world and lost concentration. These codes were found in 6 documents. Participants T26, T58, T45 and T10

echoed this attitude in the following statement,

The meditations in the third session, for example, the running meditation was slightly abstract. The whole operation was a bit abstract, and it might take time to master it...Yes, that's right. I think it was complicated than other meditations. I have to try much harder to get into concentrate. Therefore, I prefer those with simple operations that can quickly get me into a relaxed state (T26, female).

I think it is the running meditation. The previous training was slowly progressing with enough time to connect to the body and allow me to discover what was happening inside. I have difficulty focusing on breathing when doing the running meditation. It could be I lack practice, or running itself is too intense to get focused. I felt hard to maintain diaphragmatic breathing while the speed is accelerated. In short, I could not adjust to diaphragmatic breathing during running (T58, male).

Walking or running meditation has more requirements for the concentration. It is hard to achieve unless I reached a certain level of concentration. Take running meditation as an example. I could not tell you what exactly I had perceived. Everything went so fast during running. Feelings had gone before, as all of these things happened in a second (T45, male).

The challenge is when I have to focus on my body's sensations while concentrating on breathing. It might be easier if it is an indoor practice since it is quiet inside. However, it became much harder for me to maintain my concentration in walking or running meditation. I would be easily disturbed by the surroundings and could not focus on breathing or other body parts (T10, female).

*Maintain focus in sitting meditation with a focus on the breath, body, and sound.* There was one code in this category. This was as follows: distracted by the sound. This code was found

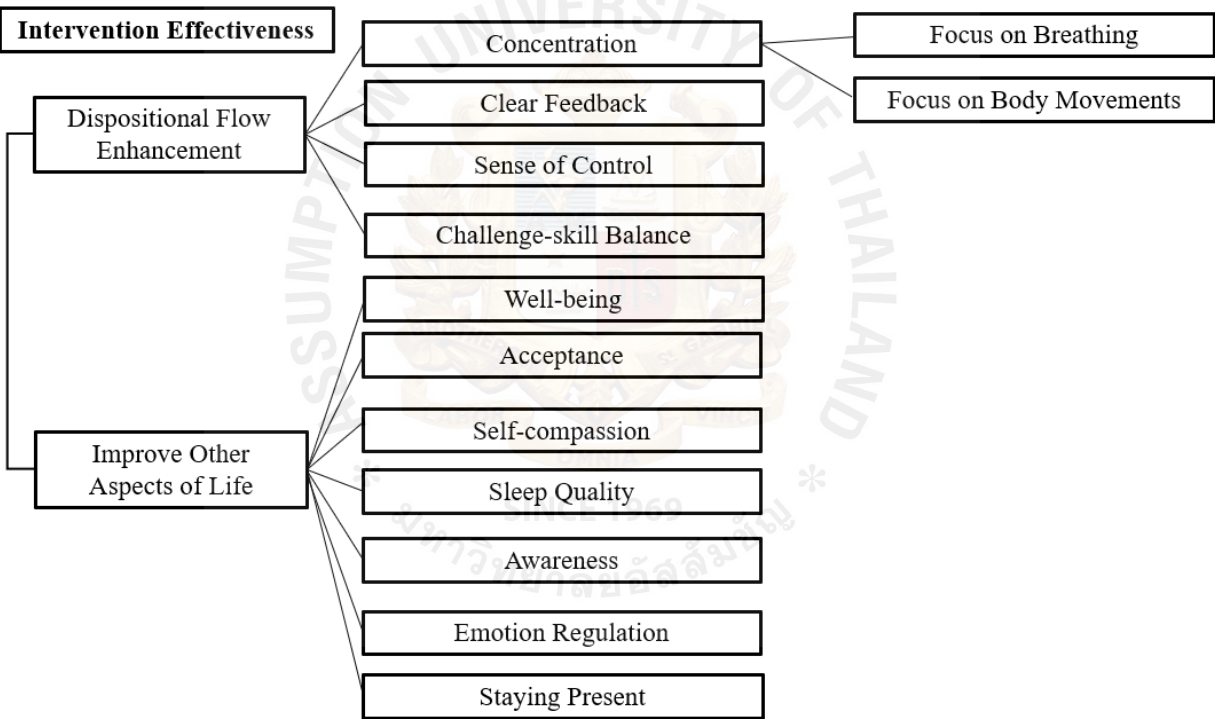
in 1 document.

2.3 Intervention effectiveness

RQ 3-2 focused on how did the four-week revised MSPE demonstrate effectiveness. To address this research question, data from 15 semi-structured individual interviews were analyzed. The themes were developed from the data that was gathered (see Figure 4-14).

Figure 4-14

The Thematic Map for the RQ3-2



**Theme 4: Challenges.** Theme 4 focus on the different aspects of dispositional flow enhancement after finishing the intervention training. The categories included 1) concentration, 2) clear feedback, 3) sense of control, and 4) challenge-skill balance. Following is an in-depth discussion of each category.

*Concentration.* There were seven codes in this category. These were a) more focus on

the movement, b) let go of other things and focus on running itself, c) focus on breathing during running, d) put more attention to the discomfort part during running, e) focus on the changes in my body, f) with attention to diaphragmatic breathing, fatigue was reduced, and g) focus on the sounds (e.g., the running meditation audio recording). These codes were found in 15 documents.

Participants T38, T10 and T47 echoed this attitude in the following statement,

I recorded an experience of practicing running meditation. I was wearing a headphone listening to your audio recording. It cycled through every 15 minutes. I remember paying attention to your sound in the first round, but I lost it after a few seconds in the second round. After the third round, I regained my awareness and was surprised I had lost consciousness for minutes (T38, male).

After attending the workshop, I began to focus on my feet and breathing, and I could do it. I remember the flow experience during running lasting for quite a long time by focusing on myself (T10, female).

Flow experience, for me, seems to be running without knowing how many kilometers I have passed. Yes, I found the time passed quickly, and I regained consciousness after running for three or four kilometers. I remember I was in the flow state after running ten kilometers one time. At that time, I was listening to your audio recording. I remember I felt so relaxed during the state, and it lasted for over two kilometers until the feeling slowly disappeared again (T47, male).

*Clear feedback.* There was one code in this category. It was as follows: positive feedback from my body. This code was found in 1 document.

*Sense of control.* There were three codes in this category. These were a) maintain the connection between consciousness and movements, b) control my body, such as tension and relaxation, and c) learned to cope with fatigue. These codes were found in 4 documents.

Participant T33 echoed this attitude in the following statement,

I learned how to cope with fatigue after attending the workshop. Before, I could only get through it by listening to music or talking to someone... But now, I choose to experience the discomfort...I accept the pain and let it exist...I feel the discomfort, accept it, and then I observe the changes in my body, from discomfort to another state. My discomfort disappeared when I reached my optimal state (T33, female).

*Challenge-skill balance.* There were three codes in this category. These were a) use the skills when running, b) know to approach flow experience, and c) know how to cope with fatigue. These codes were found in 5 documents. Participants T26 and T47 echoed this attitude in the following statement,

After the four weeks of training, I have already established the connection of being mindful. I can recall what we have learned in class in most circumstances. For example, when running, I would experiment with some elements learned from the training. Even while walking, I recalled some contents from the training from time to time...I think it's a good thing. It opened me up to some better or different methods (T26, female).

It gets me more focused when I am fatigued during running. If I am focused, the time will pass faster than usual to make myself go through that stage faster (T47, male).

***Theme 5: Improve other aspects of life.*** Theme 5 focus on the additional effects after finishing the intervention training. The categories included 1) well-being, 2) acceptance, 3) self-compassion, 4) sleep quality, 5) awareness, 6) emotion regulation, and 7) staying present. Following is an in-depth discussion of each category.

*Well-being.* There was one code in this category. This was as follows: It makes me feel how wonderful the world is. This code was found in 1 document.

*Acceptance.* There were three codes in this category. These were a) aware of its (discomfort) existence and let it exist, b) not to react, only observe and let it be, and c) non-judgement. These codes were found in 1 document. Participant T33 echoed this attitude in the following statement,

It's like what I was dealing with fatigue when running. I am aware of its existence and let it exist. I choose not to react, only observe and let it be. It is not necessary to react to the discomfort...If we can be non-judgment, when something evokes negative emotion, we still could manage it by being aware of its existence without reacting to it (T33, female).

*Self-compassion.* There were three codes in this category. These were a) enjoying spending time with myself, b) listen to the inner voice, and c) take things slowly and leave time and space for me every day. These codes were found in 2 documents. Participant T61 echoed this attitude in the following statement,

After I attended this workshop, I realized that I needed to find my own time every day, and enjoy spending time with myself, alone. It has to be a moment for me every day. I did not realize it before, but now I take things slowly and leave a little time and space for myself every day. To connect me, listen to the inner voice of my body, or relax from the tension of daily life...For example, I may find a quiet place to breathe or a quiet place to sit quietly and let my emotions ease. This training gives me a tool to cope with the stress in my life and work (T61, female).

*Sleep quality.* There was one code in this category. This was as follows: relax my body and deal with insomnia. These codes were found in 2 documents. Participant T42 echoed this



attitude in the following statement,

I used the body scan when I had trouble sleeping...It helps me improve my sleeping quality (T42, female).

*Awareness.* There were four codes in this category. These were a) it tells me where the pain is, b) more aware of the nervousness and anxiety, c) more aware of my body, and d) connection with my body (such as relaxing my body). These codes were found in 6 documents.

Participant T3 echoed this attitude in the following statement,

The mindfulness training helped me calm down, especially in Guangzhou city. I think the pace of living in Guangzhou is quite fast. It's like I always follow someone, and I have no time to stop to think about what I want...For me, it's not just this restlessness. When I encountered some emergency issues, most of them were not particularly serious; however, I became agitated eventually without awareness. It might be stress coming from living in a metropolis. Or the rhythm of life drives me. Some people are in similar situations with me. They constantly feel pushed, and they quickly overreact in this anxious time. So, I think this mindfulness meditation may be an essential practice for everyone living in the metropolis (T3, male).

*Emotion regulation.* There were five codes in this category. These were a) cope with stress, b) less anxious, c) helps me to calm down and be patient, d) non-judgmental saves me from negative emotions, and e) dealing with relationships. These codes were found in 6 documents. Participant T10 echoed this attitude in the following statement,

In some circumstances, let's say, I was upset about something or being disturbed by something. I needed to get myself out of it when I was running. I can utilize this mindfulness training to manage our negative emotions. This training helps me focus more on walking or running and prevents me from being dragged into a negative emotional state. I think that's probably one thing that benefits me a



lot...Recently, I used this strategy to manage whenever I was aware I needed to calm down, and I took diaphragmatic breathing. It works well for me, especially when dealing with relationships. I stopped and focused on breathing when I noticed I was about to lose control. It helps me save myself from negative emotions and prevent things from worsening. It is an effective emotion-controlling strategy I learned from this workshop that helps me avoid magnifying the issue in relationships. Although I could get a footstep away from my emotion at that time, the problem was still there. But this strategy could solve the crisis at that moment effectively. (T10, female).

*Staying present.* There were three codes in this category. These were a) focus on me at the moment, b) shifting my attention back to the current work, and c) focus more on thing matters instead of wasting my concentration on something bothering or upsetting me. These codes were found in 8 documents. Participants T3, T2 and T38 echoed this attitude in the following statement,

There are things in our lives that are similar. We cannot fight against its nature. What we can do is to change our attitude. Instead of thinking about it, we shift our attention back to the present moment (T3, male).

No matter what I am doing, for example, talking to you, I don't concern about other things, just focus on the talking itself. That is a good experience for me, focusing on the present moment and being aware of the present moment. I think that's a significant change for me after attending the workshop...I believe as long as I am present at the moment, focusing on one thing at a time, that is great for me (T2, male).

The body scan and the other training concentration exercises are helpful to my life. They are valuable tools to get myself focused. Sometimes I use them at work. For example, when I'm typing on the computer while my mind wanders, I will use

them to get my mind back to the present work. I also use them to get focused during running. So, the training you've provided is instrumental in life, learning how to shift attention back to work or the present moment. It is a way of practicing concentration (T38, male).



## CHAPTER V.

### DISCUSSION AND CONCLUSION

In this study, flow experience as the emotional determinant in maintaining exercise behaviors was investigated by examine the relationship between passion, mindfulness, rumination, and their impacts on flow experience towards exercise maintenance among leisure-time runners. This study also investigated a revised mindfulness-based intervention enhance dispositional flow among runners. The discussion and conclusion of three related studies—Study 1(the DFS-2 adaptation), Study 2 (model testing), and Study 3(mixed-method study)—are presented in this chapter. The following are the main results for each study in the current study:

Study 1: There were enough evidences supporting the Chinese DFS-2 as a sufficiently reliable tool for measuring dispositional flow in Chinese leisure-time runners.

Study 2: The revised structural model was sufficiently enough to support the relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time runners.

Study 3: The outcome of this mixed-method study strongly supported hypothesis that the revised MPSE is acceptable and effective in enhancing dispositional flow among Chinese leisure-time runners. After four weeks of the revised MSPE training, 41 Chinese leisure-time runners showed an increase in dispositional flow.

## Study I

### Overview the Discussion

Study I aimed to assess the psychometric properties of the instruments to be used in study I, study II and study III. Specifically, assessing the reliabilities and validities of all the five instruments. Four of them are standardized questionnaires with their original forms being written in Chinese:

The Chinese version of the Mindful Attention Awareness Scale (MAAS)

The Chinese Version of Ruminative Responses Scale (RRS)

The Chinese Version of the Sports Passion Scale (SPS)

The Chinese version of URICA-E2

The special aim of this study was to examine the psychometric properties of the Chinese DFS-2 to provide a quality tool that can be used in cross-cultural studies and studies with Chinese leisure-time runners (Study II and Study III).

The results of Study I were divided into four major aspects according to the objectives of the Study. The first three were the validity and reliability results of the Chinese DFS-2. The rest was for the validity and reliability results of the other four scales. In sum, these four aspects of the results provided enough evidence for the psychometric properties of the five instruments.

## Discussion of the Psychometric Properties of Chinese DFS-2

In Study I, the DFS-2 was translated into Chinese by following translation and back-translation procedures. Integrating a focus group approach and a pre-test on 26 leisure-time runners made the translation process more rigorous. An EFA and CFA were conducted to investigate the nine-structure of the Chinese version to address any potential cross-cultural issues that may have arisen with the translation of English questionnaires into Chinese (Arafat et al., 2016). Finally, a trustworthy instrument for evaluating dispositional flow among Chinese leisure-time runners was developed, consisting of 35 questions.

Overall, the results from Study I were in line with the original findings from Jackson and Eklund (2002). Excellent internal consistency reliability was found in Chinese leisure-time runners ( $\alpha = .95$ ). The CFA results also indicated a good structure validity to measure dispositional flow in the present study ( $N = 534$ ).

The “Item 36” was removed from the initial scale according to three major concerns. First, two focus group members confused by the terms of “extremely rewarding”, they could not specify what was the rewarding feeling. Therefore, there was a serious concern that giving people major in psychology could not understand this question, how about leisure-time runners? Second, the feedback from 6 pre-test confirmed this concern. The number of 6 out of 26 leisure-time runners confused by this question. Third, results from EFA confirmed this concern, again. This item should be in the "Autotelic Experience (AE)" dimension, which means that runners are satisfying when they have high level of dispositional flow. However, Item was overlapping with the "Loss of Self-Consciousness" dimension. There are two possible explanations for this.

The first explanation of the result is in line with the findings of a study conducted in Germany. Engeser and Rheinberg (2008) stated that flow experience varied for each person depending on how significant the activity is judged to be. For instance, a person should have an easier time experiencing flow with a less substantial task than an essential one. Because most of the flow studies have been done in competition settings, this may imply a distinction between leisure activities and activities of competition (Jackson & Csikszentmihalyi, 1999).

The second explanation of the result could be the differential interpretation of “rewarding” between collectivist and individualistic cultures. Feedbacks from six pre-test respondents are consistent with the findings from Moneta (2004). He discovered that Chinese people are more intrinsically motivated in low-challenge, high-skill circumstances than western people (both high challenge and skill; Moneta, 2004). This distinction may be attributed to cultural differences.

Despite this issue, the final version of the Chinese DFS-2 remains the same structure as the original English scale, and CFA confirmed this in 534 leisure-time runners. These findings are also consistent with other cultural adaptation studies (e.g., Kawabata et al., 2008). In conclusion, adequate evidence supports the Chinese DFS-2 as a sufficiently reliable instrument for evaluating dispositional flow in Chinese leisure-time runners.

### **Discussion of the Psychometric Properties of Four Instruments**

In Study I, the reliability and validity of the Chinese version of Mindful Attention Awareness Scale (MAAS); the Chinese version of Mindful Attention Awareness Scale (MAAS); the Chinese Version of Sports Passion Scale (SPS); and the Chinese version of URICA-E2 were tested by CFA and reliable examination. The results indicated these trustworthy instruments for

evaluating dispositional mindfulness, harmonious passion, obsessive passion and rumination in Chinese leisure-time runners.

#### *Discussion of the Chinese version of URICA-E2*

The results from Study I were in line with previous findings from Chen and colleagues (2019). Good internal consistency reliability was found in Chinese leisure-time runners ( $\alpha = .87$ ). The CFA results also indicated a good structure validity to measure exercise maintenance (running) in the present study ( $N = 534$ ).

#### *Discussion of the Chinese version of SPS*

The results from Study I were in line with previous findings from Chiung-Huang Li, Li-Kang Chi & Han-Ni Peng (2007). In their study, the Cronbach alpha coefficient of each subscale was .84 (harmonious passion subscale) and .88 (obsessive passion subscale). In the present study, an excellent internal consistency reliability was found in Chinese leisure-time runners ( $\alpha = .96$ ). The CFA results also indicated two dimensions structure validity to measure harmonious passion and obsessive passion in Chinese leisure-time runners ( $N = 534$ ).

#### *Discussion of the Chinese version of MAAS*

The results from Study I were in line with previous findings from Chen and colleagues (2012). They reported the Cronbach alpha coefficient of the scale was .89. In the present study, an excellent internal consistency reliability was found in Chinese leisure-time runners ( $\alpha = .94$ ). The CFA results also indicated a structure validity to measure dispositional mindfulness in Chinese leisure-time runners ( $N = 534$ ).



*Discussion of the Chinese version of RRS*

The results from Study I were in line with previous findings from Han Xiu & Yang Hongfei (2009). They reported the overall Cronbach alpha coefficient of the scale was .90. In the present study, an excellent internal consistency reliability was found in Chinese leisure-time runners ( $\alpha = .92$ ). The CFA results also indicated two dimensions structure validity to measure rumination in Chinese leisure-time runners ( $N = 534$ ).



## Study II

The purpose of this study was to advance the understanding of the factors that facilitate exercise maintenance. This was achieved by examining the relationships hypothesized among harmonious passion, obsessive passion, rumination, dispositional flow, dispositional mindfulness, and exercise maintenance in Chinese leisure-time runners. The study adopted a convenience sample of runners recruited from communities located in China. Participants were leisure-time runners of relatively high education level, were largely adherent to regular exercise and scored higher on the Chinese DFS-2.

### 1. Hypothesis 1.1: Harmonious Passion Directly and Positively Influences Exercise

#### Maintenance in Chinese Leisure-time Runners

Harmonious passion was found to have directly and positively influenced exercise maintenance in Chinese leisure-time runners, which supported Hypothesis 1.1. It is in line with several studies, which harmonious passion is related to lower dropout rates and higher levels of engagement in the passionate activity (e.g., Bonneville-Roussy & Vallerand, 2017; Aujla et al., 2015). In an SEM study, Bum (2019) found exercisers who had harmonious passion led to exercise adherence (the estimate of direct effect between harmonious passion and exercise adherence is .166,  $p < .01$ ). Because of the intrinsic motivation, runners with harmonious passion show flexibility in their devotion and can balance the activity with other life events (Vallerand et al., 2003).

## 2. Hypothesis 1.2: 1.2 Obsessive Passion Directly and Negatively Influences Exercise

### Maintenance in Chinese Leisure-time Runners

Obsessive passion was found to have an insignificant impact on exercise maintenance in Chinese leisure-time runners. This result might be explained by the conflict findings from both the passion theory and the previous studies. On the one hand, since obsessive passion is still a type of passion, it has the nature of motivation for passion activities. People with OP lead to displaying rigid perseverance toward the action, as they can't help but participate in the passionate activity. Recently, some researchers turned to investigate exercise dependence: "A desire for leisure-time physical activity, leading in uncontrolled excessive exercise behavior, manifesting in physiological symptoms (Hausenblas & Symons Downs, 2002)". DSM-V (American Psychiatric Association, 2013) includes a category called "Behavioral Addiction." however, only gambling addiction and internet addiction are included in this category of behavioral addictions. Exercise addiction remains undiagnosed in the DSM-V. Indeed, it sounds like OP and inflexible perseverance are similar to the behaviors linked with addiction and dependence (Vallerand et al., 2003). Obsessive passion, given its nature, is linked to inflexible perseverance, life conflict, physical illness, and avoidant tendencies (Vallerand, 2012). Parastatidou and colleagues (2014) investigated obsessive passion as a mediator between introjected regulation and exercise dependency symptoms among 549 Greek exercisers. Their findings indicated a positive relationship between OP and exercise dependency symptoms.

Although obsessive passion may seem helpful on the surface, it almost always has negative consequences, both in the short and long term (Curran et al., 2015). This kind of passion

is linked to negative affect, tension, anxiety, and feelings of guilt during exercise due to its obsessive character (Curran et al., 2015). The difficult challenge of balancing training and competition loads over a season (Bridekirk et al., 2016) shows that obsessive passion is especially detrimental. In obsessive individuals, this poor decision-making about exercise activity may lead to overuse injuries, overtraining syndrome, and burnout (Curran et al., 2015).

Some passion studies confirmed this negative relationship between OP and exercise maintenance. They found individuals with obsessive passion tend to have highly risky behavior (e.g., injury in dancers, Akehurst & Oliver, 2014; or cycling on ice in the winter, Vallerand et al., 2003). These findings provided insights into this insignificant relationship between obsessive passion and exercise maintenance. Runners with obsessive passion might become addicted to exercise at the initial stage, but it inevitably leads to injury. Therefore, they will eventually drop up the running routine because of injuries. This finding also is confirmed by another SEM study, in which Bum (2019) found exercisers who had obsessive passion had the opposite impact on exercise adherence (the estimate of direct effect between obsessive passion and exercise adherence is  $- .228, p < .01$ ). Therefore, this conflict findings on the relationship between OP and exercise maintenance may provide explanation to the present insignificant relationship between these two variables.

### **3. Hypothesis 1.3: Harmonious Passion Indirectly and Positively Influences Exercise**

#### **Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Flow**

Harmonious passion was found to have indirectly and positively influenced exercise

maintenance in Chinese leisure-time runners by being mediated by dispositional flow in this study. On the one hand, HP has a positive impact on dispositional flow could be explained by the DMP model. According to the DMP model, harmonious passion could promote adaptive cognitive processes, such as a certain sense of self-esteem, flexibility, and an openness to experience (Vallerand, 2010). People have harmonious passion, and integrative self-processes are at work, allowing them to thoroughly engage in the passionate activity with an openness that promotes focused attention, focus, and flow (Vallerand, 2010). According to previous empirical studies, harmonious passion showed positively related to task focus and other components of flow (i.e., perceived control, the balance between challenge and skill, and absence of self-consciousness) during activity engagement (e.g., Philippe et al. 2009; Forest et al. 2011; Mageau et al. 2005; Vallerand et al. 2003).

On the other hand, Flow experience is linked to long-term behavioral adherence (Petosa & Holtz, 2013). According to the previous discussion about the intrinsically-rewarding nature of the flow, flow experiences may be motivating and can aid in sticking to specific kinds of activities (Abuhamdeh, 2021). In this study, the dispositional flow was found to have a strong effect on exercise maintenance. Therefore, the findings of the study support that dispositional flow served as a mediator in the relationship between harmonious passion and exercise maintenance.

#### **4. Hypothesis 1.4: Harmonious Passion Indirectly and Positively Influences Exercise**

##### **Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Mindfulness**

Harmonious passion was found to have indirectly and positively influenced exercise maintenance in Chinese leisure-time runners by being mediated by dispositional mindfulness. On the one hand, this positive impact could be explained by the DMP model. Runners with HP will fully participate in running while maintaining a sense of control. Even though this passionate activity occupied a portion of their identity, it is consistent with other critical parts of their identity and aspects of their lives. It is important to note that HP is influenced by the genuine integrating self (Deci & Ryan, 2000). Individuals may participate in the passionate activity with a secure feeling of self-worth and a flexible, open, non-defensive (Hodgins & Knee, 2002) and aware manner as a result of this process (Brown & Ryan, 2003). Therefore, harmonious passion is associated with an adaptive accomplishment process defined by focus and positive motivation when engaged in a task (Vallerand et al., 2003).

On the other hand, mindful individuals are more likely to participate in and sustain healthy habits (such as running; Roberts & Danoff-Burg, 2010). Evidence showed that self-regulation of thoughts and emotions, which are associated with behavior change, persuaded aware people to alter their behavior more readily than those with weaker mindfulness abilities (Levesque & Brown, 2007). PA self-regulation and result expectancies were favourably associated with dispositional mindfulness, whereas perceived personal obstacles to PA were negatively correlated, according to a study conducted by Grinnell et al. (2011). In a systematic

review, Schneider and colleagues (2019) found that people with higher dispositional mindfulness have more capacity to translate PA intentions into behaviour, which were intrinsically motivated to engage in PA. They would accept negative feelings that were likely to occur during exercise (e.g., fatigue) and enjoy the exercise experience.

Runners who have a harmonious passion for running are considered mindful since they hold a flexible, open, and non-defensive manner towards running (Vallerand, 2015). According to previous studies, high levels of mindfulness are linked with increased intrinsic motivation and physical activity (e.g., Ruffault et al., 2016; Brown & Ryan, 2003). Especially for distance running, fatigue and boredom are the major maintenance obstacles, especially for distance running. Therefore, being mindful is a potentially helpful way of managing exercise-related difficulties (Ulmer et al., 2010). Therefore, the study's findings support that dispositional mindfulness served as a mediator in the relationship between harmonious passion and exercise maintenance.

## **5. Hypothesis 1.5: Obsessive Passion Indirectly and Negatively Influences Exercise**

### **Maintenance in Chinese Leisure-time Runners by Being Mediated by Rumination**

Obsessive passion was found to have an insignificant relationship with exercise maintenance in Chinese leisure-time runners. However, a significant relationship between obsessive passion and rumination, rumination and exercise maintenance were found in this study. First, the results in the present study indicated obsessive passion had a positive impact on rumination. It is consistent with some previous studies. Obsessive passion is positively associated with feelings of guilt and negative emotions both during and after engagement in the



passionate activity (Mageau et al., 2005), negative affect, and rumination when prevented from engaging in the passionate activity (Ratelle et al., 2004), depression (Rousseau & Vallerand, 2008). People (e.g., runners) who have an obsessive passion may therefore find themselves with an overwhelming need to participate in the activity (e.g., running) that they see as essential and pleasant (Vallerand & Verner-Filion, 2020). They are more likely to experience conflict in their passionate activity (e.g., running) and other areas of their lives (such as a job or being with families; Vallerand & Verner-Filion, 2020), which may lead to negative emotional, cognitive (rumination), and behavioral repercussions both during and after the activity.

Second, the results in the present study indicated rumination had a negative impact on exercise maintenance. According to previous rumination studies, individuals have ruminations as a reaction to the roadblock, and normally, they feel hopeless (Geiger & Kwon, 2010). They are unlikely to come up with a different way to accomplish their objective or have the motivation to keep thinking in a goal-oriented manner. Instead, they will be prone to engage in the kind of ruminative thinking identified as a depression component. Therefore, runners who have ruminative thoughts tend to drop their running routine.

## **6. Hypothesis 1.6: Harmonious Passion Indirectly and Positively Influences Dispositional Flow in Chinese Leisure-time Runners by Being Mediated by Dispositional Mindfulness**

Harmonious passion was found to have indirectly and positively influenced dispositional flow in Chinese leisure-time runners by being mediated by dispositional mindfulness. The finding is consistent with a study conducted by St-Louis and colleagues (2018). They examined

passion as a determinant of mindfulness, and found harmonious passion is positively and predicted mindfulness.

Kee and Wang (2008) found five out of nine flow dispositions were shown to be substantially high in the high level of mindfulness cluster. Individuals in the high mindfulness group are more likely to take on new tasks than those in low mindfulness clusters. The explanation they provided was the high mindfulness group did better at the challenge–skill balance owing to they had a more flexible mindset. The way individual encounter difficulty is more essential than the actual challenge given in order to facilitate flow experience (Jackson & Eklund, 2004). Being adaptable in one's mindset enables one to be less constrained in one's assessment of abilities and difficulties. This result in a more balance between challenge and ability, which facilitate flow experience.

## **7. Hypothesis 1.7: Dispositional Mindfulness Indirectly and Positively Influences**

### **Exercise Maintenance in Chinese Leisure-time Runners by Being Mediated by Dispositional Flow**

Dispositional mindfulness was found to have indirectly and positively influenced exercise maintenance in Chinese leisure-time runners by being mediated by the dispositional flow. This finding is in line with a cluster analytic study conducted by Kee and Wang (2008). On the one hand, more mindful individuals during their activities tend to use emotional regulation and goal planning (Kee & Wang, 2008). Other evidence showed that self-regulation of thoughts and emotions, which were associated with behavior change, persuaded aware people to alter their behavior more readily than those less mindful (Levesque & Brown, 2007). In the

present study, staying present allows runners using a self-regulation strategy to maintain their running behavior.

Mindfulness could enhance flow experience in sports settings (Cathcart et al., 2014). Previous studies proved that mindfulness training enhances flow experience and sports performance (e.g., Bernier et al., 2009; Schwanhausser, 2009). Kaufman and colleagues (2009) reported improved confidence and flow in a community sample of archers and golfers receiving mindfulness training, while De Petrillo et al. (2009) reported decreased worry and perfectionism among long-distance runners receiving mindfulness training. Aherne and colleagues (2011) found an enhancement of flow experience after mindfulness training in a university student-athlete sample in a randomized controlled study. It is convincing that an individual's ability to have a flow experience is related to mindfulness. Improving one's capacity to be aware will also improve the ability to emerge flow (Thienot et al., 2014).

On the other hand, since flow theory was developed to explain why people continuously engage in self-serving behaviors, it is believed to lay the groundwork for long-term behavioral adherence (Petosa & Holtz, 2013). According to the previous discussion about the intrinsically-rewarding nature of the flow, flow experiences may be motivating and can aid in sticking to specific kinds of activities (Abuhamdeh, 2021). Flow occurs when a person's attention is so entirely concentrated on the task at hand that awareness of self and surroundings is diminished, resulting in a decrease in self-conscious cognitions. Time perception is often changed. Exercisers (e.g., runners) might experience time loss and possibly alleviate boredom from engaging in exercise (Petosa & Holtz, 2013). The present finding is in line with an intervention study

conducted by Petosa and Holtz (2013). They found the Flow of Exercise Assessment Scale (FEAS) scores were reported to be linked with exercising days, as anticipated by flow theory. In the present study, a high level of dispositional flow predicts exercise maintenance in leisure-time runners.

## **8. Hypothesis 1.8: Harmonious Passion is Related with Obsessive Passion in Chinese**

### **Leisure-time Runners**

Harmonious passion is related to obsessive passion in Chinese leisure-time runners. The correlation between these two types of passion in the present finding is consistent with the empirical evidence by Vallerand et al. (2003) and other studies (e.g., Vallerand et al., 2008). Theoretically, this correlation indicated that both passions are positively associated with the passion criteria (Vallerand et al., 2003). Moreover, the present finding is in line with the DMP model in which these two passions are positively related in various passion activities. In a study that aimed to verify the DMP model to explain being a sports (football) fan (Vallerand et al., 2008), researchers reported a positive relationship between these two passions ( $r = .60$ ).

## **9. Overview of Study II**

In sum, the findings supported the mediation role of dispositional flow and dispositional mindfulness on harmonious passion and exercise maintenance in Chinese leisure-time runners.

### Study III

Study III was conducted with the intention of determining whether or not the revised 4-week MPSE is acceptable and whether or not it is successful in affecting the dispositional flow of Chinese leisure-time runners. According to significant increase in dispositional flow (measured by the Chinese DFS-2), the outcomes of this study indicated a statistically significant post-intervention enhancement in the flow. Through an emphasis on the intervention's direct application to flow indicators linked with leisure-time runners and other aspects of life, the qualitative strand provides additional evidence and explanation for the acceptability and effectiveness of the intervention. This evidence and explanation are provided to show that the intervention is effective.

#### 1. Intervention acceptability

The four-week revised MSPE intervention has been determined to have acceptability in terms of the mode of delivery and the format of the sessions. According to the qualitative design results, the intervention's acceptability may be broken down into four aspects, as follows. First, the results indicated training with precise operations and straightforward instructions was more acceptable. For example, the diaphragmatic breathing exercise and the body scan were more attainable for some leisure-time runners.

This finding is consistent with a theoretical framework for the acceptability of healthcare intervention developed by Sekhon and colleagues (2017). According to their framework, acceptability is the level to which participants consider the intervention suitable, according to their anticipation or emotional reactions. In the present study, leisure-time runners experienced

straightforward instructions from most mindfulness practices (e.g., diaphragmatic breathing and body scan). This aspect corresponds well with the intervention coherence construct (Sekhon, Cartwright & Francis, 2017). Coherence in an intervention refers to how a participant understands the intervention and how it is supposed to work. It represents the apparent legitimacy of the intervention to the person receiving it or the one delivering it (Sekhon, Cartwright & Francis, 2017). Runners in the study were easier to accept the training by having a clear impression of the objective of the training. For instance, most runners reported applying the idea of scanning their body from feet to head to train their attention regulation (Kaufman, Glass & Pineau, 2018).

The second aspect of acceptability regarding the mode of delivery and the format of the sessions is that interventions could be worked into a daily practice and were more acceptable. It is in line with the opportunity costs in Sekhon, Cartwright & Francis' (2017) framework. Runners had lower time and travelling costs to participate in these four weeks of training because of the benefit of the online sessions. They were more inclined to follow through and attend every session. Moreover, most of the training was readily integrated into day-to-day tasks (e.g., breathing exercises). Runners did not have to give up their free time to get into this mindfulness training. As a result, there are fewer opportunity costs associated with participating in the intervention.

The third aspect of acceptability regarding the mode of delivery and the format of the sessions is how easy this training can be completed. The definition of burden in Sekhon, Cartwright & Francis' (2017) framework refers to the extra effort required to participate in the

intervention. The completion of interventions should not require an additional amount of time or effort. The results from the present study confirmed this statement. Except for the active meditations (e.g., running meditation), runners showed less acceptance of those active meditations compared to sitting meditations. This is likely because active meditations need more effort and time from the runners to train their ability of attention regulation.

The fourth aspect of acceptability regarding the mode of delivery and the format of the sessions is the leisure-time runners showed more acceptance of those elements that could benefit their running and other aspects of their lives. The definition of perceived effectiveness in Sekhon, Cartwright & Francis' (2017) framework refers to the extent to which an intervention is seen to have a benefit to participants' lives. Once the runners understand how beneficial the intervention is, it will be easier for them to accept it. They are more open to experimenting with mindfulness techniques in running and other parts of their lives.

## **2. Intervention effectiveness**

The result of quantitative design has provided evidence of the intervention's effectiveness. Enhancing dispositional flow was determined to have a medium effect size based on the outcome of the paired sample t-test, which was part of the quantitative analysis. It was determined that the evaluations of leisure-time runners on the exit questionnaire were satisfactory. Moreover, the result of the qualitative design has provided in-depth explanations of this intervention's effectiveness. After the intervention, there was an improvement in four aspects of runners' dispositional flow, according to the results from the qualitative design.

The first aspect of the intervention's effectiveness is the increasing focus on the task at



hand. By training paying attention to their breathing, and building a connection with their bodies, runners have developed the ability to regulate their attention during running. The capacity of runners to control their attention is positively connected to their dispositional flow (e.g., Cermakova, Moneta & Spada, 2010).

The second aspect of the intervention's effectiveness is to obtain feedback from the body during running. Since clear feedback is one of the dimensions of flow, building connections with the body by practising mindfulness could eventually enhance dispositional flow (Csikszentmihalyi 1991). This kind of feedback benefits runners because it allows them to make adjustments during running. Clear feedback was also found to decrease internal conflict (Ovington, Saliba & Goldring, 2018). Runners develop the ability to receive feedback from bodies that could improve their sense of self-efficacy, decrease internal conflict they experience, and prevent burnout and injuries (Chen, Kee & Tsai, 2008).

The third aspect of the intervention's effectiveness is runners have established coping methods to handle the various discomforts associated with running. They have developed bodily awareness and attention flexibility through this mindfulness training. Engaging these facilitators helps runners employ the basic concept of mindfulness, which are awareness and acceptance, in a way that supports crucial self-regulatory skills (Kaufman, Glass & Pineau, 2018). They could obtain the sensation of control necessary to handle the discomforts that had previously served as barriers preventing them from being in the zone.

The fourth aspect of the intervention's effectiveness is developing a better balance between the challenge and skills. Runners obtain these skills learned from training to running to

meet the challenge. These abilities included attention and emotion regulation. Appropriate self-regulation, such as anxiety management, has been recognized as an important psychological process that enables athletes to achieve peak-performance experiences such as flow (Anderson, Hanrahan, & Mallett, 2014).



## **Limitations and Suggestion for Future Research**

### **Study I**

The limitation of Study I may be attributed to the cross-sectional data collection method. Because the Chinese DFS-2 was only tested on leisure-time runners, further research would be required in order to generalize the results to other forms of leisure activity, such as bicycling. In addition, since the objective of positive psychology is to promote well-being, the primary emphasis of research in the future should be on determining the mechanism that enables flow experiences to encourage healthy behaviors, such as encouraging people to engage in physical activity.

Overall, there are adequate evidences to support the Chinese DFS-2 as a sufficiently reliable instrument for evaluating dispositional flow in Chinese leisure-time runners.

## Study II

Due to the limitations of the cross-sectional design, any conclusions on the possible causal links that exist between the variables should be cautious. Repeated measurements and longitudinal research might provide light on the temporal nature of correlations (Elhai, Rozgonjuk, and Liu, 2020). Furthermore, since the present study was relied on self-report measures, while an objective behavioral evaluation of exercise behavior would have provided a more realistic picture. Additionally, majority of the participants were from Guangzhou city, the study's capacity to be generalized is restricted. Despite this, these findings provide light on the the mediation role of dispositional flow and dispositional mindfulness on harmonious passion and exercise maintenance in Chinese leisure-time runners. Recommended use of the exercising facilitators (such as dispositional flow, dispositional mindfulness) to maintain exercise behaviors.

### Study III

While this study's findings are promising, future researchers may want to consider the following limitations: First, the small sample size in the quantitative might have increased the risk of Type II error. In addition, owing to the lack of a control group, it is impossible to claim with absolute confidence that the outcome was solely attributable to the intervention. Nonetheless, qualitative data have offered further confirmation that this intervention was beneficial. Third, due to the nature of online delivery, some formal mindfulness meditations (e.g., candy exercise) were unable to be included in this study. Despite these limitations, this mixed-method study still provided encouraging quantitative and qualitative evidence to the 4-week revised MSPE. Further study with a bigger sample size and control group is required to strengthen the results. Furthermore, researchers may wish to compare the effectiveness of MSPE with varying session lengths, as well as some combination of online and on-site sessions.

## **Implications of the Study**

### **Study I**

Study I made a contribution to research in the field of positive psychology in China because it provided evidence of the validity and reliability of the Chinese DFS-2. This is an instrument that can be used to measure the dispositional flow, which is an essential construct in the area of motivation. Because of the favorable relationship between flow and motivation, it is highly valued in various settings, including academic study and education. Athletes, coaches, and exercisers (such as leisure-time runners) all priorities achieving and maintaining a state of flow (Goddard et al., 2021). The findings from Study I provided evidence that the construct validity of the Chinese DFS-2 was adequate, which hints to the possibility of its use in upcoming flow studies.

The same nine-structure of flow in Chinese culture is another implication of Study I because of the promising results. There was a claim that the individualistic culture was where the idea of flow originated. In a collectivistic society, it may not be successful work. Evidence from Study I confirmed the concept of flow work successfully in the collectivistic culture (e.g., Chinese culture).

## Study II

Study II contributed to the field of exercise psychology since it provided evidence of the mechanism for maintaining exercise behavior. Promoting individuals to participate in PA is the biggest concern in exercise psychology. Factors (harmonious passion, obsessive passion, dispositional flow, dispositional mindfulness, rumination) influencing exercise maintenance have been investigated in Study II. The findings provided implications for the maintaining stage, which are as follows:

1. Exercisers (such as leisure-time runners) who have harmonious passion are more likely to maintain their exercise behaviors.
2. Exercisers (such as leisure-time runners) who could experience flow during the exercise are more likely to maintain their exercise behaviors.
3. Exercisers (such as leisure-time runners) who are more present are more likely to maintain their exercise behaviors.

Another implication of Study II is these findings have expanded The Affective–Reflective Theory of physical inactivity and exercise (ART; Brand & Ekkekakis, 2018). It provided empirical evidence of flow experience being a positive emotional valence in predicting future exercise behaviors for the first time. Exercisers (such as leisure-time runners) who experience flow in exercise settings engage would exercise (e.g., running) more often and for longer lengths of time.



### Study III

Study III contributed to the health science field because it provided evidence of the acceptance and effectiveness of the 4-week revised MSPE. Since one of the main goals of health science is to promote healthy behavior, the findings of Study III provided an effective intervention to approach it. Exercisers (such as leisure-time runners) could enhance their dispositional flow by practicing mindfulness. According to the implications from Study II, a high level of dispositional flow would enhance exercise behavior (e.g., running).

Another implication of Study III is it provided empirical evidence for the distance-based intervention. Since the global pandemic of COVID-19 has had a substantial influence on people's day-to-day lives, which has led to restrictions on physical contact between individuals. Therefore, it is becoming more normal to conduct health-related sessions using a method known as a distance-based intervention. On the other hand, it is not yet known whether it can produce high-quality and effective results compared to more conventional in-person sessions. There was contradictory information about the impact of the intervention that was carried out remotely and provided at a distance. The findings from Study III provided acceptance and effectiveness of this distance-based intervention.

## **Conclusions**

### **Study I**

There is adequate evidence to support the Chinese DFS-2 as a sufficiently reliable instrument for evaluating dispositional flow in Chinese leisure-time runners. The findings obtained from EFA and CFA provided substantial support for the nine first-order structures. The scale's internal consistency was found to be excellent ( $\alpha=.95$ ).

### **Study II**

The SEM results of Study II provided evidence for the mediation role of dispositional flow and dispositional mindfulness on harmonious passion and exercise maintenance in Chinese leisure-time runners.

### **Study III**

The outcomes of study III using a mixed-method study provided enough evidence that the revised four-week MPSE was acceptable and effective in enhancing dispositional flow in Chinese leisure-time runners. After four weeks of the revised MSPE training, 41 Chinese leisure-time runners showed an increase in dispositional flow. Other promising findings from the qualitative design explained the intervention's acceptance and effectiveness.

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## **APPENDICES**

### **Appendix A**

#### **Cover Letter (English)**

November 29, 2021

“Getting to flow is what I race for,” says Ward, who followed this race up by placing an unexpected 6th at the Rio Olympic Marathon. “The feeling of competition that supersedes pain and any other type of interference is incredible. Mastering how to get my body there is the art.”

If you are a target long-distance running exerciser, 18 years or older, and are interested in learning new mental skills that may help you enjoy more on your running habit, the Exercise Research Group at the Assumption University of Thailand will be offering a 4- week mental training workshop on December based on mindfulness meditation. Dr. Jon Kabat-Zinn, founder of the stress reduction program at the University of Massachusetts Medical School, used a similar mental training program in his work with 1984 U.S. Men's Olympic Rowing Team.

It will be an online weekly group meeting training on Saturday night, and it will be lasted 3 hours. The class is free, for more information about the workshop or to register, please contact Yang Lijuan (13560241084)/ [alkaidwind@163.com](mailto:alkaidwind@163.com).

Regards,

Yang Lijuan, Ph.D. Student

## Appendix B

### Cover Letter (Chinese)

“进入心流状态是我参加比赛的目的，”沃德说，他在这次比赛之后出人意料地在里约热内卢奥林匹克马拉松比赛中获得了第 6 名。“超越痛苦和其他干扰的竞争感觉是难以置信的。掌握如何让我的身体到达那个状态是一门艺术。”

如果您是一位长跑运动爱好者,18 岁以上,并有兴趣学习新的心理技能,这里有可以帮助您,让您更能从跑步中获得愉悦的训练。泰国易三仓大学研究小组将提供为期四周的正念冥想训练,这个训练曾经由马萨诸塞大学医学院 (University of Massachusetts Medical School) 压力减压项目的创始人乔恩·卡巴金 (Jon Kabat-Zinn) 博士在 1984 年美国奥林匹克男子赛艇队比赛时使用过。

正念冥想训练计划于每周六晚上线上进行,时长 3 个小时。本课程是免费的,如需更多关于本次训练或有意向报名,请联络杨莉娟 (13560241084)/[alkaidwind@163.com](mailto:alkaidwind@163.com)。

## Appendix C

### Informed Consent Form for Study I and II (English)

You have been invited to participate in a research study that is being conducted by YANG LIJUAN, who is a student at the Assumption University in Bangkok, Thailand. This research is being conducted in fulfillment of counselling psychology's doctoral program at The Assumption University. The purpose of the study is to explore factors influencing exercise maintenance.

The researcher is grateful to you for taking the time to complete this survey. All information gathered as a part of this study is strictly confidential. Your name will never be attached to the data and a case number will be used instead of your name. Results of the survey will be reported only in summary form, so that no individual participant's responses can ever be identified. Please confirm that you have consented to participate in this study. You are willingly participating and providing express permission for the data to be used in this dissertation and any subsequent published article(s).

This survey is divided into six sections. Please answer each question and then click "Next" to go to the next one. When done, click "Submit." There is no data collection until the "Submit" button is clicked, and you may withdraw at any moment. On average, the total duration of your involvement in this study is about 20-25 minutes. Should any questions upset you, you may stop at any point. If you have any concerns about your participation in this study the researcher will be available to you via phone and email should any questions or concerns arise.

Thank you for your participation.



YANG LIJUAN (13560241084)/ alkaidwind@163.com.



## Appendix D

### Informed Consent Form for Study I and II (Chinese)

您被邀请参加由杨莉娟主持的一项研究，她是泰国曼谷易三仓大学的博士学生。这项研究是为完成易三仓大学咨询心理学博士课程的要求而进行的。本研究旨在探讨影响运动维持的因素。

研究人员非常感谢您花时间完成这项调查。作为本研究的一部分，所收集的所有信息是严格保密的。您的姓名将不会附在资料上，案件编号将代替您的姓名。调查的结果将只以摘要的形式报告，因此没有参与者的个人信息可以被识别。请您再次确认已同意参与本次研究。您愿意参与并提供在本论文和任何后续发表的文章中使用的数据的许可。

本调查分为六个部分。请回答每一个问题，然后点击“下一步”进入下一个。完成后，单击“提交”。点击“提交”按钮后才会进行数据采集，您可以随时退出。这项调查研究将占用您 20-25 分钟。如果任何问题让您心烦，您可以在任何时候停止。如果您对参与这项研究有任何担忧，请通过电话和电子邮件向杨莉娟(13560241084)/[alkaidwind@163.com](mailto:alkaidwind@163.com)提出任何问题或担忧。

感谢您的参与。

## Appendix E

### Informed Consent Form for Study III (English)

You have been invited to participate in a research study that is being conducted by YANG LIJUAN, who is a student at the Assumption University in Bangkok, Thailand. This research is being conducted in fulfillment of counselling psychology's doctoral program at The Assumption University. The purpose of the study is to explore factors influencing exercise maintenance.

The researcher is grateful to you for taking the time to take part in this study. All information gathered as a part of this study is strictly confidential. Your name will never be attached to the data and a case number will be used instead of your name. Results of the study will be reported only in summary form, so that no individual participant's responses can ever be identified. Please confirm that you have consented to participate in this study. You are willingly participating and providing express permission for the data to be used in this dissertation and any subsequent published article(s).

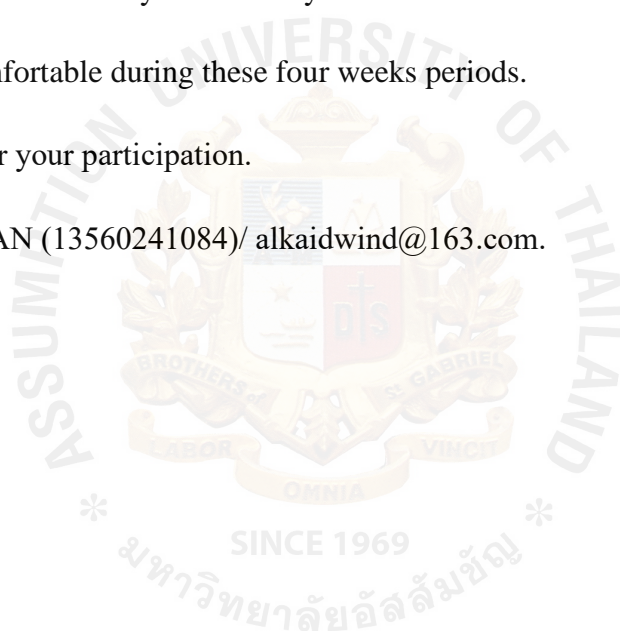
This study will take place for 4 weeks, with a 2.5-hour session once a week. During these sessions, you will learn about mindfulness. Mindfulness is the practice of cultivating non-judgmental awareness in day-to-day life. These Mindfulness meditation practices can help you decrease suffering and bring you greater balance and peace. Physicians are prescribing training in Mindfulness practice to help people deal with stress. Mindfulness consists of cultivating awareness of the mind and body and living in the here and now. In this study, you will engage in formal practices and informal practices, including breathing exercise, the Body Scan, and

mindful movements. The program will be led by an instructor with a lot of experience in mindfulness, which is helpful to ensure you are comfortable and safe during this experience and aid in any posture (sitting or standing) changes that can be made to help in your comfort.

Every week, you will have an online meeting section with the researcher, and you will be asked to answer surveys before the first session and after the last session. You will also be asked to write down logs during these four weeks periods. Additionally, you might be invited to an online interview at the last day of this study. Please feel free to contact researcher if you have any doubts or discomfortable during these four weeks periods.

Thank you for your participation.

YANG LIJUAN (13560241084)/ [alkaidwind@163.com](mailto:alkaidwind@163.com).



Appendix F

Informed Consent Form for Study III (Chinese)

您被邀请参加由杨莉娟主持的一项研究，她是泰国曼谷易三仓大学的学生。这项研究是为完成易三仓大学咨询心理学博士课程的要求而进行的。摘要本研究旨在探讨影响运动维持的因素。

研究人员非常感谢您抽出时间参与这项研究。作为本研究的一部分所收集的所有信息是严格保密的。您的姓名将不会附在资料上，案件编号将代替您的姓名。研究的结果将只以总结的形式报告，因此不会泄露参与者的个人信息。请您再次确认已同意参与本次研究。您愿意参与并提供在本论文和任何后续发表的文章中使用的数据的许可。

这项研究将进行 4 周，每周约 2.5 小时。在这些课程中，你将学习正念训练。正念是在日常生活中的一种非评判的态度。这些正念冥想练习可以帮助您减少内心痛苦，为您带来更大的内心平和。在西方，医生们开出正念训练的处方来帮助人们应对压力。正念训练包括培养对精神和身体的意识，活在此时此地。在这项研究中，你将参加几种主要的正念训练，包括呼吸练习，身体扫描，和正念运动。该项目将由一位具有丰富正念经验的教练领导，这有助于确保您在这一过程中感到舒适和安全。

本次的正念训练包含了两次调查，以作为其有效性的判断依据，因此您将被邀请在第一次会议之前和最后一次会议之后回答一些问题。同时，因为平日的课后训练对培养活在当下的态度至关重要，您将被邀请记录在四个星期的训练日志。此外，如果您愿意，您可能会在研究的最后一天被邀请参加在线面试。在这四个星期内，如果您有任何疑问或不适，请随时联系杨莉娟 (13560241084) / [alkaidwind@163.com](mailto:alkaidwind@163.com)。感谢您的参与。

## Appendix G

### **Mindful Sport Performance Enhancement: A Treatment Manual for running exerciser**

#### **Session 1 (Approximately 2.5 Hours)**

##### *Participant/Facilitator Introductions*

Facilitator will introduce herself to the group, explaining who she is and her relevant credentials in some detail. Then, participants will introduce themselves to the group, indicate why they have come, and reveal what they are expected from attending the workshop. Additionally, participants could share how long and how often they have been engaging in running.

##### *Introductory Breathing Exercise*

Facilitator will introduce diaphragmatic breathing to the group members. Diaphragmatic breathing is usually slower and deeper than chest breathing, which tends to be rapid and shallow (Kabat-Zinn, 2009). In diaphragmatic breathing, the idea is to relax the belly as much as possible. Then, as the breath comes in, the belly expands slightly in an outward direction as the diaphragm pushes down on the contents of the abdomen from above. The diaphragm can go down farther when this happens, so the in-breath is a little longer and the lungs fill with a bit more air. A little more air is then expelled on the out-breath, so that, overall, the full cycle of breathing will be slower and deeper. At the beginning, it may be helpful to put one hand over the belly and feel it move as the breath flows in and out. The hand should be rising during the inhalation and falling during the exhalation.

According to Kabat-Zinn (2009), being aware of one's breathing may assist to relax the

body and mind. Giving the mind just one item to keep track of instead of the full variety of things it normally seeks to preoccupy itself with may improve concentration. He said that remaining with the breath during meditation, no matter what, may lead to profound states of serenity and awareness. According to Kabat-Zinn (2009), mindfulness of breathing is fundamental to all elements of meditation practice.

**Script for Diaphragmatic Breathing Exercise (From Kaufman, Glass & Pineau, 2018):** To begin, sit up tall with your feet planted firmly on the ground, and imagine each of your vertebrae stacked one on top of the other, all the way up your spine, with your head resting comfortably atop your shoulders. You can close your eyes if you'd like, or, if you prefer, you can leave them open slightly, allowing your gaze to rest unfocused on a spot on the floor a few feet in front of you. Many of us can develop the habit of breathing into our chest and tightening our abdomen as we move throughout the busyness of our lives, so it may take a few moments to find a comfortable rhythm of belly breathing. Allow the muscles in your abdomen to relax, letting your stomach expand and deflate as you breathe down into your belly. You may find it helpful to place one of your hands, palm open, on your belly, just above the belly button. See if you can sense your hand rising and falling with the rhythm of your breathing, and see if you can intentionally take in more air with each in-breath. Notice any changes that occur by breathing into your belly in this way. You can leave your hand on your belly as long as you like, or, when you feel at ease maintaining a gentle awareness of the breath traveling down into your belly, you can place your hand wherever feels right to you. (Pause for 1 minute.)

Now, take one more deep, full inhalation, and then imagine that your belly button is



trying to reach all the way back to your spine as you slowly and completely exhale. When you're ready, you can open your eyes and return your attention to the world around you (Kaufman, Glass & Pineau, 2018, pp. 77-78).

### *Diaphragmatic Breathing Discussion*

After the breathing exercise, participants will be given a chance to share their experiences in terms of it. Facilitator will respond to any observations, questions, or concerns mindfully. In order to facilitate this discussion is to ask the participants open-ended questions:

1. What were your experiences while engaged in this breathing activity?
2. Describe your thought patterns as you attempted to focus on your breathing.
3. How might this breathing activity apply to participation during running?

### *Sitting Meditation with a Focus on the Breath*

Sitting meditation, according to Kabat-Zinn (2009), is the core of formal meditation practice. He said that in order to practice sitting, one must deliberately assume an attentive and relaxed bodily posture, so that one may feel reasonably comfortable without moving, and then live in the present with peaceful acceptance without attempting to fill it with anything. It is best to sit upright and dignified, with the head, neck, and back aligned vertically, since this enables the breath to flow most freely. According to Kabat-Zinn, sitting meditation is often done in a chair or on the floor (with a pillow or cushion to elevate the buttocks 3 to 6 inches). Whether sitting on the floor or on a chair, posture is critical to maintaining throughout sitting meditation practice because it may serve as an external support in developing an inner attitude of dignity, patience, and self-acceptance.

According to Kabat-Zinn (2009), after a posture has been chosen and adopted, the focus should move to the breath. Dwell in the present now, minute by moment, breath by breath, fully conscious of each in-breath and out-breath. Allow the breath to happen naturally, watching and experiencing all of the feelings that come with it. Observe the want to get up or the ideas that arise, and then softly but firmly bring attention back to the abdomen and the waves of breathing without judgment. Recognize ideas for what they are: thoughts, not necessarily realities, and let them go (note that letting go does not equal suppression). According to Kabat-Zinn, doing so trains the mind to be less reactive and steadier. The capacity to concentrate is being developed. Concentration is developed and deepened by constantly returning attention to the breath when it wanders off, just as muscles are developed by repeatedly lifting weights. The goal is to utilize the breath as an anchor or "home base" for observation, serving as a reminder to remain focused and calm. Linehan (1993) proposed that when emotions or ideas emerge, participants should recognize them by writing them down before letting them go and continuing to the work at hand.

**Script for Sitting Meditation with a Focus on the Breath (From Kaufman, Glass & Pineau, 2018):** To begin, sit tall, with your spine straight, your ears over your shoulders, and your chin slightly tucked toward your chest. The idea is to adopt a posture that is comfortable and erect. Place your hands wherever feels right to you, maybe on your knees or in your lap. Lay them with the palms facing upward and allow the muscles in your fingers to relax. You may find it helpful to gently close your eyes, but if you would rather keep them open, let your gaze fall unfocused to a spot on the floor about a foot in front of you. (Pause for 10 seconds.)

Now, bring your attention to the tips of your toes. From there, allow your attention to

slowly rise up through your whole body with each in-breath. As your attention passes through each body part, see if you can notice any tension being held by your muscles. If you do notice tension, you can sit with that experience or you can gently tense that area of your body as you breathe in and relax as you exhale, leaving behind loose muscles as your attention rises a bit more in your body on the next in-breath. As you continue to breathe, imagine that each inhalation is taking in a cool, peaceful, relaxing feeling that is slowly permeating your being, from your toes to the top of your head. (10 seconds)

Your breath is your anchor. It is always present. No matter where you are or what you are doing, your breath is with you. It is happening right now, in this moment. Each time you breathe, let your breath remind you that you are alive, right here, right now. Notice now the rhythm of your breath as it flows naturally. You do not need to try to breathe more deeply or at a different speed. Allow your breath to do what it always does and just observe this process. Feel the air as it enters your lungs and fills your abdomen. Notice the brief pause just before you exhale, then let go of this breath. Pay close attention to each moment of the breath, from the in-breath, to the pause, to the out-breath. One continuous flow. Each breath keeps us alive. Each breath is vital to us. Yet we always let it go. We are always breathing. We are always letting go. (10 seconds)

As you watch your breath, it might be helpful to settle your attention on the physical sensations you are feeling. Notice the feeling of expansion in your torso as you inhale. And notice your muscles relax with the sense of gentle deflation as you exhale. These feelings may be centered in your chest or in your belly. Wherever you notice them is perfectly fine. Or notice

the feelings in your nostrils and on your upper lip, perhaps feeling the coolness of the air entering your nose and the sensation across your upper lip as the air flows back out. Allow these sensations to fill your field of awareness as you sit with your breath. They do not need to be different; they do not need to be changed. Right now, for this breath, they are exactly what they need to be. (10 seconds)

You will find, as you sit with your breath, that your attention wanders away, perhaps getting caught up in the endless flow of thoughts and feelings that we all have each day. This is perfectly natural. Minds wander; that is just what they do. When you notice your mind has wandered from the breath, you may have a reaction such as “I am terrible at keeping my focus” or “I must be doing this wrong.” Rest assured, this is not the case. You are also not doing anything wrong by having these judgments. They are perfectly natural too. But, as best you can, try to let such judgments of your experience just pass out of your mind. In realizing that your attention has wandered, you are truly present. You are noticing something right here and right now. You are seizing the opportunity to observe what your mind is doing in this very moment.

If you notice your thoughts being drawn away, maybe by the memory of where you have been or in anticipation of where you are going next, see if you can acknowledge where your mind has gone, appreciate that it might be important to you, and then gently bring your attention back to your breath. The past has come and gone, and the future has not yet arrived. Give yourself the gift of this moment. Let those thoughts about other times go; let them pass through your mind. Your thoughts are like clouds, and you are like a mountain. Just as the harshest storm clouds may batter a mountain, they always pass by in time, but the mountain remains. Recognize

this inner, imperturbable calm that resides in us all. When you notice that your mind has left the breath and followed a thought, congratulate yourself, for you have taken advantage of a valuable opportunity. Thank yourself for your patience and understanding as you, again and again, bring your attention back to the anchor of your breath, tuning into your present-moment experience.

(1 minute)

Now, begin to draw this experience to a close. Feel where your hands are positioned on your body; feel the points of contact between your body and the chair or ground. Maybe wiggle your fingers and toes, seeing what sensations arise. Observe any feelings that may have been generated by this practice. Take three deep breaths as you sit with these feelings, letting them be just what they are. (10 seconds) When you are ready, gently open or refocus your eyes, and bring your awareness back to the world around you. (Kaufman, Glass & Pineau, 2018, pp. 79-80)

### *Sitting Meditation Discussion*

Following the sitting meditation practice, participants will have the opportunity to share their thoughts and feelings. Again, workshop facilitators must be attentive in their responses to any observations, questions, or concerns. Segal et al. (2002) provided an example in which a participant complained of back and leg aches as a result of sitting motionless for so long, but refused to move since it would interfere with focus. Segal et al. (2002) recommended reminding the participant to just become aware of that inclination and, to the greatest extent possible, to take a kindly interest in it, or to bring consciousness to the feeling of discomfort itself. Similarly, Kabat-Zinn (2009) said that by sitting with some pain and embracing it as part of the present moment experience, even though it is unpleasant, one may find that it is possible to relax into such feelings. One approach for the facilitator to start this conversation is to ask



open-ended questions:

1. Describe your experiences as you completed the sitting meditation.
2. What thoughts or feelings were you experiencing during the sitting meditation?
3. What does your body feel like now that the sitting meditation is complete?
4. How might this sitting meditation apply to participation in your sport?

#### *Home Practice for Session 1*

All participants will receive an Email listing the home practice requirements.

**1. Practice Diaphragmatic Breathing.** Participants should sit for 5 minutes practicing awareness of their breathing at least three times before the second session. As described by Segal et al. (2002), participants should be reminded that breathing can be used as a tool to bring stability to the body and mind when one deliberately chooses to become aware of it. They should try to notice how the breath changes with fluctuations in mood, thought, and body posture. The goal is not to control the breath, but to simply notice it and get to know it, like a friend. All that is necessary is to watch and feel the breath with a sense of interest, in a relaxed manner. With practice, focus on the breath can help individuals relax tense muscles, deal with powerful emotions (e.g., pain, anger), and improve their awareness of various other aspects of their lives, which can be crucial to enhance flow experience.

**2. Practice Sitting meditation.** Participants should sit for 15 minutes practicing awareness of their breathing at least one time before the second session. As described by Segal et al. (2002), participants should be reminded that breathing can be used as a tool to bring

stability to the body and mind when one deliberately chooses to become aware of it. They should try to notice how the breath changes with fluctuations in mood, thought, and body posture. The goal is not to control the breath, but to simply notice it and get to know it, like a friend. All that is necessary is to watch and feel the breath with a sense of interest, in a relaxed manner. With practice, focus on the breath can help individuals relax tense muscles, deal with powerful emotions (e.g., pain, anger), and improve their awareness of various other aspects of their lives, which can be crucial to enhance flow experience.

**3. Record mindfulness practice and flow experience.** Each time participants engage in breathing exercise, they should record the date, the length of their practice session, and any comments they have in the Daily Mindfulness Log they will receive. They should record the flow experience after running in Flow State Log including the date. The facilitator will remind all the participants how crucial home practice is to mindfulness training at the summary part and have a discussion with the participants how they could put those practices into their time schedules.

## **Session 2 (Approximately 2.5 Hours)**

Segal et al. (2002) proposed starting the second session with a body scan to allow participants to transition from the mode of doing to just being. They stated that the themes that emerge from the body scan exercise at the start of the second session often mirror the participants' previous week's experiences. They've seen that when participants reflect on this body scan, they often doubt if they're performing it properly, remark any discomfort or suffering they're feeling, and comment on how frequently their thoughts wander. Themes that usually



emerge more specifically from home practice include being unable to find time to practice at home, becoming bored with the scan, enjoying or disliking the practice because it is so easy to fall asleep, failing to understand the purpose of the exercise, and struggling to keep the mind from racing.

### *Body Scan Meditation*

The facilitator will introduce body scan meditation according to Kabat-Zinn (2009) descriptions. According to Kabat-Zinn (2009)'s descriptions, the facilitator will teach body scan meditation. The body scan is a very effective method for reestablishing touch with the body and cultivating moment-to-moment awareness. It is an excellent method for simultaneously increasing focus and attention flexibility. According to Kabat-Zinn (2009), the objective behind scanning the body is to really feel each area focused on and stay there with the attention right on or in it. Participants breathe in and out of each area several times before letting go in their minds' sight as their focus shifts to the next region. As they let go of the feelings in each area, as well as any ideas or inner pictures connected with them, the muscles in that area actually release go, extending and releasing much of the collected tension. The key to practicing the body scan is to retain awareness in every instant, a detached witnessing of the breath and the body, region by region, as you scan from the feet to the top of your head.

**Script for Body scan meditation (From Kaufman, Glass & Pineau, 2018):** Position yourself comfortably on the floor, perhaps on a towel or mat, lying on your back with your arms next to your body, your palms facing upward, and your eyes gently closed. Or if you'd rather

not close your eyes fully, allow your eyelids to shut partially and let your gaze rest, unfocused, on a distant point above you. Notice sensations in the places where the back of your head, your shoulder blades, your buttocks, your calves, and your heels are making contact with the ground. Very slowly, lift your arms up over your head and stretch your body, reaching out with your toes and your fingertips as far as you can at this time. Feel the muscles in your arms, abdomen, and legs elongate as you reach away from your body in these two opposing directions. (Pause for 2 seconds.) And let go. Now, stretch your left arm and your right leg, and feel the sensations coming across your entire body. (2 seconds) And let go. Now, stretch your right arm and left leg, reaching as far as your body presently allows, feeling the sensations that arise. (2 seconds) And let go. Slowly bring your arms back to your sides, palms up, and, again, take a moment to notice the points of contact between your body and the ground.

Now, direct your attention to your breath. Allow the muscles in your abdomen to soften and relax, letting that region expand and deflate as you breathe down into your belly. If you notice chest breathing, that's ok too. Just try to breathe naturally, letting the pace and depth of your breaths find a comfortable, steady rhythm. As you breathe in this way, see if you can notice the sensations in your torso as it fills with air on the in-breath and then deflates on the out-breath. Notice the ever-present process of letting go with each exhalation.

We are about to tour the entire body with our attention. The goal here is not to relieve tension or to relax your muscles, although this may happen along the way. If you do enter a relaxed state, it is still important to remain awake and alert while on this journey. Our intention is to notice the variety of sensations that occur in our bodies at each moment, to acknowledge

these sensations with our full attention, and then simply to let them go. So, make every effort to remain awake and aware during this scanning of the body. If a particularly intense sensation calls for your attention at some point on this journey, it is not necessary to resist it. Listen to that call, and take a moment to direct your attention to it. Welcome the sensation into your experience. Acknowledge and appreciate this communication from your body. Once you have heard what your body has to say, gently let go of the intense sensation and bring your attention back to where you are in your tour.

With your next inhalation, direct your attention down to your left foot. Imagine your attention is like a laser beam, an intense, directed point of focused awareness. With this focused awareness, begin to scan the toes on your left foot. If you can, try to follow the contours of each toe. Maybe you can notice the slight sensation of pressure where your toes touch each other, how your socks or shoes feel against the pads of each toe, or, if your feet are bare, how the air feels as it surrounds your toes. As best you can, approach these sensations with an open curiosity, as if you are noticing these subtle sensations for the first time. If you are having trouble noticing anything in your toes at this time, that is okay too. Just let your experience be whatever it is at this moment. (10 seconds)

Imagine that the sensations you are experiencing are like a rising tide, blanketing the shore of your consciousness. Now, as you exhale, let go of these sensations you have noticed, allowing the tide to flow back out to sea, leaving your field of awareness bare to receive what new sensations may come. And, as you let go, gently shift the beam of your attention to the bottom of your left foot. As you breathe in, explore, in turn, the sensations in the ball of your

foot, the arch, and the heel. Can you notice any difference in the feelings present at the top and bottom of your foot? Is there tension or discomfort in these well-used, important muscles? To whatever you may find, bring an attitude of warmth and acceptance. (10 seconds)

On your next exhalation, observe the retreating tide of these sensations as you let them go from your field of awareness and shift your attention up your left leg to the ankle, calf, and knee. Allow your focused attention to move up your lower leg, exploring the skin, penetrating the muscles. Is there any tightness, any tingling you can sense? Can your attention find its way into the joints of your ankle or knee? What are you sensing there? Allow a stillness to fill your being as you listen with careful intention to what your body is communicating. (10 seconds)

On your next exhale, let go of this region. Allow your laser beam of attention to move to your \_\_\_\_\_ (Insert in sequence the body parts listed in the next paragraph.). With awareness and intention, scan this body part, maybe even imagining that you are breathing into it, so that it expands and deflates with your breath. As best you can, notice each sensation, powerful or subtle, that rises and falls moment-by-moment. Allow each sensation to maintain a place in your field of awareness, without judging and without wanting it to be any different than what it is. Then, as you exhale, let it go. With every breath, you are letting go, allowing these sensations to pass through your mind, as your attention moves on through the tour of your body. (5 seconds)

Insert the following body parts in sequence, as noted in the previous paragraph:

upper left leg

right toes

right foot

lower right leg

upper right leg

Pause to read this paragraph before proceeding to hip and pelvic region. At times, you may find your inner stillness disrupted by chatter the mind tends to generate. Your attention may be drawn away from the sensations within a region of the body by a thought, a memory, or a plan for the future. This is natural and to be expected. Our minds are very busy, and no fault or blame is to be placed when the mind wanders. That is just what minds do. Acknowledge what has drawn you away, and gently bring your attention back to the region you are focusing on at this moment. (5 seconds) hip and pelvic region

lower back

abdomen

chest

shoulders

upper left arm

left forearm

left hand

upper right arm

right forearm

right hand

On your next exhale, let go of this region. Allow your laser beam of attention to move to your neck and facial muscles. These muscles help us speak, laugh, eat, and express ourselves



without words. We use them all the time, and they can hold a great deal of tension. Notice your jaw. Is it clenched at all? Perhaps your tongue is pressed up against the roof of your mouth. Or maybe your eyes are closed just slightly tighter than they need to be. If you notice any of this tension, you can allow yourself to release it, letting it drain out with each exhalation, as you continue to explore the sensations around your face. Can you feel your ears? The top of your head? The point of contact between your head and the ground? Just note what's there, letting the sensations rise and fall along with your breath. (10 seconds)

Now, take a moment to allow the focused beam of your attention to relax and expand. Let this laser point become an expansive, shining light. Permit it to flood over your entire body, as you become aware of all its sensations happening at once. (10 seconds) As you breathe, feel the hum of life that comes from the endless motion within us, from the blood flowing through our vessels to the constant movement of each tiny cell. Just float in the sea of your inner stillness, and allow this moment to be exactly what it is. Quiet and calm. (1 minute) Now, take a final deep breath, gently wiggle your fingers and your toes, open or refocus your eyes, and bring your attention back to the world around you. (Kaufman, Glass & Pineau, 2018, pp. 91-93).

### *Body Scan Meditation Discussion*

Participants will be given the opportunity to share their experiences after the body scan meditation. It will be critical for facilitator to respond to any observations, comments, or concerns in a thoughtful manner. In order to facilitating this conversation is for the facilitator to pose open-ended questions to the participants. Here are several examples:

1. Describe your experiences as you completed the body scan meditation.

2. What thoughts or feelings were you experiencing during the body scan?
3. What does your body feel like now that the body scan is complete?
4. How might the body scan meditation apply to participation during running?

It is critical for the facilitator to respond to the participants mindfully. For example, if participants are doubting whether they are performing the body scan correctly, facilitator can respond by saying that there are a million ways for people to think they are doing it incorrectly, and the mindfulness approach allows for the experience of these thoughts in the moment, the acknowledgment of them as events in the mind, and the letting go of them to allow the exercise to continue (Segal et al., 2002). Participants should be reminded that the goal of the body scan is to retain awareness in every instant, to be a detached witness to the breath and the body, region by region, while scanning from the feet to the head (Kabat-Zinn, 2009).

Whatever themes arise during the discussion of the in-session practice or the home practice during the past week, facilitator must respond mindfully to the participants. Dwell and breathe at the body's present limitations, striking a balance between challenging it and pushing it too far. Whatever the present limitations are, they are fine, and all that has to be done is to watch to see if and when they change. It may also be helpful to explain to participants that in order to discover the realm of being, they must learn and practice mobilizing their capacities of attention and awareness during exercise (Kabat-Zinn, 2009).

### *Applications to Running*

1. Concentration. It is very important to keep the mind from wandering during running.
2. Relaxation. Participants should practice keeping their minds on their breathing during



running.

3. Letting go of thoughts. Participants can learn to be aware of fatigue and boredom, as thoughts and to "let go" of them as in the formal meditation practice.

### *Informal Practice*

Participants are encouraged to practice mindfulness informally in addition to their weekly regular home practice. Facilitator can explain that informal practice entails taking advantage of the chance to focus mindfully while going about daily tasks. This type of attention can be brought to whatever is taking place at the time, such as while driving, eating, taking a shower, walking to practice, working out, or getting ready to compete. Any activity offers the chance to improve mindfulness abilities by focusing on the here and now.

STOP (Stahl & Goldstein, 2010), which stands for Stop, Take a few breaths, Observe what's occurring, and then Proceed, is an acronym to keep in mind during informal practice. The connection between participants and what is occurring is improved when they check in with themselves in this manner. This enables them to feel events more fully and react more skillfully, both within and outside of their sport. It's a wonderful chance to strengthen and practice the diaphragmatic breathing habit. Remind the participants that the T in STOP may also stand for "take a few diaphragmatic breaths."

Facilitator will suggest setting alerts or alarms, such as those on a phone or calendar, as reminders to STOP at certain times throughout the day, in a manner similar to how participants arrange their formal practice. From this week, when participants are attempting to establish the habit of informal practice, having such reminders may be very crucial.

### *Home Practice for Session 2*

Home practice for Session 2 will include the following (all participants will receive an Email listing the home practice requirements):

1. **Body scan practice.** Participants should complete the 40-minute body scan at least one time before the third session.

2. **Diaphragmatic Breathing.** Participants should sit for 5 minutes practicing awareness of their breathing at least three times before the third session.

3. **Record mindfulness practice and flow experience.**

Each time participants engage in breathing exercise, they should record the date, the length of their practice session, and any comments they have in the Daily Mindfulness Log they will receive. They should record the flow experience after running in Flow State Log including the date.

The facilitator will remind all the participants how crucial home practice is to mindfulness training at the summary part and have a discussion with the participants how they could put those practices into their time schedules.

### **Session 3 (Approximately 2.5 Hours)**

In session 3, participants will learn sitting and walking meditation. Guidelines for running meditation will be introduced. According to Segal et al. (2002), regularly practicing sitting and walking meditation can provide many opportunities to notice when the mind has wandered away from awareness of the moment, to observe whatever took the mind away with friendly awareness, and to gently but firmly bring attention back to the present, reconnecting

with moment-by-moment awareness. Mindfulness cultivation via formal practice may assist people in connecting with each moment in their daily life as well as on exercise settings.

*Sitting Meditation with a Focus on the Breath, Body, and Sound*

With some new components, this practice is an extension of sitting meditation. This meditation is extended to include awareness of noises beyond the body and breath, such as a clock ticking or distant talk. Participants are urged to take note of these noises and their responses to them while attempting to accept them as they are without passing judgment.

The conclusion of the meditation is now followed by a 3-minute quiet. The majority of other MSPE meditations have been led. For those who are new to meditation, a voice might serve as a helpful indication to go back to an anchor. The direction, however, may also provide the mind with something to do, either lessening its propensity to get bored or diverting it from perceived pain, both of which can provide some of the most fruitful possibilities for mindfulness practice. According to Kabat-Zinn (1990), during the sitting meditation, "self-observation becomes especially engaging and beneficial" when the mind has had enough of the boredom or pain (p. 64).

**Script for Sitting Meditation with a Focus on the Breath, Body, and Sound**  
**Meditation (From Kaufman, Glass & Pineau, 2018):** Your field of awareness has been filled with the sensations in your entire body. Now, allow your awareness to expand once again. Invite the sounds all around you into your awareness. As best you can, continue to follow the rhythm of your breath and the flow of life within your body, while also noticing the noises occurring all around you, perhaps appreciating how complex each and every moment can be. Maybe you can

hear a distant conversation, the hum of some electric device, the ticking of a clock, the chirping of birds, or the buzz of traffic. Just as you did earlier with your body, explore these sounds with a gentle curiosity as they enter your awareness. (Pause for 5 seconds.) Observe any reactions you have to the sounds, noting what thoughts and feelings arise, but without holding onto them. These sounds are part of your experience right now, in this moment, and need not be changed. (10 seconds)

Maybe you find yourself wishing that these sounds would change, linger, or go away. Such reactions are a wonderful opportunity for you. Try to notice them, and recognize how your thoughts have taken you into a desired future, to a time and an experience that has not yet and might not occur. Our thoughts often take us into the future and away from the lives we are living right now. Congratulate yourself when you notice this happening because, in that moment, you are awake, you are aware, you are present. You are giving yourself the opportunity to fully and truly experience your life. And, with this recognition, gently bring your attention back to your current experience: the rising and falling of your abdomen with your breath, the sensations flowing throughout your body, and the sounds that compose every one of our complex and unique moments of life. We will now sit in silence with this awareness, noting the natural wandering of the mind, and you can congratulate yourself on your reconnection to the present moment as you bring your attention back again and again to the anchor of your breath, your body, and the sounds around you. (Allow for 3 minutes of silence.)

Now, start to draw this experience to a close. Gently bring your attention back to the tips of your toes. Allow your attention to again rise up through your body with each in-breath,

scanning each area of your body for sensations that may be lingering. (10 seconds) Notice those sensations that let you know where your body is. Feel where your hands are positioned on your body and the points of contact between your body and the ground. Observe what this moment is like, right here, right now. Notice feelings that may have been generated by this practice. Take three deep breaths as you sit with these feelings. (10 seconds) When you are ready, gently open or refocus your eyes, and bring your awareness back to the world around you. (Kaufman, Glass & Pineau, 2018, pp. 134-135).

#### *Sitting Meditation with a Focus on the Breath, Body, and Sound Meditation Discussion*

Participants get the opportunity to share their thoughts and feelings after this sitting meditation. It is still crucial for leaders to provide thoughtful responses to any observations, queries, or issues that are brought up. They may assist this conversation by devoting 2 to 3 minutes to each of the following open-ended questions, for example:

1. What came up for you during this extended sitting meditation?
2. How did it feel to include sound as an anchor into the sitting meditation?
3. What impressions did you get of this sitting meditation's quiet period?
4. How may this kind of exercise improve your flow experience?

#### *Walking Meditation with Specific Applications to Running*

Another exercise that helps people become more aware of physical sensations is mindful walking (Segal et al., 2002). Walking meditation, according to Kabat-Zinn (2009), entails paying attention to the sensation of walking itself. One concentrates on feelings in the feet, legs, or, alternately, on feeling the whole body move. This sensation may be enhanced by being aware of



one's breathing. It is necessary for a person to just be with each step, aware that he or she is only where he or she is, and to be fully present.

According to Kabat-Zinn (2009), mindful walking starts with an attempt to be completely aware when one foot touches the ground, the weight transfers to it, the other foot rises and goes ahead, and then it comes down to make contact with the earth. Simply bring the attention back to the feet, legs, or the sensation of the body walking when it wanders. Furthermore, Kabat-Zinn advised that in order to deepen concentration, one should not glance about at the sights or at one's feet, but rather to concentrate straight ahead. Mindful walking may be done at any speed, although it should be done at a slower pace than regular walking. After practicing mindful walking as a formal activity, one may progress to a more casual walking meditation in a variety of settings (Kabat-Zinn, 2009). Participants in this session will practice formal walking meditation for 10 minutes before learning how to adapt this method to their running.

**Script for Walking Meditation (From Kaufman, Glass & Pineau, 2018):** Take a moment to notice your breath and your posture as you stand. Observe the placement of your feet, the bend in your legs, the curve of your spine, and the angle of your neck. Now, with a deliberate intention, gaze down at your feet. Slowly, with careful attention, arrange your feet, starting with your left foot, so they are parallel, slightly less than shoulder width apart. (Pause for 5 seconds.) As you settle your weight evenly in your feet, move your attention up to your knees. Take a moment to bend and straighten your legs slightly, without moving your feet, noticing the flexing and relaxing of the muscles that surround your knees.

After a few bends, settle into a comfortable standing position. Now, roll your shoulders up and back as you take a deep breath, and as you do, place your head squarely atop your shoulders, then allow your shoulders to relax. As you do this, feel your back straighten and your chest expand. Sense the peaceful calm that comes with a tall, dignified posture. Allow your arms to find a comfortable and relaxed position, maybe hanging down by your sides or with your hands gently clasped behind your back. Again, notice your posture as you stand, and allow your gaze to settle on a spot several feet in front of you on the floor.

Once you are comfortable in your stance, gently direct your attention to the soles of your feet. Notice the sensations at the points of contact with the ground. Feel the pressure on the balls and the heels of your feet. Notice the tilt in the foot, how there is slightly more pressure along the outside of each foot than on the inside. Notice the constant shifting of your weight as your stabilizer muscles flex and relax, keeping you upright and balanced.

Now, without lifting your feet off the floor, begin to shift your weight from your left foot to your right foot, and continue shifting, back and forth. Notice the changing sensations in your feet as the pressure of contact drains out of one foot and fills the other. Notice the flow of this pressure as you shift, like pouring water back and forth between two glasses. (15 seconds)

As you continue to shift your weight, allow your field of awareness to expand. Notice the tension generated in the calf muscle of the leg holding your weight. Observe the flexing and relaxing of your quadriceps, the gentle rhythm of the tilting of your hips, and the subtle sway of your shoulders as your weight flows back and forth, from leg to leg. Even the simple motion of shifting your weight from foot to foot reverberates through your entire body. Even the smallest



actions cascade far beyond what we usually notice. (5 seconds)

Maintain the slow rhythm you have created, but now begin to lift each foot off of the floor, one at a time, as the weight flows out of each leg. Allow the muscles in your foot and calf to relax as you lift each foot. Notice how your toes hang down as you lift your leg. They are the last part of the foot to leave the ground and the first to reestablish contact. Make your movements slow and deliberate, giving yourself the opportunity to feel every sensation. Notice the wave of pressure as your foot comes in contact with the ground, starting at the toes and flowing through the ball of the foot, the instep, and finally to the heel. (15 seconds)

Now, as your weight shifts to your left foot, pause with your right foot off of the ground. Direct your attention to your right leg, and very slowly begin walking. Feel the tension created in the upper thigh as you lift each leg off of the ground, and pay careful attention to the bottom of each foot as it makes contact with the ground. As you continue taking slow steps forward, feel the wave of pressure move through your foot, starting with your heel. Notice how the pressure increases on your heel as your weight begins to shift from your back leg to your front leg, and notice how that pressure flows through the outside of your foot, to the ball of your foot, and finally to your toes as you take another step forward. Notice the intricate, coordinated sensations between your feet as you walk, placing each step with careful intention. Observe how even the slightest relief of pressure from your back foot pours that pressure into your forward foot. Feel the gentle rhythm of this process, noticing every small step in the sequence. (20 seconds)

Recognize the interconnectedness of every motion. As you continue to walk in this

intentional way, allow your awareness to expand beyond your feet and legs. Feel the muscles in your lower back tensing as you step forward. Feel the muscles in your neck as they stabilize your head on your shoulders. Feel the air against your face as you move through it. Feel the gravity of the earth pull you down with each footfall. Every movement you make establishes connection after connection after connection. When you walk, allow yourself to take in the entirety of this connective process. Not only do these motions reverberate through your body, but you move the air that surrounds you and push off the earth below you. A single step cannot exist by itself. To take a single step you need muscles and tendons to move your body, you need the earth to walk on, and the earth needs space to float through. With every step you are connected to the infinite space that surrounds you. (5 seconds)

With your attention comfortably settled on the sensations associated with each slow, deliberate step, allow your pace to gradually increase. As best you can, continue to notice the waves of pressure as they move through your feet when you reach your regular walking pace and all the various sensations throughout your body when you exceed your regular walking pace. Observe how the experience of walking changes as your speed increases, while also observing the ways the experience stays the same. If you notice your mind wandering, be thankful for this connection to the present moment and gently escort your attention back to the soles of your feet, allowing your field of awareness to again expand through your whole body and to the greater connections associated with each and every step. (1 minute)

Now, begin to slow your pace back down and come to a stop. Do a quick scan of your body, from your feet to the top of your head, taking in the sensations generated by this practice.

(5 seconds) When you're ready, take a deep breath and full exhalation, and bring your attention back to the world around you. (Kaufman, Glass & Pineau, 2018, pp. 119-121).

### *Walking Meditation Discussion*

Participants are given the option to share their thoughts and feelings after the walking meditation. It is still crucial for facilitator to react to any observations, inquiries, or concerns with consideration. They may assist this conversation by devoting 2 to 3 minutes to each of the following open-ended questions, for example:

1. What thoughts, emotions, and sensations did you experience?
2. How was it to move on while still attempting to concentrate on the here and now?
3. How did this exercise stack up against the other meditations in the MSPE?
4. What benefits may this exercise have for running?

### *Introducing Running Meditation*

The sport meditation (e.g., running meditation) marks the culmination of the participants' efforts to cultivate a mindful style of attention while doing ever more physical activity. This practice leverages the physical sensations produced by the fundamental movements of the sport(s) that participants are focusing on as present-moment anchors. This exercise aims to develop the ability of using sport-specific sensations as anchors. The idea is that being present with what is occurring while moving in sport (e.g., running) is an effective way to disengage from the reactions (such as worry, fatigue, or pain) that can so easily hijack attention, undermine control, and prevent immersion in the task at hand, all of which prevent flow and optimal-performance states (Csikszentmihalyi, 1990).

As was indicated in Session 1, it is crucial to distinguish between micromanaging or excessively scrutinizing well-learned abilities and carefully monitoring a present-moment anchor (such as feelings of movement). Focusing on step-by-step instructions for something that is already a well-trained talent might squander those resources and interfere with the efficiency attained with competence, while mindfulness can allow attentional resources to be allocated where they are most required. When one is paying attention to the mental directives more typical of a novice first trying to learn the skills, it is difficult to maintain control of the performance process. However, being mindful of core motions in a sport (i.e., observing them for what they are while they are occurring) can maximize control of the performance process.

Participants will be running while focusing on different physical motions throughout this activity. The present-moment anchors are the feelings brought on by these motions, and participants are encouraged to pay attention to how these sensations affect them. This meditation is not intended to teach how to run. Instead, the focus should be on being in the moment while running, letting go with each step. Participants may use the cues to pay attention to their motions as a general guide. They just need to focus on what applies to them. Running consciously might help you become aware of things that interfere with your performance. It is possible to have the flexibility to decide whether to operate more efficiently by accepting that these things exist without labeling them as "evil."

**Script for Running Meditation (From Kaufman, Glass & Pineau, 2018):** We now take the mindfulness skills that we have learned and apply them directly to your running. As in many of the other meditations we have done, you will use your body to help keep you connected

to the present moment. Although every individual runs a bit differently, we will use several common elements of running form as anchors for our attention. In addition to these specific movements, also try to maintain awareness of the sense of connectedness between all of your body parts. Recognize how each muscle and each motion play its unique parts in creating the greater whole that is your running. (Pause for 5 seconds.)

Now, begin running at a slow and relaxed pace, allowing your muscles to warm and stretch. As you run, allow your field of awareness to be filled with each of the following elements in turn. Also, keep in mind that this exercise, in itself, is not about maximizing speed or effort but about noticing the sensations in your body as you run, allowing all that arises through this experience to come and go without judgment. As you explore each component of your form, as best you can, allow your attention to remain expansive, taking in the entirety of your body and all of its sensations. (5 seconds)

First, take a moment to notice your breath. Are you breathing into your nose? Your mouth? Either way, there is no need to change it; just observe the natural experience of breathing as you run. Notice also where your breath is going. Breathing down into your belly, rather than into your chest, can allow your lungs to more efficiently get needed oxygen to your muscles. It can also help keep the body relaxed, saving you precious energy. As best you can, in the background of your awareness, maintain a gentle focus on your breath, perhaps periodically wondering to yourself, without any self-blame or reproach, but simply with a kindhearted curiosity, “Where is my breath going right now?” If you notice that you are not breathing into your belly, congratulate yourself on this connection with the present moment, and if you choose, you can



then give your body the gift of belly breathing. (5 seconds)

Once you have found a comfortable rhythm with your breath, allow your attention to shift to the placement of your head and the direction of your gaze. How is your head positioned? Is it sitting squarely atop your shoulders? If so, or if not, what does it feel like? Where is your gaze directed? Perhaps notice how looking out ahead of you a short distance or toward the horizon helps align your neck with your spine, allowing the muscles in your neck to stay loose and relaxed. Take a moment to explore with your attention the muscles in your forehead, cheeks, and jaw. Tension can sometimes reside in these places. Breathe with whatever you are experiencing and, on your next exhalation, allow your forehead to soften, your cheeks and jaw to slacken, letting any tension go. (5 seconds)

Next, allow your attention to shift down to your shoulders. Notice their positioning. Are they hunched up toward your ears? Are your shoulder blades pinched back behind you? Muscle tension can cause fatigue and can make running more difficult. If you notice any tension or tightness, explore this sensation for a moment, and on your next exhalation, allow the tension to drain from these muscles. Feel your shoulders drop with each exhalation, and let your shoulders stay loose as they gently sway back and forth with each stride you take. (5 seconds)

After you have scanned your head, neck, and shoulders, allow the focus of your attention to move down to your arms and hands. Notice the angle of your elbows, the rhythm created by the swinging of your arms. Observe how your arms are moving. Are they out away from your body, or do they brush up against you? Are your fingers loose and relaxed, or are your fists tight and clenched? Feel how the motion of your arms works in synchrony with your legs, propelling

you forward. As you breathe, see if you can allow your hands to relax, perhaps cupping them gently as if you were holding something small and delicate in your palms. Let your arms bend comfortably at the elbows. Permit your arms to swing rhythmically by your side, forward and back, between your waist and chest. Feel how this motion incorporates itself into the momentum of your body. (5 seconds)

Next, allow your attention to move down to your lower body. Notice the sensations in your hips as your legs swing back and forth. Feel the gentle alternation of flexion and relaxation in your quads and hamstrings as each leg switches from the driving leg to the recovering leg. Pay particular attention to the sensations in your feet, ankles, and knees as each foot contacts the ground. Notice what part of your foot hits the ground first, how your weight transfers through your foot with each step. Observe how high your knees come up with each stride and where you place your foot under your body with each step. (5 seconds) If you find any especially powerful sensations in any of these locations, allow yourself to note them and then let them fade gently into the background of your awareness. (5 seconds)

As we proceed, try to remain conscious of your breath going down into your belly. Allow the focus of your attention to now come to the soles of your feet. As each foot hits the ground, see if you can follow the sequence of pressure that travels through it. Observe your foot falling under your center of gravity with each stride. As each foot hits the ground, notice how the first point of pressure may be in your midfoot, just behind the outside of your little toe. If so, as your weight moves forward, the pressure may shift to the ball of the foot and then to the heel. Finally, as your center of gravity moves beyond the planted foot, the pressure may shift to your toes as



you push off of the ground, propelling yourself forward, allowing gravity to pull you down into your next step. Take some time to maintain a focus on this progression of pressure, from the ball of the foot at the foot plant, to the heel as your weight settles on your foot, and then to the toes as you push off the ground. This progression of pressure through your foot may happen very quickly, and, if you find it difficult to feel the sequence, that is okay. As you continue to focus your attention, you may find that, over time, you are able to notice finer details of your experience. If you find that your particular sequence of contact is different than this, that is okay too. Just notice your sequence and do your best to follow it, whatever it is. (5 seconds)

Now that you have scanned through these aspects of form in turn, allow your awareness to expand to your body as a whole and the sensations of running itself. Notice your posture. What does it feel like? Is your stance tall and erect or something different? Perhaps see if you can sense your body leaning forward slightly, how this lean comes from your ankles rather than your hips or back, and how it creates a subtle sense of falling into each step. Let the full experience of running wash over you. (5 seconds) Recognize the trust and acceptance so inherent in running. Just as breathing is a constant process of letting go, so too is running. You connect to the ground with each step, but to move forward you must let that connection go, let gravity take over, let the process be exactly what it is in each moment. (5 seconds)

If you find your mind wandering while you run, drawn away from the sensations in your body, perhaps by thoughts of where you need to go, what you need to do, or how fast you need to do it, that is just fine. Noticing this is a wonderful opportunity, and you can kindly congratulate yourself for taking advantage of it. This is part of your experience. This is neither good nor bad,

it just is. Once you have noticed that your mind has gone elsewhere, you may, with a mindful intention, bring your attention back to the anchor of your breath and the sensations of your stride. Although many moments have come and gone, and many are still to come, the moment that is right now is the only moment in which you live, the only moment in which you have control. It is a wonderful and generous thing to give yourself the opportunity to be in this moment, to truly experience your life and the wonders of running. (1 minute)

Now, begin to slow your pace and gradually come to a stop. (10 seconds) Once you have stopped, close your eyes, take some deep breaths, and notice any sensations in your body after having done this exercise. (5 seconds) When you are ready, gently open your eyes and bring your attention back to the world around you (Kaufman, Glass & Pineau, 2018, pp. 131-133).

### *Home Practice for Session 3*

Home practice for Session 3 will include the following (all participants will receive an Email listing the home practice requirements):

1. **Practice sitting meditation with a focus on the breath, body, and sound.**

Participants should complete the 15-minute body scan at least one time before the fourth session.

2. **Practice walking meditation.** Participants should practice for 10 minutes walking meditation at least one times before the fourth session.

3. **Practice running meditation.** Participants should complete a running meditation at least one time before the fourth session. During the running meditation, participants should focus on their breath and their body.

4. **Diaphragmatic Breathing.** Participants should sit for 5 minutes practicing awareness

of their breathing at least three times before the fourth session.

### **5. Record mindfulness practice and flow experience log.**

Each time participants engage in breathing exercise, they should record the date, the length of their practice session, and any comments they have in the Daily Mindfulness Log they will receive. They should record the flow experience after running in Flow State Log including the date.

The facilitator will remind all the participants how crucial home practice is to mindfulness training at the summary part and have a discussion with the participants how they could put those practices into their time schedules.

### **Session 4 (Approximately 2.5 Hours)**

Session 4 will be the close session of the intervention. Only one meditation will be introduced in this session. Participants will discuss their experience of running meditation before the conclusion of this final session.

#### *Running Meditation Discussion*

Participants are given the option to talk about their experiences and responses of the running meditation. It is still crucial for facilitator to react to any observations, inquiries, or concerns with consideration. They may assist this conversation by devoting 2 to 3 minutes to each of the following open-ended questions, for example:

1. What stood out to you while you engaged in this running meditation?
2. How does this activity compare to previous MSPE meditations you've participated in?
3. What was it like to practice conscious execution of running?

#### 4. How may your ability to compete be affected if you use this kind of attention?

##### *Sitting Meditation with a Focus on the Body as a Whole*

This sitting meditation instructs participants to direct their attention away from the breath and onto the whole body. Segal et al. (2002)'s sitting meditation with awareness of the breath and body served as the foundation for this development.

Participants might be informed by the facilitator that this sitting meditation is similar to the one so far, but is a little longer and has an extra anchor for attention. Similar to how increasing weight at the gym makes the body stronger, improving on meditation techniques in this manner may strengthen the mind. Participants might be reminded that it is normal for the mind to wander when engaging in this kind of activity.

**Script for sitting meditation with a focus on the body as a whole (From Kaufman, Glass & Pineau, 2018):** Your field of awareness has been filled with the experience of your breath. Now, allow your awareness to expand beyond the sensations associated with the rising and falling in your torso and the air flowing in and out of your nose. Begin to take in the sensations from the rest of your body. Maybe you can feel your heart beat in your chest or the pulsation in your legs or your arms as your heart completes each contraction. Perhaps you can feel a slight tingling in your fingertips, the sensation of the air on places where your skin is bare, or the feeling of your clothes resting against your skin. Your body is sensing all the time. As best you can, notice this vast array of sensations as your entire body hums with life. (Pause for 10 seconds.)

Using your attention, explore your body with a gentle curiosity. Maybe you notice the

pressure of contact where your body touches your seat, or where your hands are resting on your body. And, as you explore, note the changes in the boundaries of your awareness. Can you, in the same moment, be aware of the rhythm of your breath, the feeling of your clothes on your skin, and the tension in your muscles? If possible, allow your attention to settle on the full, rich experience of your entire body in this moment. (10 seconds)

If you are noticing that your mind is drawn to one sensation in particular, in just one part of your body, that's fine. That is not a failure or a mistake. That is your body communicating with you. Maybe you notice tightness in a particular muscle, an itch, or even a sensation of pain or discomfort. Take a moment to explore the sensation. It is asking for your attention. As best you can, welcome it into your experience. These kinds of sensations are a part of what makes your life so rich. (5 seconds) Also, notice your mind's reaction to this sensation. Do you feel the desire to shift in your seat or to scratch the itch? You may choose to respond to this desire or not. If you do respond, observe the process of this response in its entirety, maybe even noting how often we react to such desires so automatically that we miss the complexity of these experiences. If you do not respond, then just allow your attention to rest on the sensation, observing how it changes, how its intensity rises and falls.

These sensations are like waves on the ocean. Though they may swell to enormous heights, they eventually dissipate. They are just on the surface and cannot disrupt the immensity of the calm sea below. (5 seconds) Once you have observed this sensation and have respectfully acknowledged your body's communication, let it go, allowing your attention to expand, taking in the entirety of your body in this moment. (1 minute)



Now, begin to draw this experience to a close. Feel where your hands are positioned on your body and the points of contact between your body and the ground. Notice any feelings that may have been generated by this practice. Take three deep breaths as you sit with these feelings. (10 seconds) When you are ready, gently open or refocus your eyes, and bring your awareness back to the world around you. (Kaufman, Glass & Pineau, 2018, pp. 111).

### *Sitting Meditation with a Focus on the Body as a Whole Discussion*

Participants will get the opportunity to share their thoughts and feelings after this sitting meditation. Once again, it's crucial to address any observations, queries, or worries that are brought up with consideration. Allowing two to three minutes for each of the following open-ended questions can help leaders promote this discussion:

1. During this extended sitting meditation, what did you feel?
2. How does it feel to include a second anchor into the sitting meditation?
3. How has your capacity to focus on and come back to an anchor changed?
4. How may concentrating on your whole body improve your ability to compete in running?

### *Conclusion and Continued Practice*

During the last session, facilitator will set time aside for participants to reflect on their experiences in the mindfulness training. As suggested by Segal et al. (2002), facilitator will ask the participants to reflect on a number of questions, including:

1. Think back to why you came originally. What were your expectations and why did you keep coming back?

2. What did you want or hope for?
3. What did you get out of coming, if anything? What did you learn?
4. What were the costs to you?
5. What are your biggest blocks or obstacles to continuing?
6. What strategies might benefit in your flow experience?

As usual, it will be critical for the facilitator to respond mindfully to the responses of the participants. Facilitator may then give a last reminder of the benefits of being aware, accepting, and reacting to events mindfully, rather than acting on preprogrammed, reflexive responses (Segal et al., 2002). Suggestions for further practice setting up and maintaining practice in the absence of weekly sessions is a major difficulty for all participants (Segal et al., 2002). Therefore, the facilitator will offer the following suggestions for incorporating mindfulness practice into everyday life as Kabat-Zinn (2009) suggested:

1. Sit every day and concentrate on the breathing. It could be a sitting meditation for at least 20-30 minutes at a time, or the body scan for at least 5-10 minutes each day. Sit for 3 minutes, or even 1 minute at least. No matter how hectic one's day becomes, there should be minimums 1 minute in the day to sit and concentrate on the breath.

2. Try to sit in the morning if possible. It may have a beneficial impact on the rest of the day. Other excellent times to practice include immediately after coming home from work, before lunch, in the evening or late at night, or whenever having spare time.

3. If considering one of the meditations to be the primary form of practice (e.g., the body scan), it is suggested to practice it every day for at least 20 minutes and ideally 30-45 minutes.



4. It will also be important to incorporate mindfulness techniques into running routines.

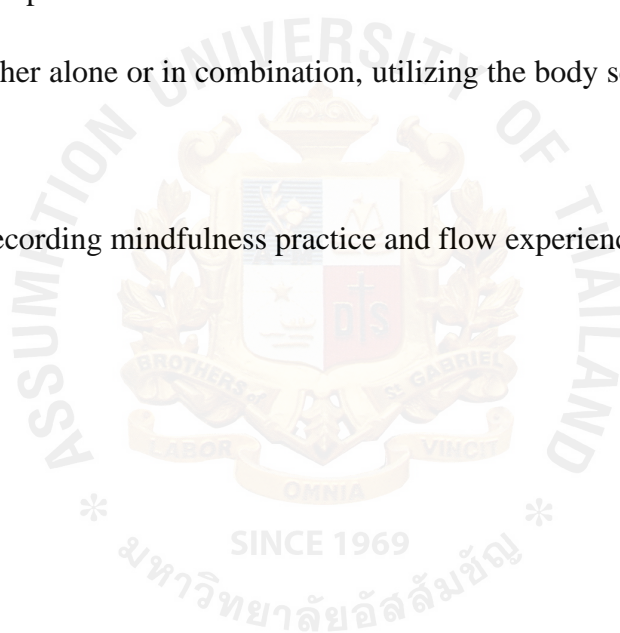
It is suggested to find time to practice running mindfully.

#### *Potential follow-up*

The researcher currently plans to follow up with participants after approximately 1 year.

Thus, participants should, if possible, do the following (all participants will receive an Email reminder for describing continued home practice):

1. Continue to practice mindfulness meditation at least six times per week for 30-45 minutes each day, either alone or in combination, utilizing the body scan, sitting meditation, or walking meditation.
2. Maintain recording mindfulness practice and flow experience log.



## Appendix H

### Demographic Question (English)

Question	Choices
Age	a) 18-29 b) 30-39 c) 40-49 d) 50-59 e) Above 60
Gender	a) Male b) Female
Highest education	a) Less than a high school diploma b) High school diploma or equivalent degree c) Bachelor's degree d) Master's degree e) Ph.D. or higher
Height	_____ cm
Weight	_____ Kg
How would you rate your present health condition?	a) Poor b) Fair c) Good d) Excellent
Is there any physical activity that you perform at least 20 min without stopping, three times a week, which is vigorous enough to make you breathe hard and sweat?	a) Yes b) No
Have you ever started an exercise program and dropped out for a while?	a) Yes b) No
Have you exercised regularly for the past year?	a) Yes b) No
Have you ever got physical injured because of exercising	a) Yes (How many times? _____) b) No

## Appendix I

## Demographic Question (Chinese)

问题	选项
年龄	a) 18-29 b) 30-39 c) 40-49 d) 50-59 e) Above 60
性别	a) 男 b) 女
最高学历	a) 高中以下学历 b) 高中学历 c) 本科学历 d) 研究生学历 (含在职研究生) e) 博士学历或以上
身高	_____ cm
体重	_____ Kg
目前的健康状况?	a) 差 b) 一般 c) 好 d) 非常好
请回想最近, 你有没有做过每周三次、每次至少20分钟让您出汗的体育活动?	a) 有 b) 无
您是否曾经开始了一个锻炼计划, 然后中途放弃了一段时间?	a) 是 b) 否
在过去的一年里您经常锻炼吗?	a) 是 b) 否
你曾经因为运动而受伤吗?	a) 是 (多少次? _____) b) 否

## Appendix J

### English Version of Dispositional Flow Scale-2

Please answer the following questions in relation to your experience during running. These questions relate to the thoughts and feelings you may experience while running. You may experience these characteristics some of the time, all of the time, or none of the time. There are no right or wrong answers. Think about how often you experience each characteristic during running and click next to the answer that matches your experience.

		Never	Very Infrequentl y	Somewhat Infrequentl y	Somewhat Frequently	Very Frequently	Almost always
1	I am challenged, but I believe my skills will allow me to meet the challenge.	1	2	3	4	5	6
2	I make the correct movements without thinking about trying to do so.	1	2	3	4	5	6
3	I know clearly what I want to do.	1	2	3	4	5	6
4	It is really clear to me how my performance is going.	1	2	3	4	5	6
5	My attention is focused entirely on what I am doing.	1	2	3	4	5	6
6	I have a sense of control over what I am doing.	1	2	3	4	5	6
7	I am not concerned with what others may be thinking of me.	1	2	3	4	5	6
8	Time seems to alter (either slows down or speeds up).	1	2	3	4	5	6
9	I really enjoy the experience.	1	2	3	4	5	6
10	My abilities match the challenge of the situation.	1	2	3	4	5	6
11	Things just seem to happen automatically.	1	2	3	4	5	6
12	I have a strong sense of what I want to do.	1	2	3	4	5	6
13	I am aware of how well I am performing.	1	2	3	4	5	6

Please answer the following questions in relation to your experience during running. These questions relate to the thoughts and feelings you may experience while running. You may experience these characteristics some of the time, all of the time, or none of the time. There are no right or wrong answers. Think about how often you experience each characteristic during running and click next to the answer that matches your experience.

	Never	Very Infrequently	Somewhat Infrequently	Somewhat Frequently	Very Frequently	Almost always
14 It is no effort to keep my mind on what is happening.	1	2	3	4	5	6
15 I feel like I can control what I am doing.	1	2	3	4	5	6
16 I am not concerned with how others may be evaluating me.	1	2	3	4	5	6
17 The way time passes seems to be different from normal.	1	2	3	4	5	6
18 I love the feeling of the performance and want to capture it again.	1	2	3	4	5	6
19 I feel I am competent enough to meet the high demands of the situation.	1	2	3	4	5	6
20 I perform automatically, without thinking too much.	1	2	3	4	5	6
21 I know I want to achieve.	1	2	3	4	5	6
22 I have a good idea while I am performing about how well I am doing.	1	2	3	4	5	6
23 I have total concentration.	1	2	3	4	5	6
24 I have a feeling of total control.	1	2	3	4	5	6
25 I am not concerned with how I am presenting myself.	1	2	3	4	5	6
26 It feels like time goes by quickly.	1	2	3	4	5	6
27 The experience leaves me feeling great.	1	2	3	4	5	6

*Please answer the following questions in relation to your experience during running. These questions relate to the thoughts and feelings you may experience while running. You may experience these characteristics some of the time, all of the time, or none of the time. There are no right or wrong answers. Think about how often you experience each characteristic during running and click next to the answer that matches your experience.*

	Never	Very Infrequent ly	Somewhat Infrequent ly	Somewhat Frequently	Very Frequently	Almost always
28 The challenge and my skills are at an equally high level.	1	2	3	4	5	6
29 I do things spontaneously and automatically without having to think.	1	2	3	4	5	6
30 My goals are clearly defined.	1	2	3	4	5	6
31 I can tell by the way I am performing how well I am doing.	1	2	3	4	5	6
32 I am completely focused on the task at hand.	1	2	3	4	5	6
33 I feel in total control of my body.	1	2	3	4	5	6
34 I am not worried about what others may be thinking of me.	1	2	3	4	5	6
35 I lose my normal awareness of time.	1	2	3	4	5	6
36 The experience is extremely rewarding.	1	2	3	4	5	6



## Appendix K

### English version of the Mindful Attention Awareness Scale (MAAS)

*Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.*

		Never	Very Infrequentl y	Somewhat Infrequentl y	Somewhat Frequently	Very Frequently	Almost always
1	I could be experiencing some emotion and not be conscious of it until some time later.	1	2	3	4	5	6
2	I break or spill things because of carelessness, not paying attention, or thinking of something else.	1	2	3	4	5	6
3	I find it difficult to stay focused on what's happening in the present.	1	2	3	4	5	6
4	I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1	2	3	4	5	6
5	I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1	2	3	4	5	6
6	I forget a person's name almost as soon as I've been told it for the first time.	1	2	3	4	5	6
7	It seems I am "running on automatic," without much awareness of what I'm doing.	1	2	3	4	5	6
8	I rush through activities without being really attentive to them.	1	2	3	4	5	6
9	I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.	1	2	3	4	5	6
10	I do jobs or tasks automatically, without being aware of what I'm doing.	1	2	3	4	5	6
11	I find myself listening to someone with one ear, doing something else at the same time.	1	2	3	4	5	6
12	I drive places on 'automatic pilot' and then wonder why I went there.	1	2	3	4	5	6
13	I find myself preoccupied with the future or the past.	1	2	3	4	5	6
14	I find myself doing things without paying attention.	1	2	3	4	5	6
15	I snack without being aware that I'm eating.	1	2	3	4	5	6



Appendix L

Chinese version of the Mindful Attention Awareness Scale (MAAS)

下面是您每天经历的描述。有1至6个不同程度的选项，请根据您最近几天的状态选择不同的选项						
	从不	很少	偶尔	有时	经常	总是
1 我无法在当时就立刻意识到我的情绪，总要推迟一会儿才能意识到。	1	2	3	4	5	6
2 我会由于走神或者粗心大意而把事情搞砸。	1	2	3	4	5	6
3 我发现我很难把注意力集中在当下发生的事情。	1	2	3	4	5	6
4 我喜欢快速地到达我想去的地方，而不关心沿途的风景。	1	2	3	4	5	6
5 我不去注意自己身体的感觉，除非有非常明显的不适感。	1	2	3	4	5	6
6 新的朋友如果只告诉我一次他/她的名字，我会记不住。	1	2	3	4	5	6
7 我总是机械地行动，而不去注意我在做些什么。	1	2	3	4	5	6
8 我匆匆忙忙地参加活动，而不去想这个活动的意义。	1	2	3	4	5	6
9 我把注意力放在要达到的目标上，而不是在当下要做的事情上。	1	2	3	4	5	6
10 我机械地工作，而不关心我在做些什么。	1	2	3	4	5	6
11 我发现自己可以一边听别人讲话，一边做自己的事情。	1	2	3	4	5	6
12 我机械地开车去一个地方，然后才去想，我为什么到这儿。	1	2	3	4	5	6
13 我发现自己会沉浸在过去的事情或未来的想象中。	1	2	3	4	5	6
14 我发现自己做事情注意力不集中。	1	2	3	4	5	6
15 我吃东西的时候，不注意我吃的是什么。	1	2	3	4	5	6

## Appendix M

### English Version of Ruminative Responses Scale (RRS)

*People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate what you generally do, not what you think you should do.*

		Never	Very Infrequentl y	Somewhat Infrequentl y	Somewhat Frequently	Very Frequently	Almost always
1	Think "What am I doing to deserve this?"	1	2	3	4	5	6
2	Analyze recent events to try to understand why you are depressed.	1	2	3	4	5	6
3	Think "Why do I always react this way?"	1	2	3	4	5	6
4	Go away by yourself and think about why you feel this way.	1	2	3	4	5	6
5	Write down what you are thinking about and analyze it.	1	2	3	4	5	6
6	Think about a recent situation, wishing it had gone better.	1	2	3	4	5	6
7	Think "Why do I have problems other people don't have?"	1	2	3	4	5	6
8	Think "Why can't I handle things better?"	1	2	3	4	5	6
9	Analyze your personality to try to understand why you are depressed.	1	2	3	4	5	6
10	Go someplace alone to think about your feelings.	1	2	3	4	5	6

## Appendix N

## Chinese Version of Ruminative Responses Scale (RRS)

每个人多多少少都会经历一些郁闷的事情，这时就会去想或做一些不同的事。请试想您在郁闷的时候，可能会想或可能会做的一些事，根据现在的程度，选择符合自己实际情况的选项。

从不 很少 偶尔 有时 经常 总是

	1	2	3	4	5	6
1 我常常想 “我究竟做了什么会导致这样？”	1	2	3	4	5	6
2 我常常分析最近发生的事情，一边解释为什么感到郁闷	1	2	3	4	5	6
3 我常常想 “我为什么这样”	1	2	3	4	5	6
4 我常常独自思考 “我为什么会有这种感觉”	1	2	3	4	5	6
5 我常常写下自己的想法并加以分析	1	2	3	4	5	6
6 我常常思考现状，并且希望它有所好转	1	2	3	4	5	6
7 我常常想 “为什么我有这些问题，而其他人没有”	1	2	3	4	5	6
8 我常常想 “我为什么不能将事情处理的更好”	1	2	3	4	5	6
9 我常常分析自己的性格一边理解为何感到压抑	1	2	3	4	5	6
10 我会常常单独到某个地方去考虑我的感受	1	2	3	4	5	6

## Appendix O

### English Version of Sports Passion Scale (SPS)

<i>While thinking of your running habit and using the scale below, please indicate your level of agreement with each item.</i>		<i>Not Agree at All</i>	<i>Slightly Agree</i>	<i>Moderately Agree</i>	<i>Mostly Agree</i>	<i>Strongly Agree</i>	<i>Very Strongly Agree</i>
1	My sport is in harmony with the other activities in my life.	1	2	3	4	5	6
2	The new things that I discover through sport allow me to appreciate it even more.	1	2	3	4	5	6
3	My sport reflects the qualities I like about myself.	1	2	3	4	5	6
4	My sport allows me to live a variety of experiences.	1	2	3	4	5	6
5	My sport is well integrated in my life.	1	2	3	4	5	6
6	My sport is in harmony with other things that are part of me.	1	2	3	4	5	6
7	I have difficulties controlling my urge to practice my sport.	1	2	3	4	5	6
8	I have almost an obsessive feeling for my sport.	1	2	3	4	5	6
9	My sport is the only thing that really turns me on.	1	2	3	4	5	6
10	If I could, I would only participate in my sport.	1	2	3	4	5	6
11	My sport is so exciting that I sometimes lose control over it.	1	2	3	4	5	6
12	I have the impression that my sport controls me.	1	2	3	4	5	6

## Appendix P

## Chinese Version of Sports Passion Scale (SPS)

请根据您对跑步的喜好程度，选择一个最符合自己的选项，答案没有对错之分。

完全不  
同  
1  
非常不  
同  
2  
比较不  
同  
3  
比较  
同  
4  
非常同  
5  
完全同  
6

1 活动能让我过着各种经验的生活	1	2	3	4	5	6
2 活动中我所能发现的新事物会让我更欣赏这项活动	1	2	3	4	5	6
3 活动能反映出我自己的品味	1	2	3	4	5	6
4 活动与我生活中的其他活动相互协调	1	2	3	4	5	6
5 我对于活动机会有了迷恋的感觉	1	2	3	4	5	6
6 这活动是唯一能让我开心高兴的事	1	2	3	4	5	6
7 我钟爱的活动融入我的生活中	1	2	3	4	5	6
8 我无法控制想去参与我的活动的冲动	1	2	3	4	5	6
9 可以的话，我只想从事这项活动	1	2	3	4	5	6
10 我钟爱的活动和其他事情成就了完整的我	1	2	3	4	5	6
11 从事活动的兴奋有时让我失去控制	1	2	3	4	5	6
12 我有种我从事的活动控制了我的感觉	1	2	3	4	5	6

## Appendix Q

### Exercise Maintenance

*Running refers to using your large muscle groups, is done for at least 20 minutes, and is performed at a level that causes your breathing rate to be heavy and your heart to beat faster. Here are a number of statements describing various levels of running. Please select the one that closely describes your own level:*

	<i>Not Agree at All</i>	<i>Slightly Agree</i>	<i>Moderately Agree</i>	<i>Mostly Agree</i>	<i>Strongly Agree</i>	<i>Very Strongly Agree</i>
1 I am finally running regularly.	1	2	3	4	5	6
2 I have started running regularly within the last 6 months.	1	2	3	4	5	6
3 Recently, I have started running regularly.	1	2	3	4	5	6
4 I have started to run regularly, and I plan to continue.	1	2	3	4	5	6
5 I have been running regularly for a long time and I plan to continue.	1	2	3	4	5	6
6 I have been successful at running regularly and I plan to continue.	1	2	3	4	5	6
7 I have managed to keep running regularly through the last 6 months.	1	2	3	4	5	6
8 I have completed 6 months of regular running.	1	2	3	4	5	6



## Appendix R

## Chinese version of Exercise Maintenance

跑步指的是使用您的大肌肉群，至少进行20分钟，并在一定程度上使您的呼吸频率沉重，您的心跳加快。下面是一些描述不同跑步情况的语句。请选择一个贴切您的描述：

完全  
不同  
经常不  
同  
比较不  
同  
比较  
同  
经常同  
完全同

- |                                |   |   |   |   |   |   |
|--------------------------------|---|---|---|---|---|---|
| 1 我终于在规律的跑步了。                  | 1 | 2 | 3 | 4 | 5 | 6 |
| 2 在过去六个月内，我已经开始规律的跑步。          | 1 | 2 | 3 | 4 | 5 | 6 |
| 3 我最近开始规律的跑步。                  | 1 | 2 | 3 | 4 | 5 | 6 |
| 4 我已经开始规律的运动，而且我计划持续下去。        | 1 | 2 | 3 | 4 | 5 | 6 |
| 5 我已经规律跑步了很长的一段时间，而且我计划继续保持下去。 | 1 | 2 | 3 | 4 | 5 | 6 |
| 6 我成功地规律跑步，而且我计划继续保持下去。        | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 在过去的六个月，我已经设法持续规律的跑步了。       | 1 | 2 | 3 | 4 | 5 | 6 |
| 8 我已经完成六个月的规律跑步。               | 1 | 2 | 3 | 4 | 5 | 6 |



**Appendix S**

**Topics of Semi-structural Interviews**

1.	What did you like most about this mindfulness training workshop?
2.	What component(s) of this mindfulness workshop was most difficult or challenging for you?
3.	How, if at all, has this workshop affected your flow experience during running?
4.	If you continue to practice what you learned in this workshop, how do you expect this training will affect your flow experience during running in the future?
5.	How, if at all, has this training affected aspects of your life other than running?
6.	What was helpful in this mindfulness training workshop?
7.	What was unhelpful in this mindfulness training workshop?
8.	What has changed for you since you began to attend?
9.	Explain how do you feel the group went? What were some of your favorite things about the group?
10.	What recommendations do you have to improve this mindfulness workshop?

## Appendix T

### Short-Answer Coding Manual

Question 1: What did you like most about this mindfulness training workshop?
(1) = Group discussion/interaction
(2) = Helped with relaxation/reducing stress
(3) = Learning to stay in the moment
(4) = Learning a new way of being/thinking
(5) = Other
Question 2: What component(s) of this mindfulness workshop was most difficult or challenging?
(1) = Having time to practice between sessions
(2) = Completing lengthy meditation activities
(3) = A particular meditation activity (e.g., sitting meditation, body scan)
(4) = Being part of a group
(5) = Other
Question 3: How, if at all, has this workshop affected your flow experience?
(1) = Not sure yet, it is too soon to tell
(2) = enhanced flow experience
(3) = More focused on present moment/task at hand
(4) = Improved mental aspects
(5) = No effect
(6) = Other
Question 4: If you continue to practice what you learned in this workshop, how do you expect this training will affect your flow experience in the future?
(1) = enhance flow experience
(2) = Help with maintaining a positive attitude
(3) = Improve focus on the present moment
(4) = Will not help in the future
(5) = Other
Question 5: How, if at all, has this training affected aspects of your life other than running?
(1) = Helped cope with stress/remain calm
(2) = Helping stay more present-focused
(3) = Noticed self being less judgmental/more open-minded
(4) = No Improvement
(5) = Other
Question 6: What recommendations do you have to improve this mindfulness workshop?
(1) = Make it longer/include more sessions
(2) = Individual sessions too lengthy
(3) = More group discussion/larger groups
(4) = More individualized attention
(5) = No suggestions/fine as is
(6) = Other

## Appendix U

### Daily Mindfulness Log

Please monitor your daily mindfulness skills practice in the log below. Make a note of anything that comes up in your practice, so that we can talk about it at the next meeting.

Week:

Day/Date	Mindfulness Practice	Comments
Saturday Date:	Yes or No (circle one) Length: min.	
Sunday Date:	Yes or No (circle one) Length: min.	
Monday Date:	Yes or No (circle one) Length: min.	
Tuesday Date:	Yes or No (circle one) Length: min.	
Wednesday Date:	Yes or No (circle one) Length: min.	
Thursday Date:	Yes or No (circle one) Length: min.	
Friday Date:	Yes or No (circle one) Length: min.	

Appendix V

Flow Experience Log

Please monitor your flow experience after every time you finishing running in the log below.

Week:

Day/Date	Running Record		Flow experience		How you felt about your running
Date:	Time:	mins.	low	high	
			Challenges of the activity:	0 1 2 3 4 5 6 7 8 9	
	Length:	Kms.	Your skills in the activity:	0 1 2 3 4 5 6 7 8 9	
Date:	Time:	mins.	low	high	
			Challenges of the activity:	0 1 2 3 4 5 6 7 8 9	
	Length:	Kms.	Your skills in the activity:	0 1 2 3 4 5 6 7 8 9	
Date:	Time:	mins.	low	high	
			Challenges of the activity:	0 1 2 3 4 5 6 7 8 9	
	Length:	Kms.	Your skills in the activity:	0 1 2 3 4 5 6 7 8 9	

## Appendix W

### Exit Questionnaire (English)

*On a scale of 1 (low) to 6 (high), please rate your reaction to this mindfulness workshop and respond to each of the following questions.*

1. How logical did this workshop seem to you?

1	2	3	4	5	6
Not Logical					Very Logical

2. How confident are you that this workshop will be successful in enhancing flow experience in your running?

1	2	3	4	5	6
Not at all Successful					Very Successful

3. How confident would you be in recommending this workshop to a friend who also is a long distance running exerciser?

1	2	3	4	5	6
Not at all Recommend					Definitely Recommend

4. How successful do you feel this workshop would be in enhancing flow experience in your other activities?

1	2	3	4	5	6
Not at all Successful					Very Successful

5. In general, how satisfied are you with your flow experience after completing this workshop?

1	2	3	4	5	6
Not at all Successful					Very Successful

---

**1. What did you like most about this mindfulness training workshop?**

**2. What component(s) of this mindfulness workshop was most difficult or challenging for you?**

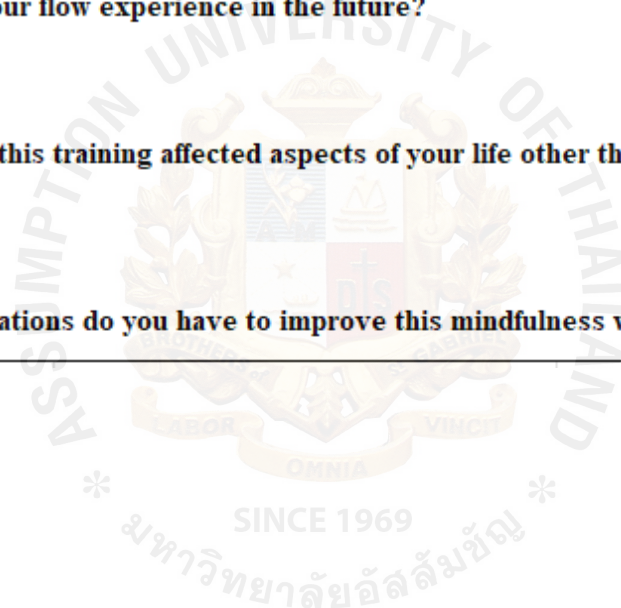
**3. How, if at all, has this workshop affected your flow experience?**

**4. If you continue to practice what you learned in this workshop, how do you expect this training will affect your flow experience in the future?**

**5. How, if at all, has this training affected aspects of your life other than running?**

**6. What recommendations do you have to improve this mindfulness workshop?**

---



## Appendix X

## Exit Questionnaire (Chinese)

请以1(低)到6(高)为分值，评估你对这个正念训练工作坊的看法，并回答以下每个问题。

1. 您觉得这个正念训练工作坊合乎逻辑吗？

1                      2                      3                      4                      5                      6

一点也不逻辑

非常有逻辑

2. 您有多大的信心，这个正念训练工作坊将成功地提高您在跑步过程中的心流体验？

1                      2                      3                      4                      5                      6

一点也不成功

非常成功

3. 您会把这个工作坊推荐给一个同样喜欢长跑的朋友？

1                      2                      3                      4                      5                      6

一点也不推荐

强烈推荐

4. 您觉得这个正念训练在提升您其他活动中的心流体验方面有多成功？

1                      2                      3                      4                      5                      6

一点也不成功

非常成功

5. 总的来说，在完成这个正念训练后，您对您的心流体验有多满意？

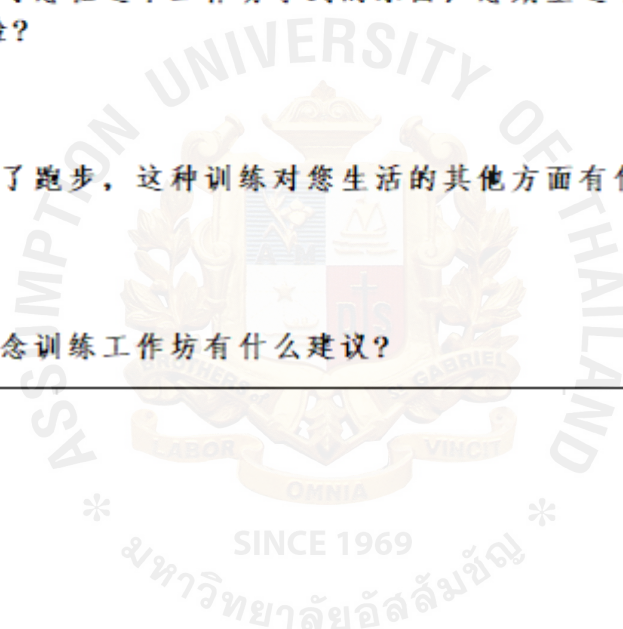
1                      2                      3                      4                      5                      6

一点也不成功

非常成功



- 
1. 关于这个正念训练工作坊，您最喜欢的内容是什么？  
.....
  2. 这个正念工作坊的哪些部分对您来说是最困难或最具挑战性的？  
.....
  3. 总体而言，这个研讨会对您的心流体验有什么影响？  
.....
  4. 如果您继续练习您在这个工作坊学到的东西，您期望这个训练在未来会如何影响您的心流体验？  
.....
  5. 总体而言，除了跑步，这种训练对您生活的其他方面有什么影响？  
.....
  6. 您对本次的正念训练工作坊有什么建议？  
.....
- 



## Appendix Y

### R Script for Study I, Study II and Study III

#### *Study I*

```
>library(psych)
```

```
>KMO(dat)
```

```
>cortest.bartlett(dat)
```

```
>scree(dat)
```

```
>fa.parallel(dat)
```

```
>fac1<-factanal(dat, 9, rotation = "promax")
```

```
>print(fac1, cutoff = .30)
```

```
>write.csv(fac1$loadings, "d:/1/efa-factor-loadings-1.csv")
```

```
>CVratio(dat)
```

```
>library(lavaan)
```

```
CFA_model <-'
```

```
CF1 =~Q1+Q10+Q19+Q28
```

```
CF2 =~Q2 + Q11 + Q20 + Q29
```

```
CF3 =~Q3 + Q12 + Q21 + Q30
```

```
CF4 =~Q4 + Q13 + Q22 + Q31
```

```
CF5 =~Q5 + Q14 + Q23 + Q32
```

```
CF6 =~Q6 + Q15 + Q24 + Q33
```

```
CF7 =~Q7 + Q16 + Q25 + Q34
```

$CF8 = \sim Q8 + Q17 + Q26 + Q35$

$CF9 = \sim Q9 + Q18 + Q27 + Q36$

```
fit<-cfa(CFA_model, data=dat)
```

```
fitmeasures(fit, "IFI")
```

```
summary(fit,fit.measures = TRUE, standardized = TRUE)
```

```
standardizedSolution(fit)
```

```
>inspect(fit, 'r2')
```

```
>cov2cor(inspect(fit, what = "est")$psi)
```

```
>lavCor(fit)
```

```
>moreFitIndices(fit, fit.measures = "all", nPrior = 1)
```

```
>library(semTools)
```

```
>reliability(fit)
```

```
>semPaths(fit, whatLabels = "std", edge.label.cex = 1)
```

```
>alpha(dat)
```

```
>library(Hmisc)
```

```
>matrx <- rcorr(as.matrix(dat))
```

```
>write.csv(matrx,"d:/1/sample1-inter-item correlations.csv",quote=F,row.name=F)
```

```
>library(performance)
```

```
>item_intercor(dat)
```

```
>item_difficulty(dat)
```

```
>library(readxl)
```

```

>library(psych)

>View(dat)

>attach(dat)

>ICC(dat,missing=TRUE,alpha=.05,lmer=TRUE,check.keys=FALSE)

>library(irr)

>icc(dat, model = "twoway", type = "agreement", unit = "single")

>CFA_model <-'
CF1 =~Q1+Q10+Q19+Q28
CF2 =~Q2 + Q11 + Q20 + Q29
CF3 =~Q3 + Q12 + Q21 + Q30
CF4 =~Q4 + Q13 + Q22 + Q31
CF5 =~Q5 + Q14 + Q23 + Q32
CF6 =~Q6 + Q15 + Q24 + Q33
CF7 =~Q7 + Q16 + Q25 + Q34
CF8 =~Q8 + Q17 + Q26 + Q35
CF9 =~Q9 + Q18 + Q27'

>fit<-cfa(CFA_model, data=dat)

>fitmeasures(fit, "IFI")

>summary(fit,fit.measures = TRUE, standardized = TRUE)

>standardizedSolution(fit)

>cov2cor(inspect(fit, what = "est")$psi)

```

```

>lavInspect(fit, "cov.ov")

>inspect(fit, 'r2')

>summary(fit, rsquare=TRUE)

>library(lavaan)

>library(rsq)

>rsq(fit)

>CFA_model <-'
hp =~Q36+Q37+Q38+Q39+Q40+Q41
op =~Q42+Q43+Q44+Q45+Q46+Q47'

>fit<-cfa(CFA_model, data=dat)

>fitmeasures(fit, "all")

>summary(fit,fit.measures = TRUE, standardized = TRUE)

>standardizedSolution(fit)

>reliability(fit)

>inspect(fit, 'r2')

>KMO(dat)

>cortest.bartlett(dat)

>CFA_model <-'
maas =~Q56 + Q57 + Q58 + Q59 + Q60 + Q61 + Q62 + Q63 + Q64 + Q65 + Q66 + Q68
+ Q69 + Q70 '

>fit<-cfa(CFA_model, data=dat)

```

```

>fitmeasures(fit, "all")

>summary(fit,fit.measures = TRUE, standardized = TRUE)

>standardizedSolution(fit)

>reliability(fit)

>inspect(fit, 'r2')

>KMO(dat)

>cortest.bartlett(dat)

>CFA_model <-'
em =~Q48+Q49+Q50+Q51+Q52+Q53+Q54+Q55'

>fit<-cfa(CFA_model, data=dat)

>fitmeasures(fit, "all")

>summary(fit,fit.measures = TRUE, standardized = TRUE)

>standardizedSolution(fit)

>inspect(fit, 'r2')

>reliability(fit)

>KMO(dat)

>cortest.bartlett(dat)

>CFA_model <-'
or =~Q71+Q73+Q76+Q77+Q78
dr =~Q72+Q74+Q75+Q79+Q80'

>fit<-cfa(CFA_model, data=dat)

```

```

>fitmeasures(fit, "all")

>summary(fit, fit.measures = TRUE, standardized = TRUE)

>standardizedSolution(fit)

>reliability(fit)

>inspect(fit, 'r2')

>KMO(dat)

>cortest.bartlett(dat)

>lavInspect(fit, "cov.lv")

```

## Study II

```

>library(lavaan)

>model <- '

  MAAS ~ a1*HP

  DFS ~ a2*HP + d1*MAAS + a3*OP

  R ~ a4*OP + d2*DFS + d3*MAAS

  HP ~~ OP

  EM ~ b2*DFS + b1*MAAS + b3*R + c1*HP

# indirect effect

  ie1 := a1*d1*b2

  ie2 := a1*d3*b3

  ie3 := d2*b3

```



ie4 := a2\*d2\*b3

ie5 := a1\*d1\*d2\*b3

ie6 := a1\*b1

ie7 := a2\*b2

ie8 := a4\*b3

ie9 := a3\*b2

ie10 := a3\*d2\*b3

# total effect

total := c1 + (a1\*d1\*b2) + (a1\*d3\*b3) + (d2\*b3)  
 + (a1\*d1\*d2\*b3) + (a1\*b1) + (a2\*b2) + (a4\*b3) + (a2\*d2\*b3)  
 + (a3\*b2) + (a3\*d2\*b3)

>fit <- sem(model, data = dat, se="bootstrap", bootstrap = 5000)

>summary(fit, fit.measure = TRUE, standardized = TRUE, rsquare = TRUE)

>fitmeasures(fit, "all")

>standardizedSolution(fit)

>parameterEstimates(fit, standardized=TRUE, rsquare = TRUE)

>lavResiduals(fit)

>lavCor(fit)

>inspect(fit, 'r2')

>lm(EM~HP, data=dat)

```
>model <- '
```

```
MAAS ~ a1*HP
```

```
DFS ~ a2*HP + d1*MAAS + a3*OP
```

```
R ~ a4*OP + d2*DFS + d3*MAAS
```

```
HP ~ OP
```

```
EM ~ b2*DFS + b1*MAAS + b3*R + c1*HP + c2*OP
```

```
# indirect effect
```

```
ie1 := a1*d1*b2
```

```
ie2 := a1*d3*b3
```

```
ie3 := d2*b3
```

```
ie4 := a2*d2*b3
```

```
ie5 := a1*d1*d2*b3
```

```
ie6 := a1*b1
```

```
ie7 := a2*b2
```

```
ie8 := a4*b3
```

```
ie9 := a3*b2
```

```
ie10 := a3*d2*b3
```

```
# total effect
```

```
total := c1 + (a1*d1*b2) + (a1*d3*b3) + (d2*b3)
```

$$+ (a1*d1*d2*b3) + (a1*b1) + (a2*b2) + (a4*b3) + (a2*d2*b3)$$

$$+ (a3*b2) + (a3*d2*b3) + c2$$

,

```
>fit <- sem(model, data = dat, se="bootstrap", bootstrap = 5000)
```

```
>summary(fit, fit.measure = TRUE, standardized = TRUE, rsquare = TRUE)
```

```
>fitmeasures(fit, "all")
```

```
>standardizedSolution(fit)
```

```
>parameterEstimates(fit, standardized=TRUE, rsquare = TRUE)
```

### *Study III*

```
>library(foreign)
```

```
>d<-dat$B-dat$A
```

```
>shapiro.test(d)
```

```
>t.test(dat$B,dat$A,paired = TRUE)
```

```
>library(effsize)
```

```
>cohen.d(dat$B, dat$A,na.rm=TRUE, pooled=TRUE, paired=TRUE)
```

```
>cohen.d(dat$B, dat$A,na.rm=TRUE, pooled=TRUE, paired=TRUE, hedges=TRUE)
```

```
>library(lsr)
```

```
>cohensD(dat$B, dat$A,method="paired")
```

```
>library(psych)
```

```
>describe(dat)
```

```
>library(nortest)
```

>ad.test(dat)



