EFFECT OF IMAGERY ON PASSION FOR PHYSICAL ACTIVITY IN INDIVIDUALS WITH TYPE 2 DIABETES

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Effect of Imagery on Passion for Physical Activity in Individuals With Type 2 Diabetes

ABSTRACT

Passion is a motivational force towards an activity that is internalised into a person's identity when the individual enjoys the activity. Passion has two types: harmonious passion (HP) and obsessive passion (OP). Imagery is a widely applied technique for developing psychological variables, such as passion, in sport and physical activity (PA) contexts. I examined the effects of imagery on passion and the impact of changes in passion on preferred PA for people with Type 2 diabetes mellitus (T2DM). In Study 1, I developed the Physical Activity Imagery Questionnaire (PAIQ), which comprised of 15-items on two subscales, showing sound validity and reliability. In Study 2, I examined the relationship between types of imagery use and types of passion in people with T2DM to determine the most effective type of imagery to develop passion for PA. I measured types of imagery use using the PAIQ and types of passion with the Passion Scale (PS). I found that there were significant relationships of cognitive imagery use and motivational imagery use with HP with smaller correlations with OP. Multiple Regression results showed that cognitive and motivational imagery use significantly predicted HP. The results indicated that both types of imagery use could increase HP when presented in an imagery intervention. In Study 3, I examined the effect of a harmonious passion imagery (HPI) intervention and a general physical activity imagery (GPAI) intervention on passion for PA in 20 voluntary male and female participants with T2DM, aged between 32 and 65 years. Participants in both conditions practised imagery for two face-to-face, individual sessions per week for six weeks and then two self-managed imagery sessions for a further six weeks. Ten participants, assigned at random, practised the HPI intervention, including cognitive and motivational imagery related to HP. Cognitive imagery included images of the place where each individual normally

exercised. It also included images of the individual warming up, exerting more effort and cooling down. Motivational imagery included images of enjoying the activity, goal accomplishment, and positive experience associated with completion of the task. The other 10 participants practised a GPAI intervention with no passion-related content. The script included images of the individual performing and completing their respective activity. Using a two-way, mixed-design ANOVA, I found a significant difference, $p <$ .05, between the HPI and GPAI conditions with a greater increase in HP for Weeks 0 to 6 for the HPI condition. I also found a significant difference, $p < .05$, between the HPI and GPAI conditions with a greater increase in PA for Weeks 0 to 12 for the HPI condition. There was no significant difference in OP in HPI and GPAI conditions. These results supported the proposition that an imagery intervention focused on HP was an effective cognitive-behavioural technique that led to an increase in HP for a preferred PA, as well as increased PA. In Study 4, I explored the subjective experience of participants, from the HPI condition, who showed an increase in HP for preferred PA. Two themes identified were lifestyle involvement in PA before and after the onset of T2DM and passion imagery as a pathway to HP development. This research indicates that an imagery intervention focused on HP is an effective, non-invasive, cognitive-behavioural technique that enhanced HP for a preferred PA and increased amount of participation in PA.

Kesan Imageri atas Keghairahan untuk Aktiviti Fizikal dalam Kalangan Individu Dengan Diabetes Jenis 2

ABSTRAK

Keghairahan (passion) merupakan satu kuasa motivasi yang diselami ke dalam identiti seseorang apabila individu berkenaan menikmati sesuatu aktiviti tersebut. Keghairahan terbahagi kepada dua jenis: keghairahan harmoni (HP) dan keghairahan obsesif (OP). Imageri adalah teknik yang digunakan secara meluas untuk membentuk pembolehubah psikologi, seperti keghairahan dalam sukan dan aktiviti fizikal (PA). Saya mengkaji kesan imageri pada keghairahan dan kesan perubahan dalam keghairahan untuk aktiviti fizikal pilihan untuk pengidap diabetes jenis 2 (T2DM). Dalam Kajian 1, saya membangunkan Soal Selidik Imageri Aktiviti Fizikal (PAIQ), yang terdiri daripada 15 item pada dua sub-skala yang menunjukkan kesahihan dan kebolehpercayaan. Dalam Kajian 2, saya telah mengkaji hubungan antara jenis penggunaan imageri dan jenis keghairahan di kalangan pengidap T2DM untuk menentukan jenis imageri yang paling berkesan untuk membangunkan keghairahan untuk PA. Saya mengukur jenis-jenis penggunaan imageri dengan PAIQ dan jenis-jenis keghairahan dengan Skala Keghairahan (PS). Saya mendapati hubungan yang signifikan di antara penggunaan imageri kognitif dan penggunaan imageri motivasi dengan HP dan korelasi yang lebih kecil dengan OP. Keputusan regresi berganda menunjukkan penggunaan imageri kognitif dan motivasi meramalkan HP secara signifikan. Keputusan menunjukkan penggunaan kedua jenis imageri dapat meningkatkan HP apabila digunakan dalam intervensi imageri. Dalam Kajian 3, saya mengkaji kesan intervensi imageri keghairahan harmoni (HPI) dan imageri aktiviti fizikal umum (GPAI) ke atas 20 orang pengidap T2DM lelaki dan perempuan yang berumur antara 32 dan 65 tahun. Peserta dalam kedua-dua keadaan berlatih imageri secara bersemuka dua sesi seminggu melalui sesi individu untuk tempoh enam minggu dan dua sesi imageri kendiri untuk tempoh enam minggu berikutnya.

Sepuluh peserta dipilih secara rawak untuk berlatih intervensi HPI, termasuk imageri kognitif dan motivasi yang berkaitan dengan keghairahan harmoni. Imageri kognitif termasuk imej tempat di mana setiap individu biasa bersenam. Ia juga termasuk imej individu memanaskan badan, memberikan usaha yang lebih dan menyejukkan badan. Imageri motivasi termasuk imej keseronokan melakukan aktiviti, sasaran pencapaian, dan pengalaman positif berkait dengan menyelesaikan tugasan. Sepuluh peserta yang lain berlatih intervensi GPAI tanpa kandungan keghairahan. Skrip termasuk imej individu melakukan dan melengkapkan aktiviti masing-masing. Dengan menggunakan ANOVA dua hala untuk reka bentuk campuran, saya dapati perbezaan yang signifikan, $p < .05$, antara keadaan HPI dan GPAI dengan meningkatkan PA yang lebih dari Minggu 0 ke 6 untuk keadaan HPI. Saya turut mendapati perbezaan signifikan, $p < .05$, di antara keadaan HPI dan GPAI dengan peningkatan yang lebih dalam PA dari Minggu 0 ke 12 untuk keadaan HPI. Tiada perbezaan yang signifikan skor OP dalam keadaan HPI dan GPAI. Keputusan ini menyokong cadangan bahawa intervensi imageri yang fokus kepada HP untuk PA pilihan turut meningkatkan PA. Dalam Kajian 4, saya telah mengenalpasti pengalaman subjektif peserta dari keadaan HPI yang menunjukkan peningkatan dalam HP untuk PA pilihan. Dua tema utama telah dikenalpasti iaitu gaya hidup penglibatan PA sebelum dan selepas bermulanya T2DM dan keghairahan imageri sebagai laluan kepada pembangunan HP. Kajian ini menunjukkan bahawa intervensi imageri yang fokus kepada imageri HP adalah satu teknik kognitif tingkahlaku bukan invasif yang berkesan yang akan membawa kepada peningkatan dalam HP untuk PA pilihan dan meningkatkan jumlah penglibatan dalam PA.

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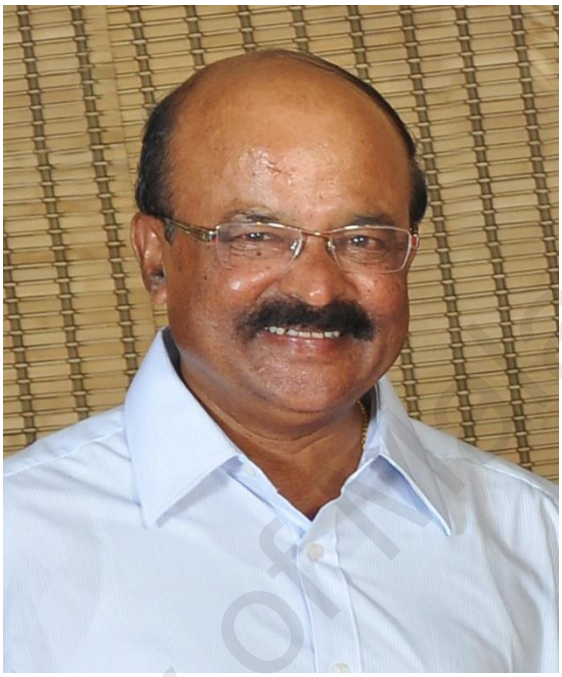
DEDICATION

'His life...A Beautiful Memory,

His Absence...A Silent Grief.'



In loving memory of

ROY KURIAN

KADIANTHURUTHIL

Born: 25th January, 1955

Died: 11th September, 2014

LIST OF PUBLICATIONS AND PAPER PRESENTATIONS

Symposiums, Oral, and Poster Presentations

Roy, A., Morris, T., & Khoo, S. (2017). Using Imagery To Increase Harmonious Passion For Physical Activity In People With Diabetes. *IV ISSP World Congress of Sport Psychology. Seville, Spain: ISSP.*

Roy, A., Khoo, S, Morris, T., & Ratnasingam, J. (2015). Passion Imagery: Using Sport psychology tool for diabetic management in Malaysia. *The 6th ISN International Sports Medicine and Sports Science Conference, Kuala Lumpur, Malaysia.*

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Roy, A. (2015). Effect of an Imagery on Passion for Physical Activity among individuals with type 2 Diabetes. University level: *University of Malaya 3 minute thesis competition, University of Malaya, Malaysia.*

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LIST OF AWARDS

1) University Championship (2015), in recognition of university level research presentation competition at University of Malaya 3-minute thesis competition. University of Malaya, Kuala Lumpur, Malaysia.
2) Winner (2015), at intra-faculty level research presentation competition at University of Malaya 3-minute thesis competition. University of Malaya, Kuala Lumpur, Malaysia.
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α	:	Cronbach Alpha
β	:	Standardised Regression Coefficient
CMIN	:	Chi-Square Value in AMOS
CFA	:	Confirmatory Factor Analysis
CFI	:	Confirmatory Factor Indices
df	:	Degrees of Freedom
eta^2	:	Effect Size
ESEM	:	Exploratory Structural Equation Modelling
F	:	F-Ratio
GFI	:	Goodness of Fit Indices
M	:	Mean
MET	:	Metabolic Equivalent of a Task
N	:	Total Sample Size
N	:	Sample Size of A Group
P	:	probability-Value
r	:	Pearson Product Moment Correlation Coefficient
R^2	:	Coefficient of Determination
SD	:	Standard Deviation
SEM	:	Structural Equation Modelling
SRMR	:	Standardised Root Mean Square Residual
RMSEA	:	Root Mean Square Approximation
TLI	:	Tucker-Lewis Index

χ^2	:	Chi-Square
AMOS	:	a statistical software package for structural equation modeling, produced by SPSS
ANOVA	:	Analysis of Variance
CG	:	Cognitive General
CS	:	Cognitive Specific
DFS	:	Dispositional Flow State
DMP	:	Dualistic Model of Passion
EFA	:	Exploratory Factor Analysis
EII	:	Exercise Imagery Inventory
EIQ	:	Exercise Imagery Questionnaire
EMG	:	Electomyography
FIFA	:	Federation of International Football Associations
GDM	:	Gestational Diabetes Mellitus
GPAI	:	General Physical Activity Imagery
HP	:	Harmonious Passion
HPI	:	Harmonious Passion Imagery
IDF	:	International Diabetes Federation
IPAQ	:	International Physical Activity Questionnaire
OP	:	Obsessive Passion
MG-A	:	Motivational General-Arousal
MG-M	:	Motivational General-Mastery
MS	:	Motivational Specific
NHMS	:	National Health and Morbidity Survey

NMI	:	Neurocognitive Model of Imagery in Sport, Exercise, and Dance.
PA	:	Physical Activity
PAIQ	:	Physical Activity Imagery Questionnaire
PNM	:	Psychoneuromuscular Theory
PS	:	Passion Scale
QMI	:	Questionnaire on Mental Imagery
SIAM	:	Sport Imagery Ability Measure
SIAM-E	:	Sport Imagery Ability Measure for Exercise
SIAQ	:	Sport Imagery Ability Questionnaire
SIQ	:	Sport Imagery Questionnaire
SPSS	:	Statistical Package for Social Science
T1D	:	Type 1 Diabetes
T2DM	:	Type 2 Diabetes Mellitus
UMMC	:	University Malaya Medical Centre
VMBR	:	Visuo-motor Behavioural Rehearsal
WHO	:	World Health Organization

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In recent times, there has been an intermingling of concepts from other disciplines within sport and exercise psychology. One such concept is passion. Passion, a concept that emerged from positive psychology, has been gaining prominence since the early 2000s. Passion is an extension of intrinsic motivation (Roy, Singh, & Morris, 2014). It is a strong motivational force towards an activity or object that is important, liked and in which exclusive time and energy is invested (Vallerand, Blanchard, Mageau, et al., 2003). Passion is enduring in nature as it appears to energise behaviours/activities to bring about positive changes. With passion gaining popularity in research, Vallerand et al. (2003) proposed the Dualistic Model of Passion (DMP). They posited that there are two types of passion: harmonious passion (HP) and obsessive passion (OP). Vallerand et al. (2003) developed the Passion Scale (PS) to measure HP and OP. HP is related to positive, affective outcomes that are adaptive, whereas OP is related to negative or maladaptive outcomes. Just as with the development of intrinsic motivation, there is a possibility to develop passion using psychological techniques. One such technique is imagery.

Imagery is a widely researched topic in sport and exercise psychology (Bhasavanija & Morris, 2014; Morris, Spittle, & Watt, 2005). Imagery is a popular intervention strategy in sport and it also has potential in exercise. It is probably the most powerful cognitive-behavioural technique used to modify behaviour to enhance sport and exercise performance (Cumming & Ramsey, 2009; Moran, 2012). Morris et al. (2005) defined imagery as re-creation of previous positive experiences or the creation of new events to prepare oneself mentally for performing a task. Imagery can facilitate motivation and build confidence (Bhasavanija & Morris, 2014).

Research has shown that in comparison to no practice, imagery usually benefits performance (Land, Liu, Cordova, Fang, Huang, & Yao, 2016), and whereas equivalent physical practice is usually more productive than imagery alone, a combination of physical practice and imagery can be more effective in enhancing performance and psychological variables. Thus, Hall (2001) suggested that imagery can serve as an effective supplement to regular physical practice and as a substitute for some amounts of physical practice. Two aspects of imagery that have been measured and employed to facilitate imagery are imagery ability and imagery use (Morris et al., 2005). The use of different types of imagery can have a variety of effects. Under certain circumstances, changing one simple thought in individuals' minds can make a difference in their lives (Compton & Hoffman, 2013). Therefore, the type of imagery used is idiosyncratic because different individuals benefit in different ways. It is possible that imagery can also help develop HP and reduce OP. According to the DMP, it is usually best for individuals to be within the zone of HP because the positive effects experienced and recalled could help them to increase their activity unlike those who have OP towards their activity, who could drop out due to negative outcomes they experience (Vallerand, 2010). Based on the research evidence, indicating that imagery can be used to modify psychological variables, in this thesis, I examined the proposition that imagery can be a powerful technique to enhance HP for preferred physical activity (PA) among individuals with type 2 diabetes mellitus (T2DM).

PA includes different types of human movement, such as exercise, play, and sports, that result in energy expenditure (Berger, Weinberg, & Eklund, 2015; Biddle & Mutrie, 2008). Involvement in any kind of PA can, not only help people acquire physiological, psychological, and emotional benefits, but also help reduce the risk of chronic conditions, including T2DM, heart diseases, and cancer (Biddle & Mutrie, 2008). Health care professionals and physicians suggest 30 minutes to one hour of low to

moderate intensity exercise a day is ideal to maintain a healthy lifestyle (WHO, 2011).

T2DM is a chronic condition that results from insufficient insulin secretion by the pancreas to break down carbohydrates, proteins, and fats into glucose (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). The Asia Pacific is rated as the region with the highest prevalence of T2DM in the world (Binns & Low, 2016; Cockram, 2000). In Malaysia, the prevalence of T2DM has increased to 20.8% according to the National Health and Morbidity Survey-4 in 2011 (Lee & Hussein, 2012) from 11.6% recorded during the National Health and Morbidity Survey-3 in 2006 (Letchuman et al., 2010). This result was alarming for the nation because it exceeded the original expectations and predictions of WHO. The high prevalence of T2DM in Malaysia was attributed to a number of cultural and environmental factors such as climatic conditions, Islamic cultural requirements (Roy, 2011, 2012, 2013; Roy & Ryba, 2012). Despite the availability and dissemination of information from Clinical Practice Guidelines (2009), global recommendations on PA for health (WHO, 2010), and hosting several health promotion campaigns in most countries, not much improvement has been seen in PA. In this research, I propose a new approach using imagery to increase HP, which should promote PA, especially, in sedentary populations, such as people with chronic illnesses, who have been found to perform less PA than similar individuals without that chronic condition (Loef, 2016).

One of the most important contributions of positive psychology is the research that psychologists have conducted on intervention methods for increasing and sustaining well-being. Most of this research initially comes from highly-controlled experimental studies, which could be successfully transferred to the clinical field (Sin & Lyubomirsky, 2009). Given that researchers have shown imagery to be effective for enhancing positive psychological states, its application could be extended to passion for PA. In this thesis, I

examine whether imagery is an approach that can be used to enhance passion to increase and sustain participation in PA that can assist in managing T2DM.

Most research done in passion supports the DMP using quantitative methods. Currently, there is only one study which supports the DMP using qualitative methods (Roy et al., 2014). Researchers have conducted many studies of imagery in sport and exercise psychology (Holt & Tamminen, 2010). Most T2DM researchers have looked at the medical aspects, or the management or prevention of T2DM (Mathur, 2011; Shazwani et al., 2010; Tuomilehto et al., 2001). Others have looked at the prevalence of T2DM (International Diabetes Federation; 2010; Malaysian Diabetes Association, 2011; Sidik & Ahmad, 2003). Despite existing research in these three areas, there is a lack of research on developing passion for PA that could help in lifestyle management. In this thesis, I examined the effects of an imagery intervention on passion for PA among individuals with T2DM in Malaysia. Particularly, I aimed to use imagery to enhance HP because HP is related to positive behavioural outcomes, such as increase in PA participation.

1.2 Study Objectives

There were four objectives of the research in this thesis. These were:

1) To develop a questionnaire to measure the types of imagery used in PA.

2) To correlate the types of imagery use (cognitive and motivational imagery use) measured by the imagery questionnaire with the types of passion (HP and OP) measured by the Passion Scale (PS; Vallerand et al., 2003), in order to determine what type(s) of imagery is most effective for influencing passion for PA.

3) To develop an imagery intervention tailored to enhance HP and examine its effects on HP and observe the impact of this imagery intervention on preferred PA compared to a general physical activity imagery intervention.

4) To explore the subjective experience of participants in the HP imagery intervention, including their perceptions of its effect on HP and preferred PA.

1.3 Significance of the Study

In this thesis, I examined two original questions. First, I tested whether a tailored imagery intervention could lead to the development of HP for individuals' preferred PA. Second, I examined whether such a tailored imagery intervention could increase PA for that preferred activity. Thus, the thesis contributes new knowledge that is important in understanding how non-invasive techniques, such as imagery, can develop passion for PA. This research provides guidance to people with T2DM and health/exercise psychologists for enhancing PA for people with diabetes and bringing about positive affect and behaviour changes by increasing HP, which enhances preferred PA.

1.4 Organisation of the Thesis

In this thesis, I aimed to extend imagery research by examining the extent to which a tailored imagery intervention can bring about positive changes in HP that are associated with PA behaviour modifications in a clinical population. First, I have provided an extensive literature review of the main thesis topics, namely passion, imagery, and physical activity, as well as addressing diabetes, especially T2DM. I then report on four studies directed at examining the proposed topic. In the first study, I developed a questionnaire called the Physical Activity Imagery Questionnaire (PAIQ) to assess the type or types of imagery use that related to the development of HP for PA. Then I examined the relationship between types of imagery use and types of passion to determine the most effective type or types of imagery used to develop passion. Next, based on the correlation and regression results between types of imagery use and HP and OP, I developed and examined differences between two different types of individualised imagery scripts. The harmonious passion imagery (HPI) condition was developed based on propositions from the DMP that HP is associated with positive affect, particularly enjoyment, satisfaction and pleasure, associated with an activity. The general physical activity imagery (GPAI) condition was based on general principles about the benefits of

PA participation. I then report on a qualitative study in which I examined the subjective experiences of five participants who completed the individualised HP imagery intervention condition. Finally, I present a general discussion of the conclusions for the whole thesis, indicating directions for further research and implications for practice.

1.5 Summary

To my knowledge, this thesis involves one of the first studies that assessed the effect of a tailored, individualised imagery intervention on passion for PA and PA participation. The findings reported in this thesis might be useful for health professionals and people in the general population to implement effective and inexpensive interventions to promote healthy lifestyle. I have also provided new avenues for research that could help in the utilisation of non-invasive imagery techniques to promote passion for PA and PA participation among various clinical populations.

CHAPTER 2

LITERATURE REVIEW

Within the field of sport and exercise psychology there is an increasing interest in positive psychology. The proponents of positive psychology aim to find uplifting opportunities in life despite the recognition that everyone experiences problems (Seligman, 2002). Seligman (2002) has argued that positive psychology is an approach to psychological health that addresses the negative experience that people have by exploring positive aspects of life. Thus positive psychology values uplifting subjective experience, well-being, satisfaction, hope, optimism (especially in the face of failure), flow, and happiness (Seligman & Csikszentmihalyi, 2000). As a psychological construct, passion is a recently developed concept that fits within the ethos of positive psychology. Theory and research on passion suggests that it has the potential to promote psychological well-being, so it is important to examine ways to enhance the positive aspects of passion. Imagery is a technique that has been used to enhance positive aspects of life, such as confidence and flow. In this chapter, I establish the relationship between imagery and passion for PA and diabetes management. First, I examine the literature on passion and distinguish between passion and the related construct of motivation. Then I elaborate on the DMP and related constructs of passion and subjective well-being. Following this, I introduce the literature on imagery, including definitions, theories, models, measures, and related research on imagery in sport, exercise, and PA. Then, I present an overview of T2DM, including its incidence, associated health implications, and benefits of PA for diabetes management. Finally, I conclude the chapter by highlighting the gap in the literature associated with the potential use of imagery training to enhance the positive aspects of passion. Thus, I present my research topic of how a non-invasive technique, such as imagery could develop passion for preferred PA among individuals with T2DM.

2.1 Passion

2.1.1 Definition of Passion

The philosophical literature on passion reveals that it has been a hotly debated concept among philosophers for thousands of years (Rony, 1990). Philosophers, including Plato (429 - 347 BC) and Spinoza (1632 - 1677), held a negative view of passion, whereas others, including Aristotle (384 - 322 BC), Descartes (1596 - 1650), Rousseau (1712 - 1778), and Hegel (1770 - 1831), viewed passion in a more positive light (Rip, 2010; Vallerand, 2010). Although passion gained much attention from philosophers, it should be noted that passion has received little empirical attention in psychology (Rip, 2010; Vallerand, 2010). Passion is a relatively new concept in sport and exercise psychology, in particular, but now passion is gaining importance in sport and exercise psychology research and practice. Until very recently, passion received little attention in sport psychology and very limited attention in exercise psychology (Roy et al., 2014). Passion is conceptualised in emotional and motivational terms (Rip, 2010). It is defined as a strong motivational energy force towards any activity that is important, liked, and in which a significant amount of time is invested (Vallerand, 2008; Vallerand, Mageau, et al., 2008; Vallerand & Miquelon, 2007; Vallerand, Rousseau, et al., 2006; Vallerand et al., 2003). Roy et al. (2014) defined passion as the higher end of the extrinsic-intrinsic motivation continuum, beyond intrinsic motivation. Vallerand et al. (2003) recognised that the concept of passion represents psychological factors that enable people to remain highly committed and dedicated. According to Vallerand (2008), there are three processes to passion development: a) *Activity selection:* which refers to personal preference; b) *Activity valuation:* subjective importance attributed to the object of passion, which is highly valued and meaningful; and c) *Internalisation:* stands for self-identity, that is, when passion for an object or activity is internalised it becomes part of people's identity. Not all activities are enjoyable from the beginning of individuals' involvement in them.

Only activities that are carried out for a considerable period eventually develop into an interest. This is especially true for activities that are most enjoyable and satisfy the basic psychological needs for competence, autonomy, and relatedness (Deci & Ryan, 2000; Vallerand, 2008; Van den Broeck, Vansteenkiste, De Witte et al., 2010). Passion is associated with other psychological concepts. For example: positive addiction towards activities people enjoy (Glasser, 1976), flow (Ciskszentmihalyi, 1978), and well-developed interests (Renninger & Hidi, 2002), nevertheless, these concepts are distinct from it. A closely related concept to passion is motivation (Vallerand et al., 2003, Study 2). Passion may include motivational components, yet a fine line divides these two concepts. There are two types of motivation: intrinsic and extrinsic motivation (Deci & Ryan, 1985, 2000). In intrinsic motivation, individuals engage in the activity because they find it enjoyable or pleasurable; however, it is *not internalised* within their identity. Extrinsic motivation, on the other hand, entails engaging in the activity to obtain external rewards. Thus, the *lack of liking* towards the activity is the key difference that distinguishes between passion and extrinsic motivation (Vallerand & Miquelon, 2007). To conclude, those activities that are done regularly, that are self-defining and that fall within the areas in which individuals find meaning, have the potential to become passions, as they become highly valued and incorporated into their identity (Vallerand & Miquelon, 2007). Passion could have adaptive and maladaptive characteristics in relation to motivation and individuals' emotional experiences (Rip, 2010). To distinguish between the positive, adaptive aspects and the negative, maladaptive aspects of passion, Vallerand et al. (2003) proposed the DMP, which comprises HP and OP.

2.1.2 The Theory of Passion: Dualistic Model of Passion (DMP)

According to Gonçalves, Orgambídez-Ramos, Ferrão, and Parreira (2014), passion can fuel motivation, enhance well-being among the individuals, and provide meaning in everyday life. Researchers have shown that initially uninteresting activities

can be internalised to individuals' identity in a controlled or in an autonomous fashion (Sheldon, 2002; Vallerand, 2010; Vallerand, Fortier, & Guay, 1997). Likewise, activities that individuals find valuable, meaningful, and enjoyable can be internalised into their identity (Vallerand, 2010). Based on this assumption, Vallerand (2010) proposed that passion could also be distinguished in terms of the way in which people internalise activities. In the DMP, Vallerand et al. (2003), proposed that there are two types of passion: HP and OP. HP represents a motivational force that enables individuals to participate in an activity *willingly* with no contingencies attached. In other words, individuals control the activity based on a feeling that originates from the intrinsic and integrative tendencies of the self (Vallerand, 2008). HP results from an autonomous internalisation of the activity into individuals' identity because they freely accept it. With this type of passion, there is no overpowering space in their identity and HP is in harmony with other aspects of the individuals' life (Vallerand, Donahue, & Lafreniére, 2011). In this way, the openness to accept any task willingly enables individuals to focus on it and experience positive outcomes. Thus, individuals find no conflict within themselves because they are able to adapt well to situations and are able to decide when to engage or disengage in the activity they chose (Vallerand, 2008, 2010; Vallerand, Donahue, & Lafreniére, 2011). On the other hand, OP is a motivational force that *urges* individuals towards an activity with some contingencies attached. In short, the activity controls individuals because it is a feeling that originates from intrapersonal or interpersonal pressure (Vallerand, 2008, 2010). It results from a controlled internalisation of the activity into individuals' identity. People experiencing OP feel compelled to participate in the activity because of a sense of excitement derived from engaging in it. This type of passion is ego-invested and must run its course. Any hindrance from doing the task would lead to negative outcomes, cognitive and behavioural consequences (Vallerand, Donahue, & Lafreniére, 2011). Thus, the lack of flexibility and rigid persistence of OP may cause

individuals to experience low self-esteem, low self-confidence, anger, irritation, frustrations, and other conflicts in life (Vallerand, 2008; Vallerand, Donahue, & Lafreniére, 2011). The influence of passion makes it a challenge for researchers to measure it (Gonçalves et al., 2014). Nevertheless, there has been considerable amount of research that has validated the PS and the DMP.

2.1.3 Measurement of Passion: Passion Scale Development and Psychometric Properties

Vallerand et al. (2003) developed the PS to measure passion for an activity. In initial studies on passion, Vallerand et al. reported the development, reliability, and validity of the PS (Vallerand et al., 2003, Study 1). The scale was administered to 539 college students who participated in a variety of activities, including sports, PA, music, watching movies, and reading. Results supported the distinction between two forms of passion. HP was associated with positive emotions, concentration, and flow, whereas OP was associated with negative emotions and conflict with other aspects of individuals' lives. Interestingly, Vallerand et al. found approximately 60% of the college students to be passionate about involvement in either sport or PA. Around 84% of the participants indicated having at least a moderate level of passion i.e., those who scored four out of seven on questions indicating they had a passion for their activity. Participants reported being engaged in the activity for an average of eight and a half hours per week for six years. This indicates that passionate activities remain meaningful to people (Vallerand et al., 2003). In a similar study with data collected from 750 participants aged between 18 and 90 years, Philippe et al. (2009) reported that 75% of participants were highly passionate about their chosen activity. The average score was 5 or more on a 7-point scale. Factorial validity of the PS has also been established to provide empirical support for passion conceptualisation. Vallerand et al. (2003, Study 1) conducted an exploratory factor analysis (EFA) after randomly splitting 539 participants into two groups. The first

group confirmed the existence of two factors, which corresponds to the two types of passion for the initial 34-item scale. The PS was later reduced to 14 items based on the factor loadings. Confirmatory factor analysis (CFA) was conducted on the 14 items using the second group. The results yielded a good fit, $\chi^2 = 171.70$ $p < .001$, comparative factor index (CFI) = .926, and root mean square error of approximation (RMSEA) = .073. The internal consistency reliability test results were also acceptable for the two subscales of OP (α = .89) and HP (α = .79). Subsequent research has supported the conceptual framework of passion confirming the existence of the two-factor structure of the PS (e.g., Carbonneau et al., 2008; Lafrenière et al., 2008; Stenseng (2008); Vallerand (2010); Vallerand, Rousseau, et al., 2006, Study 1; Vallerand et al., 2003). Vallerand et al. (2003) reported the internal consistency for the PS to be within high levels. Correlation between the two subscales was .46 with a mean score of 5.01 (*SD* = 1.15) for HP and 3.20 (*SD* = 1.47) for OP (Vallerand, 2010). Test-retest reliability over a period of three months also revealed high stability of the PS (Carbonneau et al., 2008; Rousseau et al., 2002). Vallerand, Mageau, et al. (2008, Study 1) tested a brief version of the PS comprising of four items per subscale on high school basketball players during a tournament. The psychometric properties of the brief version were quite similar to the full measure χ^2 (19) *n* = 184, *SD* = 23.27, *p* = .23, CFI = .99, RMSEA = .04. All factor loadings were significant and exceeded .49. Internal consistency was within the acceptable range for OP (α = .84) and HP (α = .73). PS was also translated into other languages which also reported adequate psychometric properties. The Portuguese version of the PS that was administered on 551 Portuguese workers also revealed adequate psychometric properties (Gonçalves et al., (2014). Likewise, the Chinese version of the PS was tested on 286 Chinese university students using CFA. The results indicated a good fit, with validity and reliability values within the accepted levels of psychometric properties (Zhao, St-Loius, & Vallerand, 2015).

There are at least 20 studies that have provided support for the psychometric properties of the PS, including its two-factor solution, using EFA, CFA, and exploratory structural equation modelling (ESEM) in various life domains (e.g., Carbonneau et al., 2008; Gousse-Lessard et al., 2013; Marsh et al., 2013; Orgambídez-Ramos et al., 2014; Vallerand, 2010, 2015). Marsh et al. (2013) used ESEM analysis, rather than the traditional CFA, to check the factorial validity of participants irrespective of gender, language spoken, or activities they were involved in. The results demonstrated sound factor structure, good internal consistency, and solid construct validity. Likewise, Chamarro et al. (2015) validated the PS in the Spanish language using ESEM on 1,007 Spanish participants. The findings indicated the 2-factor ESEM model to be acceptable with values including CFI = .951; TLI = .917, RMSEA = .072, SRMR = .031 to be within the acceptable range of psychometry. In addition, all studies, including in lab settings, showed high levels of internal consistency for both types of passion with Cronbach's alpha between .70 and .92 (Marsh et al., 2013; Stenseng, 2008; Vallerand, 2015; Vallerand et al., 2003).

Parastatidou and Doganis (2012) undertook psychometric evaluation of the PS on Greek exercise participants. Results supported the 2-factor structure of the PS. The internal consistency level, convergent validity, and factor discriminant validity were favourable and supported the use of the scale in the exercise domain. Apart from validating the questionnaire in the area of sport and exercise, there are other studies that have supported the bi-factorial structure of the scale in other contexts, including gambling (Rousseau et al., 2002), dance (Rip et al., 2006), online gaming (Stoeber et al., 2011), romance (Ratelle et al., 2013), and work (Houlfort & Vallerand, 2006). The PS questionnaire has, thus, been found to be sound in its factor structure in different cultural contexts irrespective of gender and activity (Marsh et al., 2013).

2.1.4 Research in Passion

Most research has validated the DMP, focusing on testing predictions about the relationship between HP and OP, typically measured by the PS (e.g., Vallerand et al., 2003; Vallerand, Rousseau, et al., 2006). The other studies examined the associations between passion and psychological variables, such as motivation, well-being, and behaviour (Vallerand, 2010, 2015). The DMP posits that once individuals develop an interest in an activity, it results in two psychological processes: positive valuation of the activity and internalisation of the activity into their identity (Vallerand et al., 2003). However, the type of passion developed depends on how the activity is internalised into individuals' identity, which is based on the social and personal factors at play. Several studies (e.g., Vallerand, 1997, 2010; Vallerand & Ratelle, 2002) have indicated that an autonomous personality orientation enables internalisation of an uninteresting activity in individuals, whereas a controlled personality orientation leads to controlled internalisation of an uninteresting activity (Guay et al., 2003; Vallerand, 1997, 2010, 2015). This indicates that highly valued and enjoyable activities facilitate the development and maintenance of HP, whereas controlled personalities may be inclined towards OP. This hypothesis was supported by Vallerand, Rousseau, et al. (2006, Study 1). Using the Global Motivational Scale (Guay et al., 2003), results from structural equation modelling (SEM) showed that both valuation of sport and autonomous personality were associated with HP, whereas valuation of an activity and controlled personality were associated with OP. Similar results were found in a study conducted on music students, parents, and music teachers (Lafreniere et al., 2013). Social setting and social support enable internalisation of the activity leading to the initial development of passion (Vallerand 2008, 2010; Vallerand & Miquelon, 2007). Supporting the statement mentioned by Vallerand (2008, 2010), Roy et al. (2014) used narrative analysis to highlight the subjective experiences that contributed to the development of passion for

PA in a person with diabetes. They found four main dispositions, namely, active lifestyle, pathway to passion development, social systems, and inner harmony, to be related to the development of HP towards individuals' preferred activity.

Other studies have focussed on validating the DMP. The focus has been on testing the relationship between HP and OP, typically measured by the PS. Based on DMP, it is expected that HP would lead to adaptive cognitive processes, whereas OP would lead to maladaptive cognitive processes. To support this assumption, Vallerand et al. (2003, Study 1) conducted a study with college students to examine the extent to which they typically experience high levels of concentration when engaged in a PA. Based on the results of the PS, the findings indicated partial correlations between HP and concentration on the passionate activity. Using a similar procedure, in research on gambling (e.g., Mageau et al., 2005) and sport refereeing (Philippe et al., 2009, Study 2), researchers reported similar results.

Studies in the area of sport and PA support the DMP hypothesis. In a study involving inter-collegiate American football players, Vallerand et al. (2003, Study 2) explored the role of passion in predicting changes in general positive and negative effect during a football season. Some of the expectations included the level of improvement in football skills, meeting school demands, time spent with friends, and part time work. Multiple regression analysis results supported the prediction that HP would be associated with positive effects over the season, whereas OP would be related to negative effects over the football season. Likewise, Vallerand, Ntoumanis, et al. (2008) assessed the role of two types of passion in predicting a number of behaviours and emotions experienced among football fans during the 2006 FIFA World Cup. Although, the findings showed both types of passion to be positively associated to team victory and fan identity, only HP was positively associated with life satisfaction, whereas OP led to maladaptive behaviours during a football match. Furthermore, the study also assessed emotions experienced by

fans during the World Cup. As expected HP and OP supported adaptive behaviours associated with emotions of pride and victory, but were unrelated to hate or taunting behaviour. Recently, Verner-Filion, Vallerand, Amiot, and Mocanu (2017) conducted a study on soccer players and hockey players to understand the need for passion mediates the relation of HP but not necessary OP in relation to performance outcomes. The results provided support that the mediating role of need satisfaction and achievement goals is associated to HP performance outcomes. Deliberate practice mediated the relation between OP and performance.

Passion for an activity promotes self-growth and fosters mastery goals within the purview of the activity (Elliot, 1997; Vallarand, 2015). Vallerand (2015) mentioned that engaging in activities that are a passion for individuals, fuels energy and vitality because they are investing their time into something meaningful. According to Vallerand and Miquelon (2007), passion is the reason professional athletes remain top-level performers. Being passionate about one's sporting career leads to improved sports performance. To attain this motive, individuals engage in alternative activities that are typically aimed at improving performance (Vallerand, 2015). This is called deliberate practice (Ericsson & Charness, 1994). Although deliberate practice is highly demanding in terms of being engaged in the activity, it provides an optimal opportunity for skill acquisition (Vallerand, 2015). With this as the base, Vallerand, Mageau, et al. (2008, Study 1) assessed passion and deliberate practice among male and female basketball players by administering the PS. Using path analysis to test the model, Vallerand, Mageau, et al. reported that HP and OP led to engagement in their activity through deliberate practice, which in turn helped to increase performance. These findings were replicated in another study on dramatic art performers (Vallerand, Salvy, et al., 2007, Study 1). Vallerand, Mageau, et al. (2008, Study 2) examined the psychological processes through which passion contributed directly to deliberate practice and indirectly to sports performance in water polo and

synchronised swimming. Results supported the DMP, wherein HP led to mastery of goals and deliberate practice, which in turn positively predicted subjective well-being and objective performance. On the other hand, OP was positively related to mastery goal performance, approach goals, and performance avoidance goals. The findings of these studies indicate that HP and OP provide energy for individuals to be engaged in their activities. Hence, deliberate practice plays a key role in individuals gaining proficiency in their activity, which leads to passion development. Another important factor for passion development is persistence towards the activity. Individuals tend to persist in their favourite activity because they consciously devote themselves to the activity for a considerable period. Such an activity persists for a longer duration or even for a lifetime. Persistence is also influenced by the type of passion. HP individuals could choose to withdraw from the activity if it is perceived as negative for them. Conversely, OP individuals will continue to persist in their activity because of their rigidity. This non-flexible response might lead to self-defeating behaviour, overtraining, and injury. To evaluate this notion, the DMP hypothesis was tested on Canadians who were engaged in cycling as part of their regular PA. The results were in line with the DMP where 30% of the participants, who were obsessed with cycling, were found to cycle even during winter, an activity not recommended due to the icy roads in Canada. Persistence towards the activity was significantly higher among OP cyclists during extreme climatic conditions than during less demanding climatic conditions, whereas no difference was found between extreme and typical weather conditions among HP cyclists (Rip, Fortin, & Vallerand, 2006). In another study involving dancers, Rip, Vallerand, and Fortin (2008) explored modern-jazz dancers' overexertion, negative consequences and the effects these had on coping strategies. The findings indicated that dancers with HP suffered less from acute and chronic injuries and were able to adopt appropriate coping strategies to overcome injuries. On the other hand, OP dancers suffered longer with acute and chronic

injuries. Their pride and ego were reported to be preventing them from obtaining adequate treatment. Similarly, Stephan, Deroche, Brewer, et al. (2009) assessed susceptibility to injuries and the number of injuries sustained during the running season. The regression analysis results showed that HP was negatively related to susceptibility to injury, whereas OP was positively associated with susceptibility to injury. These findings show that OP individuals are prone to chronic injuries because of their rigid persistence towards their activity which can border on obsession.

Research indicates that injuries result from physical exhaustion (Dugan & Frontera, 2000). Individuals experience exhaustion when they are involved in their activity for longer durations. Exhaustion results when a severe lack of energy affects individuals' ability to perform mental or physical tasks. A comprehensive literature search identified studies that have assessed the extent to which engagement in an activity leads to exhaustion. Gustafasson et al. (2012) examined athletes' passion in relation to their emotional exhaustion. They found that HP was negatively related to emotional exhaustion, whereas OP was positively related to emotional exhaustion. Lalande et al. (2014, Study 3) also found that OP was positively correlated with emotional exhaustion. These results show that HP individuals experience less tension and emotional exhaustion during their activity than those who have OP towards their activities. Vallerand (2015) suggested that this is because OP requires more energy to complete the desired task. The tension experienced in completing the task causes mental fatigue, which leads to exhaustion. Thus, if OP individuals were engaged in prolonged and sustained PA, it would be likely to lead to tension and burn out. In such cases, the beneficial effects experienced through PA are diminished by negative effects of exhaustion, which would in turn affect individuals' health (Vallerand, 2015). These studies indicate that individuals should be encouraged to have HP towards their PA to experience health benefits and discourage negative effects of exhaustion.

Emotions have been found to be a mediator in the relationship between passion and outcome (Donahue et al., 2012). The type of passion individuals' possess towards an activity plays an important role in identifying psychological adjustment, subjective well-being, and life satisfaction experienced during and after engaging in a PA (Vallerand, Donahue, & Lafreniére, 2011). For instance, Rousseau and Vallerand (2003) found that HP was positively associated with psychological adjustments, including increases in life satisfaction, meaning in life, and vitality, as well as decreases in anxiety and depression in older adults. On the other hand, OP resulted in negative effects, i.e., increases in anxiety and depression, and was negatively associated with life satisfaction, meaning in life, and vitality. Rousseau and Vallerand (2008) used path analysis to identify the role of positive effects experienced during engagement in a task as a mediator of HP for psychological adjustment. HP positively predicted positive effects, i.e., people showed positive engagement and flexible persistence in the activity, leading to an increase in psychological adjustment. Thus, HP showed positive impact on psychological adjustment, such as life satisfaction and meaning of life, which makes life worth living (Seligman & Csikszentmihalyi, 2000). Carbonneau, Vallerand, and Massicotte (2011) examined whether OP for yoga was associated with less positive outcomes when compared to HP. The findings of the study indicated that HP was positively associated with positive outcomes when compared to OP. These results were replicated in the second part of the study that used a three-month prospective design to test the hypothesis. These results suggest that the types of passion individuals have towards an activity, which yield positive benefits, have an effect on their psychological and physical well-being. A comprehensive literature search on HP and OP within sport and exercise psychology shows that HP has repeatedly been shown to be related to effective outcomes, whereas OP has frequently been related to maladaptive outcomes, which is in line with the DMP proposed by Vallerand et al. (2003). In another study, Stoeber et al. (2011) assessed the

effects of passion during individuals' involvement in cognitive activities. They used the PS to examine the relationship between HP and OP and the vigour experienced by undergraduate students while studying. The results revealed that HP and OP positively predicted vigour during engagement in the activity. However, it was found that both types of passion did not significantly predict vigour when confounding variables, such as intrinsic motivation and extrinsic motivation were controlled statistically. These studies indicate that HP leads to high levels of energy, vigour, and enthusiasm irrespective of the activity, whereas OP is unrelated to energy experienced in sport and exercise, but is positively related to cognitive tasks such as studying.

This literature review of passion highlights a view of how passion is related to different psychological constructs, especially within sport and exercise psychology. A variety of studies elaborated on the role of both types of passion, with results that mostly were in line with the DMP. Those results indicate that the development of HP and the control of OP are facilitative for behaviour in many contexts, including PA. Although research sheds light on the two types of passion, there are limited studies on how passion can be developed. I hypothesise that imagery may be a tool that can facilitate passion development. In the next section, I provide an overview of imagery, theories of imagery and positive benefits of imagery training interventions that should be applicable to facilitating HP and enhancing PA.

2.2 Imagery

Imagery is an effective cognitive behavioural technique for enhancing learning and execution of a task (Cox, 2007). It is a well-researched topic in sport psychology with numerous published articles and book chapters (see Callow & Hardy, 2005; Morris, Spittle, & Watt, 2005). According to Perry and Morris (1995), imagery is a "central pillar of applied sport psychology" (p. 339) and is considered an integral part of athletic success in sports (Cumming, Hall, & Shambrook, 2004). It is a popular and widely accepted

strategy for enhancing performance (Cumming & Ramsey, 2009; Hall, Mack, Pavio, & Haunsenblas, 1998). Previous research findings suggest that imagery plays an important role in life domains, including sport and exercise (Annett, 1996). Imagery training is widely used by athletes and coaches (Hall, Rodgers, & Barr, 1990). It is not a cure for poor skill or a mode for relaxation; rather, it is an active process that increases individuals' levels of concentration, focus, arousal regulation, and attempts to eliminate maladaptive behaviours (Peluso, Ross, Gfeller et al., 2005).

2.2.1 Definition of Imagery

Definitions and descriptions of imagery vary depending upon the purpose for which imagery is used. Imagery has been associated with a number of terms like mental practice, mental rehearsal, imaginary practice, symbolic rehearsal, mental training, visualisation, and cognitive practice (Munroe-Chandler & Morris, 2011). Corbin (1972) defined mental practice as repetition of a task, without any observable movement, with the specific intent of learning. Mental practice, however, is a broad term for a wide range of mental processes that might not include imagery. For example, repeating a phone number after looking it up until reaching the telephone to dial can be considered to reflect mental practice, but there might be no imagery involved. On the other hand, imagery involves use of the senses to create an experience. For example, imagining dialling the number, using visual imagery, would reflect imagery as a way to mentally practice the telephone number. Richardson (1969) defined mental imagery as "those quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts" (p. 2 - 3). Morris et al. (2005) expanded Richardson's definition by acknowledging that imagery can be based on memory or generated anew, and by recognising the volitional control of the imager. They stated that mental imagery is

> the creation or re-creation of an experience generated from memorial information, involving quasi-sensorial, quasi-perceptual, and quasi-affective characteristics, that is under the volitional control of the imager, and which may occur in the absence of the real stimulus antecedents normally associated with the actual experience (p. 19).

In this thesis, I use another definition of imagery by Morris et al. (2005), which is re-creation of previous positive experiences or creation of new events to prepare individuals mentally for a task or to affect psychological variables, such as motivation, confidence, or concentration. Imagery is an experience that mimics real experiences, involving the use of different sensory modalities even in the absence of actual perception (Cumming & Ramsey, 2009). Therefore, imagery is an experience that includes at least one, often several, and, ideally, all of the senses, which would enable individuals to be consciously aware and have the ability to control their thoughts and images.

2.2.2 Theories of Imagery

Psychologists have proposed theories about how imagery works, since Carpenter's (1894) Ideomotor Principle. Researchers in sport and exercise psychology have focused more attention on certain theories, so I will recount those theories in this section (e.g., Hall, 2001; Weinberg & Gould, 1999). Theories that have been of particular interest in the context of sport and exercise include psychoneuromuscular theory (Jacobson, 1930), symbolic learning theory (Sackett, 1934), triple code theory (Ahsen, 1984), and bioinformational theory (Lang, 1977) (see Morris et al., 2005 for a review).

2.2.2.1 Psychoneuromuscular Theory (Jacobson, 1930)

Carpenter (1894) originally proposed the Ideomotor Principle. He argued that imagery assists the learning of motor skills by innervating neuromuscular pathways in a manner similar to actual performance of the activity. Jacobson elaborated on this proposition in the Psychoneuromuscular (PNM) Theory. According to Jacobson (1930),

imagery of a movement innervates the muscles involved in that movement, as if individuals were actually practicing the movement, but with smaller magnitude nerve impulses. Jacobson (1930) proposed that imagery rehearsal duplicates the actual motor pattern being rehearsed (Vealey & Walter, 1993). When performing mental imagery, the brain sends subliminal electric signals to the muscles that are similar to the signals produced when a physical movement is actually performed; however, the intensity of electrical activity is at a lower level (Hardy, Jones, & Gould, 1997). Therefore, whenever athletes actually perform a movement or vividly imagine their performance of that particular moment, similar neural pathways to the muscles are activated. Jacobson argued that this strengthens those pathways, which leads to learning of the movement. Jacobson provided empirical support for PNM theory by measuring electomyographical (EMG) activity of relevant muscles during imagery of a movement, such as a biceps curl. Slade, Landers, and Martin (2002) compared the EMG activity in both active and passive arms while participants imagined performing dumbbell curls. Results showed that EMG activity increased during imagery in the active arm when compared to the passive arm. Some researchers have been critical of psychoneuromuscular theory (Driskell et al., 1994; Hall, 2001). One continuing criticism is that no studies to date have been conducted to test whether performance changes matched changes in EMG activity (Morris et al., 2005). More definitive research needs to be undertaken to know whether imagery works as predicted by this theory.

2.2.2.2 Symbolic Learning Theory (Sackett, 1934)

In contrast to PNM Theory, which focuses the explanation of how imagery works on psychophysiological processes, Symbolic Learning Theory is concerned with the cognitive processes associated with imagery. According to Sackett (1934), imagery helps performers to symbolise the required movement sequences in the brain. Rehearsal of these symbolic components facilitates performance enhancement. He also proposed that

cognitive skills are much more easily coded than primarily motor skills. Weinberg and Gould (2007) stated that when individuals create a motor programme in the central nervous system, a mental blueprint or a map is formed that enables them to successfully complete the desired movement (Munroe-Chandler & Morris, 2011; Vealey & Walter, 1993). According to this theory, skills that are more cognitive in nature (e.g., playing chess) are more easily coded than pure motor skills (e.g., lifting weights). One way that individuals learn certain skills is by becoming familiar with that skill and learning what needs to be done in order to become successful. A "mental blueprint" (Vealey & Walter, 1993) is formed through the process of making the motor programme in the central nervous system that enables successful completion of the movement. Sackett proposed that when people imagine performing a task that has sequential elements, they develop and refine that mental blueprint in terms of the sequential elements. Thus, when they later perform the task physically the sequential elements, including their temporal coordination are improved. A concern for Symbolic Learning Theory as a comprehensive explanation of how imagery works, is that there are many studies of imagery of tasks that are largely motor in nature that show improvements in performance. It is difficult for Symbolic Learning Theory to explain how this occurs when there is little or no symbolic content to imagine (Morris et al., 2005). Therefore, like PNM Theory, Symbolic Learning Theory does not adequately address all forms of imagery (Hall, 2001, Munroe-Chandler & Morris, 2011).

2.2.2.3 Bioinformational Theory (Lang, 1977, 1979)

Lang (1977) proposed Bioinformational Theory to explain the psychophysiology of imagery. According to the theory, all knowledge can be represented in memory as units of information about objects, relationships, and events. Lang called these representations propositions. Propositions are based on interpretative or analytical decisions that are used to define the significance of the events and the consequence of the action. Lang (1977)

proposed two main classes of propositions: stimulus propositions and response propositions. Stimulus propositions are specific stimulus features of the situation being imagined, whereas response propositions are elements of the response to the scene. Lang argued that there is a link between appropriate stimulus and response propositions and the process of imagery allows the strengthening of this link. This helps to bring about appropriate behaviour modifications or improve individuals' performance. To bring about behaviour modification, imagery scripts that include both stimulus and response propositions are considered most effective (Lang, 1979, 1985). The importance of response propositions appears to be well established for optimisation of imagery interventions (Munroe-Chandler & Morris, 2011). Lang (1985) proposed that there is a greater conceptual match between memory and the scene imagined depending on how relevant the image is for individuals. Cuthbert, Vrana, and Bradley (1991) stated that response propositions need to be personalised for an effective imagery intervention due to individual differences that exist in the way stimuli and responses are coded in memory for a specific event and performance. Although there is direct and indirect research support for this theory, its applicability to movement and performance is still being studied because Lang's theory was originally developed in the context of fear and emotional imagery (Morris et al., 2005). To date, results have been promising (Munroe-Chandler & Morris, 2011).

2.2.2.4 Triple Code Theory (Ahsen, 1984)

Ahsen (1984) developed the triple code theory that not only recognises the primary importance of psychophysiology in the imagery process, but also considers the critical role of the meaning the image has for individuals. Ahsen proposed that there are three important components of imagery that are essential to understand its effects. First, the image is defined as a centrally-aroused sensation that includes all attributes of sensation, however, it is internal at the same time. Second, the somatic response

represents the act of imagination that results in psychophysiological changes in the body. Third, meaning of the image indicates that every image rehearsed in the mind has meaning and attached significance for individuals (Munroe-Chandler & Morris, 2011). Ahsen developed this theory outside the sport context. Sport psychologists have only recently begun conducting research to examine this theory, but it does appear that the meaning of the experience being imagined is a component to be considered in preparing imagery scripts (Morris et al., 2005).

Munroe-Chandler and Morris (2011) observed that the use of imagery in sport psychology encompasses a much wider range of applications than the acquisition of relatively simple movements. PNM Theory (Jacobson, 1930) and Symbolic Learning Theory (Sackett, 1934) have been applied for over 80 years, yet, those theories do not explain how imagery works in all the contexts in which researchers and practitioners have used it (Munroe-Chandler & Morris, 2011). PNM Theory and Symbolic Learning Theory were developed to explain skill learning. Each provides interesting insights, but a broader view is required. Bioinformational Theory (Lang, 1977) and Triple Code Theory (Ahsen, 1984) provide alternative explanations that early research in sport and exercise contexts suggests might also be useful (Morris el al., 2005; Munroe-Chandler & Morris, 2011). Research must continue in imagery to substantiate its theoretical bases.

2.2.3 Conceptual Models of Imagery

Conceptual models of imagery are equally important to consider in order to understand how to apply imagery to sports. Among the many models of imagery research, the most widely used include Visomotor Behaviour Rehearsal (VMBR; Suinn, 1972), the PETTLEP Model (Holmes & Collins, 2001), and the Neurocognitive Model of Imagery in Sport, Exercise and Dance (Murphy, Nordin, & Cumming, 2008).

2.2.3.1 Visomotor Behaviour Rehearsal (VMBR; Suinn, 1976)

Suinn (1976) proposed the VMBR technique for the delivery of imagery. VMBR

is a covert activity wherein sensory-motor sensations experienced by the individuals reintegrate reality experience along with neuromuscular, physiological, and emotional involvement. VMBR is based on the suggestion that imagining a task, such as tennis service, slalom skiing, or a gymnastic vault, before actually performing it can enhance performance of the task at the time of execution (Alrahamneh & Elbokai, 2011). Suinn proposed that VMBR should include the imagery programme in a holistic and multidisciplinary form, involving reintregration of experience derived from visual, auditory, tactile, kinesthetic, and emotional cues (Morris et al., 2005). In VMBR, Suinn proposed that imagery should be preceded by a period of relaxation, which he based on progressive muscle relaxation (PMR; Jacobson, 1930), a technique widely used in psychology. Suinn claimed that PMR creates a physical and mental calmness and focus that facilitates imagery. VMBR has been well documented, systematically analysed, and is a popular technique used in sport psychology. For example, Alrahamneh and Elbokai (2011) reported the effect of a 12-week VMBR programme on psychological variables of athletes with special needs in Jordan. The findings of the study indicated that there was a significant improvement in self-concept and anxiety was reduced across the intervention phase. Previously, Hall and Erffmeyer (1983) had tested VMBR with women intercollegiate basketball players. They found that VMBR lead to significantly improved foul shooting. Likewise, Gray (1990) found that VMBR training led to improved racquetball and Frisbee tossing performance. These studies indicated that VMBR is an effective technique for improving sports performance. However, more recently some researchers have questioned the need for induction of a relaxed state as a precursor to imagery and VMBR has been studied less (Munroe-Chandler & Morris, 2011).

2.2.3.2 PETTLEP Model of Imagery

PETTLEP is based on findings of research in sport psychology, cognitive psychology, and neuroscience (Wakefield & Smith, 2012). It carries the distinction of

being one of few models that have been developed specifically in the context of sport psychology. The PETTLEP model was developed by Holmes and Collins (2001) to provide guidelines for imagery interventions to enhance performance. It aimed to provide applied psychologists with a set of practical guidelines for imagery use. PETTLEP conceptualises physical practice and imagery to be on a continuum such that the closer imagery is to real experience, the more effective it will be (Wakefield & Smith, 2012). PETTLEP is the acronym for seven components that facilitate performance, namely physical, environmental, task, timing, learning, emotion, and perspective aspects of imagery (Holmes & Collins 2001). Physical is related to experiencing imagery that is as similar as possible to the actual performance. For example, wearing the clothes worn during performance and holding a bat, ball, or club used in the sport would be expected to enhance imagery. Environment refers to the physical environment where imagery is performed. Holmes and Collins proposed that performing imagery in the environment in which the task is performed should promote the efficacy of the imagery practice. Task emphasizes that the content of the imagery should be appropriate to the skill level and preferences of the athlete. This should help to enhance attentional focus, which should enrich the imagery. Timing is related to the pace at which individuals imagine doing the activity. There are uses of imagery in which individuals imagine in slow motion, such as when they are examining their performance for technique errors, or at a speed faster than actual performance, to "fast forward" through irrelevant parts of the imagined performance. However, Holmes and Collins proposed that imagery should usually be performed in real time because both technical and temporal aspects of performance might change at different speeds, leading to performance decrements. Learning refers to the need for imagery content to be reviewed and modified as new skills are learnt (Morris et al., 2005). Emotion relates to all the emotion-laden experiences that individuals can include in imagery practice (Wakefield & Smith, 2012). The aims of imagery should be

to control negative emotions and to facilitate the experience of positive emotions to enhance later performance. Finally, perspective provides guidance from a visual perspective that most closely reflects the view adopted by athletes when actually performing the task. There are two perspectives, internal or first person perspective, in which imagers imagine being in their bodies experiencing what they would if actually performing the task, and external or third person perspective, in which imagers imagine being outside their body watching their own performance. Holmes and Collins proposed that the internal perspective is usually more effective, but recent research suggests that there might be circumstances in which an external perspective would be more useful and others where experience of both perspectives in imagery might lead to the best outcomes (Morris & Spittle, 2012). The PETTLEP model has not only gained prominence in sport psychology, but it has also received support in the neuroscience literature (Ganis, Thompson, & Kosslyn, 2004). A number of studies have highlighted that the PETTLEP model has enabled performance to be effectively enhanced (Munroe-Chandler & Morris, 2011; Smith & Collins, 2004; Smith et al., 2007; Wakefield & Smith, 2012). For example, Wakefield and Smith (2012) examined use of the PETTLEP imagery technique in netball shooting performance. The results of the study showed that PETTLEP imagery improved netball shooting performance, when it was practiced at least three times a week, when compared to less frequent PETTLEP imagery. Similarly, Wakefield and Smith (2011) researched PETTLEP imagery of the biceps curl performance across time. The findings indicated that, although three times a week was most effective for an improvement in biceps curl performance, one session per week also showed a significant increase in strength performance. Based on research support, PETTLEP has gained popularity as a guide to delivering imagery and is now used widely in sport.

2.2.3.3 Neurocognitive Model of Imagery in Sport, Exercise, and Dance

Murphy, Nordin, and Cumming (2008) introduced the Neurocognitive Model of Imagery in Sport, Exercise, and Dance (NMI). This model is organised around the functions that imagery serves in support of attainment of individual goals. The NMI model comprises of three major components in accordance with the neurocognitive approach and establishes a link between cognitive processes, cognitive effects of imagery, and attention to imagery outcome or behaviour. In addition to this, the model also explores cognitive processes, functions, outcomes and interaction with self-talk. Nordin and Cumming (2005) found differences in imagery content that depended on the time when people performed the same imagery. They suggested that it is important to consider and define the time when the imagery was done and the situation in which the imagery is done. To bridge this limitation, Murphy et al. (2008) added spontaneous imagery into the model, which suggests that the situation of the imagery will influence imagery use because it allows the content and characteristics of the image generated mentally to respond to the needs or functioning in a specific situation (e.g., preparing for easy or difficult sequences, steps, or activity). In conclusion, this model states that situational imagery is a combination of what is happening in a situation and all the conditions that exist at a particular time in a particular place (Nordin & Cumming, 2008). Although, the use of this model as a theoretical framework has proved successful in some research (Bernier & Fournier, 2010), it needs to be tested in applied settings.

2.2.4 Measurement of Imagery in Sport

Two imagery concepts have been measured in the context of sport, namely imagery ability and imagery use or function. In this section, I briefly review the measurement of imagery ability and imagery use.

2.2.4.1 Imagery Ability

Psychologists have measured imagery ability since Betts (1909) developed the

Questionnaire on Mental Imagery (QMI). Betts focused on the extent to which people reported imaging in all their sense modalities. The QMI was a self-report rating of the extent to which people experienced imagery in each sense modality. In sport, Martens (cited in Vealey, 1986) developed an imagery activity-based, self-report measure, the Sport Imagery Questionnaire (SIQ). In the SIQ, individuals imagine four scenes relevant to their sport. After imagining each scene, they rate their imagery with reference to vividness of visual, auditory, kinaesthetic, and mood imagery. The test examines imagery relevant to sport situations. They include the three sensory modalities and mood characteristics, dimensions of vividness and controllability, and the visual imagery associated to the internal and external perspective (Morris et al., 2005). Unfortunately, Martens never validated the SIQ, although it has been popular in applied work. Based on the SIQ, Watt, Morris, and Andersen (2004) developed a more extensive measure called the Sport Imagery Ability Measure (SIAM). The SIAM involves people performing the activity of imagining four scenes from their sport, then, after imagining each scene, rating their imagery on all six sense modalities (vision, kinaesthesis, audition, olfaction, touch, and gustation [taste]), five dimensions (vividness, controllability, speed, ease, and duration of imagery), and the emotion associated with each imagery experience. Ratings are made on a 100mm visual analogue scale. The SIAM has been validated in a number of countries and languages (Munroe-Chandler & Morris, 2011) and has been used mainly as a screening device in research to ensure that potential participants have at least moderate levels of imagery ability to be included as participants in studies. Williams and Cumming (2011) developed the Sport Imagery Ability Questionnaire (SIAQ), a measure of the ability to image sport specific, cognitive and motivational imagery content. This questionnaire measures five uses of imagery that correspond to the five imagery uses or functions described by Hall (2001). They are skill imagery ability, strategy imagery ability, goal imagery ability, affect imagery ability, and mastery imagery ability. In

addition to its role in screening, the measurement of imagery ability is important to monitor changes that might occur over the course of studies, and to assist practitioners in the design of individualised imagery-training programmes.

2.2.4.2 Imagery Use or Function

Paivio (1985) proposed a model of imagery functions based on the distinction between cognitive and motivational functions. In addition to the cognitive-motivational dichotomy, Paivio argued that imagery could be either specific or general in its use. Thus, he proposed four functions, namely cognitive specific (CS), which involves imagining the performance of specific tasks, such as sports skills, cognitive general (CG), which focuses on the use of strategies, such as imagining set moves in team games, motivational specific (MS), which relates to imagery of goals, and motivational general (MG), which refers to imagery of psychological processes related to motivation. Based on Paivio's model, Hall, Mack, Paivio, and Hausenblas (1998) developed a self-report measure of imagery function/use called the Sport Imagery Questionnaire (SIQ), not to be confused with Martens' SIQ, which is a measure of imagery ability. In exploratory factor analysis, five factors emerged. Cognitive specific, cognitive general, and motivational specific imagery use were clear factors, but motivational general split into two factors, motivational general-arousal (MG-A), which relates to imagery of the experience of emotion, and motivational general-mastery (MG-M), which is associated with imagery of feeling confident and successful. The SIQ has been widely used in research (Abma, Fry, Li, & Relyea, 2002; Watt, Spittle, Jaakkola, & Morris, 2003; Weinberg, Butt, Knight, Burke, & Jackson, 2003) where it has been correlated with a range of psychological variables and behaviours. In research, the SIQ can be used to correlate with target variables, so that the most effective imagery functions feature strongly in imagery training programmes designed to enhance the target variables. In one of the first examples of this approach, Koehn, Morris, and Watt (2014) correlated SIQ subscales with the nine

dimensions of flow in the Flow State Scale-2. Then they developed an imagery-training programme using the imagery functions and flow dimensions with the highest correlations. Koehn, Morris, and Watt (2014) reported that the imagery-training programme was effective in enhancing flow state and performance in a single-case design study with elite junior tennis players. Based on this research, the SIQ has great potential to be used as a measure of individuals' imagery use on the basis of which practitioners can design imagery-training programmes that focus on the imagery functions that each individual uses most frequently.

2.2.5 Research on Imagery in Sports Performance

Athletes use imagery to enhance their performance (Anderson, 2000; Hall, 1998; Haunsenblas et al., 1999). Imagery is a powerful tool that is used to help individuals meet their personal or performance goals, but it is most effective when used for a specific purpose. Bell and Thompson (2007) and Smith et al. (2007) mentioned that it is evident that imagery training improves sporting performance (Hall, 2001; Hird et al., 1991). Short, Tenute, and Feltz (2005) reported that there were over 200 studies that provided information on how imagery works (e.g., what images are used, when, and why imagery was used, and where imagery was used). In this section, I provide a brief summary of research involving imagery in sport and exercise performance.

Imagery helps both novice and expert sport and exercise participants, especially, if it is accompanied by physical practice (Blair, Hall, & Leyson, 1993; Hird et al., 1991). According to Nordin and Cumming (2005), imagery is widely used by professional athletes during practice and training sessions because it enables them to enhance performance. Nordin and Cumming mentioned that athletes might also use imagery to predict their opponents' strategies and seek solutions to achieve their goal or seek appropriate ways to be successful in each situation. Imagery training is useful for athletes because they can mentally rehearse certain skills or strategies to overcome their

opponent's attitude, behaviour, and emotions (Singer & Anshel, 2006). Mackenzie and Howe (1991) conducted a study to examine the effect of imagery on tackling performance in rugby players. The players were divided into two conditions either practising only mental imagery or practising a combination of mental imagery along with physical practice. The results showed that mental imagery with physical practice significantly improved tackling performance compared to exclusive use of mental imagery. Another study examined the effect of two conditions (physical practice and physical practice with an imagery intervention) on foul shooting in highly-skilled basketball players. The findings indicated that physical practice with an imagery intervention had a positive effect on performance when compared to physical practice alone (Savoy & Beitel, 1996).

Further review of the literature shows that using imagery immediately before performance can produce improved effects on strength tasks, such as biceps curls (Vealey & Greenleaf, 2006), self-confidence (Callow, Hardy, & Hall, 2001; Ross-Stewart & Short, 2009; Short et al., 2002), intrinsic motivation (Martin & Hall, 1995), anxiety (Carter & Kelly, 1997), and self-efficacy (Beauchamp et al., 2002; Jones, Mace, Bray et al., 2002).

2.2.5.1 Imagery and Self-Confidence

Researchers have shown that imagery techniques were effective in improving self-confidence. Imaging positive strategies lead to desirable performance outcomes (Cumming et al., 2006; Williams, Cumming, & Balanos, 2010). Visualising images of mastering a skill has an added advantage to increase confidence. Bandura (1997) concluded that people imagining themselves completing an activity increased their confidence, which in turn facilitated performance during the actual situation. According to Nordin and Cumming (2005), cognitive and motivational imagery help to enhance confidence (e.g., Callow, Hardy, & Hall, 1998). Short and Short (2005) reported a positive relationship between cognitive imagery and sport confidence in team sports

(netball and football). A similar study by Adegbesan and Adegbola (2010) on elite volleyball, basketball, and football players in Botswana also indicated that there was a significant positive relationship between sport imagery use and sport confidence in team sports. In another study, it was found that those participants who imagined completing a downhill skiing course while standing in their racing position with their equipment, generated more vivid images that increased their confidence levels (Callow, Roberts, & Fawkers, 2006). Williams and Cumming (2012) researched the interplay among athletes' sport imagery ability, trait confidence, and tendency to appraise a challenging situation. Structural Equation Modelling (SEM) indicated a positive relationship between sport confidence, mastery, and goal imagery ability. This result highlighted the importance of motivational imagery ability and the need to assess athletes' ability to imagine different content. Callow and Hardy (2001) found that CG and MG-M imagery use were related to state confidence in lower skilled national netball players, whereas motivational specific imagery use was related to state confidence in higher skilled national netball players. Callow, Hardy, and Hall (2011) examined the effects of MG-M imagery use on the confidence of three elite badminton players. The results showed that a 20-week imagery programme led to an increase in sport confidence in two of the badminton players and stabilised the sport confidence of the third player. Vadocz, Hall, and Mortiz (1997) conducted a study that investigated the relationship between imagery use, anxiety, and self-confidence. Vadocz et al. reported that motivational imagery use was related to both competitive state anxiety and self-confidence. Furthermore, the more the athletes used MG-M imagery, the more confident they were. Mortiz et al. (1996) reported similar results These studies indicate that regardless of the level at which the athletes competed, participants boosted their self-confidence with the help of imagery. In particular, use of the MG-M function was found to improve individuals' confidence level (Munroe-Chandler, Hall, & Fishburne, 2008).

2.2.5.2 Imagery and Self-Efficacy

Imagery has also been shown to improve self-efficacy (Short, Monsma, & Short, 2004). Callow and Hardy (2005) stated that successful images might improve individuals' self-efficacy. Self-efficacy is the belief that individuals have the ability to successfully perform a specific behaviour to obtain a desirable outcome (Bandura, 1986). According to Martin and Hall (1995) and Bandura (1997), there is an association between imagery and self-efficacy. Hall (1995) proposed that imagery might have an influence on exercise participation through the effects of self-efficacy and outcome expectancy. Short, Tenute, and Feltz (2005) examined the relationship between self-efficacy in using imagery and imagery ability in athletes from various sports. The findings indicated that athletes used imagery more often if they were confident in their ability to use it. The results also showed that efficacy in using imagery was a mediator in the relationship between imagery ability and cognitive imagery use. Munro-Chandler et al. (2008) compared the effects of imagery of practice and competition in 345 recreational athletes competing at various levels in 32 sports. They found CS imagery use to be a significant and positive predictor of practice and competition self-efficacy. Davis, Boxall, Szekeres et al. (2014) examined the effects of a CS imagery intervention on equestrian training quality and self-efficacy within a naturalistic environment in three amateur equestrian athletes. All three athletes showed an increase in target skill self-efficacy and two showed an increase in target skill performance quality. All three athletes claimed that the imagery intervention, especially, CS imagery, was useful in improving personal training quality and self-efficacy. Another study examined the temporal patterns of imagery, self-efficacy, and rehabilitation adherence during eight weeks of a rehabilitation programme on 90 injured individuals participating in 28 sports in New Zealand and Canada. The findings indicated that task efficacy, imagery use, and adherence level remained stable, while coping efficacy declined over time (Wesh, Hall, et al., 2012). O, Munro-Chandler, Hall et al. (2014)

conducted a study that examined the effect of an individualised MG-M imagery intervention on enhancing self-efficacy in youth squash players. The daily imagery practice sessions and weekly face-to-face guided imagery sessions improved self-efficacy in the athletes. Likewise, Beauchamp et al. (2002) examined the relationship between self-efficacy and pre-competition imagery use in golf performance. Their findings demonstrated that pre-competition MG-M imagery resulted in a significant improvement in self-efficacy and golf performance. Parkson, Harris, Langdon, et al. (2015) examined the effects of individualised MG-M imagery use on self-efficacy in youth gymnasts. The results suggested a facilitative effect of imagery on self-efficacy across the intervention phase of some gymnasts, whereas self-efficacy remained fairly stable between baseline and intervention phase for others. These studies indicate that MG-M imagery is a means of improving young athletes' self-efficacy.

2.2.5.3 Imagery and Flow

As psychological skills influence flow, it has been suggested that imagery could be a tool to facilitate flow experience (Nicholls, Polman, & Holt, 2005). Flow is theoretically described as an optimal mental state (Csikszentmihalyi, 1990). In a qualitative study, Munroe, Giacobbi, Hall, et al. (2000) found that athletes used motivational imagery to access flow. Nicholls, Polman, and Holt (2005) investigated the effects of an individualised imagery intervention on the intensity of flow state and golf performance in four amateur golfers. Three of the golfers increased in mean global flow intensity and all four increased in mean global flow frequency and performance from baseline to post intervention. Pates, Karageorghis, Fryer, et al. (2003) examined the effect of performance imagery and self-selected music, flow, and performance on a training task in three college netball players. Results of the study showed an increase in flow states in two participants that enhanced their performance. Using a single-case design, Koehn, Morris, and Watt (2014) investigated the effectiveness of an imagery intervention in

enhancing the experience of flow state and performance in four junior tennis players. Following six weeks of imagery training, after a stable baseline had been attained, three players reported a sustained increase in experience of flow state. Koehn et al. also found that all four players improved their service performance, groundstroke performance, and national junior ranking-list position.

2.2.5.4 Imagery and Motivation

It is well documented that imagery can be employed to develop, maintain, and even regain the motivation to train and compete in various contexts, including sport (Paivio, 1985). Based on this, Martin and Hall (1995) examined how mental imagery affected social cognition and intrinsic motivation on a golf putting task. They found that golfers in the imagery intervention condition invested more time in practising the golf-putting task than those in the control condition. Furthermore, Martin and Hall found that golfers who practised imagery techniques had more realistic self-expectations and set higher goals for themselves. This study supported the proposition by Paivio (1985) that imagery could be used to enhance motivation to practice and persist at a task. Hall (2001) stated that mental simulation has been an effective technique for task and behaviour moderation. Hall, Rogers, Wilson, et al. (2010) were interested in identifying the patterns of imagery use and motivational self-determination. Their study mainly examined the patterns of imagery use between regular exercisers and non-exercisers who intended to exercise and the non-exercisers who did not intend to exercise. The results highlighted that the imagery intervention was effective in increasing the time spent on exercising among regular exercisers who intended to exercise, but not among non-exercisers. In another study, Ramirez (2010) examined the effects of PETTLEP imagery and video-observation on the motivation of four badminton players. The imagery session was conducted twice a week for six weeks. The finding supported the use of PETTLEP imagery in improving motivation in players, especially when combined with video-

observation. This is because when athletes physically see themselves performing the task, they are able to understand the emotions they went through while performing the task. This had a greater positive impact on their motivation to compete.

2.2.5.5 Imagery and Exercise Adherence

There is research evidence showing that regular participation in PA can have positive benefits for physical and mental health (Berchicci et al., 2014; Eime et al., 2013), mood, and psychological disorder, such as depression and anxiety (Martinsen, 2008; Wegner et al., 2014; Yoshihara et al., 2014). Most people do not exercise or exercise enough to accrue these benefits (Cameron, Craig, Stephens, et al., 2002). To spread awareness about the importance of maintaining healthy lifestyles, governments and other organisations in various countries have organised public health-promotion campaigns to encourage sedentary people to begin exercise (e.g., Bauman, Madill, Craig, et al., 2004). Very little is known about the motivation of people who do not intend to exercise and why they do not intend to do so. For this reason, it is important to investigate exercise motivation and cognitions among individuals who do not exercise and who have no intention to exercise, so that adequate and effective interventions can be developed and implemented to encourage non-exercisers to start exercising (Hall, Rogers, et al., 2010).

Imagery plays important cognitive and motivational roles in many areas of life (Paivio, 1985), including arousing positive and negative emotions, identifying specific goals and behaviour for obtaining it (Gammage, Hall, & Rogers, 2000). In his seminal paper on imagery and exercise, Hall (1995) made three predictions. First, individuals experience a diverse range of exercise images. Second, exercise images have cognitive or motivational functions. Third, exercise behaviours will be influenced when the images imagined raise expectations of positive and desirable outcomes of exercise, either directly or indirectly. These predictions have been supported quantitatively and qualitatively by several studies (for example, Gammage et al., 2000; Giacobbi et al., 2003; Kim &

Giacobbi, 2009). Walsh (2005) stated that benefits of imagery were not only found in sport settings, but could be extended into exercise settings. The Exercise Imagery Questionnaire (EIQ; Hausenblas, Hall, Rodgers, et al., 1999) and the Exercise Imagery Inventory (EII; Giacobbi, Hausenblas, & Penfield, 2005) are two questionnaires designed to measure imagery use in exercise. The EIQ was originally developed to examine the use of imagery by aerobic exercise participants; however, it has been generalised for other forms of exercise (Rodgers, Hall, Blanchard et al., 1999). The EIQ is a 9-item measure which is rated on a 9-point Likert scale (1= *never*, 9 = *always*). It comprised of three subscales with three items in each: appearance, technique, and energy. The appearance subscale focuses on the attainment of a fit-looking body, the energy subscale is related to being psyched up or feeling energised from exercise, and the technique subscale interprets how well individuals perform their skills and techniques correctly with good form. The questionnaire is designed in such a way that the appearance and energy subscales represent motivational function of imagery whereas the technique subscale represents cognitive function of imagery. Rodgers et al. (1999) have reported good alpha values for the three subscales. In addition, qualitative research i.e., a grounded theory approach was also done to provide richer and more complex discussion about the nature and potential influence of this type of imagery (Giacobbi, Hausenblas, Fallon, et al., 2003). The inductive analysis revealed eight higher order themes, with most participants indicating that appearance and fitness imagery had implications for sustaining their exercise behaviour. Despite the questionnaire having good psychometric properties, a number of limitations were noted by Hausenblas et al. (1999). Firstly, the questionnaire was developed and validated on one form of exercise (aerobics). Secondly, the participants comprised only females, which make it difficult to generalise. Thirdly, the participants were predominantly students. Fourthly, no justification was provided on why 60% of the items from the original scale was removed (from 23 items to 9 items). To address the

limitations of the EIQ, Hall (1998) proposed the need for a more general measure of exercise imagery that allowed valid and reliable assessment for individuals using exercise imagery in other forms of exercise (e.g., joggers, weight lifters). With further refinements in the item construction undertaken in the EIQ, Giacobbi et al. (2005) developed the Exercise Imagery Inventory (EII). This 19-item instrument consists of four subscales: exercise technique, exercise self-efficacy, appearance/health imagers, and exercise feelings. The questionnaire is measured on a 7-point Likert scale (1 = *rarely* and 7 = *often*). The EII supported a four-factor model and demonstrated adequate fit in confirmatory and exploratory factor analysis. The results support the use of the EII in research and applied purposes, however, as the use of exercise imagery is still in its infancy, Giacobbi et al. (2005) recommended further research to strengthen the validity and reliability of the instrument.

There is limited research in imagery and exercise adherence. Most research within the literature was based on developing and validating the EIQ and EII. Researchers have conducted few studies to investigate the use of imagery in increasing exercise for maintaining a healthy lifestyle. Using the EIQ, Gammage, Hall, and Rodgers (2000) examined how the cognitive and motivational roles of exercise imagery varied according to gender, frequency, and type of activity. The findings revealed that regardless of gender, frequency of exercise, or type of activity, appearance imagery was most frequently used, followed by technique and energy imagery. Gammage et al. also found that men used more technique imagery, whereas women used more appearance imagery. Additionally, they reported that those individuals who exercised more frequently used all types of imagery more often than those who exercised less frequently.

Most of the research included samples of mostly young exercisers (Gammage et al., 2000; Thogersen-Ntoumani, Cumming, & Ntoumanis, 2012). According to Wesch et al. (2006), imagining feelings of being energised and psyched up have emerged as more

important in older adults' exercise behaviour. Older adults may also benefit from using imagery by experiencing changes in subjective vitality (Thogersen-Ntoumani et al., 2012). Older adults often report multiple barriers to PA and as a result avoid doing activities (Buman, Yasova, & Giacobbi, 2010; Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2007). Researchers have reported that imagery can increase PA in inactive or middle-aged adults, such that they would engage in their PA on a daily basis (Chan & Cameron, 2011; Kim & Giacobbi, 2009). Thogersen-Ntoumani et al. (2012) used the EIQ to examine the inter-relationship between exercise imagery, self-reported exercise behaviour, and well-being in older adults in Greece. They found that energy imagery positively predicated exercise behaviour and subjective vitality. Appearance imagery and technique imagery positively predicted physical self-worth. This indicated that older adults engaged in different types of imagery to motivate themselves to exercise to maintain a healthy lifestyle. Giacobbi (2007) assessed relationships of age, gender, and differences in activity level with exercise imagery, measured by the EII and extent of activity measured by Godin & Shephard's (1997) Leisure Time Exercise Questionnaire. The results suggested that individuals who were very active used appearance/health imagery more than those who were less active. Giacobbi also observed that participants' level of activity varied with age, so that those in the younger age group (18 to 25 years) were more active and used exercise imagery techniques more than those in the older age group (45 to 65 years), who did not use exercise imagery because they did not exercise regularly. Likewise, Kim and Giacobbi (2009) observed that the imagery used by older adults could be categorised into seven themes: exercise technique, appearance images, health outcome image, stress level/emotion image, plan/strategy imagery confidence imagery, enhancing imagery, and energy/drive image. Gurine (2015) examined the impact of a 4-week imagery intervention undertaken by older adults on their daily living activities and instrumental activities that enabled individuals to live independently. The

findings indicated that visual imagery ability significantly improved after providing guided imagery intervention. Kalicinski and Lobinger (2013) used a narrative approach to identify the potential benefits of motor and exercise imagery in older adults. It was revealed that imagery helped to improve skills, self-efficacy, and exercise behaviour. Furthermore, the findings also highlighted that imagery ability deteriorated as age increased. Of the many studies mentioned in this thesis, only one study investigated the relationship between exercise imagery use and PA level among exercisers based on gender and ethnicity in Malaysia using the EII (Kok, Omar-Fauzee, & Rosli, 2010). Kok et al. highlighted that frequent exercisers used appearance imagery more than those who did not exercise frequently. The findings also showed that there was no significant gender difference in imagery and exercise frequency level. However, there was a significant difference in level of PA among different ethnic groups in Malaysia (Kok et al., 2010).

Throughout the review and synthesis of imagery research, the use of the term exercise by the researchers specialised in imagery was mostly with regards to PA. It can be noted that imagining positive strategies or facilitative imagery leads to desirable outcomes, such as improved self-confidence, performance, or skill learning, stress and anxiety reduction, as well as enhanced motivation for performing a particular PA. These studies strengthen the understanding that imagery is a strong non-invasive technique that could increase PA levels among clinical and non-clinical individuals who are inactive.

2.3 Physical Activity

PA is an umbrella term for different forms of human movement, including exercise, play, and sports (Berger, Pargman, & Weinberg, 2007). PA is any bodily movement produced by skeletal muscles that results in energy expenditure (Willis & Campbell, 1992). Exercise, a subset of PA, is planned, structured, and repetitive with the primary objective of improving or maintaining physical fitness (Caspersen et al., 1985). Being involved in PA is important for a healthy lifestyle. A sedentary lifestyle leads to

hypokinetic complications (problems associated with lack of movement), comprising a range of physical health problems, including coronary heart disease, obesity, low back pain, osteoporosis, hypertension, cancer and diabetes (Biddle & Mutrie, 2001), as well as poor mental health (Hoare, Milton, Foster, & Allender, 2016), including higher levels of anxiety and depression (Biddle & Mutrie, 2001).

2.3.1 Benefits of Physical Activity

Regular PA reduces the risk of chronic conditions (Biddle & Mutrie, 2001). Corbin et al. (2011) suggested that the more PA individuals do, the more beneficial it is; however, the benefits are unique for each person. It is evident from research that a moderate level of PA for 30 minutes a day is useful for maintaining a healthy lifestyle (Blair et al., 2004; Corbin et al., 2011). Moderate PA is described as brisk walking for 60 minutes for five days per week. This is equal to 10,000 steps per day (Goodpaste, Delany, Otto, et al., 2010). PA less than this are rated low and above this are rated vigorous. According to US Department of Health and Human Services (2005), there is general consensus that 2,500-2,800 kcal per week or 60-90 minutes per day of moderate intensity PA is required for long-term weight loss. There are physiological, psychological, and emotional benefits of PA (Guerin et al., 2003). It is recommended that in order to gain psychological benefits from PA, persons should engage in low-intensity exercise (DeVries, 1981) Psychological benefits include increased happiness, reduced anger, tension, fatigue, depression, anxiety, decreased negative thoughts, improved mood, better coping skills, and improved drive for social interaction (Kozlowski, 2013; Kulas, 2013; Miulescu et al., 2013; Vasile, 2013). In terms of emotional benefits, PA helps to boost self-confidence and self-esteem (Kulas, 2013; MacAnaney et al., 2012; Vasile, 2013). PA helps in managing weight, increasing bone density, and reducing the onset of chronic health diseases, including heart disease, cancer, and diabetes.

2.4 Diabetes

Diabetes is among the most common chronic illnesses and a leading cause of death in most countries (National Diabetes Information Clearinghouse, 2008). It is a chronic condition wherein individuals' bodies are not able to break down the carbohydrates, proteins, and fats that they eat into glucose due to insufficient insulin secretion from the pancreas or due to insulin resistance, a failure of the mechanism that transfers glucose from the blood to the muscle cells (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). When food is consumed, it is broken down into glucose, which is the primary source of energy for the body. In people who do not have diabetes, the glucose passes into the bloodstream where the cells use it for growth and energy. The pancreas is the main organ that produces insulin, which permits glucose to enter the cells of the body (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). In people with diabetes, the pancreas either produces little or no insulin or the cells may not be responding appropriately to the insulin that is produced (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). As a result, glucose remains in the blood instead of entering the cells. This results in a condition known as hyperglycaemia (Taylor, 2006). The body then attempts to rid itself of the excess glucose through the urine. In this way, the body loses glucose and sends signals to the hypothalamus that more food is required for energy (National Diabetes Information Clearinghouse, 2008; Taylor, 2006).

2.4.1 Types of Diabetes

There are three main types of diabetes. Type 1 diabetes mellitus (insulin-dependent diabetes; T1DM), Type 2 diabetes mellitus (non-insulin dependent diabetes; T2DM), and gestational diabetes mellitus (GDM; glucose intolerance that occurs with pregnancy). T1DM is an autoimmune disorder (Taylor, 2006) characterised by sudden onset of symptoms resulting from lack of insulin production by the pancreas. Symptoms include increased thirst and hunger, frequent urination, weight loss, blurred vision,

extreme fatigue, irritability, nausea, and fainting (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). T1DM is usually diagnosed in childhood or adolescence. If untreated with insulin shots, individuals with T1DM can slip into life-threatening ketoacidosis also known as diabetic coma. Type 2 diabetes has also been called late-onset diabetes mellitus, but increasing diagnosis of T2DM in younger people has led some experts to question this name (WHO, 2011). T2DM is milder than T1DM. It is a typical metabolic disorder associated with old age, obesity, family history, and a sedentary lifestyle (Mathur, 2011; National Diabetes Information Clearinghouse, 2008; Taylor, 2006; Tuomilehto et al., 2001). T2DM results from the body's inability to utilise the insulin hormone produced by the pancreas (Taylor, 2006). Symptoms develop gradually for T2DM. They include frequent urination, increased hunger and thirst, dryness in the mouth, impotence, irregular menstruation, loss of sensation, skin and gum infection, pain or cramps in the leg, feet and fingers, slow healing of wounds, and blurred vision (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). T1DM and T2DM differ in their origin, pathology, the role of genetics, age of onset, and treatments (Taylor, 2006). GDM is defined as carbohydrate intolerance recognised with first occurrence during pregnancy (Daniel, Dikki, & Ibrahim, 2014). GDM has been identified as a major complication of pregnancies (Daniel et al., 2014). GDM has short-term and long-term implications both for the mother and her unborn baby. Some of these risks may even persist after childbirth (Daniel et al., 2014).

Diabetes is associated with thickening of the arteries. This is due to the build-up of excess glucose waste in the blood. Therefore, individuals with diabetes are prone to coronary heart disease (National Diabetes Information Clearinghouse, 2008; Taylor, 2006). Diabetes can also lead to long-term complications that affect every part of the body including blindness, stroke and heart disease, kidney failure, damage to the nervous system, and amputation of the extremities i.e., toes and feet (Mathur, 2011; National

Diabetes Information Clearinghouse, 2008; Taylor, 2006). Other difficulties associated with diabetes are eating disorders, psychosocial functioning problems, and depression (Taylor, 2006). Researchers have shown that T2DM can be treated by diet and PA in the early stages, but once more advanced must be managed by oral medication and then by insulin injections, although a low-sugar diet and being physically active remain part of the treatment of T2DM for life (Taylor, 2006). Epidemiological research indicates that people diagnosed with T2DM tend to be less physically active than the general population (WHO, 2000) and that they find it difficult to become more active and to sustain sufficient activity to manage their diabetes in the long term (National Diabetes Information Clearinghouse, 2008) Thus, people with T2DM represent a ready source of sedentary, older adults, whose life could be improved considerably by becoming more active.

2.4.2 Incidence of Type 2 Diabetes Mellitus: Global and Malaysian Perspective

According to the International Diabetes Federation (IDF), over 415 million people around the world have been diagnosed with diabetes and the incidence is expected to increase to 642 million by the year 2040 (IDF, 2015). The prevalence of T2DM is high in countries such as Tokelau (37.5%), Federated States of Micronesia (35%), Marshall Islands (34.9%), Kiribati (28.8%), Cook Islands (25.7%), Vanuatu (24%), Saudi Arabia (23.9%), Nauru (23.3%), Kuwait (23.1%), and Qatar (22.9%) (IDF, 2015). The Asia Pacific region has the highest diabetes prevalence of any region in the world (Cockram, 2000).

The rapid socio-economic development in Malaysia has resulted in significant lifestyle changes that, in turn, have increased the risk of several chronic diseases. The most common of all is the rate of increase in diabetes, particularly T2DM, and it is a cause of growing concern in Malaysia (Sidik & Ahmad, 2003). The climatic condition in Malaysia is humid due to equatorial climate. As a result, the general population are found to exercise indoors than outdoors (Roy 2011, 2012). Other reason, especially with regards

to the Malaysian culture include the abidance of Islamic religious codes of conduct which restricts the individuals to be involved in any form of PA (Roy 2011, 2012). Likewise, due to the fast paced life led by the people, most people are found to resort to fast food with lack of exercise which in turn has increased the diabetes and obesity rates in Malaysia (National Diabetes Information Clearinghouse, 2008). The Malaysian Diabetes Association (2011) mentioned that of the 1.2 million individuals with diabetes in Malaysia, 98% have T2DM. Among them, more than half are unaware that they have diabetes. The IDF (2015) estimated that the number of cases of diabetes in adults that are undiagnosed is 1,716 cases in 1000s diabetic population (IDF, 2015). The latest report provided by the IDF (2015) indicated that 3.3 million cases of diabetes were registered in Malaysia. The total number of cases between those aged 29-79 years with diabetes is 3,303 cases in 1000s diabetic population (IDF, 2015). The prevalence of T2DM in Malaysia is higher than the average for all regions of the world (IDF, 2010).

In Malaysia, the Institute of Public Health conducts a health-related community-based survey to inform the Ministry of Health about the status of people's health and well-being. The first National Health and Morbidity Survey (NHMS) in Malaysia was conducted in 1986. The prevalence of T2DM was recorded as 6.3% and the disorder was common among adults aged 30 years and above (Letchuman et al., 2010; Malaysian Diabetes Association, 2011). The second national survey conducted in 1997 indicated that the prevalence of diabetes exceeded 8% in the adult population. This number was expected to increase rapidly in Malaysia within one or two decades (Cockram, 2000). The third NHMS conducted in 2006 reported the overall prevalence of T2DM (recorded and newly diagnosed) to be 11.6%. Malaysia has three main ethnic groups: Malay, Chinese, and Indian. According to the survey by NHMS 2006, Indians had the highest prevalence of diabetes at 19.9% followed by Malay with 11.9%, and Chinese with 11.4% (Clinical Practice Guidelines, 2009; Letchuman et al., 2010). Thus, by the year 2009 Malaysia had

reached the projected prevalence estimated to exist by the year 2015 (Letchuman el al., 2010). T2DM was higher among the urban population than the rural population (Letchuman et al., 2010). The statistics showed that T2DM was highest among senior officials and managers with a percentage of 15.9% (95% CI: 12.9 -18.9). Homemakers and unemployed people showed a prevalence of 14.2% and 16.1%, respectively (Letchuman et al., 2010). The fourth NHMS conducted in 2011 reported that the diabetes prevalence in Malaysia had increased to 20.8%. This exceeded the original expectations from the projected diabetes epidemiology figures estimated by WHO (Lee & Hussein, 2012).

2.4.3 Diabetes Management and Exercise Precautions

PA is important in managing T2DM and maintaining quality of life (MedlinePlus 2011; Shazwani et al., 2010). Participation in regular PA helps to improve glycaemic control. An adequate glycaemic level ranges between 4 - 7 mmol/l when fasting. A reading of up to 8 mmol/l two hours after eating is considered normal for individuals with T2DM (Clinical Practice Guidelines, 2009; Sean, 2011). Prior to the discovery of insulin in 1921, exercise was the only treatment advised for individuals with diabetes (Berg, 1986). When individuals with diabetes exercised, their blood sugar level was controlled, fat metabolism efficiency was enhanced, the likelihood of hypoglycaemic attacks were reduced, and body weight was also controlled (Biddle & Mutrie, 2001). Exercise and PA can also enhance insulin sensitivity, reduce the risk of developing diabetes among adults, improve glucose tolerance, and reduce plasma insulin levels (Bouchard & Despres, 1995). These results related to the benefits of PA in individuals with diabetes were replicated in other studies (e.g., Gudat, Berger, & Lefebvre, 1994; Helmrick et al., 1991; Manson, Rimm, & Stampfer, 1991). Similar benefits for reduction of the risk of diabetes and management of the impact of diabetes have also been found in studies done in Malaysia

(Malaysian Diabetic Association, 2007; 2008). These results highlight the importance of PA in controlling and managing T2DM.

2.5 Purpose of the Thesis

Imagery has been intensively studied in sport and exercise psychology for many years (e.g., Morris et al., 2005), but passion in sport and exercise psychology is relatively new and gradually gaining importance within this field (Roy et al., 2014). Using imagery techniques prior to the execution of the task has proven successful in most sport and exercise settings. While imagery has been examined in exercise contexts (e.g., Gammage, Hall, & Rodgers, 2000; Hausenblas, Hall, Rodgers, & Munroe, 1999), the extent to which mental simulations (i.e., imagery) can be used to produce specific health behaviour change (e.g., increasing PA levels) has yet to be considered (Hall, Rogers, et al., 2010). In this thesis, I consider that if positive emotions and enjoyment of individuals' chosen PA is experienced and recalled then it could be beneficial in influencing passion for PA. To my knowledge, no research has examined the efficacy of an imagery script designed to enhance passion for individuals' selected PA, and to monitor the impact this has on the amount of PA those individuals do in PA. This is noteworthy because such an intervention would provide a different approach to promotion of individuals' participation in and maintenance of PA. With this as the basis, the primary aim of the research in this thesis was to examine the effect of an imagery training program on HP and OP and to examine associated changes in the amount of PA undertaken by participants.

In Study 1, I developed a questionnaire called the Physical Activity Imagery Questionnaire (PAIQ). It is an adaptation of the original SIQ (Hall et al., 1998). The PAIQ is a measure of the types of imagery people use in the context of PA. In Study 2, I explored the associations between type of imagery use and the two types of passion identified in the DMP and measured by the PS. Following this, I determined the types of imagery use that were most effective for developing HP for a preferred PA. The results acquired from

correlation and regression analysis enabled me to design a tailored imagery programme to increase HP for preferred PA. In Study 3, I examined the effects of two imagery intervention programmes, the HPI intervention condition, which was based on the effective types of imagery use for promoting HP and the GPAI intervention condition, which encouraged participants to imagine the general benefits of doing PA. Finally, in Study 4, I explored the experiences of participants in the HPI intervention programme towards the imagery programme, their passion, and their preferred PA to add richness to the quantitative results. In conclusion, the general aim of this research was to increase HP through a tailored imagery intervention and to examine the impact of the imagery intervention on individuals' preferred PA.

CHAPTER 3

STUDY 1: DEVELOPING A MEASURE OF IMAGERY USE SPECIFIC TO PHYSICAL ACTIVITY

3.1 Introduction

Imagery is a widely accepted strategy for enhancing and improving techniques in sport and PA (Cumming & Ramsey, 2009; Cumming & Williams, 2013; Hausenblas et al., 1999; Murphy & Martin, 2002; Short, Tenute, & Feltz, 2005). Paivio (1985) suggested that imagery plays key cognitive and motivational roles in many important areas of life, such as language and sports. According to Paivio (1985), cognitive and motivational imagery both operate at specific and general levels. Based on Paivio's analytical framework, Hall et al. (1998) developed the Sport Imagery Questionnaire (SIQ), which enables psychologists to classify imagery use into five distinct types: cognitive specific (CS), which includes images of specific sport skills; cognitive general (CG), which is imagery related to competitive strategies and game plans; motivational specific (MS), which is imagery that represents specific goals and goal-oriented behaviour; motivational general-arousal (MG-A), which includes images related to physiological and emotional arousal; and motivational general-mastery (MG-M), which represents images of being confident and adopting effective coping skills in challenging situations (Cumming & Ramsey, 2009; Morris et al., 2005; Munroe-Chandler & Morris, 2011). The items in the SIQ are rated on 7-point Likert scales with 1 (*rarely*) and 7 (*often*) to indicate the use of that function of imagery. A substantial number of studies have been based on Paivio's (1985) theoretical framework of imagery (Adegbesan, 2010; Adegbesan & Adegbola, 2010; Morris et al., 2005; Watt, Spittle, et al., 2008).

Researchers have demonstrated that the SIQ has sound psychometric properties. Research on the SIQ has confirmed the questionnaire to have sound validity and reliability (e.g., Abma et al., 2002; Gregg et al., 2011; Hall et al., 1998; Hall, Stevens, & Paivio,

2005; Watt, Jaakkola, & Morris 2006; Watt, Spittle, et al., 2008; Weinberg et al., 2003). Researchers have reported the questionnaire has acceptable internal consistency ranging from .70 to .88 and possesses adequate factorial validity (Hall et al., 2005). With sound psychometric properties established during the development of the SIQ, the scale has been used extensively in research and applied work and has been translated into other languages, such as Finnish (Watt, Jaakkola, & Morris, 2006) and Spanish (Ruiz &Watt, 2012). In both cultural contexts, the SIQ showed good internal consistency.

The SIQ is widely used in research and applied work in competitive sports (Munroe-Chandler & Morris, 2011). Researchers have examined what type of imagery use is most common among athletes (e.g., Callow & Hardy, 2005; Short, Zostautas, & Monsma, 2011; White & Hardy, 1998). Other researchers have investigated the relationship between imagery ability and imagery use using the SIQ (e.g., Abma et al., 2002; Monsma & Overby, 2004; Moritz et al., 1997; Short et al., 2005).

The SIQ has also been used as the basis for developing imagery scripts in sport. For example, Koehn, Morris, and Watt (2014) administered the SIQ and the Dispositional Flow Scale-2 (Jackson & Eklund, 2002) to tennis players and correlated the five subscales of the SIQ with the nine dimensions of the DFS-2. Then they developed an imagery script based on the SIQ and DFS-2 subscales that correlated most highly. That script was effective in increasing the frequency of flow experience and performance in tennis service and ground strokes. Jeong (2012) conducted a similar process in a successful study of imagery and flow in dance. Thus, I proposed to use the SIQ as the basis for developing imagery scripts in PA by identifying types of imagery that would be effective for delivering imagery in that context.

Despite the SIQ demonstrating sound psychometric properties in competitive sports settings, I identified its item construction to be a limitation for identifying types of imagery used in a PA context because of the reference to sport, competition, and winning.

To examine imagery use in a PA setting outside competitive sport, it was necessary to develop and validate a PA version of the SIQ. Thus, I aimed to develop a valid, reliable, and comprehensive assessment device that would quantify imagery use in a PA context. I modified the SIQ items to suit the PA context creating the Physical Activity Imagery Questionnaire (PAIQ).

3.2 Instrument Development

Hall et al. (1998) developed the SIQ to assess the cognitive and motivational use of imagery (i.e., CS, CG, MS, MG-A, MG-M) based on Paivio's (1985) model. Each of the 30 items in the SIQ represented one of the five types of imagery use. For example, an item from the CS subscale is: "I can re-create in my head the emotions I feel before I compete", a CG subscale item is: "I imagine myself being mentally tough", an item from the MS subscale is: "I image the atmosphere of winning a championship (e.g., the excitement that follows winning a championship)", an MG-A subscale item is: "I imagine the stress and anxiety associated with competing." ,and an MG-M subscale item is: "I imagine myself working successfully through tough situations (e.g., a power play, sore ankle)". Because the PAIQ is intended to assess imagery use in a PA, some item wordings of the SIQ were modified and some replicated. The stem sentence of PAIQ was modified from "I image..." to "I imagine..." because the stem "I image..." was often misinterpreted by participants. Such modifications to stem sentences were also reported in a previous study on the development of the Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011). Based on the limitation expressed in a previous study, I decided to change the stem of the items in the PAIQ for improved effectiveness of the questionnaire. Informal feedback indicated that the stem "I imagine..." was comprehended more clearly by participants as they read the items in relation to their PA. For instance: a CS subscale item is: "I imagine my skills improving", an item from the CG subscale is: "I imagine myself successfully following my PA plan", an MS subscale is: "I imagine the feelings

of doing my activity very well (e.g., pride, excitement)", an MG-A subscale item is: "I can re-create in my mind the emotions I feel before I do my PA", and an MG-M subscale item is: "I imagine myself being mentally tough." The initial PAIQ that was designed retained 30 items with seven items in the CS subscale, five items in the MS subscale and six items each on the CG, MG-A, and MG-M subscales, which represented each of the five subscales from the original questionnaire. A list of all 30 items in the SIQ and the PAIQ is presented as in the original version in Table 3.1.

Table 3.1

Lists of items of the SIQ and PAIQ

Item No.	**SIQ Item Wording**	**PAIQ Item Wording**
1	I make up new strategies in my head	I make up *new ways of doing my activity* in my head
2	I image the atmosphere of winning a championship (e.g., the excitement that follows winning a championship	I *imagine* the *way I feel after a very good session of my physical activity*
3	I image giving 100% during an event/game	I *imagine* giving 100% during *my physical activity*
4	I can re-create in my head the emotions I feel before I compete	I can re-create in my head the emotions I feel before *doing the activity*
5	I image alternative strategies in case my event/game plan fails	I *imagine* alternative strategies in case my *activity does not feel good*
6	I image myself handling the stress and excitement of competitions and remaining calm	I *imagine* myself handling the stress and excitement of *my activity* and remaining calm

7	I image other athletes congratulating me on a good performance	I *imagine* other people *complementing me for my involvement in physical activity*
8	I can consistently control the image of physical skill	I can consistently control the image of physical skill
9	I image each section of an event/game (e.g., offense vs. defence, fast vs. slow)	I *imagine* each section of *my physical activity (e.g., the warm-up, the early part of the activity, the middle part, and the final part of the activity)*
10	I image the atmosphere of receiving a medal (e.g., the pride, the excitement, etc.)	I *imagine* the *feelings of doing my activity very well* (e.g., pride, excitement)
11	I easily change an image of skill	I easily change an image of *physical activity*
12	I image the audience applauding my performance	I *imagine other people complimenting my physical activity*
13	When imaging a particular skill, I consistently perform it perfectly in my mind	When imaging a particular *part of my physical activity*, *I* consistently perform it perfectly in my mind
14	I image myself winning a medal	I *imagine* myself *remaining fit and healthy because of the activity I do*
15	I image the stress and anxiety associated with competing	I *imagine* the stress and *exhaustion* associated with *doing my activity*
16	I image myself continuing with my game/event plan, even when performing poorly	I *imagine* myself continuing with my *physical activity* even when *I feel uncomfortable doing it*

17	When I image a competition, I feel myself getting emotionally excited	When I *imagine doing my physical activity*, I feel myself getting emotionally excited
18	I can mentally make corrections to physical skills	I can mentally make corrections to particular parts in the physical activities
19	I image executing entire plays/programs/sections just the way I want them to happen in an event/game	I *imagine* executing my entire physical activity session just the way I want it to happen in real life
20	Before attempting a particular skill, I imagine myself performing it perfectly	Before attempting a particular *part of my activity*, I *imagine* myself performing it perfectly
21	I imagine myself being mentally tough	I *imagine* myself being mentally tough
22	When I image an event/game that I am to participate in, I feel anxious	When I image *the physical activity* that I participate in, I feel anxious
23	I imagine myself appearing self-confident in front of my opponents	I *imagine* myself appearing self-confident in front of *other people who do physical activity*
24	I imagine the excitement associated with competing	I *imagine* the excitement associated with *my physical activity*
25	I image myself being interviewed as a champion	I *imagine* myself being *appreciated for being very good at my physical activity*
26	I image myself to be focused during a challenging situation	I *imagine* myself to be focused *on my activity* during a challenging situation
27	When learning a new skill, I imagine myself performing it perfectly	When learning a new *aspect of my activity*, I imagine myself performing it perfectly

28	I imagine myself being in control of difficult situations	I *imagine* myself being in control of difficult situations
29	I imagine myself successfully following my game/event plan	I *imagine* myself successfully *performing my physical activity* plan
30	I image myself working successfully through tough situations (e.g., a power play, sore ankle, etc.)	I *imagine* myself working successfully through tough situations *(e.g., a sore ankle, bad weather conditions)*

Note. Italics indicates the modifications made to create PAIQ items

As in the original questionnaire each item is rated on a 7-point Likert scale ranging from 1 (*rarely*) to 7 (*often*) to indicate frequency of use of that type of imagery use.

3.3 Psychometric Properties of the PAIQ

3.3.1 Method

3.3.1.1 Participants. The questionnaire was tested with 413 participants (278 females, 135 males), representing physically active people (students and working community), with age range of 20 to 73 years (M_{age} 35.57 ± 49.50). I recruited participants through social media (e.g., Facebook and email), which reached out to various nationalities and varied age groups. I also used paper-and-pencil administration to recruit participants from the University hospital, office, library, and several University departments, including the Sport Centre, the Asia-Europe Institute, the Faculty of Medicine, and the Institute of Postgraduate Studies in Kuala Lumpur. All participants were informed about the details and objectives of the study verbally and in written format. They were allowed to clarify any aspect of the research if required. Details on participants' involvement in various types of PA and nationality are provided in sections that follow.

3.3.2 Measures

3.3.2.1 Demographic Information

In the PAIQ I retained similar demographic details as in the original version. They included name, age, gender, type of PA, and how many days a week each individual was involved in their respective PA.

3.3.2.2 Physical Activity Imagery Questionnaire (PAIQ).

The development of the PAIQ was described in section 3.2. To summarise, the PAIQ is based on the structure and items of the SIQ, which were converted to refer to the non-competitive PA context. In addition, the word "imagine" replaced the word "image" from the SIQ to increase clarity. The five subscales of the SIQ, namely CS, CG, MS, MG-A, and MG-M, containing between five and seven items, constituted the content of the PAIQ. The final 30-item version of the PAIQ that was employed in the first phase of the development process is presented in Table 3.1.

3.3.3 Procedure

Following ethics approval, participants voluntarily completed the PAIQ in English language online, using e-mails and Facebook, as well as through the conventional paper-and-pencil method. I created a link online, through google docs, which reached out to many physically-active people who were engaged in various forms of PA in different countries. I provided the participants with information about the PAIQ and I assured them of anonymity. I received all responses completed online into an Excel spreadsheet created automatically by google docs. I collected data using the paper-and-pencil method in the country where I resided, namely Malaysia. I entered this data manually into the Excel spreadsheet, which I subsequently exported into SPSS and AMOS version 18 for analysis.

3.3.4 Data Analysis

To test the reliability of the questionnaire, I used Pearson product-moment correlation using SPSS version 18 to check for the internal consistency of the

questionnaire. Establishing reliability of the questionnaire is of prime importance. Reliability is concerned with the question of whether the test results of a study are repeatable (Bryman, 2012). Researchers aim to identify how consistent the results are for different items for the same subscale within the measure. The most commonly reported item covariance method in the testing literature is Cronbach's alpha (Field, 2004). The alpha coefficient is a measure of internal consistency and is characterised by the positive inter-correlations that comprise the scale.

Validity has been identified as the most important consideration in test development (American Educational Research Association, 1985). Because the present questionnaire is an item-for-item, scale-for-scale modification of the SIQ, which has been widely examined using exploratory factor analysis (EFA), I considered that it was appropriate to move directly to confirmatory factor analysis (CFA) to examine how well the data I collected fitted the 5-factor model of the PAIQ. The guidelines for cut-off scores in CFA have been widely debated (e.g., Barrett, 2007; Markland, 2007). Because of certain limitations expressed previously (Kelloway, 1998), in this study, the CFA model fit was examined using the chi-square statistic (χ^2), value ratio of chi square (CMIN), comparative fit index (CFI), goodness of fit index (GFI) and root mean square error of approximation (RMSEA). For CFI and GFI, a cut-off score greater than .90 indicates a sound fit. The RMSEA assesses the discrepancy between implied and observed correlation matrices (Kelloway, 1998). An RMSEA value below .05 reflects a good fit and a value between .05 and .07 indicates an adequate fit (Hooper, Coughlan, & Mullen, 2008). The five factors were allowed to covary with each other with variance for each latent factor fixed at 1. Maximum likelihood estimation was employed to test the model.

3.4 Results

Based on the demographic details the participants took part in various forms of PA. They were walking (n = 100), stretching exercise (n = 35), gym (n = 30), yoga (n =

28), badminton (*n* = 20), jogging (*n* = 20), pilates (*n* = 17), swimming (*n* = 17), cycling (*n* = 15), running (*n* = 14), futsal (*n* = 13), volleyball (*n* = 10), aerobics football (*n* = 9), table tennis (*n* = 8), dance (*n* = 7), basketball (*n* = 6), hockey (*n* = 6), tai chi (*n* = 6), tennis (*n* = 6), wushu (*n* = 6), hiking (*n* = 5), netball (*n* = 5), waterpolo (*n* = 5), abdominal exercise (*n* = 5), boxing (*n* = 4), bowling (*n* = 4), and golf (*n* = 4).

Responses that met the criteria for participation and included responses to all 30 items were obtained from participants from various countries, including India (*n* = 80), Malaysia (*n* = 58), USA (*n* = 52), Finland (*n* = 47), Singapore (*n* = 24), Australia (*n* = 23), Germany (*n* = 22), UK (*n* = 22), China (*n* = 21), Norway (*n* = 9), Hungary (*n* = 8), Russia (*n* = 7), Canada (*n* = 5), New Zealand (*n* = 5), Poland (*n* = 5), Greece (*n* = 4), UAE (*n* = 4), Sweden (*n* = 4), Alaska (*n* = 3), Japan (*n* = 3), Kenya (*n* = 3), Ireland (*n* = 2), Belarus (*n* = 1), and Israel (*n* = 1).

3.4.1 Phase 1: 30-Items, 5-Factor Model

In Phase 1, using SPSS, I analysed the descriptive statistics and normality of the data. The descriptive statistics showed that all five subscales had a normal distribution with skewness and kuthosis within the values –1.96 to +1.96 which is within tolerance levels of normality assumptions (Chua, 2013; Williams & Cumming, 2011). Means for subscales ranged from 4.60 to 4.89 (± .96 to 1.07). On the 7-point Likert scale, these means reflected moderately high use of all five types of imagery (Williams & Cumming, 2011). I initially examined the internal consistency of the 30-item questionnaire with five subscales. The seven item CS had a mean *M* = 4.60 ± .96, and the CG subscale with 6 items had a mean *M* = 4.61 ± .97. The five item MS subscale had a mean *M* = 4.89 ± 1.07, the MG-A subscale with six items had a mean *M* = 4.72 ± .99, and the MG-M subscale with six items had a mean *M* = 4.72 ± 1.07. The alpha value of the CS subscale was .53, the CG subscale alpha was .50, the MS subscale alpha was .60, the MG-A subscale alpha was .60, and the MG-M subscale alpha was .53. Pearson product-moment correlations

were significant and ranged from, r = .62 to .72, for the five subscales of PAIQ. The acceptable range of reliability indicates that the PAIQ was a reliable questionnaire. Once the reliability was established, I examined the data for goodness of fit, using structural equation modelling (SEM) in AMOS version 18, that is, I conducted a CFA. The questionnaire involving 30 items with five subscales resulted in poor fit: χ^2 = 1281.91 (395), CMIN = 3.285, GFI = .81, CFI = .74, RMSEA = .074. I reduced the number of items by removing those items with factor loadings below .4 (Field, 2004) to increase the model fit. However, this procedure resulted in minimal changes and little reduction in errors in the fit indices. My original intention was to retain all subscales of the original questionnaire, but the CFA analysis did not support the 5-factor structure (see Figure 3.1).

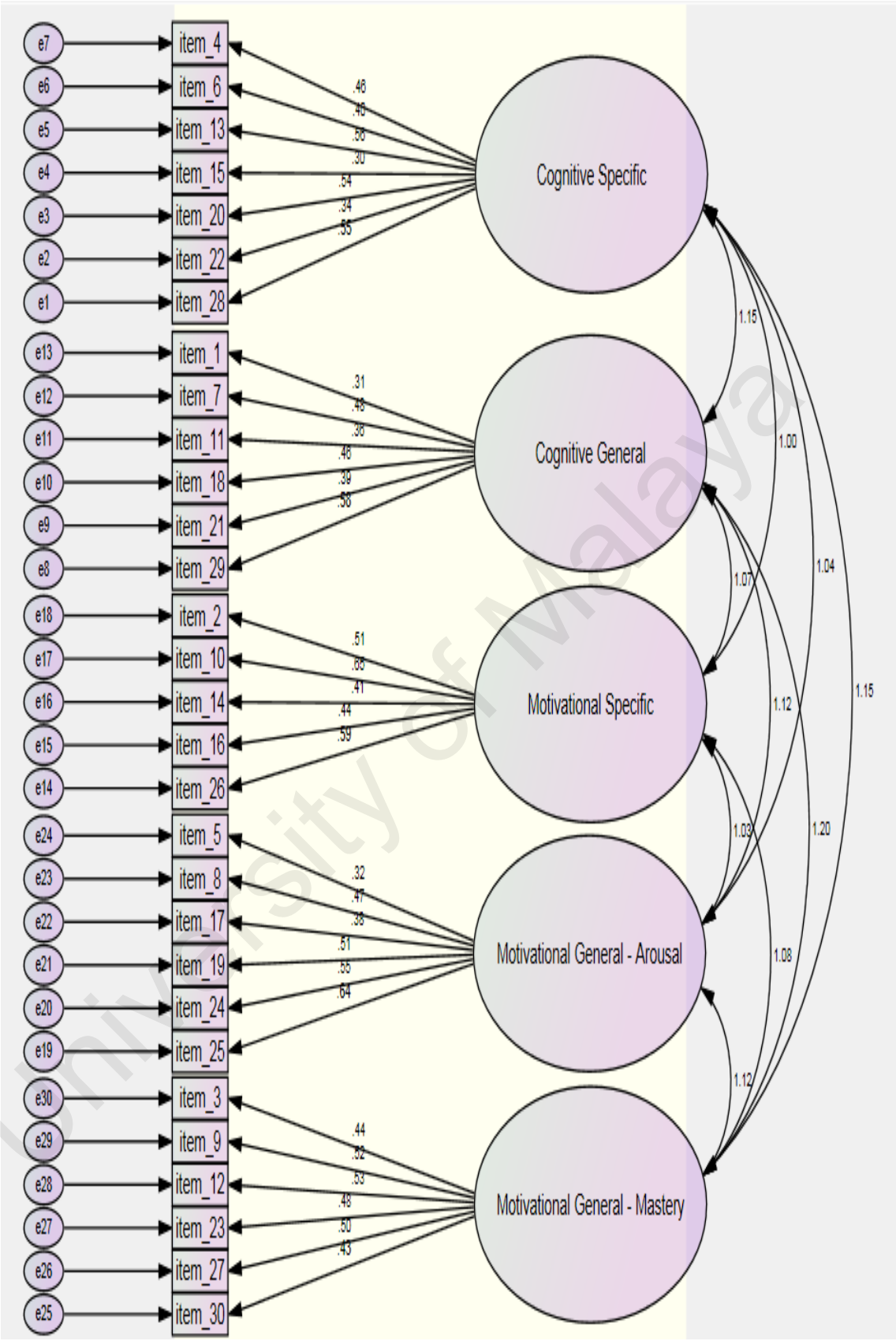

Figure 3.1. CFA for the 5-factor structure PAIQ model.

I made a decision to collapse the CS and CG into one subscale, which I identified as the cognitive subscale. Likewise, I combined the MS, MG-A, and MG-M subscales to

form another independent subscale, which I identified as the motivation subscale. This decision was based primarily on Hall's (1998) argument on Paivio's (1985) model that imagery should have both cognitive and motivational uses for exercise. The process of collapsing the subscales made the subscales broader and more encompassing, with a 13-item cognitive subscale that included items from the SIQ CS and CG subscales, modified to the non-competitive, PA context, and a 17-item motivational subscale that included items from the MS, MG-A, and MG-M subscales of the SIQ, also modified to the non-competitive, PA context. The 5-factor model was, thus, modified to a 2-factor model and re-examined using CFA analysis.

3.4.2 Phase 2: 30-Items, 2-Factor Model

In Phase 2, I reconfigured the same data set for further analysis of the PAIQ version involving 30 items (see Figure 3.2). The modification, described in Section 3.4.1, included collapsing of subscales to form two major subscales (i.e., cognitive and motivational subscale). Analysis in Phase 2 followed the same procedures of Phase 1. First, I checked for the internal consistency of the 30-item questionnaire with two subscales. The 13-item cognitive subscale had a mean, $M = 4.87 \pm 1.05$, with an alpha value of .7, and the motivational subscale with 17 items had a mean, $M = 4.82 \pm 1.01$, with an alpha value of .81. The Pearson product-moment correlation was significant with an r value of .72 between the cognitive and motivational subscales. Once reliability was established, I analysed the data in this 2-subscale structure, using CFA in AMOS. The findings once again resulted in a poor fit: $\chi^2 = 1327.2$ (404), CMIN = 3.285, GFI = .81, CFI = .73 and RMSEA = .074.

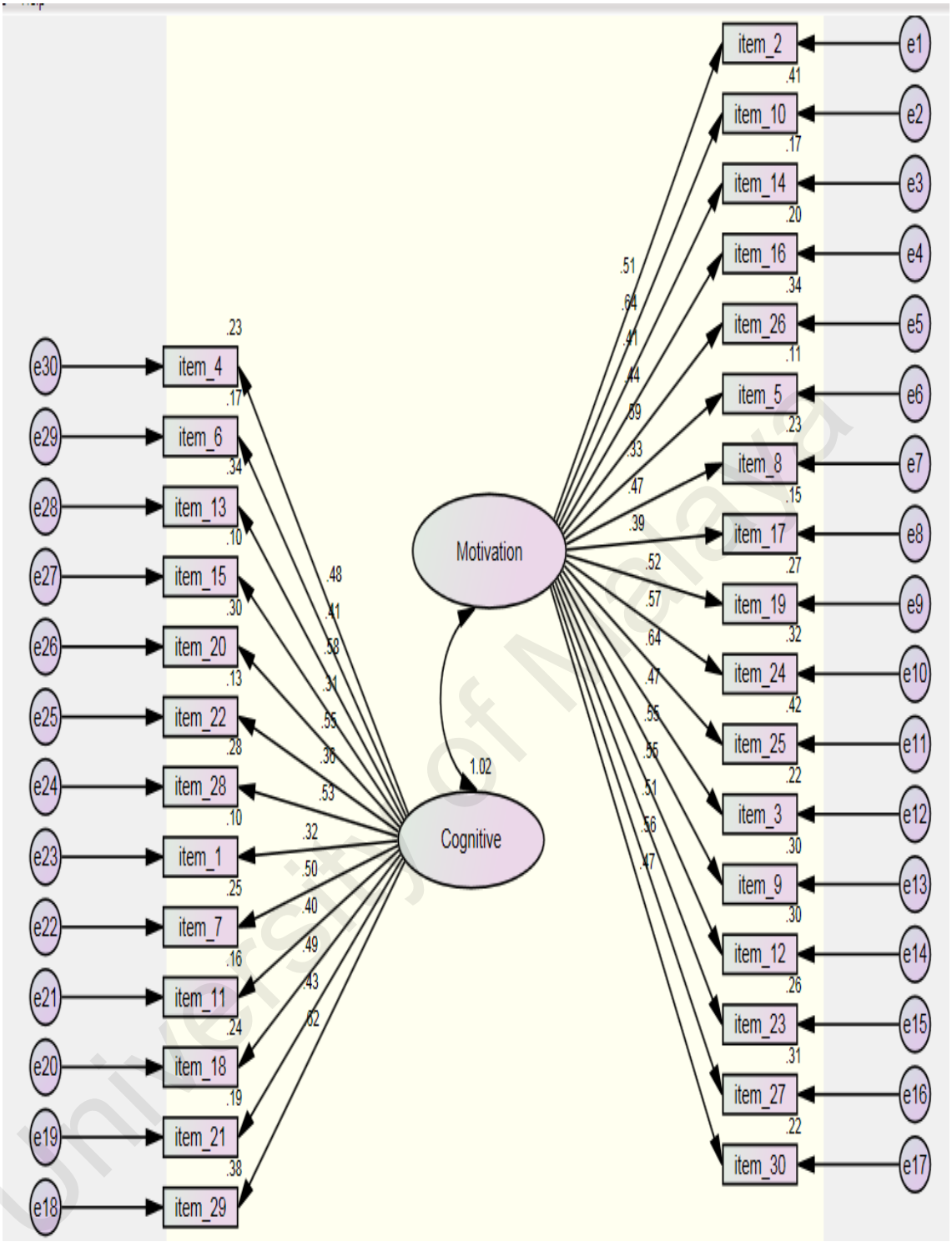

Figure 3.2.CFA for the 2-factor structure PAIQ model with 30 items.

3.4.3 Phase 3: 15-Items, 2-Factor Model

In Phase 3, I referred to the factor loadings under the modification indices generated in the output of Phase 2. I then removed 15 items with factor loadings below .4 (Field, 2004) and covaried items wherever possible within the subscale (Byrne, 2010). The reduction process resulted in 15 viable items (see Table 3.2). I then re-examined the

questionnaire for reliability of the resulting 15-item, 2-subscale version of the PAIQ, using Cronbach's alpha coefficient and Pearson product-moment correlation. The 5-item cognitive subscale had a mean, $M = 4.87 \pm 1.06$, and an alpha value of .70, while the 10-item motivation subscale had a mean, $M = 4.82 \pm 1.01$, and an alpha value of .81, demonstrating acceptable levels of internal consistency. The Pearson product-moment correlation between the cognitive and motivational imagery use subscales was significant, $r = .72$, $p < .001$. This high correlation indicates that individuals who said they used a larger amount of cognitive imagery also said that they used a larger amount of motivational imagery. Once the reliability was established, I conducted another CFA on the reduced 15-item data set, with five items representing the cognitive use of imagery subscale and 10 items representing the motivational use of imagery subscale. This CFA produced an adequate fit, within the acceptable range: $\chi^2 = 252.2$, (84), CMIN = 3.01, GFI = .92, CFI = .90, RMSEA = .07 (see Figure 3.3).

Table 3.2 represents the number of items that were removed from PAIQ to obtain an adequate model fit. The reduced item numbers presented in the table and its corresponding statements are in sequential order as they were originally listed in the 30-item PAIQ.

Table 3.2

List of Items Removed from the 30-item PAIQ to Produce the 15-item PAIQ

Item No:	**Wording of Items Removed**
Item 1	I make up new ways of doing my activity in my head
Item 3	I image giving 100% during my physical activity
Item 4	I can re-create in my head the emotions I feel before doing the activity
Item 5	I image alternative strategies in case my activity does not feel good

Item 6	I image myself handling the stress and excitement of my activity and remaining calm
Item 7	I image other people complementing me for my involvement in physical activity
Item 9	I image each section of my physical activity (e.g., the warm-up, the early part of the activity, the middle part, and the final part of the activity)
Item 11	I easily change an image of physical activity
Item 14	I image myself remaining fit and healthy because of the activity I do
Item 15	I image the stress and exhaustion associated with doing my activity
Item 17	When I image doing my physical activity, I feel myself getting emotionally excited
Item 19	I image executing my entire physical activity session just the way I want it to happen in real life
Item 21	I imagine myself being mentally tough
Item 22	When I image the physical activity that I participate in, I feel anxious
Item 27	When learning a new aspect of my activity, I imagine myself performing it perfectly.

The final CFA analysis supported a 2-factor, 15-item structure of the PAIQ. The collapsing of subscales process showed a more meaningful model than five independent subscales for the imagery use questionnaire modified to focus on PA (see Figure 3.3). Hence, the final questionnaire comprised of 15 items, with five items in the cognitive

subscale (e.g., "I can mentally make corrections to particular parts in the physical activities") and 10 items in the motivation subscale (e.g., "I imagine other people complimenting my physical activity") (see Table 3.3). The subscale cognitive use represents the thought process of imagining the specific skills, and the strategies, routines, and plans of a PA in general. Motivational use represents the thought process of imagining PA performance, feelings, emotions, and goal achievement-oriented behaviour. Table 3.3 presents a list of items that were retained after factor reduction with their original item numbers.

Table 3.3

List of Items Retained in PAIQ with their Factor Loadings

Original Item numbers in Final PAIQ	**Wording of Items Retained**	**Factor Loadings**
Item 2	I image the way I feel after a very good session of my physical activity	.47
Item 8	I can consistently control the image of physical skill	.45
Item 10	I image the feelings of doing my activity very well (e.g., pride, excitement)	.64
Item 12	I image other people complimenting my physical activity	.51
Item 13	When imaging a particular part of my physical activity, I consistently perform it perfectly in my mind	.53

Item 16	I image myself continuing with my physical activity even when I feel uncomfortable doing it	.43
Item 18	I can mentally make corrections to particular parts in the physical activities	.44
Item 20	Before attempting a particular part of my activity, I imagine myself performing it perfectly	.50
Item 23	I imagine myself appearing self-confident in front of other people who do physical activity	.54
Item 24	I imagine the excitement associated with my physical activity	.61
Item 25	I image myself being appreciated for being very good at my physical activity	.65
Item 26	I image myself to be focused on my activity during a challenging situation	.62
Item 28	I imagine myself being in control of difficult situations	.52
Item 29	I imagine myself successfully performing my physical activity plan	.62
Item 30	I image myself working successfully through tough situations (e.g., a sore ankle, bad weather conditions)	.50

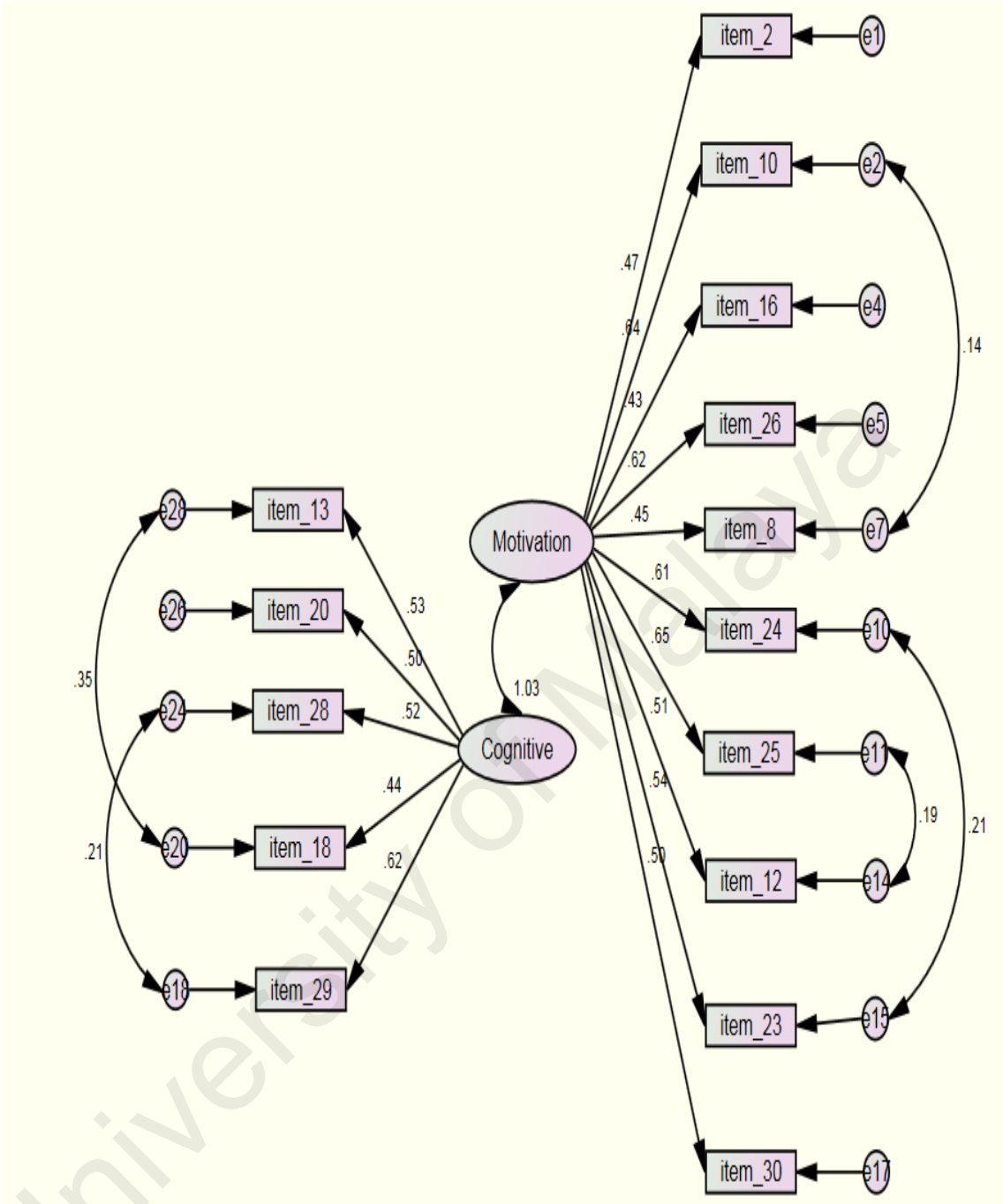

Figure 3.3. 15 item, 2-factor model

The five items listed in the cognitive subscale are a combination of items from the CS and CG subscales of the 30-item PAIQ in which items were modified directly from the SIQ. Likewise, the 10 items listed in the motivational subscale reflected items that were combined from the MS, MG-A, and MG-M subscales of the 30-item PAIQ that was modified directly from the SIQ. It is important to note that there are some concerns expressed on the cut-off for inclusion of items based on standardised factor loadings

(Markland, 2007; Marsh, Hua, & Wen, 2004). For this reason, caution needs to be observed when interpreting the results. For example, Stevens (1992) calculated a cut-off value of .4, which was proposed to be acceptable irrespective of the sample size. Comrey and Lee (1992) suggested using more stringent cut-off values i.e., .32 (*poor*), .45 (*fair*), .55 (*good*), .63 (*very good*) or .71 (*excellent*). This was supported by Tabachnick and Fidell (2007). Bearing in mind the debates that exist on the cut-off values for standardised factor loadings, the values proposed by Hair et al. (1998) are widely accepted for use in research. In my research, I considered the cut-off values calculated by Hair et al. for establishing the validity of PAIQ. The 2-factor structure demonstrated an adequate fit with moderate factor loadings, which Hair et al. proposed to be acceptable. Such values in standardised factor loadings have also been reported in developing questionnaires in recent studies (Cumming, 2008; Madrigal et al., 2013; Robin et al., 2007; Williams & Cumming, 2011). Overall, the standardised factor loadings ranged from .43 to .64. Four items had factor loadings between .40 and .49 (i.e., Items 2, 8**,** 16, 18), six items had factor loadings between .50 and .59 (i.e., Items 12, 13**,** 20, 23, 28, 30) and five items had factor loadings of .60 or more (i.e., Items 10, 24**,** 25, 26, 29).

3.5 Discussion

The purpose of this study was to modify the SIQ to develop a measure that would be suitable to examine types of imagery use in a PA context, the PAIQ. Indeed, a comprehensive literature search has shown that there are questionnaires such as the exercise imagery questionnaire (EIQ; Hausenblas, Hall, Rodgers et al., 1999) and the exercise imagery inventory (EII; Giacobbi, Hausenblas, & Penfield, 2005) which aimed at measuring specific aspects of exercise imagery use. Because there was no measure which was developed applying to the much broader area of PA, the PAIQ was developed to examine the type of imagery use examined in PA. The results provide support for the proposal that PAIQ is a reliable and valid measure to identify types of imagery use in a

PA. The item constructions of the PAIQ were simply modifications of the SIQ items that I formulated based on Paivio's (1985) framework. The difference was SIQ items were designed for competitive sport contexts, whereas the PAIQ items were modified wherever required to suit PA contexts. Paivio's (1985) framework has been widely explored in sport and more recently it has been successfully applied in dance, exercise, and rehabilitation (Cumming & Williams, 2013; Driediger, Hall, & Callow, 2006; Fish, Hall, & Cumming, 2004; Gammage, Hall, & Rodgers, 2000). However, an argument was made by Hall (1998) on Paivio's (1985) framework stating that imagery use in exercise should have cognitive and motivational functions.

In Phase 1, the internal consistency values and the Cronbach alpha values were within the acceptable range of psychometry; however, the results of CFA analysis on the data generated in Phase 1 did not produce a sound model. As a result, the five subscales that represent distinct kinds of imagery use in the SIQ were combined to form two major subscales, namely cognitive and motivational imagery use, that assessed the general types of imagery used by individuals in their PA. The process of collapsing of the subscales was primarily based on Hall's (1998) argument. The other reasons include that the outcome and goals of PA imagery use may be affective, behavioural, or cognitive in nature (Cumming & Williams, 2013). In such cases, individuals who participate in PA would have their initial focus on achieving health-related (physical and psychological health) goals (Giacobbi et al., 2003; Schuster et al., 2012).Collapsing the five subscales into two general and boarder subscales would effectively serve either a particular function or multiple functions (Cumming & Williams, 2013). For instance, Maddison et al. (2012) examined the effects of a guided imagery intervention on patients recovering from anterior cruciate ligament surgery. They found that participants were able to experience the effects of physical rehabilitation, which reduced stress and improved freedom of knee movement. This is because the imagery intervention encouraged participants to use

cognitive imagery to rehearse specific exercises and participants used motivational imagery to imagine themselves dealing with their feelings of discouragement, improve confidence in the rehabilitation process, and improve strength through the healing process and reconstruction of tissues in the body. Another example is a case study by Deutsch, Maidan, and Dickstein (2012) who used cognitive and motivational imagery use along with physical practice to improve motor ability, walking speed, endurance, balance, and confidence of a 38-year-old woman who had post-left subarachnoid hemorrhagic stroke for 10 years. This implies that type of imagery use need not be exclusive to Paivio's (1985) 5-factor framework of cognitive and motivational imagery (Cumming & Williams, 2013). In this thesis, my aim is to use imagery to increase passion for PA and also to increase amount of PA. I aim to examine the relationship between individuals' imagery use during PA and their levels of harmonious passion and use relationships I observe as a guide in the development of an effective imagery script. Measuring imagery use based on the cognitive and motivational imagery subscales of the PAIQ provides a systematic foundation for that process. The collapsing of the subscales in the questionnaire was related to the basic definition of PA, which includes different forms of human movement and skeletal muscle movement in exercise, play, and sports (Berger et al., 2007; Willis & Campbell, 1992).

In Phase 2, the same data from the PAIQ as in Phase 1, with the original 30 items combined into two subscales, i.e., cognitive and motivation imagery use, underwent reliability and CFA analysis as in Phase 1. Though reliability values were acceptable, the results of CFA showed no improvement in the fit of the data to the model from Phase 1. Examination of the factor loadings for the 30 items indicated that a number of items had weak loadings, so it was decided to remove these items from the PAIQ. As a result, 15 items with loadings below the threshold of .4 proposed by Hair et al. (1998) and reported as an acceptable threshold in other studies of imagery use (e.g., Cumming, 2008; Robin

et al., 2007; Williams & Cumming, 2011) were removed and the 15-item PAIQ was submitted to further analysis.

In Phase 3, the data from the 15 items in the revised PAIQ, comprising five cognitive imagery use items and 10 motivational imagery use items underwent CFA analysis as in Phases 1 and 2. The results produced a sound model for the 15-item, 2-factor version of the PAIQ. All fit index values obtained from the CFA analysis supported the revised 15-item PAIQ to be a valid questionnaire as they were within the accepted statistical parameters of CFA (Hooper et al., 2008; Kelloway, 1998). Thus, the final version of the Physical Activity Imagery Questionnaire (PAIQ) has a total of 15 items and two subscales. The questionnaire has five items that measure cognitive imagery use and 10 items that measure motivational imagery use in PA. This was acceptable as it is within Marsh's (2007) recommendation that there needs to be at least three items included in a subscale for any statistical test to be undertaken.

With reference to the reliability of the questionnaire, the internal consistency of the two PAIQ subscales was sound, indicating acceptable levels of internal consistency (Coakes & Steed, 2007; Chua, 2013). These results suggest that PAIQ is not only a valid measure, but also a reliable questionnaire for use in research and practice in measuring cognitive and motivational imagery use in PA.

The model underlying the 30-item version of the PAIQ that included the five distinct types of imagery use previously established in the SIQ (i.e., CS, CG, MS, MG-A and MG-M) was not supported by CFA. As a result of examining modification indices in the CFA, I adopted the strategy of collapsing the subscales to form one general cognitive and one motivational imagery use subscale. The collapsing of the subscales into cognitive and motivational types of imagery provided conceptually different characteristics suitable for study of the types of imagery used in PA. For example, it is possible for individuals to imagine the skills involved in executing a particular part of their PA, that is, cognitive

imagery use, and successfully being in control of a difficult situation, that is, motivational imagery use, at the same time. Likewise, it is possible to imagine execution of a particular task or skill, that is, cognitive imagery use, and at the same time imagine the feelings associated with the outcome of continuing the activity and being appreciated for successfully completing the PA plan despite difficulties experienced, that is, motivational imagery use. Therefore, the items in the PAIQ reflect the conception that cognitive imagery use in PA includes imaging specific PA skills (CS imagery in the SIQ) and the sequence of activities done in a gym-based exercise circuit (CG imagery in the SIQ). Motivational imagery use in the PAIQ reflects a combination of how imagery can be used to depict achievement of a specific goal or goal-directed behaviour (MS imagery in the SIQ), how imagery can be used to improve performance of a task or skill (MG-M imagery in the SIQ), and how imagery can be used to manage emotional arousal during PA (MG-A imagery in the SIQ). The crucial difference between the SIQ and the PAIQ is that the SIQ subscales were formulated on the basis of Paivio's (1985) 5-factor framework, whereas in developing PAIQ, I moved from the 5-factor framework to a 2-factor framework on the basis of Hall's argument about the overarching psychological dichotomy in Pavio's (1985) framework between cognitive and motivational uses of imagery. The difference is SIQ is designed to identify athletes' imagery use at the specific or general level (Paivio, 1985), while PAIQ is designed to identify the imagery functions in general in a non-competitive PA. Thus, PAIQ should be considered to represent a new measure to assess the types of imagery used in a PA that covers all the aspects of imagery use reflected in the SIQ, but categorised into just two types of imagery use, cognitive and motivational imagery use.

3.6 Conclusion

PAIQ was developed to measure the types of imagery used by individuals in their PA. It was designed as an instrument for assessing how individuals use different types of

imagery such as cognitive imagery and motivational imagery for PA. PAIQ showed acceptable psychometric properties. Results of the Phase 3 CFA supported the 2-factor structure of PAIQ. The reliability analysis produced sound results. These statistical test results provide initial support for the proposal that PAIQ may be an effective measure for use in research and applied exercise psychology. Nevertheless, more studies are warranted with diverse samples to establish the reliability and validity of the PAIQ for wide-ranging use. The development of this scale was a necessity in my research because it would help me determine what types of imagery function must be given more emphasis in an imagery script for developing passion for PA. Because PAIQ is a newly-developed measure, it is recommended that further validation of the questionnaire should be undertaken.

CHAPTER 4

STUDY 2: RELATIONSHIP BETWEEN TYPES OF IMAGERY USE AND PASSION AMONG INDIVIDUALS WITH T2DM

4.1 Introduction

As reported in the literature review (Chapter 2), passion is a relatively new concept that has received limited attention in exercise psychology (Roy et al., 2014). It is defined as a strong inclination towards an activity that people like, that they find important, and in which they invest their time and energy (Vallerand et al., 2003). In the DMP, Vallerand et al. (2003) proposed that there are two types of passion, HP and OP. HP is associated with adaptive behaviours, whereas OP can be associated with maladaptive behaviours (Vallerand, 2008, 2015). Imagery is one of the most powerful techniques used by athletes (Cumming & Williams, 2013) and exercise participants (Hausenblas et al., 1999) for performance enhancement, skill development (Bell & Thompson, 2007; Hall, 2001; Hird et al., 1991; Smith et al., 2007) and enhancement of psychological variables, such as motivation Martin and Hall (1995) and self-confidence (Williams and Cumming , 2012). Thus, it is possible that imagery training can be used to enhance passion, in particular HP.

Short, Tenute, and Feltz (2005) reported that there were more than 200 research studies providing information on how imagery works in sport and exercise settings. Research on imagery shows that imagery interventions have improved performance on strength tasks (Vealey & Walters, 1993), enhanced self-confidence (Ross-Stewart & Short, 2009), increased intrinsic motivation (Martin & Hall, 1995), reduced anxiety (Carter & Kelly, 1997), and enhanced self-efficacy (Beauchamp, Bray, & Albinson, 2002). Likewise, a comprehensive literature search on passion shows that there is an association between passion and other psychological constructs, which supports the DMP (e.g., Rip, 2010; Vallerand et al., 2011; Vallerand & Miquelon, 2007). Although research

on passion and imagery has led to important findings for each of these variables, no research that I could identify in the literature has explored the relationship between the two variables.

Based on the potential to use imagery training to enhance HP, the aim of the present study was to examine how the types of imagery use associated with exercise and measured by the PAIQ, are related to the types of passion measured by the PS. Then this information was used to design an imagery script intended to enhance HP. That script was used in an intervention study on enhancing HP for PA, as well as participation in PA, that is reported in Chapter 6.

4.2 Method

4.2.1 Participants

I recruited participants from the University of Malaya Medical Centre in Malaysia. Participants were 127 individuals who had been diagnosed with T2DM for more than six months (male = 44; female = 83). The sample size was calculated using G-power statistics to obtain atleast 80% power for this study. The participants age ranged from 25 to 70 years (M_{age} 50.84 ± 12.24). Participation was voluntary.

4.2.2 Measures

4.2.2.1 Demographic Information Form

Demographic details were collected prior to administration of the questionnaires. The details included name (optional), age, gender, number of years since the onset of T2DM, type of PA involved, and the number of days a week each individual was involved in their respective PA.

4.2.2.2 Passion Scale

The PS is described in Chapter 2.

4.2.2.3 Physical Activity Imagery Questionnaire (PAIQ)

The PAIQ is described in Chapter 3.

4.2.3 Procedure

This study was approved by the University of Malaya Medical Centre (UMMC) Ethics Committee. I then established contact with the endocrinologist at UMMC, under whose guidance I recruited the participants for this study. Following standard consent procedure, including the provision of oral and written descriptions of all procedures that participants would be asked to undertake during the study, encouragement to the participants to ask any questions and resolution of any issues, participants signed informed consent forms. The data was collected within hospital premises. All participants received oral and written information about the measures. First, I administered the Demographic Information Form. Then I explained to the participants what each questionnaire was about and how to complete the questionnaires. Next, I administered the PS and the PAIQ in that sequence. I instructed participants to think about their favourite type of PA when they completed the PS. Likewise, I instructed participants to provide their responses for PAIQ, keeping in mind the PA in which they were involved. Once I had provided this oral information, I urged participants to read the introduction section once again for thorough understanding of the questionnaire, before they responded to the items. Upon completion, participants returned the completed questionnaires to me for analysis.

4.2.4 Analysis

I analysed the data using SPSS version 18. I calculated Pearson's Product-Moment Correlation Coefficients (*r*) between the two types of passion, HP and OP, and the two types of imagery, cognitive and motivational, to gain insight into the relationship between types of passion for PA and types of imagery use among individuals with T2DM. Significant correlations between HP and OP and, cognitive and motivational imagery use provided the basis for conducting two hierarchical regression analyses. In the first hierarchical regression analysis, HP was the criterion variable and significant PAIQ

variables were the predicator variables. A separate hierarchical regression analysis was conducted with OP as the criterion variable based on similar procedures. This helped determine what types of imagery use contributed to imagining passion for PA effectively. This information was used in the development of the imagery training script in the intervention study, which is reported in Chapter 6.

4.3 Results

The results are presented in three subsections. First, I present the descriptive statistics, including information on means and standard deviations for the sample. In the second subsection, I examine correlations between types of imagery and types of passion using the PAIQ and PS. In the third subsection, I highlight the results of hierarchical multiple regression analyses in which HP and OP were criterion variables in separate regression analyses and cognitive and motivation imagery types were predictor variables.

4.3.1 Descriptive Statistics

For the sample of 127 T2DM respondents, the descriptive statistics showed that the mean value for HP (M = 5.41 ± .94) was higher than the mean value for OP (M = 3.30 ± 1.38). This indicates that participants typically scored medium on HP, whereas they scored low on OP. The statistical analysis also showed that cognitive imagery use (M = 5.07 ± 1.09) was higher than motivational imagery use (M = 4.65 ± .91). Both these means were relatively moderate on the PAIQ.

4.3.2 Relationships between Imagery Use and Passion

A Pearson product-moment correlation coefficient showed a substantial, significant, positive correlation between cognitive imagery use and HP (r = .45, p < .01). The correlation between motivational imagery use and HP was similar in scale, significant, and positive in direction (r = .44, p < .01). There was a smaller, yet significant, positive correlation between cognitive imagery use and OP (r = .22, p < .05) and between

motivational imagery use and OP (r = .19, p < .05). The correlation values between types of imagery use and HP were positive, indicating that higher levels of cognitive and motivational imagery use were associated with higher levels of HP. The levels would be considered to reflect a moderate effect based on the effect size calculation provided by Cohen (1988), but in practice these are noteworthy correlations that account for 20% of the variance in HP in the case of cognitive imagery use and 19% of the variance in the case of motivational imagery use. This indicated that both cognitive and motivational imagery use should be included in the regression analysis with HP. The correlations between types of imagery use and OP were smaller, but still of note, accounting for approaching 5% of the variance in OP. Thus, I decided to run a hierarchical multiple regression analysis for OP, including cognitive and motivational imagery use.

4.3.3 Hierarchical Multiple Regression between Imagery Use and Passion

To determine the influence of cognitive and motivational imagery on passion for PA, I conducted two hierarchical multiple regression analyses, one for HP and another for OP. The passion measure was the criterion variable in each case and the imagery use measures were the predictor variables. This strategy allowed me to determine which types of imagery use significantly contributed to changes in variance in HP and OP. The findings of the first hierarchical multiple regression analysis showed that cognitive imagery use and motivational imagery use were significant predictors of HP [F (2, 124) = 18.85, p < .01]. Both predictor variables contributed 23% of variance to the criterion variable (R^2 = .23). This means that both cognitive imagery use (β = .28, p = .01) and motivational imagery use (β = .25, p = .01) were significant predictors of HP. The types of imagery use did not significantly predict OP [F (2, 124) = 3.22, p < .01]. The predictor variables contributed only 5% of variance in the criterion variable (R^2 = .05). The β value for cognitive imagery use was .16, p = .19 and for motivational imagery use the β value was = .80, p = .51.

4.4 Discussion

The main purpose of this study was to determine the relationship between types of imagery use and aspects of passion using the PAIQ and PS, respectively. In this study, I aimed to determine the extent of the relationship between frequent use of cognitive and motivational imagery use and HP and OP for preferred PA. The results showed moderate correlations of cognitive imagery use and motivational imagery use with HP and small correlations of both imagery use variables with OP. Hierarchical multiple regression analysis clarified that more extensive use of cognitive and motivational imagery predicted higher levels of HP. These results indicate that both cognitive and motivational imagery can be effectively used in imagery interventions to develop HP for a preferred PA. Effectiveness of imagery interventions has been shown to be related to exercise adherence and to help individuals to achieve affective, behavioural, and cognitive outcomes (Callow, Hardy, & Hall, 2001; Cumming, 2008; Goss et al., 1986; Hall, Schmidt, et al., 1994; Ramsey et al., 2009; Rodgers, Munro, & Hall, 2001). With reference to passion, it is preferable for individuals to develop HP towards their desired PA, because this enables them to experience physical, psychological, and emotional benefits. This is because HP is an autonomous motivational force that allows individuals to decide if they would like to engage or disengage in the activity (Vallerand et al., 2003). This flexibility allows people to sustain their PA for a longer duration because the expectation from the activity is minimal and enjoying the activity is preferred (Vallerand & Miquelon, 2007). Because HP is autonomous in nature, the freedom of choice can help individuals to switch between activities without experiencing any conflicts within themselves. Similar results that support the DMP have been reported in previous studies (e.g., Vallerand et al., 2003; Vallerand, Donahue, & Lafreniére, 2011; Vallerand, Rousseau, et al., 2006; Vallerand, 2008, 2010, 2015).

Multiple regression analysis further elucidated the correlation results. The outcome of the regression analysis for HP indicates cognitive imagery use and motivational imagery use may be influential in imagery interventions for developing HP towards individuals' preferred activity. I found no significant results relating cognitive or motivational imagery with OP. Statistically, the significant results showed that both types of imagery use were significant predictors of HP. In combination, cognitive and motivation imagery contributed 23% (R^2 = .23) of the variance in HP.

The results indicate that both types of imagery use may increase HP when presented in an imagery intervention. These findings support Hall's (1998) argument that imagery should have cognitive and motivational uses for PA adherence. The findings of this study suggest that the type of imagery use need not always be exclusive to Paivio's (1985) framework that distinguishes between cognitive and motivational imagery at the specific and general levels (Cumming & Williams, 2013). Imagery interventions that include both types of imagery use should enhance adherence to a PA (Hall, 1995). In summary, the statistical values obtained in this study suggest that imagery interventions can facilitate HP. In previous studies, researchers have documented that imagery interventions can help control negative psychological indices and improve positive psychological indices (e.g., Martin & Hall, 1995; Monsma et al., 2009; Mousavi & Meshkini, 2011; Ramsey et al., 2009; Williams, 2011). Based on the evidence I generated in this study, imagery interventions could be designed and administered with a focus on imagining aspects of the production of PA behaviours and related strategies for doing PA (cognitive imagery) and imagining the attainment of PA goals, along with calm, confident, successful participation in PA (motivational imagery) to enhance HP.

4.5 Conclusion

Imagery is one of the most powerful tools used in sports science and it has been shown to be beneficial in competitive sport and exercise. In this study, I found moderate, positive relationships of cognitive and motivational imagery use with HP and weak, yet significant, correlations of the two imagery use subscales with OP. This indicates that there is potential to develop HP for individuals' preferred activity with the help of imagery interventions that use cognitive and motivational imagery appropriately. Based on the correlation and multiple regression results, my next step was to design a HPI script, including cognitive and motivational imagery content, in which I aimed to increase HP and, through that increase, to facilitate PA adherence among individuals with T2DM.

CHAPTER 5

STUDY 3: EFFECTS OF AN IMAGERY INTERVENTION ON HARMONIOUS PASSION AND PHYSICAL ACTIVITY IN PEOPLE WITH TYPE 2 DIABETES MELLITUS

5.1 Introduction

Vallerand (2015) suggested that passion for any type of activity, irrespective of being physical or non-physical, can play a major role in bringing about desirable health outcomes, especially if the passion is harmonious in nature. This means that HP and OP should have different effects on PA. The effect of passion, as proposed in the DMP, varies with HP predominantly leading to adaptive outcomes and OP often leading to maladaptive outcomes (Vallerand et al., 2003). Imagery is a powerful tool used in sport psychology that has the potential to enhance sport performance and participation in PA, and improve psychological variables, such as self-confidence, self-efficacy, flow, and motivation (see Chapter 2 for a review). I have identified three studies that used quantitative techniques to empirically establish the role of passion for PA (Carbonneau et al., 2010; Halvari et al., 2009; Parastatidou et al., 2012). Only one study has used qualitative techniques to explore the pathway in developing passion for PA on an individual with T2DM (Roy et al., 2014). None have uniquely targeted an intervention study that examined the role of passion for PA in a clinical population, such as people with T2DM. In this study, I examined the effects of a tailored imagery intervention programme for HP and PA participation in individuals with T2DM.

5.2 Method

5.2.1 Participants

Out of 120 participants who volunteered in Study 2, I contacted only those individuals whose scores were below four, that is, at or below moderate in terms of passion criteria of the PS. Participants were required to speak, read, and write competently

in English as I conducted all aspects of this study in English. I selected a total of 20 volunteers with T2DM to participate in this intervention study. I randomly assigned them into two conditions: HP Imagery (HPI) and General PA Imagery (GPAI) intervention conditions. The HPI condition comprised 10 T2DM individuals (male = 5 and female = 5) and the GPAI condition also comprised 10 T2DM individuals (male = 3 and female = 7). At the time of data collection, the age ranged from 34 to 65 years for both conditions. In the HPI condition, mean age was 50.1 years (*SD* = 9.67) and for GPAI the mean age was 49.8 years (*SD* = 10.98). All participants recruited for the study were diagnosed with T2DM more than six months before they commenced participation in the study.

5.2.2 Measures

5.2.2.1 Demographic Information

I gathered demographic information, namely participants' name (optional), age, gender, type of PA they were involved in, number of days a week they participated in their PA, number of hours of PA per week, and number of years since the onset of T2DM. The Demographic Information Form is presented in Appendix A

5.2.2.2 Sport Imagery Ability Measure for Exercise

In line with the original Sport Imagery Ability Measure (SIAM), the Sport Imagery Ability Measure for Exercise (SIAM-E) was developed by Gaskin, Morris, and Watt (2005). It is a 48-item questionnaire that is designed to measure task-oriented, multimodal, and multidimensional imagery ability in an exercising population. It has four generic scenes, namely a difficult exercise, a slow start, your exercise venue, and successful session. These scenes are assessed using the same 12 subscales as in the original questionnaire. The items assess five imagery dimensions: vividness, control, ease at which the image is generated, speed of generation, and duration and the involvement of six senses (visual, auditory, kinaesthetic, olfactory, gustatory, and tactile), in addition to emotional experiences during imagery. All responses are recorded by placing a cross

at the point on a 100mm visual analogue scale that reflects individuals' judgement of that dimension, sense modality, or emotion, with scores ranging from 0 to 100. Each 100mm line separates two opposing anchor statements (e.g., *no feeling* (0) and *very clear feeling* (100) on the tactile sense modality). To obtain a score for each dimension, sense modality and emotion, the scores of each of the four scenes in that subscale are added together to produce a subscale score ranging from 0 to 400.

In this study, I used the SIAM-E as part of the initial screening process, however, I decided to use only two scenes out of four scenes, namely your exercise venue and successful session. This is because when the first participants were asked to complete the questionnaire, they were easily fatigued and quickly distracted due to the length of the questionnaire. This affected authenticity of data collection. Due to these limitations, I carefully chose only two scenes from SIAM-E with the aim that it would enable me to screen out participants with low imagery ability for exercise. Hence, the "exercise venue" scene was chosen because it is directed towards visualising the place where participants performed their PA. The "successful session" scene was chosen because it focuses on doing the PA. The SIAM-E questionnaire with the two scenes used for this study is presented in Appendix B.

5.2.2.3 Passion Scale

Vallerand et al. (2003) developed the PS. It is a 16-item questionnaire in which each item in the scale is rated on a 7-point Likert scale with 1 *(not agree at all)* and 7 *(very strongly agree)*. The PS assesses two types of passion towards a preferred activity: HP and OP. An example of a HP item is "This activity is in harmony with the other activities in my life". An example of an OP item is "I have almost an obsessive feeling for this activity". The last four items in the questionnaire measure passion criteria. An example for passion criteria is "This activity is a passion for me". Vallerand and his colleagues have established sound psychometric properties for the English version of the

PS (see Mageau et al., 2005; Rip, Fortin, & Vallarand, 2006; Vallerand et al., 2003). The validity and reliability values were also found to be adequate (Vallerand et al., 2003) with alpha values ranging from α = .79 for HP and α = .89 for OP (Vallerand, 2015). A recent literature search by Vallerand (2015) showed that more than 100 published studies have shown similar alpha values for the HP and OP subscales of the PS. The PS questionnaire is presented in Appendix C.

5.2.2.4 International Physical Activity Questionnaire

Craig, Marshall, Sjostrom, et al. (2003) developed the IPAQ as a tool for measuring the amount of PA individuals undertake for use in research and applied work. It is designed for population surveillance of PA among adults (Ekelund et al., 2006; Macfarlane, Lee, Ho, Chan, & Chan, 2007; Oh, Yang, Kim, & Kang, 2007). The IPAQ is used among adults aged from 15 to 69 years. It assesses three specific types of PA, namely walking, moderate intensity activity, and vigorous intensity activity. Particularly, the items indicate how active individuals were for more than 10 minutes at a time either in walking, doing moderate intensity activity, or vigorous intensity activity during the seven days prior to completing the IPAQ (IPAQ guidelines, 2005). In this study, I used the IPAQ to monitor the level of PA at Weeks 1, 6, and 12. IPAQ data is obtained in the form of MET-minutes/week (IPAQ guidelines, 2005). METs is a value of the metabolic energy equivalent of doing a wide range of physical activities that are considered to be either low, moderate, or vigorous in energy expenditure. MET-minutes is computed by multiplying the MET score of an activity by the minutes that individuals report they performed it each day. The equation used to compute MET-minutes is MET level * minutes of activity/day * days per week. Individuals report their activity separately for walking, moderate activity, and vigorous activity. To obtain the total IPAQ score, scores for walking, moderate activity, and vigorous activity are summed, that is, Total MET-minutes/week = Walk (METs*min*days) + Moderate (METs*min*days) + Vigorous

(METs*min*days) (IPAQ guidelines, 2005). If the total is less than 600 MET-minutes per week then individuals are categorised to be low in PA. Between 600 and 3,000 MET-minutes per week, individuals are categorised as moderate in PA. If the total score is above 3,000 MET-minutes per week then individuals are categorised as high in PA (IPAQ guidelines, 2005).

Craig et al. (2003) validated the IPAQ in 12 countries. Test-retest reliability, using Spearman's rho, ranged from .66 to .88 (averaging .76), indicating good repeatability. Concurrent validity of the IPAQ short form was demonstrated by Spearman's rho correlations with the IPAQ long form from .64 to .70 (averaging .67). IPAQ has been adopted widely across different countries. The IPAQ short form is presented in Appendix D.

5.2.3 Imagery Intervention Scripts

For the intervention, I developed a standardised imagery script using the seven components of the PETTLEP model of imagery and based on the correlational findings for imagery use and passion in Chapter 4. In both types of script, HPI and GPAI, the use of senses, imagining the context where the individual performed the activity, and performing of the activity itself were primarily connected to cognitive imagery use. The desire to do the activity, the feeling of achievement to complete the activity, and the feelings of accomplishment associated with doing the activity were related with motivational imagery use. Previous studies suggest that inclusion of all PETTLEP elements in an intervention could maximise performance results (Quinton et al., 2014). However, if a large amount of information is provided during imagery interventions, it is possible that individuals may find it difficult to focus on the appropriate stimuli and responses (Quinton et al., 2014). To manage the complexity of PETTLEP imagery, Williams et al. (2013) proposed a delivery process that they called "layering", in which simple elements (e.g., physical and

environment) are introduced to imagery first. Then, other elements (e.g., task, timing, and learning) are systematically added. Finally, more complex elements, including emotion and perspective, are added to the imagery script. I adopted this approach to the inclusion of the seven PETTLEP components. In this way, I ensured that the imagery experience progressed from simple to complex with systematic and gradual inclusion of all PETTLEP elements. The experience of emotions was common to both types of script, however, there was a subtle difference which distinguished the two scripts. Overall, the HPI and GPAI imagery scripts were descriptive and consisted of three subsections, which varied according to the HPI and GPAI conditions.

5.2.3.1 Harmonious Passion Imagery Script

In the HPI script, the first subsection included breathing techniques for relaxation. For instance, "Close your eyes and begin to take several deep breaths**.** As you inhale, slowly count 1, 2, 3, 4 in your mind and as you exhale repeat the count slowly". The second subsection required participants to imagine the place they perform their PA. For example, "Imagine the place you usually go for your exercise. See every detail in it… hear the sounds in the image… feel the fresh air as you breathe… Imagine that you have begun your warm up exercise. As you gradually begin your activity, feel the muscles in the body moving. Your body is slowly getting warmed up… you are beginning to move faster". Because passion is anchored to enjoying the activity, I induced enjoyment as the main element in the following subsection. In the third subsection, I introduced the participants to *enjoying* the activity followed by completion and recalling of positive emotional experiences associated with imagining performance of the activity. An example to represent the third subsection of the script is "Picture in your mind that you are feeling very happy and joyful as you enjoy performing the activity in your mind… you are feeling fit and healthy as you have completed your activity…

there is a great feeling of achievement flowing throughout your body… you are feeling confident, thrilled, excited, bright, positive, satisfied, refreshed, and relaxed." The first two subsections in the imagery script remained similar for all participants in the study. I individualised the PA context i.e., the type of activity involved and the location in which the individual would perform the activity. The focus on enjoying the activity in the third subsection remained as the unique factor that distinguished the HPI script from the GPAI script. An example of the HPI script is presented in Appendix E.

5.2.3.2 General Physical Activity Imagery Intervention

In the GPAI script, the first and the second subsection of the imagery script were similar to the information provided in the HPI script. Only the third subsection of the imagery script was modified to suit the GPAI condition. For this subsection, I only included information on completion of the activity and recalling general experience associated with imagining performance of the activity. For example, "Picture in your mind that you are gradually reducing the speed of your activity as you're nearing completion… as you have successfully completed your activity, think about your experience of performing your activity". The GPAI script was generalised with only performance and completion of the activity chosen by the individual. An example of the GPAI script is presented in Appendix F.

5.2.3.3 Delivery of Imagery Interventions

The imagery intervention period lasted 12 weeks in total in both the HPI and GPAI conditions. In the first six weeks, I personally administered the imagery sessions to participants in both conditions based on their preferred PA. In the next six weeks, the imagery interventions continued without any guidance from me. Participants undertook the intervention twice a week for approximately 45 minutes. This procedure was the same for both conditions.

5.2.3.3.1 Stage 1: One-on-one Delivery of Imagery Interventions

This is the stage during which I introduced the imagery intervention to each participant in both the HPI and GPAI conditions for six weeks. I delivered the HPI script individually to each participant in the HPI condition and the GPAI script individually to each participant in the GPAI condition. I explained the content of the script and checked that participants understood what they should do during their imagery. Then I guided them through the script. At the end of each imagery session, I asked them to report their experiences of imagery to me. I positively reinforced appropriate imagery and guided the participants not to repeat inappropriate aspects of their sessions. In particular, I ensured that participants were imagining the condition-specific elements of each imagery intervention, as a manipulation check that participants did experience the imagery interventions as intended. Before moving to the next stage, I was, thus, reassured that each participant was conducting their imagery intervention as prescribed. This was verified though a retrospective feedback session after each guided imagery. The face-to-face interaction through a conversational style enabled me to understand if these individuals were able to image the sequence of their respective PA through the guided imagery.

5.2.3.3.2 Stage 2: Independent Practice of Imagery Intervention

After completion of the six weeks of one-to-one guided imagery, I instructed each participant to continue to perform two imagery sessions per week on their own for the next six weeks. A follow up was conducted through telephonic conversations with each participants to ensure they continued practicing their imagery. I asked participants to complete a log book for each session they undertook, indicating when and where the imagery session occurred and making any comments on the content of their imagery during each session. An example of the log book is

presented in Appendix K. This allowed me to check that participants continued to perform the imagery as requested and to gain some insight into the extent to which each participant continued to experience the imagery as intended. At the end of this 6-week independent imagery training period, I collected the log books after having an informal discussion on each participant's experience of the imagery intervention to initiate and sustain their PA. This was then followed by a formal interview within one week, to record the participants' subjective experiences of the imagery they did and its impact on passion and PA (see Chapter 6 for a detailed account of these interviews).

5.2.4 Procedure

Following ethics approval from UMMC, I contacted the participants who volunteered to participate in Study 2. Out of 120 participants who expressed an interest in the study, I selected 20 volunteers to participate in Study 3. I undertook screening, using the SIAM-E, to confirm that participants had the ability to image adequately. Individuals who scored below 150 on any SIAM scales were not selected. I also used IPAQ Week 0 score to determine participants' level of PA at the time of data collection. The intervention was administered in two conditions (i.e., HPI and GPAI) and participants were randomly assigned to a condition. Participants in the HPI condition practiced the HPI script, whereas participants in the GPAI condition practiced the GPAI script. The whole imagery intervention is carried out for 12 weeks in total for each participant. In both conditions, I individually delivered an individualised imagery script based on their preferred PA twice a week from Weeks 1 to 6. At the end of the first six weeks, I administered the PS and IPAQ to identify changes associated with face-to-face delivery of HPI and GPAI interventions. During Weeks 7 to 12, I instructed participants in the HPI and GPAI conditions to continue practising their imagery script independently twice a week. This was done to determine whether independent imagery practice

continued to have an impact of HP and PA. In Week 12, I administered the PS and IPAQ again to identify changes associated with participants' independent practice of the HPI and GPAI interventions. Upon completion of the 12-week intervention programme, I collected the log books from all participants in both conditions, to check their conduct of independent imagery practice during Weeks 7 to 12 and the extent of their involvement in their chosen PA. Before thanking the participants for their involvement in the study, I engaged in an informal discussion with them to understand their perceptions of the imagery intervention, including its effect on HP and PA.

5.2.5 Data Analysis

For this study, I employed two-way mixed-design ANOVA using SPSS version 23 to examine how the imagery interventions affected the levels of HP, OP, and PA. For gain scores for each of these dependent variables from Week 0 to the end of Week 6 and from Week 0 to the end of Week 12, the ANOVA examined the main effect of the independent groups factor, the two imagery intervention conditions, with two levels, namely the HPI and the GPAI conditions, the main effect of the repeated measures factor, occasion, with three levels, Weeks 0, 6, and 12, and the interaction effect between the intervention conditions and occasions factor. Post hoc tests were applied to identify the location of significant differences for the main effect of occasion and the interaction effect.

5.3 Results

I present the results of this intervention study for each dependent variable, HP, OP, and PA in turn. For each variable, first, I display a figure to illustrate the results visually for Weeks 0, 6, and 12, then I present a table of gain scores for Weeks 0 to 6, and Weeks 0 to 12, and, finally, I report the results of a two-way mixed design ANOVA to examine the main effect of conditions (imagery interventions), the main effect of

occasions, and the interaction effect between intervention conditions and occasions for the gain scores for that dependent variable.

5.3.1 Effect of Imagery Interventions on Harmonious Passion

Figure 5.1 illustrates the means for Weeks 0, 6, and 12 for the HPI and GPAI intervention conditions for HP.

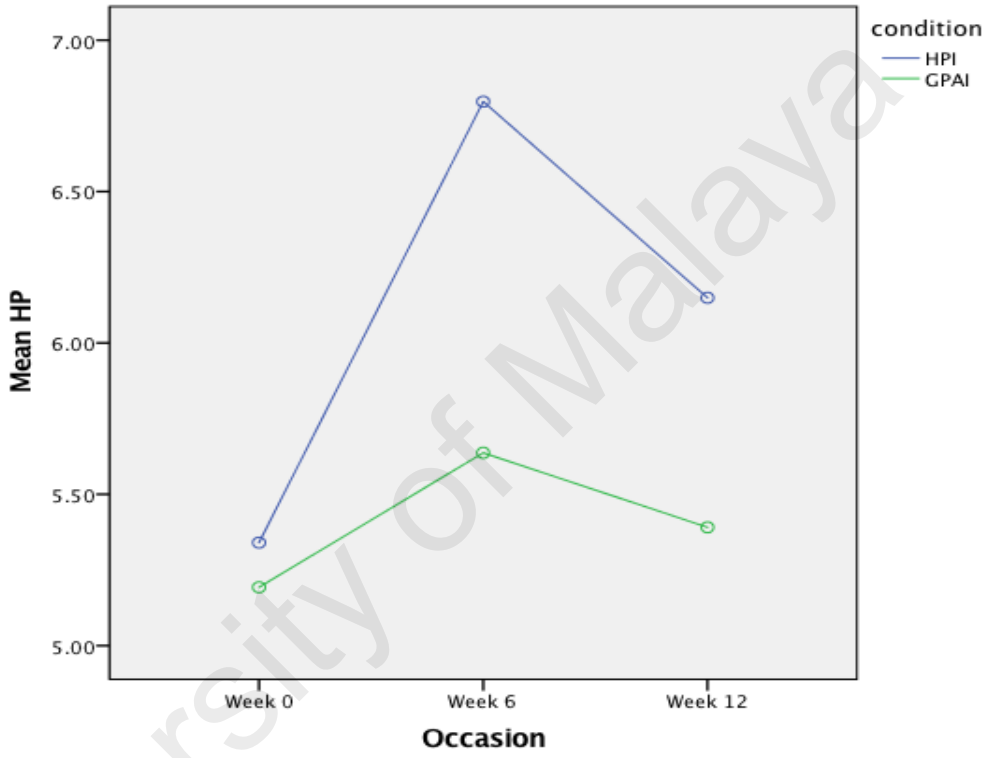

Figure 5.1. Mean HP for the HPI and the GPAI imagery interventions at Week 0, end of Week 6, and end of Week 12.

Figure 5.1 highlights that there was very little difference between the means for the HPI and GPAI conditions at Week 0. A one-way independent groups ANOVA showed no significant difference, F (1, 18) = .095, p = .761. In both intervention conditions, HPI and GPAI, participants increased their levels of HP from Week 0 to the end of Week 6, when I delivered the intervention face-to-face for six weeks. However, participants' level of HP declined in both imagery conditions from the end of Week 6 to the end of Week 12, during the period when participants were asked to self-manage their

HP imagery or GPA imagery for a further six weeks. Figure 5.1 depicts a much steeper slope for the graph for the HPI condition than the GPAI condition from Weeks 0 to 6, reflecting a considerably bigger increase in HP. Although both the HPI condition and the GPAI condition showed decreases in HP from the end of Week 6 to the end of Week 12, the difference between the means for the HPI and GPAI conditions was substantially larger at the end of the intervention than at Week 0.

To examine the changes in HP from Week 0 to Weeks 6 and 12 more closely, I calculated gain scores for these changes. The means and *SD*s for gain scores for HP in the HPI and the GPAI conditions depicting change from Week 0 to the end of Week 6, and from Week 0 to the end of Week 12 are presented in Table 5.1.

Table 5.1

Means and SDs for Gain Scores for HP in the HPI and the GPAI Conditions from Week 0 to the end of Week 6, and from Week 0 to the end of Week 12

Intervention Period	**HPI Gain Score Mean**	**HPI Gain Score *SD***	**GPAI Gain Score Mean**	**GPAI Gain Score *SD***
Week 0 to end Week 6	1.45	.98	.80	1.10
Week 0 to end Week 12	.44	.87	.19	1.45

Table 5.1 shows that the mean gain scores for HP in the HPI and the GPAI conditions increased from Week 0 to the end of Week 6 and from Week 0 to the end of Week 12. At the end of Week 6, after six weeks of face-to-face, one-on-one intervention sessions, the gain score mean for the HPI intervention condition had increased considerably more than the mean in the GPAI condition. For the period from Week 0 to the end of Week 12, reductions were apparent in the mean HP gain scores for both conditions, compared to the gain score means for Week 0 to Week 6. Nonetheless, the

gain score mean for the HPI intervention showed a noticeable increase in passion from the start of the intervention to the end, whereas the gain for the GPAI condition was limited.

I conducted a two-way, mixed-design ANOVA to examine further the observed differences in gain scores for HP. The independent groups factor was imagery intervention condition with two levels (HPI condition and GPAI condition) and the repeated measures factor was intervention period with two levels (Week 0 to the end of Week 6, and Week 0 to the end of Week 12), while HP was the dependent variable. The main effect of imagery intervention condition was not significant, F (1, 18) = 3.02, p = .10, eta^2 = .14, which is a small effect size. The main effect for occasion was significant, F (1, 18) = 5.54, p = .03, eta^2 = .23, which indicates that, regardless of imagery condition, mean HP changed between the two gain scores examined. For occasion, regardless of condition, the gain score from Week 0 to the end of Week 6, was .95, which was significantly larger than the gain score from Week 0 to Week 12, which was .50. The two-way mixed-design ANOVA also tested for the interaction effect between imagery intervention conditions and occasion for HP. There was no significant interaction effect, F (1, 18) = 1.12, p = .30, eta^2 = .06. Although the main effect of condition was not significant, there was a substantially larger gain score for the HPI condition than for the GPAI condition from Week 0 to end of Week 6 (1.45 – .44 = 1.01). Based on this observation, I ran pairwise comparisons for gain scores. I found that the difference between the gain scores for the HPI and the GPAI conditions for Week 0 to end of Week 6 was significant (p = .03), but there was no significant difference between the conditions for Week 0 to Week 12.

5.3.2 Effect of Imagery Interventions on Obsessive Passion

Figure 5.2 illustrates the means for Weeks 0, 6, and 12 for the HPI and GPAI intervention conditions.

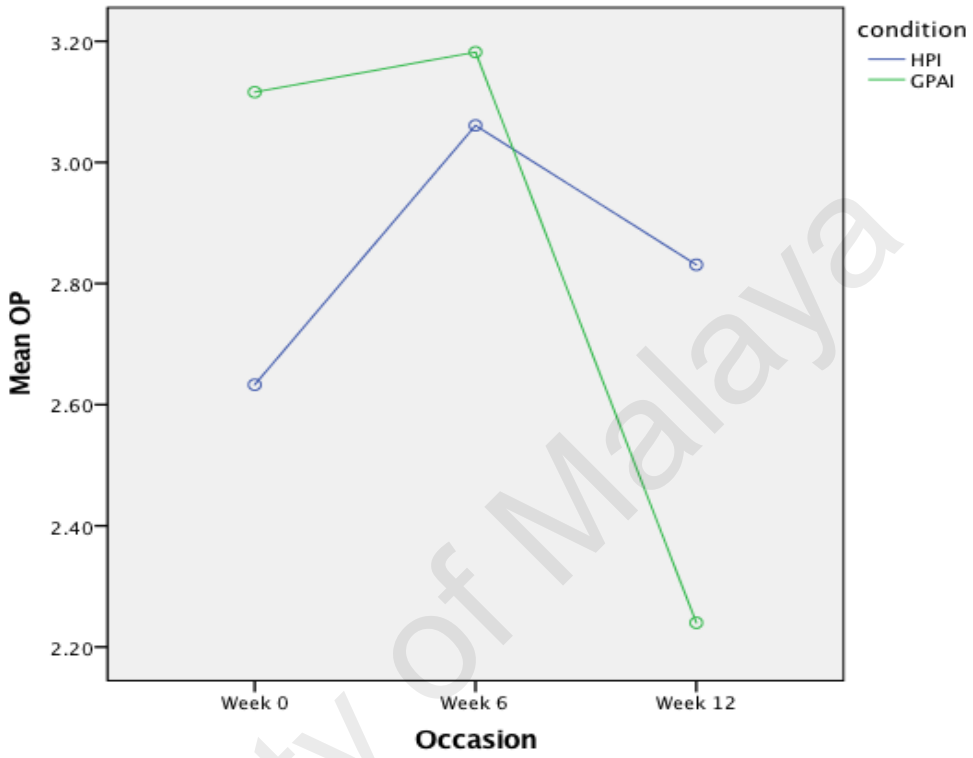

Figure 5.2. Mean OP for the HPI and the GPAI imagery interventions at Week 0, end of Week 6 and end of Week 12.

In a one-way independent groups ANOVA for HPI and GPAI in Week 0, there was no significant difference, F (1, 18) = .49, p = .49. Participants in the HPI and GPAI conditions showed small increases in their levels of OP from Week 0 to the end of Week 6, when I delivered the intervention face-to-face for six weeks. However, a decline in the level of OP was seen from the end of Week 6 to the end of Week 12, during the period when participants were asked to self-manage their HP imagery or GPA imagery for a further six weeks in both conditions. Figure 5.2 depicts a steeper incline for the graph for the HPI condition than the GPAI condition from Week 0 to the end of Week 6, reflecting a greater increase in OP for the HPI condition. There was a substantial decline in OP from the end of Week 6 to the end of Week 12. Comparing the conditions, the difference

between the means for the HPI and GPAI conditions was larger at the end of the intervention than at Week 0.

Figure 5.2 shows the results for OP for the HPI and GPAI conditions across the three occasions of testing OP. The figure shows what appears to be quite a large difference between the two conditions at Week 0, which signals caution in interpretation of changes at Week 6 and Week 12. Figure 5.2 highlights that in both intervention conditions, HPI and GPAI, participants increased their levels of OP from Week 0 to the end of Week 6, during which I delivered the intervention face-to-face for six weeks. The increase was larger for the HPI condition than for the GPAI condition, but the HPI condition started from the lower position. Participants' level of OP declined in both imagery conditions from the end of Week 6 to the end of Week 12 when participants were asked to self-manage their HP imagery or GPA imagery for a further six weeks. Figure 5.2 depicts shallow positive slopes for the graphs for the HPI condition and the GPAI condition, from Week 0 to the end of Week 6, reflecting only small increases in OP. Although both the HPI condition and the GPAI condition showed decreases in OP from the end of Week 6 to the end of Week 12, the steep slope of the graph for the GPAI condition suggests a substantial drop in OP to a much lower level than at Week 0 or the end of Week 6, which is not observed for the HPI intervention.

The means and SDs for gain scores in OP in the HPI and the GPAI conditions from Week 0 to the end of Week 6, and Week 0 to the end of Week 12 are presented in Table 5.2. In this case, where there is a noteworthy, but not significant, difference between the HPI condition and the GPAI condition at Week 0, the use of gain scores takes account of this difference by examining changes from Week 0.

Table 5.2

Means and SDs for gain scores in OP in the HPI and the GPAI conditions from Week 0 to the end of Week 6, and Week 0 to the end of Week 12

Intervention Period	**HPI Gain Score Mean**	**HPI Gain Score *SD***	**GPAI Gain Score Mean**	**GPAI Gain Score *SD***
Week 0 to end Week 6	.43	1.92	.07	2.74
Week 0 to end Week 12	.20	1.56	-.88	2.23

Table 5.2 shows that following the 6-week, face-to-face, one-on-one intervention sessions, mean OP had increased by a small amount in the HPI condition and in the GPAI condition there was very little change. The difference between the changes for the HPI condition and the GPAI condition (.36) was also relatively small. For the following 6-week self-managed imagery period, reductions were apparent at the end of Week 12 in mean OP ratings for both conditions. Although the reduction was relatively small for the HPI condition, mean OP ratings for the GPAI condition decreased dramatically by the end of the study.

I conducted a two-way, mixed-design ANOVA to examine the observed differences in gain scores for OP. The independent groups factor was imagery intervention condition with two levels (HPI condition and GPAI condition) and the repeated measures factor was intervention period with two levels (Week 0 to the end of Week 6, and Week 0 to the end of Week 12), while OP was the dependent variable. The main effect of imagery intervention condition was not significant, F (1, 18) = .62 p = .44, eta^2 = .03. The main effect for occasion approached significance, F (1, 18) = 3.45, p = .08, eta^2 = .16. The interaction effect between imagery intervention conditions and occasions for OP was not significant, F (1, 18) = 1.27, p = .27, eta^2 = .07. I ran pairwise comparisons for gain scores. I found that the differences between the gain scores for the

HPI and the GPAI conditions for Week 0 to the end of Week 6 and Week 0 to end of Week 12 were not significant.

5.3.3 Effect of Imagery Intervention on Physical Activity.

Figure 5.3 illustrates the means for PA for Weeks 0, 6, and 12 for the HPI and GPAI intervention conditions.

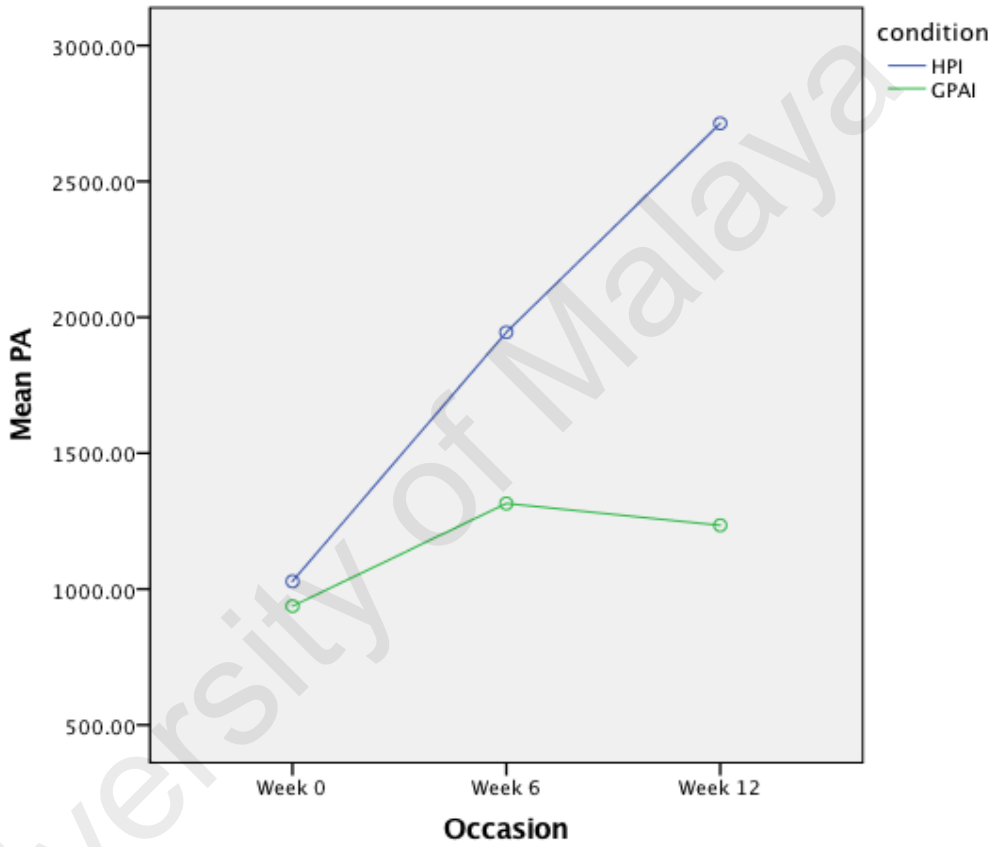

Figure 5.3. Mean PA for the HPI and the GPAI imagery interventions at Week 0, the end of Week 6, and the end of Week 12.

Figure 5.3 shows the results for PA for the HPI and GPAI conditions across the three occasions of testing PA. The figure shows that there was very little difference between the means for the HPI and the GPAI conditions at Week 0. In a one-way independent groups ANOVA there was no significant difference, F (1, 18) = .10, p = .75. Figure 5.3 highlights that in the HPI intervention condition participants increased their levels of PA substantially from Week 0 to the end of Week 6, when I delivered the

intervention face-to-face for six weeks. Then HPI participants' level of PA continued to increase noticeably from the end of Week 6 to end of Week 12, during the period when participants were asked to self-manage their HP imagery for a further six weeks. Figure 5.3 depicts shallow slopes of the graph for the GPAI condition, with a positive slope from Week 0 to the end of Week 6, reflecting only a small increase in PA and then a negative slope from the end of Week 6 to the end of Week 12.

The means and SDs for gain scores for PA in the HPI and the GPAI conditions from Week 0 to the end of Week 6, and Week 0 to the end of Week 12 are presented in Table 5.3.

Table 5.3

Means and SDs for gain scores for PA in the HPI and the GPAI conditions for Week 0 to the end of Week 6, and Week 0 to the end of Week 12

Intervention Period	**HPI Gain Score Mean**	**HPI Gain Score *SD***	**GPAI Gain Score Mean**	**GPAI Gain Score *SD***
Week 0 to end Week 6	916.50	919.38	377.85	615.96
Week 0 to end Week 12	1684.90	1259.66	297.70	719.70

Table 5.3 shows that mean gain scores for PA ratings for the HPI condition were substantially higher than those for the GPAI condition at Weeks 0 to 6, following the 6-week, face-to-face, one-on-one intervention sessions. Mean PA gain score in the HPI condition was more than double that in the GPAI condition. The mean PA gain score for the HPI condition for Weeks 0 to 12, the 6-week self-managed imagery period, showed another substantial increase, whereas there was only a very small increase for the GPAI condition.

I conducted a two-way, mixed-design ANOVA on the gain scores to examine further the observed differences in PA. The independent groups factor was imagery intervention condition with two levels (HPI condition and GPAI condition) and the repeated measures factor was intervention period with two levels (Week 0 to the end of Week 6, and Week 0 to the end of Week 12), while OP was the dependent variable. The main effect of imagery intervention condition was significant, F (1, 18) = 7.25, p = .01, eta^2 = .29, indicating that across all occasions PA in the HPI condition was significantly higher than PA in the GPAI condition. The main effect for occasion was not significant, F (1, 18) = 3.07, p = .010, eta^2 = .15. The interaction effect between imagery intervention conditions and occasions for PA was significant, F (1, 18) = 4.66, p = .04, eta^2 = .21. Pairwise comparison between the mean for the HPI condition and the mean for the GPAI condition for Week 0 to the end of Week 6 showed a mean difference of 538.65, which was not significant (p = .14), whereas the mean difference for Week 0 to the end of Week 12 of 1387.20 was significant (p = .007). This indicated that there was no difference between PA in the HPI and GPAI conditions from Week 0 to the end of Week 6, but PA in the HPI condition was significantly higher than the GPAI condition from Week 0 to the end of Week 12.

5.4 Discussion

The main purpose of this study was to examine the effects of a tailored imagery intervention programme designed to promote greater PA participation by people with T2DM. Specifically, I aimed to identify if an imagery intervention designed to enhance harmonious passion would have a greater effect on HP and PA than an intervention that focused on promoting PA in general. In this section, I discuss the effect of the two imagery interventions on HP and PA in relation to the design of the interventions. The effect of the imagery interventions on OP was only monitored as it a secondary variable in the study and neither imagery intervention was designed to change OP. I also consider

the outcomes in the context of theory and research associated with passion and imagery. Next, I address methodological issues associated with the study, including its limitations. Finally, I propose further research that should be conducted on this issue.

5.4.1 Conclusions in Relation to Theory and Research

The primary goal of the study was to examine the effect of an imagery intervention designed to enhance HP (HPI intervention) compared to an imagery intervention that was developed to promote general PA (GPAI intervention). The secondary goal of the intervention was to enhance levels of PA among individuals diagnosed with T2DM, so that they would be able to more effectively control their blood sugar levels and lead a healthier lifestyle.

The results of one-way ANOVA indicated no significant difference between the HPI and GPAI conditions in HP, OP, or PA at Week 0. ANOVA was conducted at Week 0, so that changes found from Week 0 to Week 6 and Week 12 could be more confidently attributed to the imagery interventions than pre-existing differences. The findings indicated that there was no pre-existing difference in HP, OP, or PA between the participants in the two interventions. Two-way, mixed design ANOVA showed main effects of Occasion for HP and PA, but not for OP, indicating that there was a significant change in HP and PA across occasions, but no significant change in OP. Overall, imagery had an effect in developing HP for PA. Further, the HPI intervention enhanced HP to a greater extent than the GPAI intervention. Also, the HPI intervention increased PA more than the GPAI intervention. Again, there was no significant effect for OP. The overall findings of the study indicated that a targeted intervention that included cognitive and motivational imagery within a PETTLEP framework and promoted the principles of HP proposed in the DMP facilitated HP and PA in individuals with T2DM. None of the participants had systematically used imagery or practiced using any kind of imagery scripts previously. This suggests that the superior capacity of the HPI intervention to

enhance HP and to increase PA participation is associated with the specific content of the script. O et al. (2014) proposed that individualised imagery scripts are more effective than those designed to be delivered in groups. O et al. showed that repeated practice of individualised MG-M imagery scripts motivated participants to adhere to the intervention, which facilitated self-efficacy perceptions in youth squash players. In the present study, the content of the HPI script was customised to each participant's preferred PA, using appropriate motivational and cognitive imagery to guide each participant through (re)creation and experience of imagery of themselves performing their chosen PA and enjoying the experience. The study showed this to be an effective way to enhance HP and PA.

Despite a small reduction in levels of HP from the end of Week 6 to the end of Week 12, I found that participants in the HPI intervention condition sustained their HP at a considerably higher level at the end of the intervention than I observed at the start of the study in Week 0. The HPI intervention certainly had an impact on HP beyond the face-to-face component of the intervention, an effect that I did not observe for the GPAI intervention. For PA, the substantial impact of the HPI intervention at the end of Week 6, was repeated during the independent imagery training period from the end of Week 6 to the end of Week 12. In the GPAI intervention, the small gain in PA observed at the end of Week 6 was not built upon during Weeks 7 to 12, so that, in the GPAI condition, PA was little different at the end of Week 12 from the level at the start of the study, that is, the GPAI intervention did not enhance PA in the longer term. It should be noted that the results for the GPAI intervention reflect common experience with general programmes that aim to increase PA among inactive people with T2DM, who are usually reluctant to commit to PA participation (Frost, Domhorst, & Moses, 2003). This supports the suggestion that elements of the HPI intervention associated with the DMP characterisation of HP had a positive impact on participants' participation in PA.

It is also possible that the elements of PETTLEP included in the design of the HPI imagery intervention could have had an impact on the performance of PA among the individuals with T2DM in this study. Ramsey et al. (2010) proposed that PETTLEP imagery interventions may be more suitable for improving performance than imagery interventions that do not actively include some or all of the seven elements of PETTLEP. This is because PETTLEP not only addresses the environment, motivation of the self, and understanding of feeling and emotions associated to PA, but also the HPI imagery intervention in the present study promoted overall self-improvement within the purview of the activity, which should have a greater impact on participants' motivation towards PA (Ganis et al., 2004; Munroe-Chandler & Morris, 2011; Ramiraz, 2010; Vallerand, 2015; Wakefield & Smith, 2012).

In this study, I found that the HPI intervention, including content based on elements of PETTLEP, had a significant effect on HP and PA, particularly during the first six weeks. In a number of recent studies that used PETTLEP-based interventions, more elements were introduced as the imagery intervention progressed (Quinton et al., 2014; Williams et al., 2013). The imagery content in the HPI script in the present study gradually evolved in detailed description of the content of the imagery related to doing the chosen PA and the enjoyment associated with PA participation. Each individualised imagery script began with basic PETTLEP elements, which then incorporated specific emotions to create a more detailed image of PA performance as the sessions progressed. The aim of such images was to help individuals with T2DM to mimic real life experience of doing their chosen PA, an approach adopted in effective PETTLEP-based imagery interventions (Cumming & Ramsey, 2009; Williams et al., 2013).

In the HPI script, the key emotional component, based on the DMP depiction of HP (Vallerand et al., 2003), was inclusion of the feeling of enjoyment towards each individual's desired PA. In contrast, the experience of enjoyment during imagined PA

was not included in the GPAI script. Imagining a positive emotion, such as enjoyment, is related to affective and cognitive investment in an activity (Roberts & Treasure, 2012). This in turn implies that individuals are committed to engage in their PA in a competent manner because they enjoy that activity (Parastatidou et al., 2012; Roberts & Treasure, 2012; Rousseau & Vallerand, 2008). The experience of affective benefits while engaging in passionate PA has also been reported by Carbonneau, Vallerand, and Massicotte (2011), Guérin et al. (2013), Roy et al. (2014), and Vallerand, Donahue, and Lafreniére (2011). The experience of positive responses found through imagery interventions has also been found in studies not focused on passion (e.g., Hall, 1995; Morris et al., 2005) particularly with PETTLEP (Quinton et al., 2014; Williams et al., 2013). As suggested by Hanin (2007), enjoyment is an emotional experience related to the person and environment. PETTLEP elements not only relate to the environment, but also with personal characteristics, such as enjoyment. The joy (emotional experience) and enjoyment (feeling) that were (re)experienced while participants in the HPI intervention in the present study were imagining themselves performing their chosen PA, should have motivated these individuals with T2DM to return to the same activity with increased motivation developing into passion for the PA.

In this study, I found that OP did not change significantly, suggesting that the imagery intervention did not have an impact on OP in the HPI condition from Week 0 until Week 12. Nevertheless, there was a substantial drop in OP in the GPAI condition from Week 6 to Week 12. This was an unexpected finding that I have not observed in the research literature, nor is there any obvious explanation that is readily derived from theory associated with OP. It is possible that it is an anomaly resulting from characteristics of the specific participants in the GPAI intervention and the particular context. However, a central tenet of DMP supported by previous research is that OP frequently leads to negative outcomes (Amiot et al., 2006; Phillipe et al., 2009; Vallerand et al., 2003;

Vallerand, 2007, 2015). Thus, if there is an aspect of imagery that can systematically produce such a dramatic reduction in OP, research to identify it and harness its power is a worthy goal.

PA is important for health and well-being and essential for people with chronic illnesses like T2DM. Thus, it is crucial for researchers to identify ways to increase PA in conditions like T2DM. Munroe-Chandler and Morris (2011) mentioned that individual imagery training provides strategic advantages. Similarly, Nordin and Cumming (2005) suggested that individualised imagery scripts with adequate training can help to increase PA. In this research, I found that an imagery intervention that incorporated PETTLEP had an impact on PA. Findings in the present study showed that imagery helped PA to increase from Week 0 to Week 6 and to Week 12 in the HPI condition. In the GPAI condition PA increased a little from Week 0 to Week 6, then declined marginally from Week 6 to Week 12. The primary reason for a significant increase in the HPI condition was the incorporation of enjoyment of the PA and positive feelings associated with the imagining of doing PA. Perhaps the imagery training that was provided initially to each participant lead to an autonomous internalisation (Vallerand, 2015) of the activity. This is because the individuals in the HPI condition freely chose the activity they preferred (Vallerand, 2015). The individualised imagery script that was designed using PETTLEP not only included these elements, they also included personal characteristics, such as enjoyment in conjunction with their PA. Thus, the enduring enjoyment of the PA (Schneider & Cooper, 2011) that was imagined using guided imagery and experienced through practice (Vallerand, 2015) encouraged the individuals with T2DM in the HPI condition to be increasingly active in their respective PA as the study progressed. Despite an initial increase from Week 0 to Week 6 in the GPAI condition, there was a slight decline in PA from Week 6 to Week 12. It is possible that the GPAI script used in this condition only aimed at motivating individuals to be involved in PA with no contingencies attached.

Hence, the PETTLEP imagery content designed for this condition was superficial, merely motivating individuals to maintain their PA around its original level. Because the element of enjoyment was not included in the script, it did not facilitate internalisation of the activity. As a result, the initial motivation that was developed through guided imagery did not convert into a passion of enduring nature (Vallerand, 2012). This shows that the internalisation process depends upon the quality of those factors in which individuals are prepared to invest their time and energy (Vallerand 2015; Vallerand et al., 2003). It is unclear at this point if imagery had a direct impact on PA or if HP was a mediating variable for PA. Research using SEM analysis with a large sample could help to examine whether HP for a chosen PA is a mediator between imagery interventions and amount of participation in PA in individuals with T2DM and a range of other populations.

Theory on passion suggests that increasing HP should have a positive impact on participation in PA (Guerin, 2013). There is little research on ways to increase HP. Imagery has been successful in interventions to enhance various psychological variables, such as self-confidence (Callow et al., 2001; Ross-Stewart & Short, 2009; Short et al., 2002), intrinsic motivation (Martin & Hall, 1995), anxiety (Carter & Kelly, 1997) and self-efficacy (Beauchamp et al., 2002; Jones, Mace, Bray et al., 2002). This suggests that imagery could be applied to improve HP. Thus, the HPI imagery intervention was developed, targeting an increase in HP and showed that in comparison to a general PA imagery intervention, the GPAI intervention, it was successful in enhancing HP. The HPI intervention also increased PA in this study.

5.4.2 Methodological Issues

I have identified several methodological issues that should be acknowledged when evaluating the results of this study. They require consideration to enhance the value of further studies. One issue faced in the study is the limited sample size. Despite T2DM being a common disorder, I faced difficulty in recruiting participants for the study. If the

current study had a larger sample size, then SEM techniques could have been used to test whether imagery had an effect on HP that led to the change in PA or whether imagery independently affected HP and PA. That is, SEM analysis with a larger sample could help to examine whether HP is a mediating variable between imagery and PA.

Another methodological issue relates to the delivery of the intervention. The intervention phase of the present study was 24 sessions (two times in a week for 12 weeks). This duration was based on intervention phases highlighted in other imagery studies (Koehn et al., 2014; Quinton et al., 2015). In the present study, I delivered the imagery intervention in two phases. During the first six weeks, I supervised each session with every participant in both conditions individually. For the next six weeks, I instructed the participants to continue practicing their imagery intervention on their own. Following a substantial increase in HP from the start of the intervention to the end of Week 6 for the HPI condition, there was a small reduction in HP, which was not significant, over the next six weeks. It is unclear at this point whether this was a result of the change in imagery delivery mode or whether HP reached an asymptote and a plateau ensued that would have happened even if I had continued to present face-to-face sessions individually. One way to examine this question would be to compare a condition that replicates the HPI intervention in the present study with a condition in which the individual, face-to-face sessions continue for the full 12 weeks, then compare the changes in HP and PA, particularly paying attention to the change from Week 6 to Week 12.

In this study, I recruited participants with T2DM from one hospital in one city, Kuala Lumpur, Malaysia. This limits the extent to which it is possible to generalise from these results to people with T2DM from other environments. This study should be replicated with people with T2DM from different socioeconomic and educational backgrounds in different countries to determine whether the principles underlying the HP imagery script are universal. I derived these guiding principles from the DMP, in

particular the detailed description of HP that has emerged from the extensive research of Vallerand and his colleagues (Vallerand, 2015), and I applied them using knowledge of imagery delivery, including the PETTLEP model and the aspects of HP that correlated with cognitive and motivational imagery functions in the previous study of this thesis. Given this systematic research and development process, imagery scripts designed to enhance HP that follow a similar process and that are individualised to focus on participants' preferred PA are expected to produce similar results.

Another limitation relates to the delivery of the HP imagery intervention by me, the person whose research this study represented. It is possible that this influenced participants' PA participation. They might have tried harder (been more motivated), knowing I was the researcher whose Ph.D depended on the results of this study. In addition, based on my commitment to the central premises of this thesis that appropriate imagery programs can enhance HP and that increasing HP can promote greater participation in PA, I might have unconsciously biased my efforts in delivery of the HPI intervention compared with the GPAI intervention. To examine these points further, in future studies, individuals who are not the PhD student or academic researcher, should be trained to deliver imagery interventions to enhance HP and PA.

5.4.3 Further Research

The results of the present study raise a number of issues that merit further study. A key finding in the present study relates to the trend for the impact of the HPI intervention to show a reduction in HP from Week 6 to Week 12. Although this reduction was not significant and HP remained at a much higher level at the end of the study than it was at the start, the question that should be asked is whether HP would continue to decline if the self-managed imagery delivery phase had continued for longer. Replicating the present study, but with a longer self-managed phase, as well as comparing different lengths of self-managed imagery are research directions that are worthy of attention.

Perhaps even more important than the duration of self-managed imagery is the duration of the individual, face-to-face imagery phase. In the present study this phase lasted for six weeks, comprising 12 sessions with each participant. Extending the face-to-face phase to determine whether this would produce a more robust level of HP during the self-managed phase is an important area for further study. An alternative question that should be investigated relates to the minimum duration for the face-to-face imagery phase. As stated, I based the six-week duration on previous research. However, six weeks of face-to-face imagery training demands considerable resources in the broader context of widespread use of this kind of programme to promote higher amounts of participation in PA among people with T2DM, other chronic conditions, or even the general population. Researchers should examine whether four weeks of face-to-face sessions or even three weeks might produce an equivalent impact on HP and PA.

In the present study, a 12-week imagery program was conceived and developed. To ameliorate the demands on the single imagery trainer's time (I conducted 120 individual, face-to-face imagery sessions), I switched participants to self-managed imagery delivery during Weeks 7 to 12. Given the limited impact of self-managed imagery for HP, researchers should examine whether self-managed imagery is preferable to no directions for imagery. Studies that replicate the present design and compare the HPI intervention with a 6-week face-to-face intervention, followed by no directions regarding further imagery, but retesting after 12 weeks would address this question. End of study interviews for participants in both conditions could then explore how much imagery participants in both conditions performed during Weeks 7 to 12 to illuminate observed changes in HP and PA.

The further research proposed here with reference to the amount and style of imagery has focused on duration in terms of the number of weeks of face-to-face and self-managed imagery. It should be noted that similar questions could be raised regarding the

number of imagery sessions per week, as well as the duration of each session. In the present context, I decided that two sessions each week was as much as I could ask of the time of participants with little background or interest in PA on entering the study. It would be possible to increase the number of imagery sessions per week or their duration in contexts where participants entered the program with higher levels of commitment to PA. Another approach might be to start with a small number of sessions and increase the number as participants' HP increases. Research to examine the impact of these kinds of manipulations on HP and PA has merit, including terminal interviews to explore participants' reactions to various changes in the number and style of imagery sessions.

Perhaps the most intriguing result in the present study is the observed substantial continued increase in PA that occurred between the end of Week 6 and the end of Week 12 among the participants who experienced the HPI intervention. Even more noteworthy, this continued increase in PA arose during a period when HP declined a little for participants in the HPI condition. It is possible that the continued increase in PA participation reflects an extended effect of the increase in HP observed during the face-to-face imagery intervention period for the HPI intervention participants. As previously noted, it is important to conduct further research with samples large enough to permit SEM analyses to be conducted. This would permit the proposition of continuing impact of the earlier increase in HP to be compared with the alternative explanation that HP is not a mediator between imagery and PA participation, but that the imagery intervention directly enhanced PA.

The present study is unlike any previous study that I have seen on imagery, passion, and PA. This discussion of further research, based on observations from the results of this study, demonstrates that there is a great deal of potential for research of this kind to be conducted to throw light on the way in which imagery training is delivered in

the PA context, the impact of imagery training on HP, the effect of imagery training on PA, and the relationship between HP and PA.

5.5 Conclusion

In conclusion, the current study supports the proposition that an imagery intervention focused on developing HP for PA was an effective, cognitive-behavioural technique for relatively sedentary individuals with T2DM. Overall, imagery requires conscious and active participation of individuals without any form of overt movement. The results of this intervention were valuable because the imagery intervention targeted towards specific aspects of HP (HPI) effectively increased HP and PA. The differences observed in the impact of the HPI intervention and the GPAI intervention arose despite the application of a number of standard principles of imagery training in both conditions. These principles included activation of PETTLEP model components and focus on associations between imagery functions, assessed by the PAIQ, and aspects of HP, measured by the PS. In this study, the administration of imagery for two sessions a week, for six weeks, was sufficient to bring about a considerable change in HP and PA. This helped to maintain interest and prevent boredom among middle-aged individuals with T2DM. Theory on passion suggests that increasing HP should have a positive impact on participation in PA (Guerin, 2013). A comprehensive literature search showed no studies that have used imagery to enhance HP and, through HP, PA. The findings of this study indicated that imagery can facilitate the development of HP and PA. Future studies should replicate and extend the present results using SEM modelling to understand explicitly the role of imagery for passion and the impact on PA when HP increases.

CHAPTER 6

STUDY 4: EXPLORING THE EXPERIENCE OF A HARMONIOUS PASSION IMAGERY INTERVENTION TO INCREASE PHYSICAL ACTIVITY IN DIABETES MANAGEMENT

6.1 Introduction

In the present study, I conducted one-to-one interviews with five participants from the HPI condition. They were selected because passion for their respective PA levels increased significantly from Week 0 to end of Week 6, to end of Week 12. In the interviews, I aimed to explore the subjective experiences embedded within the narratives of the participants in order to understand how HP imagery promoted PA adherence for managing T2DM. A comprehensive literature search has shown one published qualitative case study that highlighted the subjective experience of participants in passion research within sport and exercise psychology that traced the pathway to passion development (Roy et al., 2014). In that study, the researchers used an in-depth conversational style of interview and narrative analysis to explore the subjective experiences embedded within the narrative of a mid-life woman with T2DM.

In this chapter, I would be focusing on two major themes. These include the type of PA involved before and after the onset of T2DM and how HP imagery lead to the development of HP towards the individuals desired PA. The analysis will begin with a brief introduction on each participant briefly, following which, I will discuss in detail about the two themes that emerged commonly in all five narratives: Physical activity involvement: Lifestyle before and after the onset of T2DM and Passion Imagery: A pathway to harmonious passion development. I will then discuss in-depth about each of these themes holistically and conclude the chapter with limitation and suggestions.

6.2 Method

6.2.1 Participants

The main intention of the study was to explore the subjective experiences embedded within the narratives of individuals who have developed HP for their respective PA. Only participants who have shown at least 20% improvement in the levels of HP and PA at the end of the 12-week intervention in the HPI condition was considered for Study 4. The five participants (2 males, 3 females) were aged between 41and 46 years (M_{age} = 52; *SD* = 7.93) and participated in walking (*n* = 3), cycling (*n* = 1) and yoga (*n* = 1).

6.2.2 Research Approach

In this study, I interviewed participants using a conversational style. I used narrative inquiry (Crossley, 2007) to analyse the transcribed data. With DMP (Vallerand et al., 2003) as the backdrop, each participant's narrative was unravelled using Crossley's (2007) narrative analysis. This helped to explore the issues of identity and construction of the self in relation to HP towards each individual's PA that was developed with the help of HPI (Roy et al., 2014).

6.2.3 Measures

6.2.3.1 Interview Process

Adopting a conversational style of interview, I utilised an unstructured interview to map participants' personal lives in relation to their PA and their personal experience of HPI that led to a change in their PA level. The interview began with a common question: Could you please share your experience on the imagery intervention you underwent recently? I followed this with probing questions to acquire more information on participants' experience. For example: *How did imagery help to initiate your PA?; What made you continue with your PA? Could you elaborate more on your feelings and experience when you began to invest exclusive time for your PA?; What are the changes you noticed or experienced within yourself after you were involved in your PA?.*

6.2.4 Procedure

The research was approved by the University of Malaya Medical Ethics Committee (UMMC). All participants were assured confidentiality and given a pseudonym to identify the participants. Interviews lasting between 60 and 90 minutes were conducted a day after the follow-up period. All participants consented to have their interviews audio recorded. The transcripts were given to participants to check their accuracy/veracity of their statements. Lastly, I thanked all the participants for their involvement in the research.

6.2.5 Data Analysis

I followed the four-step procedure proposed by Crossley (2007) to explore the self and identity construction. Particularly, the focus was to analyse situations or experience within the narrative of each individual in relation to each person's PA Crossley, 2007).

Step 1: *Reading and familiarising*: I read and re-read the transcripts to become familiar with them and obtain a general gist of the themes emerging from the material.

Step 2: *Identifying important concepts specifically looking for:*

(a) *Narrative tone*: In this step, I identified content and the form or manner in which the story was conveyed in relation to individuals' past and also the way in which they executed their actions. For example, a story can be expressed in an optimistic tone or pessimistic tone.

(b) *Imagery:* Here I explored the unique way in which language was used to describe certain events or experiences in the participant's life.

(c) *Themes*: In this step, I classified common patterns identified within the narrative into themes.

Step 3: *Weaving all of this together into a coherent story:* I put together my interpretation of the emerging images and themes into a single coherent story.

Step 4: *Writing up research report:* After deriving the results I transformed the narrative into a meaningful report.

6.3 Results

6.3.1 Participant 1: Diana

Diana was a 56-year old school principal who was diagnosed with T2DM 13 years ago. The onset of T2DM occurred due to the side effects of the medication that she took to treat cancer. She started doing some PA (walking) after completing cancer treatment in the early 2000s. However, it was not regular. She discontinued her PA due to poor time management owing to her busy professional career and personal life. Before the intervention, her HP and PA were very low. Diana's HP and PA gradually increased from Week 0 till the end of Week 12.

The interview began with Diana explaining about her involvement in PA the activities she was involved in before and after she was diagnosed with T2DM. Her narrative also highlighted her experience with the imagery intervention and how it gradually enabled her to initiate her PA that eventually developed into a HP for walking.

6.3.1.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Diana described the different types of sports and PA she was involved in since childhood.

> I was a sportswoman. I did 100 metres, 200 metres. I was into hurdles also, during my school days and my college days... I played a lot of sport and represented my school at interschool competitions. I went up to the district level.

This quotation shows that Diana discovered her talent in athletics at a young age and took part in competitions at the district level. Diana had a neutral tone of voice when describing her past PA. It was apparent that when Diana was younger, she was a very enthusiastic and active sportswoman, perhaps, due to her achievements in sports. Diana's account also reflects an image of a physically active woman who identified her talent and passion for

sport and continued to be involved in sport as long as it was possible because it made her feel fit, healthy, and positive about herself. Diana was physically active initially, but discontinued her sporting career and was relatively sedentary after marrying young and starting work. The following statements substantiate the effect of work and marriage on Diana's PA.

> Once I started working, I stopped everything and dedicated myself to teaching... I was married at 23 and after that I had no time to take part in any PA because of other commitments like taking care of my family, teaching, I just didn't have the time to do anything at all.

Diana expressed her views in a neutral and confident tone of voice while describing the institution of marriage and family commitments. As marriage and professional life involved responsibilities, she prioritised her responsibilities and compromised on her PA. This resulted in Diana leading a relatively sedentary lifestyle. Diana's life changed when she was diagnosed with kidney cancer in 2001. According to Diana, the onset of T2DM was a secondary side effect of surgeries, medications, and chemotherapy that she underwent as part of her treatment.

> I am actually a cancer survivor. I was diagnosed with a kidney tumour in 2001. One of my kidneys has been removed and in 2004 the cancer cells had spread to the uterus and that was removed later on. I was diagnosed with diabetes 45 days after I was diagnosed with the tumour... it was the surgeries, medication and chemo which led to my diabetes.

In the aforementioned context, Diana had an optimistic tone of voice when she shared her experience related to her cancer diagnosis and treatment undertaken. This showed that she held a positive attitude towards cancer and her recovery; perhaps, this could have been one reason for the speed of her recovery process. The tone of voice and the language Diana used to describe her life indicated that she was a strong woman who could endure

pain and the subsequent complications caused by the cancer treatment. Post cancer, she gradually began to invest some time into walking as she could see herself persisting in this activity. However, it was irregular due to poor health as well as personal and professional commitments. The following statements substantiate these points made by Diana in her interview.

> After the tumour and the recovery, I started to do a little bit of exercise...I cannot do much because I don't have one kidney. So the walking I do, I cannot walk too much... like very fast and so on... I couldn't do it fully and every day because I am a principal of a school, so I had lots of work to be finished every day.

Diana's tone of voice was optimistic when she explained her involvement in walking. The cancer recovery process enabled her to invest time and energy into walking, a PA she was most comfortable to do. Despite her medical condition and the necessity to exercise, Diana was unable to keep up with her walking on a daily basis due to her work commitments, which made her sedentary.

6.3.1.2 Passion Imagery: A Pathway to Harmonious Passion Development

Diana was unaware of imagery until I introduced it to her; however, she took the effort to read up on imagery from the internet prior to my visit. The following statement reflects this.

> I have not heard about imagery before. It was all new to me. I did not know anything about it... I was very blank about this. So just before the first session I had with you, I had a little bit of an idea what it was all about because I read it online just to know what it was all about and I was prepared before you came.

Diana used an optimistic tone of voice while describing her eagerness to learn new ways to manage her lifestyle. The above statement reflects her enthusiasm to gain new knowledge and find new ways to initiate her PA in her daily routine. She required

guidance and encouragement to lead a healthy lifestyle though PA. The initial informational support I gave enabled Diana to have an open mind about the intervention. This open-mindedness enabled Diana to practice imagery, such that over six weeks she experienced a difference emotionally, physically, and psychologically as a result of walking. The following statement exemplifies this.

> From the first session onwards, I was feeling good. It made my mind relaxed. Also something inside told me that I should start doing the exercise...while you were talking, that is, while I was closing my eyes and you asked me to see the trees, people, everything, that was a turning point for me...It was that phrase that triggered everything... Beginning I was feeling very tired, as I was doing (activity) after such a long time, but as days went by it was becoming very easy, it became very easy and it has become like a routine for me... I started with 10 minutes, slowly increased and now 40 minutes I do walking... I saw many changes, because I know myself... My sugar level has dropped...I had sleep problems before, but now I really have a good sleep. I feel very happy and I feel different... my eyes are not puffy... I can manage my time better."

Diana had a positive tone while describing her feelings and outcomes experienced when she initiated walking. She developed confidence in herself because she took the initiative to invest time and energy into a PA of her choice. As Diana's narrative progresses, it threw light on how the intervention helped Diana in PA adherence. Diana found the individualised imagery script to be very beneficial as its continuous revisions led to information processing, such that she decided to initiate her PA. These thought processes facilitated continued involvement in walking even post-intervention.

> You gave me a piece of imagery script right, I was reading it... I kept it in school, so when I am free I usually read it and I imagine that I am exercising...you feel different when you were going through the script... there is an urge for you to do

the exercise and I want to see what the result is since I have been feeling different ever since I have started to exercise... I have achieved it and you can see me also I look different from day one when you came to visit me.

Diana had a positive tone of voice when describing her experience with the imagery intervention. The initial guidance that I gave in the script enabled her to continue using the script to do PA and keep herself healthy and manage T2DM well. This quotation shows that she was determined to return to an active lifestyle and achieve her goal of regular PA.

In conclusion, Diana described her involvement in sport and PA in an optimistic manner. Diana mentioned that her personal and professional life was prioritised over PA. The turning point in her life occurred when she was diagnosed with kidney cancer. Her medical condition and other complications caused her to permanently stop her PA. Upon recovery from her cancer surgeries, Diana initiated some PA in the form of walking, but it was irregular. Rose gradually started walking regularly again during the six weeks of intervention when she worked face-to-face with me. This is because the imagery script was designed using PETTLEP and incorporated a passion component which was individualised to her desired PA. With repetitive experience of positive emotions associated to her PA, Diana felt a desire to commit herself towards PA. Her autonomous decision making skills enabled Diana to initiate walking because of the physical, emotional, and psychological benefits she experienced. This helped Diana to develop a HP towards her PA leading to PA adherence.

6.3.2 Participant 2: Rose

Rose was a 41-year old customs officer. She had a family history of diabetes and was diagnosed with T2DM 10 years before participating in this research. Rose was an amateur sportsperson. She used to participate in volleyball when she was at university. Over the years when her social circles (peer support) reduced, she stopped playing

volleyball. In due course, she got married and started working. Rose continued to lead a sedentary lifestyle because of her family responsibilities and busy work schedule. After I introduced her to imagery, Rose started to invest time and energy into cycling on an exercise bike at home.. Rose's HP and PA levels is to found to increase from Week 0 to the end of Week 12.

In the interview, Rose began by describing her involvement in PA, the reasons for leading a sedentary lifestyle and the onset of T2DM. Rose's narrative highlighted her experience with the imagery intervention and how it enabled her to develop a HP for cycling on an exercise bike over a period of time.

6.3.2.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Rose considered herself to be an amateur sportsperson. She was interested in sports because of her friends' influence. Rose, who preferred team sports to individual sports, traced her life in the following manner.

> I used to be an active person. I used to participate in sports events in the school, but of course, not like the running, I will do other activities like volleyball... I like group activities more than being very individual. I like to be in a team.

In the aforementioned context, Rose had a neutral tone of voice when describing her sports activities. It depicted Rose as a woman who was not passionate about sports, but participated in group activities as part of recreation, peer support, and enjoyment. As the years progressed, Rose married and worked as a Malaysian Customs officer. Due to the nature of her work and family commitments, Rose led a sedentary lifestyle. The following statement substantiates this.

> I got married at a very young age. So basically, I don't have much time for any activity, even for social life. My office is far and it is a hectic schedule... I come back home very late by 11, 11.30pm... my time for personal life is so short that after office hours I have to drive a long way and I am tired by then. As a

> lady of the house I have to cook for my family. So you see, I just do not have time for myself.

Rose had a neutral tone of voice when explaining the transitions that had taken place in her life. From the two quotations above, I interpreted that Rose was a responsible woman who was committed and dedicated to her family and work. For these reasons, Rose compromised on her PA to uphold other commitments in her life. Rose was at risk with the onset of T2DM due to family history. Despite the onset and knowledge about T2DM and its complications, Rose remained laid-back about PA and did not do regular exercise. Instead, she considered dieting as a way to manage T2DM.

> It is almost like 10 years now since I was diagnosed with diabetes. I was not worried much because I had a family history. My father had diabetes. Since the onset, I have been reading many articles to get to know about diabetes and the symptoms, consequence about being a diabetic... I did exercise but not much because of my schedule... I controlled my diet a lot... I really cut down on my rice quantity and switched to wheat products more. Since then my glucose has been in control and maintained.

Rose had a neutral tone of voice when describing the onset of T2DM and how she managed it only with diet control. From her statements in the narrative, I characterised Rose as a woman with a casual attitude towards health-related aspects of her lifestyle because she did not participate in PA to manage T2DM despite being educated and having knowledge of T2DM and related health complications.

6.3.2.2 Passion Imagery: A Pathway to Harmonious Passion Development

Rose developed a HP for cycling on an exercise bike through the HPI intervention. Rose mentioned that her glucose was maintained due to her diet control, rather than with exercise. She was also unaware of imagery and its benefits to exercising. After an introduction and experience with the imagery intervention, Rose developed a sense of

determination to cycle on the exercise bike. She also mentioned that imagery helped her change her lifestyle to allocate time for cycling.

> No, I was not aware of imagery at all. It's when you came, I came to know about it… it was like someone bringing me to a direction... like channelling me in a proper way for a healthy living... When I went through the first session, it was like I want to do it...That urge was in my mind... I did not wait much... I went to my bike and began to give some time of my life for exercise and it's because of that imagery that I did with you.

Rose had an optimistic tone of voice when she mentioned how imagery played an important role in initiating cycling. It is apparent that Rose was enthusiastic and eager to acquire new knowledge that could help her to initiate her PA Initially, she required social support to motivate her to exercise and maintain a healthy lifestyle. The initial six weeks of guided imagery enabled Rose to initiate and continue PA. Rose was optimistic while emphasising the positive changes that she began to see in herself as she started cycling. Her story highlights some of the benefits that she noticed with cycling, and this further encouraged her to continue with her PA. She described her experience in the following statement.

> When I did this intervention with you it actually benefited me a lot because you had a lot of positive emotions in it like happy, joy, refresh and so on... so every time I read that script you gave me, I imagined myself as happy after exercise... after that I go and exercise. When I am free from work for some time or once I finish my job, I am able to generate those emotions. So that actually has helped me a lot because I feel nice and it makes me want to exercise more... I can feel that I can manage my life better now... I feel free.

Rose had an optimistic tone of voice while describing her feelings towards imagery and her involvement in cycling. From her narrative, I derived that her self-confidence

increased after being involved in PA. The experience of positive emotions obtained through her participation in PA helped Rose to realise the physical and emotional benefits of PA. This in turn helped her to boost her self-confidence leading to a more effective lifestyle management. It is evident that the script that was tailor-made for Rose's PA had an impact in her developing an initial interest in cycling, which developed into a motivation and finally into a passion in due course. Despite experiencing affective outcomes with imagery , her active involvement in her PA reduced from Week 6 to the end of Week 12. She did not continue PA after the imagery intervention due to other commitments. Nevertheless, as she realised that she was regressing back to her previous lifestyle she decided to re-initiate her PA. This decision helped Rose to recall and experience the positive changes that she once experienced when she began with her PA. This enabled Rose to persist in cycling in the long-term.

> I was extremely happy when you were coming and guiding me through the imagery. The fact I knew that you will come on such and such a date, made me feel like I have to do it and see if this research really helps in exercise... I started with 5 to 10 minutes. It was really going up and up every week and then at one time it went down when you did not come. So other commitments were given priority... I started to see my old image... I was gaining weight... I was getting tired fast and irritated... I saw the script you gave me and went through it again and again... I went back to my bike and exercised... the feeling I had when you were helping me was coming back...I did not give up cycling after that... I do it daily and I can see a difference.

Rose had a depressed tone of voice while she explained about my absence in delivering imagery. This showed that Rose depended on other people for direction and instructions. However, as she continued talking, Rose had a confident tone of voice when she emphasised re-initiating cycling. This decision-making skill shows that Rose is a

determined woman who is goal directed and wanted to be successful in achieving what she had achieved previously with her own effort. Thus, this autonomous decision to participate in PA and the benefits re-experienced through exercising, enabled Rose to develop a HP for cycling at the long-term.

In summary, Rose's narrative highlights that she is a determined woman who is goal directed and would try to achieve the target she set. Indeed, she is a woman who has a laid-back attitude toward exercising; however, with appropriate guidance and direction, Rose initiated exercise to maintain a healthy life. The narrative reflects the HPI intervention to have influenced Rose in a positive way from pre-test to post-test. My absence resulted in her reducing her PA; however, having realised the negative effect of not exercising on her lifestyle and health, she decided to restart her cycling. Therefore, the positive outcome she experienced with cycling enabled her to develop a HP for cycling.

6.3.3 Participant 3: Neil

Neil was a 55-year old managing director of his own company. He was diagnosed with T2DM 14 years before participating in the intervention and had a family history of T2DM. He was involved in walking after the onset of T2DM. Before he was diagnosed with T2DM, Neil led a sedentary lifestyle. On his physician's advice, Neil went on a strict diet and became relatively active. However, he remained intermittent with walking due to lack of social support and his erratic business schedule. At the time of the intervention, his HP level and PA were between low and moderate. Having undergone the imagery intervention, I analysis indicated a change in his HP and PA, which was maintained at follow up.

Neil described his participation in PA upon the onset of T2DM, the role of social support when he started walking, and how the imagery intervention helped him to develop a HP toward his preferred PA.

6.3.3.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Prior to the onset of T2DM, Neil did not place any importance on PA due to his busy work schedule. His tiredness was quoted as the main reason for his low level of exercise.

> I am a businessman; a managing director of my company. I have no fixed timing and I work at erratic timings. By the time I come back from my work I am very tired and I just want to relax... I do not have the time for exercise... I feel demotivated to exercise.

I noted that Neil had a casual tone of voice when describing his lifestyle before the onset of T2DM. The above statement depicted an image of a man whose business life seemed more important than his health and well-being. Neil was diagnosed with T2DM 14 years ago. He mentioned that he had a family history of T2DM and work was stressful as he had to ensure good returns in his business. Following his physician's advice, Neil started walking.

> As my business grew, it was becoming harder for me to handle it and was more stressful... I have a family history of diabetes. My father was a diabetic...once the doctor confirmed that I have diabetes, he told me to go for walking and do some exercise. Since then, I have been going for early morning walks... the frequency has increased from 15 minutes to one hour now.

Neil had an optimistic tone of voice while explaining his career and family life. This reflected an image of a man whose personal life and work were given more importance than his health. As the story progressed, Neil had an optimistic tone of voice when he described his lifestyle after being diagnosed with T2DM. This showed that Neil was an open-minded person who was eager to learn, gain new knowledge, and follow instructions from professional people. This enabled Neil to start walking to maintain a healthy

lifestyle. Although, Neil started walking after his diagnosis, he did not continue regular PA due to his work schedule and life commitments. The following statement reflects this.

> I started walking everyday in the morning...it felt good, but as I told you earlier, my business schedule is very erratic. I had to be in the company most of the time and then I am tired. So I could not go for walking everyday in the morning... it was difficult for me and I did not feel the drive to get me started with exercise.

Neil had a depressed tone of voice when describing his failure to adhere to his PA due to his erratic work schedule. This context portrays an image of an individual who required social support to help him re-initiate the exercise regimen.

6.3.3.2 Passion Imagery: A Pathway to Harmonious Passion Development

Neil described how the HPI intervention enabled him to develop a passion for walking. In the narrative, Neil explained that he began to invest time for walking after the onset of T2DM; however, he did not do it regularly because of his job commitment. Like the other participants, Neil was not aware about imagery and its benefits. With an introduction to the HPI intervention, felt motivated to exercise.

> This is the first time I have heard about imagery. So when you came with this topic, I had an open mind to learn something new. I thought maybe it will help me in my fitness... Once I began with the programme, it felt good and I felt motivated to go and walk.

Neil initially had a neutral tone of voice when describing his lack of knowledge about imagery. Nevertheless, he had an enthusiastic tone when he explained his initial experience with HPI. This showed that Neil was an enthusiastic learner who was eager to try new approaches that would enable him to exercise and managing T2DM. As the interview progressed, Neil highlighted his experience with the imagery intervention. He mentioned that the personalised guided imagery script had an impact on him by motivating him to walk for health.

> The imagery script was so effective. I could see myself walking and enjoying the activity... when you came for six weeks regularly, it helped me a lot to focus and it was like someone motivating me to walk. This really impacted me in a positive way.

Neil had an optimistic tone of voice while explaining his experience with the imagery intervention. The imagery intervention motivated Neil to initiate his walking activity and set aside time for PA. According to him, the positive changes he experienced because of walking enabled him to continue walking after the guided HPI intervention ended. The statements below illustrate these points:

> In the beginning, I felt very tired with one round. But as the days went by, I began to feel some difference within myself. I was able to sleep well, manage many things well... I was feeling happy... I was feeling very fresh and relaxed... I knew these good changes are happening because of my early morning walks that I go. Now it has become a passion for me.

I identified that Neil had a positive tone of voice while sharing his experience with the imagery intervention. Possibly, the physical and emotional changes that Neil experienced with his interest in walking activity enabled him to persist in his activity. Through his narrative I also identified that Neil portrayed an image of a satisfied man who has accomplished his goal to be involved in walking. The determination and dedication that Neil showed towards the intervention motivated him to be involved in PA to manage T2DM and maintain a healthy lifestyle.

In conclusion, Neil's narrative highlighted how his busy work schedule affected his PA, leading to the onset of T2DM. Despite his physician's advice to exercise every day, Neil was unable to commit to his PA due to his erratic work schedule. Having undergone the intervention programme, Neil initiated his walking activity and experienced positive changes. Given the benefits Neil experienced with walking, he

decided to continue walking as a PA after the intervention. This autonomous decision-making about walking every morning resulted in the development of HP, and an increase in PA.

6.3.4 Participant 4: Brian

Brian was a 61-year old retired air force officer (rank undisclosed upon request) who served in the Royal Malaysian Air Force for 15 years. He was diagnosed with T2DM 10 years ago. He had a family history of T2DM; however, his diabetes onset occurred due to the side effects of the medications he took to treat his knee injury. As an air force officer, Brian had always led an active lifestyle. He retired early from the Air Force because of knee damage. He eventually stopped regular PA. Before the intervention, Brian was not regular with his PA (yoga). His HP and PA were low. After the imagery intervention, Brian's HP improved which was associated with an increase in his participation in yoga. Due to the physical and emotional benefits he experienced, he continued doing yoga for longer durations during the follow up.

In Brian's narrative, he explained the kind of life he led as an air force officer and post retirement. In particular, his narrative describes how the imagery intervention helped him to be motivated to participate in yoga, which later developed into a HP for the activity.

6.3.4.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Brian worked for the Royal Malaysian Air Force for 15 years. As part of his professional requirement, Brian remained very active in sport and PA during his service period. This active lifestyle helped Brian to remain fit and healthy; however, in due course he mentioned that he injured his knee due to overuse. For this reason, he retired from service and thereafter remained intermittent with his exercise. The following statements exemplify this.

> I worked for the Royal Malaysian Air Force for 15 years. Being in the armed forces, it is a must to remain fit and healthy. So every day, we are made to jog, run, and do a lot of exercise to be fit and healthy. I used to feel very strong those days because we are forced to be active. Later, due to overstrain, I happened to have a knee injury. The scan report showed that my synovial fluid was less. After that, I retired from the air force earlier and was at home... I tried to exercise, but it was difficult.

Brian had a happy tone of voice while explaining his active lifestyle as an air force officer and a depressed tone of voice while narrating the incident that led to an early retirement from the armed forces. This showed that Brian was a dedicated air force officer who followed a disciplined life. His career transition had an impact on his lifestyle. Brian had a family history of T2DM, but he reported that his physician informed him that the onset of his T2DM occurred due to side effects of the medication he took to treat his knee injury. Upon the physician's advice, Brian became involved in yoga; however, he did not participate regularly due to lack of interest and motivation.

> My father was a diabetic but my diabetes started not because of my family history, but the medicines I took for the knee. That is what the doctor said. It was like in two weeks the doctors checked my blood told me that I have diabetes. Since, then the doctors told me that I need to exercise. I wondered how to do it with my knee... I was involved in yoga, but it was not regular.

Brian had a disappointed tone of voice when he talked about the onset of T2DM and his involvement in yoga. This portrayed an image of a depressed man, who was probably undergoing conflicts within himself associated with his sudden career transition. I suspected that Brian was probably not deeply interested in yoga, perhaps because he was used to high intensity PA when he was an air force officer. This may be the reason that he discontinued yoga as this activity was less intense.

6.3.4.2 Passion Imagery: A Pathway to Harmonious Passion Development

In this theme, Brian explained his experience with the imagery intervention and how it enabled him to resume and continue with yoga. He mentioned that he was unaware of imagery prior to the intervention study and was looking forward to learning new approaches in lifestyle management.

> I have never heard of imagery before. From the word, I knew it should be something to do with imagination, but never got a chance to try it for starting yoga as such. So when you came and explained to me about this new approach to PA I was excited to try out something new.

Brian had an optimistic tone of voice while describing his lack of knowledge about imagery and his interest to find out more about it. This showed that Brian was an enthusiastic learner, who would like to experience new ways to accomplish an active lifestyle. Brian found that from Week 0 to the end of Week 6, HPI intervention had an effect on modifying his routine behaviour. He confirmed that he resumed yoga and began to invest time on this PA. Brian mentioned that the imagery script that included images of feeling positive and enjoying the activity were triggers to initiate the activity.

> When you guided me through the script for six weeks, I could see myself doing the different asanas in yoga. Doing yoga is now part of my daily routine. I get up in the morning and I do yoga for half hour now... The part I felt good was when you said positive things like feeling happy, good and enjoying the activity... I think that was a trigger that got me started with yoga because I felt like doing it... I felt a push.

Brian had a positive tone of voice while sharing his experience with the imagery intervention. From Brian's statements, I concluded that the positive emotions that were included in the imagery script enabled him to resume participation in yoga. This brought about a change in his daily routine where he set aside time for yoga in order to maintain

a healthy lifestyle. Brian confirmed that he persisted in the activity after undergoing imagery sessions. He mentioned that he was able to recollect the positive emotions that were re-experienced in each imagery session. This allowed Brian to continue involvement in yoga after the guided imagery intervention was over.

> After six weeks when you told me now the choice is mine, I thought I was brought to a direction by someone to lead a healthy lifestyle. So I imagined sometimes doing the activity and then did some asanas. Then when I am resting, I could recall the positive emotions and it was making me feel so relaxed and refreshed...I think this imagery really helped me so much in terms of my health because now I do my exercise on daily basis. I try not to miss it... I am enjoying it.

Brian had an optimistic tone of voice when he narrated his experience after the HPI intervention. From Brian's statement, I inferred that he was a dedicated and motivated individual who was able to manage his lifestyle better after participating in yoga due to the affective outcomes he experienced. This confirms that yoga was internalised into Brian's identity leading to HP development.

On the whole, Brian's narrative provided a synopsis of how imagery enabled HP development for yoga. Because he was involved in Air force that followed a disciplined lifestyle and intense training, he was aware of the benefits of PA and urged him to be involved in a PA despite his knee injury. Through the HPI intervention, Brian experienced positive benefits after he developed an interest in yoga. The autonomous decision that was undertaken by Brian to continue with the activity from post-test to follow-up showed that he enjoyed being involved in yoga. This continued persistence in the activity showed the development of HP for yoga.

6.3.5 Participant 5: Hana

Hana was a 47-year old high school teacher and a tutor at her own tutorial centre. She was involved in walking. She was a breast cancer survivor and was diagnosed with T2DM 12 years ago. She had a family history of T2DM. Despite these medical conditions, she remained intermitted with her PA regimen. Hana's lifestyle changed once she was employed followed by marriage a few years later. At the time of intervention, Hana led a sedentary life. Her HP and PA were low at the time of data collection. With reference to the 12-week HPI intervention programme, Hana was one of those participants who showed an increase in the levels of HP and PA from Week 0 till end of Week 12 intervention period.

Hana's narrative highlights her PA before and after breast cancer and T2DM. In particular, her narrative explains her experiences with the HPI intervention and the development of a HP for walking.

6.3.5.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Hana described herself as an introvert, who was not interested in sport or PA from childhood. She mentioned that she spent more time doing routine household activities rather than engaging in any form of PA. She was sedentary and concentrated on being a mother and teacher.

> From childhood, I did not play any sport. I liked to read more and do other kind of activities, such as housework, cleaning and so on. I was quite a homely girl back then...I am a high school teacher now and a mother of two...I did not have time for any kind of exercise because I have to finish all the household chores and then rush to school, come back and the routine goes on. So I just couldn't exercise any point of the day.

Hana had a neutral tone of voice while describing her lifestyle. It is evident from the narrative that Hana was never interested in any form of PA. Like most working women

in today's world, Hana had to juggle both work and family. As a result, her PA was compromised. Hana was diagnosed with T2DM 12 years prior to participation in this research. She was diagnosed with gestational diabetes during her second pregnancy and T2DM remained post her delivery. Despite her physician's advice, Hana refused to take medications due to oral medication aversion and failed to exercise due to lack of time. The following statements substantiate these points made by Hana in her interview.

> I have a family history of T2DM. My father and mother were diabetic. Actually, mine probably started with my second pregnancy. The doctors told me that I have diabetes while I was carrying. After my delivery, I still had diabetes. So since then, I was given medications, but I was not regular in taking it. I hate oral medicines... My glucose was not at all in control. My doctor used to be very angry at me and finally, he said enough is enough, and put me on insulin... I was asked to exercise, but I didn't have the time for it because I have to take care of the house, cook, look after my children and work. Absolutely no time for me.

Hana had a casual tone of voice when explaining her medical condition. This depicts an image of a woman who did not care about her health and well-being. Her casual approach to life showed that Hana assigned greater importance to other aspects in life than her health. Hana was diagnosed with breast cancer in 2005. After lumpectomy and six rounds of chemotherapy, she initiated walking as part of her rehabilitation; however, she discontinued due to family and professional commitments.

> I am a cancer survivor. I was diagnosed with breast cancer in 2005. The oncologist did lumpectomy and around six sittings of chemo. After that, I started to walk slowly, but you know, I am a single mother, my husband is no more and I have to run the family. My kids are very young. So I just didn't have the time and energy for exercise.

Hana had an optimistic tone of voice when she described her medical condition and how she coped with it. This showed that Hana is a strong woman who was brave to endure pain and took precautionary measures to modify her lifestyle to avoid other medical complications in future. Despite initiating early morning walks, she discontinued due to responsibilities that she had to adhere to as a mother and as a teacher.

6.3.5.2 Passion Imagery: A Pathway to Harmonious Passion Development

Hana mentioned that she was not aware of imagery as a technique. Nevertheless, she had an open mind about imagery and felt positive after the first session. She did not immediately begin with her walking routine, but decided to do a week later for health reasons.

> I did not know what imagery was. So when you came, I had an open mind that someone is coming to push me to exercise...In the first session, I could imagine that I am walking outside my house and everything fell into place with imagining...Of course, I did not start walking immediately. It took me like 4-5 days and by then I began to feel guilty within myself... You come every week and put all this information into my mind and the mind will say, don't just keep thinking about it, just do it. So I pushed myself to go for it, just to satisfy my mind.

Hana had an optimistic tone of voice while explaining her experience with the imagery intervention. This showed that she had an open mind and attitude towards learning new ways of lifestyle management. Hana admitted that there was no immediate effect with the intervention; however, she mentioned that she developed a feeling of guilt because she was unable to adhere to the intervention programme. This feeling became the turning point in her life such that she motivated herself to be involved in walking. With the increased walking frequency, Hana began to notice a physical and emotional change within herself. She confirmed that my guidance in reading the imagery script had an

impact on her. For Hana, the feelings of positivity and enjoyment were triggers that enabled her to initiate her exercise.

> My walking started because of imagery. Ever since you started to come regularly and guide me through it, they were like inputs into my mind on how to get started with walking in my layout. Especially, when you were talking about seeing the environment and then you feel happy, refreshed and so on gave me a good feel, like I was getting prepared... Though, I did not start walking immediately, your mind tells you not to cheat yourself. I started, to satisfy myself so that I do not feel guilty. Then I found it to be fun... I felt happy, good and fresh...I could manage everything in much better manner than before.

Hana had a positive tone of voice when she narrated her experience with imagery. The elements described in the script reflected the PETTLEP which majorly influenced her to initiate her PA. Another reason inferred from her narrative was my presence which guided her through the HPI intervention. The openness to learn and the willingness to try new methods showed that Hana was an optimistic woman. Having completed the intervention programme, Hana affirmed that she continued walking. After experiences changes, Hana willingly set new goals to achieve. Goals were related to the frequency, duration, and the speed of her walk based on what she could achieve. This statement exemplifies Hana's approach to walking as a regular PA:

> I started to feel changes in myself. My glucose and my weight was under control. I felt happy and fresh all day. I did not feel lethargic as before and I am able to sleep well the whole night... I first started with ten minutes and then as and when I got comfortable, I myself increased the speed and the number of rounds. Now I go for 45 minutes of walking. I even go on top of the hill to see the landscape and I feel really good about all this. It's a routine for me now.

Hana had an excited tone of voice when she talked about walking and her experience of leading an active lifestyle. From her statement, I inferred that Hana has a positive image of herself that had developed due to her continued involvement in walking. She also had a confident tone of voice when she described setting realistic goals to achieve with walking. This showed that Hana had a practical approach to life and made realistic decisions that enabled her to adhere to walking to live a healthy lifestyle.

In conclusion, Hana's narrative describes her lifestyle before and after being diagnosed with breast cancer and T2DM. Hana was found to prioritise her responsibilities and commitments while compromising on her health. This casual attitude towards PA underwent a change with the help of the HPI intervention. Hana was found to gradually develop an interest in walking every morning as a result of the positive outcomes she experienced with walking. These benefits conditioned Hana to internalise the activity such that it became a part of her daily routine. This shows the development of HP towards Hana's preferred PA.

6.4 Discussion

In the current study, I aimed to explore the subjective experiences embedded within the narratives of the individuals with T2DM who have shown an improvement in HP and PA with 12 weeks HPI intervention programme. Primarily, I was interested to explore what types of activities the individuals were involved in before and after the onset of T2DM as well as the effect of imagery intervention in managing lifestyle. The results of the study revealed two major themes: a) Physical activity involvement: Lifestyle before and after the onset of T2DM, b) Passion Imagery: A pathway to HP development. The former theme chronologically documents the five participants' involvement in PA before and after the onset of T2DM. The latter highlights the participants' experiences with the imagery intervention and how it enabled them to subsequently increase their HP and

chosen PA. These two themes will be discussed in relation to Crossley's (2007) narrative analysis and the DMP proposed by Vallerand et al. (2003).

6.4.1 Physical Activity Involvement: Lifestyle Before and After the Onset of T2DM

Out of five participants, three participants (Diana, Brian, and Rose) were involved in PA before they were diagnosed with T2DM. Two participants (Hana and Neil) prioritised their activities significantly such that other aspects of their lives were given more importance than their health. Diana and Brian's onset of T2DM occurred due to medication side effects whereas Rose, Neil and Hana's onset of T2DM was due to their family history. From these five participants, Diana, Brian, Neil, and Rose participated in irregular PA after being diagnosed with T2DM. Only Hana remained sedentary even after the onset of T2DM.

Based on the DMP (Vallerand et al., 2003) I inferred that Diana, Brian, Neil, and Rose had a HP towards their chosen PA (e.g., walking, yoga, cycling) because it was an autonomous decision to be involved in PA to maintain a healthy lifestyle. They felt no conflicts within themselves because their decisions originated from an intrinsic and integrative motivational force. These results are indicators of HP toward the participants' preferred PA. The findings are in line with previous research (e.g., Rousseau & Vallerand, 2008; Roy et al., 2014; Seligman & Csikszentmihalyi, 2000; Vallerand et al., 2003; Vallerand & Miquelon, 2007, Vallerand, Rousseau, et al., 2006; Vallerand, 2008, 2010, 2015). Diana, Brian, Neil, and Rose were involved in their chosen PA intermittently because they did not manage their time well. All four mentioned that they compromised their PA because of work and/or family responsibilities. This resulted in a subsequent drop in their HP and PA. Family and work commitments were also found to be other factors that caused a decline in individuals HP and PA (Roy et al. 2014, 2013). Perhaps, Diana, Brian, Neil, and Rose only developed an interest or a motivation for their respective PA. However, it failed to internalise into their identity because they did not

realise or recollect the feelings of enjoyment and positive experience associated with their chosen PA. This explanation supports Vallerand and Miquelon's (2007) proposition that the activity develops into a passion for the individual only if it is enjoyed and internalised into the person's identity.

Hana was the only participant who was sedentary before and after the onset of T2DM. Her glucose was not under control and she never exercised despite her physician's advice. It was only after her cancer treatment that Hana started walking in the early morning. However, due to her work and family commitments, she stopped her PA. Roy et al. (2014, 2013) also found that family and career responsibilities resulted in low PA participation. From the DMP (Vallerand et al., 2003), I inferred that Hana probably developed little HP for walking after her cancer treatment. However, due to lack of internalisation of the activity into her identity, there was no transition that took place from interest development to motivation to passion development (Roy et al., 2014, 2013). This finding supports Vallerand and Miquelon's (2007) notion that interest and passion, likewise, motivation and passion are not the same.

6.4.2 Passion Imagery: A Pathway to Harmonious Passion Development

This theme reflects the participants' experience in relation to the HPI imagery intervention. It is apparent from the results that all five participants showed an improvement in their HP and PA with the help of the imagery intervention. Although they were all unaware of the use of imagery as a technique and the positive benefits associated with it, they agreed that the imagery script that was tailored to their PA had a direct effect in bringing about a change in their PA behaviour. The elements in the script that included positivity and particularly the enjoyment component were embedded within the PETTLEP model that became core inputs that influenced of each individual towards their PA. These results are in line with previous research which reported that an imagery script helps to maximise performance and effectiveness (David, 2013; Stanley & Cumming,

2003, 2010; Wilson et al., 2010). In particularly, the use of PETTLEP is found to enhance performance was also reported in the previous studies by Quinton et al. 2014, Wakefield & Smith, 2009, 2012, and Wright & Smith 2007. Apart from this, all participants emphasised that the manner in which I guided them through their script enabled them to initiate their exercise and be continually involved in the activity even after the end of the follow-up period. From the DMP (Vallerand et al., 2003), it can be noted that the initial information I provided to participants, guided each participant to remain optimistic in trying a new approach to increase PA. My presence twice a week for six weeks helped them to choose a PA in which they could see themselves be continually involved. This type of mentor support had a significant role in channelling the participants to exercise for a healthy lifestyle. Recently, Roy et al. (2014) proposed that the initial information provided can contribute in making any activity highly valued and incorporated into a person's identity, thereby developing HP. Likewise, mentor support in promoting exercise participation has been reported in earlier studies (e.g., Doyle,1999; Duncan, 1993; Duncan et al., 1993; Pender et al., 1994; Zakarian et al., 1994). Evidence that imagery intervention programmes lasting for six weeks helped in sports performance and exercise adherence was reported in previous studies (Kim et al., 2011; Koehn et al., 2014; Nicholls, Polman, & Holt, 2005; Thøgersen-Ntoumani et al., 2012; Roy et al., 2014; Stanley & Cumming, 2010; Wright & Smith, 2007).

In all five narratives, I identified that each individual's optimistic attitude, determination, and eagerness to learn a new skill, instilled an initial interest that was a pathway to HP development for a chosen PA. Imagery helped Hana, who was initially sedentary, to select an activity, value the activity and internalise it (Vallarand & Miquelon, 2007). Once this process was established, she developed HP for her PA. From her narrative, I inferred that the positive input included in the imagery script enabled her to start exercising. These explanations are in line with research by Vallerand et al. (2003),

Vallerand and Miquelon (2007), and Vallerand (2008, 2010, 2015). A common factor reported in the five narratives was the introduction of positive emotions and enjoyment for their respective PA. Recalling these positive emotions, especially, enjoyment, paved the way for Diana, Brian, Neil, Rose, and Hana to continue involvement in their PA even after the intervention ended. The autonomous decision taken by each individual, the flexibility, personal decision to engage or disengage in the activity, the affective outcomes experienced physically, psychologically, and emotionally are strong indicators that Diana, Brian, Neil, Rose, and Hana developed HP towards their preferred PA. These results support previous research by Roy et al., (2014), Rousseau and Vallerand (2003, 2008), Vallerand et al. (2003), Vallerand, (2008, 2010, 2015).

6.5 Conclusion

The findings of this study reflected the subjective experience of five participants who showed an improvement in HP and PA with HPI at follow-up. The narratives highlighted the kind of lifestyle lived before and after the onset of T2DM and how HPI intervention facilitated in the increase of HP for the individuals preferred PA. It is apparent from the narratives that the HPI script which included components of enjoyment and positive emotions facilitated in the increase of HP and PA across the 12 weeks intervention programme. Also, the initial guidance (mentor support) I provided was highlighted as a factor in initiating each participant's PA. The autonomous decision taken by the participants in continuing their respective PA led to affective outcomes and development of HP. Recalling the affective outcomes experienced through their participation in the chosen PA brought about positive changes in each participant's lifestyle which is in line with the DMP.

CHAPTER 7

GENERAL DISCUSSION

7.1 Introduction

The general purpose of this thesis was to examine the effect of an imagery intervention designed to enhance harmonious passion for preferred PA on HP, OP, and PA in individuals with T2DM. In this thesis, I employed propositions from the DMP (Vallerand et al., 2003) as a theoretical base. Although the DMP has not been used to implement interventions, to my knowledge, the inclusion of the DMP through imagery intervention facilitated performance. In this final chapter, I first summarise the conclusions from all four studies in relation to theory and existing research. Then, based on the findings from the four studies, I present directions for future research. Next, I describe a number of implications of the research based on what I found in the four studies. Finally, I provide concluding remarks about the research reported in this thesis.

7.2 General Conclusions

The major finding of this thesis was that an imagery intervention designed to enhance HP was an effective, non-invasive technique to optimise HP and PA in individuals with T2DM. The findings of this thesis support the DMP (Vallerand et al., 2003), which proposes that HP is related to positive and adaptive outcomes, especially pleasure and enjoyment, whereas OP is related to maladaptive outcomes. The results also suggest that guided imagery using the PETTLEP model promoted PA. The research in this thesis comprised of four studies. Firstly, I developed a questionnaire to determine the types of imagery people with T2DM used in PA (Study 1). This questionnaire, the PAIQ, focused on cognitive and motivational imagery functions. I then examined the relationship between types of imagery used in PA and types of passion (Study 2) by correlating the PAIQ subscales with the HP and OP subscales of the PS among people with T2DM. I incorporated the findings from Study 2 into an intervention involving

imagery of HP to increase passion for PA (Study 3), as well as examining how this was associated with amount of PA participation. I followed this by examining the subjective experience of those individuals who were influenced by the HP imagery intervention (Study 4). I discuss the relationship between conclusions drawn from each study and relevant theory and research. The results supported Vallerand et al. (2003) DMP, although several findings were unexpected and require additional research to investigate them further.

7.2.1 Development of Physical Activity Imagery Questionnaire

In Study 1, I aimed to develop a questionnaire that determined the type of imagery used in PA. I modified items in the SIQ (Hall et al., 1998; Paivio, 1985) to refer to the PA setting and named the resulting questionnaire PAIQ. The scale underwent standard procedures to establish reliability and validity after minor modifications to the items were incorporated. Statistical analysis followed three phases. In the first two phases, I found that the questionnaire showed good reliability and internal consistency values; however, CFA revealed the fit of the model to the data was not adequate during Phase 1 (30 items and 5-fator model) and Phase 2 (i.e., 30 items and 2-fator model) of the validation process. As a result, I collapsed the subscales from five subscales to form two major subscales namely: *cognitive use and motivation use*. In the third phase, I found that internal consistency reliability values were within acceptable levels. Validation procedures using CFA established an adequate model fit. Collapsing of the subscales was primarily based on Hall's (1998) argument on Paivio's (1985) theoretical framework that imagery should have both cognitive and motivational use. The final questionnaire that resulted after factor reduction comprised of 15 items with two subscales. This included five items measuring cognitive imagery use for PA and 10 items related to motivational imagery for PA.

I decided to develop a measure of imagery functions or imagery use based on the SIQ because previous research has demonstrated that the SIQ is a useful tool for

developing imagery scripts to suit specific contexts. Given the similarity between sport and non-competitive PA, I was surprised that the PAIQ required such substantial change from the items and subscales of the SIQ. The removal of 15 of the 30 SIQ items in their modified form from the initial version of the PAIQ and the corresponding removal of the distinction between specific and general aspects of cognitive and motivational imagery functions reflects considerable variation from the SIQ format and content. Nonetheless, the PAIQ appears to be a meaningful measure that can be used in association with measures of psychological variables to identify key themes to include in imagery scripts, in the way it was used in Study 2 here to produce content for the HP imagery intervention. The PAIQ should be used with caution in further study of imagery functions associated with passion to examine whether it does help to target appropriate imagery content for enhancing HP in a variety of contexts.

To summarise, development of the PAIQ was important because it permitted further research to be undertaken to identify the type of imagery used to imagine PA in specific populations and contexts. The results of Study 1 showed that unlike SIQ, which targeted the type of cognitive and motivational use of imagery at a specific and general level, PAIQ focused on overall cognitive and motivational imagery use in PA. This conclusion was made based on Hall's (1998) argument, which emphasised that if cognitive and motivational use of imagery are implemented together, the effect of the imagery intervention is likely to be beneficial. Determining types of imagery use for the context of non-competitive PA was important for examination of the relationship between imagery use and types of passion, which was the focus of Study 2.

7.2.2 Relationship between the Physical Activity Imagery Questionnaire and the Passion Scale

In Study 2, I aimed to investigate the relationship between types of imagery use (i.e., cognitive imagery use and motivational imagery use) and types of passion (i.e., HP

and OP) in individuals with T2DM. Furthermore, I intended to determine which types of imagery use contributed to passion. I found a positive relationship of both cognitive and motivational imagery use with HP. Although, the correlation values were lower, I also found a positive relationship between types of imagery use and OP. The results provided evidence that there is potential for imagery interventions, using cognitive and motivational imagery, to increase passion for PA in individuals with T2DM. Cognitive imagery use involves imagining skills, strategies, and emotions appropriate for executing a task. Motivational imagery represents images associated with achieving a specific goal that is influenced by the anticipated outcome expectancy of performing the task. It has been documented that imagery interventions can help to control negative psychological indices and improve positive psychological indices (e.g., Martin & Hall, 1995; Monsma et al., 2009; Mousavi & Meshkini, 2011; Ramsey et al., 2009; Williams, 2011). Hence, the results of Study 2 were important in determining how types of imagery use could contribute to enhance HP for PA, thus, providing information about how an imagery intervention designed to enhance HP could be developed in Study 3.

The technique of relating aspects of imagery function or use to psychological variables to enable imagery scripts to be devised that target key imagery functions as they relate to those psychological variables is a recent development that has been applied successfully to the development of imagery scripts in sport, with a focus on flow state (Koehn et al., 2014). I have not identified any applications of this approach in PA, but the present study in which the cognitive and motivational imagery functions measured by the PAIQ were correlated with the two types of passion, harmonious and obsessive, assessed in the PS. The identification of correlations between aspects of passion, especially HP, and elements of cognitive and motivational imagery seems to be a fruitful approach to examine further in other studies of imagery related to passion and PA.

7.2.3 Imagery Intervention to Develop Harmonious Passion for Physical Activity

In Study 3, I aimed to examine the effect of the HPI intervention compared to a GPAI intervention on passion for PA in individuals diagnosed with T2DM. In the DMP, Vallerand et al. (2003) proposed that HP is associated with positive outcomes, whereas OP is associated with negative outcomes. In particular, in the DMP, Vallerand et al. identified the key role of enjoyment of an activity as a foundation for HP. Results of Study 2 demonstrated that cognitive use and motivational imagery use were positively correlated with HP, which suggested that they could facilitate the development of passion for PA by linking them with enjoyment of each individual's chosen PA. Using these results, I designed the intervention to amplify the effect of imagery on HP for PA with a special focus on enjoyment in individuals with T2DM. The intervention was carried out for 12 weeks in total. For the first six weeks, the imagery was presented in individual, face-to-face sessions, after which I instructed participants to continue using the imagery for the following six weeks in a self-managed format. This helped to determine if a non-invasive cognitive behaviour technique could optimise passion for PA, so that it would help in managing T2DM.

As expected the face-to-face sessions during the first six weeks promoted the practice of imagery that was directed towards the increase in HP in individuals with T2DM in the HPI intervention condition and this was associated with increased participation in PA, whereas there was little impact on HP or PA in the GPAI intervention condition. The manner in which the HP script was designed enabled individuals to execute their imagined PA. In the intervention study of this thesis, I examined the effect of imagery on passion for PA for the first time in the literature, to my knowledge, it is currently not possible to make direct comparison to the existing literature. Further studies are warranted that aim to replicate the effects found in the intervention study of this thesis and identify what aspects of imagery interventions play a key role in enhancing HP and

PA. PA is essential for every individual to maintain a healthy lifestyle and it is particularly important for managing T2DM (Biddle & Mutrie, 2008).

In this study, I found that the HPI script, including elements of PETTLEP and statements based on cognitive and motivational aspects of imagery use, had an impact on PA because the HPI scripts were individualised for each participant to relate to that participant's PA (Munroe-Chandler and Morris, 2011; Nordin & Cumming, 2005). Based on the results of previous studies (e.g., Cumming, Hall, & Shambrook, 2004; Cumming & Ramsey, 2009; Koehn et al., 2014), I administered the imagery intervention for 12 weeks. The first six weeks was conducted face-to-face after which it was self-managed for the following six weeks. The 12-week intervention facilitated an increase in HP and PA. This contributed towards continued involvement in the PA based on individuals' perception of increasing satisfaction and enjoyment (Vallerand, 2015). An addiction towards the activity was avoided due to prolonged exposure to the activity. These findings lend support to the DMP (Vallerand, 2010, 2015; Vallerand et al., 2003).

This study examined the central proposition of the present thesis, namely that an imagery intervention could be devised specifically to enhance HP on the basis of the relationship between imagery functions and HP and that such an intervention would also increase PA participation. The results supported both these claims. They suggest that imagery interventions can be designed specifically to enhance HP and promote increased participation in PA. There appears to be great potential in using strategies like imagery to enhance HP. This suggestion should be examined more widely with passion for other behaviours, such as sport, dance, and music performance, as well as in various educational contexts to test whether the approach is universal or domain specific.

7.2.4 Subjective Experiences of Participants in the HPI Condition

In addition to monitoring the effects of the intervention with self-report scales, I explored the subjective experiences of participants in the HPI condition to determine how

they perceived imagery helped them to participate in more PA. This information was helpful in identifying underlying factors that facilitated the development of HP to refine and target imagery interventions in future research and practice. The narratives of five participants emphasised that inclusion of enjoyment and positive emotions in the HPI script helped them to imagine these emotions. In turn, imagining the emotions made them feel eager to continue with their PA. Participants reported that positive affective outcomes, experienced physically, psychologically, and emotionally during imagery, encouraged them to continue doing their chosen PA. I suggest that the autonomous decision-making skills, flexibility of choice, and experiences of positive emotions, including enjoyment of their PA are indications of developing HP for that preferred PA. Similar results were also reported in a recent case study by Roy et al. (2014), who examined the development of HP for preferred PA in a case study with an older female diagnosed with T2DM. Importantly, the present results, which are powerful because they come from the participants' own words, also provide support for the DMP (Vallerand, 2010, 2015; Vallerand et al., 2003). The DMP suggests that HP is associated with positive affective outcomes because individuals control the activity, whereas OP is related to negative outcomes because the activity controls the individuals who do it, as it becomes an obsession. The subjective experiences described by the five purposively selected participants in the qualitative study support and add richness to the statistical findings reported in Study 3.

At this time, the case study by Roy et al. (2014) and the present narrative study reflect a research approach to understanding passion and PA that I have not observed elsewhere in the literature. As a stand-alone approach to understanding the role of harmonious and obsessive passion in the context of PA, in-depth exploration of the experiences of individuals has great potential. In addition to providing insights, such exploration will raise issues that can lead to new research directions, which can be

followed up using quantitative methods. Further, in-depth study of individuals' experiences of passion associated with PA can be particularly valuable when used in mixed methods research on passion and PA alongside quantitative methods. This is especially valuable in intervention research, in which, over weeks or months of intervention, participants can have a wide variety of experiences that are not monitored by specific tests, such as the PS, which measures passion and the IPAQ, which monitors amount and intensity of participation in PA. Results of studies in the present thesis, particularly the intervention study and the narrative analysis of experiences of participants in the HPI intervention suggest that there is great potential for techniques like imagery to change both HP and OP, but there remains a great deal to be understood about how to most effectively and efficiently make such changes. Importantly, the present research indicates that HP and OP could be key psychological constructs in promoting long-term participation in PA, which is important for the maintenance of health and well-being, as well as for the treatment of major physical and psychological conditions.

7.3 Future Research Directions

Currently, research on passion for PA is in its infancy, whereas intervention research using techniques like imagery to enhance HP has barely commenced. The present intervention study provides encouragement and support for further research to empirically establish the importance of imagery interventions for developing HP for PA among individuals with T2DM. Prospective studies should be undertaken to establish the proposition that imagery interventions designed to promote highly positive emotions, particularly enjoyment, pleasure, and satisfaction with individuals' chosen PA, help in the enhancement of HP for PA and participation in PA.

One aspect of the development of research and practice of imagery interventions to develop HP is the need to guide the content of imagery scripts that are constructed to enhance HP. Use of measures, such as the PAIQ, to clarify the links between imagery use

and passion in various contexts should be informative. I suggest further research with diverse samples to more firmly establish the psychometric properties of PAIQ for wide-ranging use. The PAIQ scale was developed and validated for the research in the present thesis and its application here suggests that it has potential for the study of imagery use in non-competitive PA. Tests like convergent, divergent, and criterion-related validity with large samples should be conducted to establish the reliability and validity of PAIQ for use in research and in the applied field.

To my knowledge, Study 3, the intervention study in this thesis, is the first study to identify whether a targeted imagery intervention has the capacity to increase HP for a PA. Participation in Study 3 was voluntary, which meant that each participant was at a different level of passion and PA. However, I did establish inclusion criteria to ensure that participants had low levels of HP for PA. In future research, I suggest participants should be selected even more carefully to ensure they have low levels of passion for their chosen PA. This should help to identify whether imagery can indeed facilitate the development of HP. I also suggest increasing the duration of imagery interventions to determine the effect they have on passion for PA. Additional investigations are also warranted that identify changes in the level of HP, OP, and PA at different levels of PA (sedentary/inactive, low active, moderate active, high active). Study 3 had a small sample size due to dropouts. Prospective research should aim to involve larger samples, which might produce even stronger results. In addition, I recommend the inclusion of a control condition in future intervention studies to provide a comparison for active imagery interventions. In the intervention study in the present thesis, I adopted the approach of comparing the HPI condition with a GPAI condition, which was intended to control for the effects of attention, while not including any content that was expected to enhance HP according to the DMP (Vallerand et al., 2003). A control condition in which testing of HP, OP, and PA are conducted on the same schedule as in the active conditions, but there

is no imagery training, would provide a baseline free from the influences of an imagery program like the GPAI condition in the intervention study in this thesis. It should be noted that proposing the need for larger samples to support more refined statistical testing and at the same time recommending the addition of a control condition would place great demands on recruitment in the context of T2DM, as experienced in the present study. Sedentary/low active individuals with T2DM represent a population that is generally reluctant to volunteer for long-term PA studies. Future studies should also include measures of health, such as glucose checks and weight management monitoring, as physical evidence for improvements in the management of T2DM among participants who complete imagery programmes designed to enhance HP for PA and participation in PA.

A critical issue in the study of the application of imagery to enhance HP for PA and to increase PA participation is examination of the causal relationships between these three variables. As shown in the intervention study in this thesis, using statistics from the ANOVA family can identify significant changes in HP and in PA, but these analyses do not address causal relationships among the three variables. It is possible that increases in HP mediate the effects of imagery on PA, but it is also plausible that imagery has an independent effect on PA. Testing alternative models using SEM is an important future direction for research aimed to understand the relationships between imagery, HP for PA and PA participation. Again, conducting this kind of research faces the challenge of recruiting large samples of low-active individuals with T2DM.

The focus of the studies in the present thesis was on people with T2DM, a condition in which PA is a critical aspect of treatment, but where research has shown that participation in PA is typically low, despite strong recommendations from medical and allied health professionals for individuals with T2DM to do more PA. Because of the importance of PA participation in people with conditions like T2DM, coronary heart

disease, and obesity, it is possible that individuals with these conditions are more amenable to interventions like the HPI condition in this thesis, especially if they are delivered in an individual manner that shows participants special attention. To determine whether the proposition that programmes involving imagery of positive affective states, such as satisfaction, pleasure, and enjoyment, associated with imagining performing individuals' chosen PA is universal, it is important to conduct studies of similar design to the intervention study in the present thesis with individuals from the general, healthy population.

I conducted the final study in this thesis using narrative analysis of the five participants who were interviewed. This approach focuses on the richness of the unique experience of each case. Future research could interview a large enough number of participants to achieve theoretical saturation, then use content analysis to identify raw data themes, higher-order themes, and general dimensions to produce models of the experience of imagery programmes associated with HP for PA and PA participation. Focus-group interviews would also offer a means to add greater breadth to the sample, while retaining richness of participants' experiences. Such information could help researchers to develop new strategies to use imagery to enhance passion in ways that bring about positive health behaviour modifications.

7.4 Implications for Practice

The findings observed in this thesis could prove useful for practitioners working with individuals in a clinical population. The DMP is relevant to designing interventions that aim to promote long-term PA adherence to maintain a healthy lifestyle. The main intention should focus on optimising HP to experience positive affective outcomes associated with PA, such as enjoyment, pleasure, and satisfaction.

The SIQ is an ideal tool established by Hall et al. (1998) to test the types of imagery used in a sport setting. Because this questionnaire is not ideal to understand the

types of imagery use in PA, I modified certain items in the SIQ to suit the PA setting. The new questionnaire that I developed after factor reduction is called PAIQ, which helped to identify the two broad types of imagery used in PA, namely cognitive imagery and motivational imagery. The final 15-item PAIQ is a relatively short measure that practitioners can use to examine imagery use in a range of PA-related contexts.

The findings of Study 2 are important for psychologists working in the applied field, whose aim is to enhance HP for PA. To date, I could find no studies in the literature that assessed the association between types of imagery use and types of passion, as a basis for designing the content of imagery scripts to enhance HP. The results of Study 2 showed a moderate, positive correlation between both cognitive and motivational types of imagery use and the HP and OP types of passion. This showed that cognitive and motivational imagery both have roles to play in the development of HP and OP for PA. The relationships observed were stronger for HP than for OP. Given that a central proposition of the DMP is that high levels of HP for behaviours are likely to promote those behaviours most, this suggests that practitioners should find the inclusion of appropriate cognitive and motivational imagery in imagery scripts to be effective for enhancing HP and promoting PA, particularly in the context of chronic illness, including T2DM.

Using the results obtained for HP in Study 2, I designed imagery scripts that were individualised, carefully drafted, and administered with each individual in the HPI condition in Study 3. All participants in the GPAI condition had the same content in their scripts, but the intervention was also presented individually to control for attention. The HPI intervention guided each individual in developing a pathway to optimise HP for their preferred PA. This means that by practising the HP imagery script, individuals were able to create strong positive emotions experienced during imagery of participation in their PA that would help them to increase the amount of time they actually participated in their

chosen activity and the degree of enjoyment they experienced when actually performing that PA. The research in this thesis provides evidence that imagery is a non-invasive technique that helped individuals with T2DM to initiate their preferred PA and persist in the activity. Thus, practitioners should note that exercise behaviour can be influenced by experiencing images of performing PA that trigger positive emotions, including enjoyment, pleasure, and satisfaction. The present research supported the DMP proposed by Vallerand et al. (2003), suggesting that there is potential for this model to be employed in the context of PA promotion by enhancing HP. Furthermore, this research also provides support to a previous study that indicated that mentor support facilitated passion development, and enabled and encouraged individuals to persist in their desired PA (Roy et al., 2014; Vallerand, 2008). The impact of HP and PA effects during the period when imagery was presented face-to-face and one-to-one was particularly strong. This certainly has implications for psychologists presenting imagery programsmes, suggesting that especially in the early stages of such programmes, a proportion of such individual face-to-face delivery is likely to be beneficial. Conversely, for HP, the evidence suggested that the self-managed period of the imagery intervention was not as effective as the 6-week face-to-face period. This also has implications for practice. Long-term individually delivered interventions are highly demanding in terms of expert human resources, in this case psychologists' time. The use of self-managed intervention sessions can substantially reduce these demands, but it must be effective. It is not clear whether the limitations of self-managed sessions relate mainly to the motivation to perform the imagery regularly or to specific aspects of the individual face-to-face delivery that enhance the impact of those imagery sessions. It is also possible that during an initial period of individual delivery, participants learn to be dependent on the practitioner making them less ready for self-managed delivery than individuals who start with self-managed sessions. Further research is needed to clarify these issues. In the meantime, the present results appear to

indicate that practitioners who choose to use a combination of face-to-face delivery to individuals or groups and self-managed delivery, or all self-managed delivery, should include strategies to ensure that individuals perform the imagery as prescribed, such as the use of diaries and regular telephone checks on progress.

Using narrative analysis, I found that participants' reports supported the quantitative evidence that guided imagery facilitated HP for PA. According to participants, the creative method in which the scripts were designed for individuals in the HPI condition, incorporating passion components in the scripts and appropriate guidance given to each participant also helped the individuals in the HPI condition to substantially increase their chosen PA. The positive comments made by the five participants from the HPI condition who I interviewed also add more credibility to what was recently reported by Roy et al. (2014) and Thogersen-Ntoumani et al. (2012). Through this study, I inferred that individualised imagery scripts enabled autonomous internalisation (Vallerand, 2015) of activity leading to increased HP for PA. This is because the individuals chose their respective PA. Particularly, the employment of enjoyment elements in the HPI condition that was initially delivered using face-to-face sessions, instilled an interest for PA. This interest was sustained in individuals in the HPI condition even when imagery was self-managed. This increased HP and further helped participants in the HPI condition to continue to increase their PA during the self-managed sessions of the intervention. These results show support for the proposition that imagining a positive emotion, such as enjoyment, is related to affective and cognitive investment in an activity (Roberts & Treasure, 2012) and can lead to the activity becoming a passion.

7.5 Concluding Remarks

In this thesis, I present a new direction for the enhancement of HP for PA and increase in PA participation. With little research done in passion in sport and exercise psychology, I used imagery as a tool to develop passion for PA. I examined how imagery

can affect HP and OP for preferred PA among individuals with T2DM. This thesis, which includes four studies, provides valuable insights into how guided imagery interventions can be used as a tool to develop passion for preferred PA for experiencing long-term benefits in terms of PA participation. A noteworthy finding from this research was the effect of mentor support that helped to bring about affective changes among individuals with T2DM through the content of the HPI intervention related to HP. This shows that expertise in psychological skills training may be important in the encouragement of people within clinical populations to participate in PA to experience positive affective outcomes, which can further enhance HP. This thesis lays a foundation for understanding about one psychological skill, imagery, and its effect on passion. I hope that this original research will stimulate other researchers to conduct intervention-based research on passion and PA, especially applying imagery in interventions, to provide more understanding about enhancing HP using imagery, as well as with other psychological skills, including goal setting, increased motivation and commitment, arousal regulation, attention and concentration, and self-talk, that could help in the development of passion for PA among clinical and general populations.

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