THE EFFECT OF USING VIRTUAL REALITY HEADSET DURING IMAGERY ON NETBALL PLAYERS' IMAGERY ABILITY, MOOD, PHYSIOLOGICAL PARAMETER AND SHOOTING PERFORMANCE

By

SITI NUR SYAFIQAH BT ROSLI

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ABSTRAK

Imageri merupakan salah satu latihan kemahiran psikologi (PST) yang menggunakan kedua-dua minda dan badan di mana ia melibatkan proses mencipta atau mencipta semula pengalaman seseorang dengan meggunakan semua deria yang ada pada manusia. Sementara itu, sejak beberapa tahun yang lalu, ramai saintis sukan telah menghasilkan sistem baru yang mengunakan teknologi untuk meningkatkan prestasi para atlit. Salah satu daripada teknologi yang digunakan adalah alat dengar realiti maya (VR). Namun, hanya beberapa kajian yang dapat ditemui dalam menggabungkan alat dengar VR dengan imageri, maka kajian ini diilakukan untuk mengkaji keberkesanan menggunakan alat pendengaran VR semasa imageri kepada pemain bola jaring pada keupayaan mengimej, mood, parameter fisiologi dan penilaian prestasi menjaringkan bola 9 pemain bola jaring dari SMK Putera, Kelantan telah terlibat dalam kajian ini. Umur mereka diantara 13 hingga 15 tahun (mean±SD = 13.44±.882). Mereka diletakkkan dalam dua keadaan kajian: kumpulan kawalan iaitu kumpulan tiada VR (NVR) dan kumpulan intervensi iaitu kumpulan VR (VR) menggunakan reka bentuk menyeberang. Peserta yang sama mengambil bahagian dalam kedua-dua keadaan kajian dengan 2 minggu rehat diantaranya . Mereka melalui 10 sesi latihan imageri. Untuk mengukur keupayaan imageri, Keupayaan Langkah Sukan Imageri (SIAM) telah digunakan. Skala Mood Brunel (BRUMS), digunakan untuk mengukur keadaan mood peserta, termasuk kemarahan,

keliruan, kemurungan, keletihan, ketegangan dan semangat. Parameter fisiologi yang diukur adalah ketepuan oksigen (SpO2) dan kadar degupan jantung (HR) dimana oximetri nadi digunakan. Hasil kajian menunjukkan kedua-dua kumpulan mempunyai kebolehan imageri yang sama apabila diukur menggunakan SIAM. Hasil kajian yang sama diperhatikan dalam BRUMS dimana imageri menggunakan alat dengar VR dilihat tidak memberi kesan kepada mood peserta. Repeated measured ANOVA untuk keupayaan menjaringkan bola menunjukkan ada peningkatan dalam skor menjaringkan bola berlaku dalam kedua-dua kumpulan. Kesimpulannya, terdapat peningkatan dalam prestasi mejaringkan bola jaring dalam kedua-dua kumpulan.

THE EFFECT OF USING VIRTUAL REALITY HEADSET DURING IMAGERY ON NETBALL PLAYERS' IMAGERY ABILITY, MOOD, PHYSIOLOGICAL PARAMETER AND SHOOTING PERFORMANCE

ABSTRACT

Imagery one of psychological training skill (PST) that use both mind and body where it involves the process of create or re-creating an experience in the mind by using all the human senses. Meanwhile, recently, many sport scientists have developed a new system that uses technology in order to improve athletes' performance. One of the technology uses is the virtual reality (VR) headset. However, there is only limited research can be found in combining VR with imagery, thus, this study was carried out to investigate the effect of using virtual reality headset during imagery on netball players' imagery ability, mood, physiological parameters and netball shooting performance. 9 netball players from SMK Putera, Kelantan, completed the study. Their age ranged between 13 to 15 years old (mean±SD = 13.44±.882). They were grouped into two research conditions: control group namely no VR group (NVR) and intervention group namely VR group (VR) using a cross-over study design. The same participants participated in both research conditions with two-week resting in between. They underwent 10 sessions of imagery training. To measure imagery ability, Sport Imagery Ability Measurement (SIAM) was employed. Brunel Mood Scale (BRUMS) was used to measure the mood states of the participants, including anger, confusion, depression, fatigue, tension and vigour. Physiological parameters measured are oxygen saturation (SpO2) and heart rate (HR) where pulse oximetry was employed. To measure the shooting performance of the participants, pre-test and post-test of netball shooting was carried out. The result showed that both groups have a similar imagery ability measure by SIAM. A similar result also observed in

BRUMS where imagery using VR headset seemed does not influence participants' mood. Repeated measure ANOVA for shooting performance showed an increase in shooting score occurred in both groups. As a conclusion, there were improvements in the shooting performance of the netball players in both groups.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Netball is the common sport widely played by almost all of the female as early as in the school (Taylor, 2001). It is played by two teams in which each team need to have seven players with different positions for each person. The seven positions are: Goal Attack (GA), Goal Shooter (GS), Wing Attack (WA), Wing Defence (WD), Goal Defence (GD), Goal Keeper (GK), and Centre (C) (Netball Australia, 2007). This game demands the players to have a rapid acceleration to break free from the opponent and also for the sudden change of direction while facing the opponents (Henderson, Hume, & Bradshaw, 2006).

For this game, the winner of the match is determined by the teams who score more goals than the other team. The when Goal Shooter (GS) or Goal Attack (GA) makes a shot through the goal ring, the team's point is counted. Thus, it is important to have goal shooting skill in order to help in the final outcome in every match. For the most shooters, they may experience fatigue more than others as they need to perform running, jogging, jumping, passing, catching and dodging movement during the game. As a result, it may influence their shooting performance (Halim & Ismail, 2016). As suggested by Steele & Furze (1991), a specific imagery intervention should be provided in order to increase shooting accuracy and motivation among the shooters.

Virtual reality simulation integrates real-time computer graphics, sounds and other sensory input to create a computer-generated world, which the user can interact

and it is not presented on a computer screen but through a head-mounted display (HMD), either using a helmet or goggles that contain two small television screens along with stereo earphones. VR is also had been used as a tool to stimulate motor imagery where it had been developed in the past 10 years with the purpose of treating mental disorders (Gregg & Tarrier, 2007). According to Romano (2005), virtual reality simulation device allows the user to recreate an artificial environment that stimulates physical response similar to the real environment that individual can control, stimulate and tailor. A study by Stinson, Bowman, Gracanin, & Ollendick (2013), stressed that virtual reality could be used to simulate large crowds, specific environments and recreate key situations for athletes, which will be very effective for athletes' mental preparation strategies. Besides, Stinson et al. (2013) also stated that virtual reality could also use to support sport imagery by simulating key environments and scenarios in a virtual system, thus, athletes would not be limited by their sport imagery skills.

Imagery is defined as the process of re-creating or creates an experience in the mind by using all the senses given (Parnabas, Alam, Parnabas & Parnabas, 2015). According to Mousavi & Meshkini (2011), imagery is one of the powerful and important psychological tools in enhancing the sporting performance of the athletes. There are two types of imagery, which are internal and external imagery (Robinson, 2014). Internal imagery is where the athletes will visualise themselves doing the task internally; while, external imagery is when the athletes visualise themselves from a third-person's perspectives (Parnabas et al., 2015a). A study by Ranganathan, Siemionow, Liu, Sahgal, & Yue (2004) found that external imagery only produces a little physiological response compare to internal imagery. But, both imagery methods showed its effect on enhancing sporting performance.

Imagery ability brings the meaning of the ability of an individual to create images (Singnoy, Vongjaturapat, & Fonseca, 2015). According to Short, Tenute, & Feltz (2005), everyone is gifted with the ability to generate images, but some people can do it better than others. Meanwhile, Gregg, Hall, & Nederhof (2005) stated that imagery ability can be defined as the quality of an individual to imagine. Thus, the better the athlete can imagine their sport performance, the more effective it can aid in improving his or her sporting performance. In order to measure the imagery ability of the athletes, the most effective and affordable way that can be used is by using a questionnaire, which is the Movement Imagery Questionnaire-Revised (Hall & Martin, 1997) or Sport Imagery Ability Measure (Watt, Morris, & Andersen, 2004).

Physiological parameters during imagery include heart rate and oxygen saturation where it is measured using pulse oximetry where the reading of heart rate and oxygen consumption is taken. The device used is known as the pulse oximeter where it will measure the level of oxygen that is carried by blood, which is the oxygen saturation level (Fahy, Lareau, & Sockrider, 2011). Pulse oximeter mostly used in the clinical field to track potentially hypoxic patients in home rehabilitation, clinic, or hospital to determine the arterial blood gas measurement of the patient (International COPD Coalition, Wonca, Efa, & Ipcrg, 2010). Heart rate is described as contractions and the release of heart muscle and it is normally expressed as the frequency of heart rate where the heart rate varies depends on individual's body need of oxygen as well as temperature, fitness, and health (Ẑenko, Kos, & Kramberger, 2016). Besides, heart rate has demonstrated that it can be used to improve neurocognitive performance by enhancing focus, visual acuity, and readiness needed for optimal performance of an individual (Conder & Conder, 2014).

Many sport psychology research had focused on the moods of the athletes related to their sport performance. Mood plays an important role for both sport and exercise psychology, where most of the athletes who is not in a good mood seem to have poor performances during the training or competition (Terry, 2000). One of the popular lines of research has focused on discriminating between successful and less successful performers based on their mood states especially before a competition, they found that athletes who feel less anxious, angry, depressed, confused and fatigued will have a better performance than those who have the opposite profile (Prapavessis, 2000).

Imagery is a powerful technique for enhancing sports performance. However, more studies are needed to understand the mechanism of imagery to rips more benefits from the imagery training. One such method could be using the virtual reality as video modelling. Thus, this study aimed to investigate the effect of using virtual reality headset during imagery on netballers' shooting performance.

1.2 General Objectives

The main objective of this study is to investigate the effect of using virtual reality headset during imagery for enhancing netball players' imagery ability, mood, physiological parameters, and shooting performance.

1.2.1 Specific Objectives

1. To investigate the effect of using virtual reality headset during imagery on netball players' imagery ability.
2. To investigate the effect of using virtual reality headset during imagery on netball players' mood.

3. To investigate the effect of using virtual reality headset during imagery on netball players' physiological parameters.
4. To investigate the effect of using virtual reality headset during imagery on netball players' shooting performance.

1.3 Study Hypothesis

Ho1 : There is no significant effect of using virtual reality headset during imagery on netball players' imagery ability,

Ha1 : There is a significant effect of using virtual reality headset during imagery on netball players' imagery ability,

Ho2 : There is no significant effect of using virtual reality headset during imagery on netball players' mood,

Ha2 : There is a significant effect of using virtual reality headset during imagery on netball players' mood,

Ho3 : There is no significant effect of using virtual reality headset during imagery on netball players' physiological parameters,

Ha3 : There is a significant effect of using virtual reality headset during imagery on netball players' physiological parameters,

Ho4 : There is no significant effect of using virtual reality headset during imagery on netball players' shooting performance,

Ha4 : There is a significant effect of using virtual reality headset during imagery on netball players' shooting performance.

1.4 Significance of the study

Virtual reality (VR) is one of the advanced technologies that are well-known as a simulation or video modelling tool. Meanwhile, imagery had been widely used in the sporting field as an effective psychological skills training for enhancing the athletes' performance. However, until today, only a few researchers attempted to examine the effectiveness of combining VR and imagery to enhance athletes' performances. Besides, most athletes and coaches do not have much knowledge on using the right skill on VR and imagery to refer as guidance before they are going to sport performance and tournaments. This is perhaps because they do not have enough information on how to use video imagery along with other technologies such as VR to assist their athletes' shooting performances. In addition, it could also help to enhance athletes' imagery ability, physiological parameters and mood. Thus, this research is designed to discover and to understand how the imagery work, to give information to both athletes and coaches to understand the potential effects of using virtual reality video in enhancing imagery ability, physiological aspects, mood, and also the netball shooting performance.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the relationship between imagery training using the virtual reality headset, imagery ability, mood, and physiological parameters are reviewed. Firstly, the literature will discuss how imagery training helps to improve sports performance. Then, how the uses of virtual reality can enhance sports performance is discussed. Next, I will discuss how the combination of virtual reality headset and imagery video for athletes' imagery ability and also how it can affect the athletes' mood. Then, the relationship between imagery training using virtual reality headset and physiological parameters is discussed.

2.2 Imagery and Sport Performance

Imagery is one of the psychological skill training techniques that use both mind and body. It involves in the process of create or recreating an experience in the mind by using all of the human senses (Arjeria & Kumar, 2015) and it has been defined as "using all the senses to re-create or create an experience in the mind". Imagery has both a cognitive and motivational function. The cognitive function of imagery is the use of mental imagery to experience specific sports skills and to plan strategies in advance for competition. The motivational function of imagery is the use of imagery to experience goal attainment, effective coping and arousal management requirements. The mental practice literature provides evidence that imagery is an effective cognitive process for enhancing learning and performance of motor skills (Parnabas, Parnabas, & Parnabas, 2015b).

By using the imagery, a person can construct their own reality with their own thoughts and mental picture. Imagery has been recognised as one of the most important techniques that are commonly used by the coaches to enhance sports performance, and it can alter psychological states of an athlete's (Arjeria & Kumar, 2015). Hence, for most athletes, imagery has been successfully used as one of the tools in the mental training in order to add the capacity to mental rehearsal an action or skills, where it may help them to increase their confidence level and focus on completing the motor skills (Amasiatu, 2013). In addition, imagery is not only popular used psychological techniques for the athletes, but it had also been used successfully by the Olympic athletes to mental rehearsal before their main competitions (Watt, 2003).

However, there are arguments that imagery can be more effective when it includes all the senses that would be engaged, together with the kinaesthetic sensation that would be experienced by the athletes during the real match. For instance, images those have the burning sensation of lactic acid build-up in the muscles, the feeling when heart is beating rapidly, and/or the smell of the grass pitch that can be very evocative during the actual performance of the athletes. Not only that, having the same posture would adopt in performing, holding any implements that would usually be held, and wearing similar clothes could improve the physical nature of the imagery. Thus, it is important for the athletes to imagine performing the relevant skill properly and if he/she is unsure of the correct techniques used, the coach could help in giving coached of the right techniques to the athletes. This is to avoid the athletes for having poor techniques (Afrouzeh, Sohrabi, Torbati, Gorgin, & Mallett, 2013).

A study by a group of neuroscientists showed that the activity of the brain during imagery can provide useful information to the person to conduct imagery more vividly (Afrouzeh et al., 2013). Besides, most sport psychologists also agreed that imagery is useful for the coaches and athletes in order to achieve their optimal performance (Hall & Martin, 1997; Janssen & Sheikh, 1994). Moreover, Wakefield and Smith (2009) also proved that imagery not only can increase the performance of the athletes, but it also can overcome the mental obstacle which is the main cause of the poor performance.

Specifically, imagery not only can improved athletes performances, but it can also enhances several aspects such as the improvement of technical skills, the learning of strategies, the arrangement of tactics, and the development of mental processes (Ribeiro et al., 2015; Munroe, Giacobbi, & Weinberg, 2000; Williams & Cumming, 2012). In general, many studies on imagery had proven that it can give ergogenic effect on motor performance for the athletes (Wakefield & Smith, 2009). In addition, there is a study that reported mental imagery is also beneficial to the athletes in four different aspects. Firstly, it helps the athletes to stay healthy because of the uses both mental and physical exercises. Secondly, it can help the athletes to specifically elevate his/her fitness ranking from the bottom to the top. Thirdly, it can help the athletes to have more specific direction on using skill either during training or competition. Lastly, it can help the athletes to boost their motivation and increase the confidence in achieving their goals. If athletes achieve the entire characteristic of both physical and mental trainings, they are expected to move toward winning the competition. (Rattanakoses, Geok, & Abdullah, 2012; as cited in Justine & Shaw, 2008).

2.3 Virtual Reality (VR) device and Sport Performance

In many years, sport scientists have developed many new system and methods to evaluate some important parameters in the sports performance such as biomechanics, physiology, and behavioural neuroscience (Bideau et al., 2010). One of the technologies is the Virtual reality (VR) device, which has been used to analyse sport performance. Virtual reality integrates real-time of computer graphics, resonances and other sensory information to create a computer-generated world in which the users can interact. The virtual environment is showed not on a computer screen, but through a head-mounted display, usually like a helmet or goggles that have two small television screens (Gregg & Tarrier, 2007).

According to Bideau et al. (2010), VR involved in three-step processes where the first step involved in capturing athletes' motion in a given sport, the second step concerns to virtual humanoids and adaptation to specific constraints to modify the part of the simulation, and the third step is the presentation of the virtual environment. VR allows the users to be completely immersed with the idea to recreate a believable artificial environment that can stimulate responses similar to when doing any physical movement in the real environment where it can be controlled, replicated and tailored to the users' experiences (Romano, 2005).

VR technologies have been applied widely to many fields include phobia therapy, military training, surgical training, entertainment, education, civil engineering, and architecture (Stinson et al., 2013). For mental health patient, the uses of VR can be one of the alternatives to imaginal exposure in which the patients do not need to rely on internal imagery or their skill to visualise. Furthermore, when patient doing imaginal exposure, the therapist has no control over, whereas in virtual

environment patients' stimuli can be presented and controlled (Gregg & Tarrier, 2007).

VR has been successfully used to many training domains. However, there is a little research investigating its benefits on sports training such as for imagery preparation. According to Stinson, Bowman, Gracanin, & Ollendick, (2013), VR can be used for sport imagery where it will simulate the environments and scenarios through the VR device and the athletes will not be limited by their own imagery skills and it will allow them to focus more on relaxation and cognitive therapies in order to enhance their performance. VR also can also be used as a platform to administer sport psychology training in which it will represent a new direction in research even there is only limited research investigating its feasibility.

2.4 Imagery Ability for Imagery Training

Imagery ability is the collection of the skills which include ease of an image generation, image vividness, image controllability, and image maintenance. According to Kosslyn (2005), she explained that imagery involves with the generation, maintenance, and transformation of an image, with an individual's imagery ability to capture the proficiency of the athletes during performing each of the processes. Meanwhile, Morris, Spittle, & Watt (2005), concluded that imagery ability is the ability of an individual to detect the image of the imager by focusing on the important sensory information and the ability of the person to visualise the picture clearly and take control the situation in their mind, which is closely linked to the experience and the vividness of the imagination (Rattanakoses et al., 2012). Research by Goss, Hall, Buckolz, & Fishburne, (1986) said that people who do not

have control over their imagery would perform more poorly than people who have control over it.

A researcher suggests that everyone can generate images, but the quality of the images generated might be different for each individual, and the degree might not be the same (Chalghaf, Sbaa, Leveque, & Azaiez, 2013). Especially, it may differ from the vividness, controllability, visual representation, kinaesthetic feeling, ease, emotional experience, and the effectiveness of the image formation, however, the imagery ability can be enhanced by practice (Gregg, Hall, McGowan, & Hall, 2011; Hall, 1998). It is important to identify the imagery ability of the athletes first before starting any imagery program to construct a better imagery process (Rattanakoses et al., 2012). Robin et al. (2011) demonstrated that people with higher imagery have a greater improvement in returning the tennis serve accurately compared to people with lower imagery ability. Moreover, it is reported that the effectiveness of imagery intervention is better for the people who have higher ability to imagine (Nezam, Isazadeh, Hojjati, & Zadeh, 2014; as cited in Hall, Buckolz, & Fishburne, 1992).

Ideally, the evaluation of imagery ability ought to be embraced with a measure that analyses those segments that are used in detailing the arrangement of pictures. Such a measure ought to be incorporated into the measurements of distinctiveness, controllability, simplicity of era, the duration, and the particular tangible modalities, For example, visual, sound-related, material, kinesthesis, olfactory, and gustatory, and the experience of feeling (Peltomaki, 2014; Watt, 2003), In general, it is hypothesised that imagery ability have a close relationship between the imagery use (Martin, Moritz, & Hall, 1999) and its intended outcome to enhance the performance outcomes (Rattanakoses et al., 2012; as cited in Cumming, 2008).

2.5 Measurement of Imagery Abilities

Researchers have shown that imagery use is most effective for those individuals who are more effective imagers and those who are higher in imagery abilities (Martin et al., 1999; as cited in Murphy, 1994). Given that imagery abilities significantly impact athletes' use of imagery, it is important to consider athletes' imagery abilities when conducting sport imagery research. To do so, valid and reliable instruments are important for assessing imagery abilities. The current and major instruments measuring imagery ability in a sport or movement context are presented.

2.5.1 Vividness of Movement Imagery Questionnaire (VMIQ; Isaac, Marks, & Russell, 1986)

VMIQ consists of 24 items that measure the vividness of visual imagery of movement and the imagery of kinesthetic sensations, which is associated with movement. Items examine participants' abilities to image-specified basic body movements and movements requiring precision and control in upright, unbalanced, and aerial situations. The VMIQ requires individuals to rate the vividness of their imagery on a 5-point rating scale, which ranges from 1 (*perfectly clear and as vivid as normal vision*) to 5 (*no image at all; you only know that you are thinking of the movement*), rating the 24 items on vividness of imagery of the movements or actions for both an external perspective (watching somebody else) and an internal perspective (doing it yourself). The VMIQ assesses strictly vividness of visual and kinesthetic movement imagery abilities (Campos & Perez, 1990). VMIQ possesses adequate psychometric properties (Atienza, Balaguer, & Garcia-Merita, 1994). Scores on the VMIQ have been linked to improvements in motor skills (Isaac, 1992). It is a relatively easy questionnaire to administer to a large group of participants.

However, a problem with the VMIQ is that the instruction to imagine as if watching somebody else is not what is generally agreed to reflect external perspective imagery. Following the original description by Mahoney & Avener (1977), external perspective imagery refers to imagery of oneself from an external perspective, for example watching oneself kick a goal from a seat in the stand.

2.5.2 Movement Imagery Questionnaire (MIQ; Hall, Pongrac, & Buckholz, 1985)

The MIQ was designed to assess kinesthetic and visual movement imagery abilities. MIQ completes over 4 phases, and consists of 18 items. The items include 9 items on the visual subscale and 9 items on the kinaesthetic subscale. For each item there is a 7-point Likert rating scale, from a 1 (*very easy to picture or feel*) to 7 (*very difficult to picture or feel*). During the 4 phases, the participants are asked to physically complete the movement sequence and then resume the starting position and recreate the experience using the visual imagery, which is then followed by using kinaesthetic imagery. The reliability of the MIQ is acceptable, with a test-retest coefficient of .83 for a 1-week interval and internal consistency coefficients of .87 for visual subscale and .91 for kinaesthetic subscale (Atienza et al., 1994; as cited in Hall et al., 1992). However, in the MIQ, a lower score represents greater imagery ability, which was criticised because it seems counterintuitive.

2.5.3 Movement Imagery Questionnaire Revised (MIQ-R; Hall & Martin, 1997)

Hall & Martin (1997), modified the MIQ to create a more compact revised version, known as the MIQ-R. MIQ-R consists of only an 8-item questionnaire constructed to assess 4 items on the visual subscales and 4 items on the kinaesthetic subscales respectively. The response to each item uses the same four steps used in

the original MIQ. Hall and Martin reversed the scoring so a rating of 1 (*very hard to see or feel*) reflects weak imagery ability and 7 (*very easy to see or feel*) indicates strong imagery ability. Thus the major modifications of the MIQ included reducing the number of items from 9 to 4 for each subscale, reversing the rating values, so that higher scores are related to higher imagery abilities, and then rewording certain items to improve the clarity of the questionnaire, with the goal to reduce administration time and eliminate those items that some participants would refuse to physically perform (Hall, 1998). Interpretation of the MIQ-R is that higher scores are indicative of strong imagery abilities. A concern with both the MIQ and the MIQ-R for research in elite sport, as well as applied work, is the content, which relates to very simple body movements. Therefore its ecological validity is questionable for those purposes. Munroe-Chandler and Morris (2011) commented on the limitations of the MIQ and MIQ-R questionnaires, stating that both MIQs only measure two sense modalities whereas imagery comprises multisensory modalities.

2.5.4 Vividness of Movement Imagery Questionnaire – 2 (VMIQ-2; Roberts, Callow, Hardy, Markland, & Bringer, 2008)

Roberts et al. (2008), later modified the VMIQ to assess the vividness of both visual and kinesthetic imagery, known as VMIQ-2. The VMIQ-2 consisted of 12 items, asking the respondents to imagine a variety of motor tasks and then rate the image from external visual imagery perceptions, internal visual imagery perceptions, and kinesthetic imagery perception. The 12 items are measured on a 5-point scale ranging from *1 (perfectly clear and as vivid as normal vision) to 5 (no image at all; you only know that you are thinking of the skill).* Although VMIQ-2 provides stronger validity as well as adequate factorial, concurrent, and constructs validity,

VMIQ-2 only measures the visual and kinesthetic sense modalities, and not multisensory modalities.

Researchers have indicated that all these measurements are useful measures of movement imagery ability (eg., Goss et al., 1986; Hall & Martin, 1997). The VMIQ, MIQ, MIQ-R, and VMIQ-2 provide a very general picture of how good an individual is at imaging specific movements, or how good they are at using cognitive specific imagery. However, these instruments are limited in their usefulness for measuring the imagery abilities, which are multisensory modalities. These instruments assess imagery ability of movements in general and were not designed specifically to examine images related to sport. Thus, other measures on imagery abilities are encouraged.

2.5.5 Sport Imagery Ability Measure (SIAM; Watt, Morris, & Andersen, 2004)

The SIAM is a 48-item questionnaire designed to measure task-oriented, multimodal, and multidimensionality of imagery ability. Participants choose a sport-specific version of each of four generic sport-related scenes and image each scene for 60 seconds. An example of a scene from the SIAM is a slow start in which athletes imagine making a slow start to a game and having to stimulate themselves to play at 100 %. The four specific sport scenes include the home venue, a successful performance, a slow start, and a tough training session. After imaging each scene, participants are instructed to respond to 12 items assessing five imagery dimensions (vividness, control, ease of generation, speed of generation, duration), involvement of six senses during imagery (visual, auditory, kinaesthetic, olfactory, gustatory, tactile), and the experience of emotion. Participants are instructed to make their responses on 100mm visual analogue scales. Each 100mm line separates two

opposing anchor statements (for example, “no feeling” and “very clear feeling” for the tactile modality). Then, the 12 subscale scores are calculated by adding together the relevant dimension or sensory-item score for each of the four scenes. Finally, summarising the scores across the four scenes produces a subscale score with a range from 0 to 400.

According to Watt & Morris (1999), the SIAM showed good to very good internal consistency with coefficients ranging from .66 (speed subscale) to .87 (gustatory subscale). Test-retest reliability results from 58 participants over a 4-week interval revealed moderate to very good correlations for the specific subscales, varying from .41 for auditory to .76 for gustatory. It is also proposed that the SIAM is a suitable tool for assessing sport imagery abilities in both research and applied settings. It has also been used extensively in Australia (Watt et al., 2004) and Finland (Watt, Morris, Lintunen, Elfving, & Riches, 2001) and has been translated into different languages such as Hebrew, Swedish and Thai (Munroe-Chandler & Morris, 2011).

2.5.6 Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011)

SIAQ is a 20-item questionnaire designed to measure athletes’ ease of imaging different types of imagery content, such as sport specific, cognitive and motivational imagery content within the SIQ framework developed by Hall, Mack, Paivio, & Hausenblas (1998). SIAQ reviews five factor model assessing skill, strategy, goal, affect, and mastery imagery ability. For example, athletes who scored higher in competitive level also found it significantly easier to generate sport images. SIAQ demonstrated good test-retest reliability with good factorial validity, internal and temporal reliability, invariance across gender, and an ability to distinguish

among athletes of different competitive levels. As SIAQ is still a new measure, Williams & Cumming (2011), suggested that future research is still needed to continue to validate the SIAQ, such as comparing the SIAQ imagery abilities with other measures of imagery ability, and other characteristics that influence sporting performance.

2.6 Mood and Sport Performance

Mood is defined as a set of feeling that occurs in a short period of time, differ in intensity and duration and commonly involve in more than one emotion. Mood and emotions usually correlated concepts while feelings are built up by both constructs (Rajkovic, 2014). Mood can also be represented as a cumulative concept whereby a series of emotional response in daily events are combined and create a mindset that able to stay in a place until it is suddenly changed by future events (Terry, 2004).

There are affirmations those athletes who reported that they encounter intense feelings before, during, and after competitive sport (Lan, Lane, Roy, & Hanin, 2012; Lane, 2007; Terry & Lane, 2000). Dysfunctional of the performance is when the individual failed to achieve the highly-valued goal, hence the ability to control emotion played an obviously one of the main parts of the preparation for the competition (Lane, Thelwell, & Devonport, 2009). In a study by Prapavessis, (2000) stated that the ability to produce and maintain a good emotional feeling before a match is commonly recognise by the athletes and coaches as one of the most consequential factors that contribute to the athletes' performance. One research has their focused on separating athletes with successful and less successful performance based on their mood state before the competition. Where they found out, athletes

who experienced less anxiety, angry, depressed, confused, fatigue, and vigorous will likely to be more successful than those who experience different profile.

For most people, they have their own strategies in order to control their emotions. For instances, they might listen to the music, be more talkative or differently, become isolated (Lane et al., 2009; Stevens & Lane, 2001; Thayer, Newman, & McClain, 1994) where is most cases, the emotion is controlled by experience which associating with some emotional condition that is experienced during the performance (Hanin, 2003). There is no denial on the relationship between mood and sport performance where it has a strong intuitive petition. However, researchers could not elaborate on the 'ideal mood' that can lead to a good performance. Nevertheless, there are also some findings that attained their support on athletic achievement can be differentiated by the mood score (Terry, 2004). With a little research exploring the predecessors of mood and how athletes manage to deal with intense mood state can weaken their sport performance; the researchers suggest that the result of mood-performance can be helping in understanding how the athletes take charge of their mood. Since mood has become the most important factor in contributing to the good performance, the ability of control the mood it becomes a great tool for the athletes and coaches (Stevens & Lane, 2001).

2.7 Virtual Reality and Physiological Parameters

Generally, human health state is defined by the assortment of physiological parameters which commonly are self-interdependent. But, not all of them are similarly informative and vital. Besides, not all the parameters could be effectively controlled, as the measurement of them needs special condition, expensive equipment and materials. While planning the monitoring system, it is important to

assess the importance of measured parameters and techniques of the measurement into the practical systems. Basic humans physiological parameters include electrocardiograph (ECG), heart rate, respiratory volume, body temperature and blood pressure (Dosinas, Vaitkunas, & Daunoras, 2006).

2.7.1 Heart Rate (HR) and Oxygen Saturation (SpO2)

Heart rate (HR) is usually recorded ass one of the measure in physiological arousal. HR the count of the number of heartbeats per unit of time and it is also known as beats per minute (bpm). The changes occur depends on the body need in absorbing the oxygen and excreting the carbon dioxide. It also measures the amount perception for every heart beat form the mean average (Ženko et al., 2016). For the most medical practitioner, HR is used to diagnose and tracking any medical conditions. However, in sports, the heartbeat pattern is related to the sport performance (Robazza, Bortoli, & Bertollo, 2017).

Many researchers had conducted studies relating HR and sport performance. For instances, lower HR is associated with a good closed skill related sport such as pistol shooting (Tremayne & Barry, 2011). In another study by Brosschot & Thayer (2003), they stated that HR response is longer after the athletes experienced negative emotions and oppositely with positive emotion. Hence, those who experienced negative emotion take a longer duration in order to reduce the HR. This condition is consistent with the view that prolonged activation of negative emotion, like stress, worry, or anxiety where longer recovery is needed.

Meanwhile, pulse oximetry is one of the standard measures for peripheral arterial oxygen saturation where it is used in many care venues such as critical care units, labour and delivery units, paediatrics, dentistry and veterinary medicine

(International COPD Coalition et al., 2010). In the pre-hospital settings, pulse oximetry can provide a rapid, non-invasive measurement, as well as monitoring the techniques to estimate peripheral oxygen saturation of haemoglobin and allocate a measure of cardio-respiratory function (Berry & Seitz, 2012). In addition, pulse oximetry also can be used to detect hypoxemia or inadequate oxygenation in the blood and specifically, it measures the percentage of the haemoglobin that bound to the oxygen in arterial blood (Hall & Jensen, 2012).

A research conducted by Berry & Seitz (2012) found that it is necessary to understand oxygen saturation values that is acquired from the pulse oxymetry in order to avoid inproper intrepretation of the results and clinical decision-making. While Lain & Granger (2014) suggest that desaturations of SpO2 during maximal performance level related to power could lead in measuring of the intense interval training. It is the same for the patients that have chronic obstructive pulmonary disease (COPD), however, by the work load of the aerobic capacity should be maintained within its duration.

2.8 Significance of this study

From the literature reviewed, virtual reality (VR) is one of the advanced technologies that are well known as a simulation tools. Meanwhile, imagery had been widely used in the sporting field as an effective psychological skills training for the athletes. However, until today, only a few researchers attempted to examine the effectiveness of combining VR and imagery to enhance athletes' performances or skills. Apart from that, most of athletes and coaches do not have much knowledge on using the 'right" skill on VR and imagery to refer as guidance before they are going to sport performance and tournaments. This is perhaps because they do not have

enough information on how to use video imagery along with others technologies such as VR in order to assist athletes' sporting performances. In addition, it could also enhance athletes' imagery ability, physiological parameters, and mood. In addition, this research is designed to discover and give a few knowledge and information to both athletes and coaches to know the effect of using virtual reality video in enhancing imagery ability, physiological aspects, mood and also the netball shooting performance along with the comparison of using it between adolescent and youth netball players. Although some evidence showed that young people tend to have stronger vividness in imagery compared to adolescent; research that examining which group of netball players are better in employing the VR imagery is yet to be identified. Thus, this purpose of the study is to examine the effect of using virtual reality simulation video during imagery on imagery ability, physiological parameters, mood, and netball shooting performance between adolescent and youth netball players.

CHAPTER 3

METHOD

3.1 Introduction

This chapter discusses the method used in this research. The main purpose of conducting this study is to identify the effect of using virtual reality to netball players in their sport imagery ability, mood, physiological parameter and shooting performance. Throughout this chapter, I will emphasise and elaborated more on the methods that were used in order to complete this study included research design, population and sampling, instrumentation, data collection procedure, data analysis and data collection flowchart.

3.2 Study Design

This study employed a pre-test, intervention and post-test, with a cross-over study design in an attempt to investigate the effect of using virtual reality headset during imagery on netball player's imagery ability, mood, physiological parameters and shooting performances. The research design type conducted was an experimental design. Participants were recruited from the Sekolah Menengah Kebangsaan (SMK) Putera, Kelantan. All of the participants had at least 2 years of experienced of playing netball. In addition, they also had experienced in representing the Kelantan state. The study only used one group where the group experienced both imagery using virtual reality headset and no imagery. Each participant was asked to fulfil a form that contained their personal information. Meanwhile, for physiological parameters, imagery ability and mood were assessed before and after imagery session takes place. A pre-test simulated netball performance was conducted before the intervention, and a post-test simulated netball performance was conducted right

after participants completed all 10 sessions of imagery intervention by using virtual reality simulation device.

3.3 Research Location

This research was conducted in SMK Putera, Kelantan. The pre-test and post-test shooting performance is conducted at the netball court of SMK Putera, Kelantan. This court is maintained by the administration of the school. The intervention session was conducted in an empty classroom in SMK Putera, Kelantan. All the sessions are conducted three times a per week. The intervention was conducted at 4 p.m. right before their training starts.

3.4 Participants

The study recruited a total of 15 netball players, however, due to injuries and tight competition schedules and training programmes, only 9 netball players were able to complete this study. All the netball players are from SMK Putera, Kelantan, who is currently active in playing netball. Their age ranged from 13 to 15 years old (mean±SD = 13.44±.882). Participants' inclusion criteria are female, age 13-15 years old. The players are currently active in competing in local netball leagues. People who are smoking could not participate in this study. They also need to have experienced at least 2 years in competitive experience. Exclusion criteria for the participants include refusing to give the informed consent. Besides that, participants below 12 years old and over 15 years old could not join this study. In addition, players who injured or not feeling well also is not encouraged to participate in this study.