3D VIRTUAL ENVIRONMENT AS A SPORT PSYCHOLOGICAL REHABILITATION TOOL TO ENHANCE PERFORMANCE OF VOLLEYBALL ATHLETES

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DEDICATION

Special thanks to my family members and my friends.

You all have been my cheerleaders and infinitely supportive….

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ABSTRACT

This study identified the pre-competitive state anxiety level among volleyball athletes in Malaysia by assessing psychology changes on the cognitive anxiety, somatic anxiety, self-confidence and several physiological parameters such as heart rate, blood pressure and skin conductance. A 3D virtual environment intervention program was then introduced as a psychological rehabilitation tool to enhance athlete's self-confidence level and to reduce their anxiety levels. The 3D virtual environment follows Paivio's theoretical framework, in which implementation of virtual learning of different skill sets, external factors of the environment and match strategies were introduced in stages using a cost-effective Google Cardboard HMD unit. A quasi experimental design consists of 20 respondents in an experimental group and 20 respondents in a control group was conducted within a period of one month with 12 sessions for the experimental group, while the control group only followed the regular volleyball training. The findings clearly demonstrated an overall improvement upon completion of the psychological rehabilitation program. The experimental group results displayed positive changes in terms of the psychological responses where the Wilcoxon Signed-Rank test indicated statistically significant improvements for cognitive anxiety, somatic anxiety and self-confidence for the experimental group ($Z > \pm 1.96$). The T-Distribution test also indicated statistically significant improvements ($p < 0.05$) of the physiological responses (heart rate, systolic blood pressure, diastolic blood pressure and skin conductance) for the experimental group. However, the results of control group indicated lack of improvements or insignificant changes in both psychological and physiological responses. Therefore, it was proven that 3D virtual environment can be utilized as an effective psychological rehabilitation tool to overcome the pre-competitive state anxiety levels and to enhance the self-confidence level of volleyball athletes.

ABSTRAK

Kajian ini mengenal pasti tahap kebimbangan seketika pra-persaingan bagi atlet bola tampar di Malaysia dengan menilai perubahan psikologi pada kebimbangan kognitif, kebimbangan somatik, keyakinan diri dan beberapa parameter fisiologi seperti kadar denyutan jantung, tekanan darah dan kadar aliran kulit. Program campurtangan persekitaran maya 3D kemudiannya diperkenalkan sebagai alat pemulihan psikologi sukan untuk meningkatkan tahap keyakinan diri atlet dan mengurangkan tahap kebimbangan mereka. Persekitaran maya 3D mengikuti kerangka teori Paivio, di mana pelaksanaan pembelajaran maya set kemahiran yang berbeza, faktor persekitaran luaran dan beberapa strategi perlawanan diperkenalkan secara berperingkat menggunakan unit Google Cardboard HMD. Satu reka bentuk eksperimen kuasi mengandungi 20 responden dalam kumpulan eksperimen dan 20 responden dalam kumpulan kawalan dijalankan dalam tempoh sebulan dengan 12 sesi untuk kumpulan eksperimen, manakala kumpulan kawalan hanya mengikuti latihan bola tampar yang biasa. Hasil kajian jelas menunjukkan peningkatan keseluruhan setelah tamat program pemulihan psikologi sukan ini. Keputusan kumpulan eksperimen memaparkan perubahan positif dari segi tindak balas psikologi di mana ujian Wilcoxon Signed-Rank menunjukkan peningkatan secara statistik ketara bagi kebimbangan kognitif, kebimbangan somatik dan keyakinan diri untuk kumpulan eksperimen ($Z > \pm 1.96$). Ujian T-Distribution menunjukkan peningkatan statistik signifikan ($p < 0.05$) dalam tindak balas fisiologi (kadar jantung, tekanan darah sistolik, tekanan darah diastolik dan kealiran kulit) bagi kumpulan eksperimen. Walaubagaimanapun, keputusan kumpulan kawalan tidak menunjukkan penambahbaikan dalam kedua-dua tindak balas psikologi dan fisiologi. Oleh itu, ianya terbukti bahawa persekitaran maya 3D boleh digunakan sebagai alat pemulihan psikologi yang berkesan untuk mengatasi tahap kebimbangan seketika pra-persaingan dan untuk meningkatkan tahap keyakinan diri atlet bola tampar.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Sport psychology is one of the important elements to be considered in the improvement of sport performance of athletes. In 1996, European Federation of Sport Psychology (FEPSAC) defined sport psychology as a study of psychological basics, processes and effects on sport. In brief, Cox (2002) explained that application of psychology in sport as one of the important ways to improve athletic performance. In addition, Grobbelaar & Potgieter (2007) also highlighted the importance of sport psychology whereby it is impossible to be ignored in serious effort to achieve excellent sport performance.

Weinberg & Gould (2010) opined that sport psychology involved the combination of the field of kinesiology and psychology. Besides that, it also consists of the study on how psychological factors influence an athlete's performance and the process of how athletes are affected by psychological and physical features in a competition. In another study, Rogulj et al., (2006) explained that sports involved complex and accurate motor skills, wherein psychological aspect plays as a key role

in sports performance during a competition. Undeniably, sport psychology plays a very crucial role in improving athletes' performance in building up mental strength required to help win a tournament.

Combination of four performance parameters of physical, technical, tactical and psychological preparations can be linked together to improve and to maintain athletic sport performance (Bompa, 1999; Bompa & Haff, 2009; Carrera & Bompa, 2007; Issurin, 2007). The purpose of psychological preparation is to teach athletes to overcome emotional and mental barriers during training or in a competition (Blumenstein et al., 2007 & Bompa ,1999). Intervention of psychology technique in sport could help enhance the level of mental toughness for an athlete, specifically in terms of attention control, reduction of anxiety level, improvement of self-confidence and motivation level, arousal control and ability to deal with pressure during the match (Garza & Feltz, 1998; Post & Wrisbergn, 2012).

Mental toughness could assist athletes to cope better than their opponent in different situations such as: competition, training, lifestyle, thus allowing them to be more consistent, better focused, higher confidence and better control under pressure as compared with opponents who are less mentally prepared (Jones et al., 2002). Recent evidences indicated that sports psychology plays an extremely essential characteristic for athletes in competitive sports including volleyball (Sheard & Golby, 2006). Volleyball is a team sport and because volleyball is a fast pace game, it requires several of the psychological skills elements such as developing the concentration of a winner, learning to control emotions when under pressure resilience and quickly recovering from mistakes made (Goldberg, 2015).

In sports psychology, some interesting but confusing questions were raised by both coaches and athletes, such as i. why certain athletes could not perform perfectly during a tournament, but manage to achieve peak performance during practice period, ii. certain athletes would feel nervous (heart beat is pumping rapidly) competing

against a higher level team opponent, and iii. athletes' movement becomes inactive or frozen when the stadium is full with rowdy spectators. Within these particular situations, one of the studies (Jarvis, 2006; Kimberly, 2013) identified that competition environment can generate an emotional state of anxiety and every athlete must have their share or experience of facing these kinds of situations during an on-going competition.

In today's modern sports psychology, the majority of coaches are emphasizing on reduction of pre-competition state anxiety of athletes. Anxiety has been acknowledged as one of the psychological factors that will adversely affect athletes' performance. Emotional state anxiety plays an important role in competition and in competitive sports, (Lizuka, 2005), wherein pre-competition anxiety may influence and effect on athletes' performance (Cox, 2002; Esfahani & Soflu., 2010); as these could distract the athletes' focus of the games consequently causing a negative effect on performance and brings interruption to athletes (Cerin, 2003; Kais & Raudesepp, 2005). Furthermore, competitive anxiety level may be aggravated by other factors such as: size and reactions of audience, intensive fighting state to maintain winning position and reception of negative disparagement (Walker & Nordin-Bates, 2010).

In sport psychology, there are various types of psychological training techniques, which are applied to solve the competitive anxiety problem, such as: imagery, relaxation, bio-feedback, mental rehearsal, self-talk and breathing. One of the mental training techniques that had been frequently used to build confidence and a feeling of enthusiasm before start a competition is imagery skills. Cumming & Ramsey (2007) defined imagery as a process that mimic a real situation and try to create an experience in mind. It allows athletes to imagine or feel themselves performing the way they desired. Garza & Feltz (1998); Post & Wrisberg (2012) revealed that imagery is an efficient psychological technique, which could influence psychological state, for instance enhancing self-confidence, increasing self-efficacy, focusing attention and reducing anxiety level.

Nowadays, intervention of video technology is emerging as a beneficial tool in psychological field to enhance the sport imagery skills. In the earlier study, Jeffrey et al., (2002) proposed that mental imagery training videos can be used for behaviour training, skills training, rehearsal imagery, motivation lessons and will assist in developing confidence level (Halliwell, 1990). The combination of visualization techniques in video had led to some outstanding conclusions in improvement of athletes' performances (Halliwell, 1990). Williams & Grant (1999); Lee et al., (2001) suggested that virtual reality may be interchanged with video systems to enhance the sports training experience of athletes. In another study, Stinson, Bowman and Ollendick (2013) revealed that virtual reality system can be used to display realistic 3D environment in inducing anxiety, allowing resilience training and allowing athletes to familiarize themselves with the high-pressure competition situation.

Virtual reality as a computer-simulated environment is able to drum up the user's senses in imaginary world in a similar manner to the real world environment. Virtual reality was first developed in 1960s, and since then had been known use gradually until it achieved wide adoption as a research tool in psychology (Rose & Foreman, 1999). According to previous research work by Katz et al., (2005), virtual reality helped in many domains including surgical training, flight simulator training, medicine science, education, civil engineering, phobia therapy, military training and sports. One of the studies from medical science discovered that virtual reality can help patients to increase their muscle movement repetitions by walking in virtual environment and grabbing virtual objects in a type of treatment to help recovery from stroke illness. Moreover, with creation of realistic environment in virtual reality, this allows better interaction and immersive training for the sport practitioners. This particular aspect of virtual reality will be discussed further in the background of the study.

1.2 Background Study

Pre-competitive state anxiety is defined as psychological and physiological states, which is experienced by athletes within the last few days before the start of a competition and is able to greatly influence the quality of an athlete's performance. Pre-competitive state anxiety is one of the factors that generate the decrement of self-confidence and concentration; ultimately leading towards a drop in the athletes' performance (Mamassis, 2004). According to a previous study, Athan and Sampson (2013) emphasized that pre-competitive state anxiety is still being considered as a critical problems for all athletes at high level of competition. Previous researcher discovered that high level of anxiety can have a worsening effect on athlete's performance (Parnabas, 2010).

During the 2012 Olympics Games, which was held in London, United Kingdom, most of the Malaysian athletes were not performing very well (Abdul Aziz, 2013). These athletes were facing pre-competitive state anxiety where they clarified that they felt too panic and nervous during competition, ultimately causing them to fail in achieving their goals. However, Abdul Aziz (2013) emphasized that such excuses are objectionable, as professional athletes are always challenged at the highest level of competition. In addition, he commented on the often-heard excuse from Malaysian athletes when they lost; the loud cheers or jeers from supporters and nervous feeling when the opponent scored a lot of points. Abdul Aziz (2013) explained that such explanations were often due to lack of mental strength. In a relevant work, Balbir (2013) highlighted that Malaysian athlete often have a lack of winning mentality, where athletes feel that they are not made to feel like champions.

In their work, Omar-Fauzee et al., (2009) opined that most Malaysian athletes do not know how to become a good player in achieving their aspiration to be on the same level as the higher level athletes that they admire. Most Malaysian athletes lack of both the imagery and coping skills knowledge, thus as a result they could not fully

utilize the imagery and coping skills for their benefits during training sessions. Due to this inadequacy of these skills and knowledge, it is more likely for Malaysian athletes to experience negatives performance during competition. Athletes frequently recall negative performance experiences after the match, where this incident could induce higher anxiety for them. In order to achieve excellent performance in sport, positive mental preparation set up before going to a tournament is required. On the contrary, it was discovered that athletes who are less developed in their mental ability, or who vividly remember negative performance experiences will face losses more frequently.

Most individuals who are taking part in competitive sports might realize that pre-competitive state anxiety as one of the most critical elements which is able to hinder peak athletes' performance in sport. Unfortunately, nobody places great emphasis on the advantageous of using psychological skills training (Jones, Hanton & Connaughton, 2002 ; Kelly Sponholz, 2012) in order to overcome pre-competitive state anxiety. In his work, Balbir (2013) stated that, sport psychology is very important in the process of creating winning mentality in athletes. Thus, coaches will have to learn important psychological skills in order to build up athletes' mental toughness because mental toughness is essential and of great importance in order achieve winning, at some point can be greater than the physical exercise or physical preparation involved (William, 1988).

1.3 Problem Statements

The most important issues which are of great concerns for coaches and sport psychologists are the recognition of the important reasons affecting sports performance of an athlete. Pre-competitive state anxiety must be treated in order to avoid from bad influence on athletes' performance and reduction in the level of self-confidence. Athan and Sampson (2013) highlighted that athletes who experience pre-competitive state anxiety might feel their heart rate is increasing, breathing rapidly, sweating excessively and their mouth is becoming dry. There are various types of sport psychological skills programs, or interventions in order to strengthen athletes' mentality in sport, such as: goal setting, biofeedback, imagery, self-talk, focusing breathing and relaxation. The paragraph below explained in great details about the problems encountered in this study.

Firstly, Moh (2013), the Malaysia National's team head coach also shared his experiences when he lead the women's volleyball team in SEA Games 2013, as he pointed out that the second setter was already well prepared outside the court, but when she entered the court, her hands were feeling cold due to competitive anxiety. In addition, Pang (2013), who had participated in Sea Games in a total four times appearances indicated that Malaysian volleyball players have a lack of international exposure because the chances of playing abroad are very slim. The effects of these negative experiences and lack of chances of playing abroad against better opponents are further amplified in the same manner for amateur and novice volleyball players throughout Malaysia as they didn't have the opportunity to be involved in the sports psychology mental training and lower chances of participating in competitive tournaments.

According to a previous work, the researcher had conducted a study, which is identification of the pre-competitive state anxiety level among Malaysia volleyball university players was conducted (Jilun, 2004). The experiment was piloted during a MASUM intervarsity competition and the results have shown that, the female

volleyball players displayed higher pre-competitive state anxiety level compared to their self-confidence level. The results also revealed that the female volleyball players showed they have the lower self confidence level if compared to the male volleyball players. Therefore, Kassim (2003) recommended utilization of sport psychology training such as: autogenic training and progressive muscular relaxation (PMR) to decrease the pre-competitive state anxiety level of athletes.

It is undeniable that involvement of video technology in sport could enhance self-confidence, motivates through sport imagery lessons and could bring out outstanding outcomes, which are due to positive performance changes by athletes, (Halliwell, 1990). Jeffrey et al., (2002) stated that video technology has become a beneficial tool in sport psychology intervention. The conventional method of video playback is considered as a limited method to enhance athlete's performance due to the fixed viewpoint of the camera position during recording. Because of this limitation of video playback, immersion of the new virtual environment technology is proposed to be used to overcome this limitation in order to help athletes in their training. William and Grant (1999); Lee et al., (2001) suggested that virtual reality may soon replace video playback system as the preferred tool to boost sport performance. Immersive virtual reality can provide the feeling of presence and extremely important information through interactive environment to all athletes (Benoit et al., 2010).

According to Bidin (2004), there are many hindering factors that are able to create influence on athletes' failure. By percentages, athletes indicated that 52% of competition venue, 63% of audience and 48% of competition preparation had significant influence on their performance in sport. In recent years, coaches often utilized conventional video playback as a coaching aid during training lesson. Most coaches preferred to use the tried and tested method of video playback to improve the sport performance of their athletes. However application of video playback analysis to do the post-mortem team discussion and most for the training is heavily require subjective feedback from coaches. Stinson, Bowman and Ollendick (2013)

explained that the knowledge of majority of the coaches is limited and this could cause athletes potential growth to be stunted as they are not to the best extent receiving full knowledge and taught the best techniques.

Meanwhile, Benoit et al., (2010) highlighted that video playback as a traditional method is very limited in enhancement of athlete's performance due to the fixed viewpoint of the camera position. Thus, the proposed application of virtual reality in sports psychological training could approximate the real games situation, simulating crowd audience with several audio effects to help reduce volleyball athletes' competitive anxiety and to overcome the limitations of traditional video playback methods. In their work, Shim & Cartlon (2006) revealed that participants' performance was progressively dropped when they reacted with video images. The non-attendance of interactivity on 3D display of the real-sport scenario would influence athletes' performance. In this coincidence, Slater et al., (1996) opined that participants' performance could decrease due to lack of the feeling of being in a real life environment.

New high impact sport technology such as virtual reality (VR) is being developed and had experience rapid growth and adoption in sports psychology field. One of these is the idea of using advance 3D virtual environment technology, is proposed to be used within this research to reduce athletes' competitive anxiety. The development of a 3D virtual environment is developed based on real situations of volleyball competition environment. Other than that, a custom made "*Google Cardboard*" was utilized to ensure that users can be immersed in the real environment which is displayed inside the device. The exposure levels during the 3D imagery training are controlled and increased gradually throughout the intervention period. The proposed intervention program can perhaps be addressed during crucial skill development phase of amateur and novice athletes or during mental rehearsal for competition conditions.

If all the problems identified due to lack of mental training are not resolved, Malaysian athletes will further find their performance will never improve and reach the point of stagnation at the international stage even though they are on par with foreign athletes in terms of physical conditioning and talent levels. Most often, at the highest level in sports, often the winning championship points are won through sheer determination and will power of the athletes which is a testimony to both their physical hard work and mental strength. At the lower level of sports, amateur or novice athletes will often find it difficult to break through the invisible mental barriers, which prevent them from performing their best at crucial times in tournament and stunted their progress to reach their full potential. Therefore these problem statements have become guidance for this research work in order to find viable solutions to the issues stated above.

1.4 Objectives of The Study

In order to achieve the purpose of study and to answer the research question, the objectives are listed as below to guide this study:

1. To identify the pre-competition state anxiety: cognitive anxiety, somatic anxiety level and the self-confidence level among males and females volleyball athletes.

2. To develop a 3D virtual environment for assisting volleyball athletes in term of focusing on their pre-competition state anxiety and self-confidence levels.

3. To test the reliability and validity of the developed 3D virtual environment.

4. To determine the effectiveness of the developed 3D virtual environment on psychological and physiological changes of experimental and control groups before and after intervention of 3D virtual environment

1.5 Research Questions

Four research questions are raised and ascertained to be explored in this study. The research questions for the exploration are as follows:

1. What is the pre-competitive state anxiety level and self-confidence level among males and females volleyball athletes?

2. How to develop a 3D virtual environment for volleyball athletes, which is able to help in pre-competitive state anxiety level and self-confidence level on volleyball athletes?

3. What is the reliability and validity of 3D virtual environment?

4. What are the psychological changes and physiological changes of experimental and control group before and after the intervention of 3D virtual environment?

1.6 Hypotheses

The following hypotheses were proposed:

H_o1: There are no difference on the pre-competitive state anxiety and self-confidence level between male volleyball athletes and female volleyball athletes.

H_a1: There are significant difference on the pre-competitive state anxiety and self-confidence level between male volleyball athletes and female volleyball athletes.

H_o2: There are no differences on psychological variables between pre-test and post-test between experimental and control groups.

H_a2: There are statically differences on psychological variables between pre-test and post-test between experimental and control groups.

H_o3: There are no differences on physiological variables between pre-test and post-test between experimental and control groups.

H_a3: There are statically differences on physiological variables between pre-test and post-test between experimental and control groups.

1.7 Significant of the Study

Some of the athletes experienced the feeling of fear, unhappiness, guilt, discouragement and focus distraction in competition seasons (Cerin, 2003; Kais & Raudesepp, 2005). Athletes should be flexible enough to adapt to the highly competitive sport environment, which is often able to induce their anxiety. Athletes

might achieve good performance if they are able to handle their competitive anxiety emotions or frequently adapt well enough with the high stress environment. Hereby, the purpose of this study is to overcome the pre-competitive state anxiety level and enhance the self-confidence level of novice volleyball athletes.

1.7.1 Athletes

In this study, virtual reality is applied in sport psychology with the main aim to improve athletes' mentality, especially amongst novice volleyball athletes. Nowadays, virtual reality is enthusiastically known as one of the state-of-the-art tool in experimental psychology. Pan et al., (2006) proven that virtual reality can reduce anxiety level, train motor and cognitive skills, enhance enjoyment, improve spatial understanding and add new benefits on learning. Hence, virtual environment could really be a useful tool that benefits athletes during psychological training. 3D virtual environment allows athletes to visualize themselves in the high pressure competition situation.

Furthermore, virtual reality can assist in full control of athletes' concentration when the virtual situations are similar to the real competition situations. Moreover, it is necessary to highlight virtual reality with "flexibility" because it is not only "close to real world" environment but also imaginary arrangement with related essential properties virtual objects. Therefore, the finding of this research will provide significant contribution to help decrease athletes' competitive anxiety level and to enhance athletes' confidence level.

1.7.2 Coaches

Additionally, the findings of this research could also be used as a reference and for development of new virtual reality tools for coaches as different teams and different levels of plays would require different content. Since virtual reality at present is still a relatively new advanced technology in sport, there are significant room for improvements where feedbacks and specific requirements from coaches will allow rapid development of the required custom 3D virtual reality contents tailored for specific skill sets, tactical plays, individual players, the whole teams or even for different competitions. A seminal contribution by Stinson and Bowman (2014) agreed that virtual environment could induce sport anxiety in high pressure games situation, where coaches can control the level of exposure and gradual introduction of the content to fit into periodization of the training cycles.

1.7.3 Sport Psychologists

There are different levels of utilizations of 3D virtual reality in sports where for some sports such as American football, the technology is adopted by professional teams to give them competitive edge in matches (Christina & Barresi and Shaffner, 1990). However, volleyball sport is different compared to these sports as the skills executions are done within split second without any opportunity to hold onto the ball or dribble the ball with exception of service skill. There are several other features of volleyball sport that make it a unique sports and this could open up new areas of research for sports psychologists.

In terms of applications of the 3D virtual reality tool, sports psychologists can plan, monitor and provide effective psychological intervention or mental rehabilitation for volleyball athletes to prepare them for upcoming competitions. In addition, after analyzing the players' mental strength or profile of pre-competition

state anxiety levels over certain time period, specific programs can be created by sports psychologists to help these athletes overcome their “mental barriers”.

1.8 Limitation of the study

The scope of the study shall be interpreted by keeping some limitations in mind. Firstly, this intervention instrument was designed only for novice volleyball athletes. Secondly, the intervention instrument was limited for 12 sessions (1 month) duration; intervention sessions were started after the pre-test, however, for the post-test was conducted after the intervention periods. The experiment was focused on pre-test and post-test of psychological changes (pre-competition state anxiety and self-confidence) and physiological changes (heart rate, blood pressure and skin conductance) among experimental group and control group. Thirdly, the development of the intervention instrument was based on cognitive behaviour therapy (CBT); relaxation, breathing and imagery, virtual reality exposure therapy (VRET) and Paivio’s Analytic framework to overcome the pre-competition state anxiety and self-confidence‘s weakness.

1.9 Scope of the Study

The scope of this study consists of four major parts. First of all, the pre-competitive state anxiety and self-confidence level among Malaysia male and female volleyball athletes have been investigated using Competitive State Anxiety Inventory (CSAI-2). Next, 3D virtual environment was decided to be developed to overcome the critical issues based on the preliminary results. There are three different theories

were involved in 3D virtual environment such as: cognitive behavioural therapy, virtual reality exposure therapy (VRET) and Paivio Imagery. Test re-test was conducted to check the reliability of 3D virtual environment upon completion of development stage. This study involved an experimental group and a control group to demonstrate the effectiveness of 3D virtual environment in pre-competitive state anxiety and self-confidence level based on the psychological and physiological changes. However, the results were presented is a quasi-experimental research design in visual analysis.

1.10 Theoretical Framework

The theoretical framework is organized to connect the theory to the development of intervention instrument. It is a guide for the research work and will help determine the parameters to be measured. Competitive anxiety can be managed and it is possible to enhance athletes 'performance, if the individual involved knows how to handle it. However, if an individual lets anxiety take over and does not manage it well, it can cause perceptual lessening, muscle stiffness and will feel worried on sport performance. This study focuses on novice volleyball athletes, who are unable to manage their pre-competitive anxiety level due to the low level of self-confidence. As identified in the literature review, there are some established methodologies in handling pre-competitive anxiety exists in sport today. Thus, cognitive behavioural theory (CBT) is also applied in this study (Luiselli & Reed, 2011).

Objectives of this study have been developed based on the cognitive behavioural therapy theory, to observe the effectiveness of the instrument in reducing pre-competitive anxiety and to enhance self-confidence. Addis et al., (2006) defined that cognitive behavioural theory (CBT) in sport is a treatment to reform negative

thought processes and it is widely observable on behaviour and cognitive structures. Meanwhile, Frodi et al., (2010) opined that cognitive behavioural theory (CBT) is able to enhance performance, thoughts and behaviours of an athlete. Luiselli & Reed (2011) had highlighted several cognitive behavioural theory (CBT) theory components such as goal setting, self-talk and mental rehearsal (imagery). This therapy will be involved during the intervention of 3D immersive environment by volleyball athletes.

At present, virtual reality is currently being used as a tool for cognitive behavioural therapy (CBT) and it is termed as virtual reality exposure therapy (VRET). Krijin et al., (2004) explained that virtual reality exposure therapy (VRET) is a combination of virtual reality and therapy, in which users are able to integrate with computer graphics, body tracking devices, visual displays and other sensory input devices. Users are allowed to immerse themselves in order to overcome their fears in a totally safe, controllable and repeatable situations through computer generated virtual environment. To ensure that users can immerse themselves during virtual reality exposure therapy (VRET), visual input, audio effect and sensory input are very important aspects to be emphasized during development of 3D virtual environment.

There is an important theory in this theoretical framework, which is identified as Paivio's analytic framework (1985) for imagery. The framework is recommended by Paivio (1985) and later operationalized by Hall, Mack, Paivio, and Hausenblas (1998). Paivio's conceptual model of imagery consists of five elements: cognitive specific (CS; imagery of skills), cognitive general (CG; imagery of game plans & strategies), motivational specific (MS; imagery of goal settings), motivational general-arousal (MG-A; imagery of stress, anxiety, and arousal), and motivational general-mastery (MG-M; imagery of being self-confident, mentally tough, focused, and positive). Thus, the 3D virtual environment will be designed by adhering to this theory with development of the competition environment and related games-play situation for volleyball athletes.

Instructional design method-technology based approach ADDIE (Analyze, Design, Development, Implementation and Evaluation) used to develop the intervention instrument. ADDIE model is a framework that consists of general processes: analysis, design, development, implementation and evaluation which are utilized as instructional design or training progress. Meanwhile, it is also characterized as a guideline for building an effective training tool. Through the integration of theories and models specified above in the treatment phase, it illuminates the positive outcome and the psychological and physiological changes within a time period.

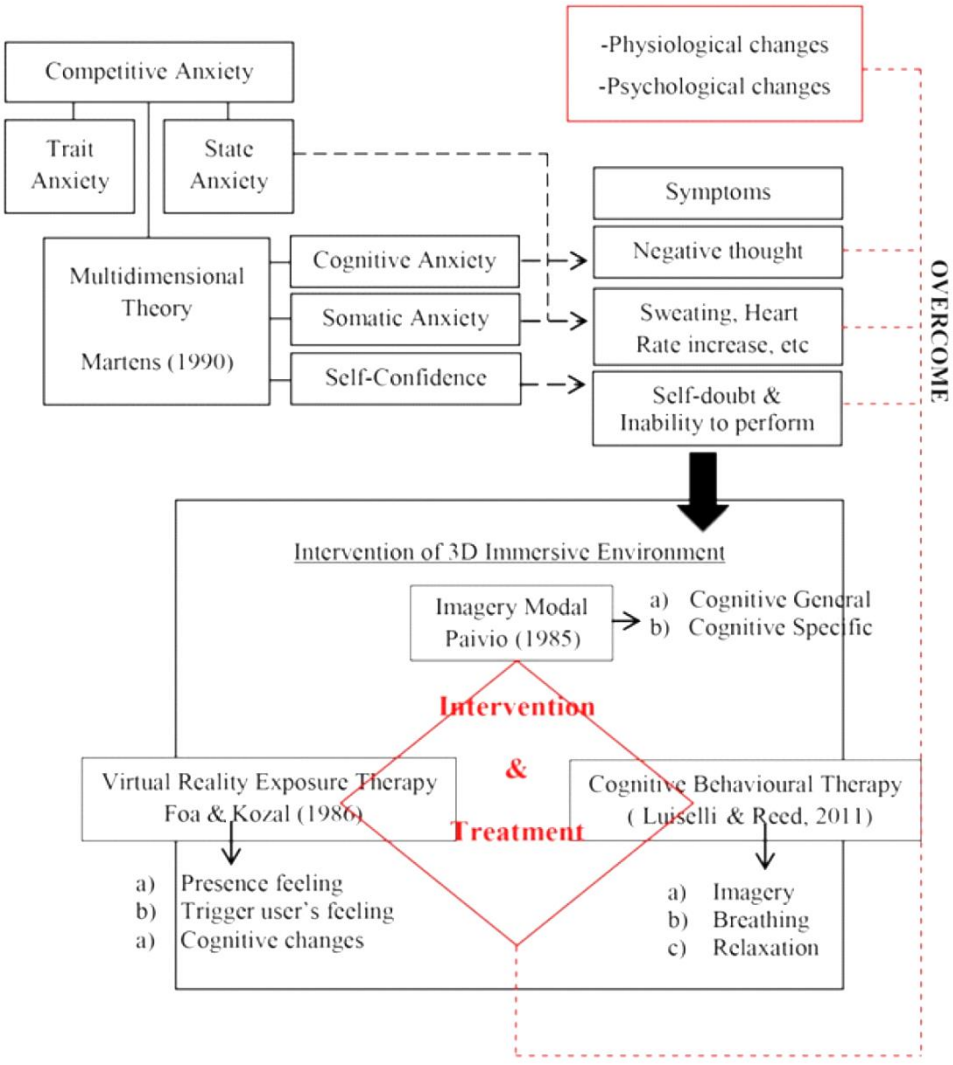

Figure 1.1: Theoretical Framework

1.11 Conceptual and Operational Definition

Several specialised terms are well-defined from different perspective to suit this study. Hence terms given below are the details of conceptual definitions and the operational terms which are equivalent to this study as described in this section.

1.11.1 Pre-Competitive anxiety

According to Jarvis (2006), competition can trigger an emotional state of anxiety and this condition usually occurs in every athlete involved in competition.

In this study, pre-competitive anxiety is an unpleasant feeling, which is able to influence on athletes emotions, changes their physiological conditions and could lessening their self-confidence and weaken their performance.

1.11.2 Sport psychology

Weinberg and Gould (2010) defined that sport psychology involved the combination of the field of kinesiology and psychology. It involved the study of how psychological factors influence on an athlete's performance and the process of how the athletes are affected by psychological and physical features during a tournament.

In this study, sport psychology is referred as one of the important elements in enhances athletes' pre-competitive state anxiety (cognitive anxiety and somatic anxiety) levels and self-confidence level.

1.11.3 Virtual environment

Burdea and Coiffet (2003) and Slater and Steed (2002) identified that virtual environment is an advanced technology, which is allow users to interact with 3D computer generated artificial by using their senses and skills.

In this study, virtual environment played as a computer-generated-simulated environment (3 dimensional graphic) and integrated it with Google cardboard HMD devices as a sport psychology tools. It allows athletes to drum up the presence feeling of competition situation in the non-physical world.

1.12 Summary

This chapter has delineated the characteristic of sport psychology and the importance of using psychological skills to address competitive anxiety issues. Competitive anxiety is the main factor that could adversely influence athletes' performance during competition periods. This chapter also briefly explained the specific guidelines to be supported in this study such as the theoretical framework and conceptual & operational definition. Besides that, this chapter also highlighted the development of 3D virtual environment which is the latest technology in sport psychology field and still new to be used to treat the anxiety level among athletes. The importance of this study is to create a 3D virtual environment as a psychological training tool in order to decrease the competitive anxiety level among volleyball athletes. The next chapter will discuss findings from the literature revie

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