The Effects of 3D Virtual Environment on Pre Competitive Anxiety among Volleyball Athletes

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Abstract: Virtual reality has been used as a common treatment for anxiety to improve athletes' performance. Pre-competitive anxiety in sports is considered as a critical issue for many athletes. The pre-competitive anxiety is able to hinder the athletes' performance. This study aims to investigate the effects of 3D virtual environment on pre-competitive anxiety in particular cognitive anxiety and somatic anxiety before and after the intervention of 3D virtual environment for experimental and control group among volleyball athletes. The quasi-experimental design included experimental group and a control group with 40 respondents in each group. The experimental group was given the intervention of 3D virtual environment, sport psychology training for 12 sessions in a month. However, for the control group there was no special training. The Competitive State Anxiety Inventory (CSAI-2) was used to measure the parameters of cognitive anxiety and somatic anxiety. To find out the effect of effects of 3D virtual environment on pre-competitive anxiety among the athletes, Kruskal Wallis test was obtained. The study findings showed that after the intervention 3D virtual environment experimental group, a significant difference was observed in somatic cognitive anxiety and anxiety. The main effect of group was significant in the test of anxiety in the post-test after controlling the effect of pre-test. The findings of this research revealed that the 3D virtual environment is able to help athlete in order to overcome their pre-competitive state anxiety.

Key words: 3D virtual environment, pre-competitive state anxiety, cognitive anxiety, somatic anxiety, volleyball athletes

INTRODUCTION

Virtual Reality (VR) has been developed and used as a research tool in psychology (Berger *et al.*, 2002; Bideau *et al.*, 2004). The VR is one of the technologies that break through psychological treatment plant and is effective in many fields including surgical training, flight simulator training, science, medicine, education, civil engineering, phobia therapy, military training and sports. The VR may provide athletes with the feeling of presence and essential information via interactive environment) (Bideau *et al.*, 2004). The VR system can be used to show to induce anxiety realistic 3D environment, allowing athlete's training capacity to adapt and that familiar with the situation of high pressure competition.

The VR has shown great potential and effectiveness in overcoming feelings of anxiety of patients undergoing this treatment. Virtual Reality Therapy (VRET) is a combination of virtual reality and therapy in which virtual reality is integrated with real-time graphics, computer, tracking device's body, visual displays and other sensory input devices to allow patients submerge and research through their fears in a completely safe, controllable and repeatable within a computer generated virtual environment situation (Bideau *et al.*, 2004). There are three conditions that must be followed in

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order to Exposure Therapy Virtual Reality (VRET) to be effective: participants need to feel present in the virtual environment in order to fully understand the environment, the virtual environment must be able to provoke emotions of the user, cognitive changes have to be generalizable to real-life situations. The VR Exposure Therapy (VRET) dynamically used in the therapy of mental health to provide treatment for a variety of phobias as: claustrophobia, acrophobia, arachnophobia, fear of public speaking and Posttraumatic Stress Disorder (PTSD) (Krijn *et al.*, 2004; Powers and Emmelkamp, 2008).

The VR could be used for the training of high stress among athletes for instance, the design of a noisy crowd in a game situation, specific environment and the restructuring of key situations during competitions. Therefore, VR also provides an imaging function for sports athletes. Skills images, sports athletes should be extended to operate the virtual reality tool to simulate game scenarios and tools to develop psychological skills. At the same time, virtual reality could help coaches and sports psychologists to control training classes. The physiological responses of the body of the athletes were similar to the situation of effective competition when athletes apply virtual environment as part of the training sessions. The situation in the real world can be matched with the reaction in the world of virtual reality (Bideau *et al.*, 2004). According neuropsychological, cognitive psychology and social sciences showed that the application of virtual reality at high performance is an accurate method etc., 2011. The VR allows athletes to run in the space of virtual environment with features and dynamic visual athletes can move your body to the appropriate shooting conditions present during the performance decisions. The VR can fully control the concentration of athletes because of the condition of stimulation are quite similar compared to the actual competition (Powers and Emmelkamp, 2008; Bideau *et al.*, 2010).

The pre-competitive state anxiety is involved with cognitive anxiety and somatic anxiety. The cognitive state anxiety and mental component which refers to the thought of anxiety and emotional distress accompanied by somatic anxiety (Bideau *et al.*, 2010; Parsons and Rizzo, 2008; Rothbaum *et al.*, 2006; Martinent *et al.*, 2010). However, the somatic anxiety is deeply intertwined with the physiological aspects of anxiety which involved physical symptoms such as palpitations, rapid breathing, increased blood pressure and 'butterflies' in the stomach feeling and muscle tension (Martinent *et al.*, 2010; Cox *et al.*, 2001). Thus, this study is to investigate the changes of

the cognitive anxiety and the somatic anxiety before and after the intervention of 3D virtual environment on experimental and control group among volleyball athletes.

Background of study: Recently, many sports psychologists and coaches are very concern about the pre-competitive state anxiety among the athletes. The Pr-competitive state anxiety had great influence on the performance of the athlete (Parsons and Rizzo, 2008; Le Unes and Nation, 1996; Dahl, 2013). There are specific situations that could lead to confusion among coaches and athletes such as athletes are reliable to reach the maximum performance level during the training but they cannot perform well during a tournament. Some athletes feel nervous (abnormal heartbeat, increased blood pressure and difficulty in breathing). The performance of elite athletes against the opponent could also be hampered by rowdy supporters at the stadium. Pre-competitive state anxiety has been acknowledged that it is one of the sport psychological factors that significantly hinder athletic performance (Dahl, 2013; Weinberg and Gould, 2007; Athan and Sampson, 2013). The pre-competitive anxiety is still considered as a critical issue for all athletes during the competition. Definitely, sports psychology is a mandatory element for achieving high performance. Athletes should be mentally prepared before the start of the competition and be able to manage your emotions during the competition.

MATERIALS AND METHODS

A total of 80 Malaysian volleyball athletes were selected randomly as respondents for this study from Springbreak League volleyball competition. A Competitive State Anxiety Inventory (CSAI-2) was used as a measurement tool to measure the pre-competition state anxiety level such as: cognitive anxiety, somatic anxiety. CSAI-2 is the most commonly used to measure pre-competitive state anxiety (Weinberg and Gould, 2007). CSAI-2 consists of 27 questions which involved three subscales of cognitive anxiety (9 items), somatic anxiety (9 items) and self-confidence (9 items) with Likert scale. Data analyzed using SPSS to conduct Kruskal Wallis test in order to study the effect of 3D virtual environment on PR-competitive anxiety.

RESULTS

Kruskal Wallis test was obtained to study the effect of 3D Virtual Environment on PR-competitive anxiety

Table 1: Kruskal wallis test for pre-test result

Variables	Cognitive anxiety	Somatic anxiety	Self confidence level
χ^2	0.082	0.360	0.026
df	1.000	1.000	1.000
Asymp. Sig.	0.774	0.549	0.871

Table 2: Kruskal wallis test for post-test result

Variables	Cognitive anxiety	Somatic anxiety	Self confidence level
χ^2	29.543	29.462	6.539
df	1.000	1.000	1.000
Asymp. Sig.	0.000	0.000	0.011

including cognitive anxiety, somatic anxiety and self confidence level for both pre test and post test in the control group and the experimental group. Table 1 shows that the cognitive anxiety statistical results are ($\chi^2 = 0.082$, df = 1 and Sig. = 0.774). The result of the somatic anxiety is ($\chi^2 = 0.360$, df = 1 and Sig. = 0.549). The result of self confidence level is ($\chi^2 = 0.026$, df = 1 and Sig. = 0.871). This result with p>0.05 indicated that the difference was not statistically significant for the cognitive anxiety, somatic anxiety and self confidence level.

Table 2 shows that the cognitive anxiety statistical results are ($\chi^2 = 29.543$, df = 1 and Sig. = 000). The result of the somatic anxiety are ($\chi^2 = 29.462$, df = 1 and Sig. = 0.000). The result of self confidence level are ($\chi^2 = 6.539$, df = 1 and Sig. = 0.011). This result with p<0.05 indicated that the difference was statistically significant for the cognitive anxiety, somatic anxiety and self confidence level for the post test between the control and experimental groups of others.

DISCUSSION

The study findings showed that after the intervention 3D virtual environment experimental group, a significant difference was observed in somatic cognitive anxiety and anxiety. The main effect of group was significant in the test of anxiety in the post-test after controlling the effect of pre-test. It was found that the intervention of the virtual 3D environment has reduced cognitive anxiety and somatic anxiety levels in the experimental group. Cognitive anxiety is always inversely proportional to the level of confidence and the non-appearance of the confidence of the athletes will experience cognitive anxiety and somatic anxiety (Athan and Sampson, 2013; Sheard and Golby, 2007). Somatic anxiety decreases mean that athletes are more relaxed and experience less anxiety and pressure. Consequently, your body will be more relaxed, breathing will be softer and pulse rate increases only slightly (Sheard and Golby, 2007; Cox *et al.*, 2003; Foa and Kozak, 1986). Therefore, the 3D virtual environment provides an environment of high tension and

volleyball athletes while volleyball athletes could take to deal with the unpleasant sensation. The combination of technology and virtual reality exposure therapy can help in reducing the level of anxiety of patients (Foa and Kozak, 1986).

The findings showed that the 3D virtual environment could help to decrease the cognitive and the somatic anxiety of athletes by applying 3D virtual reality in sports which provide real game scenarios, allow virtually volleyball athletes adapting to the competitive environment. In addition, the gradual exposure of crowd noise capable athlete's volleyball to reduce the level of anxiety (Rothbaum *et al.*, 2006; Foa and Kozak, 1986). Therefore, use of surgery, behavioral processes occur in the amygdale in the medial prefrontal cortex and during gradual exposure, structural changes in the hippocampus in the end of therapy (Hariri *et al.*, 2000).

However, there was no significant improvement observed in the control group. The reason that the control group showed no significant improvement because this group did not go through any specific sport psychology training as similar to the experimental group. Hereby it directed that the sport psychological training had 3D virtual environment influences on the criterion variables.

It is suggested that athletes could use the 3D virtual environment as sport psychology tools during off-season to enhance self-mental. However, further research is required to develop a CAVE system for volleyball athletes which is fully immersed in the computer-generated environment with a realistic point of view. Further, research with moderating factors that may influence the effect of using 3D on pre-competitive anxiety for the athlete's performance should be considered. Therefore there is a need for additional well-designed and adequately powered studies investigating the affective outcomes of VRET.

CONCLUSION

The assumption of this study is 3D virtual environment is able to help athlete in order to overcome their pre-competitive state anxiety among athletes. Thus, this study aims to investigate the changes of the cognitive anxiety and the somatic anxiety before and after the intervention of 3D virtual environment on experimental and control group among volleyball athletes. Competitive State Anxiety Inventory (CSAI-2) was used to measure the parameters of cognitive anxiety and somatic anxiety. The findings of this study determine that the experimental groups had shown significantly improved on the cognitive anxiety and somatic anxiety after undergoing an organized intervention of 3D virtual environment.

According to the results of this study it can be concluded that 3D virtual environment could assist to decrease athletes' cognitive and somatic anxiety. However, this study recommends further researches such as developing a CAVE system for volleyball athletes which is fully immersed in the computer-generated environment with a realistic point of view. Further research with moderating factors that may influence the effect of using 3D on pre-competitive anxiety for the athlete's performance should be considered.

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