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THE EFFECT OF SPORTS MASSAGE TOWARDS CORTISOL AND PRE-COMPETITION ANXIETY AMONG MALAYSIAN ELITE TENNIS ATHLETE

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Abstract Nowadays, psychological issues often occurs among elite athletes and were higher than the general population. However, this problem can be controlled by providing an appropriate intervention. In addition, studies on the impact of Sports Massage toward cortisol and pre-competition anxiety were still lacking in attention on tennis. Thus, this study was conducted to evaluate the effectiveness of Sports Massage intervention on cortisol and pre-competition anxiety. A total of 14 elite tennis athletes were participated in this study and were divided into treatment groups and control groups by using the Quasi-Experimental study design, quantitatively. Instruments used in this study were Enzyme-Linked Immunosorbent Assay (ELISA) and Competitive State Anxiety Inventory (CSAI-2). There were three phase of instrument measurement in this study namely pretest, first posttest and second posttest. Repeated Measures Two Way ANOVA was performed, there was a significant difference in the cognitive anxiety, somatic anxiety, and self-confidence ($p < 0.05$). However, there was no significant difference on cortisol ($p > 0.05$). These findings suggested as the basis for determining the effect of Sports Massage therapy towards cortisol level and pre-competition anxiety level among Malaysian elite tennis athlete.

Keywords Pre-competition Anxiety, Cortisol, Tennis

1. Introduction

The Malaysian contingent has been reported as the overall champion in the 2017 SEA Games tournament, with 145 gold, 92 silver and 86 bronze medals [1]. However, the national tennis athletes can only contribute one bronze medal in the 5 categories they participated in the 2017 Games [2]. The last time a national tennis athlete won a SEA Games gold medal was in 2001 [3]. This is a huge pressure on tennis practitioners in Malaysia and on the Lawn Tennis Association of Malaysia (LTAM).

For tennis, it is a sport that requires competencies of physical fitness, physiological, technical, environmental, and psychological [5, 48]. However, in this study, researcher was only focusing on psychological aspect because, although an athlete is competing in his 'own competition venue' before the competition there is also a spike in cortisol level [7]. This is showed by the national professional athletes such as Datuk Lee Chong Wei, Datuk Nicole David and Azizulhasni Awang are also no exception when confronting the issue of anxiety before they enter the competition [8].

In the context of sports psychology, anxiety is one of the psychological factors to be considered in ensuring athletes perform in good condition [9]. Pre-competition anxiety among athletes usually occurs within 24 hours until the time of the competition [10]. In pre-competition anxiety there are three key factors that need to be examined, namely cognitive anxiety, somatic anxiety, and self-confidence [11]. Anxiety was heightened as extremely important as the type of competition that athletes will go through [12]. On top of that, anxiety can cause a physiological stress response through an immediate increase in cortisol as the duration of the tournament approaches [13]. Cortisol has been widely used as a predictor of psychological stress [14, 15].

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National tennis athletes also need a new approach in the pre-competition phase to achieve strong preparation before participating in any tournament. In the context of sports science education in Malaysia, among the sports psychology skills training taught to students were breathing training, progressive muscle relaxation, imagery, and self-talk [49]. Thus, to increase the number of studies in the field of sports, researcher is strongly encouraged to explore the effectiveness of Sports Massage therapy as a contribution to the psychological aspects among national tennis athletes. This was in line with The National Sports Institute (ISN), whereby the objective is to conduct research to produce performance solutions, new knowledge applied in training as well as cost effective [6].

2. Research Objective

There are four (4) objectives in this study:

1. To measure the effectiveness of Sports Massage intervention and conventional training based on salivary cortisol among Malaysian elite tennis athletes.
2. To measure the effectiveness of Sports Massage intervention and conventional training based on cognitive anxiety among Malaysian elite tennis athletes.
3. To measure the effectiveness of Sports Massage intervention and conventional training based on somatic anxiety among Malaysian elite tennis athletes.
4. To measure the effectiveness of Sports Massage intervention and conventional training based on self-confidence among Malaysian elite tennis athletes.

3. Null Hypothesis

There are four (4) null hypotheses in this study:

Ho1: There is no significant changes in salivary cortisol between Sports Massage intervention and conventional training.
Ho2: There is no significant changes in cognitive anxiety between Sports Massage intervention and conventional training.
Ho3: There is no significant changes in somatic anxiety between Sports Massage intervention and conventional training.
Ho3: There is no significant changes in self-confidence between Sports Massage intervention and conventional training.

4. Literature Review

Pre-competition concerns need to be studied in detail and find the best solution or method. In addition, this effort needs to be made because the level of anxiety among athletes can influence the performance of athletes in the competitions they participate in [16]. Athletes are often shrouded in pre-competition anxiety before participating in any actual tournament. This is due to physical problems, fear of defeat, feelings of inadequacy, loss of control and guilt [17, 44].

In this study, Multidimensional Theory of Anxiety explained that there are three dimensions of the relationship namely cognitive anxiety, somatic anxiety, self-confidence in performance [18, 45]. Cognitive anxiety is a mental component caused by fear of negative self-assessment and threats to self-esteem [19, 20, 46]. Somatic anxiety, on the other hand, is related to physiological aspects of environmental anxiety that are directly related to physiological awakening. Physiological responses involve increased heart rate, increased respiratory rate, sweaty palms, abdominal discomfort, and muscle tension [21, 22]. While the aspect of self-confidence is a person's belief in facing the challenges of the task to be performed [23]. Figure 1 is a detail graph of cognitive anxiety, somatic anxiety, and self-confidence in performance in sports.

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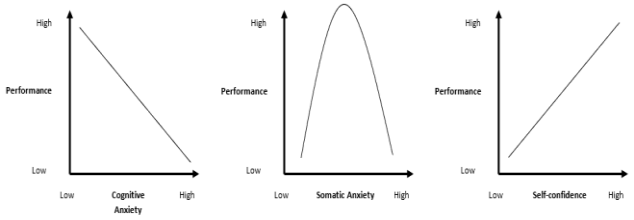

Figure 1. Graph of Multidimensional Theory of Anxiety

There are three types of graphs to be understood, namely, cognitive anxiety is assumed to have a negative linear relationship with performance, somatic anxiety is assumed to have quadratic (U-shaped inverted) relationships with performance, while self-confidence is hypothesized to have a positive straight line of relationships with performance [23, 25].

One of cortisol's primary roles is to cope with the mental or physical stressful condition of a person [26]. ACTH (adrenocorticotropic) stimuli control the cortisol secretion in the Adrenal Cortex. After passing through the Anterior Pituitary gland, ACTH is then regulated with CRH (corticotrophin-releasing hormone) [26, 47]. Generally, the stimulation of stress on an individual begins in the hypothalamus. Figure 2 illustrates the process of cortisol production and interaction in Hypothalamic-Pituitary-Arenal Axis (HPA Axis):

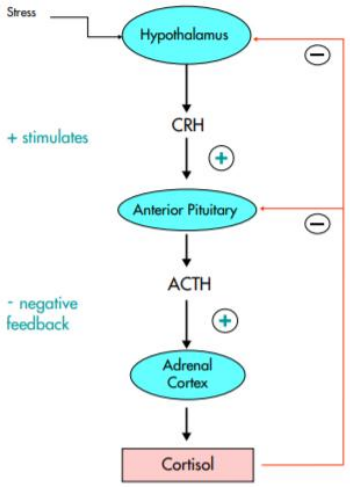

Figure 2. The process of cortisol interaction in HPA Axis. Figure was adopted from Les and Sami (2013)

The highest cortisol production rate occurs around 8.00 a.m. to 9.00 a.m., while this production decreases at night or at rest [27]. This statement is also supported by [28], the high cortisol production rate occurs at 7.00 a.m. to 9.00 a.m.

A review of the literature shows that Sports Massage therapy can be performed either in the pre-competition or post-competition phase to improve athlete performance, aimed at slowing down fatigue and assisting in the recovery process [29, 30]. Sports Massage is also applied along with other psychological skills such as self-talk, imagery, and mental rehearsal to address pre-competition anxiety among athletes [31]. For a long period of time, continuous Sports Massage therapy can reduce the level of anxiety especially for those who are so agitated [43].

Based on [32], there is a significant change in the study of Sports Massage therapy on cortisol that there is a decrease in cortisol levels after receiving massage therapy. These findings are in line with [33] and [35], there was a positive change after receiving the massage therapy intervention, which was a significant decrease in cortisol levels.

However, there are also study results that do not show significant differences after receiving sequence interventions from

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researchers. The first study conducted by [34] when respondents completed receiving massage therapy intervention, there was no significant decrease in cortisol levels. The second study was from [36] there was no significant decrease in cortisol after massage therapy was performed.

5. Methodology

The study design selected in this study was Quasi-Experimental study design, quantitatively. Researcher have established the sport of tennis at the professional level. All respondents consisting of 14 elite tennis athletes have the same characteristics of training specifically with the same coach, continuously and participating in international tennis tournament. All respondents were divided into treatment groups and control groups by using the Quasi-Experimental study design, quantitatively. Treatment group received Sports Massage intervention and conventional training provided by the researcher and coach. While control group just received conventional training provided by the coach.

Previous researchers have conducted research on tennis athletes using parametric analysis quantitatively even though the number of respondents in the study is less than 50 people (N = 21) [51]. Moreover, there were also research conducted on tennis athletes by using quantitative parametric analysis even though the number of respondents in the study was less than 50 people (N = 9) [52].

Researcher have decided that non-probability sampling (purposive sampling) has been used as a guideline for sampling procedures in this study. Non-probability sampling was used to select a sample when each subject in the population did not have the same opportunity to be selected as the study respondent. Purposive sampling refers to a non-probability sampling procedure in which a group of subjects with certain characteristics are selected as study respondents [37].

To ensure that the study ethic is adhered, the researcher first makes an application letter together with a data collection acknowledgment letter confirmed from the Faculty of Education, Universiti Kebangsaan Malaysia (UKM) to the several tennis associations in peninsular Malaysia. There were only two tennis associations agreed to provide elite tennis athlete in this study. The researcher also provided information, consent and ethics recognition forms to the respondents to be directly involved in this study.

The Sports Massage therapy protocol in this study was adapted from [38]. There was 4 technique applied in this therapy, which is Effluerage, Petrissage, Friction and Tapotament. This study was assisted by qualified sports masseurs. Sports masseurs began therapy gradually from the lower body until upper body of the athlete. Each respondent received 9 therapy sessions and conducted for 3 weeks continuously. Each session performed for 27 minutes. The total amount of intervention time that has been allocated to the athlete is 243 minutes. Each repetition of the technique is 8.4 seconds. The equipment that required for the intervention was portable massage bed, massage oil, towel, stopwatch, and a room.

This study consists of 2 instrument which is Competitive State Anxiety Inventory – 2 (CSAI-2), to evaluate the pre-competition anxiety and the Enzyme-Linked Immunosorbent Assay (ELISA) by using the Salimetrics Salivary Cortisol Enzyme Immunoassay Kit [39], to access the cortisol level. Table 1 show an assessment of anxiety level before the competition according to the components of the CSAI-2 questionnaire.

CSAI-2 have undergone a pilot test and Cronbach's Alpha results show that the reliability was 0.709. The correlation between saliva and Salimetrics serum kit is high, $r(47) = 0.91$, $p < 0.0001$. Both instrument tests in this study were performed one day before the first intervention (pre-test), one day after the last intervention (post-test). On the other hand, researcher decided to collect the saliva sample at 8.00 a.m. on pre-test and post-test.

Before determining the type of statistical test in research, it is important for researchers to conduct normality tests so that the observed data are from the normally scattered study population [40]. Based on [41] in [42], the use of Shapiro-Wilk analysis is limited to study samples less than 50 ($N < 50$). Therefore, the researchers conducted a Shapiro-Wilk analysis, as in this study there were only 7 respondents. [37] asserts that the normality of the data can also be measured from the values of Skewness and Kurtosis. Requirement for identifying normally distributed data, Skewness and Kurtosis values should be located between -1.96 and +1.96. Table 3 represent the result of Skewness and Kurtosis in cognitive anxiety, somatic anxiety, self-confidence, and cortisol.

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	Skewness	Kurtosis
Cognitive anxiety	.529	-.963
Somatic Anxiety	1.340	1.868
Self-confidence	-.783	.229
Cortisol	.625	-1.192

Table 3. Result of Skewness and Kurtosis in this study.

This result shows that the value of skewness and kurtosis is between -1.96 and +1.96. Thus, researcher decided to use the Repeated Measures Two Way ANOVA in this study.

6. Results

Table 6 report the result of Repeated Measures Two Way ANOVA of cortisol level and pre-competition anxiety level among elite tennis player before and after intervention of Sports Massage therapy.

	Wilks's Lambda	F	Df Between group	Df Within group	Sig
Cortisol	0.948	0.302	2	11	0.745
Cognitive anxiety	0.393	8.504	2	11	0.006
Somatic anxiety	0.570	4.151	2	11	0.045
Self-confidence	0.579	4.006	2	11	0.049

Table 6. Repeated Measures Two Way ANOVA of cortisol and pre-competition anxiety.

Based on Table 6, the results of the analysis show that there was no significant difference in term of cortisol among elite tennis athlete, Wilks' $\lambda = 0.948$, $F(2, 11) = 0.302$ dan $p = 0.745$ ($p > 0.05$). Thus, the first null hypothesis was failed to reject.

However, there was a significant difference in term of cognitive anxiety, Wilks' $\lambda = 0.393$, $F(2, 11) = 8.504$ dan $p = 0.006$ ($p < 0.05$), somatic anxiety, Wilks' $\lambda = 0.570$, $F(2, 11) = 4.151$ dan $p = 0.045$ ($p < 0.05$), and self-confidence, Wilks' $\lambda = 0.579$, $F(2, 11) = 4.006$ dan $p = 0.049$ ($p < 0.05$) among elite tennis athletes. Thus, the second until forth null hypothesis was rejected.

Table x showed mean scores and standard deviations of cognitive anxiety level between treatment group and control group for the three phases. Figure x showed comparative graph of the level of cognitive anxiety between the treatment group and the control group for the three phases of the test.

Phase	Group	Mean	Std. Deviation	N
Pretest	Treatment	3.25	0.153	7
	Control	2.87	0.342	7

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1st posttest	Treatment	2.74	0.366	7
	Control	2.87	0.335	7
2nd posttest	Treatment	2.31	0.636	7
	Control	2.82	0.512	7

Table x Mean scores and standard deviations of cognitive anxiety level between treatment group and control group

Treatment Control

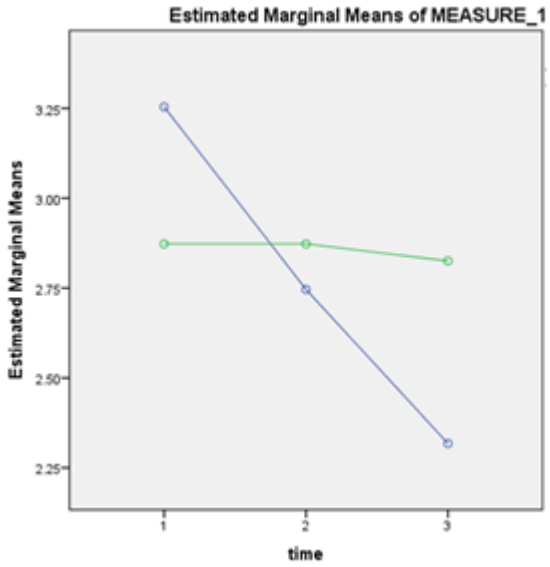

Figure x Comparative graph of the level of cognitive anxiety between the treatment group and the control group for the three phases of the test.

Based on the Table x and Figure x, researcher concluded that elite tennis athletes who received Sports Massage interventions have successfully reduced the level of cognitive anxiety to a lower level than conventional training.

Table x showed mean scores and standard deviations of somatic anxiety level between treatment group and control group for the three phases. Figure x showed comparative graph of the level of somatic anxiety between the treatment group and the control group for the three phases of the test.

Phase	Group	Mean	Std. Deviation	N
Pretest	Treatment	1.93	0.378	7
	Control	2.28	0.338	7
1st posttest	Treatment	2.87	0.473	7
	Control	2.34	0.397	7
2nd posttest	Treatment	1.88	0.528	7
	Control	2.31	0.510	7

Table x Mean scores and standard deviations of somatic anxiety level

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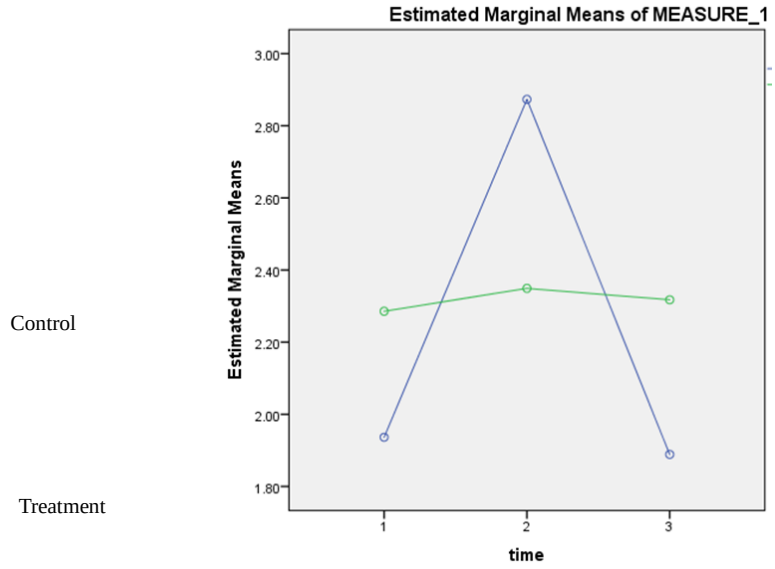

Figure x Comparative graph of the level of somatic anxiety between the treatment group and the control group for the three phases of the test

Based on the Table x and Figure x, researcher concluded that elite tennis athletes who received Sports Massage interventions had shown a more significant change in somatic anxiety levels than conventional training.

Table x showed mean scores and standard deviations of self-confidence level between treatment group and control group for the three phases. Figure x showed comparative graph of the level of self-confidence between the treatment group and the control group for the three phases of the test.

Phase	Group	Mean	Std. Deviation	N
Pretest	Treatment	2.46	0.342	7
	Control	2.80	0.139	7
1st posttest	Treatment	3.09	0.564	7
	Control	2.80	0.254	7
2nd posttest	Treatment	2.92	0.419	7
	Control	2.87	0.260	7

Table x Mean scores and standard deviations of self-confidence level

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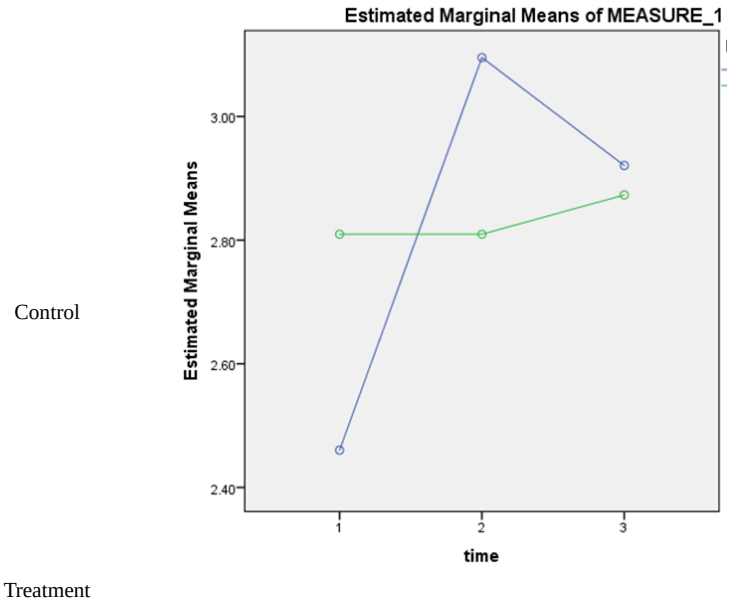

Figure x Comparative graph of the level of self-confidence between the treatment group and the control group for the three phases of the test

Based on the Table x and Figure x, researcher concluded that elite tennis athletes who received Sports Massage intervention have shown a higher level of self-confidence than conventional training.

7. Discussion and Conclusion

The result showed that Sports Massage has a significant effect towards pre-competition anxiety which is cognitive anxiety, somatic anxiety and self-confidence among Malaysian elite tennis athlete. This result support the findings by [43] continuous Sports Massage therapy can reduce anxiety levels particularly for those who are so agitated.

Meanwhile, result showed that Sports Massage has no significant effect towards cortisol among Malaysian elite tennis athlete. This result support the findings by [34] and [36] there was no significant decrease in cortisol levels after respondents completed undergoing massage treatment intervention.

Indeed, Sports Massage therapy has been an efficient approach to help Malaysian elite tennis athletes to handle pre-competition anxiety issues. Researchers in this study would like to suggest adding Sports Massage therapy as sports psychology skills training in sports science education in Malaysia. Future researchers are advised to add control group, increase the number of respondent, and also add on other aspect such as biomechanics, nutrition, physical fitness and tactical in tennis. It is hoped that one day, Malaysia will have a star tennis athlete who is ranked in the top 10 in the world.

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