

## Effects of Progressive Muscle Relaxation and Internal Imagery on Competitive State Anxiety Inventory – 2R among Taekwondo Athletes

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**Abstract** – The aim of this study was designed to compare the effects of two different techniques, namely progressive muscle relaxation (PMR) and internal imagery on state anxiety among taekwondo players in Malaysia and Iran. The method was designed by eighty eight taekwondo players (Mean age: 12.79) were randomly assigned into 4 groups, 1) imagery exercise, 2) progressive muscle relaxation, (PMR) 3) combined imagery exercise and progressive muscle relaxation and 4) control group. The experimental sessions consisted of 2 times per week. CSAI-2R has been measured after the 8<sup>th</sup>, 16<sup>th</sup>, 24<sup>th</sup> session of intervention and the measurement was repeated after the completion of 24<sup>th</sup> session of follow up (without any intervention). Using 4 (groups) x 5 (trials) repeated measured ANCOVA, the results revealed significant difference in somatic anxiety in Malaysia. In somatic, cognitive anxiety and self confidence significant difference was found between experimental groups. Hence, it is concluded that these two techniques have effects on reduce somatic and cognitive anxiety and increase self confidence in Malaysian and Iranian taekwondo players.

**Keywords**- progressive muscle relaxation, Internal imagery, Competitive state anxiety.

### 1. Introduction

Stress and anxiety produce situations can affect athletes by negatively affecting performance, which can even lead to the concept of choking [3]. Davidson and Schwartz suggest it is important for athletes to control their anxiety to achieve peak performance [4] and also many researchers indicate a relationship exists between anxiety and performance during competition [6]. There are two major reasons why athletes are more likely to experience anxiety than non-athletes: First, athletic performances take place in front of people, whereby they can assess the success or failure of the athlete. Secondly, the amount of success an athlete experiences is measurable, such as distance, scores, times, winning, and losing [14]. Several techniques are available and can be categorized as mental training and physical relaxation such as progressive muscle relaxation which is a physical relaxation technique in which an individual learns to achieve the goal of stress reduction by becoming aware of tensions in various muscle groups and then relaxing them one at a time throughout the body [7] and internal imagery is cognitive practice of a physical skill without obvious physical performance and effects on increase physical performance, and self confidence and decreased anxiety [11]. Some of the researcher believed that the effects of various relaxation and imagery techniques may differ on several dimensions and every technique also has specific effects [1]. For instance Nassau believed progressive muscle relaxation is a process that involves decreasing the physiological aspects of anxiety while distracting the individual from their awareness of anxious feelings. And imagery is a cognitive function of the mental skill which plays an important role in learning [10]. Weinberg et.al (1981) examined the effects of visual-motor behavior rehearsal on performance in karate using 32 male karate students aged 18-24 and assigned to four groups. After the six weeks of training the relaxation and VMBR groups showed less precompetitive state anxiety than the imagery and attention-placebo groups [19]. In contrast, Ryska used goal setting, relaxation, mental imagery, attention control, and positive self-talk and reported lower anxiety

in recreational athletes. Specifically, Ryska found goal setting and attention control contributed to lower cognitive state anxiety, whereas attention control, imagery, and relaxation techniques resulted in lower somatic state anxiety [15]. Additionally, Romero (1990) explained mental imagery is an effective strategy which at reducing pre-competitive anxiety, but suggested a more effective strategy is to combine mental imagery with relaxation techniques [16]. In another study indicated the effectiveness of using mental imagery on controlling anxiety in novice climbers. The researchers reported novice climbers showed significantly lower levels of perceived stress before, as well as during the climb [7]. In contrast, Wollman et al. (1985) provided training in relaxation, imagery, attention focusing and positive mental attitude to professional bowlers and found a significant negative effect. The training, however, was accomplished in one lecture, with a small sample size [20] and also Sloman didn't find any significant differences for improve between PMR and imagery and control group. In this study variables were measured immediately after intervention and they have 4 intervention sessions [1]. Indeed, it is not clear how many sessions are required before mastery of technique is achieved and effects are produced. Some researchers have found 18 sessions of PMR have reduced in anxiety [18]. Another study with 24 sessions of PMR among children and adolescents (6-14yrs) has shown level of anxiety which were significantly reduced for the PMR group [2]. In another research, they did not find any significant difference between 5 and 10 sessions training [9]. In another research after eight weeks of mental training on anxiety among 56 college soccer players, they did not find significant differences between groups [12]. The type of methodology effect on results for example some of the study measured variables immediately after completing the training but some study give attention to long term effects. In this regard, there is need to identify appropriate combination which is important to ensure its effectiveness, identify the effects of extended sessions of both imagery and PMR training and identify the long term effects of extended sessions of both imagery and PMR training. In terms of skills acquisition, although internal imagery and PMR have suggested producing the best effects, contradictory findings were still found in the literature. Therefore the aim of this study is investigated in progressive muscle relaxation and imagery on psycho physiological parameters, psychomotor, and physical performance among adolescent Taekwondo athletes.

## **2. Methodology**

### **2.1. Participants**

This study consisted of two phases. The first phase was conducted in Malaysia and second phase was conducted in Iran. Eighty eight taekwondo players (Malaysia taekwondo players=40, Iranian taekwondo players =48) aged 8-17 years were recruited in this study. The subjects reported that they had never received any relaxation and imagery.

### **2.2. Instrument**

Questionnaire: Competitive state anxiety inventory [13] that assesses cognitive anxiety (five items), somatic anxiety (seven items) and self-confidence (five items) among taekwondo players. CSAI-2R consists of 17 items. Relaxation and imagery instrumentation: pre-recorded progressive muscle relaxation and internal imagery were used for relaxation and imagery training along with other relaxation and imagery training accessories (e.g., mats, CD players and headphone). The relaxation instructions followed a script proposed by Greenberg [5].

### **2.3. Procedures**

Permission to conduct the study was obtained from the relevant authorities. Furthermore, the study protocol was approved by the Research Ethics' Committee (Human) of the author's institution. Three coaches provided scores of the participants' reverse swing kick technique at the baseline measurement and the groups were matched according this score, age and gender. They were then randomly assigned into 4 groups, 1) imagery exercise, 2) progressive muscle relaxation, (PMR) 3) combined imagery exercise and progressive muscle relaxation and 4) control group. Relaxation, imagery and combined group listened to pre-recorded audio-tape two times per week. Competitive state anxiety questionnaire was measured after 8<sup>th</sup>, 16<sup>th</sup>, 24<sup>th</sup> intervention session. The measurement were repeated (without any intervention) after 3 months (24 sessions) of completion of intervention.

### 3. Statistic Analysis

Two statistical analyses were used. Descriptive statistics were used for data screening and two way repeated measurements ANCOVA was used to examine between groups differences. Data were analyzed using SPSS (V. 18).

#### 3.1. Study I

##### Results

The data were checked for accuracy, distributional properties, and missing values. No missing values or outliers were present, and the distributional properties were within normal range. Descriptive statistics are presented in Tab: 1.

Table 1. Means and S.D. Values For Measured Parameters in the Four Experimental Groups Across the Experimental Trial

	Group	Cognitive Anxiety		Somatic Anxiety		Self Confidence	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
First measurement	Control	10.6250	4.10357	12.0000	3.31662	12.2500	2.76457
	Relaxation	9.3750	3.02076	14.0000	4.14039	10.5000	3.11677
	Combine	9.1111	2.08833	13.2222	2.86259	13.1111	1.69148
	Imagery	9.2222	2.43812	12.5556	3.46811	12.6667	3.35410
Second measurement	Control	10.1250	3.60307	11.6667	2.34521	12.3750	4.06861
	Relaxation	9.1250	2.23207	11.8750	2.74838	11.2500	2.49285
	Combine	8.6667	2.06155	11.5556	3.24465	13.5556	2.45515
	Imagery	9.1111	2.71314	11.8889	4.01386	12.8889	2.36878
Third measurement	Control	10.1250	3.60307	12.3333	4.30116	11.5000	2.77746
	Relaxation	9.1250	2.23207	12.0000	3.38062	11.7500	4.26782
	Combine	8.6667	2.06155	10.7778	3.23179	14.4444	3.74537
	Imagery	9.1111	2.71314	10.7778	2.99073	13.2222	3.86580
Fourth measurement	Control	10.3750	2.92465	13.2222	2.90593	11.5000	1.85164
	Relaxation	7.3750	2.38672	11.5000	3.96412	12.1250	2.69590
	Combine	7.3333	2.17945	9.6667	2.29129	15.2222	3.66667
	Imagery	6.5556	1.33333	9.5556	1.74005	14.4444	4.41902
Fifth measurement	Control	10.2500	3.49489	12.1111	3.37062	10.3750	4.37321
	Relaxation	6.7500	1.98206	8.0000	2.44949	14.5000	1.92725
	Combine	6.3333	2.50000	8.0000	2.23607	16.2222	2.81859
	Imagery	5.5556	1.87824	7.4444	1.2360	15.5556	2.40370

The differences in the State Anxiety scores across the independent variables were analyzed using two way repeated measurements ANCOVA and for measurement between groups LSD post hoc has been used. Based on Mauchly's test of sphericity, no significant differences in the variances of the differences in all of the subscales were found across the test sessions. Therefore, the assumption of the homogeneity of variance was met. The results revealed in somatic anxiety were found significant differences between groups. In the fourth measurement the control group has significant difference with the combined and imagery group ( $p < 0.00$ ) and in the fifth measurement the control group has significant difference with the relaxation, imagery and combined group ( $p < 0.00$ ) and no significant differences were not discovered in cognitive anxiety and self confidence.

Table 2. Compare Groups in Across Five Measurements of Somatic Anxiety

Times	Groups	Groups	Mean Difference	Std. Error	P value
Fourth measurement	Control	Relaxation Group	1.763	1.412	0.222
		Combined Group	3.563*	1.348	<b>0.013</b>
		Imagery Group	3.682*	1.349	<b>0.011</b>
	Relaxation	Combined Group	1.800	1.408	0.211
		Imagery Group	1.919	1.404	0.182
		Combined Group	-0.119	1.348	0.931
Second measurement	Control	Relaxation Group	3.924*	1.227	<b>0.003</b>
		Combined Group	4.095*	1.171	<b>0.002</b>
		Imagery Group	4.635*	1.172	<b>0.000</b>
	Relaxation	Combined Group	0.171	1.223	0.890
		Imagery Group	0.711	1.220	0.565
		Combined Group	-0.540	1.171	0.648

#### 3.2. Study II

##### Results

The data were checked for accuracy, distributional properties, and missing values. No missing values or outliers were present, and the distributional properties were within normal range. Descriptive statistics are presented in Tab: 3.

Table 3. Means and S.D. Values for Measured Parameters in the Four Experimental Groups Across the Experimental Trial

	Group	Cognitive Anxiety		Somatic Anxiety		Self Confidence	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
First measurement	Control	11.0000	2.98481	15.3333	4.51932	13.1667	4.68718
	Relaxation	10.0000	3.33030	14.1667	4.74501	13.5833	2.77843
	Combine	11.4167	2.53909	16.0833	3.94181	13.2500	3.27872
	Imagery	9.9167	2.74552	16.4167	4.73782	12.1667	3.37998
Second measurement	Control	11.4167	2.81096	16.0833	3.55370	12.5000	1.16775
	Relaxation	6.6667	1.55700	10.2500	2.45412	15.0000	3.19090
	Combine	8.7500	2.83244	11.1667	3.04014	15.3333	2.14617
	Imagery	9.3333	2.80692	13.0833	3.62963	13.1667	1.40346
Third measurement	Control	11.6667	2.46183	15.9167	4.05549	12.5833	1.88092
	Relaxation	6.5833	1.62135	9.9167	1.83196	15.0833	2.46644
	Combine	8.3333	1.66969	10.1667	2.24958	15.4167	2.42930
	Imagery	8.5833	2.60971	12.0833	2.64432	13.5000	1.93061
Fourth measurement	Control	11.5833	1.16450	15.9167	2.60971	12.8333	1.89896
	Relaxation	8.0000	.98473	9.8333	1.58592	15.4167	1.72986
	Combine	8.0000	2.04495	10.3333	2.22928	15.7500	2.09436
	Imagery	8.4792	1.34840	11.7500	2.22077	13.8333	2.24958
Fifth measurement	Control	11.1667	1.89896	16.4167	2.19331	12.0833	2.50303
	Relaxation	6.5833	0.66856	10.1667	1.40346	16.1667	1.64225
	Combine	7.9167	1.16450	10.3333	1.82574	16.1667	1.58592
	Imagery	7.7500	1.35680	11.9167	3.02890	17.0833	1.24011

The differences in the State Anxiety scores across the independent variables were analyzed using two way repeated measurements ANCOVA and for measurement between groups LSD post hoc has been used. Based on Mauchly's test of sphericity, no significant differences in the variances of the differences in all of the subscales were found across the test sessions. Therefore, the assumption of the homogeneity of variance was met. The results revealed significant differences between groups in somatic anxiety. The second, third and fourth measurement control group has significant difference with the experimental groups ( $p < 0.00$ ) and relaxation group has significant difference with imagery group ( $p < 0.00$ ) in fifth measurement control group has significant difference with experimental group ( $p < 0.00$ ) and relaxation group has significant difference with imagery group and imagery group has significant difference with combined group.

Table 5. Compare Groups in Accroce Five Mesurements of Cognitive Anxiety

Times	Groups	Groups	Mean Difference	Std. Error	P value
Second measurement	Control	Relaxation Groups	4.750*	1.045	0.000
		Combined Group	2.667*	1.045	0.014
		Imagery Groups	2.083	1.045	0.052
	Relaxation	Combined Group	-2.083	1.045	0.052
		Imagery Groups	-2.667*	1.045	0.014
	Imagery	Combined Group	0.583	1.045	0.580
Third measurement	Control	Relaxation Group	5.083*	0.873	0.000
		Combined Group	3.333*	0.873	0.000
		Imagery Group	3.083*	0.873	0.001
	Relaxation	Combined Group	-1.750	0.873	0.051
		Imagery Group	-2.000*	0.873	0.027
	Imagery	Combined Group	0.250	0.873	0.776
Fourth measurement	Control	Relaxation Group	5.250*	0.589	0.000
		Combined Group	3.583*	0.589	0.000
		Imagery Group	3.583*	0.589	0.000
	Relaxation	Combined Group	-1.667*	0.589	0.007
		Imagery Group	-1.667*	0.589	0.007
	Imagery	Combined Group	1.480	0.589	1.000
Fifth measurement	Control	Relaxation Group	4.583*	0.550	0.000
		Combined Group	3.250*	0.550	0.000
		Imagery Group	3.417*	0.550	0.000
	Relaxation	Combined Group	-1.333*	0.550	0.019
		Imagery Group	-1.167*	0.550	0.039
	Imagery	Combined Group	-0.167	0.550	0.763

Table 4. Compare Groups in Across Five Measurements of Somatic Anxie and Self Confidence

Times	Groups	Groups	Somatic anxiety			Self confidence		
			Mean Difference	Std. Error	P value	Mean Difference	Std. Error	P value
Second measurement	Control	Relaxation Groups	5.833*	1.308	0.000	-2.500*	0.869	0.006
		Combined Group	4.917*	1.308	0.027	-2.833*	0.869	0.002
		Imagery Groups	3.000*	1.308	0.487	-.667	0.869	0.447
	Relaxation	Combined Group	-0.917	1.308	0.036	-.333	0.869	0.703
		Imagery Groups	-2.833*	1.308	0.150	1.833*	0.869	0.041
	Imagery	Combined Group	1.917	1.308	0.000	-2.167*	0.869	0.016
Third measurement	Control	Relaxation Group	6.000*	1.152	0.000	-2.500*	0.896	0.008
		Combined Group	5.750*	1.152	0.002	-2.833*	0.896	0.003
		Imagery Group	3.833*	1.152	0.829	-.917	0.896	0.312
	Relaxation	Combined Group	-0.250	1.152	0.067	-.333	0.896	0.712
		Imagery Group	-2.167	1.152	0.103	1.583	0.896	0.084
	Imagery	Combined Group	1.917	1.152	0.000	-1.917*	0.896	0.038
Fourth measurement	Control	Relaxation Group	6.083*	0.895	0.000	-2.583*	0.818	0.003
		Combined Group	5.583*	0.895	0.000	-2.917*	0.818	0.001
		Imagery Group	4.167*	0.895	0.579	-1.000	0.818	0.228
	Relaxation	Combined Group	-0.500	0.895	0.038	-.333	0.818	0.685
		Imagery Group	-1.917*	0.895	0.121	1.583	0.818	0.059
	Imagery	Combined Group	1.417	0.895	0.000	-1.917*	0.818	0.024
Fifth measurement	Control	Relaxation Group	6.250*	0.896	0.000	-4.083*	0.736	0.000
		Combined Group	6.083*	0.896	0.000	-4.083*	0.736	0.000
		Imagery Group	4.500*	0.896	0.853	-5.000*	0.736	0.000
	Relaxation	Combined Group	-0.167	0.896	0.057	.000	0.736	1.000
		Imagery Group	-1.750	0.896	0.084	-.917	0.736	0.220
	Imagery	Combined Group	1.583	0.896	0.763	.917	0.736	0.220

Cognitive anxiety results have shown significant difference in control group with experimental groups ( $p < 0.00$ ) and relaxation group has significant difference with combined and imagery groups ( $p < 0.00$ ). results finding about self confidence demonstrated that control group has significant difference with relaxation and combined groups but, relaxation group with imagery and imagery with combined group have significant differences in the second, third and fourth measurements and in fifth measurement control group only has significant difference with experimental groups.

#### 4. Discussion

Little is known about the effect of progressive muscle relaxation and internal imagery and the relative effectiveness on state anxiety among taekwondo athletes. The present study indicated that 24 sessions of relaxation, imagery and combined training induced long term effects on the state of anxiety in Malaysia and Iran. We found 24 sessions were enough to stabilize the effects of both of PMR and IM in these samples, but it is difficult to ascertain the number of secessions required for trainee to have sufficient with technique. In fact, in researches review Zaichkowsky and Zaichkowsky and Chiang et al found significant differences between 18 sessions and 24 sessions of relaxation training on anxiety [18, 2]. And in contrast some study did not find any significant differences during the measurement variables after 5 and 10 sessions interventions [9] and also in another research, they did not find significant difference between groups during 8 weeks of mental training [12]. The results of the present study shown significant reduction in somatic anxiety for combined, imagery and relaxation groups compare control group and experimental groups have significantly reduced in somatic anxiety after the completion 24 sessions of follow up. In this regard Ryska found both of these techniques reduced somatic anxiety between tennis players. Imagery, relaxation and combined groups have improved in reducing cognitive anxiety during the measurement even after the follow up. The experimental groups also have improved in self confidence after the post and follow up measurement. The Iran results in somatic anxiety have shown that imagery group was significantly better than the other groups and all experimental groups significantly better than the control group after follow up. Weinberg et.al in comparison to relaxation and imagery during 6 weeks training found that relaxation group has lower [19]. We have used 24 training sessions and also sample size was more than 8 subjects in every group, but in this research they had less numb theses subjects and training sessions. In cognitive anxiety all experimental groups has been significantly better that control group. Combined and imagery group has significantly better

than relaxation group. However they have similar lower of cognitive anxiety after follow-up. Romero demonstrated combined relaxation and imagery as a more effective strategy in reducing anxiety [16] but Wolman indicated bowler and runner did have significant differences. [20]. Experimental groups have significantly lower. Combined groups have significantly better than relaxation and imagery group in self confidence. After the follow up's measurement all experimental groups are significantly better than the control group. In contrast Martin studied about effect progressive muscle relaxation and imagery among soccer players and the authors did not found any significant difference between experimental and control groups. They measured anxiety five minutes before competition [12], but variables in present study were measured after the completion relaxation training and in resting condition. In comparison results in the variables of all three experimental groups have lower somatic anxiety but in Iran all three groups have significantly lowly in all subscales.

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