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Dr. Ekta Bhambri
Associate Professor, Department
of Applied Psychology, S.P.M
College (W), Punjabi Bagh West,
University of Delhi, New Delhi,
India

Corresponding Author:
Dr. Ekta Bhambri
Associate Professor, Department
of Applied Psychology, S.P.M
College (W), Punjabi Bagh West,
University of Delhi, New Delhi,
India

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Effect of biofeedback assisted psychological interventions of anxious sports persons

Dr. Ekta Bhambri

Abstract

The present study was aimed at examining the effect of biofeedback assisted training methods such as Progressive Muscle Relaxation, Imagery, and combination of the two on anxiety, electrodermal response & performance of Table-Tennis players. The study was carried out on 80 Table –Tennis players in the age group of 12-17 years. The I.P.A.T anxiety test by Cattell & Scheier (1963) was administered to assess the anxiety level both covert and overt anxiety of the sportspersons, electro Dermal Response consisting of Basal value and Relaxation value was also measured. Only players who were scoring high/medium on the anxiety test were selected, and each group consisted of 20 individuals, 3 experimental groups were provided with different intervention. The data obtained was analyzed using correlation, ANOVA, and t test. The sports persons were subjected to 30 minutes, 6 days a week for 3 weeks: Biofeedback assisted Progressive Muscle Relaxation training on electrodermal response (Grp1), another group of sports persons were subjected to Imagery training (Grp2) third group was subjected to combination of Biofeedback assisted Progressive Muscle Relaxation & Imagery (Grp3). The results indicate that all the 3 psychological interventions enhanced performance of sports persons.

Keywords: anxiety, electrodermal response, biofeedback, progressive muscle relaxation, imagery

Introduction

It has been seen that Competitive Sports and anxiety are linked to each other. Anxiety in sports has been one of the most researched topics as it is one of the major factors which effects performance and is present at various levels of sports participation ranging from lowest level (district level) to the highest level (Olympics) of participation. The primary focus of coaches and sportspersons is to know how one can deal with such situations and avoid such types of condition to occur in sports activities. The reduction of anxiety is contemporary cultural concern and forms the substance of many popular self-help books. A poll of 458 wrestlers from 13-19 years of age who were involved in 1981 national championship competition in America, found that these elite competitors characterized themselves as being nervous or worried in 66% of their matches (Gould, *et al.* 1983)

Anxiety is one of the most common problem faced by sports persons, especially for those engaged in individual sports and for those in ‘exposed’ or isolated positions in team sports such as goalkeepers in football and hockey. Anxiety in context of sports is considered as a typical response to a situation where an athlete’s skills are being assessed. Anxiety is usually characterized by a varied types of physiological responses (e.g., sweating, increased heart rate), behavioral (e.g., biting fingernails, fidgeting), and/or cognitive (e.g., negative thoughts, inattention) signs and symptoms (Weinberg and Gould, 2015) ^[19]. It is significant to take note that sport-related anxiety is thought to be an unpleasant response mostly associated with the stress of participating in sport.

The relationship between anxiety and performance has received extensive investigation over many years. Yerke Dodson (1908) ^[21] carried out the classical studies *and* their findings verified by numerous subsequent researches, indicates that there is an optimum level of anxiety which is facilitates performance with both low and high levels of anxiety being associated with relatively poor standards of play. Performance improves up to an optimum level of anxiety beyond which there is a decline. The relationship, however, is generally not so simple. A player’s level of anxiety is likely to vary according to how difficult and how important he/she considers a particular match to be.

Thus, more able players are likely to be less adversely affected by the inhibiting effects of high anxiety than inferior players because they perceive matches as being relatively less difficult. High level of anxiety is disadvantageous for optimum performance in competitive sport. Anxious people, for example, generally do less well in the important competition than they do in the less important ones and in practice situations. It is also the case that anxious sport persons are more adversely affected by failure than are people of a more stable disposition.

The skin conductance response, also known as the Electrodermal response (and in older terminology as "galvanic skin response") refers to the principal ways our body reacts to tension and stress which is through skin and is called galvanic skin resistance. The galvanic skin response (G.S.R.) feedback instrument measures skin conductivity from the fingers and / or palms. The G.S.R is highly sensitive to emotions in some people. G. S.R. feedback has been used in the treatment of excessive sweating and related dermatological conditions, and for relaxing and desensitization training.

Thus, apart from assessment & identification of anxiety various psychological interventions have been suggested to reduce anxiety and increase performance in sportspersons. Most sports psychologists and elite sports persons, however, believe that learning how to relax allows sportspersons to take giant step towards optimal performance. Today, relaxation is used widely in psychotherapy, stress management and medicine, as well as performance enhancement, self – exploration, and personal growth. Out of these techniques, biofeedback training along with Progressive Muscle Relaxation (PMR) & Imagery has gained popularity as an efficient intervention in reducing stress, anxiety, and various other health conditions, along with enhancing performance. Progressive Muscle Relaxation training developed by DR. Edmund Jacobson is a systematic technique used for achieving a deep state of relaxation was used for the study along with guided imagery. The technique of biofeedback has been used for assessment as well as training by practitioners. Psychological skills learned through biofeedback training can be applied in practice and competition and can lead to improved athletic performance.

Methodology

Taking into consideration how anxiety impacts the performance of sportspersons and appropriate psychological intervention can reduce the anxiety and the importance of mental training in optimizing the performance the present study was undertaken.

Objective

The objective of the present study was to: -

- (a) To investigate the level of Anxiety (overt & covert), & Electrodermal Response of sports persons.
- (b) To examine the effect of individual interventions – Biofeedback assisted Progressive Muscle relaxation, imagery, and combination of the two on anxiety level (covert and overt) and electro dermal responses of the players.
- (c) To examine the effect of individual interventions – Biofeedback assisted Progressive Muscle Relaxation, Imagery, and combination of the two on electro dermal/

galvanic skin response of sports persons.

Sample

The sample consisted of 80 Table-tennis players and the age range of these players was 12-17 years. Only players who were scoring high/medium on the anxiety test were selected, and they were further divide into 3 Exp & a Control group and each group consisted of 20 sportspersons.

Tools

I.P.A.T anxiety scale: developed by Cattell & Scheier (1963), was used which consist of 40 items and can be broken down into overt symptomatic conscious anxiety raw score and covert anxiety an unrealized raw score.

Electrodermal Response (G.S.R): is a measure of the sweat gland activity. The biofeedback instruments are used to amplify the signals in the digital audio and visuals form so that the response can be easily interpreted. Initially the two electrodes are placed on the tips of the fingers of the individuals and wrapped by the Velcro tape, values are recorded in kilo-ohms. To assess the rate of skin conductivity, these are two measures: Basal Value (BV) and Relaxation Value (RV)

Procedure

These players were administered I.P.A.T anxiety test and they were also measured on Electro dermal Response (G.S.R). Electro dermal response is a measure of the sweat gland activity. Palmer sweat is one of the most salient symptoms of an anxiety state and, for some, the single most noticeable bodily reaction. The biofeedback instruments are used to amplify the signals in the digital audio and visuals form so that the response can be easily interpreted. 3 Experimental groups were provided with different intervention techniques for 30 minutes 6 days a week for period of three weeks, and the 4th group was control group where no intervention was given to sports persons

The three interventions which were provided to the sportspersons were Biofeedback assisted Progressive Muscle Relaxation training by Jacobson, second being Biofeedback assisted Imagery and third involved the combination of the two. Progressive muscle relaxation is based upon the simple practice of tensing, or tightening, one muscle group at a time followed by a relaxation phase with release of the tension. Second type of intervention, which was provided, was Biofeedback assisted imagery training. Mental Imagery involves that the athlete imagines himself in a specific environment performing a specific activity he/she sees himself or she is enjoying the activity and feeling satisfied with their performance. The third intervention involved the combination of the two PMR & imagery.

The data collected from the 3 experimental groups and one control group before and after the interventions were subjected to analysis using descriptive statistics, like mean & standard deviation. Inferential statistic like ANOVA, and t Score were calculated to find out the mean differences between groups.

Results and discussion

First objective was to investigate the level Anxiety (overt & covert), & Electrodermal Response of sports persons

Table 1: Shows i.p.a.t. scores and galvanic skin response of all 4 groups pre-test and post test scores

S. No.	Subscales	F ratio (Pre test)	F ratio Post test
1.	Raw scores	.008	6.95**
2.	Overt Score	0.32	3.89**
3.	Covert Score	.017	3.65**
4	Basal Value	0.08	3.80**
5	Relaxation Value (RV)	0.06	7.09**

** Significant at .01 level

All the four groups are similar on I.P.A.T. test dimensions and electro dermal responses test scores indicating they are matched Second objective was to investigate effect of

individual interventions-Relaxation, Imagery and combination of the two on anxiety level (covert and overt) and electro dermal responses of the players.

Table 2: Shows pre and post test result of biofeedback assisted progressive relaxation group on i.p.a.t. test

Sub scales		Mean	SD	t
Raw Scores Progressive General Relaxation Group	Pre – test	39.37	3.65	-4.06**
	Post – test	34.00	3.47	
Overt Scores Progressive Relaxation Group	Pre – test	19.87	3.04	-2.81*
	Post-test	15.62	3.39	
Covert Progressive Relaxation Group	Pre-test	19.50	3.16	-3.05**
	Post-test	16.50	3.92	
Basal value (BV)	Pre - test	118.25	35.49	4.86**
	Post - test	141.62	9.86	
Relaxation Value (RV)	Pre - test	147.50	5.36	5.50**
	Post - test	182.12	9.23	

There is a significant difference pre and post test scores on anxiety(I.P.AT) and Electro dermal response.

** Significant at .01 level

* Significant at .05 level

Table 2(a): Shows pre and post test results of biofeedback assisted imagery group on i.p.a.t. test and electrodermal response

Sub scales		Mean	SD	t
Raw Score Imagery group	Pre – test	39.50	2.24	5.40**
	Post – test	34.00	2.17	
Overt Score Imagery group	Pre – test	20.87	3.29	4.67**
	Post-test	18.37	2.11	
Covert Imagery group	Pre-test	18.37	1.40	3.05**
	Post-test	15.62	2.15	
Basal Value (BV)	Pre – test	115.25	6.28	5.51**
	Post - test	139.12	5.85	
Relaxation Value (RV)	Pre – test	146.62	5.12	6.97**
	Post - test	172.50	4.58	

** There is significant difference at .01 level

* There is significant difference at .05 level

Table 2(b): Shows pre and post test results of combination group on IPAT scores and electro dermal response

Sub scales		Mean	SD	t
Raw Score Anxiety	Pre - test	37.25	3.36	-5.76**
	Post - test	26.12	3.09	
Overt Anxiety	Pre - test	19.87	3.56	-5.68**
	Post - test	13.37	2.33	
Covert Anxiety	Pre-test	17.37	3.73	-3.16**
	Post-test	12.75	2.49	
Basal Value (BV)	Pre – test	116.12	6.57	9.57**
	Post - test	188.25	7.42	
Relaxation Value (RV)	Pre – test	146.75	7.28	9.11**
	Post - test	281.12	6.91	

There is significant difference at .01 level

Table 2 (C): Pre and post test result of control group on i.p.a.t. test and electro dermal response

Sub scales		Mean	SD	t
Raw scores	Pre-test	37	4.92	-.435
	Post - test	36.50	4.64	
Overt Scores	Pre - test	18.75	4.17	-.146
	Post-test	18.62	4.43	
Covert Scores	Pre-test	18.25	3.10	-.629

	Post-test	17.87	2.72	
Basal Value (BV)	Pre - test	149.90	7.56	.942
	Post - test	154.40	7.97	
Relaxation Value (RV)	Pre - test	180.10	10.37	.108
	Post - test	189.10	12.01	

No difference was observed for the control group

The four groups were tested on I.P.A.T anxiety test and Electrodermal response; Table I shows the F ratio on pre and post test score of all the four groups. i.e. Biofeedback assisted Progressive Muscle Relaxation, Biofeedback assisted Imagery, and combination of the two and control group.

After the initial testing, three weeks training with 30 minutes session per day was provided to all the 3 groups consisting of 20 sportspersons in each group. Biofeedback assisted Progressive Muscle Relaxation training was provided to group I, similarly, group II was provided with Biofeedback Assisted mental imagery training and group three was provided with both the interventions i.e., was provided with Biofeedback assisted Progressive Muscle Relaxation and Biofeedback Assisted Imagery and control group was not given any training.

After three weeks training these sports persons were tested again. Table-2 (a) (b) & (c) shows pre and posttest scores on mean, S.D. and t scores of all the 4 groups. The results indicate that Biofeedback assisted Progressive Muscle Relaxation groups anxiety decreased significantly and electrodermal responses improved significantly. Similarly, Table-2 (a) shows the results of Biofeedback assisted Imagery group on anxiety and electrodermal response.

The result show significant decline at .01 level on anxiety dimensions and increase on basal value and Relaxation value. Whereas significant decline at .05 levels was observed for convert anxiety. This is because in imagery training subjects visualized themselves doing the task successfully, which helped them in reducing uncertainty and made them confident and in control of the situation. The obtained results are in accordance with the theoretical expectation, Fowles ((1986). This is indicative of the fact that under stress individual's gland activity increases there by lowering the skin resistance. Initially after installation of electrodes, the sportspersons palms started to sweat, which indicated a stimulated state in sports persons, leading to low scores on electrode response. Once interventions were provided to the subjects, they became relaxed and in control leading to higher electro dermal values and low anxiety.

Table-2(b) shows the results of combination of both (Imagery and Relaxation) of the groups on Anxiety and Electro dermal response. Results indicate a significant decline at .01 level is observed on anxiety dimensions and increase on basal and Relaxation value. Wrisberg and Ashel, (1989) ^[20], in a similar study found that relaxation used in conjunction with imagery was effective in enhancing the basketball performance of young boys. No improvement was observed for control group. Research has focused on combining BFB training with other psychological techniques and strategies, such as relaxation, imagery, self-talk, and breathing. It was found that BFB training as part of an intervention package has an augmenting effect on athletic performance enhancement (e.g., Beauchamp, Harvey, & Beauchamp, 2012; Blumenstein, Bar-Eli, & Tenenbaum, 1995, 2002; Crews & Landers, 1993; Petruzzello, Landers, & Salazar, 1991) ^[1, 3, 4, 6, 15].

Conclusion

The present study clearly indicates that sportspersons in the experimental groups showed decline on anxiety dimensions

significantly and showed improvement on the electro dermal response. No improvement was observed for control group. This is indicative of the fact that Biofeedback is an effective assessment tool and can be used in conjunction with various interventions techniques like P.M.R & Imagery to reduce the anxiety and thereby improving sports performance

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