ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2018; 4(12): 269-274
www.allresearchjournal.com
Received: 22-10-2018
Accepted: 26-11-2018

Dr. Syed Johar Ali Naqvi
Asso. Professor, Central Police Hospital, Dr Bhim Rao Police Academy, Civil lines, Moradabad Uttar Pradesh, India

Dr. Nitin Sakhare
Asso professor, Nav Yuva Institute of Medical Sciences and Research, Physiotherapy, Bhandara, Maharashtra, India

Dr. Harpreet Singh
Professor, Department of Physiotherapy, AIIMS, New Delhi, India

Correspondence
Dr. Nitin Sakhare
Asso professor, Nav Yuva Institute of Medical Sciences and Research, Physiotherapy, Bhandara, Maharashtra, India

To compare the effects of bimanual functional practice training versus unimanual functional practice training on functional performance of upper extremity in chronic stroke

Dr. Syed Johar Ali Naqvi, Dr. Nitin Sakhare and Dr. Harpreet Singh

Abstract
Objective- To compare the effects of bimanual functional practice training versus unimanual functional practice training on functional performance of upper extremity in chronic stroke.
Design: - Pre-test and Post test design.
Setting: - Inpatient and rehabilitation hospital.
Participants: - Patients were randomized to receive bimanual functional practice (n=15) or unimanual functional practice training (n-=15) at 3-4 months post-stroke onset.
Intervention- Supervised bimanual or unimanual practice training for 25 minutes on 5 days week over 2 weeks using a standardized program.
Main Outcome Measures: - Upper extremity outcomes were assessed by Graded Wolf-Motor Function test (GWMFT) and Fugl-Meyer scale (F.M.S).
Results: - No significant differences were found between the group on any measure (GWMFT-MPT. p=0.75 & GWMFT-FAS. P=0.31 & FMS-p=0.43). But within the group there were significant changes in mean performance time (Bimanual group-p=0.002 &Unimanual group-p=0.029) and there were significant difference found in functional ability scale (GWMFT-FAS Bimanual group p=0.00 &Unimanual group p=0.00) Similarly, there were significant changes in fugl-Meyer score (Bimanual group p=0.00 & Unimanual group-p=0.00).
Conclusion- This study suggest that 20 minutes a day of bilateral training of funcationally related tasks is no more effective than unilateral training for upper limb functional recover in chronic stroke patients, regardless of the initial severity of the impairment, Furthermore, for recovery of functional motor performance, unimanual training appears less beneficial than bimanual practices. Several other studies have found benefits of bimanual training: therefore, this approach can be accepted as and upper limb intervention in stroke on the basis of finding this study. The study does not suggest the training characteristics, such as the nature of the tasks and strength of inter limb coupling required for effects may influenced outcomes: therefore future work should examine the optimal timing, dose and training tasks that might optimize the already known facilitatory effects of inter limb coupling.

Keywords: Parental attitude, MPT, Bimanual, Unimaual, GWMFT, FAS

Introduction

Stroke is an acute onset of neurological dysfunction due to and abnormality in cerebral circulation with resultant signs and symptoms that corresponds to involvement of focal areas of the brain [1]. This can be due to ischemia (lack of blood supply) caused by thrombosis or embolism or due to a hemorrhage. As a result, the affected area of the brain is unable to function, leading to inability to move one or more limb on one side of the body, inability to understand or formulate speech or inability to see one side of the visual field. In the past, stroke was referred to as cerebrovascular accident or CVA, but the term "stroke" is now preferred. The term cerebrovascular accident (C.V.A) is used interchangeably with stroke to the cerebrovascular conditions that accompany either ischemic or hemorrhagic lesions. A stroke is a medical emergency and can cause permanent neourological damage, complications and death. It is the leading cause of adult disability.

Systemic hypoperfusion (general decrease in blood supply, e.g. in shock) and venous thrombosis Stroke without and obvious explanation is termed "cryptogenic" (of unknown origin); this constitutes 30-40% of all ischemic strokes. intraparenchymal hemorrhage or intraventricular hemorrhage (blood in the ventricular system).

Intracranial hemorrhage is the accumulation of blood anywhere within the skull vault. A distinction is made between intra-axial hemorrhage (blood inside the skull but outside the brain). Intra-axial hemorrhage is due to The main types of extra-axial hemorrhage are epidural hematoma (bleeding between the dura mater and the skull), subdural hematoma (in the subdural space) and subarachnoid hemorrhage (between the arachnoid mater and pia mater). Most of the hemorrhagic stroke syndromes have specific Intracerebal hemorrhage (ICH) is bleeding directly into the brain tissue, forming a gradually enlarging hematoma (pooling of blood). Stroke is a major global health problem. It is the third most common cause of death in world and risk factors for stroke onset are high blood pressure, smoking, diabetes, heart failure, carotid artery stenosis and hyperlipidemia (SBU 1992; Gresham *et al*. 1995).

The incidence of stroke increases exponentially from 30 years of age. And etiology varies by age. Advanced age is one of the most significant stroke risk factors. 95 % of strokes occur in people age 45 and older, and two-thirds of strokes occur in those over the age of 65. A person's risk of dying if he or she does have a stroke [3]. Improve movement control of impaired limb promoting neural plasticity. Bimanual practice is getting both hands to work co-operatively to hold and manipulate and object using each hand to perform different actions.Thus the objective of the study is to compare the efficacy of bimanual functional practive with unimanual functional practice on functional performance upper extremity in chronic stroke.

Methodology

A total of 30 subject (26 males and 6 females), at O.P.D. Of Fortis Hosptial, Sector-62, NOIDA, U.P, were be included in the study and will be divided by sample of convenience into two groups with 15 subjects each. Group (1) will be given bimanual practice intervention for 5 days a week for 2 weeks. Each treatment session will be of 1 hour.

Group (2) will be given unimanual practice intervention for 5 days a week for 2 weeks. Each treatment session will be of 1 hour.On the first visit a complete neurological assessment was done subjects found suitable for participants in the study as per the inclusion and exclusion criteria were requested to sign the consent form. A detailed subjective examination was taken regarding type, side, duration, occurrence of stroke, handedness and motor function.

All the selected subject were informed in detail about the type and nature of the study and asked to sign the informed consent.After taking down the demographic data the asurement of functional performance were assessed by fugl. Mayer assessment scale and graded wolf motor function test. Group "1" Participants of group 1 were trained for bimanual activity participants were encouraged to do the bimanual practices for 25 minutes with 10 minutes rest periods The total time period of the bimanual practice was one hour, which was divided into two training sessions (25*2=50min) and one rest period of 10 minutes. Participants were trained for following bimanual task practices (15). Each participants were taught about individually and sitting at the chair comfortably in font of the cable.

1. To ask the patient to hold the one cup with one hand (non- affected) which was initially filled with water and asked to hold the another cup with other hand (affected) and both hands held up the table. Instruct the patient to pour the water first from non-affected hand to affected hand and than affected hand to non-affected. This task was performed for 5 minutes daily in two sessions.
2. To ask the patients to hold the receiver with one hand (non-affected) and the numbers with another hand(affected) again this task performed alternately hold the receiver with affected hand and dial the number with affected hand.
3. Intially fold the towel lengthwise and asked the patient to roll the towel with both hands up to the towel end.
4. Asked the patients to hold the jar with non-affected and practiced to open the jar or move the cup of the jar to clockwise and anticlockwise. This task was practiced for 5 minutes in two sessions.

A. Asked the patient to hold the lock with non- affected hand and open the lock or move the key in the lock.

Clockwise and anticlockwise for 5 minutes daily in two sessions. Group "2": Participants of the intervention group '2' were taught about the unimanual practice. Participants were encouraged to do the unimanual practice for 5 days in a week for 2 weeks. Total treatment time was 1 hour only. Two treatment sessions were given for 25 minutes and after each treatment session 10minutes rest was given. Following unimanual activities will be practiced by all Group-Participants:-

- Spoon out dry ingredients (Rajma)
- Grasp the glass and attempts to supinate the forearm
- Tries to touch the glass to the table.
- Hold the glass to drink the water.
- Brush the teeth.
- Wipe the table.

Firstly, to trained the patient hold the spoon, and practiced the patient spoon out the dry ingredients like Rajma. This task was practiced for 5 minutes in two session. Initially, a patient was trained to hold glass by cylindrical grasp and after that patient was practiced to supinate the forearm tries to touch the glass to table Again, firstly patient was trained to grasp the glass and was instructed to drink the water or tries to take the glass near the mouth. This task was trained for 5 minutes in two sessions.

Patient was instructed to bring their own tooth brush and was trained to brush the teeth. This task was practiced for 5 minutes in two sessions. Patients was trained to hold the towel and practiced to wipe the table with full flexion and extension of the arm and the elbow.

Results

The results in table 5.4 show that MPT of Wold-motor Function Scale after 2 weeks of bilateral training program was significantly less. Similarly FAS score improved significantly after a 2 week training program.

Table 1: MPT of Wold-motor Function Scale after 2 weeks of bilateral training program

Variable $	Pre-test Day0 Mean+ S.D N=15	Post-test Week 2 Mean +- S.D N=15	Paired T test	
			T Value	P Value
GWMFT	1.75+0.46	2.05+0.57	-7.35	0.00
FAS	17.13+4.6	15.80+5.5	3.69	0.00
GWMFT	0	3	-	2
MPT	36.93+4.0	42.87+5.2	11.6	0.00
FMS	7	5	0	

Table 2 shows that the MPT of GWMFT reduced significantly after unilateral training, but the improvement was not as significant as FAS score. The table also shows that unilateral arm training also provided a significant improve in FMS score (table 2)

Table 2: Within group analysis: Group 2

Variable$	Pre-test Day0 Mean+ S.D N=15	Post-test Week 2 Mean +- S.D N=15	Paired T test	
			T Value	P Value
GWMFT	1.57+0.52	1.82+0.62	-7.73	0.00
FAS	17.93+6.4	16.5+5.5	2.43	0.02
GWMFT	6	3	-	9
MPT	35.87+4.8	44.53+6.2	12.7	0.00
FMS	4	0	3	

Discussion

The Study compared the effects of bilateral and unilateral upper limb-task training on upper limb motor functions during post stroke rehabilitation. The result of this study showed that there was a significant improvement in functional performance of upper extremity on G.W.M.F.T and Fugl-Meyer scale in chronic stroke patients after 2 week of bimanual and unimanual functional practice. The result of the study showed that there was no significant difference in bimanual and unimanual practice group on GWMFT (Pre MPT: p=0.70 & Post MPT: p=0.75 and Pre FAS: p=0.32 & Post FAS: p=0.312) and Fugl-Meyer score. (Pre: p=0.519 and Post: p=0.43) Participants of bimanual practice group showed a decrease in performance time (p=0.002) and increase on functional ability score (p=0.00) and showed highly significant improvement on motor functional performance of Fugl-Meyer scale (p=0.00). The mean time to perform 15 tasks in GWMFT was (17.13+4.60) which decreased after 2 weeks of bimanual practice training (15.80+5.53) and the functional ability score (1.75+0.46) improved after training (2.05+0.57). The result showed that 2 weeks of bimanual training improved motor functional performance on Fugl-Meyer scale (42.87+5.25).

Similarly participants of unimanual practice group showed a decrease in performance time (p=0.029) and increase on functional ability score (p=0.00) and showed highly significant improvement on motor functional performance of Fugl-Meyer scale (p=0.00). The mean time to perform 15 tasks in GWMFT was (17.93+46) which decreased after 2 weeks of unimanual practice training (16.5+6.88) and the functional ability score (1.57+0.452) improved after training (1.82+0.62). The result showed that 2 weeks of bimanual training improved motor functional performance on fugl-Meyer scale (44.53+6.20). The result of the study suggested that, training involving the practice of actions bilaterally and simultaneously may be effective in promoting recovery of upper limb motor function in chronic stroke patients. Of particular importance was signigicant increase in participants of the bilateral training group in functional ability from the training of a specific movement to general upper limb function. Moreover individuals receiving bilateral training showed improvements in the time to complete the graded wolf motor function test (GWMFT) movement with the impaired limb movement in individuals engaging in unilateral training [15]. In the study, participants were trained in complex multijoint functionally relevant tasks, whereas other bilateral training studies have involved protocols using simple repetitive movements with electric stimulation [45] or auditory cueing [35, 36]. Such augmentation of bilateral movement may provide more effective upperlimb coupling and consequent facilitation of the paretic arm than was possible with the free movements practiced in the study, suggesting that the effects of bilateral training may be influenced by task constrains. Furthermore visualizing and processing information from the non-paretic limb, while simultaneously attempting to perform new, Progressively changing, relatively complex precise motor goals with both arm may have provided a dual-task challenges greater than in other studies. Evidence suggests that stroke participants find tasks requiring divided attention difficult, and aimed movements of the hemiplegic arm require greater attention resources then aimed movement in healthy subjects. Participants receiving bilateral training in the study reported ease of performing the task bilaterally. The effectiveness of bilateral movement training in promoting stroke recovery is also likely to depend on the extent of damage sustained to direct corticospinal pathways [58]. While bilateral movements may also help recruit secondary motor areas in both hemispheres, recovery promoted by these areas will be less than that obtained through direct corticospinal projections [58, 59]. This can be explained by the changes in the functional ability of impaired limb as evidenced by GWMFT scores and in motor performance by Fugl-Meyer score in the patient group used in the study. Recent research has shown that lesion location greatly influences the pattern of motor cortex excitability observed [60]. Intervention timing may have influenced outcomes. The study showed significant effects of bilateral training n chronic stroke participants, whereas some studies showed no effects of bilateral training in patients acute stroke [34]. Stroke appears to alter normal transcallosal inhibition resulting in increased intact hemisphere excitability during hemiparetic arm movement that may be inhibitory in nature, thus suppressing output

from the damaged hemisphere [23]. Depending on the lesion site and size, these over activation appear transient, and more normal contralateral activation pattern resume over time [49]. Identical motor command generated in each hemisphere during bilateral movement may modulate transcallosal inhibition, balancing stroke related interhemspheric over activity and facilitating output from the damage hemisphere as well as from normally inhibited ipsilateral pathway of the undamaged hemisphere to augment movement of the paretic arm [50]. The extensive disruption of normal transcollassal inhibition soon after stroke may, however render bilateral training more in chronic stages when interhemspheric interactions have resumed a more normal balance; therefore the effects of bilateral Training may be time dependent. Inter limb coordination studies in healthy adults have identified the coupling of homologous muscles as the preferred control mode of the motor system. The present results indicate that this tendency can be exploited to promote functional recovery of a paretic limb in the chronic stroke patients. Further more, there is a strong neurophysiological evidence to suggest that when the impaired and non-impaired arms are moved symmetrically, crosses facilitatory drive from the intact hemisphere will be produced increase excitability in homologous motor pathways in the impaired limb[50, 51]. Additionally, cortical damaged from stroke produces hyperexcitability of the contralesional M1 [52] leading to abnormally high levels of transcollasal inhibition (TCI) on the legend hemisphere, thereby further impairing motor performance of the paretic hand [53]. There is recent evidence of improved affected hand performance in chronic stroke patients from reducing the abnormal inhibitory drive to the ipsilesional hemisphere [54, 55]. Furthermore balanced interhemspheric interactions appear necessary for normal voluntary movements [56] and the restitution of the voluntary movements and the restitution of the normal balance between the two hemispheres has been linked to better recovery following stroke [57]. It has been bypothesized that practicing by lateral symmetrical movements may facilitate motor output from the ipsilesional hemisphere by normalizing (TCI) influences. Interestingly, in the subset of patients assessed with wolf motor function test and Fugl-Meyer scale in the study the bilateral trained patients exhibiting the latgest increase may promote increased involvement of pathways not investigated in the present study such as spared corticopropriospinal pathways [50]. The improvement in the unimanual practice group might be due to greatly improved motor performance. This can be explained by muscle output area size in the affected hemisphere might have enlarged and also there might be recruitment of the adjacent brain areas [23]. The improvement can also be seen through the unimanual training which was task oriented and specific to the affected extremity. Both the training groups showed a significant improvement after training, which might be explained by the stage of stroke. The chronic nature of stroke might have allowed the plastic nature of brain to adjust to the various levels of tasks to be performed, both unimanualy and bimanually. Initially, just after stroke, bimanual movement echanced activation in the primary motor cortes M1 of the affected hemisphere did not differ between unimanual paretic hand and bimanual movement [14]. Also, the tasks performed both during unimanual paretic hand both during unimanual and bimanual practice training were almost similar in nature. Therefore, non-significant between group difference can be explained. The frequency and duration of the program may not have been optimal. One may ask whether 20 25 minutes session devoted to the bimanual and unimanual task are sufficient to trigger brain reorganization and to observe a change. This scheduled was based on practical reason and although it is similar to that used in previous study [34, 61], it has never been experimentally proven to be the optimal dose. More important is the fact that the participants in both groups received high level of stimulation in the training program, leading to the possibility of a saturation effect in arm recovery. In fact, participants in both groups were stimulated every day to use their arms in their daily activities. Therefore, the technique used to promote batter recovery could not have had any impact on the final result. In other words, regardless of the technique used, perhaps the important thing in the spontaneous recovery and training period is to provide patients with frequent and continuous opportunities to use their arms in their activities further more for recovery of functional motor performance, unilateral training appears less beneficial than bilateral practices. Several other studies have found benefits of bilateral training: therefore, this approach can be accepted as an upper limb intervention in stroke on the basis of finding this study. The study does not suggest the training characteristics, such as the nature of the tasks and strength of inter limb coupling required for effects, may influenced outcomes: therefor future work should examined the optimal timing, dose and training task that might optimize the already known facilitatory effects of interlimb coupling.

Conclusion

The study suggest that 20 minutes a day of bilateral training of functionally related tasks is no more effective than unilateral training for upper limb functional recovery in chronic stroke patients, regardless of the initial severity of the impairment. Further more, for recovery of functional motor performance, unimanual training appears less beneficial than bimanual practices. Several other studies have found benefits of bimanual training: therefore, this approach can be accepted as an upper limb intervention in stroke on the basis of finding this study. The study does not suggest the training characteristics, such as the nature of the tasks and strength of inter limb coupling required for effects, may influenced outcomes: therefor future work should examine the optimal timing, dose and training tasks that might optimized the already known facilitatory effect of interlimb coupling. Thus, null-hypothesis proved.

References

1. Gresham GE, Duncan PW, Stason WB. Post-stroke rehabilitation; Clinical practice guideline. [AHCPR.], 1995, 16.
2. Broeks JG, Lankhorsi GJ, Rumping K, Prevo AJH. The long- term outcome of arm function after stroke: results of a follow up study. [Disability and Rehabilitation. 1999; (21):357-364.
3. Ostendorf C, Wolf SL. Effect of forced used of the upper extremity of a hemiplegic patient on changes in function. Physical Therapy. 1981; (61):1022-1028.
4. Morris DM, Taub E. Constraing- induced therapy approach to restoring function after neurological injury. Top stroke Rehabil. 2001; (8):16-30.

5. Senesac D, Davis SB, Richard LG. Generalization in repetive bilateral training in stroke.
6. Nagako Murase, Julie Duque *et al*. Influence of Interhemispheric Interactions on motor function in chronic stroke. Ann Neurol. 2004; 55:400-409.
7. Patricia Pohl S, Carl Luchies W, Pamela Duncan W *et al*. Upper Extremity Control in Adults Post with Mild Residual Impairment. Neurorehabitation and neural repair. 2000; 14(1):33-41.
8. DT Wade, Wood VA, Hewer RL *et al*. Recovery After stroke-the first 3 months. Journal of Neurology, neurosurgery and psychiatry. 1985; 48:7-13.
9. Leeanne Carey M, David Abbott F, Gary Egan F *et al*. Motor Impairment and Recovery in the Upper Limb After Stroke. Stroke. 2005; 36:625-629.
10. Hirofumi Nakayama *et al*. Henrik Stig Jorgenses *et al*. Recovery of Upper Extremity Funciton in Stroke patients: The Copenhagen Stroke Study. Arch Phys Med Rehabil Val. 1994; 75:394-398.
11. Judith SchaechterD. Motor Rehabilitation and Brain Plasticity after hemiparesis. Progress in Neurobiology. 2004; 73(1):61-72.
12. Gert K wakkel, Robery Wagenaar C, Tim Koelman W. Effects of Intensity of Rehabilitation after Stroke. Stroke. 1997; 28:1550-1556.
13. Koichi Hiraoka. Rehabilitation effort to Improve Upper Extremity Function in Post Stroke Patients: A Meta-Analysis. Journal of Physical Therapy science. 2001; 13(1):5-9.
14. Staines WR, Mcilory WE. Bilateral Movements Enhances ipsilesional cortical activity in acute stroke: A pilot functional MRI study. Neurology. 2001; 56:401-404.
15. Mudie MH, Matyas TA. Can simultaneous bilateral movement involue the undamaged hemisphere in reconstruction of neural networks damaged by stroke? Disabil Rehabil. 2000; 20(22):1-2.
16. Cunningham CL, Phillips Stoykov ME, Walter CB. Bilateral facilitation of motor contral in chronic hemiplegia. Acta Psychologica.
17. Michael Garry I, Ian Franks M. Spatially precise bilateral arm movements are controlled by the contralateral hemisphere. Exp Brain Res. 2002; 142:292-296.
18. Lang Catherine E, Wagner. Upper Extremily use in people with hemiparesis in the first few weeks after stroke. Journal of Neurologic Physical Therapy. 2007; 31:56-63.
19. Nestor Bayona A, Jamie Bitensky. The role of task specific training in rehabilitation therapies. Topics in Stroke Rehabilitation. 2005; 12(3):58-65.
20. Fiseher, Heide C, Stubble field. Hand rehabilitation following stroke: a pilot study of assisted figure extension training in a virtual environment. Topic in stroke rehabil, 2007.
21. Laufer Y, Gatternio L, Sinai B. The time related changes in motor performance of upper extremity inpsilateral to the side of the lesion n stroke survivors. Neurorehabilitation and neural repair. 2001; 15(3):167-172.
22. Michaelsen, Stella Maris. Specific training with trunk restraint on arm recovery in stroke: RCT. Stroke. 2006; 37(1):186-192.
23. Liepert. Treatment induced cortical reorganization after stroke in humans. Stroke. 2000; 31:1210-1216.
24. Timothy Carroil J, Michael Lee. Unilateral practice of a ballistic movement bilateral increases in performance and corticospinal excitability. J Appl. Physiology. 2008; 104:1656-1664.
25. Carole Ostendorf G, Seven Wolf L. Effect of forced use of upper extremity of a hemiplegic patient on changes in funcation. Physical Therapy. 1981; 61(7):1022-1028.
26. Johana Van der Lee H, Robert Wagenaar C. Froced use fo the upper extremity in chronic stroke patients. Stroke. 1999; 30:2369-2375.
27. Edward Taub, Neal Miller E, Thomas. Technique to improve chronic motor deficit after stroke, Arch Phys Med Rehabil. 1993; 74:347-354.
28. Wolfgang Miltner HR, Monika Sommer. Effects of constant induced movement therapy on patients with chronic motor deficit after stroke. 1999; 30586-592.
29. Steven Wolf L, Carolee Winstein J, Philips Miller, Edward Taub. Effect of constant induced movement therapy on upper extremity function in 3 to 9 months after stroke. JAMA. 2006; 296:2095-2104.
30. Sandy Mc Combe Waller, Jill Whit all. Fine Motor Control in adults with and without chronic hemiparesis: Baseline comparison to nondisabled and effects of bilateral arm training. Adults, Arch Phy Med Rehabil. 2004; 85:1076-1082.
31. Dorian Rose K, Carolee Winstein J. Bimanual training after stroke: Are Two hands better than one? Topics in Stroke Rehabil. 2004; 85:1087-1082.
32. Dorian Rose K, Carolee Winstein J. Bimanual training after stroke: Are Two hands better than one? Topics in Stroke Rehabil. 2004; I1(4):22-30.
33. Jeffery Summers J, Florian Kagerer A, Michael Garry I, James Cauraugh H *et al*. Bilateral and unilateral movements training on upper limb functions in chronic stroke patients; A TMS Study. Journal of Nourological Sciences. 2007; 252:76-82.
34. Jacqui Morris H, Frederike Van Wijck, Sara Joice *et al*. A comparison of bilateral and unilateral upper limb task training in early post stroke rehabilitation: A RCT. Arch Phys Med Rehabil. 2008; 89:1237-1245.
35. Jill Whitall, Sandy Mc Combe Waller, Richard MackoF.Repetitive bilateral arm training with rhythmic auditory cueing improves motor function in chronic hemiparetic stroke. Stroke. 2000; 31:2390-2395.
36. Andreas Luft R, Sandy Mc Combe Waller, Jill Whiltall. Repetitive bilateral arm training and motor cortex activation in chronic stroke. JAMA.2004; 292(15):1853-1861.
37. Steven Wolf L, Pamela Catlin A, Michael Ellis. Assessing wolf motor function test as outcome measure for research in patients after stroke. Stroke. 2001; 32:1635-1639.
38. Pamela Ducan W, Larry Goldstein B, David Matchar. Measurement of motor recovery after storke: Outcome assessment by Fugl Meyer Scale. Stroke. 1992; 23:1084-1089.
39. Evelyn Lee Teng, Helena Chang Chui. The modified mini-mental state (3MS) examination. JClin. Psychiatry. 1987; 48:314-318.
40. Janet Car, Roberta Shepherd. Bimanual Practice Neurological Rehabilitation Optimizing Motor Performance, 1998, 142-145.

41. Dickstein T, Hocherman S, Pillar T, Shaham R. Three exercise therapy approaches, Physical Therapy. 1986; 66:1233-38.
42. Kelso JA, Southard DL. Goodman D. On the nature of human inter limb coordination. Science. 1979; 203:1029-31.
43. Canningham CL, Stoykov ME, Walter CB. Bilateral facilitation of motor control in chronic hemiplegia. Actapsychol (Amst). 2002; 110:321-37.
44. Lewis GN, Byblow WD. Neurophysiological and behavioral adaptation to a bilateral training intervention in individuals following stroke. Clin Rehaabil. 2004; 1848-59.
45. Dorian Rose K, Carolee Winstein J. Bimanual training after stroke: Are two hands batter than one? Topics in stroke rehbil. 2004; 11(4):20-30.
46. Hesse S, Suhulte-Tigges G. Konard M, Baradeleben A, Werner C. Robot-assisted arm trainer for the passive and active practice of bilateral forearm and wrist movements in hemiparetic subjects. Arch Phys Med Rehabil. 2003; 84:915-920.
47. Janet Car, Roberta Shepherd. Bimanual Practice neurological Rehabilitaion Optimizing Motor Performance, 1998, 142-145.

ORIGINAL RESEARCH PAPER

Physiotherapy

PROGRESSIVE MUSCULAR RELAXATION TECHNIQUE ON COMPETITIVE STATE ANXIETY : COHORT STUDY

KEY WORDS:

Dr Nitin Sakhare Asso.Professor, Vav Yuva Institute of Medical Science and Research Physiotherapy, Kardha, Bhandara

Dr Amit Ambulkar* Asso.Professor,YMT College of physiotherapy, Navi Mumbai *Corresponding Author

Dr Minakshi Sangode Asst.professor ,Vav Yuva Institute of Medical Science and Research Physiotherapy, Kardha, Bhandara

ABSTRACT

Objective: Effect of progressive muscular relaxation technique and autogenic relaxation technique on pre competitive state anxiety and self- confidence in athletes.
Design: Pre-test and Post test control group design.
Participants: 30 subjects were selected on the basis of their CSAI-2R score, they were randomly allocated to one of the three groups. Group 1 (progressive muscular relaxation) group 2 (control).
Intervention: Progressive muscular relaxation technique for 15-20 minutes.
Main Outcome Measures: somatic anxiety, cognitive anxiety, self-confidence.
Results: There was significant reduction in somatic anxiety & cognitive anxiety and improved self confidence found in Group 1 whereas no significant difference observed in group 2.
Conclusion: From the result of the study it was concluded that relaxation technique is an effective intervention for reducing pre competitive state anxiety and improving self-confidence in athletes. As progressive muscular relaxation was significantly effective on reducing competitive state anxiety & improving self-confidence in group 1 as compared to control group.

INTRODUCTION

Sport for leisure can be both fun and thrilling but when competition sets in, it may no longer be so. With competition the first thought that comes to mind is the pressure, tension, stress or anxiety. There can be tons of pressure in any sport, it can come from expectations of the coach, friends and supporter's who expect you to win. It can also come from with in a person, some time we can be very hard on ourselves. We push ourselves to excel and this further ads to the stresses that come with playing in competitive sport.

Coakley (1994) define competition as "a social process that occurs when rewards are given to people on the basis of how their performance compare with the performance of other doing the same task or participating in the same event". Today's sporting arena is highly competitive. Sport competition is well known for placing extremely high demand on athlete and that ever-increasing demand put the athlete in stressful condition. People have been using relaxation techniques for many years. Relaxation techniques have been used in some Asian cultures and in many of the Eastern religions to promote meditative practices to control the mind and relax the body Benson and Klipper (1976) also reported that yoga was part of Indian culture thousands of years ago to provide a higher level of brain control. Currently, yoga is considered to be one of the most important types of relaxation techniques. In the medical field positive impacts on some diseases such as cardiovascular disease, hypertension and asthma were reported (Sangthong et al., 2004; Kellett and Mullan., 2002). In relation to sports, Solberg et al. (2000) reported positive effects of relaxation in enhancing recovery from training, mitigating champion anxiety and improving performance. "Anxiety is a negative emotional state in which a person experiences a combination of nervousness, worry and fairness, and activation of the autonomic nervous system" (Ampofo-Boateng, 2009). Anxiety is also "multidimensional in nature with cognitive and somatic responses. The cognitive anxiety is the mental component of anxiety, while somatic is the physical component of anxiety" Anxiety reflects a threat of negative evaluation or negative performance, and can manifest itself in all aspects of the competition from beginning to end. This implies that anxiety is one of the major problems facing players as well as the team (Murphy, 2005).

Researchers have tried to resolve problems of stress and anxiety in players by using different strategies .According to Ampofo-Boateng (2008) there are many strategies in sports for coping with stress and anxiety in elite athletes, including self talk, thought control, identification of symptoms, self-monitoring, stress inoculation training, and relaxation techniques.

METHOD

Subjects

30 male athletes (10 Table tennis, 10 Bad- minton, 6 Karate, 4 Skating) with the mean age of 17.8±4.6 were selected for the study after fulfilling the all inclusion & exclusion criteria. Subjects were randomly assigned to one of three groups. Group 1 received Progressive muscular relaxation technique (n=15), group 2 subjects form a control group (n=15).

Measure: Pre competitive state anxiety and self confidence was measured by using revised version of competitive state anxiety inventory 2 (CSAI-2R) This is 17 items measure & has three subscales cognitive anxiety, somatic anxiety and self confidence. 7 items in somatic anxiety subscale and 5 items in each of the subscales of cognitive anxiety and self-confidence The 17-item revised CSAI-2 was subjected to a confirmatory factor analysis (CFA) using the validation data sample, resulting a good fit of the data to the model which comparative fit index was .95, non-normed fit index was .94 and the root mean squared error of approximation was .054 (Cox, Martens & Russell, 2003).

Protocol

1 hour prior to the competitive performance Subject were asked to fill the revised version of competitive state anxiety inventory 2 (CSAI 2R) on the basis of fulfillment of all inclusion and exclusion criteria subject were selected for the study and their CSAI 2 score consider as a pre intervention data. Than subject were randomly assigned to one of two groups. Group (1) received Progressive muscular relaxation technique [PMR]. Group (2) was control group. Subject of intervention group [PMR] explained about the procedure and effect of their respected intervention while subject of control group was kept blind about the purpose of the study. Subject of intervention group [PMR] received relaxation technique in quiet and suitable place for 15 – 20 min. after that subject were returned back to competitive environment. 30 min. prior to competitive performance subject was again asked to fill the CSAI 2R scale and score were collected as post intervention data.

Dependent variables: somatic anxiety, cognitive anxiety, self confidence

Procedure

The selected place was quite and well ventilated, with dim lighted and favorable for relaxation with no external noise or distraction.

Subject were asked to wear comfortable light clothing, and asked to remove shoes, watches or any band if wear. Every subject received relaxation technique in supine lying position.

All the procedures were properly explained to the subject, and they were asked to listen & follow the instruction carefully.

Progressive muscular relaxation technique:

Progressive muscular relaxation is the systemic technique developed by Edmund Jacobson's in (1938). It is widely used active procedure for aid relaxation and relieves tension.

The procedure involve, asking the subject to focus on a specific muscle group which are going to be tense than taking deep breath and simultaneously tense that specific muscle group & feel the tension for 5 - 7 sec. which are guided by the therapist counting (1 to 5) followed by exhale and simultaneously released the tension and feel the sense of relaxation for 10 – 15 sec.

RESULTS

The data were analyzed using SPSS (version 15) in within group comparison by using paired t - test results revealed that PMR group showed significant difference in pre test post test mean value of somatic anxiety, cognitive anxiety and self-confidence than the control group at p<0.05 level of significance.

Table 1 showed that there is no significant reduction in somatic & cognitive anxiety and increased self confidence in group 2. The mean value change of pre test to post test of somatic anxiety was 14.06±1.4 to 14.2± 3.2. cognitive anxiety 12.6±0.9 to12. 9 ±3.4 & self confidence 5 to 5.2±1.

The result of two tailed paired 't' test analysis showed that there is no statistically significant difference found in pre test post test value of somatic anxiety ,cognitive anxiety & self confidence at p<0.05 level of significance.

TABLE 1. Within group analysis: Group 2

	Pre-test Mean±SD	Post-test Mean±SD	Std. Error Mean diff	t value	P value
Somatic anxiety	14.06±1.4	14.2± 3.2	0.682	-0.195	0.848
Cognitive anxiety	12.6±0.9	12. 9 ±3.4	0.753	-0.442	0.665
Self-confidence	5	5.2±1	0.266	-1.00	0.335

*significant at p < 0.05

Table 2 showed that there is significant reduction in somatic & cognitive anxiety and increased self confidence in (group 1), after receiving PMR technique. The mean value of somatic anxiety is reduced from 14.27±2 to 10± 3.8. the mean value of cognitive anxiety is reduced from 13±1.8 to 9 ±3.8 7 the mean value of self confidence increased from 5 to 8.6± 4.1.

The result of two tailed paired 't' test analysis showed that there is statistically significant difference found in pre test post test value of somatic anxiety (t=4.17,p<0.001), cognitive anxiety (t=5.20 , p<0.00) & self confidence (t=-3.39, p<0.004) at p<0.05 level of significance.

TABLE 2 With in group analysis : Group 1

	Pre-test Mean±SD	Post-test Mean±SD	Std.Error Mean diff	t value	P value
Somatic anxiety	14.27±2	10± 3.8	1.021	4.17	0.001*
Cognitive anxiety	13±1.8	9 ±3.8 7	0.768	5.20	0.00*
Self-confidence	5	8.6± 4.1	1.059	3.39	0.004*

*significant at p < 0.05

DISCUSION

The purpose of this study was to asses the effectiveness of PMR technique technique on pre competitive state anxiety and self-confidence in athletes The within group analysis results revealed that there was a significant reduction in the competitive state anxiety and improved self- confidence in group 1 (somatic t = 4.17 p<0.001, cognitive t = 5.2 p<0.00 , self confidence t = - 3.39 p<0.004) and there was no significant difference found in pre test & post test measures of competitive state anxiety and self-confidence in group 2

These findings were consistent with previous research of David C. et al [18] they found that single session of PMR technique significantly reduced the snake-phobic behavior in adults. Result confirms the considerable effect of PMR technique on autonomic activity. This finding was similar with the finding of William et al. [84], who reported that brief relaxation training did not significantly affect either verbal report of anxiety or autonomic level, following training but did affect autonomic response in the anxiety condition. Similarly Khanna et al.[7], found that PMR technique does effective reduction in pulse rate on first day of treatment. Other studies also confirm the immediate effect of relaxation training on ANS activity (Thomas W.Vodde [79], Jan Falkowski [37], Karen S.Lucic [42])..

These findings also consisted with the previous research of Peter E.Crocker et al.[61] they found that single session training significantly reduced the induced state anxiety. He further revealed that more the level of anxiety, more powerful the relaxation effect. In group analysis of findings revealed that the group 1 had significantly reduced competitive state anxiety and improved self-confidence. These finding support the previous finding of Rodney K. Millere et al.[65] who reported that 30 min. of PMR training significantly reduced the state anxiety. These findings also consistent with the previous finding of Gordan L. Paul et al.[30] they reported that PMR intervention produced significantly greater reduction in physiological response to stressful images than the control group.

CONCLUSION

From the result of the study it was concluded that relaxation technique is an effective intervention for reducing pre competitive state anxiety and improving self-confidence in athletes. As progressive muscular relaxation were significantly effective on reducing competitive state anxiety & improving self-confidence than the control group.

REFERENCES

1. A. Arntz (2003) Cognitive therapy versus applied relaxation as a treatment of generalized anxiety disorder. Behaviour research and therapy. 41; 633-646.
2. A.Groslambert. R. Candau. Effect of autogenic and imagery training on the shooting performance in biathlon. Research Quarterly for Exercise and sport. Vol.74. No.30 pp. 337-341.
3. Anne Kennedy, Jan M. A Vries. Article on Relaxation.
4. A.Mark Williams (2002) The effect of anxiety on visual search, movement kinematics and performance in table tennis. Journal of sport & exercise psychology, 20; 81-97.
5. Andrew M.Lane (1999) Confirmatory factor analysis of the competitive state anxiety inventory-2.Journal of sport science, 17; 505-512.
6. Apter M J. (1982) The experience of motivation: The theory of psychological reversal. London: Academic press.
7. Archanakhanna,Jaspal S.Sandhu.(2007) Efficacy of two relaxation technique in reducing pulse rate among highly stressed females. Calicut Medical Journal 5(2): e 2.
8. Ashton C.Jr. whitworth GC. (1997) Self-hypnosis reduces anxiety following coronary artery bypass surgery, Journal of cardiovascular surgery. 38(1):69-75.
9. A.W.Garvin (1997) Influence of acute physical activity and relaxation on state anxiety and blood lactate in untrained college male. Int.J. Sports Med. 18; 470-476.
10. BA Edimansyah, (2008) Effect of short duration stress management training on self- perceived depression, anxiety and stress in male automotive assembly workers. J. Occup Med Toxicol, vol.3:28.
11. Boris Blumenstein (1995). The augmenting role of biofeedback: Effect of autogenic, imagery and music training on physiological indices and athletic performance. Journal of sport science, 13; 343-354.
12. Brain C. Focht (1998) Influence of resistance exercise of different intensities on state anxiety and blood pressure. Medicine & Science in sport & exercise, 456-463.
13. Burton et al (1988) do anxious swimmer swim slower? Re-examine the elusive anxiety-performance. Journal of sport psychology. 10; 45-61.
14. Caradiff (1994) The relaxation and stress reduction.3rd edition.
15. Chapman C. Lane (1997) Anxiety, self confidence and performance in tae kwon-do. Percept mot. Skills, vol. 3; 1275-8.
16. Cox JA, Terry PC, (1996) Measure of anxiety among tennis players in single & double matches. Percept mot. Skills, vol. 2; 595-603.
17. Cristina Akiko Iizuka (2006) Anxiety and performance in young table tennis players. University of Queensland, Australia.
18. David C, Rimm (1970) the role of muscle relaxation in participant modeling.

Behaviour research and therapy vol. 8, pp. 127-132.
19. Decaria, M. D. (1977) The effect of cognitive rehearsal training on performance and self-report of anxiety in novice and intermediate female.
20. Deutsch (1999) A discussion on performance anxiety.
21. Dedorah- Alix, Sy (2008) Psychological response in the pre competition period in elite soccer player. Journal of sport science & medicine. 7; 46-54.
22. D.J. Bhum (200) The effect of psychological training on anxiety and archery performance. 2000 Pre- Olympic
23. Dr. Mevhibe Akandere & Ali Teken (2002). The effect of physical exercise on anxiety. The sport journal, vol. 5; 1- 9.
24. E.E Solberg (2000) Stress reactivity to and recovery from a standardized exercise bout: a study of 31 runners practicing relaxation techniques. Br. J sports med; 34; 268-272.
25. Eileen Israel (1977) Live versus recorded relaxation training: a controlled investigation. Behavior Therapy, vol.8: issue 2; pages 251-254.
26. F.Dudely Mcglynn (1970) systematic desensitization of snake- avoidance following three types of suggestion. Behaviour research and therapy, vol.8, pp. 197-201.
27. Gaynor Parfitt and John Pates (1999) the effect of cognitive and somatic anxiety and self confidence on components of performance during competition. Journal of sport science, 17; 351-356.
28. GAA. Medical scientific and player welfare. Progressive muscular relaxation.
29. GAA. Medical scientific and player welfare. Autogenic relaxation training.
30. Gordon L. Paul (1969) Inhibition of physiological response to stressful imagery by relaxation training and hypnotically suggested relaxation. Behaviour research and therapy, vol.7, pp.249-256.
31. Graham Jones (2001) Pre-competitive feeling state and directional anxiety interpretations. Journal of sport science, 19; 385-395.
32. Graham Jones (1994) Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers. Personality and individual difference, vol.17, issue 5, pp 657-663.
33. Gian Mauro Manzoni (2008) Relaxation training for anxiety: a ten-year systematic review with meta-analysis. BMC Psychiatry 8: 41.
34. G. R.Norton (1983) A comparison of two relaxation procedure for reducing cognitive and somatic anxiety. J. Behaviour research and therapy, vol. 14, No. 3, pp. 209-214.
35. Hardy, l. (1996) A test of catastrophe models of anxiety and sport performance against multidimensional anxiety theory model. Anxiety, Stress and Coping: An international journal, 9; 69-86.
36. Irving Beiman (1978) during training and post training effects of live and taped extended progressive relaxation, self relaxation, and electromyogram biofeedback. Journal of consulting and clinical psychology. Vol. 46, issue 2, pp 314-321.
37. Jan Falkowski (1983) biofeedback- assisted relaxation in the control of reaction to a challenging task and anxiety-provoking film. Behaviour research and therapy. Vol. 21, no. 2, pp. 161-167.
38. Janet Ortiz Efficacy of relaxation technique in increasing sport performance in women golfers. The sport journal- ISSN: 1543-9518.

INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 6)
Available online at: www.ijariit.com

Effect of progressive muscular relaxation technique and autogenic relaxation technique on pre competitive state anxiety and self-confidence in athletes

Dr. Nitin Sakhare
drnitinsakhare12@gmail.com
Nav Yuva Institute of Medical Sciences and Research Physiotherapy, Kardha, Maharashtra

Kalpana Sharma
drkalpanas@gmail.com
Nav Yuva Institute of Medical Sciences and Research Physiotherapy, Kardha, Maharashtra

Anjali Syal
anjalisl@yahoo.com
Nav Yuva Institute of Medical Sciences and Research Physiotherapy, Kardha, Maharashtra

ABSTRACT

Pre-test and Post-test control group design. Participants: 45 subjects were selected on the basis of their CSAI-2R score, they were randomly allocated to one of the three groups. Group 1 (progressive muscular relaxation) group 2 (autogenic relaxation) group 3 (control). Intervention: Progressive muscular relaxation technique and Autogenic relaxation technique for 15-20 minutes. Main outcome measures include somatic anxiety, cognitive anxiety, self-confidence. There was a significant reduction in somatic anxiety and cognitive anxiety and improved self-confidence found in both groups 1and 2 than group 3 ($p < 0.05$) whereas no significant difference observed in group 1 and group 2. From the result of the study it was concluded that relaxation technique is an effective intervention for reducing pre competitive state anxiety and improving self-confidence in athletes. As both progressive muscular relaxation and autogenic relaxation technique were significantly effective in reducing competitive state anxiety and improving self-confidence than the control group.

Keywords— *Cognitive, Somatic, Autogenic, CFA, PMR*

1. INTRODUCTION

Sport for leisure can be both fun and thrilling but when competition sets in, it may no longer be so. With competition, the first thought that comes to mind is the pressure, tension, stress or anxiety. There can be tons of pressure in any sport, it can come from the expectations of the coach, friends, and supporters who expect you to win. It can also come from within a person, sometimes we can be very hard on ourselves. We push ourselves to excel and this further ad to the stresses that come with playing in the competitive sport.

Coakley (1994) define competition as "a social process that occurs when rewards are given to people on the basis of how their performance compares with the performance of other doing the same task or participating in the same event".[14]

Today's sporting arena is highly competitive. Sports competition is well known for placing an extremely high demand on the athlete and that ever-increasing demand put the athlete in a stressful condition. Which cause the athlete to react in both physical (somatic) and psychological (cognitive) manner that can negatively affect their performance. [27, 70, 78.] "Anxiety is a normal response for threat or to a psychologically stress and it is experienced occasionally by everyone it is a reaction by an individual to a stressful situation" (Spiel Berger 1972) [74]. Anxiety detracts from one's overall psychological well-being and is defined as the surfacing of a negative form of cognition characterized by worry, self-doubt and apprehension [56]. Researchers classify anxiety into two type trait anxiety and state anxiety. Trait anxiety is the characterized of our personality of general anxiety whereas state anxiety is our response to a particular situation, it is a temporary reaction (Spiel Berger 1972). [74]

Pre-competitive state anxiety is the state anxiety that occurs prior to a competitive situation. It has been one of the most thoroughly examined topics in sport and performance psychology. This is mainly due to the perceived detrimental effect of anxiety on performance.

The relation between anxiety and sports performance has attracted much research attention over the past 20 years and

researchers have tried to clarify this relationship by advancing several models and theory. These include drive theory of "inverted U hypothesis" (Broadhust, 1957), "Individual zone of optimal functioning" (Hanin, 1980) "Reversal theory" (Apter, 1982) "catastrophic model" (Hardy, 1990, 1996a) and "Multidimensional anxiety theory" (Marten et al. 1990).[50,56,78]

There has been a large amount of research concerning the multidimensional aspect of anxiety (Jones, Swain and Cale 1990, marten, Burton, Vealey and Smith 1990). This theory suggests that anxiety consists of two sub-component cognitive and somatic anxiety and they should influence performance differently. Cognitive anxiety is defined as the mental component of anxiety and in sport, it is commonly manifested by the negative expectation of performing a task and thus negative self-evaluation. According to Marten et al (1990), there is a negative linear relationship between cognitive anxiety and performance. [47, 50, 56]

The somatic anxiety refer to the physiological element of the anxiety it is reflected in such response as rapid heart rate, shortness of breath, clammy hand, butterflies in the stomach and tense muscle (Gould and Krane 2002 Hardy 2001 Marten (1990) suggest that somatic anxiety has an inverted U shaped relationship with performance in a curvilinear fashion with lower and higher level of somatic anxiety being detrimental to performance.[50, 56] Sheldon Hanton (2002)[70].

Caruso (1990) confirmed that state anxiety is multidimensional and it's psychological and physiological component changed over time. Somatic anxiety tends to increase rapidly as the start of an event approach while cognitive anxiety increases more gradually.

A third subcomponent discussed by the Martens (1990) is the individual difference factor of self-confidence this encompasses the athlete's global perception of confidence although not originally proposed as a sub-component of anxiety. But it has been found to account for a greater proportion of variance in performance than cognitive or somatic anxiety and has a positive linear relationship with performance[50,56]. Tim Woodman and Lew Hardy (2003)[78] supported the relationship that is found between self-reported state anxiety and performance. They suggest that high anxiety level leads to poor athletic performance. Better performance has been attributed to either lower level of cognitive and somatic anxiety or higher level of self- confidence (Martens, Burton, Bump and Smith (1990) as cited in Sara Legion).[68]

More recent finding has been revealed that other dimension of the competitive response, in addition to intensity and frequency, may also play an important role in influencing performance. In particular, the dimension of "direction" of an individual' interpretation of thought and feeling (i.e. facilitative or debilitative) to performance has received considerable attention. The researcher had been concluded that anxiety level higher in an athlete who interpreted their anxiety as a debilitative as those who reported it as being facilitative.[31, 47, 70]

A review of the sports psychology literature reveals that a wide variety of psychologically skill training or technique has been used with the athlete. most anxiety reduction and performance enhancement intervention include cognitive-somatic technique like Cognitive behaviors therapy, Thought control strategy such as Positive thinking and Cognitive restructuring, Goal setting, Mental imagery, Meditation, Cyclic meditation, Biofeedback, Yoga, Benson technique, Laura Mitchell's, Applied relaxation, Diaphragmatic breathing exercise, Music therapy, Passive relaxation technique, Progressive muscular relaxation technique, Autogenic relaxation technique have all been employed effectively in sport psychology such intervention are generally aimed at helping athlete to control or manage their arousal, stress, and anxiety. [11, 56, 47]

Gables (1990) used two computerized databases to review the research on physical intervention in sport. Based on 128 studies they concluded that most of the published work consists of anecdotal evidence or systemic description of the case study, not controlled experimentation. In line with this conclusion, Whelen (1991) reported over 100 empirical evaluation of psychological intervention in sport. Only 19 intervention concerned athlete in a competitive situation and Relaxation technique is a widely accepted intervention in sport.[11]

A relaxation technique is the effective intervention for manage anxiety. A recent 10-year systematic review with Meta-analysis study showed consistent and significant efficacy of relaxation training in reducing anxiety. [33] The relaxation response is proposed to involve decrease arousal of the autonomic nervous system and the central nervous system and increase parasympathetic activity characterized by lower musculoskeletal and cardiovascular tone and altered neuroendocrine function.[14, 37,42,79] It helps to promote rest, recovery and recuperation.[24] It has been suggested to increase concentration[2], enhance motor skill and improve the ability to handle arousal and stress[24,80]. It helps to establish of a set level of physical and mental arousal prior to warming up for competition. When player become relax they can make better attention and concentration towards the game and able to take a quicker decision as well as able to play more confidently at their topmost level.

According to review the literature of past 20 years there is an increase in the prevalence of competitive state anxiety in athletes, and it is highly accepted that the competitive state anxiety plays a major role in the performance of an athlete in competition. As the competition gets closer there is a gradual increase in the intensity and frequency of anxiety [70] athlete feels nervous, unease, and tense that all does the athlete to feel like choking under pressure which can affect their performance. Therefore many studies had suggested that there is need of an effective coping strategy to handle the pre-competitive anxiety for better performance. [47, 50, 55, 70]

Autogenic relaxation and progressive muscular relaxation is widely accepted as an effective relaxation technique for reducing

competitive anxiety. They showed their effectiveness consistently in competitive sport and there considerable effect on reducing state anxiety is also proved.

2. METHOD

Subjects: 45 male athletes (15 Table tennis, 15 Badminton, 9 Karate, 6 Skating) with the mean age of 17.8±4.6 were selected for the study after fulfilling the all inclusion and exclusion criteria.

2.1 Inclusion criteria

- Athlete performs in competitive sport.
- An athlete who perceive their anxiety feeling as a debilitative (un-helpful) to their performance
- An athlete with somatic anxiety score between (12–24), cognitive score (10 –20) and self-confidence score (10–5) was included in the study.
- Athlete gave a written consent as a participant for study.

2.2 Exclusion criteria

Athlete took any medication or any specialized technique for controlling anxiety were excluded from the study

Subjects were randomly assigned to one of three groups. Group 1 received Progressive muscular relaxation technique (n=15), group 2 received Autogenic Relaxation Technique (n=15) and group 3 subjects form a control group (n=15).

2.3 Measure

Pre-competitive state anxiety and self-confidence were measured by using a revised version of competitive state anxiety inventory 2 (CSAI-2R). This is 17 items measure and has three subscales cognitive anxiety, somatic anxiety, and self-confidence. 7 items in somatic anxiety subscale and 5 items in each of the subscales of cognitive anxiety and self-confidence The 17-item revised CSAI-2 was subjected to a confirmatory factor analysis (CFA) using the validation data sample, resulting a good fit of the data to the model which comparative fit index was .95, not- normed fit index was .94 and the root mean squared error of approximation was .054 (Cox, Martens and Russell, 2003).

2.4 Protocol

1 hour prior to the competitive performance Subject were asked to fill the revised version of competitive state anxiety inventory 2 (CSAI 2R) on the basis of fulfillment of all inclusion and exclusion criteria subject were selected for the study and their CSAI 2 score consider as a pre-intervention data. Than subject were randomly assigned to one of three groups. Group (1) received Progressive muscular relaxation technique [PMR], group (2) received the Autogenic Relaxation Technique [AR], and group (3) was the control group. The subject of intervention group [PMR, AR] explained the procedure and effect of their respected intervention while the subject of the control group was kept blind about the purpose of the study. The subject of intervention group [PMR, AR] received relaxation technique in quiet and suitable place for 15 – 20 min. after that subject was returned back to the competitive environment. 30 min. prior to competitive performance subject was again asked to fill the CSAI 2R scale and score were collected as post-intervention data.

Dependent variables: somatic anxiety, cognitive anxiety, self-confidence

3. PROCEDURE

The selected place was quiet and well ventilated, with dim lighted and favorable for relaxation with no external noise or distraction.

Subject was asked to wear comfortable light clothing and asked to remove shoes, watches or any band if wear. Every subject received relaxation technique in a supine lying position.

All the procedures were properly explained to the subject, and they were asked to listen and follow the instruction carefully.

3.1 Progressive muscular relaxation technique

Progressive muscular relaxation is the systemic technique developed by Edmund Jacobson's in (1938). It is a widely used the active procedure for aid relaxation and relieves tension.

The procedure involves, asking the subject to focus on a specific muscle group which is going to be tense than taking a deep breath and simultaneously tense that specific muscle group and feel the tension for 5 - 7 sec. which are guided by the therapist counting (1 to 5) followed by exhaling and simultaneously released the tension and feel the sense of relaxation for 10 – 15 sec.

Table 1: Instructions for progressive muscle relaxation training

Hand	Make a tight fist of left hand….. feel the Tension….. Relax and let hand hang loosely. Same for the right side.
Wrists	Bend left hand back hyper extending your Wrists…..feel the tension…… Relax. Same for the right side.
Upper arms	Tightly pull your left lower arm towards your upper arm and tense biceps muscle…..feel the tension…..Relax. Same for the right side.
Shoulders	Bring your both shoulders up toward your ears…… feel the tension…….Relax let your shoulders drop down.
Forehead	Wrinkle your forehead, raise your Eyebrows……feel the tension……. Relax.
Eyes	Close your eyes tightly…..feel the tension…… Relax.
Jaws	Clench your jaws tightly…..feel the tension…… Relax.
Tongue	Press your tongue against the roof of Your mouth…..feel the tension…….. Relax.

Mouth	Press your lips together tightly ….feel the tension …… Relax.
Neck and Jaws	Bend your head forward, pressing your Chin against your chest…….feel the tension …… Straighten and relax.
Chest	Take a deep breath and hold it for 5 Seconds…feel the tension…. slowly exhale and relax.
Abdomen	Tighten your stomach muscles…. feel the tension …… Relax.
Thighs	Stretch your right legs in front of you. Tighten Your thigh muscles…….feel the tension…… Relax. Same for the left side.
Hamstrings	Push your right heels down into the floor, tighten Your hamstring muscles……feel the tension…….. Relax. Same for the left side.
Calves	Point your toes toward your head…… feel the tension…..Relax. Same for the left side.
Feet	Curl your toes toward the bottom of your Feet…… feel the tension….. Relax. Same for the left side.

Autogenic relaxation technique Autogenic relaxation technique All the procedures were properly explained to the subject, and subjects were asked to listen and follow the instruction carefully.

The instructions are as follows:

1. Close your eyes imagine you are sitting in a peaceful place.
2. Take a slow deep breath and exhale slowly repeat for three times.
3. Concentrate on your arm and hands……. say and feel "My arm and hand are heavy" "My arm and hand are heavy" repeat for 5 times.
4. Concentrate on your leg and feet……say and feel "My leg and feet are heavy" "My leg and feet are heavy" repeat for 5 times.
5. Concentrate on your arm and hands……. say and feel "My arm and hand are warm" "My arm and hand are warm" repeat for 5 times.
6. Concentrate on your leg and feet……say and feel "My leg and feet are warm" "My leg and feet are warm" repeat for 5 times.
7. Concentrate on your heart beat…….. and say "My heartbeat is calm and regular" "My heartbeat is calm and regular" repeat for 5 times.
8. Concentrate on your breath…….. take a deep breath in……. feel the air drawn in from your nose and filling your lungs…….. Slowly release the breath and say "My breathing is smooth and rhythmic". "My breathing is smooth and rhythmic" repeat for 5 times.
9. Concentrate on your forehead……. Say and feel " My forehead is cool" " My forehead is cool" repeat for 5 times.
10. Now take a slow deep breath……. Slowly release the breath and say……. "My body feels calm and relaxed" "My body feel calm and relaxed" repeat for 3 times. stay quite for few mins. then slowly open your eye.

4. RESULTS

The data were analyzed using SPSS (version 15) in within-group comparison by using paired t-test results revealed that both PMR group and AR group showed a significant difference in pre-test post test mean value of somatic anxiety, cognitive anxiety, and self-confidence than the control group at $p<0.05$ level of significance. (See table no. 2 for descriptive statistics). between group analysis by using one way ANOVA with Scheffe post hoc test results revealed that both the PMR and AR group were significantly different from the control group in posttest measure at $p<0.05$ level of significance (see table no. 3 for descriptive statistics).

Table 2: Within group analysis: Group 1

		Group 1	Group 2	Group 3
Somatic anxiety:	Pretest	14.27±2	14.3±1.8	14±1.4
	Posttest	10±3.8*	8.8±3.3*	14.2±3.2
Cognitive anxiety:	Pretest	13±1.8	13±1.9	12.6±0.9
	Posttest	9±3.8*	8.3±3.3*	12.9±3.4
Self- confidence:	Pretest	5	5	5
	Posttest	8.6±4.1* 8.8±4.3*	5.2±1	8.6±4.1* 8.8±4.3*

*significant at $p < 0.05$
Data are expressed as Mean± S.D

Table 3: Within group analysis

		Group 1 vs. 2	Group 1 vs. 3	Group 2 vs. 3
Somatic anxiety:	Mean difference	1.13	-4.2	-5.3
	Scheffe sig.	0.67	0.008*	0.001*
Cognitive anxiety:	Mean difference	0.66	-3.93	-4.6
	Scheffe sig.	0.87	0.014*	0.003*
Self- confidence:	Mean difference	**-0.2**	**3.33**	**3.53**
	Scheffe sig.	0.98	0.04*	0.03*

*significant at $p < 0.05$ Mean diff. = mean difference
Scheffe sig. = Scheffe significance

5. DISCUSSION

The purpose of this study was to assess the effectiveness of PMR technique and AR technique on pre-competitive state anxiety and self-confidence in athletes.

The within-group analysis results revealed that there was a significant reduction in the competitive state anxiety and improved self- confidence in group 1 (somatic $t = 4.17$ $p<0.001$, cognitive $t= 5.2$ $p<0.00$, self-confidence $t= -3.39$ $p<0.004$) and group 2 (somatic anxiety $t = 6.56$ $p<0.00$, cognitive $t = 5.86$ $p<0.00$, self- confidence $t = -3.37$ $p<0.005$. and there was no significant difference found in pre-test and post-test measures of competitive state anxiety and self-confidence in group 3.

In between group analysis, the results revealed that there was a significantly greater reduction in competitive state anxiety and improved self-confidence in group 1 than the group 3. (Somatic $p<0.008$, Cognitive $p<0.014$, Self-confidence ($p<0.43$).

These findings were consistent with previous research of David C. et al [18] they found that single session of PMR technique significantly reduced the snake-phobic behavior in adults. Result confirms the considerable effect of PMR technique on autonomic activity. This finding was similar with the finding of William H. et al. [84], who reported that brief relaxation training did not significantly affect either verbal report of anxiety or autonomic level, following training but did affect autonomic response in the anxiety condition. Similarly, Khanna et al.[7] found that PMR technique does an effective reduction in pulse rate on the first day of treatment. Other studies also confirm the immediate effect of relaxation training on ANS activity (Thomas W.Vodde [79], Jan Falkowski [37], Karen S.Lucic [42]). Between groups analysis results further revealed that there was a significantly greater reduction in competitive state anxiety and improved self-confidence in group 2 than the group 3. (somatic $p<0.001$, cognitive $p<0.003$), self-confidence ($p<0.30$).

These findings consisted with the previous research of Peter E.Crocker et al.[61] they found that single session AR training significantly reduced the induced state anxiety. He further revealed that more the level of anxiety, more powerful the relaxation effect.

In between group analysis of Group 1 and Group 2, findings revealed that both the group had significantly reduced competitive state anxiety and improved self-confidence. But there was no significant difference found between both the groups.

These findings support the previous finding of Rodney K. Miller et al. [65] who reported that 30 min. of PMR and AR training significantly reduced the state anxiety but there was no significant difference found between these two interventions. These findings also consistent with the previous finding of Gordan L. Paul et al.[30] they reported that both the intervention produced a significantly greater reduction in physiological response to stressful images than the control group.

The result of the study clearly indicated that relaxation technique has a significant effect on pre-competitive state anxiety. Both the techniques were found to be effective in reducing somatic and cognitive anxiety and improving self-confidence. Hence the first and second experimental hypothesis was proved. The relaxation response is proposed to involve decreased arousal of the autonomic nervous system and central nervous system, and increased parasympathetic activity, which does lowered musculoskeletal and cardiovascular tone and recovered normal neuroendocrine function.[14] Cognitive theory had suggested that relaxation technique work on distraction hypothesis it can distract attention from anxiety-provoking thoughts and produce a "time-out" from cares and worries.[14] although the mechanism by which relaxation might exert its influence is not fully understood.[47]

As there is no significant difference found in the effectiveness of PMR and AR technique on reducing pre-competitive state anxiety and improving self-confidence. Both the techniques were reported to significantly effective in controlling the arousal of ANS and CNS system. Hence the third experimental hypothesis was rejected and the null hypothesis was accepted.

In this study, the effect of relaxation technique was explained to the Athlete prior to the relaxation session, which is found to be significantly helpful in reducing anxiety. Similar findings reported by W.Steward Agras et al.[87] they found that subject who receive instruction about immediate blood pressure lowering effect of PMR training showed significant lowering in blood pressure than who received the instruction of late effect of PMR training on blood pressure.

The findings of this study have laid the foundation for further experimentation to determine whether relaxation training is effective on reduction of pre-competitive state anxiety. The identification of the limitations of this study points the way to design modifications required in future research All the findings found in the study are up to 30 min prior to competition. (Sheldon Hanton[22], Lew Hardy[47]) reported that there was a gradual increase in cognitive anxiety and sharp increase in somatic anxiety as close to the competitive performance. Increased somatic and cognitive anxiety in the control group was found in this study, so the persistent effect of relaxation training is not checking as close to competition, as they might change. Also, the effect of relaxation training on athlete performance is not addressed in this study so there is need of a future study to assess the level state anxiety on before the start of the competition and also assess the effect on performance due to anxiety reduction

6. CONCLUSION

From the result of the study, it was concluded that relaxation technique is an effective intervention for reducing pre-competitive state anxiety and improving self-confidence in athletes. As both progressive muscular relaxation and autogenic relaxation technique were significantly effective in reducing competitive state anxiety and improving self-confidence than the

control group.

7. REFERENCES

[1] A. Arntz (2003) Cognitive therapy versus applied relaxation as a treatment of generalized anxiety disorder. Behavior research and therapy. 41; 633-646.

[2] A.Groslambert. R. Candau. Effect of autogenic and imagery training on the shooting performance in biathlon. Research Quarterly for Exercise and sport. Vol.74. No.30 pp. 337-341.

[3] Anne Kennedy, Jan M. A Vries. Article on Relaxation.

[4] A.Mark Williams (2002) The effect of anxiety on visual search, movement kinematics, and performance in table tennis. Journal of sport and exercise psychology, 20; 81-97.

[5] Andrew M.Lane (1999) Confirmatory factor analysis of the competitive state anxiety inventory-2.Journal of sports science, 17; 505-512.

[6] Apter M J. (1982) The experience of motivation: The theory of psychological reversal. London: Academic Press.

[7] Archana Khanna, Jaspal S. Sandhu. (2007) Efficacy of two relaxation technique in reducing pulse rate among highly stressed females. Calicut Medical Journal 5(2): e 2.

[8] Ashton C.Jr. whitworth GC. (1997) Self-hypnosis reduces anxiety following coronary artery bypass surgery, Journal of cardiovascular surgery. 38(1):69-75.

[9] A.W.Garvin (1997) Influence of acute physical activity and relaxation on state anxiety and blood lactate in untrained college male. Int.J. Sports Med. 18; 470-476.

[10] BA Edimansyah, (2008) Effect of short duration stress management training on self- perceived depression, anxiety, and stress in male automotive assembly workers. J. Occup Med Toxicol, vol.3:28.

[11] Boris Blumenstein (1995). The augmenting role of biofeedback: Effect of autogenic, imagery and music training on physiological indices and athletic performance. Journal of sports science, 13; 343-354.

[12] Brain C. Focht (1998) Influence of resistance exercise of different intensities on state anxiety and blood pressure. Medicine and Science in sport and exercise, 456-463.

[13] Burton et al (1988) do anxious swimmer swim slower? Re-examine the elusive anxiety-performance. Journal of sports psychology. 10; 45-61.

[14] Caradiff (1994) The relaxation and stress reduction.3rd edition.

[15] Chapman C. Lane (1997) Anxiety, self-confidence, and performance in taekwondo. Percept mot. Skills, vol.3; 1275-8.

[16] Cox JA, Terry PC, (1996) Measure of anxiety among tennis players in single and double matches. Percept mot. Skills, vol. 2; 595-603.

[17] Cristina Akiko Iizuka (2006) Anxiety and performance in young table tennis players. University of Queensland, Australia.

[18] David C, Rimm (1970) the role of muscle relaxation in participant modeling. Behavior research and therapy vol. 8, pp. 127-132.

[19] Decaria, M. D. (1977) The effect of cognitive rehearsal training on performance and self-report of anxiety in novice and intermediate female.

[20] Deutsch (1999) A discussion on performance anxiety.

[21] Deborah- Alix, Sy (2008) Psychological response in the pre-competition period in an elite soccer player. Journal of sports science and medicine. 7; 46-54.

[22] D.J. Bhum (200) The effect of psychological training on anxiety and archery performance. 2000 Pre- Olympic

[23] Dr. Mevhibe Akandere and Ali Teken(2002). The effect of physical exercise on anxiety. The sports journal, vol.5; 1- 9.

[24] E.E Solberg (2000) Stress reactivity to and recovery from a standardized exercise bout: a study of 31 runners practicing relaxation techniques. Br. J sports med; 34; 268-272.

[25] Eileen Israel (1977) Live versus recorded relaxation training: a controlled investigation. Behavior Therapy, vol.8: issue 2; pages 251-254.

[26] F.Dudely Mcglynn (1970) systematic desensitization of snake- avoidance following three types of suggestion. Behavior research and therapy, vol.8, pp. 197-201.

[27] Gaynor Parfitt and John Pates (1999) the effect of cognitive and somatic anxiety and self-confidence on components of performance during competition. Journal of sports science, 17; 351-356.

[28] GAA. Medical scientific and player welfare. Progressive muscular relaxation.

[29] GAA. Medical scientific and player welfare. Autogenic relaxation training.

[30] Gordon L. Paul (1969) Inhibition of physiological response to stressful imagery by relaxation training and hypnotically suggested relaxation. Behavior research and therapy, vol.7, pp.249-256.

[31] Graham Jones (2001) Pre-competitive feeling state and directional anxiety interpretations. Journal of sports science, 19; 385-395.

[32] Graham Jones (1994) Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers. Personality and individual difference, vol.17, issue 5, pp 657-663.

[33] Gian Mauro Manzoni (2008) Relaxation training for anxiety: a ten-years systematic review with meta-analysis. BMC Psychiatry 8: 41.

[34] G. R.Norton (1983) A comparison of two relaxation procedure for reducing cognitive and somatic anxiety. J. Behaviour research and therapy, vol. 14, No. 3, pp. 209-214.

[35] Hardy, l. (1996) A test of catastrophe models of anxiety and sports performance against multidimensional anxiety theory model. Anxiety, Stress, and Coping: An international journal, 9; 69-86.

[36] Irving Beiman (1978) during training and post-training effects of live and taped extended progressive relaxation, self-relaxation, and electromyogram biofeedback. Journal of consulting and clinical psychology. Vol. 46, issue 2, pp 314-321.

[37] Jan Falkowski (1983) biofeedback-assisted relaxation in the control of reaction to a challenging task and anxiety-provoking film. Behavior research and therapy. Vol. 21, no. 2, pp. 161-167.
[38] Janet Ortiz Efficacy of relaxation technique in increasing sports performance in women golfers. The sports journal- ISSN: 1543-9518.
[39] James Lowther (2002) Self-efficacy play an important role in the performance of an athlete in competition and psychological skill are an effective to measure to controlling that. Athletic Insight, online journal of sports psychology.
[40] Kais. K. and Raudsepp, L. (2005) Intensity and direction of competitive state anxiety, self-confidence, and athletic performance. Kinesiology, 37; 1: 13-20.
[41] Kanji N, (2006) Autogenic training to reduce anxiety in nursing students. J Adv Nurs.53 (6): 729-35.
[42] Karen S. Lucic (1991) progressive relaxation training: muscle contraction before relaxation? Behavior Therapy 22; 249-256.
[43] Kirby, R J., Liu. (1999) Pre-competition anxiety in Chinese athletes Percept and mot. Skills. 88; 297-303
[44] L, A. Pawlo and P. M. Oneil (2003) Night eating syndrome: effect of brief relaxation on stress, hunger, mood and eating pattern. Int. J. of obesity.27; 970-978.
[45] Lars-Goran (2000) applied relaxation vs. cognitive therapy in the treatment of generalized anxiety disorder. Behaviour Research and Therapy. 38, pp. 777-790.
[46] Laura A. Pawlow (2005) The impact of abbreviated progressive muscle relaxation on salivary cortisol and salivary immunoglobulin A (sIg A) Applied psychophysiology and biofeedback. Vol. 30, No.4 375-387.
[47] Lew Hardy and Graham Jones (1994) Current issues and future directions for performance-related research in sports psychology. Journal of sports science 12; 61-92.
[48] Luke Behuke. Mental skill training for sport: A brief review. Athletic insight the online journal of sports psychology.
[49] Lundqvist, Carolina (2005) Competitive state anxiety inventory- 2: evaluating the Swedish version by confirmatory factor analysis. Journal of sports sciences. 1-3.
[50] Lynette L.Craft (2003) The relationship between the competitive state anxiety inventory-2 and sports performance: A Meta-analysis. Journal of sport and exercise psychology .25; 44-65.
[51] Martens. R.S (1977). Sport competition anxiety test. Champaign, IL : Human Kinetics.
[52] Martens. R.S, Vealy and D. Burton (1990) Champaign, IL: Human Kinetics.
[53] Martens, R, Burton. D, Vealy, R.S. Bump (1990). Development and validation of the competitive state anxiety inventory-2. Competitive anxiety in sport, Human Kinetics, Champaign, IL. 117-190.
[54] Martin, K.A. and Halls (1997) Situational and interpersonal moderator of sports competition state anxiety. Journal of sports behavior, 20; 435-446.
[55] Michael Behan (2008) state anxiety and visual attention: the role of the quiet eye period in aiming to a far target. Journal of sports science, 26(2): 2007-215.
[56] Miguel Humara, M.A. (2006) The relationship between anxiety and performance: a cognitive-behavioral perspective. The Online Journal of sports psychology, 1-13.
[57] M.Mike Nawas (1970) The comparative effectiveness of pairing aversive imagery with relaxation, neutral task and muscular tension in reducing snake phobia. Behav. res. and therapy, vol.6 pp.63-68.
[58] Natural standard research collaboration (2007). An article on relaxation therapy.
[59] Parish, Thomas S (1998) The effect of two types of relaxation training on students level of anxiety. Adolescence.
[60] Paul M.B.Yung (1996) A controlled comparison on the effect of muscle and cognitive relaxation procedure on blood pressure: implications for the behavioral treatment of borderline hypertensive. Behav. Res. Ther. vol.34, no.10, pp. 821-826.
[61] Peter R.E. Crocker (1991) Reducing induced state anxiety: Effect of acute aerobic exercise and autogenic relaxation. J. Sports Med. Phy. Fitness, 31: 277-82.
[62] Philip Wilson (1998) The relationship between competitive anxiety and self- presentational concerns. Journal of sport and exercise psychology, 20; 81-97.
[63] Renato D. Alarcon (1982) The effectiveness of progressive relaxation in chronic hemodialysis patients.Journal of chronic disease, vol. 35. Issue 10, pages 797-802.
[64] Richard H.cox. (2003) measuring anxiety in athletics: The revised competitive state anxiety inventory-2. Journal of sport and exercise psychology, 25;519-533.
[65] Rodney K.Miller (1977) Thirty- minute relaxation: A comparison of some methods. Journal of sport and exercise psychology, vol. 8 .pp 291-294.
[66] Rober T. Coutre (1999) Can mental training help to improve shooting accuracy? Journal of police strategies and management .vol 22, issue 4, pp. 696- 711.
[67] Roger T. Coutre (2007) Can active seniors gain stress-reducing result from acute exercise? The online journal of sports psychology. 1-11.
[68] Sara L Elgin (1999) State anxiety of women basketball players prior to competition. Missouri western university.
[69] Sherman JJ.(1997) Effect of a stretch – based progressive relaxation training on the secretion of salivary immunoglobulin A in Orofacial pain patients. Crit. Rev. Oral Bio-Med.
[70] Sheldon Hanton (2002) A qualitative investigation of the temporal patterning of the pre-competitive anxiety response. Journal of sports science. 30; 911-928.
[71] Shoshana Shapiro (2005) psychophysiological effect of autogenic training and progressive relaxation. Applied Psychophysiology and biofeedback. Vol.5, no. 2 pp. 249-255.
[72] Simons, J and Martens, R. (1977) SCAT as a predictor of A- a state in varying competitive situations. Human Kinetics, Champaign, IL, 146-156.
[73] Spielberger, C.S.(1966). Theory and research on anxiety. In C.S. Anxiety and behavior, Academic Press, New York.

[74] Spielberger, C.D. (1972). Current trends in theory and research on anxiety: current. Anxiety: current trends in theory and research. New York: Academic Press.
[75] Suryanarayana P. Effect of yoga for anxiety and depression scale in therapy participants. Swami Vivekananda yoga research foundation, Bangalore.
[76] Susan Zaro, MFT. Effect of EmWave biofeedback on competitive state anxiety. A case study.
[77] Terry. P.C. and Mayer (1998) Effectiveness of a mental training program for novice scuba driver. Journal of applied sports psychology, 10; 251-267.
[78] Tim Woodman and Lew hardy (2003) The relative impact of cognitive anxiety and self-confidence upon sports performance: a meta-analysis 21; 443- 457.
[79] Thomas Hollendick (1977) Differential effectiveness of muscular and cognitive relaxation as a function of locus control.
[80] A. Behav. Ther. and Exp. psychiatry. vol.8, pp.223-228.Thomas W. Vodde (1971) The effects of exposure to fear stimuli on fear reduction. Vol.9, pp. 169-175.
[81] Topp R. (1989) effect of relaxation or exercise on undergraduates tests anxiety. Percept Mot. Skill. 69(1) pp.35-41.
[82] Usha Kiran, Behari (2005) The effect of autogenic relaxation on chronic tension headache and in modulating cortisol response.Indian J. Anaesth. 49(6) : 474- 478.
[83] Victoria L Salt (1997) Mitchell's simple physiological relaxation and Jacobson progressive relaxation technique: A Comparison. vol. 83, issue 4, pp. 200- 07.
[84] William H. Connar (2007) effects of brief relaxation training on autonomic response to anxiety-evoking stimuli. Psychophysiology vol. 11, issue 5, pp. 591-599.
[85] Wiggins, M.S.(1998) Anxiety intensity and direction: pre-performance temporal patterns and expectation in athletes. Journal of applied sports psychology, 10;201-211.
[86] Weinberg, Daniel Gould (1995). Foundation of sport and exercise psychology. Human Kinetics.
[87] W. Stewart Agras (1982) expectation and blood-pressure-lowering effect of relaxation. Psychosomatic Medicine, vol. 44, No. 4.

