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THE EFFECT OF MUSIC THERAPY AND MEDITATION ON SPORTS PERFORMANCE IN PROFESSIONAL SHOOTERS

Kachanathu Shaji John[1]*, Verma Satish Kumar[2], Khanna Gulshan Lal[3]
[1]Researcher, College of Applied Medical Sciences, King Saud University, KSA
[2]Professor, Department of Sports Sciences, Punjabi University, Patiala, India
[3]Dean, Faculty of Applied Medical Sciences, Manav Rachna International University, Faridabad, India

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***Corresponding author**
Email: johnsphysio@gmail.com

ABSTRACT
Little has been known about the response to relaxation therapies such as of Music Therapy (MT) and Mindfulness Meditation Therapy (MMT) in sports. Researchers have been performed on the psychophysiological responses of MT and MMT on normal and diseased persons, but little has been done on sports population especially in shooters during competition. The purpose of this study was to estimate the contribution of MT and MMT training on shooting performance of shooters. 165 professional male shooters age of 29.5±4.3years were examined in three groups Group A, B, and C, MT, MMT, and as a Control respectively, n= 50±3 in each group. Duration of the study was 4 weeks. Pre and post data of quantitative Performance Score (PS) were analyzed. Results of the study showed positive correlation, highly significant ($p<0.0001$) post-intervention PS. Ultimately resulted in reduction of competition stress level and increase in PS. Comparatively Group A an B, and group A shown marginal improvement than Group B. Whereas the Control group has been shown non-significant result compare to experimental groups ($p<0.05$). Study concluded that relaxation therapies such as MT and MMT interventions along with routine sports specific training may decrease Competition Stress (CS) level and will enhance sports performance and also found MT has been shown better effectiveness than MMT in 4 weeks of training.
Keywords: Music Therapy, Meditation, Competition Stress, Shooting, Sports Performance.

INTRODUCTION

In shooting the requirement of good physical and psychological condition as well as technical perfection is highly demanded. The important use of vision for shooting, leading to compensation through subconscious postural mechanisms based on proprioceptive and vestibular information, such as a less elevation of pre-shot heart rate and blood pressure, a lower sweating and a more appropriate preparatory brain activity[1]. Pistol shooting is a static activity requiring a strict control of body segments and posture to align the rear sight aperture and the foresight through proprioceptive feedback and gaze fixation either on the target directly or between the target and the weapon and, therefore, to increase precision of the shot[2]. Air pistol shooting is an Olympic sport requiring extreme mental concentration and movement precision for success. While a number of studies have examined both psychological and physiological factors related to shooting performance, to our knowledge, this is the first study to determine the efficacy of MT and Meditation (M) on Competition Stress in PS in professional shooters.

CS is a widely prevalent condition that exists among athletes of all levels and within every sport. Stress is most often used to describe an unpleasant emotional state or condition which is characterized by subjective feelings of tension, apprehension, and worry. In sports context it is commonly known as pre-competition stress or anxiety. Further, research indicated that anxiety has a negative effect on these sport outcomes[3]. Research on how athletes cope with sport-related stress has been recognized for both its practical and its theoretical importance because of the debilitating effects that stress may have on athletic performance. Study findings suggest that, prior to competing, sport performers encounter more stressors pertinent to performance these observations highlight that all the demands faced by athletes should be considered when preparing and implementing interventions to manage competition stress[4]. Its relationship to performance has been studied both in and out of the sport context through test anxiety research and anxiety research with athletes[5,6,7]. Despite the large body of research on competition anxiety, our understanding of its relationship to performance remains elusive. Research has been conducted to discover or identify the sources of stress in various competitive sports, including basketball[8], golf[9], and wrestling[10].Anxiety and stress decreases the concentration and performance level of sports persons[11]. A recent meta-analysis examined the effects of competitive anxiety and self-confidence on athletic performance[12].

Relaxation techniques have been used in sports primarily to enhance recovery from training and competition, manage anxiety and improve performance[13]. In a recent review, presented a strong case for the mood-enhancing effects of music in a sport context[14]. Studies supported that music can be an effective tool for improving athletic performance[15].

The techniques of MMT, which focus on awareness to develop a detached observation of the contents of consciousness, may represent a powerful cognitive behavioural coping strategy for transforming the ways in which we respond to life events[16]. Even though many studies on MMPs have been criticized for the lack of scientific rigor, including the lack of high quality randomized controlled studies designed to differentiate between the specific (i.e. specifically related to repeated sitting meditation practice) and the non specific (i.e. related to benefits' expectations) effects of such practices[17] and the frequent use of self report instruments as measures of clinical improvements following mindfulness training[18].

The present study focused on examining the relation of relaxation therapies response to skilled sport performance, and investigating the relevance of relaxation therapies in CS in improving PS.

MATERIALS AND METHODS

Subjects

A total of 165 healthy male elite level shooters aged (29.5±4.3yrs.) selected in the present study and were voluntarily recruited from Indian shooting team; permission was obtained from chief coach and officials. No volunteers are included as per exclusion criteria such as any physical or mental illness, hearing impairment, and have been undergoing neither MT nor MMT for last 3 months. All subjects were nonsmokers, medication-free and not habitual drinkers. The procedures involved and potential risks of the study were explained to the subjects, and the written consent was obtained prior to the study. The study and all protocols were approved by research ethical committee of Punjabi University.

The program consisted of two components: (1)MT and, (2)MMT. 165 Participants were randomly allocated into three groups; Group-A (MT), Group-B (MMT) and, Group-C (Control) by multiple blocked randomization, 55 in each group, after the dropout 147 (50±3) subjects could complete the study. Heart Rate (70±3bpm), Respiratory Rate (15±2rpm), BMI (24±1.04kg/cm^2) and Blood Pressure (119±4/79±4 mm of Hg) were recruited to participate in this study. Intervention trial was conducted to the respective subjects one week prior to the study**.** Concerning impediments to effective practice, subjects were monitored by the researcher and experts during the interventions. The interventions were provided over the course of 4 weeks, group sessions with a maximum of 8 participants each, 20 minutes session per day, 6 days a week and one day was off. Participants were asked not to consume caffeine or alcoholic beverages for 12 h, and not to exercise for 12 h prior to the experiment especially during testing.

Procedure

All participants of each batch reported to the stadium at 08:00AM, each session conducted in the morning (between 8 AM and 10 AM) and the subject changed into loose fitting clothing, and shoes removed then the participants were instructed to lie in the supine position on the floor mat in a quiet, room with the temperature between 24 and 28 °C with their eyes closed.

Music Therapy

CD of 30-40 music of classical based songs given to the MT subjects 1 week prior to the study and asked them to select 5-10 songs according to their choice from the songs given , and were made separate folder for each subjects. The music was delivered on Sony^{TM} MP3 player by headphone with volume of 60-70 dB, 60 to 70 beats per minute. The MT group was encouraged to assume a comfortable position in supine position on a floor mat during delivery of the music intervention, advised subjects to clear their minds and allow their muscles to relax throughout the training session and left the room after 20 minutes of session.

Meditation Therapy

The first step in performing meditation was to adopt a posture that ensures an erect spine and shoulder resting on the mat, with the hands should be placed on the upper position of the abdomen, the position of head kept slightly foreword with the support of small towel roll. The eyes may be fully closed, or the upper lids may be dropped and was given 1 minutes of adaptation period. As meditation in progress, subjects were asked to under go 3 minutes for stabilization by Shavasana, For Shavasana training the technique recommended by Coulter[19] was used. The subject was asked to relax , after this, they performed meditation comprising a Pranayam for 4 min while situated as in the control condition (in the supine position with the eyes closed and respiration at a constant frequency of 0.2 Hz in tempo with the sound of a metronome (i.e., 5 breaths/min for 4 min)). Then the participants were instructed mindfulness by body scan i.e. focusing attention on various joints by simply focuses on the way each part of body feels without labeling the sensations as either “good” or “bad” in a sequence from the each joint from proximal to distal as described by the expert, once they completes this, subjects performed 4 minutes Pranayam at a constant frequency of 0.2 Hz in tempo with the sound of a metronome. Finally ended with 3 minutes of Shavasana**.** Subsequently, the participants left the room after 20 minutes of session.

Testing

Subjects were assessed for pre-test and post-test data of Performance Score Test. The performance score calculated by pre-scheduled a competition in an internationally standard shooting range on one day prior to beginning the 1st week, and on 29th day. Measure of shooting accuracy or shooting score was calculated from the standard shooting scoring board and the final result of competition obtained from the chief coach after the completion of competition, in order to test shooting performance.

RESULT

Descriptive statistics (mean and SD) were used to describe all the study variables Age (A), Body Mass Index (BMI), Heart Rate (HR), Respiratory Rate (RR), Blood Pressure Diastolic (BPD), Blood Pressure Systolic (BPS) (Table 1). All groups showed a non statistically significant difference in the baseline mean values of A (F= 1.15; p= 0.332), HR (F= 0.10;p=0.961), RR (F=2.44;p=0.066), BPD (F=0.42;p=0.736), and BPS (F=1.11;p=0.347). But there is a statistically significant difference in the mean values of BMI (F= 3.57; p=0.015, PS (F= 0.40; p = 0.756).

Table 1: Comparison of study variables of shooters in study groups

Study Variables	M T		MMT		Control	
	Mean	± SD	Mean	± SD	Mean	± SD
Age	28.67	4.24	29.40	4.08	30.2	4.68
BMI	24.27	1.11	23.65	.76	23.8	1
HR	69.54	4.14	69.67	5.89	70.02	4.12
RR	15.46	1.73	14.69	1.99	15.61	1.58
BPD	119.42	4.38	118.67	5.96	119.41	3.2
BPS	78.58	3.92	78.74	5.09	79.93	3.3

Outcome variable Performance Score (PS) (Table 2), PS analysis showed a highly statistically significant difference in the mean values of PS across the 3 study groups at 29th day (F= 13.69; p <0.0001) (Table 3).

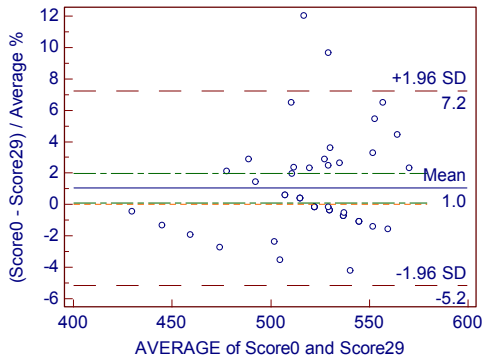
Table 2: Comparison of PS at 2 stages in study groups

Outcome Variable	MT		MMT		Control	
	Mean	± SD	Mean	± SD	Mean	± SD
PS-0Day	528	29	528	25	522	31
PS-29th Day	544	30	541	25	518	28

Table 3: One way Analysis of Variance Comparison of PS at 2 Stages

Variable	F	Sig.
PS 0- Between Groups	.40	.756
PS 29- Between Groups	13.69	.000

When compared the mean values performance score of study subjects of MT (544.31), MMT (541.69) and of Control (518.04) at 29th day. Among the 3 groups the mean values of PS at 29th day was statistically significantly lower in control group (Graph 1). And among the intervention groups, the mean values of PS of MMT were significantly lower than the mean values of MT.



Graph 1: Bland and Altman plot Comparison of pre and post performance values of Control group

DISCUSSION

In the current study, used PS as a subjective marker used to assess the changes with different interventions in two interventional groups and also assessed changes in control group during the same duration. This study showed the pre and post competition PS of all two interventions were increased (F=13.69; p<0.0001) whereas Control showed a decrease of PS. In MT showed an increase of PS than MMT. Percentage values of changes are 3% (544), 2.6% (542), and 0.9% (518) for Groups A, B and, C respectively.

The result of the study indicated that there is an increase in post intervention values in all interventional groups was showing more effective, whereas the control groups it was highly insignificant result. The reason for these changes might be supported by studies on competition stress have been observed[4], supported that, prior to competing, sport performers encounter more stressors pertinent to performance. The level of anxiety automatically narrows perception restricting the focus of attention[20,21,22]. Thus result of this study indicated that there is an decrease in control group and increase in post intervention performance score in all interventional groups; the reason for these changes might be due to decrease in pre competition anxiety.

Music affects a reduction in sympathetic nervous control and therefore a reduction in heart and respiration rates, metabolism, oxygen consumption, and muscle tension[23]. Reduced heart and respiration rates lead to less anxiety and can promote relaxation. This study supports the more result in group involved with music. Also supported by reductions in autonomic activity and self-reported tension and improved performance of surgeons[24]. Current study also given MT based on classical music that might have increased relaxation in groups which have under gone music interventions. As repeated listening to music affects people's preference for it as well as their physiological responses to it[25], in our study we have given 20 minutes session for 4 weeks this could supports the more effect of meditation in frequency components than music.

Studies supported by participants who meditated had better attentional processing on alerting function as well as better mood, lower cortisol, and better immune function, allowing to conclude that randomly assigned short-term intensive meditation causes immediate benefits[26]. Researchers found low concentrations of the blood levels of cortisol in TM practitioners, in comparison with non-practicing subjects[27]. Music listening may influence cognitive functioning via alternate pathways by helping to better organize cortical brain transmissions[28].this might have been improved performance.

CONCLUSION

The past empirical evidence has lent support to the view that psychophysiological recordings may even provide insight into the skill related aspects of a shooter's psychomotor strategies and determinants of successful shooting performance. It is also shown comparatively music is better than meditation alone group in one month duration training. As previous studies the long term training may enhance the further in each group.

REFERENCES

1. Tremayne, P., & Barry, R. J. Elite pistol shooters: Physiological patterning of best vs. worst shots. International Journal of Psychophysiology 2001; 41:19–29.
2. Mononen K, Konttinen N, Viitasalo J, Era P. Relationships between postural balance, rifle stability and shooting accuracy among novice rifle shooters. Scand J Med Sci Sports 2007; 17:180–5.
3. Terry, P. C., & Slade, A. Discriminate effectiveness of psychological state measures in predicting performance outcome in karate competition. Perceptual and Motor Skills 1995; 81(i):275-286.
4. Stephen D Mellalieu, Richard Neil, Sheldon Hanton, David Fletcher. Competition stress in sport performers: Stressors experienced in the competition environment. Psychology of sport and exercise 2009; 27(7):729-736.
5. Chamberlain, S. T., & Hale, B. D. Competitive state anxiety and self-confidence: Intensity and direction as relative predictors of performance on a golf putting task. Anxiety, Stress, and Coping 2007; 20:197-207.
6. Kais, K., & Raudsepp, L. Intensity and direction of competitive state anxiety, self-confidence and athletic performance. Kinesiology 2005; 37:13-20.
7. Swain, A., & Jones, G. Explaining performance variance: The relative contribution of intensity and direction dimensions of competitive state anxiety. Anxiety, Stress, and Coping 1996; 9:1-18.
8. Maddan, Summers,and Brown. Coping behavior and susceptibility to chocking, Journal of sports Behavior 2004; 2:7-23.
9. Cohn, P. J. An exploratory study on sources of stress and athlete burnout in youth golf. The Sport Psychologist 1990; 4(2):95 – 106.

10. Gould, Eklund, & Jackson. U.S. Olympic wrestling excellence: I. mental preparation, precompetitive cognition, and affect. The Sport Psychologist 1988; 6(4):358 - 382.
11. E E Solberg, K A Bergulund. The effect of meditation on shooting performance. British Journal of Sports Medicine 1996; 30:342-346.
12. Craft, L. L., Magyar, M., Beaker, B. J., & Feltz, D. L. The relationship between the Competitive State Anxiety Inventory-2 and sport performance: A meta-analysis. Journal of Sport and Exercise Psychology 2003; 25:44-65.
13. E E Solberg, F Ingjer, A Holen. Reviews of the literature, Recovery from a standardized exercise bout: a study on 31 runners practicing relaxation technique. British Journal of Sports Medicine 2000; 34:268-272.
14. Vlachopoulos, S.P., Karageorghis, C.I. and Terry, P.C. Motivation profiles in sport: A self-determination theory perspective. Research Quarterly for Exercise and Sport 2000; 71:387-397.
15. Karageorghis, C. I., Drew, K. M., & Terry, P. C. Effects of pretest stimulative and sedative music on grip strength. Perceptual and Motor Skills 1996; 83:1347-1352.
16. Astin JA. Stress reduction through mindfulness meditation: Effects on psychological symtomatology, sense of control and spiritual expe-riences. Psychotherapy and Psychosomatics 1997; 66(2):97-106.
17. Chiesa A and A. Serretti. A systematic review of neurobiological and clinical features of mindfulness meditations, Psychological Medicine 2010; 40:1239-1252.
18. Chambers, R., Lo, B. C. Y., & Allen, N. B. The impact of intensive Mindfulness training on attentional control, cognitive style and affect. Cognitive Therapy & Research 2008; 32:303-22.
19. Coulter, H.D. (Ed.). Relaxation and meditation. In: Anatomy of Hatha Yoga: Body and Breath, first ed. Inc. Honesdale, 2001 pp. 547–557.
20. Curry, D. G., Meyer, J. E., & McKnney, J. M. Seeing versus perceiving: What you see isn't always what you get. Professional Safety 2006; 57(6):28-34.
21. Fredrickson, B. L., & Branigan, C. Positive emotions broaden the scope of attention and thought-action repertoires. Cognition & Emotion 2005; 19(3):313-332.
22. Most, S. B., Scholl, B. J., Clifford, E. R., & Simons, D. J. What you see is what you set: Sustained in attentional blindness and the capture of awareness. Psychological Review 2005; 112(1):217-242.
23. Lee OK et al. Music and its effect on physiological and anxiety levels of patients receiving mechanical ventilation: a pilot study. Journal of Clinical Nursing 2005; 14(5):609-620.
24. Allen K, Blascovich J. Effects of music on cardiovascular reactivity among surgeons. JAMA 1994; 272:882-884.
25. Knight WEJ, Rickard NS. Relaxing music prevents stress-induced increases in subjective anxiety, systolic blood pressure and heart rate in healthy males and females. Journal of Music Therapy 2001; 38:254-272.
26. Tang, Y., Ma, Y., Wang, J., Feng, S., Yu, Q., Rothbart, M. K., et al. Short-term meditation training improves attention and self-regulation. PNAS Proceedings of the National Academy of Sciences of the United States of America 2007; 104:17152–17156.
27. Walton KG, Pugh ND, Gelderloos P and Macrae P. Stress reduction and preventing hypertension: preliminary support for a psychoneuroendocrine mechanism. Journal of Alternative Complementary Therapy 1995; 1:263-283.
28. Rauscher FH, Shaw GL, Ky KN. Music and spatial task performance. Nature 1993; 365:611 .

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