

# Comparison of State and Trait Anxiety Response to Music Therapy and Aerobic Exercise in Non-Elite Collegiate Athletes

Shahin Naz Jamali<sup>1</sup>, Anuradha Solanky<sup>2</sup>

<sup>1</sup>Assistant Professor, School of Physiotherapy, Noida International University, Greater Noida, Uttar Pradesh, India

<sup>2</sup>Sports Psychologist, Sports Authority of India, New Delhi, India

**Abstract:** *The present study aim is to determine and compare the effectiveness of relaxing music and aerobic exercises on state and trait anxiety in non-elite collegiate athletic population. Thirty one male and female collegiate athletes were recruited. The subjects were randomly allocated into Music therapy group and aerobic exercise group. Music therapy was given to subjects of music therapy group for 20 minutes in each session. Subjects of aerobic exercise group performed 20 minutes aerobic exercise on treadmill in each session. Protocol lasts for two weeks (one session per day) for both of the groups. STAI measurement was taken before and after completion of two weeks of intervention. Unpaired-t test was used to analyse the between group difference and paired-t test is used to check within group effect. The significant difference has been seen in anxiety level in both of the interventional groups but magnitude of anxiety reduction is more by performing aerobic exercise than having music therapy. So result of the study states that Music therapy and aerobic exercise both are helpful in reducing state and trait anxiety in non-elite collegiate athletes but aerobic exercise is more beneficial than music therapy.*

**Keywords:** State–Trait anxiety, Aerobic exercise, Music therapy, STAI, Non elite collegiate athletes

## 1. Introduction

Stress particularly chronic stress, can lead to mental health problems, including anxiety and anxiety disorders. When such chronic stress lead to feeling of always being - "on guard", anxiety is the resultant experience. This is the feeling that goes beyond normal feelings of worry and fear [1]. Aurbey Lewis (1970) define anxiety - "as an emotional state, with the subjectively experienced quality of fear as a closely related emotions" [2]. In athletes, episodes of anxiety can have very deteriorating effect on their performances. So in order to give one's best performance athletes must have to control their anxiety level. Various measures and techniques is being used by athletes in order to control their anxiety.

There are various forms of anxiety. In 1966, Spielberger defined trait anxiety as individual's predisposition to respond, and state anxiety as a transitory emotion characterised by physiological arousal and consciously perceived feeling of apprehension, dread and tension [3]. There are two state anxiety components (cognitive worry and autonomic emotional) and four trait anxiety components (social evaluation, physical danger, ambiguous, and daily routine) have been identified [4]. Thus state anxiety is assessment of how the individual "feels right now, at this moment" and trait anxiety is an assessment of how the individual "generally feels." [5]

Traditional treatment protocols for anxiety (medication and psychotherapy) are often expensive and time consuming. For quite some times, physical activity (e.g. exercise) has been examined as a potential tool in both the prevention and treatment of anxiety. From previous studies it has been seen that aerobic exercise has very good results in order to reducing anxiety level than any other form of exercise [6]. Aerobic exercises act as a stress buster agent and ultimately reduce anxiety. Most of the studies of aerobic exercises and anxiety has been done on non-athletic population. Music

therapy is an upcoming anxiety controlling intervention which can help in controlling anxiety level in athletes. Music therapy is defined as - "A behavioural science that applies music and musical interventions systematically to restore, maintain and improve emotional, physiological and spiritual health and well-being." [7]. Music, of special relaxing character, helps in reducing anxiety to greater extent. The use of music as a relaxation aid has largely been ignored by sports research; however its use within medical environment has received some attention. Use of music during exercise have ergogenic effect (work - enhancing) [8], [9], [10], [11]. So present study is concerned about determining and comparing aerobic exercise and music therapy in order to reduce anxiety in non-elite athletes so that most effective treatment can be used by athletes to control their anxiety level and to enhance performance.

## 2. Review of Literature

Anshel et al., define anxiety as a - subjective feeling of apprehension or perceived threat, sometimes accompanied by heightened physiological arousal [12]. It is the state which resulted when individual doubts his or her ability to cope with situation that causes him or her stress. So it is a apprehensive anticipation of future danger or misfortune accompanied by feeling of dysphoria or somatic symptoms of tension [13].

Anxiety can be manifested both psychologically and physiologically. Some characterizing features of anxiety are (1) unpleasant feelings, (2) physical symptoms caused by activation of autonomic nervous system, (3) altered cogitative process, (4) altered behaviour, (5) vigilance etc. When the person's appraisal of that stress becomes negative, anxiety is the result. Normal anxiety became clinical anxiety when the number and intensity of the aforementioned symptoms increases and degree of suffering and ensuring dysfunction become disruptive of usual activity. This is the state characterised by worry self-doubt,

nervousness, and tension, but it also disrupts thought process and behaviour and alters physiological functioning [1].

Uncontrolled Anxiety has very deteriorating effect on athletic performance. Martens et al., [14] expanded on the inverted U from Yerkes and Dodson to include a multidimensional approach in which they looked at the relationships between cognitive anxiety and performance in addition to somatic anxiety and performance (inverted U). They found that a strong negative linear relationship exists between cognitive anxiety and performance. Woodman and Hardy [15] have determined that cognitive anxiety has a significantly higher negative impact on sports performance in male athletes in comparison to female athletes. Papastergiou et al., established that winners have higher level of self-confidence and low level of anxiety [16].

In 1966, Spielberger suggested that conceptual anxiety could be introduced to multifaceted definitions of anxiety by distinguishing trait anxiety from state anxiety [3].

In general state anxiety may be regarded as temporal cross section in the stream of life of a person [17] and emotional reaction as expression of personality state [18]. An emotional state exists at a given moment in time and at particular level of intensity. It is noticeable, but transient emotional state characterized by feeling of worry and apprehension and by heightened autonomic nervous system activity. Thus state anxiety is an assessment of how the individual feels "right now, at this moment." [1].

The classical definition of trait (Allport, 1937) implies a generalized and enduring predisposition to react to many situations in a consistent manner. Trait anxiety reflects a more general predisposition to respond across many situations with apprehension, worry, and nervousness. Thus trait anxiety is an assessment of how an individual "generally feels." [1].

Previous literature has suggested that physical activity has great influence on psychological status like anxiety and depression [19], [20], [21]. It has been established that there is positive correlation between exercise and acute mood state benefits [22], [23]. Meta-analysis of 124 studies gives a number of potential mechanisms in an attempt to explain the exercise-anxiety [19]. From two studies conducted by Broman et al., it has been seen that aerobic exercise yield significant reduction in self-reported anxiety sensitivity [24], [25]. Very few studies have been done over effect of aerobic exercise on state and trait anxiety specifically on athletic population. Raglin and Morgan found that exercise induced reduction in anxiety, persist for longer period than the anxiolytic effects observed following quiet rest [26]. Hale et al., has seen effect of different forms of exercise on state anxiety and concluded that aerobic exercise has great influence in reduction of state anxiety than any other forms of exercise [27].

Music has great influence upon health and well-being and reduction of feeling of stress [28], [29]. The use of music as a relaxation aid has largely been ignored by sports research;

however its use within medical environment has received some attention. Use of music during exercise has ergogenic effect (work - enhancing) [8], [9]. Music also helps in fasten the post exercise recovery [30]. It has been seen that Music when combined with exercise intervention produces great physical and psychological benefits [31], [32], [33]. A great effectiveness of music in cardiac care unit has been seen in order to reduce stress and anxiety in cardiac patients [34], [35].

Different types of music shows different responses to psychological status, motivational quality, performance enhancement and imparting relaxation. In order to select relaxing music for anxiety control, it has been seen that music for anxiety researches has generally adopted one of the two approaches. A participant centred- approach in which the participant select the music, or the experimenter-centred approach in which the music is selected by experimenter. The participant centred approach has an inherent bias as the listener may unwittingly over evaluate the effect of the music [36]. Although the experimenter-centred method nullifies the possible response. It has been reported that state anxiety benefit from acute exercise, and trait anxiety from chronic exercise, [27] but long term effects of exercise on state anxiety is still under studied.

### 3. Objective

To determine and compare the effectiveness of relaxing music and aerobic exercise on state and trait anxiety in non-elite collegiate athletic population.

### 4. Methodology and Procedure

#### 4.1 Sample

Thirty one male and female collegiate athletes from Jamia Millia Islamia and other nearby colleges were recruited for the study by convenience sampling method (Mean  $\pm$  SD for age  $20.87 \pm 1.82$  years, height  $164.2 \pm 8.2$  cm, weight  $57.04 \pm 7.2$  kg and BMI  $21.09 \pm 1.84$ ). Ethical clearance was taken from Institutional Ethical Committee of Jamia Millia Islamia, New Delhi, India.

#### 4.2 Sample size

Prior to conducting the study, sample size was calculated. The number of subjects were determined using Software G. Power 3.15 using data of changes state anxiety level by Baldari et al., [33]. 15 subjects per group were shown to be necessary based on the effect size of 0.14, alpha level of 0.05 and power (1-beta) of 0.80.

#### 4.3 Inclusion criteria

- Age = 18-30 years
- Both males and females
- BMI 19 – 24.9 kg/m<sup>2</sup>
- Be in good physical health (assessed using physical activity readiness questionnaire, PAR [37]).
- No auditory impairment
- Previous experience of treadmill running.
- No injury in last six months.

#### 4.4 Exclusion Criteria

- Any health condition that would preclude aerobic exercise
- Current involvement in psychotherapy
- Current use of psychiatric medicines

#### 4.5 Research Design

Prospective pre-test- post-test experimental design with random allocation into groups using lottery system.

#### 4.6 Variables

##### Independent Variables

- Music therapy
- Aerobic exercise

##### Dependent Variables

State and Trait Anxiety level

- State and Trait Anxiety inventory level for state anxiety (STAI-Y1)
- State and Trait Anxiety inventory level for trait anxiety (STAI-Y2)

#### 4.7 Instruments

- State trait anxiety inventory for adults

The present study used State trait anxiety inventory for adults (STAI) [38], [39] to measure participant's anxiety levels. STAI represent different anxiety symptoms that participant's rate on 4-point likert scale. The state anxiety scale (STAI Form Y-1) evaluates how respondent feels "right now, at this moment". The trait anxiety scale (STAI Form Y2) assesses how people generally feel. The STAI-Y1 and Y2 (State Anxiety and Trait anxiety) scales are printed on opposite sides of a single page test form.

- State trait anxiety inventory for state anxiety (STAI-Y1)

The state anxiety scale (STAI Form Y-1) consists of twenty statement that evaluate how respondent feels "right now, at this moment". In responding to the STAI state anxiety scale, examines blacken the number on the standard test form to the right of each item statement that best describe the intensity of their feelings: (1) not at all; (2) somewhat; (3) moderately so; or (4) very much so.

- State trait anxiety inventory for state anxiety (STAI-Y2)

The trait anxiety scale (STAI Form Y2) consists of twenty statements that assess how people generally feel. In responding to the trait anxiety scale, examinees were instructed to indicate how they generally feel by rating the frequency of their feelings of anxiety on the following four point scale: (1) almost never; (2) sometimes; (3) often; or (4) almost always.

#### 4.8 Procedure

Subjects who met the inclusion and exclusion criteria were selected for the study. Then subjects were randomly allocated into one of the two groups: music therapy group or aerobic exercise group. Prior to participation, all subjects were explained about the purpose of the study. All subjects gave their informed consent to participate in the study and the information was kept confidential by assigning a number to each subject. Weight and height of the subjects were measured by digital weighing machine and stadiometer respectively. Physical Activity Readiness Questionnaire (par-q) was established, whether the subjects assigned to aerobic exercise group were of optimal physical fitness to complete the activities required to them.

Subjects of music group received no exercise intervention but only music therapy at relaxed seated position in calm and distraction free environment for 20 minutes in each session. Subjects of aerobic exercise group performed 20 minutes aerobic exercise on treadmill in each session without any music intervention. The whole protocol lasts for two weeks (one session per day) for both of the groups. STAI measurement was taken before starting the intervention and then post measurement was taken after completion of two weeks.

##### 4.8.1 Music Selection

In present study, relaxing music was selected by experimenter centred method (nullified the possible response biased due to participant selected music). For this, instrumental Indian classical music was selected for anxiety control as per recommendations of Elliott et al., [40]. For example, tempi ranged between 80 and 100 beats per minute, rhythms were relatively subtle, simple and constant, melodies were strong and secure and harmonies were consonant. The music was transferred to iPod or other portable listening device and played by using headphones. Intensity (volume) was self-selected by the subject according to their comfort [33].

##### 4.8.2 Aerobic Exercise Protocol

Participants in the exercise group completed an aerobic exercise regimen designed to expose them to the bodily sensations presumably associated with anxiety. The exercise participants completed 20-minute aerobic exercise sessions daily over a 2-week period. At each session, exercisers were fitted with a Polar heart rate monitor. Consistent with the recommendations of the American College of Sports Medicine (2000) for aerobic activity, exercise participants were asked to briskly walk or jog on a treadmill at a speed that maintained their heart rate between 60 and 90% of their predicted maximum heart rate for the full 20-minute session. The lower and upper bound for each participant's aerobic heart rate range was computed using the following formula:  $(220 - \text{age}) \times (0.60 \text{ [lower bound] or } 0.90 \text{ [upper bound]})$ . Heart rates were monitored by the experimenter at 2-minute intervals, and treadmill speeds were adjusted as necessary to maintain aerobic heart rates. Participants were not allowed to engage in any other

activities while exercising (e.g., talking, eating) to minimize distractions from arousal sensations [24]

### 5. Statistical Analysis

The SPSS Version 21.0 software programme was used for the data analysis. Mean and standard deviation (SD) of the demographic characteristics of age, height, and weight were analysed. To check within group anxiety difference pair t-test was done and to compare post anxiety measures difference between the groups independent t – test was used. The confidence interval used was 95% with level of significance was set at  $p < 0.05$ .

### 6. Result

Comparison of baseline criterion measurement between two groups, group 1 i.e. Music therapy group (n=15) and group 2 i.e. aerobic exercise group (n=16) was done by using independent t – test (Table 1) to prove the homogeneity

between the groups. No significant difference in STAI-Y1 and STAI-Y2 was found between the groups (Table 1). So the groups were comparable at the baseline.

**Table 1:** Comparison of baseline criterion measurement

Variables	Group 1 Mean (SD)	Group 2 Mean (SD)	F value	P value
STAI -Y1 Pre	49.20 (5.63)	50.75(4.559)	.543	.467
STAI -Y2 Pre	46.53(6.74)	42.88(8.45)	.413	.525

Independent t test was used to compare post anxiety measure i.e. STAI-Y1, STAI-Y2 between two groups. It shows significant difference in both state anxiety level i.e. STAI-Y1,  $F(1, 29) = 7.57, p = 0.010$  and trait anxiety level i.e. STAI-Y2,  $F(1, 29) = 7.81, p = .009$ , indicating the effect of both intervention in reduction of anxiety. The mean difference of both groups indicates that group 2 is reducing anxiety more in magnitude than group 1 (Table 2).

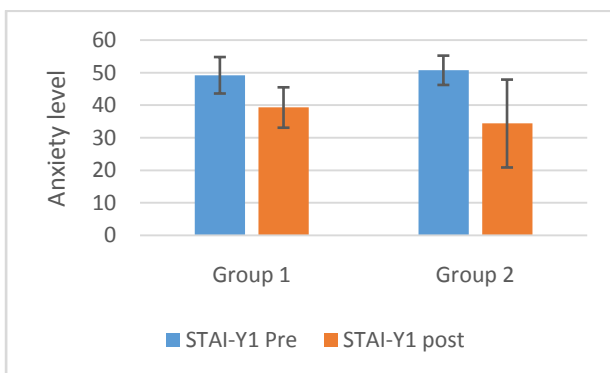
**Table 2:** Comparison of post anxiety measurement

Variables	Group 1 Mean (SD)	Group 2 Mean (SD)	df	F	p	Partial eta squared
STAIY1-Post	39.33(1.29)	34.37(1.25)	1	7.57	.010	.207
STAI- Y2 Post	41.60(1.3)	36.3 (1.3)	1	7.81	.009	.212

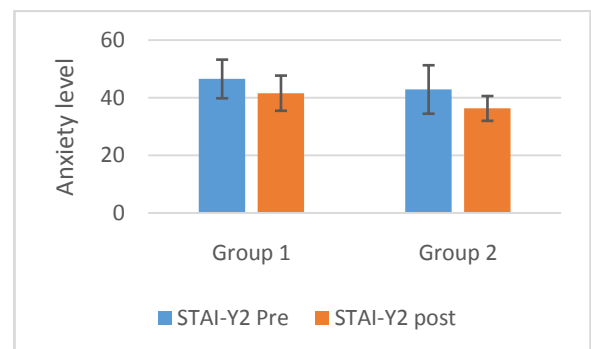
Pair-t test was done to check within group effect. That shows significant difference in pre and post anxiety level of both groups (Table 3).

**Table 3:** Within group difference

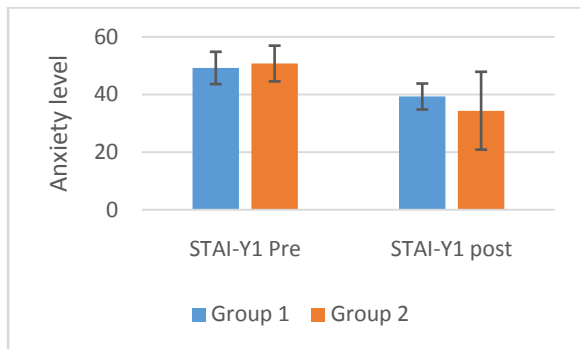
Groups	Variables	Pre test Mean SD	Post test Mean (SD)	n	t	df	p
Group 1	STAI-Y1	49.20 (5.6)	39.3 (6.2)	15	10.06	14	$\leq .000$
	STAI-Y2	46.53 (6.7)	41.60 (6.1)	15	5.043	14	$\leq .000$
Group 2	STAI-Y1	50.75 (4.5)	34.38 (3.5)	16	11.04	15	$\leq .000$
	STAI-Y2	42.88 (8.4)	36.31 (4.3)	16	3.97	15	.001



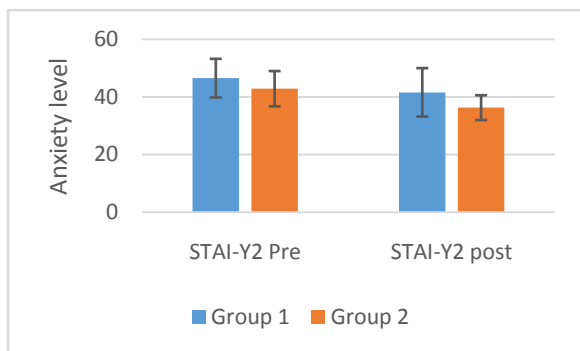
**Figure 1:** Comparison of STAI-Y1 within the groups



**Figure 2:** Comparison of STAI-Y2 within the groups



**Figure 3:** Comparison of STAI-Y1 between the groups



**Figure 4:** Comparison of STAI-Y2 between the groups

## 7. Discussion

Concerning about aerobic exercise and anxiety the present study found that there is significant difference in anxiety level in both state and trait anxiety before and after the exercise intervention. The present study support the findings of review done by Petruzzello et al that anxiety reduction occurred following exercise training when the exercise was aerobic [19]. But most of these studies have been conducted upon non athletic population. It has been seen that anaerobic form of exercise (e.g. resistance training), did not change the anxiety level or actually resulted in slightly increase in anxiety [19], [6]. Aerobic exercise highly affects the mood statue of an individual and ultimately reduces the stress level [21], [22]. A variety of mechanisms, ranging from simple distraction to changes in brain neurochemistry to the psychological changes associated with exercise is accepted for effect of aerobic exercise on anxiety reduction.

The result of this study showed that there is also a significant reduction in anxiety level in non-elite collegiate athlete after having music therapy intervention. So this study supports the various studies which have investigated the Anxiolytic effects of music; these have generally conducted within medical environment. And some of these studies have been conducted on the normal healthy but non athletic population in any stressful or anxious environment. Very few studies have been done to check effect of music therapy on anxiety level in solely on athletic population so far. Study conducted by Bhana et al. in 2013 has reported that therapeutic use of music is highly beneficial to ICU patients who have had cardiac surgery and that together with routine postoperative care it can promote holistic patient care [34]. Review by Bradt et al., concluded that music reduces stress and anxiety in coronary heart disease

patient, Nilsson conducted a systemic review to check the anxiety and pain reducing effects of musical intervention in surgical, pre-operative and post-operative patients and concluded that music therapy reduces pain and anxiety in hospital settings [35]. MacDonald, R. A. In 2013 stated that music therapy promotes mental health and well-being among community [28]. So result of this study also supports the fact that music therapy exhibits the Anxiolytic.

## 8. Major Findings

Our primary findings are that aerobic exercise and music therapy each reduce anxiety level, but magnitude of anxiety reduction is more by aerobic exercise. So the result of this study support the hypothesis that there is significant difference in these two forms of intervention and aerobic exercise is the more effective than music therapy in anxiety reduction. Moreover, Anxiety reductions were greater among subjects with higher baseline anxiety level than that of lower baseline anxiety level.

## 9. Conclusion

It is concluded from present study that both music therapy and aerobic exercise are helping in reduction of state trait anxiety level in non-elite collegiate athlete, but aerobic exercise reduces anxiety more in magnitude than music therapy. Therefore, athletes who wish to regulate their anxiety through physical activity should be encouraged to perform aerobic exercises at moderate intensity.

## 10. Perspective for Future Study

- Objective measures to assess anxiety like muscular tension, cardiovascular measurement or alteration in central nervous system can be taken
- Subjects from any specific sport can be studied according to arousal required in their sport.

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### Author Profile



**Shahin Naz Jamali** received the B.P.T and M.P.T degrees in Sports Medicine from Jamia Millia Islamia, New Delhi, India. Now From 2015 she is staying in Noida International University, School Of Physiotherapy as an Assistant Professor.



**Anuradha Solanky** received the M.A., M. Phill and P.hD. degrees in psychology from Bangalore University, Karnataka, India. Now From 1993 she is working with Sports Authority of India, New Delhi, as a sports psychologist.