



## CAN ANXIETY LEVEL DURING TRAINING AND COMPETITION AFFECT THE PERFORMANCE SCORE AMONG ELITE YOUTH SHOOTERS? A CORRELATION STUDY

<b>Dr. Vaishali R*</b>	MD Sports Medicine Department of sports medicine Chettinad Hospital Research Institute, India. *Corresponding Author
<b>Dr. C. Ramesh</b>	MD Physical Medicine And Rehabilitation Prof. and HOD at Department of Sports Medicine in Chettinad Hospital Research Institute, India.
<b>Dr. Arvind S</b>	MBBS, MD Sports Medicine Assistant Professor at Chettinad Hospital Research Institute, India.
<b>Dr. Harish Narayana</b>	MBBS, MD Sports Medicine Senior Resident at Chettinad Hospital Research Institute, India.
<b>Dr. Deepak Ram T</b>	MBBS, MD Sports Medicine Junior resident at Chettinad Hospital Research Institute, India.
<b>Dr. Siva Prasanth</b>	MBBS, MD sports medicine, Junior Resident in Chettinad Hospital and Research Institute, India.

**ABSTRACT** **BACKGROUND:** Shooting is one of the sports that can be taken up by an individual regardless of age and gender for professional involvement. It has higher mental fitness demands, which might reflect the ranking in top-level competition. However, it is unclear what type of anxiety affects the performance score. Therefore, the current study is to find the anxiety pattern, i.e., cognitive, somatic, and self-confidence among the elite youth shooters during training and competition correlating with their sports performance. **METHOD:** We analyzed the sports performance during training and competition and conducted Personal interviews with elite youth pistol and rifle shooters. The subject's Mental fitness was assessed by using the Competitive state anxiety inventory-2 methodology, which was evaluated just before 30mins on two occasions and correlated with scoring sheets. **RESULTS:** The Difference in mean of COGNITIVE ANXIETY score during match day and training day was statistically significant ( $p$ -value  $>0.05$ ). The Difference in mean of SOMATIC ANXIETY, SELF CONFIDENCE, SCORE-TRAINING during match day and training day was not statistically significant. ( $p$ -value  $>0.05$ ). **CONCLUSION:** Thus competitive anxiety is one of the determinant factors experienced by young elite shooters, and training them with appropriate modalities can help them to pursue the highest level of performance.

**KEYWORDS :** Shooting, Anxiety, cognitive, somatic, psychological factors, air-pistol, air-rifle shooters.

### INTRODUCTION:

Shooting is a precision sport introduced on the world championship level in 1970. This sports activity requires accuracy, consistency, and speed influenced by both physical and psychological parameters. It can be described as a static sport requiring extreme precision. Research in pistol and rifle shooting is centered on the areas of body sway and aiming point fluctuation (Ball et al., 2003) (1). An Experimental study conducted in Malaysia in the year 2007 to find the specific physical fitness among the youth rifle and pistol shooters assessed with intervening six week auxiliary conditioning program.(2) The age group selected was 13.1 to 18.2 years similarly to our study and results concluded with significant improvement in general fitness in pre training and pre competition phase. But the results of both also depend on visualization, the level of anxiety, confidence, and emotional reaction to the environment (1). Depending on the required skills for this sport, the beginning age ranges from 12 to 15 years, and finding the extrinsic and intrinsic factors such as psychophysiological balance like peer pressure, competition stressors, training volume, mental fatigue, and other factors are a hindrance in reaching a higher level of competition.

Most Olympic shooters are between 26- 40 years and the medal winner are usually between that age group. Recently, the youngest to ever get a medal in Tokyo Olympic 2022 was 16 years from China and won the silver medal in 10-m air pistol.(3) There is no minimum age group to participate in the Olympic shooting. But many other federations can require a qualification category to enter the Olympics. So the training volume and exposure to such competition from a young age can precipitate anxiety components in individuals.(4)

One of the most studied and frequently cited areas within the field of applied sports psychology is the competition stressors and anxiety but done among elite shooters of age 25-50 years. In line with the description above, 80% of professional athlete victories are determined by psychological factors, which have a very important role in helping athletes pursue high achievements. (5)

Anxiety occurs in any amateur to elite athlete relevant to the level of competition and situation at hand. Children's anxiety predominantly influences their performance regardless of exposure to training and competition simulations.(6-7) Anxiety is a negative emotional state characterized by nervousness, worry, and apprehension and associated with activation or arousal of the body. Thus, anxiety has a thought component (e.g., worry and apprehension) called cognitive anxiety. It also has a somatic anxiety component, which is the degree of physical activation perceived.(7)

Cognitive state anxiety concerns the degree to which one worries or has negative thoughts, whereas somatic state anxiety concerns the moment to moment changes in perceived physiological activation. Somatic state anxiety is a physical perception such as increased heart rate, respiration, and muscle tension. Thus, in addition to experiencing negative thoughts and perceived physiological activation, the degree to which one believes one has the resources and ability to meet challenges is an important component of state anxiety as well.(7)

Hanton et al explain the Multidimensional anxiety theory which predicts that cognitive state anxiety (worry) is negatively related to performance. "That is, increases in cognitive state anxiety led to decreases in performance. But the theory predicts that somatic state anxiety (which is physiologically manifested) is related to performance in an inverted U, with increases in the anxiety facilitating performance up to an optimal level, beyond which additional anxiety causes performance to decline."(7,8) Following the introduction into sports psychology of this multidimensional conceptualization of anxiety, Martens and colleagues (Martens, Vealey, Burton, Bump, and Smith, 1990) developed the Competitive State Anxiety Inventory-2 (CSAI-2) to measure the intensity of performers' cognitive and somatic responses and self-confidence. Over 40 studies have examined the relationship between the CSAI-2 subcomponents and sports performance.(9)

The purpose of this study is to find the anxiety pattern changes during

training and competition and correlate the performance with self-reported questionnaires and find the predominant cause of the performance deterioration i.e cognitive anxiety, somatic anxiety and self-confidence among the sub-elite youth shooters.

**METHODS AND MATERIALS:**

**Participants:**

This study was designed as a correlation study among Sub elite youth athletes participating in rifle shooting and 10m air pistol shooting who have experience and training for more than ±5 years and assessed for anxiety level and self-confidence during the training as well on the competition day.

Age category under 18, with a sample size of 26 (National rifle association of Indian shooters-10 and ISSF members-17) who have accredited a minimum of 350 scores in national events.

**Assessment method:**

Anxiety level investigated using the Competitive state anxiety inventory-2 scale divides anxiety into three components: cognitive anxiety, somatic anxiety, and a related component—self-confidence consisting of 27 items 9 for each of the three sub-scales. Self-confidence tends to be the opposite of cognitive anxiety and is another important factor in managing stress.

To score the CSAI-2, the scores were taken for each item at face value except for item 14, where it is to be “reverse” the score. Scores for each will range from 9 to 36 with which 9 indicating low state anxiety and 36 indicating high state anxiety.

On arrival during the training session participants when they are fairly relaxed, informed about the purpose of the study, and were randomly assigned to fill the questionnaire. The total time given is about 10-15mins and mentioned not to spend too much time on one statement. During the state competition day, the participants were asked to fill out the questionnaire before entering the console. The performance score of the athlete was collected from the range officer committee after the event.

**STATISTICAL ANALYSIS:**

Cognitive, somatic, and self-confidence during training day and match day were considered primary outcome variables.

Descriptive analysis was carried out by frequency and proportion for categorical variables and mean and standard deviation for continuous variables. Data was also represented using appropriate diagrams like pie diagrams, and bar charts.

The mean difference between the explanatory variable and outcome variable on training day and match day was assessed by using paired t-test.

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis. (2)

1. IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

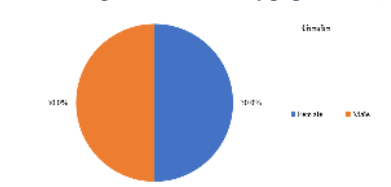
**RESULTS:**

**Table 1: Descriptive analysis of gender in the study population (N=26)**

Gender	Frequency	Percentages
Female	13	50.00%
Male	13	50.00%

Among the study population, 50.00% of them were male, and 50% of them were female.

**Figure 1 : Pie chart of gender in the study population (N=26)**

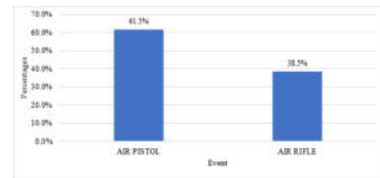


**Table 2 : Descriptive analysis of event in the study population (N=26)**

Event	Frequency	Percentages
AIR PISTOL	16	61.54%
AIR RIFLE	10	38.46%

Among the study population, 61.54% of them event were AIR PISTOL and 38.46% of them event were AIR RIFLE

**Figure 2 : Bar chart of event in the study population (N=26)**



**Table 3: Descriptive analysis of age in study population (N=26)**

Parameter	Mean ± SD	Median	Minimum	Maximum
Age	15.27 ± 2.62	15.50	11.00	23.00

Among the study population, the mean age was 15.27 ± 2.62 (11 to 23)

**Table 4: Descriptive analysis of cognitive anxiety at training, somatic anxiety at training, self-confidence at training, score-training in study population (N=26)**

Parameter	Mean ± SD	Median	Minimum	Maximum
Cognitive Anxiety At Training	19.77 ± 5.67	19.00	11.00	33.00
Somatic Anxiety At Training	16.58 ± 4.79	17.00	9.00	27.00
Self Confidence At Training	25.46 ± 4.52	26.00	14.00	32.00
Score-Training	348.77 ± 21.05	349.00	299.00	394.00

Among the study population, the mean Cognitive Anxiety At Training was 19.77 ± 5.67, the mean Somatic Anxiety At Training was 16.58 ± 4.79, the mean Self Confidence At Training was 25.46 ± 4.52 and the mean Score-Training was 348.77 ± 21.05.

**Table 5: Descriptive analysis of cognitive anxiety at match day, somatic anxiety at match day, self-confidence at match day, score-match day in study population (N=26)**

Parameter	Mean ± SD	Median	Minimum	Maximum
Cognitive Anxiety At Match Day	22.6 ± 5.27	24.00	11.00	33.00
Somatic Anxiety At Match Day	19.2 ± 4.62	19.00	10.00	27.00
Self Confidence At Match Day	23.72 ± 4.89	25.00	12.00	31.00
Score-Match Day	348.32 ± 20.07	346.00	313.00	386.00

Among the study population, the mean Cognitive Anxiety At match day was 22.6 ± 5.27, the mean Somatic Anxiety At match day was 19.2 ± 4.62, the mean Self Confidence At match day was 23.72 ± 4.89 and the mean Score-Training was 348.32 ± 20.07.

**Table 6: Comparison of parameter during training day and match day (N=26)**

Parameter	Mean ± STD	Mean Difference	P-value
COGNITIVE ANXIETY at training	19.72 ± 5.78	-2.88	0.035
COGNITIVE ANXIETY at Match Day	22.6 ± 5.27		
Parameter	Mean ± STD	Mean Difference	P-value
SOMATIC ANXIETY at training	16.48 ± 4.87	-2.72	0.023

SOMATIC ANXIETY at Match Day	19.2 ± 4.62		
Parameter	Mean ± STD	Mean Difference	P-value
SELF CONFIDENCE at training	25.36 ± 4.58	1.64	0.282
SELF CONFIDENCE at Match Day	23.72 ± 4.89		
Parameter	Mean ± STD	Mean Difference	P-value
SCORE-TRAINING	348.96 ± 21.46	0.64	0.891
SCORE-MATCH DAY	348.32 ± 20.07		

Among the study population, the mean COGNITIVE ANXIETY at training was 19.72 ± 5.78 and it was 22.6 ± 5.27 at Match Day. The mean SOMATIC ANXIETY at training was 16.48 ± 4.87 and it was 19.2 ± 4.62 at Match Day. The mean SELF CONFIDENCE at training was 25.36 ± 4.58 and it was 23.72 ± 4.89 at Match Day. The mean COGNITIVE ANXIETY at training was 19.72 ± 5.78 and it was 22.6 ± 5.27 at Match Day. The mean SCORE-TRAINING at training was 348.96 ± 21.46 and it was 348.32 ± 20.07 at Match Day. The Difference in mean of COGNITIVE ANXIETY score during match day and training day was statistically significant. (p value >0.05) The Difference in mean of SOMATIC ANXIETY, SELF CONFIDENCE, SCORE-TRAINING during match day and training day was not statistically significant. (p value >0.05)

#### DISCUSSION:

The ability to think critically in games and sports is typically assessed concerning general cognitive-somatic techniques, such as mental rehearsal of visualizing cognitive behavior therapy and muscle relaxation in demonstration to a particular sport as the source of its ability to supervise itself. Results were acquired to achieve through modified mental skills training, which is crucial to implement cognitive-somatic therapy. Psychological skills training has been created with a variety of approaches to satisfy the psychological skill requirements among athletes as perceived by any one athlete and depending on the individual's psychological state during athletic events. It is important to describe the physical skill training methods because they take into account psychological effects in helping athletes develop their confidence and focus. This is because they are a necessary tool for assisting in the improvement of physical training skills, which early research suggested has a crucial impact on achieving the desired performance.

In competitive sports, anxiety symptoms are consistently linked to both decreased cognitive performance and general functioning. Although there is little data on top young athletes. In elite athletes, higher self-reported anxiety levels are linked to worse performance results and skill mistakes. Athletes competing in important events can anticipate experiencing pre-competitive anxiety, and how they perceive this concern may moderate the symptoms' functional significance. Therefore, this study examined the changing patterns of anxiety levels (cognitive and somatic) among the sub-elite youth rifle and 10m air pistol shooters during the training and competition day with the Competitive state anxiety inventory-2 questionnaire correlated with the performance scoring.

There was no level of discrepancy observed in the participation with respect to gender. That is half of the study subjects were males and the other half were females. This supports the following explanation and hence outlines the need for equality. "The Assembly is dismayed to notice that women still frequently experience prejudice in their access to, and practice of, both amateur and professional sport," it is written in a 2005 recommendation adopted by the parliamentary assembly. Stereotyping, a lack of support for sportswomen, the challenge of integrating life, work, and sport, insufficient media attention, and a lack of money were all mentioned in the article. The "absence of women on sport's ruling bodies" was also seen as a significant issue. In a revised "Code of Sports Ethics" published in 2010, the Committee of Ministers reiterated its call for gender equality and requested "equal participation of women, girls, men, and boys in all individual and/or team sports without gender-based discrimination."(10)

Among the study population, nearly two-thirds of the participants used AIR PISTOL and the remaining one-third of them used AIR RIFLE. However, in a study conducted by Mon Lopez et al, they found that majority of the subjects had used Rifles than pistols. The reason behind this is that Rifles are typically shot more accurately because of their weight. More particular, the weight of long guns typically exceeds the force (weight) needed to pull the trigger.(11)

A normal pistol may only weigh 2 pounds, yet breaking the trigger may require 5 to 12 pounds of power. While pushing through the trigger's resistance, the shooter must keep the pistol still. When you exert those 5 to 12 pounds of pressure, the much lighter pistol wants to move. Another reason is that since rifles have a slightly longer radius, they are preferred.

In our study population, the mean age was 15 years. Similarly, Gulbensike et al found that the ages of the shooters ranged from 15 to 23. According to their athletic prowess, the shooters were split into two groups: those with high expertise and those with moderate competence.(1)In addition to this, Casali et al in their study observed that the mean age of their study participants was found to be nearly 20 years of age.(12) S. Hanton and colleagues' (2000) examination of the shooters' mental health included a thorough analysis of two psychological abilities: self-assurance and the capacity to control one's emotions. The visual creation method is advocated by shooting specialists (Chakraverty, Babar, 1998), researchers (Dubier et al., 1999), and top shooters (Orlick, Partington, 1986) as a strategy to enhance shooting technique and mental fitness.

The training method and its capacity to deepen self-awareness enables the achievement of specific and difficult objectives in developing mental toughness and confidence. While mental skills training requires a visible level of tolerance and trust during competitions as results may not be achieved correctly as some difficulties were associated while executing the mental skills training that could alleviate motivational characteristics to increase performance, physical skills training only requires physical training to bring effective results and reduce anxiety during competitions. Among the study population, the mean cognitive anxiety at training was 19.72 ± 5.78 and it was 22.6 ± 5.27 on Match Day. The mean somatic anxiety at training was 16.48 ± 4.87 and it was 19.2 ± 4.62 on Match Day. The mean self-confidence at training was 25.36 ± 4.58 and it was 23.72 ± 4.89 on Match Day. The mean cognitive anxiety at training was 19.72 ± 5.78 and it was 22.6 ± 5.27 on Match Day. The mean score at training was 348.96 ± 21.46 and it was 348.32 ± 20.07 on Match Day. The Difference in mean of cognitive anxiety score during match day and training day was statistically significant. (p-value <0.05) The Difference in the mean of somatic anxiety, self-confidence, and score-training during match day and training day was not statistically significant. (p-value >0.05).

This was in accordance with the results of a study conducted by Sarah et al, where they found that Between practice and competition, there were statistically significant differences in the subscale scores for cognitive anxiety, somatic anxiety, and self-confidence (p 0.05). (13)Negative expectations, low self-esteem, worries about one's abilities, and failure are just a few examples of the types of negative ideas that are typically associated with cognitive anxiety. However, there was no statistical difference found in the scores between match day and training day. One of the limitations of this study was the smaller sample size. Also, the administration of questionnaires was held at the field which would interfere in revealing the true situation. This study found that there was a strong correlation between somatic and cognitive anxiety and performance. The recommendation of the study is as follows.

Before a competitive event, somatic and cognitive state anxiety levels might rise, which can have a negative impact on performance and raise the risk of injury. So that effective anxiety management approaches may be used, it is crucial to recognize situations that might lead to high levels of anxiety.

#### CONCLUSION:

The observed change on cognitive anxiety, somatic and self confidence level among the sub elite youth athlete assessed during training and competition evaluated with CSAI-2 questionnaire and performance score showed statistical significance. These findings suggests that psychological training for particularly competitive anxiety such as imagery, self-talk, relaxation technique and mindfulness can help the youth athletes to reduce the anxiety and enhance the performance and overcome their psychological factors.

**PERSPECTIVE:**

In this study, Cognitive anxiety was the main predictor of performance scores during competition; thus, intervention strategies can facilitate performance in young athletes. Not only shooting but other competitive sport athletes experience depression, anxiety, lack of self-esteem, poor feeling of recovery, lack of confidence, competitive insecurity, distrust about their own level of expertise, and fear of failure. To succumb, the effect of mindfulness intervention for precision sports, when given consistently during regular training, can improve performance. Exposure to a shooting environment at a young age will reflect the attitude toward the prospective competition level.(14)

In the future, Assessing the athlete's pre-competitive anxiety state with the CSAI-2 tool in training and during competition can be used to evaluate the situational anxiety on particular sub-dimensions of the tool on how to intervene, and that can give the coaches to support and help their athletes to control and manage anxiety.

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