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The effect of instructional conditions on competitive state anxiety and free-throw performance in adolescent basketball players

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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Abstract

Background & Study Aim: In basketball, one of the most important, and at times anxiety provoking, game situations is free throw shooting. Many contests are won or lost in the final minutes by slim margins, and the outcomes of these games are often decided by how accurate athletes are at free throw shooting. The purpose of this research was the effect of instructional condition on competitive state anxiety levels and free-throw performance in young basketball players.

Material & Methods: Statistical sample included 28 elite basketball players aged between 13-17 years with at least four years playing experience. The research method of this study was quasi-experimental with 2 (trait anxiety group: high, low) ×2 (instructional condition: control, pressure) design. Firstly, the subjects took Sport Competition Anxiety Test for screening and then 11 players were assigned to high-level trait anxiety group and 10 players for low-level trait anxiety group. At the first day, the high and low-level trait anxiety groups were evaluated in terms of competitive state anxiety under control condition. Then they were requested to perform five basketball free-throws. At the second day, both groups again retook competitive state anxiety test under pressure instruction condition followed by performing five basketball free-throw.

Results: One-way ANOVA showed that pressure instructional conditions had a significant effect on cognitive anxiety in both low anxiety trait and high anxiety trait groups ($p \leq 0.05$). The effect of pressure instructional conditions had not a significant effect on somatic anxiety and self-confidence in both low anxiety trait and high anxiety trait groups ($p > 0.05$). The effect of pressure instructional conditions had not a significant effect on basketball free-throw performance in low anxiety trait, but the effect of pressure instructional conditions on basketball free-throw performance in high anxiety trait group was significant ($p \leq 0.05$).

Conclusions: The results of this study support multi-dimensional theory of state anxiety. In both groups with high and low state anxiety experienced average level of somatic anxiety compared to cognitive anxiety implying that all players should experience an optimal level of somatic anxiety in order to have better performance and indeed somatic anxiety has less impact on performance than cognitive anxiety.

Keywords: cognitive state anxiety • somatic state anxiety • state self-confidence

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Anxiety – *noun* the state of being very worried and afraid [25].

Competitive state anxiety – *noun* a feeling of stress caused by competition, especially when the athlete does not feel able to meet the challenges [25].

Free throw – *noun* (in basketball) an opportunity to shoot at the basket unhindered by the opposing players, awarded to a player who has been fouled [25].

Cognitive – *adjective* relating to the process of acquiring knowledge by the use of reasoning, intuition or perception [25].

Cognitive anxiety – *noun* stress that derives from an athlete thinking consciously about what may go wrong, which may be detrimental to performance [25].

Performance – *noun* the level at which a player or athlete is carrying out their activity, either in relation to others or in relation to personal goals or standards [25].

INTRODUCTION

Anxiety's effect on sports performance continues to be one of the main research interests for sports psychologists [1]. In basketball, one of the most important, and at times anxiety provoking, game situations is free throw shooting. Many contests are won or lost in the final minutes by slim margins, and the outcomes of these games are often decided by how accurate athletes are at free throw shooting [2]. Basketball, like any sport, is an emotional activity and a cognitive one, in which players have to make decisions or to execute an action using the knowledge that he or she already possesses, which "are coloured by the player's feelings and perceptions of competition" [3]. Athletes often encounter pressure situations such as a game-winning free throw in an important game; however, if an athlete fails to prepare oneself for these situations, it is common to see what is known as choking [4]. Anxiety is multidimensional in that it can be divided into different categories, including trait and state anxiety. Trait anxiety is a personality characteristic that remains relatively stable over time, while state anxiety is activated in response to certain situations, such as an athletic competition. Trait anxiety is characterised by an inherent inclination to perceive certain stimuli as threatening and in turn to respond with increased state anxiety when a particular stimulus is present. Conversely, state anxiety involves increased levels of physiological arousal, apprehension, fear, and tension [5]. Researchers have shown that high trait anxiety levels may lead to an increase in state anxiety in performance-related situations [5, 6].

Multidimensional anxiety theory expanded on reversal theory's inclusion of cognitive and physiological factors [7]. In this model, cognitive anxiety (the central tenet of which is concerned with the consequences of failure) has been found to have a negative linear relationship with performance [8]. Self-confidence (a separate cognitive component) has been found to have a positive linear relationship with performance. Finally, somatic anxiety (physiological symptoms) has been found to have an inverted-U shaped relationship with performance. Although this model incorporates many elements of anxiety, it still treats them as separate entities. The next model that arose looked at the interaction between two of these three factors [8].

From a theoretical point of view, according to Spielberger [9] athletes with a high degree of trait anxiety will also have a higher level of state anxiety and consequently a higher risk of performing below his or her potential in the competition. These athletes are predisposed to perceive a wide range of competitive circumstances as threatening and to respond to them with states of anxiety and a disproportionate magnitude with regard to the demand [10]. Anxiety creates a sense of "fear of failure" in the mind of the athlete who is faced with a pressure situation in which the game is in his or her hands [11]. Anxiety is a psychological state characterised by cognitive, somatic, emotional, and behavioural components [12]. There are many different types of anxiety including trait anxiety, state anxiety, cognitive anxiety, and somatic anxiety. Trait anxiety is the way someone responds to state anxiety and is relatively stable to one's personality [12]. Athletes who are trait anxious may experience anxiety throughout an entire game or competition. On the other hand, state anxiety is a temporary emotional condition characterised by fear and tension about a particular situation or activity [7]. State anxiety is evaluated more frequently than trait anxiety since a specific event, such as shooting a game-winning free throw, can increase anxiety levels, which in turn, may lead to a negative outcome. Athletes experience different levels of anxiety during different periods of competition, but anxiety typically increases dramatically when the game is close, and there is limited time remaining in the competition [12]. Even elite and professional basketball players encounter the problem of missing free throws in high anxiety, close game situations. In order to use anxiety to one's advantage, the optimal level of anxiety of each athlete must be identified.

Trained basketball players tend to be exceptional free throw shooters during practice, since shooting free throws is a closed skill. Jenkins [13] described the closed skill of shooting free throws as having a stable environment, in which the player prepares for the shot with a routine, and he or she is unguarded. Therefore, basketball players are expected to make a higher percentage of free throws more than any other shot. However, even though free throws are made consistently in practice, there is a substantially lower success rate in competition. Kozar et al. [14], showed that overall free throw shooting percentage in practice was about 75%, whereas, for games, the percentage dropped to 69%. Since the mid-1960s, men's collegiate basketball players have made

approximately 69% of free throws during competition [15]. In 2009, the average was 68.8%. Throughout these years, the average free throw percentage has reached a low of 67.1% but has never surpassed 70% [15].

With these statistics in mind, games can be won or lost at the free throw line. Free throws make up approximately 20% of the points a team scores during a game [14]. Many coaches believe it is the deciding factor in winning or losing a game, especially in close games [14]. Ryan and Holt [16] reported that the team which obtains the higher free throw shooting percentage wins 80% of the time. Within the last 5 minutes of a close game, free throws accounted for approximately 48% of the scoring, and within the last minute of a close game, free throws accounted for approximately 69% of the points [13]. Given the importance of free throws to the game of basketball, one would expect a steady increase in free throw percentage as individuals master the game and become experts at playing. However, over the last 50 years, average free throw percentages have not fluctuated substantially. Researchers have yet to explain the reason for the significant difference between practice and game free throw percentage.

Considering that the present study is a new research and has not been conducted in Iran so far, the researcher decided to study the effect of instructional conditions (control and pressure) on competitive state anxiety and free-throw performance in adolescent basketball player in order to identify some factors of the psychological profile leading to successful exercise performance and provide valuable knowledge to be used by coaches in selecting eligible players for performing basketball free-throw.

The purpose of this research was the effect of instructional condition on competitive state anxiety levels and free-throw performance in young basketball players.

MATERIAL AND METHODS

The research method in this study was quasi-experimental with 2 (trait anxiety group: high, low) × 2 (instructional condition: control, pressure) design. Twenty-eight young students male basketball players (13-17 years, were selected from basketballs club of Torbat-e-Heydarieh educational office (Khorasan Razavi province, Iran) that play in first leagues of Khorasan Razavi province in 2015 to participate in the screening test, all of whom signed an informed consent letter. At first, the Iranian version of the *Sport Competition Anxiety Test (SCAT)* [17] was used to assign participants to one of two groups (high or low trait anxiety group). The mean score of their trait anxiety was 16.46 ±3.46, and the criterion for inclusion in the experimental group was above or below 1 standard deviation from this mean score. With this selection method, 22 players were included in this research.

The 22 basketball players were divided into two groups of high and low trait anxieties on the basis of their *SCAT* scores. The mean score of the high trait anxiety group (*n* = 11) was 19.54 (range: 10 to 30) while that of the low trait anxiety group (n = 10) was 13.00 (range: 10-30). At the second stage, we considered two instructional conditions for high and low-level trait anxiety groups in two days respectively. The first day both of groups, before control condition and free throw performance, filled the *Competitive State Anxiety Inventory-2 (CSAI-2)* [18] and then basketball players in each group performed 5 *basketball free-throw under control condition (without stress). Then in second day under stress and pressure condition for both groups (high and low level of trait anxiety) we had made stress situations such as the importance of your free-throws as selecting in basketball team, inviting of important person at the moment of throw and* we emphasized to increase their successful *free-throw* from the control condition level. Then again retook competitive state anxiety test under pressure instruction condition followed by performing 5 basketball free-throw.

Measure

Demographic Questionnaire

1. Participants were asked to indicate their age, training experience and skill level.
2. Competitive State Anxiety Inventory-2 (CSAI-2).

Before basketball free throw performance under control condition (without stress) and under pressure instruction condition, players completed the 27-item *CSAI-2* as an assessment of situation-specific state anxiety in both high and low level of anxiety groups [18]. Participants responded to on scales from 1 (*not at all*) to 4

(*very much so*) to statements such as "I am concerned about this competition" and "I feel comfortable." There were 3 subscales composed of 9 items each, including Cognitive State Anxiety, Somatic State Anxiety, and State self-confidence. Participants took roughly five minutes to complete this questionnaire.

3. Sport Competitive Anxiety Test (SCAT) [17]
In order to evaluate the athletes' trait anxiety for a screening test, we used *SCAT* and contains fifteen items. The subjects were asked to indicate how they felt in competitive sports situations and responded to each item using a three-point ordinal scale (hardly ever, sometimes, or often). Out of fifteen items, only ten items examine competitive sports trait anxiety proneness (before I compete I feel uneasy") and are used for scoring purpose. These ten items were: 2, 3, 5, 6, 8, 9, 11, 12, 14, and 15. The other five test items were the spurious items, which were added to the questionnaire to diminish response bias towards the actual test items (e.g., "Competing against others is socially enjoyable"). These five spurious items were not scored. These spurious were: 1, 4, 7, 10 and 13.

Data Analysis

In this study, descriptive statistics has been applied for determination and drawing of diagrams and normal distribution table of scores and also for measuring mean and standard deviation. For measuring the mean difference and basketball free- throw scores in athletes with high and low state anxiety one-way ANOVA was used.

RESULTS

The results of one-way ANOVA showed that the effect of pressure instructional conditions had a significant effect on cognitive anxiety in both low anxiety trait and high anxiety trait groups ($p \leq 0.05$). The results of one-way ANOVA showed that the effect of pressure instructional conditions had not a significant effect on somatic anxiety in both low anxiety trait and high anxiety trait groups ($p > 0.05$). The results of one-way ANOVA showed that the effect of pressure instructional conditions had not a significant effect on self-confidence in both low anxiety trait and high anxiety trait groups ($p > 0.05$). The results of one-way ANOVA showed that the effect of pressure instructional conditions had not a significant effect on basketball free-throw performance in low anxiety trait, but the effect of pressure instructional conditions on basketball free-throw performance in high anxiety trait group was significant ($p \leq 0.05$).

Table 1. Mean values and one- way ANOVA of competitive state anxiety and free-throw performance among adolescent basketball players.

Variable	Group	Condition	N	Mean (SD)	F	p-value
Cognitive anxiety (9-27)	low trait anxiety	control	10	14.40 (3.62)	**5.17**	**0.035***
		pressure	11	19.09 (5.52)		
Cognitive anxiety (9-27)	high trait anxiety	control	10	17.30 (2.86)	18.62	0.000*
		pressure	11	24.36 (4.38)		
Somatic anxiety (9-27)	low trait anxiety	control	10	14.60 (4.35)	0.34	0.855
		pressure	11	15.00(5.40)		
Somatic anxiety (9-27)	high trait anxiety	control	10	17.40 (1.95)	0.888	0.358
		pressure	11	18.54 (3.35)		
Self confidence	low trait anxiety	control	10	27.00 (3.33)	0.715	0.408
		pressure	11	25.36 (5.22)		
Self confidence	high trait anxiety	control	10	20.60 (5.10)	3.10	0.094
		pressure	11	24.63 (5.37)		
Free-throw	low trait anxiety	control	10	2.30 (0.674)	0.032	0.860
		pressure	11	2.36 (0.924)		
Free-throw	high trait anxiety	control	10	2.00 (0.666)	**8.29**	**0.010***
		pressure	11	1.00 (0.899)		

*$p \leq 0.05$

DISCUSSION

The results of one-way ANOVA showed that pressure instructional conditions had a significant effect on cognitive anxiety in both low trait anxiety and high trait anxiety groups ($p \leq 0.05$). Previous studies indicated that stressful instructions and competitive condition factors decreased sports performance [19]. This study showed instructions associated with pressure and feedbacks based on results for gaining success increased the most important element of competitive state anxiety, i.e. cognitive anxiety which in turn had a detrimental influence on successful basketball free- throw resulted in decreasing performance efficiency.

An additional factor that causes cognitive anxiety is the expectation of success. Some athletes rise to the challenge imposed by public expectation while others can choke. The trick is to become sufficiently 'psyched-up' without becoming 'psyched-out'. The result of the present study confirmed that the level of trait anxiety predicted the level of cognitive anxiety [20-23]. In this study, the mean scores of cognitive anxiety in high trait anxiety group after stress intervention increased up to7 scores, but the mean scores of cognitive anxiety in high trait anxiety group after stress intervention increased up to 4.69 scores.

The results of one-way ANOVA showed pressure instructional conditions had not a significant effect on somatic anxiety and self-confidence in both low anxiety trait and high anxiety trait groups ($p > 0.05$).

In fact the higher level of cognitive anxiety the weaker performance. According to the multidimensional theory, the relationship between performance and somatic anxiety is an inverted-U. If an athlete worried about competition (cognitive anxiety), his or her performance will be poor. The relationship between somatic anxiety, where an athlete experiences physiological changes, such as increases in the levels of muscle tension, nervousness, sweating and heartbeat and performance is, however, similar to the inverted-U theory [24]. When increases in somatic anxiety are recorded in an athlete, it can result in arousal at an optimal level that results in the best performance results. However, an increase in arousal beyond or below the optimal level of arousal will lead to a decrease in athletic performance.

CONCLUSIONS

The results of this study support multi-dimensional theory of state anxiety. In both groups with high and low state anxiety experienced average level of somatic anxiety compared to cognitive anxiety implying that all players should experience an optimal level of somatic anxiety in order to have better performance and indeed somatic anxiety has less impact on performance than cognitive anxiety.

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