

## Effect of Focus of Attention and Skill Level on Basketball Free-Throw Shot under Psychological Pressure

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**Abstract:** The purpose of this study was to determine the effect of focus of attention and skill level in free throw basketball under psychological pressure. The accessible sample for this study included 32 right-handed male voluntary subjects registered in general physical education course (age=25±5 years, height=174±5 cm and weight=75±7 kg). Following the completion of SCAT inventory and identifying the trait anxiety of the subjects, they were randomly divided into two equal groups of high and low level skill. Then each of these groups was further divided into two groups of external versus internal focus of attention strategies instructed by the researcher. The subjects performed a basketball free throw. The performance was scored based on a 5-point scale aimed at measuring the precision. The results of ANOVA and independent t-tests showed that the skill alone had no significant effect on performance ( $F(1,28)=2.254$ ,  $p=0.144$ ), however, focus of attention had significant effect of the performance ( $F(2,28)=4.939$ ,  $p=0.015$ ); the group in the internal focus of attention and high level of skill performed better ( $p<0.05$ ). Considering the findings of this research, it was concluded that subjects with low level of skill under psychological pressure perform the motor task better.

**Key words:** Accuracy • Anxiety • Attention • Choking • Constrained Action Hypothesis • Nodal Point

### INTRODUCTION

Considering the large number of the stimuli we are facing in our daily activity, without selective attention, definitely life will be very difficult. Such condition is also true in sport activities. In deed, it is difficult to find factors that are more important than the ability to focus on the appropriate cues in sport of performance [1-3]. It is well known that paying conscious attention to a well learned task, especially if the task is automatically executed, can deteriorate its execution [4]. Directing attention to the movement outcome is defined as the external focus attention and directing it to the task itself during the execution phase is called focus of internal attention [5]. The focus of external attention leads to the development of action automaticity [4], reducing the workload of the working memory [6] and decreasing the effort to represent the movement [7]. In the other hand, focus of internal attention engages more information processes [8]. There are theories in regard to the superiority of the external focus of attention compared to the internal focus of

attention. In common coded theory, the events surrounding the body create afferent and efferent codes and common abstract representation of them [9]. While, based on James' ideomotor principle, paying attention to the effects of movement instead of the method of execution create more stable representation for learning the motor task [10]. Wulf and associates in their explanation for the superiority of adopting the external focus of attention instead of using internal focus of attention rely on the constrained action hypothesis that claims devoting attention to external sources enhances motor system self-control and it is not considered in the central decision making, thus performer can act this way with more fluent action [5, 8, 11, 12].

The past research has shown that learning environment for the learners in such a condition they focus attention to outcome and effects of action and not the act itself can increase the accuracy of golf shoots [13], volleyball service [14], throwing in soccer [15,16], tennis strike [17] and basketball free throw [18, 19]. Among the team sports, basketball has its own attractions and is one

of the popular and exciting sports [20, 21]. Among the basic skills of this game, shooting has a determining rule in winning the game [2, 22]. In biomechanical research, various aspects such as basic shoot technique [23,24], sex difference in executing skill of basketball [25] and the characteristics of the players in various levels [26] has been emphasized. However, there is not sufficient research devoted to the study of execution of the game in real situation. In basketball game, free throw is one of the key skills that in many circumstances due to the high pressure the executioner is experiencing do not enter into the basket. Few investigations have shown that in various skill levels, the optimal focus of attention varies. Despite the fact that some researcher have pointed to this issue, but the results show that the effects of the focus of attention could really depend on the individuals experience in a specific task [4].

Choking phenomenon is a common experience among many athletes who perform under the pressure [26]. During the psychological pressure, the attention of athlete shifts from the relevant cues to the irrelevant cues such as the anxiety about the performance and the probable outcomes. It is assumed that the poor performance of the performer is due to these types of thoughts. While disruption of attention may be one of the main causes of poor performance, there are evidences showing that choking is dependent on the self-consciousness and excessive anxiety the athlete experienced step by step during the task execution [27]. Applying conscious control processing under the pressure for excellent performance is an indication of the temporary decline in early stage of learning with poor and unstable performance [6, 28]. There are research results that show high pressure during the performance of motor tasks lead to less efficient motor patterns [26]. Ehrlenspiel and Hossner in their hypothesis known as the nodal point have identified the sensory motor system as the main cause of motor disruption [29-31].

State anxiety is one of the most important attributes of personality that under the ecological condition may have an effect on organizing motor commands and their outcomes, but the majority of the researches conducted in this regard have used cognitive task instead of real world task or near such conditions. The majority of the researches carried earlier studied the focus of attention at the presence of no psychological stress. The aim of this study was to improve the ecological validity of studying the effect of focus of attention and level of skill of basketball free throw shot under psychological pressure.

## **MATERIALS AND METHODS**

This research employed two independent variables including level of skill and focus of attention. The statistical population included male healthy college students (age 20 - 30 yr.) registered for basketball skill as the general physical education course and participated in free basketball throw. The subjects were volunteers who signed the human consent form following the completion of the Illinois trait anxiety inventory in order to assure homogeneity of the subjects. Overall, 32 individuals were selected as the subjects for this study. Every subject performed 10 free throws to determine the percent of the successful execution of the task. The subjects who scored more than 70 percent of the shots were considered as the group with high skill level and those who scored less than 30 percent of the shots placed at the low level skill group, thus two groups of low and high level of skill was identified. Then these two groups were randomly divided into two groups of internal versus external focus of attention (n=8 for every groups).

For the purpose of assessing the precision of free throws, Zachry and associates 5 -point scale was used [19]. The entry of the ball into basket received 5 points, hitting the ball to the basket ring, 3 points, touching the basket board and ring, 2 points hitting the basket board 1 point and air ball received no point. For the purpose of assessing trait anxiety, Illinois SCAT was used. This instrument includes 15 question items scored by 3-point Likert scale. The total score was used to define anxiety rate of the respondent ranging from score 10 or less as the low state anxiety to 30 and higher as the highly anxious state. The reliability of the instrument is determined by test-retest procedure and the coefficient of reliability ranging between 0.73 to 0.88 with mean value of 0.81 has been reported. Richard-Kudorson-20 has indicated the internal consistency of 0.95 to 0.07 for children and adults, respectively [32]. The state anxiety of the subjects prior and after the creation of psychological pressure for the execution of basketball free throw was assessed through the use of CSAI-2 in order to produce environment as similar to as the real state condition of performing the task to assure ecological validity. This instrument uses 29 question items designed to measure three sub-scales of cognitive, physical anxiety and self-confidence. Reliability coefficients for the sub-scales in some researches has been reported by using Cronbach alpha for cognitive anxiety (0.79-0.83), physical anxiety (0.82- 0.83) and self-confidence (0.88-0.90) plus concurrent validity, respectively [33, 34].

Following the assessment of trait anxiety, anthropometric measures including height, weight, length of two arms, right hand, arm, elbow, leg, thigh and foot were measured to control for the various measures as close as possible. Following the completion of the assessments, every subject in the four experimental conditions of low and high anxiety with internal and external focus of attention performed 5 free throws.

For the purpose of creating psychological pressure, Ehrlenspiel method was used [35]. By using this method, the subjects were pair-matched in such a way that they were virtually compared with each other. Every subject was told that providing he could score 20 percent higher than the initial point he scored, if his partner could also score 20 percent higher than his own performance will receive 3 final point and tangible reward.

For the purpose of presenting attentional instructions (internal and external), Zachry method was employed [19]. In this method the subjects in the internal focus of attention were instructed to pay attention to the flexion of their wrist while executing the free throw. Prior to the completion of the state anxiety questionnaire, the performer was informed that his partner has succeeded to score 20 percent higher than his mean score and then he was instructed to perform stable position free throw behind the free throw line in the court. A free throw basketball shot was demonstrated for all the subjects following warm-up with and without the ball. Then they completed the state anxiety inventory and every subject performed three free throws before completing the information. This protocol was repeated for all four groups [19]. For the purpose of assuring the application of the attentional instructions, the instructions were repeated prior to the start of the shots and following the third throw. At the termination of the trials, subjects were asked about their focus of attention during the execution of the task.

Statistical analysis including descriptive (mean and standard deviation) as well as inferential statistics such as two-factor analysis of variance and Bonferoni post hoc t-test at the alpha level set to 0.05 was used.

### RESULTS

Table 1 presents the results of descriptive analysis of data according to the level of skill, focus of attention, state and trait anxiety of the subjects. Figure 1 also depicts the interaction of focus of attention and skill level in *pressure conditions* conditions. The results of two-way ANOVA showed that there was no significant main effect

Table 1: Descriptive data of the subjects according to anxiety condition, skill level and focus of attention

Variable	Skill level	Mean	Standard deviation	Number
Internal attention	high	3	0.53	8
External attention	high	1.84	0.60	8
External attention	low	3.05	0.73	8
Internal attention	low	2.62	0.93	8
Trait anxiety	low	17.12	3.38	16
Trait anxiety	high	17.93	4.73	16
State anxiety	high	14.93	6.11	16
State anxiety	low	13	2.22	16

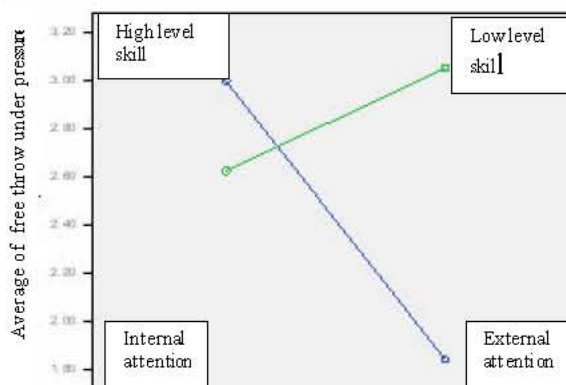


Fig. 1: The interaction of focus of attention and skill level in pressure conditions

for the psychological pressure ( $F(1,28)=2.254, P=0.144$ ), but there was a significant main effect present for the focus of attention ( $F(1,28)=4.939, P=0.015$ ). In addition, there was a significant interaction between these two factors ( $F(1,28)=8.135, p=0.008$ ). The results of post hoc t test with Bonferoni correction indicated that a significant difference between the external focus of attention in high or low level of skill ( $t=-3.610, p=0.003$ ) and in high level group with internal and external focus of attention was present ( $t=-10.954, p=0.0005$ ).

### DISCUSSION

The purpose of this research was to determine the effect of focus of attention and skill level on the precision and accuracy of a free throw basketball shot under psychological pressure. The results of this research indicated that focus of attention had a significant effect on the performance of the free throw whereas there was not such effect present for the skill level of the performers.

Considering the fact that skill level had no significant effect on the accuracy of the execution of free basketball throw, it seemed that these results were due to the varying degree of perceived rate of exertion.

An inspection of the data presented in table 1 reveals that state anxiety in subjects with high level of skill (mean=14.937 ±6.11) was higher than the subjects with low skill level (mean=13±2.21), despite the fact that psychological pressure on the performance of the subjects with higher level of skill in spite of the fact that their mean score compared to the subjects with lower level of skill was higher, the result showed that the effect of focus of attention was significant ( $F_{1, 28} = 4.939, p = 0.015$ ). In subjects with high level of skill, performance in the group with internal focus of attention compared ( $M = 3 \pm 0.43$ ) with the subjects with external focus of attention ( $M = 1.843 \pm 0.6$ ) was better. Such finding are contrary to what was reported earlier [4-8,18,19]. This result did not support the Constrained action hypothesis [5,8,11,12]. Considering the state anxiety of the subjects and conscious processing hypothesis [7], probably the subjects in high skill level, due to the presence of psychological pressure, controlled processing created by the psychological pressure caused temporary regression to the initial stage of learning [27] where the performance was unstable and weak, while such was not the case in subjects with low level of skill because of their low level of expectation and insignificance of the circumstances.

Hossner and Ehrlenspiel consider the sensory motor system as the foundation of disruption in movement and accordingly propose the nodal point hypothesis [31]. During the motor skill learning, the stimulus-response-effect segments are established and through the formation of the triad segments and their association with each other result to the motor control in a way that motor control is transferred chain wise from segment to segment till finally moves from the initial stage of learning to the end segment effect and cover the entire chain. When such condition is met, execution of the motor act requires no attention. If attention is directed toward the motor skill execution, it is likely that first, muscle activity due to the re-freeze and secondly (b) decrease of the use of task characteristics compared to the end point control occurs. With structural control foundation, these effects can only occur when attention is directed to some specific points. Therefore, expecting general effects of a focus of internal attention, very specific effects in nodal points of time is anticipated [30].

Considering the findings of Ehrlenspiel and Hossner, despite the fact that the subjects have used internal focus of attention, but the presence of psychological pressure and choking conditions have led to the result similar to the time when the subject uses internal focus of attention. But in condition of internal focus of attention, the

presence of psychological pressure probably prevented the disruption of movement to some point since the presence of such pressure in subjects with high level of skill takes them back to the initial stage of learning that uses internal focus of attention effectively.

The results showed that there was a significant difference between the performance of subjects with higher and lower level of skill in the internal focus of attention condition ( $t = -3.610, p = 0.03$ ). These results are in agreement with the findings of some studies reported earlier [3,6,37]. Since the subjects in the external focus of attention perceive the situation as important in addition to the presence of financial motive beside the desire to demonstrate their skill experience more psychological pressure and consequently their mean performance decreases. But, since the subjects with lower level of skill had lower level of expectation and entry to the research project was seen as the only subjects advantage in this condition, therefore this condition did not result in psychological pressure, but instead it caused social facilitation, probably the subjects in this condition did not consider the situation as very important and had no expectation of great success. The interaction effect of focus of attention source and skill level was significant at the presence of psychological pressure ( $F_{1, 28} = 8.135, p = 0.008$ ). Inspection of the data presented in table 1 and figure reveals that free throw score during the internal focus of attention for the high level skill performers ( $M = 3 \pm 0.438$ ) was better than the score during the internal focus of attention for the low level skill performers ( $M = 2.625 \pm 0.934$ ), however, this difference was not statistically significant. The results of research have confirmed that the use of internal focus of attention in low level skill performers leads to better execution of the task [28, 37, 38] where as such condition results in poorer performance in high level skill performers [8]. It should be noted that this is true when there is no psychological pressure; such was not the case in this research and since performers were faced with psychological pressure, the score of subjects with high level of skill was better than the subjects with lower level of skill, contrary to what was reported earlier. On the contrary, during the execution of the free throw shot with external focus of attention and psychological pressure, the results changed completely. In subjects with high level of skill since they were faced with choking condition beside the significance of task compared with the low level skill performers who did not consider the task as important, the mean score of the free throw was higher for the low level skill ( $M = 3.05 \pm 0.730$ )

compared to the high level skill performers ( $M = 1.843 \pm 0.6022$ ). This phenomenon indicates that psychological pressure for high level skill performers when they are applying external focus of attention has a negative effect compared to the low level skill performers.

Since Ehrlenspiel method (2006) was applied to impose psychological pressure on the performers and they virtually compared their performance with their counterparts, perhaps the performance in the high level skill subjects was deteriorated because of the cognitive and mental engagement with the task and anxiety about the result; confirming the nodal points [30], the coordination was disrupted due to the sensory - motor integration. Probably, in subjects with low skill level, the user of the external sources of attention who verbally reported that they paid attention to the basket rim did really do so and paying attention to an external source as such caused them to forget about the psychological pressure. On the contrary, in subjects with high level of skill, the use of external source of attention despite their effort to pay attention to the rim resulted in poorer performance since paying attention to the execution of the task at hand and experiencing the psychological pressure leads to self-consciousness. This way was in agreement with the findings of Masters [37].

The findings of this research confirmed the fact that characteristics of subjects such as state and trait anxiety, types of focus of attention employed, attribute of the task (e.g. precision of basketball free throw), environment condition (competitive and contrasting), level of skill and choking condition probably have different effects on performance.

The researched suggest that these factors be included in further research in execution of gross motor skill.

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