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Increasing the distance of attentional focus improves free throw accuracy in male basketball players

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Abstract

Basketball requires a distinctive blend of physical strength and technical skill, where exceptional players are set apart by their precision, accuracy, and ability to handle the ball. The objective of this study is to examine how various external focus instructions affect the accuracy of shooting free throws for inexperienced male basketball players. The objective is to offer valuable knowledge to coaches and players in order to enhance methods of training to improve free throw accuracy.**Methods** the study involved 40 male participants aged 18-25 assigned to Distal External Focus, Proximal External Focus, Internal Focus and Control Group. Participants performed a pretest block followed by 5 acquisition blocks with specific focus instructions. Each block consisted of 5 throws. Shooting accuracy was measured using the registration system of (VaezMosavi and Rostami, 2009). Statistical analysis was done using SPSS version 20, which included a mixed Paired T-Test and One-Way Anova to compare the group performances. **Results** the group of participants with a distal external focus (M = 8.68) consistently obtained the highest scores, followed by the group with a proximal external focus (M = 6.46), while the internal focus (M = 4.84) and control groups (M = 4.88) had the lowest scores.**Conclusion** the study demonstrates that using distal

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external focus instructions improves free throw shooting accuracy considerably when compared to instructions of proximal external focus, internal focus or no specific focus instruction. These discoveries offer valuable perspectives for maximizing motor abilities and improving free throw shooting precision in basketball.

Keywords: External Focus Distance, Proximal Focus Distance, Motor Skills, Basketball Free throw, Saudi Arabia

Introduction

In recent decades, significant research has focused on identifying the elements that influence skill performance and learning (Wulf, Shea, & Lewthwaite, 2010). One of these variables is referred to as the focus of attention. Wulf, Hoss, and Prinz (1998) were the first to investigate the impacts of various instruction methods on skill acquisition. The authors contrasted the impacts of various instructions, either focusing on body movements (internal emphasis) or on the repercussions of these motions on the environment (external focus). Their findings demonstrated that learning was more effective with an external focus of attention (EF) than with an internal focus of attention (IF). Subsequent studies consistently confirmed the results of the initial study, demonstrating improved motor performance and learning with the use of external focus instructions or feedback statements (Lohse, Wulf, & Lewthwaite, 2012; Wulf, 2013; Wulf & Prinz, 2001).

The "constrained action hypothesis" frequently explains the performance enhancements associated with EF (McNevin, Shea, & Wulf, 2003; Wulf, McNevin, & Shea, 2001). This concept suggests that an inhibitory function (IF) involves a higher level of conscious control that disrupts automatic control processes and limits the motor system. The hypothesis suggests that an interruption factor (IF) actively intervenes in automatic control processes and disrupts coordinated motor output. Conversely, an external focus appears to encourage more automatic control mechanisms, leading to improved performance (Wulf, 2013). Studies have shown that evidence of enhanced neuromuscular strategy and improved brain activation efficiency in people with an EF supports the constrained action hypothesis.

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While the performance-enhancing benefits of EF instructions have been well proven, there is limited study on whether these findings have been applied practically. Research in track and field by Porter, Wu, & Partridge (2010) indicates that coaches and players commonly utilize sentences with an "IF" despite scientific evidence favoring the use of an "EF." Running, a repetitive sport with few external cues, limits coaches' ability to deliver instructions about movement outcomes. The lack of reference points may be the reason why nearly 85% of the instructions led to an incorrect response in track and field. One could argue that motor tasks with a distinct environmental objective increase the likelihood of providing executive function instructions. A study by van der Graaff, Hoozemans, Pasteuning, Veeger, & Beek (2018) found that 31% of utterances related to baseball throwing involved an EF. Disciplines focused on external objectives and environmental aims may be more effective in promoting executive function.

Proficiency level is a crucial factor to take into account, as research indicates that focus statements might impact low-skilled and high-skilled players differently. Emphasizing a movement effect that is distant from the body typically results in more efficient motor performance compared to focusing on a movement effect that is proximal to the body. The ideal distance of the external focus depends on the ability level, with less skilled participants benefiting from a closer external focus, while highly competent athletes gain more from a more distant external focus (Singh & Wulf, 2020). Furthermore, there is conflicting research about the performance-enhancing impact of an EF on elite athletes. Some research has demonstrated improved performance in elite athletes using an external focus (EF) (Ille, Selin, Do, & Thon, 2013; Wulf & Su, 2007), while other studies have failed to reproduce these results (Keller, Kuhn, Luthy, & Taube, 2018; Winkelman, Clark, & Ryan, 2017; Wulf, 2008). The athletes' competence level could influence the appropriate attention used. This study aimed to investigate the effects of attentional focus on learning free throw shooting in basketball. We compared between internal focus and two distances of external focus (proximal and distal external focus).

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Methods

Participants

40 young adults all males aged 18-24 were recruited from Umm Alqura University undergraduate students, who had never played nor had basketball training. All participants were healthy without any recent injuries, especially upper extremities and head injuries. All participants signed the Research Informed Consent Form before the investigation. The participants had no previous knowledge of the hypothesis being tested. The participants, then, were divided into 4 focus groups Internal Focus (IF), proximal External Focus (pEF), distal External Focus (dEF) and a control group (CG). The study required two separate visits to the research site (the basketball court at Umm Alqura University).

Task and Apparatus

At the beginning of the first visit, a simple video was shown to the participants to explain the skill of shooting a free throw in basketball, which described how to hold the ball and stand behind the free throw line, and then how to aim and shoot the ball. The participants were given enough time to ask questions about the task. Then, 5 shots as a pretest were given to each participant from the free throw line (the basket is 4.57 m away from the free throw line, 0.45 m in diameter, and 3.05 m above the ground). An additional 25 shots were divided into 5 acquisition blocks with 5 shots in each block. The participants were given a two-minute resting period between blocks. During the pretest, the participants performed without any attentional focus instructions. However, during the acquisition blocks, each subject was given a specific instruction according to their respective group. The verbal cues were as follows:

• The internal focus cue was "Look at the basket and focus on the movement of your wrist and push the ball out using your fingers"

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• The proximal external focus cue was "Look at the basket and focus on the trajectory of the ball"

• The distal external focus cue was "Look at the basket and focus on the near edge of the basket ring"

• The control group were not given any specific instructions regarding the focus of attention. Their cue was "Look at the basket and shoot."

The present study repeated the registration system of (VaezMosavi and Rostami, 2009) to measure the accuracy of the free throw more accurately. The scoring system was giving 3 points to the ball entering the basket without touching the edge or the backboard, 2 points to the ball touching the edge of the backboard before entering the basket, 1 point to the ball touching the edge of the backboard without entering the basket, and 0 points for not recording a basket, or touching the edge or the backboard. All points were recorded in a data collection sheet for each participant in the study.

Finally, a second visit was administered after 48 hours, in which the participants were asked to shoot one more block as a retention test. In this block, there was no instruction given to the participants.

Statistical Analysis

The study employed SPSS Version-20 to evaluate the influence of internal and external focus cues on free throw accuracy in basketball. A mixed Paired T-test was conducted involving a Four Group x Five Trials design. Two separate one-way ANOVAs were conducted, one for the pretest trials and the other for the retention trials, to specifically investigate any learning effects within each group. The significance level for all statistical tests was set at $p < .05$, specifying the threshold for statistical significance. These analyses provided a thorough evaluation of how internal and external focus signals affect basketball free throw accuracy, taking into account both current performance and potential long-term learning effects.

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Results

Pretest

A separate one-way ANOVA on the pretest block found no significant differences between groups in free throw scores (F=0.168, *p*=0.917) (*p*<.05) (Table 1).

Table 1. One-way ANOVA on Pretest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.700	3	.567	.168	.917
Within Groups	121.400	36	3.372		
Total	123.100	39			

Acquisition

The free throw scores analysis reveals significant differences in performance between the focus conditions for five out of six pairs. The dEF group consistently achieved the highest scores (M = 8.68 and Std = 2.123), followed by the pPE group (M = 6.46 and Std = 1.693); whereas, the pair of IF and CG was the only pair with no significant difference with both groups achieving the lowest scores of (M = 4.84 and Std = 1.530) (M = 4.88 and Std = 1.612) respectively with p < 0.05 (Table 2 and 3). The findings of the study provide strong evidence that a Distant external focus is associated with superior and better basketball free throw performance.

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Table 2. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	IF	4.84	50	1.530	.216
	pEF	6.46	50	1.693	.239
Pair 2	IF	4.84	50	1.530	.216
	dEF	8.68	50	2.123	.300
Pair 3	IF	4.84	50	1.530	.216
	CG	4.88	50	1.612	.228
Pair 4	pEF	6.46	50	1.693	.239
	dEF	8.68	50	2.123	.300
Pair 5	pEF	6.46	50	1.693	.239
	CG	4.88	50	1.612	.228
Pair 6	dEF	8.68	50	2.123	.300
	CG	4.88	50	1.612	.228

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Table 3. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	IF - pEF	-1.620	2.108	.298	-2.219	-1.021	-5.434	49	.000
Pair 2	IF - dEF	-3.840	2.652	.375	-4.594	-3.086	-10.237	49	.000
Pair 3	IF - CG	-.040	1.177	.167	-.375	.295	-.240	49	.811
Pair 4	pEF - dEF	-2.220	2.652	.375	-2.974	-1.466	-5.920	49	.000
Pair 5	pEF - CG	1.580	2.269	.321	.935	2.225	4.925	49	.000
Pair 6	dEF - CG	3.800	2.579	.365	3.067	4.533	10.417	49	.000

Retention

A separated one-way ANOVA analyzed retention and found a main effect of groups on free throw scores, F= 13.855, p=0.000 (p<.05). Duncan's MRT on retention showed a significant difference in free throw scores between dEF (M=9.2) and all the other groups; IF group (M=5.5) pEF group (M=6.3) and the CG (M=5.1) with p < .05 (Table 4).

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Table 4. One-way ANOVA on Retention

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	102.875	3	34.292	13.855	.000
Within Groups	89.100	36	2.475		
Total	191.975	39			

Discussion

This study aimed to investigate how various attentional focus impacts learning basketball free throws. We assessed the efficacy of three different types of attention (internal, proximal external, and distal external) on the execution of a difficult motor task that involves coordinating various degrees of movement. The present study's findings indicate that distal external focus enhances free throw accuracy, as compared to both a proximal external focus, internal focus and a control group. The results of the present study, which emphasize the advantages of a distant external focus in improving basketball free-throwing precision, align with previous research undertaken in many disciplines. Previous studies have demonstrated that in stable environmental settings, skilled and novice athletes tend to perform better in short-duration, discrete tasks and serial activities when they focus their attention farther away from the movement. Skilled individuals demonstrated superior performance by employing a distal external focus during tasks such as the standing long jump (Porter et al., 2012) and hitting golf balls (Bell and Hardy, 2009). Furthermore, research has shown that distal concentration cues can improve performance even in sequential activities, such as playing a succession of alternating notes on a piano (Duke et al., 2011).

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In a study by Singh et al. (2022), it was found that a distal exterior focus led to considerably greater accuracy ratings compared to proximal external focus and internal focus conditions. The current investigation on basketball free throw and a separate study conducted by McKay and Wulf on dart throwing both examined the impact of distal versus proximal external attentional focuses. (Salman et al., 2022) Both experiments illustrate the efficacy of a distal external focus in enhancing motor function. The study highlights the benefits of focusing one's attention on a distant target or goal, emphasizing the importance of an external focus that is far away in order to enhance motor abilities and performance (McKay and Wulf, 2012). Additional support for the efficacy of a distal external focus is presented in Wulf's investigation on skilled kayakers, and the results align with the findings of the present study conducted by Banks et al. (2020). Both research highlight the benefits of focusing one's attention on a movement effect that is located at a greater distance from the body (Banks et al., 2020). The kayaking study found that adopting a distal external focus led to considerably faster sprint times compared to both a proximal external focus and a control group (Banks et al., 2020).Philip E. Kearney conducted a study to investigate the most effective area of concentration for beginner golfers while doing a putting task (Kearney, 2015). The research findings indicate that novices' putting ability was enhanced to a greater extent by employing a distal external focus, as compared to utilizing a proximal external focus or an internal focus (Kearney, 2015). In addition, a study conducted by Sarhan on beginner soccer players reported significant improvement in shooting accuracy when the players directed their focus on the target rather than the ball (Sarhan, 2024). Although there are differences between golf and soccer shooting, both studies emphasize the importance of considering the nature of the job when determining where to focus attention. In specific settings of skill learning, it has been found that focusing on external factors that are farther away can be useful. (Kearney, 2015; Sarhan, 2024).

The results of our current study indicate that the positive benefits of distal external focus might be attributable to several causes, as indicated by McNevin et al. (2003) and Shea and Wulf (1999). The immediate impacts are frequently linked with

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the body's moves, rendering it more challenging for the performers to exert exact control and make adjustments to their movements. On the other hand, distal impacts, which are more noticeable, enable more precise evaluations (Shea and Wulf, 1999). The superior free throw accuracy seen in the distal external focus in the present study can be attributed to the combination of spatial distinctiveness and holistic action planning .

Conclusion

The study shows that directing attention to a distant target greatly enhances accuracy in basketball free throws, as compared to focusing on a nearby target or on the body movement itself. The findings confirm the efficacy of a remote target concentration, offering vital knowledge for optimizing motor abilities and improving shooting precision and performance.

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