



Resistance priming induced shooting performance Enhancement among male basketball players

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ABSTRACT

*Post activation potentiation is a phenomenon where the force exerted by a muscle is increased due to its previous contraction (Robbins). The use of resistance exercise before the activity to initiate the Post activation potentiation effect is called resistance priming. Basketball has been described as an intermittent sport, being physically very demanding sports which requiring players to frequently repeat bouts of intensive actions with one of the main skill as shooting. The purpose of the study was to understand the impact of pre-competition resistance priming exercises on shooting performance of college basketball players at various phases of the day. The study adhered one pre-test and two post-tests experimental design protocol with n=5 male collegiate basketball players were selected as subjects with purposive random sampling. The sample size was estimated by using G*Power software. For the collection of data 3-point test and free test was conducted without resistance priming and 6 hours after resistance priming exercises. For statistical analysis of the data Repeated Measures ANOVA within group design was used. A significant difference in the long-range shooting accuracy of basketball players were observed. Thus resistance priming can be utilised for improving the shooting accuracy of the basketball players in their training regime.*

Keywords: Resistance training, Post activation potentiation, Resistance priming, shooting accuracy.

Received 27.12.2023

Revised 13.01.2024

Accepted 22.02. 2024

INTRODUCTION

Basketball has been described as an intermediate sport which requires players to have repeated bout of highly intensive action. It involves both aerobic and anaerobic energetic processes [2] [6]. Consequently, in order to play successfully, basketball players must be physically well prepared by having optimally developed levels of explosive power, agility, anaerobic power and anaerobic capacities [11]. The physical and metabolic capacities of basketball players have been extensively researched, less effort has been made to understand the relationships they have with specific performance aspects, such as shooting. With the development of modern basketball, the trends of three-point popularity have greatly changed the game. In recent years, many National Basketball Association (NBA) teams have emphasized more three-point shooting attempts as an essential part of preparing for the game. Game-related statistics showed that three-point field goal attempts/field goal attempts (%) (3PA/FGA (%)) have increased in the NBA at an average annual rate of 0.6% over the past 40 years, indicating that three-point shooting is becoming more and more important in high-level basketball games [12]. Shooting is the skill which requires not only good technique but also good muscular contraction as well as long range of muscular motion. The muscular activation play a vital role in the shooting accuracy of a player for the log duration of the game. So the activation of the muscle group is an important factor in the context of the game.

Post activation potentiation (PAP) is a phenomenon by which the force exerted by a muscle is increased due to its previous contraction (Robbins). According to the theory of PAP the contractile history of a muscle influences the mechanical performance of subsequent muscle contractions. Resistance priming is the use of resistance exercise before the activity to initiate the Post activation potentiation (PAP) [5]. Application of various resistance training modalities for long term strength development proven to be effective and in light of that there are research finds in support of the acute effects of resistance exercise to improve shooting performance and range of motion of the players. Although the aim of any resistance priming is to prepare the body to take up the work demand as quick as possible, often it takes a considerable amount of time to achieve the optimum power and muscular performance during the game. The player who attains the optimum muscular performance as early as possible will have a strong hand in the game. Various

resistance priming exercises respond differently over varied period of time. However many studies have confirmed that priming performed between one hour to 48 hours impact the muscular performance positively [5]. This study was undertaken for the better understand for the relation of resistance priming exercises on the shooting accuracy of the players by inducing post activation Post activation potentiation.

MATERIAL AND METHODS

PARTICIPANTS

For this study five male (n=5) collegiate basketball (age: 20.4 ± 1.1401 , height: $176.8\text{cm} \pm 2.8635$, weight: $66.8\text{kg} \pm 2.5884$) were selected. The subjects was selected on the basis of purposive random sampling method. The subject must at least participate in intercollegiate or inter university tournament. The G*power software was used of the estimation of the sample size. The demography of the subjects are shown in the table 1.

Table 1: Demography of the Subjects

Variables	Mean \pm SD
Age (years)	20.4 ± 1.1401
Height (cm)	$176.8\text{cm} \pm 2.8635$
Weight (kg)	$66.8\text{kg} \pm 2.5884$

EXPERIMENTAL PROTOCOL

The study was on the basis of one pre-test and two post-test experimental research. For this study the subjects (n=5) was made aware about the benefits of resistance priming before an activity and the appropriate time of the use of priming which enhance the post activation potentiation on our muscles. Two priming exercises were chosen for the experiment bench press and overhead press because these two exercise mostly involves the muscle group which are involved in shooting. The subject were though the proper technique of performing the exercises. For the evaluation of the shooting accuracy was done using stationary three-point test (STT) and free throw test (FTT) was contacted.

STATIONARY THREE-POINT TEST (STT)

Each player, performed three shots from five different positions, i.e. fifteen shots in total. The player's starting position was on the right wing, right 45, center, left 45 and left wing. Shooting positions were set beyond the three-point arc. There was no time limit for the shots. The total number of baskets made from a whole total of fifteen shots was given as the score.

FREE THROW TEST (FTT)

Each player, perform five shots from the free throw line. There was no time limits for the shots. The total number of baskets made was given as the score.

PROCEDURE

Familiarisation phase the subjects was familiarized with the priming exercise and was also given awareness about the proper technique for doing the exercises for getting the maximum result with minimal effort. Further in this phase the 1RM of the subjects were also estimated in the selected exercises. To estimate 1 RM the Epley equation was used [6].

In the phase 1 of the study, a test was conducted on the evening session to know the shooting accuracy of the selected subjects using the STT and FTT without any intervention of the resistance priming to know there natural shooting accuracy and capacity.

In the phase 2 of the study in the morning session the subjects were made to do the priming exercise using bench press exercise. The subject were made to perform the exercise at 85% of 1 RM [5] (set3, rep-3) with 2 minutes rest between the set. In the evening session that is six hours from the priming exercise [3] [4], the subjects were made to the STT and FTT for knowing the shooting accuracy after priming.

The phase 3, which was conducted after 72 hours after the phase 2 of the study. It is because the muscles requires a period of 72 hours for full recovery for the next priming session as in some review of literatures. In the morning session the subjects were made to do the priming exercise using overhead press exercise. The subject were made to perform the exercise at 85% of 1 RM [5] (set-3, rep-3) with 2 minutes rest between the set. In the evening session that is six hours from the priming exercise [3] [4], the subjects were made to the STT and FTT for knowing the shooting accuracy after priming.

STATISTICAL ANALYSIS

The study was aimed at examining the potential effect of resistance priming exercise on the shooting accuracy of the male basketball players at different point of time. The study utilised a repeated measure with-in subject experimental research design withal variables measured and analysed using quantitative data analysis. Since repeated measure design was used the following analysis were carried out:

- To understand the nature of the spread data descriptive statistics were used.
- The Shapiro-Wilk test was performed to verify the normality of the data.

- Mauchly's test of Sphericity was calculated to assumption for Sphericity

Table 2: Research Design

	MORNING SESSION	EVENING SESSION (AFTER 6 HOURS)
FAMILIARISATION PHASE	ORINTISATION	• 1 RM TEST
PHASE 1	NO TREATMENT	Stationary three point test (STT) FREE THROW TEST (FTT)
PHASE 2	RESISTANCE PRIMING USING BENCH-PRESS	Stationary three point test (STT) FREE THROW TEST (FTT)
PHASE 3	RESISTANCE PRIMING USING OVERHEAD-PRESS	Stationary three point test (STT) FREE THROW TEST (FTT)

RESULT

From the analysis of the data and the finding of the study it was founded that there was a significant difference in the three point shooting accuracy of the players after the resistance priming was induced shown in (table 3). There was no significant difference in the free throw shooting accuracy of the players.

Table 3: Shooting Accuracy Parameters With Reference To Different Resistance Priming Exercise

	No treatment Mean ± SD	RP (bench press) Mean ± SD	RP (overhead press) Mean ± SD	Effect size	p- value
Three point shots (TPS)	6.6000 ± 1.14018	9.8000 ± 1.48324	9.4000 ± 1.14018	.877	.000*
Free throw shot (FTS)	3.8000 ± .83666	4.0000 ± .70711	4.0000 ± .70711	.067	.759

Notes: *. The mean difference is significant at the .05 level.

Abbrev: SD standard deviation, RP: resistance priming

From the pairwise comparison in shooting accuracy of three-point shots on no treatment, RP on bench press and RP on overhead press shown in the (table 4) we can state that there was an significant difference between non treatment and resistance priming using overhead press and also resistance priming between bench press. It was also seen that there was not much difference between the two priming exercise on shooting accuracy of the players.

Table 4: Pairwise Comparison In Shooting Accuracy Of Three Point Shots On No Treatment, RP On Bench Press And RP On Overhead Press

(I) RP	(J) RP	Mean Differen ce (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
NT	RP-Bench Press	-3.200*	.374	.003*	-4.682	-1.718
	RP-Overhead Press	-2.800*	.583	.026*	-5.110	-.490
RP-Bench Press	NT	3.200*	.374	.003*	1.718	4.682
	RP-Overhead Press	.400	.400	1.000	-1.184	1.984
RP-Overhead Press	NT	2.800*	.583	.026*	.490	5.110
	RP-Bench Press	-.400	.400	1.000	-1.984	1.184

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

Adjustment for multiple comparisons: Bonferroni.

Abbrev: RP- Resistance Priming, NT- No Treatment

DISCUSSION

The study help the coaches, players and members of the basketball community to develop an insight into the mechanism of achieving Post Activation Potentiation (PAP) in basketball through resistance priming exercises. It was also seen that the best time for getting maximum result on Post Activation Potentiation (PAP) is 6 to 8 hours after priming exercise. [3] [4]. From the findings of the study it was seen that, there was a significance difference in the shooting accuracy of 3-point shots following resistance priming rather than in the case of free throw. From this we can say that the muscular involvement in the long-range shooting is more that of a free throw which can be improve through priming exercises. So, any type of priming exercise which involves the muscle group for shooting can improve the accuracy of long-range shooting which is done with proper technique.

CONCLUSION

The main purpose of the study was to throw light on the scope of resistance priming on improving the shooting accuracy of the basketball players. On the basis of this, a model for resistance priming program could be developed for basketball players. From the results of this study coaches and players could be educated on the relevance of incorporating resistance priming with the training sessions in improving the long-range shooting accuracy of the players. It can also be concluded that the resistance priming exercise may induce post activation potentiation in basketball players and also enhance performance during playtime.

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CITATION OF THIS ARTICLE

Muhammed S, Sudheesh C S. Resistance priming induced shooting performance Enhancement among male basketball players. *Bull. Env. Pharmacol. Life Sci., Spl Issue* [1]: 2024: 86-89.