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IMMEDIATE EFFECT OF MEDICINE BALL DOWNWARD SLAM EXERCISE ON JUMP SMASH SHUTTLE SPEED AMONG BADMINTON PLAYERS

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Abstract: The purpose of this study was to examine the immediate effect of a medicine ball downward slam exercise on the jump smash shuttle speed of badminton players. The study aimed to determine whether performing the slam exercise before executing a jump smash could acutely enhance smash velocity through a post-activation potentiation effect. A total of 20 male badminton players from Lakshmibai National Institute of Physical Education, Gwalior, were randomly divided into two groups: an experimental group that performed the medicine ball downward slam exercise before executing the jump smash, and a control group that performed the jump smash without any prior activity. The jump smash shuttle speed was measured using a radar gun immediately after the intervention. Data analysis was performed using Jamovi statistical software (version 2.6.13). The Shapiro–Wilk test ($W = 0.931$, $p = 0.162$) confirmed normality of data distribution. Analysis of Covariance (ANCOVA) was applied to compare post-test mean differences between groups while adjusting for pre-test scores. The ANCOVA results revealed a significant main effect of the medicine ball downward slam on jump smash shuttle speed, $F(1,17) = 81.8$, $p = 0.001$. The adjusted post-test means were higher for the experimental group (147) compared to the control group (130), indicating a meaningful improvement in smash velocity following the immediate slam activity. Post hoc comparisons (Tukey) further confirmed a significant difference between the two groups (mean difference = 16.8, $p = 0.001$). The findings suggest that performing medicine ball downward slams immediately before executing a jump smash can acutely enhance shuttle speed in badminton players. This improvement may be attributed to post-activation potentiation mechanisms that temporarily increase neuromuscular efficiency. Coaches and trainers may incorporate medicine ball slams as part of dynamic warm-up protocols to optimize power output during competitive play.

Index Terms: Medicine ball slam, Jump smash, Shuttle speed, post-activation potentiation, Badminton performance.

1. Introduction

In badminton, the jump smash is a crucial offensive skill that relies heavily on explosive power, coordination, and speed. Enhancing shuttle speed during the smash can provide a significant competitive advantage. Recent studies have shown that post-activation potentiation (PAP) exercises can acutely improve muscular performance. The medicine ball downward slam, being biomechanically similar to the smash movement, may help activate the neuromuscular system before performance. This study aims to examine the immediate effect of a medicine ball downward slam exercise on the jump smash shuttle speed among badminton players from Lakshmibai National Institute of Physical Education, Gwalior. The research explores whether this simple, short-duration activity can enhance shuttle velocity and serve as an effective pre-performance warm-up strategy.

2. Significance of the Study

The Study:
2.1 Examines a practical, immediate warm-up strategy to enhance smash performance
2.2 Provides scientific insight into post-activation potentiation in badminton performance.
2.3 Helps coaches and trainers optimize pre-match routines for better power output.
2.4 Contributes to evidence-based training methods for improving shuttle speed and game performance.

3. Purpose of the Study

The purpose of this study was to investigate the immediate effect of a medicine ball downward slam exercise on the jump smash shuttle speed of badminton players of LNIPE, Gwalior.

4. Hypothesis

It was hypothesized that performing a medicine ball downward slam exercise would have a significant immediate effect on the jump smash shuttle speed of badminton players.

5. Methodology

5.1 Sources of Data

The data required to assess was collected from LNIPE, Gwalior, MP, India.

5.2 Selections of Subjects

5.2.1 A total of 20 male students were selected as subjects and equally divided into two groups: Experimental (n = 10) and control (n = 10).

5.2.2 The aged ranged from 18 to 25 years

5.3 Sampling Procedure

Purposive sampling followed by the Simple Random Sampling Method was adopted for the selection of subjects

5.4 Tools and Criterion Measures

Radar Gun was used, and the score was recorded in numbers.

5.5 Collection of Data

The necessary score required to examine for the test were collected before the administration of the Exercise and immediately after completion of the exercise program, keeping in mind that clear instruction was given before applying any test to the subjects.

5.6 Administration of Training Program

The study was conducted on 20 male badminton players from Lakshmibai National Institute of Physical Education, Gwalior. Participants were randomly divided into an experimental group and a control group. Each player performed the jump smash twice—first as a pre-test (before performing the medicine ball downward slam) and again as a post-test (immediately after the slam exercise). The experimental group performed the medicine ball downward slam between the two jump smashes, while the control group rested for the same duration without performing any activity. The jump smash shuttle speed was measured using a radar gun to determine the immediate effect of the medicine ball slam exercise.

6. Analysis of Data

The data were statistically analysed using JAMOVI software (version 2.6.13). To test the hypotheses, Analysis of Covariance (ANCOVA) was employed to determine the significance of differences and the effects of the interventions, with the level of significance set at 0.05.

Table no.01

Testing of Normality

Dependant Variables	Mean	SD	Sk	Ku	Shapiro-Wilk	
					W	*p value*
Jump Smash shuttle Speed (Experimental/ Control Group)	132	18.2	-0.308	-1.25	0.931	0.162

Sk= Skewness**, Ku=** Kurtosis**, W=** Shapiro Wilk Coefficient**, p value=** Shapiro Wilk p

Prior to statistical analysis, the assumption of normality was assessed using the Shapiro-Wilk test in JAMOVI software. The results indicated no violation of normality, W = 0.931, p = 0.162 (p > 0.05).

6.1 Computation of ANCOVA to Assess the Immediate Effect of the Medicine Ball Downward Slam Exercise After Adjusting for Pre-Test Scores

Table no.02

6.1.1 Analysis of Covariance (ANCOVA) for Medicine Ball Downward Slam Score

Adjusted Mean		Source of Variance	Sum of Squares	Mean Squares	df	F-Ratio	*P* Value
Experimental Group	Control Group						
147	130	Treatment Group	2268	2268	1	81.8	0.001*
		Error Group	471	27.7	17		

Table no.03

6.1.2 Description of Pretest, Posttest, and Adjusted Mean of Medicine Ball Downward Slam Test for Analysis of Covariance

Groups	Pre Test Mean	Post Test Mean	Adjusted Mean
Experimental	144	157	147
Control	120	120	130

Table No. 02 presents the results of the Analysis of Covariance (ANCOVA) based on the adjusted means shown in Table 03. The findings indicated a statistically significant difference among the groups ($F = 81.8$, $p = 0.001^*$; $p < 0.05$). Therefore, a post hoc Tukey test is appropriate to further explore specific differences, which are presented in the subsequent table.

Table no. 04

Post Hoc Comparison of Paired Mean Differences in Medicine Ball Downward Slam Score Between Experimental and Control Groups

Experimental	Control	Mean Difference	Critical Difference	*P(tukey)* Value
147	130	16.8	6.475	0.001*

Table 04: The Post Hoc Tukey test was conducted to determine the significance of mean differences between the experimental and control groups. The results revealed a mean difference of 16.8, which exceeded the critical difference value of 6.475. The obtained p-value (0.001) was found to be statistically significant at the 0.05 level, indicating that the experimental group performed significantly better than the control group in jump smash shuttle speed following the medicine ball downward slam exercise.

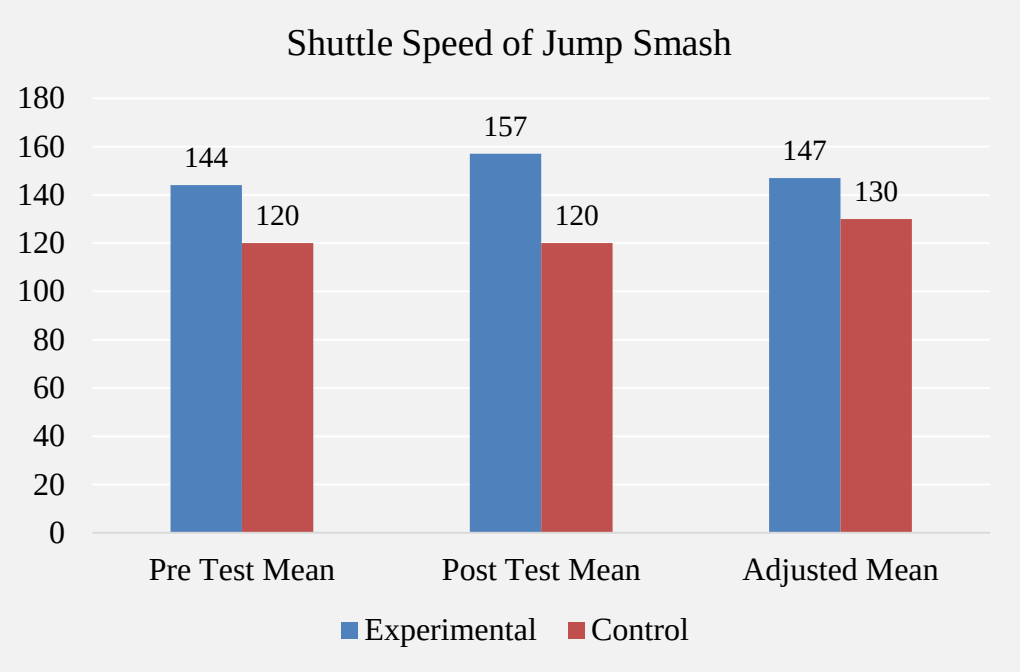

Fig no.01: Diagram Showing Pretest Mean, Posttest Mean and Adjusted Mean Comparison of Medicine Ball Downward Slam Test Between Experimental and Control Groups

7. Discussion on Finding

The findings of the study revealed a significant improvement in jump smash shuttle speed among badminton players who performed the medicine ball downward slam exercise immediately before executing the smash. The significant difference between the experimental and control groups ($p = 0.001$) indicates that the slam exercise effectively enhanced power output and performance. This improvement can be attributed to post-activation potentiation (PAP), which temporarily increases neuromuscular efficiency and explosive strength. The results support previous research suggesting that dynamic, sport-specific warm-up activities can acutely improve performance outcomes. Thus, incorporating medicine ball slams in pre-performance routines may be beneficial for enhancing smash speed and overall game performance in badminton players.

8. Conclusions

8.1 The medicine ball downward slam exercise produced a significant immediate improvement in jump smash shuttle speed among badminton players.

8.2. The observed enhancement is likely due to post-activation potentiation (PAP), which increases neuromuscular efficiency and explosive power.

8.3. Experimental group performance was significantly higher than the control group, confirming the positive acute effect of the exercise.

8.4 Coaches and trainers can incorporate medicine ball slams as part of dynamic warm-up routines to enhance power output and smash performance during competitive play.

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