

Indian Journal of Modern Research and Reviews

This Journal is a member of the '*Committee on Publication Ethics*'

Online ISSN: 2584-184X



Research Paper

The Effect of a Neuromotor Learning Program on Some Kinematic Indications and The Accuracy of The Smash Shot in The Badminton Players

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DOI: <https://doi.org/10.5281/zenodo.14253578>

ABSTRACT	Manuscript Info.
<p>The main objective of the current study is to identify the effect of the neuromuscular learning program on some kinematic indicators and the accuracy of performing the smash skill in badminton, as the accuracy of the smash skill requires neuromuscular coordination according to the organization of the neural fluidity of the instructions concerned with the motor units, which enhances the success in achieving accuracy in performance and motor guidance. Hence, the importance of the research was found due to its major role in achieving motor behavior with a smooth interaction between the nervous and muscular systems. The researcher used the experimental method by designing a single experimental group with a pre-and post-test due to its major role in achieving the goals for which the research was established. The research sample included (8) players who represented the research community after (6) players were selected from them to represent the community from which they were taken, as (2) player was excluded to conduct the exploratory experiment on them and to ensure accuracy in the results, the sample members were homogeneous in the variables of height, weight and age. As for the research tests, they were conducted on the research sample individuals, then the motor neuron learning program was applied, and after that the tests were repeated in the pre-tests, and the information was collected and processed statistically and the results were extracted, based on which the most important conclusions were reached, including:</p> <ol style="list-style-type: none"> 1. Increasing the accuracy of performance achieves good results in performance and increases the chances of success in the match. 2. The development of kinematic indicators was reflected in the accuracy of the smash skill in badminton and enhanced the chances of success in the match. 	<p>✓ ISSN No: 2584-184X ✓ Received: 05-09-2024 ✓ Accepted: 24-11-2024 ✓ Published: 29-11-2024 ✓ MRR:2(11):2024; 41-46 ✓ ©2024, All Rights Reserved. ✓ Peer Review Process: Yes ✓ Plagiarism Checked: Yes</p> <p>How To Cite</p> <p>Jabbar Ali Kadhim. The Effect of a Neuromotor Learning Program on Some Kinematic Indications and The Accuracy of The Smash Shot in The Badminton Players. Indian Journal of Modern Research and Reviews: 2024;2(11):41-46.</p>

KEYWORDS: Neuromotor, learning kinematic indications and accuracy.

1. INTRODUCTION

Badminton is one of the most important sports in the field of fast sports, which requires great mastery of its skills, which are characterized by high accuracy and perfect motor control. Motor abilities are the most important thing that distinguishes players in this game, as the players' performance in this game

depends on the motor and coordination ability that distinguishes the players in this game. This type of game requires the players' quick and accurate interaction to implement movements and achieve the best results, as the ability to develop movement indicators is necessary to develop

the players' ability to achieve distinguished performance in this sport. Here we find that the neuro-motor educational program plays an important role in improving motor coordination and motor indicators to achieve the basic goal, which is the result of high accuracy to win the rounds and then the match. Motor performance requires coordination between motor units, which are a combination of muscle fibers and nerve stimuli, so mastering neuro-muscular coordination achieves speed in special movements in performing the crushing hitting skill in badminton.^[1] The interaction between the nervous system and the performance of different skills, especially the smash skill in badminton, requires coordination and enhancement of neural fluidity by increasing the ability to identify the group of muscles working in each performance to achieve the principle of saving effort and increasing accuracy in moving in a compatible and harmonious manner. Achieving maximum accuracy and power in the smash skill in badminton requires precise timing and high accuracy in synchronizing the shuttlecock and racket according to the appropriate body angles to achieve the best results, as this matter requires technique and coordination between the player and the shuttlecock.^[2] From here we notice that the neuromotor educational program works to improve motor response and enhances attention and focus, which is reflected in the players' performance and improves the accuracy of the smash skill in badminton. The pivotal integration between the nervous and muscular systems plays an important and major role in strengthening the muscles and achieving neuromuscular flow and balance. Through the above, the importance of the research lies in studying the effect of the neuromotor educational program on some kinematic indicators that have a clear impact on the accuracy of performance of the smash skill in badminton by improving the coordination between motor units and muscle contractile capabilities to increase the accuracy of direction and performance of the smash skill in badminton.

Research Problem

The ability to direct the performance angles for each skill requires the ability to influence the neural fluidity of motor units to achieve the ability to direct the different parts of the body in performance to achieve the required accuracy in performing the smash skill in badminton, and this is not done by most of the researches related to badminton. The researcher found it important to delve into this type of research as it

achieves the ability to build a model capable of building the interaction between the nervous and muscular systems to direct the movement of performance and achieve accuracy.

2. RESEARCH OBJECTIVES

1. Identifying the effect of the neuromotor learning program on some kinematic indicators in the skill of the smash in badminton.
2. Identifying the effect of the neuromotor learning program on the accuracy of performing the skill of the smash in badminton.
3. Identifying the effect of changes in some kinematic indicators on the accuracy of performing the skill of the smash in badminton.

Research hypotheses

There are statistically significant differences between the pre- and post-tests in some kinematic indicators and the accuracy of performing the smash skill in badminton, in favor of the post-tests.

Research field:

Human field: Al-Mustaqbal University badminton team players.

Time field: From 1/12/2023 to 3/5/2024.

Spatial field: The closed sports hall at Al-Mustaqbal University/College of Physical Education and Sports Sciences.

3. RESEARCH METHODOLOGY

The nature of the research procedures determines the type of method used to suit the nature of the research sample and the procedures for which it was developed. Therefore, the researcher used the experimental method with a single group with a pre-and post-test.

Research community and sample

The research community included the badminton players team at Al-Mustaqbal University/Faculty of Physical Education and Sports Sciences. The community consisted of (8) players, and (6) players were selected from them to represent the community. Homogeneity was achieved among the individuals of the research sample in the variables of height, weight, and age, as shown in Table 1.

Table 1: Shows the homogeneity of the research sample

N	Valid	Age	Height	Weight
	Missing	6	6	6
Mean	0	19.83	175.5	174.5
Median		20	176	173.5
Std. Deviation		0.75	2.74	5.75
Skewness		0.32	0.88	1.42
Std. Error of Skewness		0.845	0.85	0.85

From table (1) it is clear that the value of the coefficient of skewness is between (± 1) and it indicates the homogeneity of the research sample.

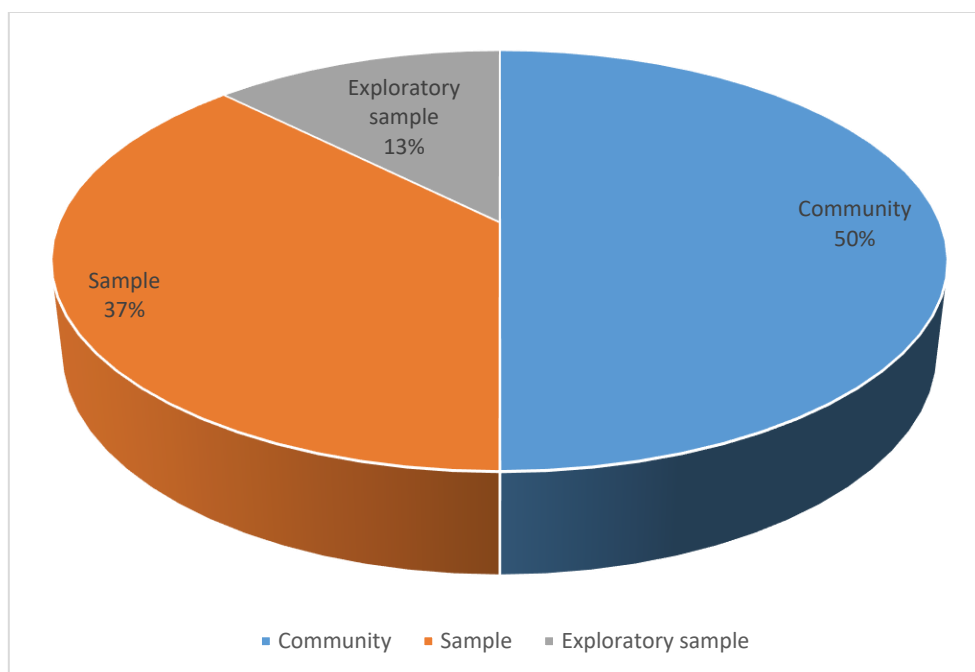


Figure 1: Shows the distribution of the research community and sample

3.2 Devices, methods, and tools used in the research

- Badminton rackets.
- Badminton feathers, number (20).
- Legal badminton court.
- Colored tapes.
- Kinovea program.
- Video camera.
- Ready laptop.
- Information collection form.

3.3 Tests used in the research:

1. Test to measure the kinematic indicators of the smash skill in badminton:^[3]

- Objective of the test: To measure the kinematic variables of the smash skill in badminton.
- Equipment used: Badminton court, shuttlecocks, motion analysis program, video camera and laptop.
- Test description: From a standing position to perform the smash in badminton, the coach throws the shuttlecock towards the player, who then jumps and hits the ball towards the designated area in the opposing team's court, where the performance is filmed by a camera installed at a distance of 3 meters and with a focal height of 1.70 meters vertically above the performance level.
- Recording method: The video recording is transferred to the laptop and through a special motion analysis program known as (Kineova) the kinematic variables of the performance are analyzed, As follows: The shoulder angle was measured by determining the angle between the humerus and the trunk, while the elbow joint angle was

measured between the forearm and the humerus, and the wrist joint angle was measured between the shuttlecock and the forearm. The instantaneous velocity was measured from the moment the shuttlecock was struck and the start of the shuttlecock leaving. The instantaneous kinetic energy of the shuttlecock was also measured through the kinetic energy law, which states:

$$\text{Instantaneous kinetic energy} = 0.5 * \text{arm weight} * (\text{speed})^2$$

The instantaneous angular velocity of the racket was also measured from the moment the shuttlecock was struck until the shuttlecock began to leave the racket.

- Units of measurement: Angles in degrees and instantaneous velocity in meters per second, instantaneous kinetic energy in joules and instantaneous angular velocity in degrees per second.
- #### 2. Badminton smash skill accuracy test:^[4]
- The aim of the test: To measure the accuracy of the smash skill with the badminton.
 - The tools used: Badminton court, badminton rackets, EMG device and colored tapes.
 - Test description: Each player is given 12 attempts and the best 10 attempts are counted, as the player stands in the designated place and works to hit the shuttlecock that reaches him and deliver it to the other side of the court, which is divided into areas from (1-5).
 - Recording method: The scores are recorded according to the place where the shuttlecock lands on the divided areas and for the best 10 attempts.
 - Measurement unit: The score.

3.4 Pre-tests

The pre-tests were conducted on the research sample on 12-3-2023.

3.5 Neuromotor Learning Program

The program was applied after conducting pre-tests on the research sample. The program included two educational doses per week for two months. In each educational dose, there are stimulating exercises for the neuromuscular system to create a state of interaction between the two aforementioned systems, which has a great benefit in improving accuracy and coordination between motor units, especially for the performance arm. The exercises included in the educational program created neuromuscular adaptations that were reflected in the ability of muscle fibers to contract quickly and efficiently. The educational program exercises in this research included exercises to develop and improve fine movements

and exercises to improve control and balance because they improve the individual's performance in different playing situations. The program also included exercises to improve strength and speed, which began in the third week of the program. One of the most important tests through which the effectiveness of the neuromotor learning program can be measured is the motor performance tests, which give us a clear picture of the amount of improvement in the vital activity of the neuromuscular system.

3.6 Post-tests

The post-tests were conducted after completing the doses of the motor neurolearning program under the same conditions as the pre-tests.

3.7 Statistical methods: The statistical bag (SPSS) was used to process the data and extract the results.

4. RESULTS & DISCUSSIONS

4.1 Presentation and analysis of the results of the descriptive analysis of the research variables in the kinematic indicators and the accuracy of the smash hit in badminton

Table 2: Shows the results of the descriptive analysis of the research variables in the kinematic indicators and the accuracy of the smash hit in badminton

Variables		Mean	N	Std. Deviation
Shoulder angle	Pretest	100.35	6	5.047
	Posttest	148.32	6	1.862
Elbow angle	Pretest	135.5	6	2.35
	Posttest	170.5	6	3.51
Wrist angle	Pretest	137.8	6	3.87
	Posttest	147.3	6	5.203
The instantaneous speed of the shuttlecock	Pretest	16.03	6	3.94
	Posttest	36.69	6	9.99
Instantaneous angular velocity of the racket	Pretest	2244.41	6	728.37
	Posttest	3983.3	6	909.58
The instantaneous kinetic energy of the shuttlecock	Pretest	468.31	6	234.95
	Posttest	2482.98	6	1245.45
Accuracy	Pretest	27.33	6	1.211
	Posttest	39.5	6	2.074

4.2 Presentation and analysis of the results of the (t) test and the significance of the differences between the pre-and post-tests of the kinematic research variables and the performance and accuracy of the smash hit in badminton

Table 3: The results of the (t) test and the significance of the differences between the pre-and post-tests of the research variables show the kinematics performance and accuracy of the smash hit in badminton

Variables	Paired Differences			(t) value	df	Sig.	Significance of differences
	Mean	Std. Deviation	Std. Error Mean				
Shoulder angle	48	4.77493	1.94936	24.62	5	0.000	Sig.
Elbow angle	35	5.21536	2.12916	16.44	5	0.000	Sig.
Wrist angle	9.5	5.43139	2.21736	4.28	5	0.008	Sig.
The instantaneous speed of the shuttlecock	20.68	10.90249	4.45092	4.65	5	0.006	Sig.
Instantaneous angular velocity of the racket	1738.89	578.38	236.121	7.36	5	0.001	Sig.
The instantaneous kinetic energy of the shuttlecock	2014.67	1304.73	532.65	3.78	5	0.013	Sig.
Accuracy	12.167	2.32	0.946	12.87	5	0.000	Sig.

Through the results presented in Tables (2 and 3), we notice that there are significant differences between the results of the pre-and post-tests, which indicates that the program related to the neuromotor aspects of learning has an effective impact in

improving the motor factors that are highly related to the kinematic variables and the accuracy of performing the smash skill in badminton. What was reflected in the results of the research is the improvement of the accuracy of the smash in

badminton, and this improvement was observed through the increase in the number of successful and accurate hits that were reflected in the improvement of the direction and control of the badminton racket.^[5] The results also showed a significant improvement in the smash skill, which was represented by the speed and coordination of the player's movements and increased their balance and stability while performing smashes in badminton. One of the most important features that enhanced the neuromotor learning program is the improvement in self-confidence and increased level of attention, which appeared in the players' performance and the execution of movements with great accuracy.^[6] The researcher indicates that subjecting players to a neuromotor learning program makes players more able to manage the game effectively, and this comes from executing movements with speed and accuracy that lead to increasing the chances of winning the point and the match as a whole and achieving success in various competitions.⁷ Also, programs related to the development of the nervous system reduce the possibility of errors and provide the efficiency of athletic performance in general and the performance of the smash skill in badminton in particular.^[8] The main goal of the research is to achieve success in the match, which depends on a point of basic effectiveness, which is achieving the element of accuracy in performance and directing the shuttlecock within the opponent's court. This is achieved by improving motor coordination, as motor coordination can help develop the players' ability to control the execution of strikes with great accuracy through their ability to control their movements.^[9] The neuromotor learning program has developed an important characteristic in players, which is the speed of response, through which players can respond quickly to the movements of the opposing player during the match, which gives players the ability to understand and comprehend all the different playing situations and increases the chances of success in the match.^[10]

5. CONCLUSIONS

1. Increasing the accuracy of performance achieves good results in performance and increases the chances of success in the match.
2. The development of kinematic indicators was clearly reflected in the accuracy of the smash skill in badminton and enhanced the chances of success in the match.
3. The neuromotor learning program showed significant differences in the results of the post-tests in the kinematic indicators and the accuracy of the smash skill in badminton.
4. An increase in motor adaptations resulting from the increase in the neural fluidity of the motor units of the body as a whole and the performance arm in particular appeared.

Recommendations

1. The necessity of using neuromotor learning exercises in all sports, especially the smash skill in badminton.

2. The necessity of developing interactions between the neuromuscular systems due to their role in improving the accuracy of performance in the smash skill in badminton.
3. The necessity of using kinetic analysis of performance to understand the kinetic behavior of performance and direct movement according to the requirements of good performance for each game, especially the smash skill in badminton.

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