THE EFFECT OF MARZANO'S MODEL ACCOMPANIED BY VISUAL PRESENTATION TOOLS ON DEVELOPING CERTAIN COGNITIVE ABILITIES AND THE SKILLS OF SPIKING AND BLOCKING IN VOLLEYBALL

Amer Rashid Shayyal Al-Zubaidi

University of Wasit,
IRAQ
Corresponding Author: amirrashid@uowasit.edu.iq

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ABSTRACT

Background. Technological advancement plays a significant role in providing educators and coaches with modern teaching tools, devices, and instructional aids, both on cognitive and practical levels, which facilitate the process of delivering information to learners. **Objectives.** The current study aimed to examine the effect of Marzano's model, accompanied by visual presentation tools, on developing certain cognitive abilities as well as the volleyball skills of spiking and blocking. **Method**. The researcher employed an experimental methodology on a primary research sample consisting of 27 youth players from the Al-Hay Sports Club. The sample was divided into an experimental group and a control group. The experimental group was trained according to Marzano's model, while the control group followed the conventional method used by the coach. After the completion of the experimental intervention, the results were collected and analyzed statistically. **Results.** The findings indicated an improvement in certain cognitive abilities as well as the spiking and blocking skills among both research groups. However, the experimental group demonstrated superiority across the studied variables, reflecting the effectiveness of the Marzano model in enhancing both mental and motor performance. **Conclusion.** Based on these results, it is recommended to implement Marzano's model in all sports activities, particularly in volleyball, due to its tangible positive effects on players' cognitive development and skill acquisition, as evidenced by the outcomes of this study.

Keywords; marzano's model, visual presentation tools, cognitive abilities, volleyball skills

A. INTRODUCTION

Technological advancement plays a significant role in providing educators and coaches with modern teaching tools, devices, and instructional aids, both on cognitive and practical levels, which facilitate the process of delivering information to learners (Driller et al., 2023; Hammerschmidt et al., 2021). Technological applications can be integrated into motor learning, which is considered a fundamental science in physical education. Motor learning aims to acquire sports skills and movements through various methods and approaches. It also contributes effectively to teaching, analyzing, and evaluating these skills and movements in all their aspects, relying on established techniques and the rich knowledge of sports sciences, which have proven effective, especially in light of recent technological developments (Camomilla et al., 2018; Cossich et al., 2023; Zhang & Breedlove, 2021).

Scientific progress has introduced many new tools that teachers and instructors can utilize to create opportunities for learners to gain experience, thus preparing them with a high degree of competence. One of these modern methods in the learning process is Marzano's model, accompanied by visual presentation tools, which represents a form of modern learning integrated into sports applications to enhance and develop the learning process. Volleyball, as a sport, is characterized by the variability of movements; the player's actions change according to the dynamics of the game, requiring continuous interaction, adaptation, and harmonization with changing situations. Players or learners must be physically and technically prepared to perform skills efficiently while economizing energy, which ultimately leads to optimal performance (Supriatna et al., 2023; Yulianti et al., 2024).

The significance of the study emerges from employing Marzano's model accompanied by visual presentation tools to teach spiking and blocking skills in volleyball, utilizing the capabilities offered by these tools as cognitive aids for learners. This approach is expected to enhance the technical aspect of skill performance. Keeping pace with technological and civilizational progress necessitates the use of modern tools across various fields, including sports, which is among the most advanced areas today. Therefore, it is imperative for coaches and educators to explore and adopt advanced technological methods that support achieving athletic objectives. One of these modern technological methods is Marzano's model accompanied by visual presentation tools, categorized under modern instructional aids. These tools establish an interactive relationship between educational media and learners by providing information, thus maximizing the benefits of their capabilities for motor learning more effectively than routine traditional methods.

The research problem arises from the need to employ this model. Based on the researcher's observations of youth volleyball teams, there was noticeable variability in skill performance and weaknesses in executing the targeted skills in accordance with their learning levels. Further review of references and practical observations revealed that certain approaches had not been tested on this population but had produced positive results when applied to similar samples. This motivated the researcher to implement Marzano's model in this study.

The study aims to prepare an instructional program using Marzano's model for youth volleyball players and to determine the effect of employing this model on learning the skills of spiking and blocking among youth players. It is hypothesized that there are statistically

significant differences between the pre-test and post-test results for both the experimental and control groups in learning the spiking and blocking skills in volleyball. Furthermore, it is expected that statistically significant differences will exist in the post-test results between the experimental and control groups, in favor of the experimental group.

B. METHOD

Research Design

The researcher employed the experimental method using a pre-test and post-test design with two equivalent groups, as it is suitable for the nature of the research problem and its objectives.

Research Population and Sample

The research population consisted of youth volleyball players from Al-Hay Club in Wasit Governorate, totaling 27 players. The research sample was randomly selected from the population and evenly divided by lot into two groups: an experimental group, which received the intervention according to the research variable, consisting of 10 youth players, and a control group, which followed the coach's usual method, also consisting of 10 youth players. Additionally, 7 players were chosen for the exploratory experiment, forming a sample representing 74% of the population.

The researcher verified the homogeneity of the sample regarding anthropometric measurements, including height, body mass, chronological age, and training age, as shown in Table 1.

Table 1. Homogeneity of the Sample in Anthropometric Variables

Variable	Unit	Mean	Median	SD	Skewness
Height	cm	149.67	153.0	5.15	-0.77
Body Mass	kg	43.37	42.5	2.81	0.93
Chronological Age	years	15.38	15.5	0.71	-0.50
Training Age	years	1.58	1.62	0.81	-0.15

The results indicate that all skewness values were less than ±1, confirming the homogeneity of the sample in all measured variables.

Group Equivalence

To ensure that both experimental and control groups started from the same baseline, the researcher assessed the equivalence of the groups across all dependent variables using pre-test results, as presented in Table 2.

Table 2. Group Equivalence in Pre-Test Variables (Reaction Time, Psychomotor Perception, Attention Concentration, Spiking, Blocking)

Test	Control Group Mean (SD)	Experimental Group Mean (SD)	Confidence Level	Significance

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Reaction Time	0.70 (0.12)	0.71 (0.04)	0.95	Non-significant
Psychomotor Perception	7.00 (2.53)	7.40 (0.61)	0.82	Non-significant
Attention Concentration	6.21 (4.35)	9.23 (1.13)	0.84	Non-significant
Spiking	16.4 (1.82)	17.3 (2.09)	0.74	Non-significant
Blocking	15.4 (3.10)	15.10 (3.70)	0.32	Non-significant

These results indicate that the pre-test values for all assessed variables were not statistically significant at the 0.05 level, confirming the equivalence of both groups.

Data Collection Tools

The researcher used the following methods to collect relevant data:

1. Questionnaires
2. Tests and measurements
3. Observation

Devices and Equipment Used

The following equipment and tools were employed in the study:

1. Volleyballs (10, Molten type)
2. Whistles (2, Chinese-made)
3. Laptop (Lenovo, 1 unit)
4. Stationery (papers, pens)
5. Colored adhesive tape (5 cm wide)
6. Camera tripod (1 unit)
7. Colored plastic cones (10 units)
8. Medical scale (1, Chinese-made)
9. Video camera
10. Performance evaluation form for spiking and receiving skills

Cognitive Abilities

To identify the most relevant cognitive abilities for this study, the researcher reviewed literature and previous research on cognitive skills. These abilities were compiled into a questionnaire and presented to a panel of experts for assessment. The relative importance of each ability was calculated, resulting in the acceptance of three out of eight cognitive abilities. Table 3 shows the results.

Table 3. Relative Importance of Cognitive Abilities According to Experts

Cognitive Ability	Relative Importance	Accepted
Reaction Time	93%	Yes
Attention Concentration	84%	Yes
Intelligence	32%	No
Psychomotor Perception	81%	Yes
Memory	52%	No
Thinking	46%	No
Motor Imagery	34%	No
Creativity	36%	No

Simple Reaction Time Test Using a Computer

1. Tools: Computer, reaction time measurement software, recorder
2. Test Description: The participant sits in front of the computer and selects a color from a changing background square. Upon pressing "Start," they wait for the background to change and then press "Stop" as quickly as possible. The software records the reaction time.
3. Scoring: Each participant is given three attempts, and the best (shortest) reaction time is recorded as their score.

Psychomotor Perception Test (60 cm Distance Jump)

1. Purpose: To measure the learner's ability to perceive and judge a horizontal jump distance of 60 cm.
2. Equipment: Floor area, stopwatch/recorder, vision-blocking mask, measuring tape.
3. Performance Procedure: Two lines are marked 60 cm apart. The participant stands with toes behind the starting line and jumps forward to reach the second line, ensuring the heels land beyond it. The participant is then blindfolded with a cloth and performs three jumps. Each attempt is recorded separately.

Attention Concentration Test

1. Purpose: This test, known as the "Concentration Grid Test," measures the learner's ability to focus attention.
2. Duration: 1 minute.
3. Procedure: The participant is instructed to place a slash (/) on the next consecutive number following a specified starting number determined by the examiner. For example, if the starting number is 17, the participant marks 18, then 19, and so on, without reversing the order.
4. The test can be repeated multiple times using different starting numbers or altered grids to prevent memorization. Numbers are always two-digit (e.g., 01, 02, 23). It

can also be conducted under various experimental conditions, such as performing in front of peers or with attention-diverting stimuli.

5. Scoring: Each correctly marked number within the 1-minute limit counts as one point. Higher scores indicate greater attention concentration.

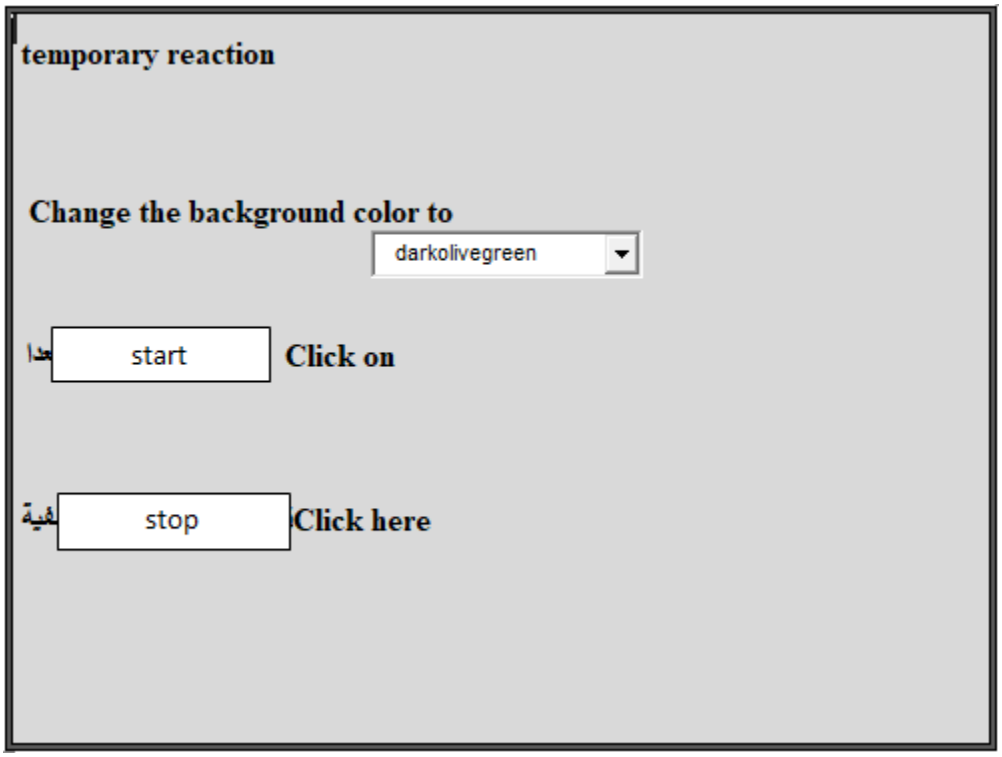

Figure 1. Front panel of the calculator in a simple reaction test

Spike Skill Test (Volleyball)

1. Purpose: To measure the accuracy of the spiking skill in volleyball.
2. Equipment: Standard volleyball court, 5 official volleyballs, colored tape to mark scoring zones (as shown in Figure 2).
3. Performance Procedure: The participant performs spikes from position 4, with the coach feeding balls from position 3.
4. Performance Conditions:
    - Each player performs 5 attempts targeting Zone A.
    - Each player performs 5 attempts targeting Zone B.
5. Scoring:
    - 4 points for each attempt landing in Zone A or B.
    - 3 points for each attempt landing in the colored zone.
    - 2 points for each attempt landing in subzones A or B.
    - 0 points for balls landing outside the court.

6. Maximum Score: 20 points per zone; total maximum score is 40 points.
7. Note: Proper ball setup by the coach is essential; otherwise, the attempt must be repeated.

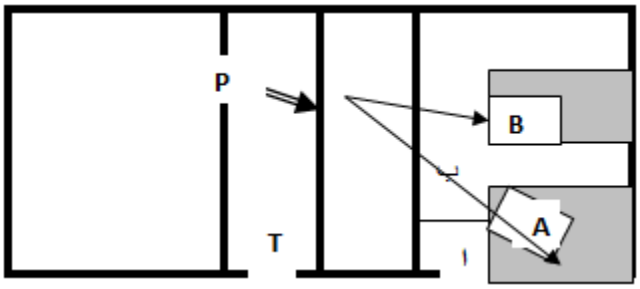

Figure 2. The figure shows the accuracy test for the smash hit skill.

Block Skill Test (Volleyball)

1. Purpose: To measure the accuracy of the blocking skill in volleyball.
2. Equipment: Standard volleyball court, 5 official volleyballs, colored tape to mark scoring zones (as illustrated in Figure 3).
3. Performance Procedure: The participant stands at position 2, ready to perform the blocking skill, while the coach stands on a table to execute the spike under normal conditions.
4. Performance Conditions: Each player performs 3 attempts from each position (2, 3, 4). Only successful attempts (offensive blocks) are scored. The maximum test score is 27 points.
5. Scoring: The player is awarded the score corresponding to the zone in which the ball lands, as shown in Figure 3.

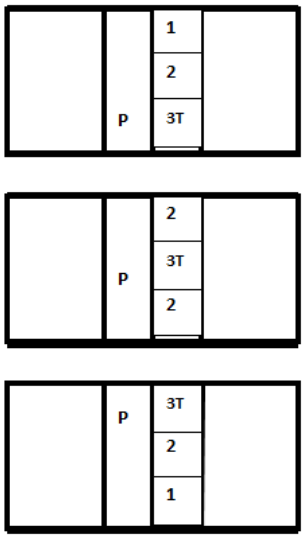

Figure 3. illustrates the accuracy zones for the blocking skill test.

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Pre-tests

Pre-tests for cognitive achievement and volleyball skills (serving and receiving) were conducted for the research sample on 29/5/2025. All tests were performed at 3:00 PM in the indoor hall of Al-Hay Sports Club.

Main Experiment

1. The experimental curriculum for the experimental group lasted 8 weeks.
2. Total number of units: 24 units for the experimental group.
3. Weekly frequency: 3 units per week.
4. Duration of each educational unit: 90 minutes.
5. The experimental group followed the Marzano model, with the researcher supervising the implementation of the model as well as pre-tests and post-tests.
6. The control group followed the method traditionally used by the coach.

Post-tests

Post-tests for the research variables were conducted on 3/7/2025 after completing the scheduled units. Procedures, conditions, and testing tools were consistent with those used in the pre-tests to ensure reliability and comparability.

Statistical Methods

The researcher used the SPSS statistical package and applied the following statistical methods:

1. Arithmetic mean
2. Standard deviation
3. Pearson correlation coefficient
4. Chi-square test
5. T-test

C. RESULTS AND DISCUSSION

Table 4. presents the pre- and post-test results for the research variables of the control group along with the statistical parameters:

Test	Pre-test Mean ± SD	Post-test Mean ± SD	t-value	Significance Level	Significance of Differences
Mental Abilities	Reaction Time	0.70 ± 0.12	0.58 ± 0.21	1.56	0.15
	Attention Focus	7.00 ± 2.53	9.00 ± 2.21	1.76	0.11
	Perception	6.21 ± 4.35	6.10 ± 1.48	0.07	0.94

Skills	Spike	16.4 ± 1.82	25.20 ± 1.54	20.95	0.001
	Block	15.4 ± 3.10	17.50 ± 1.90	5.42	0.00

Table 5 shows the pre- and post-test results for the experimental group:

Test	Pre-test Mean ± SD	Post-test Mean ± SD	t-value	Significance Level	Significance of Differences
Mental Abilities	Reaction Time	0.71 ± 0.04	0.49 ± 0.03	3.85	0.00
	Attention Focus	7.40 ± 0.61	11.70 ± 0.70	6.00	0.00
	Perception	9.23 ± 1.13	3.60 ± 0.43	4.73	0.001
Skills	Spike	17.3 ± 2.09	34.4 ± 1.64	33.47	0.001
	Block	15.10 ± 3.70	20 ± 1.70	19.38	0.00

Table 6 displays the post-test results comparing the control and experimental groups:

Test	Control Mean ± SD	Experimental Mean ± SD	t-value	Significance Level	Significance of Differences
Mental Abilities	Reaction Time	0.58 ± 0.21	0.49 ± 0.03	6.91	0.000
	Attention Focus	9.00 ± 2.21	11.70 ± 0.70	2.89	0.018
	Perception	6.10 ± 1.48	3.60 ± 0.43	9.92	0.000
Skills	Spike	25.20 ± 1.54	34.4 ± 1.64	12.27	0.000
	Block	17.50 ± 1.90	20 ± 1.70	2.94	0.013

The results presented in Tables 4, 5, and 6 show statistically significant differences in most of the research variables for both the pre- and post-tests, favoring the post-test results, except for reaction time, attention focus, and perception in the control group. These differences are attributed to the use of the Marzano model by the experimental group.

Table 6 highlights the superiority of the experimental group in all post-test variables compared to the control group, due to the application of the Marzano model. This model enhances both cognitive and motor skills and helps build accurate movement programs for learning sports skills. It also promotes inquiry-based learning, enabling students to seek correct information about skill performance, facilitates effective communication between learners and instructors, and accounts for individual differences among learners. Such an approach ensures that the acquired information is retained for a longer period and supports faster and more precise learning.

The Marzano model engages all brain functions, including comprehension, analysis, thinking, and problem-solving, reflecting three core educational theories: brain-compatible

learning, cooperative learning, and problem-centered learning. This contributes to a deeper understanding of the game and optimizes how the received information is utilized.

The experimental group's success is also supported by the motivational aspect of the model, which encourages learners to exert additional cognitive and physical effort without experiencing boredom. The use of interactive and structured visual aids enhances the learning process, improves cognitive acquisition, and facilitates skill retention. Moreover, combining theoretical instruction with practical application promotes correct and fluid skill execution, as opposed to relying solely on practice (Dewantara et al., 2024; Haniyyah et al., 2025; Hardinata et al., 2023; Mahesvi et al., 2023).

Overall, the use of the Marzano model in conjunction with visual aids fosters effective cognitive processing, self-directed inquiry, and collaborative learning, all of which contribute to improved skill performance and mastery in volleyball.

D. CONCLUSION AND RECOMMENDATIONS

The study reached several conclusions: There was progress in the research variables for both the control and experimental groups.The methodology applied according to Marzano's model for the experimental group demonstrated superiority over the control g roup across the research variables. The Marzano model enhances cognitive and motor knowledge among learners, which consequently leads to better skill acquisition and performance. Following Marzano's model, the methodology contributed to developing the ability to search for and gather information in support of skill learning. The model fosters teamwork among learners, which promotes greater success, especially considering that volleyball is a team sport. Educators should be encouraged to diversify their modern training and teaching methods, employing innovative approaches such as Marzano's model. Marzano's model should be applied in learning most skills across various sports, particularly volleyball. Similar research should be conducted for other volleyball skills or for different age categories. Coaches in specialized schools should focus on utilizing Marzano's model for learning, developing, and retaining core volleyball skills. Schools should ensure the availability of necessary equipment and tools to facilitate the application of these modern methods in volleyball training.

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F. AUTHOR CONTRIBUTION STATEMENT

All authors are responsible for the completed manuscript.

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