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The effect of the cube model on visual-spatial intelligence and learning the skill of spiking in volleyball for female students

El efecto del modelo del cubo sobre la inteligencia visoespacial y el aprendizaje de la habilidad de rematar en voleibol para estudiantes femeninas

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Abstract

Objective: To identify the effect of the cube model on visual-spatial intelligence and learning the skill of spikinging in volleyball for female students, The researchers used the experimental method by designing two equivalent groups with pre- and post-measurements.
Research methodology: The main research sample of (30) female students was selected from the research community represented by second-stage students in the College of Physical Education and Sports Sciences - University of Baghdad for the academic year (2024-2025). The sample was divided equally into two control and experimental groups. The researchers conducted the sample homogenization process and the equivalence process between the two groups in the variables of visual-spatial intelligence, technical performance and accuracy of the skill of spikinging in volleyball based on the results of the pre-measurement. Then, the cube model was applied to the experimental group at a rate of (2) units per week and for a time of (90) minutes, for a period of (4) weeks. After that, the post-measurement was conducted and the research experiment continued from (2/3/2025) until (20/3/2025).
Result: There were significant differences between the pre- and post-measurements of the variables of visual-spatial intelligence, technical performance, and accuracy of the volleyball spiking skill in favor of the post-measurement and the control and experimental groups. The researchers attribute the reason for these differences for the control group to the method followed in the educational units for the members of this group.
Conclusions: Using the cube model contributed in a positive and effective way to developing visual-spatial intelligence and learning the skill of spiking the volleyball for the members of the experimental group.

Keywords

Cube model; visual intelligence; spiking skill.

Resumen

Objetivo: Identificar el efecto del modelo de cubo en la inteligencia visual-espacial y el aprendizaje de la habilidad de rematar en voleibol para estudiantes femeninas. Los investigadores utilizaron el método experimental diseñando dos grupos equivalentes con mediciones previas y posteriores.
Metodología de investigación: La muestra principal de investigación de (30) estudiantes femeninas fue seleccionada de la comunidad de investigación representada por estudiantes de segunda etapa en la Facultad de Educación Física y Ciencias del Deporte - Universidad de Bagdad para el año académico (2024-2025). La muestra se dividió equitativamente en dos grupos de control y experimental. Los investigadores llevaron a cabo el proceso de homogeneización de la muestra y el proceso de equivalencia entre los dos grupos en las variables de inteligencia visual-espacial, desempeño técnico y precisión de la habilidad de rematar en voleibol con base en los resultados de la medición previa. Luego, el modelo de cubo se aplicó al grupo experimental a una tasa de (2) unidades por semana y por un tiempo de (90) minutos, por un período de (4) semanas. Posteriormente se realizó la medición posterior y el experimento de investigación continuó desde (2/3/2025) hasta (20/3/2025).
Resultado: Se encontraron diferencias significativas entre las mediciones previas y posteriores de las variables inteligencia visoespacial, rendimiento técnico y precisión en el remate de voleibol a favor de la medición posterior y los grupos control y experimental. Los investigadores atribuyen la razón de estas diferencias para el grupo control al método seguido en las unidades educativas para los miembros de este grupo.
Conclusiones: El uso del modelo del cubo contribuyó de manera positiva y efectiva al desarrollo de la inteligencia visoespacial y al aprendizaje de la habilidad de rematar el balón de voleibol para los miembros del grupo experimental.

Palabras clave

Modelo de cubo; inteligencia visual; habilidad para rematar.

Introduction

Many educational models have emerged that aim to improve motor learning, and among these models is the cube model, which is one of the educational models that depend on content in terms of cognitive organization, as it helps the student understand and organize the intertwined information of different scientific phenomena by looking at these phenomena from their six sides, which are the six-sided cube faces represented by (description, comparison, connection, analysis, application, and proof), i.e. explaining the topic in the form of six different sides, as the teacher works to put the basic lines for the title of each face of the cube, and then the student puts her ideas under each of the six faces of the cube. (Fakhri & Al-Shammari, 2015). The cube Strategy relies on the learner's effectiveness through practical application of knowledge through individual or group activities, which helps them, develop research and thinking skills, solve problems, and acquire new knowledge about various skills. Therefore, the cube Strategy is one of the most important modern educational strategies and plays a significant role in teaching sports skills. It also provides learners with modern tools and methods that have a positive impact on the learning process because it facilitates the speed and ease of transferring information and provides the learner with the appropriate environment to develop various motor skills. It also allows them opportunities for effective participation through individual and group activities under the guidance and supervision of the teacher, allowing them to be a positive participant with their teacher and colleagues.The cube model is also one of the educational models based on the principle of organizing knowledge (that the student builds the meaning herself and reaches knowledge by herself, as it works to motivate the student to think when reading by looking at the subject from six aspects represented by the six faces of the cube, as this model allows for a deep analysis of the subject (Dick & Ann. 2010) (Al-Dulaimi, 2002).

This model also has an advantage in that it expands the student's thinking in a way that makes it flexible, as a result of the depth of seeing the subject from different aspects (representing the faces of the cube), and includes building a hexagonal cube, and each face of the cube looks at the subject from a specific aspect. This model also depends on organizing scientific knowledge in the student's cognitive structure and the constructivist theory. To build the student's knowledge and link it to the previous knowledge she possesses to reach results that can be applied in new situations, this model also has the advantage of expanding the student's thinking, making it flexible. This is due to the depth of the subject's vision from different perspectives (representing the faces of the cube). It includes constructing a six-sided cube, with each face of the cube viewing the subject from a specific perspective. This model also relies on organizing scientific knowledge within the student's cognitive structure. Constructivist theory focuses on building knowledge within the student and linking it to the prior knowledge they possess to arrive at results that can be applied in new situations. The cube strategy is a modern teaching strategy that relies on cognitive organization of content. It is a visual method that helps students organize complex scientific information for a single scientific phenomenon by looking at the scientific phenomenon or topic from six perspectives which are the six faces of the cube." (Al-Janabi, 2018). This model is also defined as "an educational model that works to motivate students to look at the subject from six different sides that represent the six faces of the cube, which are: description, comparison, association, analysis, transformation, and proof. The cube model is also used as an educational model to enhance motor understanding and develop mental abilities related to mathematical skills, as this model focuses on presenting educational content in a gradual and organized manner, which helps the student learn the required skill by improving her visual-spatial perception and then achieving more accurate and efficient performance in this skill. (Ahmed, 2019). Visual-spatial intelligence is the ability to perceive the visual-spatial world and make transformations based on that perception. It also includes the ability to visually imagine and represent ideas of a visual or spatial nature, as well as to identify self-faces. Sensitivity to colors, lines, shapes, spatial depth, and the relationships between these elements, in addition to vision and visual formal reproduction of spatial ideas, visual sensation, the ability to see creatively, and the ability to create and create visual perceptions. In addition, visual-spatial intelligence includes the ability to recognize and use open spaces as well as confined spaces. Visual-spatial intelligence is also considered one of the important and essential mental abilities in learning complex motor skills.

Visual-spatial intelligence is defined as "the ability to perceive visual and spatial information or internal mental images, and includes sensitivity to colors, lines, shapes, space and the relationships between these elements. It includes the ability to visually visualize and represent ideas of a visual or spatial nature, as well as to determine one's own direction." (Abdel Fattah, 2022). Among the sports that rely heavily on this type of intelligence is volleyball, which is one of the team games that requires a high level of skill performance for each of the different playing situations, as players with high levels feel from time to time a strong desire to know their levels and abilities in relation to the game's requirements, and novice players quickly feel the same desire, especially since this allows them to know their levels as well as their rates of progress in the game.

Volleyball is also a mental game that has a special characteristic that distinguishes it from other sports, as it has a fast motor perception with a quick change in playing situations that do not continue at the same pace. Therefore, proper skill performance and good behavior in different playing situations are among the topics required by competitions or matches, and the use of mental abilities for playing situations gives one team the upper hand over the other in winning or losing, as the accuracy of skill performance in volleyball occupies a position in the game that is important in the superiority of competing teams. Volleyball requires high and precise training at the beginning of learning it, so that the student can master the skill well, as technical skills cannot be performed unless he has physical, skill and mental abilities that form a basic axis in learning. Therefore, mental abilities are important in various sports, especially in volleyball, due to its specificity in focusing continuous attention on areas or places of the field during performance, because any error in performing skills leads to loss. Therefore, abilities, especially visual-spatial intelligence, play an important role in many volleyball skills, including the spiking.

Developing visual-spatial intelligence is essential for volleyball training, as the element of surprise and tactical deception dominates the course of the game (Attia , & Sattar , 2022) .This skill is defined as "the player spiking the ball with one hand forcefully by crossing it completely over the vertical level and directing it downward towards the opponent's court, which is usually the final touch in team play.

Therefore, this strike is designed to win a point." (Al-Dulaimi, et al., 2014). This skill also requires ideal timing, accurate spatial awareness, and integrated motor coordination between the eye, the striking arm, and the body as a whole. From the above, the importance of the research lies in using the cube model in the educational units of the volleyball subject to improve mental abilities, especially visual-spatial intelligence and skillful performance of crushing spiking among female students. The breadth of the field of vision and accurate observation are one of the basic components that help in developing skill performance (Subhan , 2015).The objective view of the researchers on the reality of teaching volleyball in the second stage in the College of Physical Education and Sports Sciences at the University is that it is a reality in which the educational methods and approaches that focus on memorization, indoctrination and memorization of information are still applied to female students at the expense of understanding and thinking. This makes female students deal with the information related to the skill that they want to learn superficially, and they find it difficult to learn and master volleyball skills, especially the skill of spiking in volleyball, which is one of the challenges facing female students, especially in light of the need for high visual-motor coordination and the ability to estimate distances and movement in space.Hence, the research problem is represented in the following question: What is the effect of the cube model in developing visual-spatial intelligence and learning the skill of spiking in volleyball for female students?

Research objective

- Identify the effect of the cube model on visual-spatial intelligence and learning the skill of spiking in volleyball for female students.

Research hypotheses

- There were statistically significant differences in the pre- and post-tests between the control and experimental groups in visual-spatial intelligence and the students' volleyball smash skill.
- There were statistically significant differences in the post-tests between the control and experimental groups in visual-spatial intelligence and the students' volleyball smash skill.

Method

Research techniques

The researchers adopted the experimental approach by designing two equivalent groups with pre- and post-measurements. The research community was determined as second-stage female students in the

College of Physical Education and Sports Sciences / University of Baghdad for the academic year (2024-2025) with a number of (150) female students, while a group of female students were excluded with a number of (8) female students, thus the total number of the community was (142) female students. The main research sample was selected randomly with a number of (30) female students and this sample was divided equally into two control and experimental groups, i.e. each group had (15) female students, thus the percentage of the sample was (21.127%). The researchers also chose a pilot sample with a number of (10) female students and a percentage of (7.042%).

Table 1. The homogeneity of the sample was verified in terms of the variables of biological age, height and mass of the research sample .

Variables	Measuring unit	Mean	Std. Deviations	Median	Skewness
Length	Cm	165,1	1,41	165	0.98
Mass	Kg	51	2,01	51	0,51
Age	Year	20	1,56	20	0,74

The skewness coefficient was used as its value indicated that all variables achieve the normal curve because Table (1) shows the skewness coefficient in the normal curve extending between (± 1).

Table 2. Shows the equivalent of the research

Variables	Control group		Experimental group		T value calculated	Type Sig
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
Visual-spatial intelligence/score	14.89	2.65	14.91	2.43	1.67	Non sig
Technical performance/score	2.17	0.82	2.28	0.71	1.49	Non sig
Performance accuracy/score	7.94	1.79	8.52	1.66	0.94	Non sig

To measure visual-spatial intelligence among the research sample members, the researchers adopted the visual-spatial intelligence scale prepared by the researcher (Hassan, 2022) consisting of (10) paragraphs. To extract the apparent validity of the scale, it was presented to (11) experts and specialists through a questionnaire. Especially in the field of volleyball, testing and measurement, and they expressed their approval of the scale by (100%) with some modifications to it, and to verify the stability of the scale, the split-half method was adopted, as the scale paragraphs, which number (10) paragraphs, were divided into two halves and the correlation coefficient was calculated between the scores of the first half, which represents the odd paragraphs, and the scores of the second half, which represents the even paragraphs. The value of the simple correlation coefficient (Pearson) between the scores of the two halves reached (0.84), and since this score indicates half the stability of the scale, the researchers used the (Spearman-Brown) equation to identify the degree of the stability coefficient for the scale as a whole, as its value appeared (0.86), which is a high value indicating the stability of the scale, and the scale was corrected using the correction key according to three alternatives, which are: (always, sometimes, never), according to the scale of degrees (1, 2, 3,) for positive paragraphs and vice versa for negative paragraphs, and thus the highest degree of the scale is (30) degrees and the lowest degree is (10) degrees and the theoretical mean is (20) degrees. (Appendix 1).

To evaluate the technical performance and accuracy of the volleyball spiking skill, standardized tests used by previous researchers were adopted, based on the same sample specifications (Appendix 1). The validity of the technical performance and accuracy tests for the volleyball spiking was extracted, by adopting apparent validity, through preparing a special questionnaire and presenting it to (11) experts and specialists in the field of volleyball, testing and measurement, and they expressed their approval of the tests at a rate of (100%), while the stability coefficient for the technical performance and accuracy tests for the volleyball spiking was extracted by adopting the test and retest method, as the first application of the two tests was on 1/20/2025 on the exploratory experiment sample of (10) female students, and after (7) days the second application of the two tests was on the same sample, i.e. on 1/27/2025, and the researchers used the simple correlation coefficient (Pearson) between the two applications, and the value of the stability coefficient for the technical performance test appeared (0.91) and for accuracy (0.92), which are two high values that indicate the stability of the two tests. As for the objectivity of the technical performance test for the spiking, it was extracted by adopting the grades of two of the three evaluators who conducted By evaluating the technical performance using the simple correlation coefficient (Pearson) between their scores, its value appeared (0.90), which is a high value indicating the objectivity of the test.

The pre-measurement of the visual-spatial intelligence scale and the technical performance and accuracy tests for the volleyball spiking were conducted for the control and experimental groups after implementing two introductory educational units on 1/30/2025. The researchers also conducted the process of equivalence between the two groups based on the results of the pre-measurement.

The Cube Strategy in Teaching: Steps for Using it Using the cube strategy in teaching helps the teacher achieve educational learning objectives, provides appropriate opportunities for students' readiness and attitudes, and helps students think. This is achieved by following the following steps:

- The teacher introduces the lesson using their preferred style and method.
- The teacher presents the lesson using common methods such as scientific demonstration, investigation, direct explanation, or others.
- The teacher forms groups of students according to their perspective and goals, whether homogeneous or heterogeneous. The class can be divided into six groups, each group taking one face, which can be divided into groups, each group taking six faces of the cube.
- Students discuss the information they have learned for each face of the cube.
- Students write down the information they have learned for each face of the cube.

The researchers intervened in the main section of the educational unit for a period of (60) minutes at a rate of (2) educational units per week for a period of application of (4) weeks, and thus the total number of educational units was (8) units and the duration of the educational unit was (90) minutes. The control group applied the educational method followed by the subject teacher, and the educational cube model was applied to the experimental group by dividing the students into groups, each group representing one of the six faces of the cube, so that the groups were arranged according to the levels of readiness and interest of the students from the least complex level to the most complex level, starting from (description, comparison, association, analysis, transformation, and proof), as follows: -

- Description: In this step, the student looks for the question about the characteristics of the subject (spiking skill) and its attributes.
- Comparison: In this step, the student looks for the similarities and differences between the subject (spiking skill) and other things around it (high facing serve (tennis).
- Relation: In this step, the student looks for things that are related to the subject (spiking skill), or make the student think about the subject when it is presented.
- Analysis: In this step, the student looks for the components of the subject (spiking skill), i.e. what does it consist of? (The fine details of the skill).
- Transformation: In this step, the student looks for the uses, function, or benefit of the subject (spiking skill) in volleyball.
- Evidence: In this step, the student employs (spiking skill) in volleyball with support for that:

A. The teacher provides the students with information about the cube and trains them on how to form it and identify the faces of the cube that are consistent with the targeted basic concept.
B. The teacher determines the tasks and explains the nature of the work of each group.
C. The teacher presents the educational unit using one of the common teaching methods such as: discovery, problem solving, or others.
D. The students, according to the faces of the cube, collect and discuss the information that should be included in each face of the cube.
E. The students write the information they have reached in each face of the cube.
F. Each group reads the information they have reached to the members of their group to negotiate and discuss the main ideas among them and organize the group summary.

G. One student from each group reads the ideas and information that their group has reached about the face that they represented from the faces of the cube to the rest of the groups representing the other faces of the cube to cover all aspects of the crushing skill.

One student from each group reads the ideas and information their group has developed about the face they represented on the cube to the other groups representing the other faces of the cube, covering all aspects of the skill of smashing.

- The students are divided into groups.
- Material is presented to stimulate thinking.
- Roles are assigned to team members, such as one student throwing the cube, another asking the question at the top of the cube, a third answering the question, and the final correcting the answer.

After completing the implementation of the educational cube model items, the post-measurement of the visual-spatial intelligence scale and the technical performance and accuracy tests for the volleyball spiking were conducted for the control and experimental groups on 27/2/2025 at ten o'clock in the morning in the indoor sports hall at the College of Physical Education and Sports Sciences - University of Baghdad and in the presence of the assistant work team. The researchers took into account the circumstances and conditions in which the pre-measurement was conducted. The researchers adopted the following statistical methods: (Al-Dulaimi, et al., 2024), to extract the values of the percentage, the arithmetic mean, the standard deviation, the correlation coefficient (Pearson), the (T-test) test for symmetrical samples, and the (T-test) test for independent samples.

Findings

Table 3. Shows the arithmetic means, standard deviations, and the calculated (t) value in the pre-measurement of visual-spatial intelligence, technical performance, and accuracy of the volleyball spiking between the control and experimental groups.

No.	Variables	Control		Experimental		T value calculated	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
1	Visuospatial Intelligence/degree	14.89	2.65	14.91	2.43	1.67	Non sig
2	Technical Performance/ degree	2.17	0.82	2.28	0.71	1.49	Non sig
3	Performance Accuracy/ degree	7.94	1.79	8.52	1.66	0.94	Non sig

The difference is not significant if the calculated value of (t) is > its tabular value of (2.05) at a significance level of (0.05) and under a degree of freedom of (14).

Table 4. Shows the arithmetic means, standard deviations and the calculated value of (t) between the pre- and post-measurements of visual-spatial intelligence and technical performance and accuracy of the spiking hit in volleyball for the control group

No.	Variables	Pre-test		Post-test		T value calculated	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
1	Visuospatial Intelligence/degree	14.89	2.65	21.34	2.19	4.12	Sig
2	Technical Performance/ degree	2.17	0.82	4.72	0.65	3.48	Sig
3	Performance Accuracy/ degree	7.94	1.79	11.96	1.08	3.75	Sig

The difference is significant if the calculated value of (t) is < its tabular value of (2.14) at a significance level of (0.05) and under a degree of freedom of (14).

Table 5. Shows the arithmetic means, standard deviations and the calculated value of (t) between the pre- and post-measurements of visual-spatial intelligence and technical performance and accuracy of the spiking hit with volleyball for the experimental group

No.	Variables	Pre-test		Post-test		T value calculated	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
1	Visuospatial Intelligence/degree	14.91	2.43	25.62	1.23	5.78	Sig
2	Technical Performance/ degree	2.28	0.71	6.81	0.42	4.19	Sig
3	Performance Accuracy/ degree	8.52	1.66	16.43	0.84	4.93	Sig

The difference is significant if the calculated value of (t) is < its tabular value of (2.14) at a significance level of (0.05) and under a degree of freedom of (14).

Table 5. shows the arithmetic means, standard deviations and the calculated value of (t) in the post- measurement of visual-spatial intelligence and technical performance and accuracy for the spiking hit in volleyball between the control and experimental groups

No.	Variables	Control		Experimental		T value calculated	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
1	Visuospatial Intelligence/degree	21.34	2.19	25.62	1.23	5.64	Sig
2	Technical Performance/ degree	4.72	0.65	6.81	0.42	4.29	Sig
3	Performance Accuracy/ degree	11.96	1.08	16.43	0.84	4.87	Sig

The difference is significant if the calculated value of (t) is < its tabular value of (2.05) at a significance level of (0.05) and under a degree of freedom of (28).

Discussion

Through the results presented in Tables (4,5), which show the existence of significant differences between the pre- and post-measurements of the variables of visual-spatial intelligence, technical performance, and accuracy of the volleyball spiking skill, in favor of the post-measurement and the control and experimental groups, the researchers attribute the reason for these differences for the control group to the method followed in the educational units for the members of this group, which relies on verbal explanation and presentation of the practical model (the live model), as this method was distinguished by the fact that the teacher is the one who makes all the decisions related to learning the skill and that the role of the students is to perform according to the model presented to them by the teacher, in addition to correcting the errors that the students make while learning the skill, and this is also the responsibility of the teacher, in addition to the commitment and organization shown by the students of this group in repeating the exercises related to the spiking skill, and this is consistent with what was mentioned in that "the learning process must be organized in a way that guarantees the learner the acquisition of the best performance of the skills to achieve the best achievement, and this is done through exercises that organize the repetition of skills or movements in a favorable manner for the purpose of possessing Special skills and their connection to the feeling of movement." (Al-Dulaimi, 2008). The cube strategy plays a role in creating an atmosphere of fun within the classroom, which leads to searching for information and carrying out activities, in addition to being more effective than the traditional method.

As for the significant differences achieved for the experimental group students between the pre- and post-measurements of the variables of visual-spatial intelligence, technical performance and accuracy of the volleyball spiking skill, in favor of the post-measurement, as shown by the results of (table 5), the researchers attribute the reason for these differences to the experimental group's adoption of the educational cube model, which allowed the students of this group to develop visual-spatial intelligence and learn the spiking skill well by converting the information they obtained into a visual-spatial method based on the sense of sight and according to the six steps that represent this model, and this is consistent with what was indicated in that the cube model is that "model that works to convert the knowledge and information that students study into a visual method or visual method that depends on the sense of sight, and helps students organize the information presented in the lesson through six faces that represent the six faces of the cube." (Moawad, 2024). The researchers attribute this positive result to the fact that this strategy has an organized scientific methodology that helps students acquire a distinct style of analysis and thinking. (Ahmed , & Al-Mousawi 2025) The researchers attribute this positive result to the fact that this strategy has an organized scientific methodology that helps students acquire a distinct style of analysis and thinking. The questions that accompany the cube strategy push students to think and discuss among themselves, which makes the lesson more active.

The results of Table (5) also show that the differences are significant for the variables of visual-spatial intelligence, technical performance and accuracy of the ball spiking skill between the two groups. The control and experimental group in favor of the experimental group. The researchers attribute the reason for these differences to the experimental group's reliance on the cube model, which was based on dividing the students into six groups, thus helping them understand the skill of crushing multiplication from six aspects that represent the faces of the cube, which are (description, comparison, association, analysis, transformation, and proof). Learning in groups helped the students largely in developing their thinking levels, in addition to feeling confident in expressing their own points of view, and in establishing strong social relationships between them. When each student collected the information provided to her from each of the six faces of the cube, she was able to understand the details of the skill of crushing multiplication in a sound and correct manner, which led to learning the skill better. This is consistent with what was mentioned in that the cube model "works to motivate and excite students towards learning and increases their ability to think, and is greatly concerned with making students more effective in research, thinking, solving problems, and acquiring new knowledge." (Abdul Wahab, 2022) Developing visual-spatial intelligence through the cube format, it organizes information about concepts or topics in a visually visible form, making it easier to remember and recall. The cube strategy incorporates higher-level thinking skills. The cube strategy is a simple method of differentiation, by teaching learners about the same topic or skill. It leads to the development of variables, as all sides of the cube contain questions and skills of different equal groups, covering all aspects of the topic. Therefore, the cube strategy is dedicated to enabling students to analyze a specific topic in depth and from different angles and dimensions, preparing them to express their opinions and write about the topic. It also enables students to visually change and move objects in space. Furthermore, those with visual-spatial intelligence are distinguished by their ability to solve problems involving spatial orientation. Learners with visual-spatial intelligence have a mental ability that includes spatial awareness to move objects through space, or their ability to use the four directions to easily locate locations in a new place, or games that require constant changes in direction during play. This fact is confirmed by the fact that a person with visual-spatial intelligence has the ability to accurately perceive the visual world, as well as the relative spatial perception of objects in space and the formation of mental images to use in solving problems (Hussein Kadhim, et al., 2025).

The researchers also believe that the cube model is one of the models that encourages the student, as it arouses in her a greater incentive to learn, because she herself notices what she has reached, and receives reinforcement and feedback. It is distinguished by giving the student the opportunity to actively integrate into the learning process by discussing solutions in its stages of interpretation, expansion, extension and exchange. This is consistent with what was mentioned in that the cube model "is one of the educational models based on organizing knowledge and focuses greatly on the effectiveness of the learner's role in research, thinking, solving problems, discovering knowledge and information and applying them practically, which helps the learner develop higher levels of thinking." (Hamad, 2023). The researchers also attribute the superiority of the experimental group over the control group to the skill exercises that were applied to the experimental group, which led to the development of the student's ability to determine the location and estimate distances, as well as the appropriate repetitions that were appropriate for her educational level and the various educational situations in which the student was placed to develop the required responses according to the motor duty assigned to her, which was reflected in the development of her visual-spatial intelligence, which in turn helped to perceive relationships and build patterns between a group of ideas specific to the skill of crushing, as this skill requires visual-spatial ability in the stages of its learning, in addition to its nature, it is a decision-making skill that requires the student to have a level of thinking and visual-spatial intelligence to enable her to make decisions to act in changing performance situations. The student who has good mental abilities can act and perform the appropriate and correct skill performance according to the educational situation she faces, which requires many methods and models that require the student to use her intelligence and thinking in learning the skill, and this is consistent with what was indicated in that intelligence is "a possibility related to the ability to solve problems and give good performance results during (Mahmoud, 2016), in addition to activating the visual-spatial tools that helped the student practice knowledge processes while learning the skill such as: observation, communication, comparison, clarifying relationships, inference, and classification. This is consistent with what was mentioned in that visual-spatial intelligence is "a system of mental processes that helps the individual read visual shapes and think about them in terms of sensitivity to colors, lines, shapes, and spaces and form an image of things through a receiving device consisting of the eye and the brain." (Abdullah & Talib, 2019) (Saeed, et al., 2019) .

This process is closely related to the intensity and duration of the physical effort, and these changes appear in the form of physiological adaptation, so we call it physical training (Badwi et al., 2023) (Almusawi DS, 2019), the researcher paved the way for the preparation of physical exercises. Preventatively, then incorporate physical exercise (Explosive force with defensive movements during the special preparation period or through exercises related to game skills (Al-Nedawy & Saeed Al-Mousawi, 2022) (Suhad, 2022) , to load the training in terms of the cool-down period or its time, and therefore did not achieve the retention of training adaptations and physical training gains (Shabib & Qassem ,2023). It has proven that the use of training means and equipment has a role Positive in sports training By using a group of muscles in the body, which in turn leads to the development of strength, because these muscles have a major role in performing skills (Alyaa & Suhad. 2022) (Abdul Kareem & Saeed, 2024)

Students must deal with constant changes in their external and internal environments, requiring them to be attentive and controlful in more than one direction (Youssef ,& Abdul-Ilah 2017). We also note that any athletic skill requires repeated training and practice, in addition to visual-spatial intelligence exercises, which leads to successful performance. (Mohammed, 2020).

Conclusions

- The cube strategy has proven effective, within the limits of the current study, in developing synthetic thinking.
- The cube strategy provides students with breadth and flexibility in thinking.
- This strategy takes into account and develops students' mental abilities, helping them think, which leads to increased academic achievement.
- Using the cube strategy for the topics they studied made them more engaged and eager to learn.
- Using the cube strategy for the topics they studied made them more engaged and eager to learn.

Recommendations

- It is preferable to use the cube model to develop visual-spatial intelligence and learn the skill of spiking the volleyball, in addition to the necessity of paying attention to the educational units for volleyball skills including the cube model as a guide to apply educational units for other subjects.
- Emphasizing the use of the cube model to cover all other types of volleyball skills for both genders, with the holding of development courses for volleyball teachers and physical education teachers on how to use modern educational models in general and the cube model in particular in learning sports skills in general and volleyball skills in particular.
- It is better to conduct other studies and research targeting the use of the cube model in volleyball and other sports and other mental abilities for both genders.

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References

Ahmed, S. A. S. A. (2019). The effectiveness of the cube strategy in teaching social studies on developing some historical imagination skills and the tendency towards teamwork among primary school students, Scientific Journal, Faculty of Education, Assiut University, Volume 35, Issue 8.

Al-Dulaimi, N.A. Z. (2002). The effect of the intervention in training methods on learning the skills of the spiking serve and the spiking hit in volleyball, PhD thesis, University of Baghdad, College of Physical Education.

Al-Dulaimi, N. A. Z. (2008). Basics of motor learning, 1st ed., Dar Al-Diaa for Printing and Design, Najaf Al-Ashraf.

Al-Dulaimi, N. A. Z., et. al. (2014). The effect of the intervention of exercises specific to musical rhythm in developing motor coordination and learning the technical stages of the spiking hit in volleyball for female students, Journal of Physical Education Sciences, Volume 7, Issue 3.

Al-Dulaimi, N. A. Z., et. al. (2024). The effect of the cognitive contradiction strategy on the trend towards learning and acquiring the skill of spiking the volleyball for students, Journal of Studies and Researches 2024 No.4 ,34Vol. of Sport Education.

Hassan, M.O. (2022). Visual-spatial intelligence and its relationship to visual-motor coordination and the accuracy of the skill of sending from the bottom and the top facing in volleyball for students, Journal of Sports Sciences, Volume 4, Issue 53.

Hamad, A.A. M. (2023). Using cube strategies in cognitive achievement and learning some offensive skills in basketball for female students of the Faculty of Physical Education - Mansoura University, Scientific Journal of Physical Education and Sports Sciences, Issue 100, Part 3

Al-Janabi , S. K. S. (2018). The effect of cube strategy on achievement and formal thinking among first-year middle school students in mathematics, Master's thesis, University of Baghdad.

Abdullah, F. M. and Talib, A. K. (2019). Visual-spatial intelligence and its impact on developing planning and color skills among students of the Institute of Fine Arts, Journal of the Faculty of Basic Education, Volume 25, Issue 103.

Abdel Fattah, F. E. (2022). The relationship between mathematical/logical intelligence and visual/spatial intelligence among children in the first grade of primary school, Journal of Educational and Social Studies, Faculty of Education, Helwan University, Volume 28, Issue 1, Part 2.

Abdul Wahab, M. F. (2022). The effectiveness of the cube strategy in developing cognitive achievement and the level of performance of some basic skills in the physical education lesson, Master's thesis, Faculty of Physical Education for Girls, Helwan University.

Mahmoud, B. A. (2016). Bodily-kinesthetic intelligence and its relationship to self-confidence among karate players, Master's thesis, Faculty of Physical Education and Sports Sciences, Mohamed Boudiaf University in M'Sila.

Moawad, N. Z. M. (2024). The effectiveness of the cube strategy on learning some basic skills in basketball for the second cycle of basic education, Journal of Comprehensive Education Research, Volume 20, Issue 37.

Fakhri , H. K. and Al-Shammari, Z. H. A. (2015). The effectiveness of using the cube strategy in developing synthetic thinking among fifth-grade literary female students in geography, Journal of the College of Basic Education for Educational and Human Sciences, University of Babylon, Issue 19.

Dick, A. , Ann, K. (2010). Teaching for student learning Becoming an Accomplished teacher. by Routiede, Madison Avenye , new York . NY.

Al-Nedawy , R. I. A. ., & Saeed Al-Mousawi , S. Q. (2022) . Effect of a training program on the development of physical abilities in football goalkeepers. SPORT TK-Revista EuroAmericana de Ciencias del Deporte, vol.11, p.36, https://doi.org/10.6018/sportk.522961

Alyaa ,A. , Suhad, Q. (2022). The effect of Cross Fit exercises on the development of explosive power, speed of Kinesthetic response , and performance accuracy of the skill of crush beating for volleyball players. Modern Sport, 21(2), 0010 https://doi.org/10.54702/msj.2022.21.2.0010

Badwi, S. H. , Saeed, A S. Q. , & Mousa, J. S.(2023) . Analysis of the amount of lost fluids, some blood components and mineral salts in volleyball under hot weather conditions. SPORT TK-Revista EuroAmericana de Ciencias del Deporte, vol.12, p. 36 , https://doi.org/10.6018/sportk.577361

Saeed, S. Q., Khalifa, M. F., & Noaman, M. H. (2019). Screening of Obesity, Blood Pressure and Blood Glucose among Female Students Athletes at the College of Physical Education and Sport Sciences in the University of Baghdad. Indian Journal of Public Health Research & Development, 10(6).

Almusawi DS. (2019). Effect of Battle Ropes Training in Some Components of Health Fitness and Vision of the Body Image of Women Aged (30-35) Years. Indian Journal of Public Health Research and Development , 10:2019. https://ijphrd.com/issues.html

Shabib, H. B . Qassem S. Al-mousawi Suhad . (2023). The effect of the two top calming strategies (straight-fixed) for the development of special strength and some functional abilities of volleyball. Wasit Journal Of Sports Sciences, 27–44, https://doi.org/10.31185/wjoss.298

Suhad, Q. Al. (2022). The effect of crossfit training in a stylistic, unified and multiple direction to develop some physical and functional abilities of young volleyball players . Journal of Sport Science, vol. 14, no. 53, pp. 185-96, https://pessj.uodiyala.edu.iq/index.php/1/article/view/1009

Hussein Kadhim, F. A., Hussein Farhan, A., Husnl Tahseen, T., Al-Mousawi, S. Q. S., & Radhi Raheem, H. (2025). El efecto de la estrategia de nominación de ideas sobre la atención dividida y selectiva y la realización de algunas habilidades de voleibol. Retos, 65, 293–306. https://doi.org/10.47197/retos.v65.111346

Abdul Kareem, Z., & Saeed, S. Q. (2024). The effect of hanging rope exercises on developing some physical and motor abilities and the accuracy of performing the Overwhelming beating for young volleyball players. Wasit Journal of Sports Sciences, 20(3), 56-72. https://doi.org/10.31185/wjoss.532.

Subhan , H. D. A. H. (2015). Visual perception and its relationship to the accuracy of performing the diagonal and straight high smash skill in youth volleyball. Journal of Physical Education, 27(4), 91-105.

Youssef , A., Abdul-Ilah, M. (2017). The effect of focusing attention on learning the volleyball smash skill among students of the College of Physical Education and Sports Sciences, University of Baghdad. Journal of Physical Education, 29(1), 48-65.

Ahmed , S. R., & Al-Mousawi , S. Q. (2025). Training with varied methods and its effect on the performance of some functional physical capabilities of young volleyball players. Retos, 66, 1049–1060. https://doi.org/10.47197/retos.v66.113884

Attia , W., Sattar , K. (2022). The effect of exercises using a designed device on the accuracy of visual perception in the volleyball smash skill for youth players. Journal of Physical Education, 34(4), 567-581.

Mohammed, L. D. (2020). The effect of motor response and motor anticipation exercises according to the representational systems (auditory-visual-kinesthetic) on the performance level of some basic volleyball skills. Journal of Physical Education, 32(2), 120-129.

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Appendix

Appendix 1. Shows an educational unit for the cube model to learn the skill of spiking the volleyball.
Group: Experimental
Number: (15) students
Educational goal: Training students to cooperate and order
Main section time:(60) minutes
Educational goal: Developing visual-spatial intelligence + learning the skill of spiking the volleyball

Section		Time	Vocabulary details Unit Educational	Notes
Main Section 60 minutes	Educa-tional part	20 minute	The teacher explains the skill of crushing and clarifies the parts of the skill and its importance. Explains the technical performance of the skill with the display of its illustrations (educational poster). The skill is presented by the teacher and then presented by a model (live model) several times.	Emphasizing students' attention to the process of explaining and demonstrating the skill.
	Practical part 40 minutes	5 minute	The students stand in one half of the court on the side lines in two groups facing each other and perform the entire skill without a ball.	The subject teacher monitors the students' application of the skill.
		5 minute	The students are divided into 4 groups, where each group performs the spiking skill from a sitting position on their knees against a wall, using a ball thrown by a fellow student from a distance of 2 meters.	Emphasizing the movement of the striking hand and the movement of the arms in the performance
		6 minute	The students are divided into 4 groups, where each group performs the ball spiking stage from a standing position, using a ball thrown by a fellow student from a distance of 2 meters against the wall.	Emphasizing the movement of the arms and trunk in the performance
		6 minute	The students are divided into 4 groups, where each group performs the ball spiking stage from a standing position on a platform placed 3 meters away, while trying to direct the ball to the square drawn on the wall.	Emphasizing the movement of the body as a whole in the performance
		6 minute	The students are divided into 4 groups, where each group performs the stage of spiking the ball from a flying position from a platform placed 3 meters away, while trying to direct the ball to the square drawn on the wall.	Emphasis on the movement of the hands and arms in the performance.
		7 minute	The students are divided into 4 groups, where each group performs a spiking from a ball thrown to them by a partner and directs the ball to the three boxes located 3 meters away.	Emphasis on the movement of the arms and accuracy in the performance.