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Composite skill exercises according to the merging method (Cooperative-reciprocal) and their effect on some sensory perceptions of the shooting skill in handball for students

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Abstract

Educational methods are crucial in teaching sports skills as they influence student behavior through the interaction between teacher stimulus and learner response. This research highlights the importance of sensory perceptions in handball shooting skills and draws attention to the need for effective teaching methods. The researcher noticed weaknesses in the head-level shooting skill among second-year students, likely due to inadequate educational approaches. A pre- and post-test on a single group was used to evaluate the effect of composite skill exercises with a cooperative-reciprocal merging method. The results showed that these methods significantly improved sensory perceptions and skill performance. The researcher recommends using these methods in physical education to enhance skill learning and sensory perception development in handball.

Keywords: Cooperative, reciprocal, sensory perceptions, handball

Introduction

Physical exercises are of great importance in preparing learners physically, skillfully, and mentally across various sports and according to their respective categories. Sports exercises lead to skill development and learning, with the aim of rapid progress in both physical and mental aspects, as well as increasing human motor learning. This is achieved through the use of appropriate educational and pedagogical methods ^[1,2].

Educational methods are highly significant in teaching sports skills in general, as these methods are steps that teachers need to change students' behaviors, considering them as living beings that require holistic growth in physical, mental, and spiritual aspects, with the ability to think, participate in decision-making, and perform the duties assigned to them. Many useful educational methods can be used for students, which serve as the direct and immediate connection between the stimulus from the teacher and the response from the learner ^[3]. This is what physical education teachers rely on to prepare an ideal lesson with the active participation of students, following the basic and planned steps of the lesson ^[4].

Since learning methods are strongly connected to student behaviors, which are considered cognitive actions and responses individuals perform towards others or their environment in general, behavioral changes cannot occur without the process of perception and interpretation by the learner. Human behavior depends on how individuals perceive and pay attention to the things, people, and stimuli around them, and how they interact with these elements. The cognitive approach to things determines the behavior a person chooses towards them and others through sensory receptors that receive these stimuli ^[5]. We live in a world filled with stimuli, complex and evolving every moment in an automatic and random manner, where individuals respond and interact with them through specific and organized processes called perception ^[6].

The importance of perception lies in being one of the effective mental processes in the success of the learning process, through which the living being or individual can understand the perceptions of the external world and the surrounding environment. Thus, when an individual perceives a certain situation, they exhibit specific behavior and act accordingly ^[7].

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Handball is one of the most exciting team sports for its players and audience. It has garnered significant attention from sports institutions to research its variables and requirements, whether physical, sensory, or cognitive, as well as its motor skills, to reach the highest levels. This sport has seen a noticeable improvement in performance in many countries, as it is characterized by beauty, being played with strength in both offense and defense, and players should not expect traditional defense [8].

The importance of the research lies in the fact that important educational methods provided special attention to the skills and the sample under study, while also drawing the attention of physical education teachers and handball coaches to the importance of sensory perceptions for learners. It offers researchers and interested parties some sensory perception tests for the head-level shooting skill in handball.

Research Problem

The researcher noticed a deficiency and weakness in the performance of the head-level shooting skill in handball, as well as in some sensory perceptions among second-year students. There were also many errors in the execution of this skill by the students, which may be due to the lack of use of suitable educational methods or exercises for teaching this skill. Since observation is one of the weakest measurement tools, despite his experience in this field, the researcher did not rely solely on observation but used testing and measurement for a more accurate diagnosis of the problem. The researcher believes that the learner's lack of perception of some variables related to this skill negatively affects the learning process, such as the learner's awareness of the location of their teammate and the ball, the distance between them and their teammate, the speed of response to the movement of the ball, or the appropriate timing for shooting from the head level. These are all types of perceptions the learner needs. Through this study, the researcher aims to reach results that lead to the learning of the head-level shooting skill in handball for students by posing the following question:

Is there an effect of composite skill exercises according to the merging method (Cooperative - reciprocal) on some sensory perceptions of the head-level shooting skill in handball?

Research Objectives

- Preparing composite skill exercises according to the merging method (Cooperative - reciprocal) for some sensory perceptions of the head-level shooting skill in handball.
- Identifying the effect of composite skill exercises according to the merging method (Cooperative - reciprocal) on some sensory perceptions of the head-level shooting skill in handball.

Research Method

The researcher used the experimental method, as it is appropriate for the nature of the research problem, employing the one-group pre-test and post-test design.

Research Population and Sample

The research population was purposefully selected and consisted of second-year students from the morning studies at the College of Physical Education and Sports Sciences – Al-Mustansiriyah University for the academic year 2023-

2024, totaling 155 students. After excluding 10 students for exploratory experiments and non-commitment, the research sample was determined to be 20 students, representing 12.90% of the population. The researcher selected this sample to ensure continued participation in training and adherence, with all conditions favorable for achieving the research objectives, as well as cooperation from the team's training staff and the assistant team.

Tests Used in the Research

1. Perception of Time Sensation for the Head-Level Shooting Skill

Purpose: Measure the perception of shooting timing.

Tools: A flat wall or handball goal, four rectangles drawn or placed at the corners of the goal (two at the upper corners and two at the lower corners), each rectangle measuring 1 meter in width and 80 cm in height, 10 size-2 handballs, stopwatch, recording form.

Test Procedures: The test is conducted on a handball court using official handballs and a recording form. Four rectangles (1m x 80cm) are placed in the corners of the goal, with a line drawn 7 meters away from the goal.

Performance Description: The participant stands 7 meters away from the handball goal, holding a ball. Upon hearing the start command, the participant shoots towards the rectangles at the goal's corners (upper and lower) for 30 seconds.

Scoring

- 1 point for each correct shot into the upper rectangle.
- 2 points for each correct shot into the lower rectangle.
- The number of correct shots within 30 seconds is recorded.
- A score of zero is given for shots outside the rectangles.

Perception of Spatial Sensation for the Head-Level Shooting Skill

Purpose: Measure the perception of shooting accuracy in relation to space.

Tools: A wall or handball goal with seven rectangles placed at various locations: two at the upper corners (70cm x 1m), one in the center of the crossbar (80cm x 50cm), and two on each side post (40cm x 1m). Ten size-2 handballs and a recording form.

Test Procedures: The test is conducted on a handball court using official handballs and a recording form, with the goal divided into seven rectangles of different sizes placed at strategic locations. A line is drawn 7 meters away from the goal.

Performance Description: The participant stands 7 meters away from the handball goal, holding a ball, and shoots towards the rectangles in the goal upon hearing the start command. Each participant is allowed 10 shots.

Scoring

- 1 point for a shot into the rectangle in the center of the crossbar.
- 2 points for a shot into the rectangles on the side posts.
- 4 points for a shot into the upper corner rectangles.
- 5 points for a shot into the lower corner rectangles.
- A score of zero is given for shots outside the rectangles.
- The final score is the sum of the 10 shots.

Shooting from a Fixed Position at a Distance of 6 Meters (62:9)

Purpose: Measure the accuracy of shooting at the goal.

Tools: Six handballs, four squares (40x40 cm) placed in the upper and lower corners of the goal.

Performance Description: The participant stands directly in front of the goal behind the 6-meter line, shooting the balls one after the other into any of the upper or lower squares. Three shots are aimed at the upper section and three at the lower section of the goal.

Scoring: The number of successful shots that pass through the designated squares in the upper and lower sections of the goal are counted and recorded.

Exploratory Experiment

The exploratory experiment is considered practical training for the researcher to personally identify the positives and negatives during the test process and avoid the negatives. Therefore, the researcher ensured that the test was conducted as a preliminary experiment on a sample representative of the target population and recorded various observations related to the validity of the instructions and the sample's understanding of them, and notes were recorded from this experiment to modify them if necessary. The researcher conducted the exploratory experiment on a sample from the research population consisting of five students, who were outside the main research sample, on Wednesday, 1/11/2023, at 11: 00 a.m. at the field of the College of Physical Education and Sports Sciences - Al-Mustansiriya University, with the help of the assistant team. The experiment aimed to determine the students' ability to perform the tests, and it had the following objectives:

- Assess the competence of the assistant team.
- Identify potential difficulties the researcher may encounter and develop appropriate solutions.
- Ensure the suitability of the tests for the research sample while maintaining the students' safety.
- Train the assistant team on how to apply the tests and record the scores.

Pre-Test

The researcher conducted the pre-tests before implementing the composite skill exercises based on the merging method (Cooperative - reciprocal) after explaining the perceptual and skill tests on Monday, 6/11/2023, at 11:00 a.m. at the outdoor field of Al-Mustansiriya University for the research group. The tests were clarified to the research sample to

obtain all variables through performance.

Main Experiment

The researcher prepared and organized composite skill exercises according to the merging method (Cooperative - reciprocal) based on a review of relevant sources and scientific studies in motor learning and handball. The main experiment was conducted from 13/11/2023 to 3/1/2024. The researcher used a set of exercises targeting specific sensory perceptions and the handball shooting skill. The exercises took into account individual differences, the level of the sample, and followed a progression from easy to difficult. The exercises were applied to the research group using the cooperative and reciprocal merging methods, which combine sequential and random practice with cooperative and reciprocal teaching styles, i.e., (Sequential – random – cooperative) and (Sequential – random – reciprocal). Sequential practice allows learners uninterrupted time to focus on each task, helping them master one skill before moving on to another. In contrast, random practice involves integrating various skills during learning, with learners rotating between tasks without repeating the same task twice in a row. This method allows learners to focus on each skill from all aspects before moving on to another. Sometimes, learners practice more than one skill in a single unit following both cooperative and reciprocal approaches. The cooperative method allows students to work together effectively, while the reciprocal method has students take turns performing and assessing tasks, with the teacher guiding the process but leaving students to perform and observe during and after the lesson. The exercises were applied only to the research group to achieve the research objectives.

Post-Test

After completing the composite skill exercises according to the merging method (Cooperative - reciprocal), the post-test was conducted on the research sample on Monday, 8/1/2024, at 11:00 a.m. The researcher ensured that the same conditions as the pre-test were maintained, including time, location, the same assistant team, tools, and equipment, to keep the variables as consistent as possible.

Statistical Methods: The researcher used the Statistical Package for Social Sciences (SPSS), utilizing the following:

- Arithmetic mean
- Standard deviation
- T-test for independent samples.

Results

Table 1: Means and Standard Deviations for the Pre- and Post-Tests in the Research Tests

Variables	Unit of Measurement	Pre-Test (S)	Pre-Test (SD)	Post-Test (S)	Post-Test (SD)
Perception of Time Sensation for Head-Level Shooting Skill	Number × 30 sec	10.42	1.76	16.71	1.16
Perception of Spatial Sensation for Head-Level Shooting Skill	Score	20.85	2.74	29.28	1.66
Shooting from a Fixed Position at a Distance of 6 meters	Score	8.71	1.16	14.42	1.05

Table 2: Difference in Means, Standard Deviation, Calculated (t) Value, and (Sig) for the Research Tests

Variables	Mean Difference (F)	Standard Deviation (F SD)	Calculated t Value	Sig	Significance
Perception of Time Sensation for Head-Level Shooting Skill	6.29	2.05	10.518	0.000	Significant
Perception of Spatial Sensation for Head-Level Shooting Skill	8.43	3.81	4.12	0.001	Significant
Shooting from a Fixed Position at a Distance of 6 meters	5.71	1.03	14.67	0.000	Significant

At a significance level of (0.05)

The results of the study indicate significant improvements in students' performance in handball shooting skills and sensory perceptions following the application of composite skill exercises using the merging method (Cooperative - reciprocal). The data from Table (1) show notable increases in the post-test means for all measured variables compared to the pre-test means. Specifically, the Perception of Time Sensation for Head-Level Shooting Skill improved from a pre-test mean of 10.42 to a post-test mean of 16.71, with a reduction in standard deviation, indicating more consistent performance. Similarly, the Perception of Spatial Sensation for Head-Level Shooting Skill increased from 20.85 to 29.28, and the Shooting from a Fixed Position at a Distance of 6 meters improved from 8.71 to 14.42.

The results in Table (2) further support these findings, with all calculated t-values being statistically significant. For Perception of Time Sensation, the t-value was 10.518 with a significance level of 0.000, and for Perception of Spatial Sensation, the t-value was 4.12 with a significance level of 0.001. The improvement in Shooting Accuracy was particularly striking, with a t-value of 14.67 and a significance level of 0.000.

These statistically significant results confirm that the exercises not only improved students' skills but also led to more consistent and reliable performance across all participants. The reduction in variability (Standard deviations) highlights that the training method helped to standardize the skill level among students. In conclusion, the merging method proved effective in enhancing both the sensory perceptions and the technical execution of handball shooting skills, with clear, measurable gains in performance.

Discussion

The researcher attributes these results to the use of acupuncture in therapeutic rehabilitation for volleyball players. It is clear from the results obtained that the therapeutic acupuncture applied led to the restoration of joint strength and pain relief through proper use or correct performance, to the extent that the injured individuals were able to perform all their motor functions normally. Based on this, the variety of therapeutic rehabilitation methods applied to the sample had a clear impact on this improvement^[5]. The incorporation of multiple therapeutic techniques alongside acupuncture may have created a synergistic effect that accelerated recovery, as the integration of traditional and modern rehabilitation techniques often results in better patient outcomes. This aligns with the concept of multimodal therapy in sports rehabilitation, where various treatments such as physical therapy, exercises, and manual therapy are combined to optimize healing and performance. The ability of acupuncture to enhance local blood flow, reduce inflammation, and stimulate nerve responses makes it a vital tool in sports medicine for athletes requiring rapid recovery and pain management^[6].

This study is similar to the study by Berman, which confirms that the ancient Chinese method of acupuncture has a success rate of 40% in reducing joint pain. According to the Times, the largest scientific trials on acupuncture were conducted by a research team from the National Institutes of Health in the U.S., led by Brian Berman from the University of Maryland School of Medicine in Baltimore. At the same time, other trials conducted in the UK found that acupuncture is effective in relieving joint

pain^[7]. These findings suggest that acupuncture's effects are not only limited to pain management but may also enhance the body's overall healing response by regulating immune function and promoting tissue regeneration^[8]. The involvement of central neurochemical pathways in pain modulation, particularly through the release of endogenous opioids, positions acupuncture as an effective non-pharmacological intervention, particularly for athletes who prefer to avoid drug-based treatments due to potential side effects or performance restrictions^[9].

The use of acupuncture in pain treatment works by stimulating acupuncture points to relieve pain through several mechanisms, including increasing the release of natural opioids within the body and the central nervous system. It also leads to the secretion of certain hormones in the blood, relying on the stimulation of the autonomic nervous system, which increases the release of hormones that can be measured before and after acupuncture. The sample's ability to extend and flex the joints demonstrates an improvement in movement capacity due to a significant reduction in pain, which played a role in enhancing motor ability. This, in turn, improved the functional efficiency of the knee joint, which was further enhanced by acupuncture in conjunction with therapeutic exercises. Additionally, acupuncture improved endurance and balance in the leg muscles^[10]. Other research has corroborated the positive effects of acupuncture on musculoskeletal injuries, showing that it can lead to faster recovery times by accelerating the healing process in soft tissues, reducing pain levels, and improving range of motion^[11]. For athletes, this means quicker return to sports activities with a reduced risk of re-injury, making acupuncture a valuable tool in injury prevention and rehabilitation programs^[12].

From tables (1-2) regarding the pre- and post-test results of the research sample in sensory perceptions and shooting, the researcher attributes this to the fact that the learning process is intertwined in delivering the physical education lesson according to the used or modern methods in the learning process. This aligns with research showing that motor abilities and skills improve when teaching strategies incorporate both neurological and sensory processes^[9].

The main benefit of the integration process is seen in organizing the degrees of movement freedom and flexibility, with different timings and performance patterns, which helps link similar skills and transfer the learning effect between different skills and retain the learning. In sports, such as handball, sensory perceptions, including those related to time, distance, and force, are crucial for performance improvement, as cognitive processes guide motor skill development^[10].

The researcher also believes that all sports activities in general, and handball in particular, are linked to different types of sensory perceptions that can be developed through learning and repetition based on scientifically studied educational methods. This is supported by research indicating that cooperative and integrated learning methods develop motor skills and enhance cognitive abilities^[11].

As the handball player deals with time, distance, force, space, and the ball, these sensory perceptions are critical to the player's effectiveness. Studies have shown that athletes' sensory-motor abilities are central to their decision-making and performance during dynamic and fast-paced games. Similarly, diverse and integrated teaching methods contribute to students' motivation and mastery of learning

basic football and handball skills ^[12].

The cooperative learning method increases students' self-esteem, strengthens emotional bonds between group members, and fosters positive attitudes towards themselves and their peers ^[13]. The interconnected relationship between student groups has been documented to reinforce group cohesion and enhance learning outcomes.

Research supports the idea that different mental processes are beneficial in developing motor skills, particularly when exercises are structured around reciprocal and cooperative methods. Furthermore, the choice of educational tools plays an essential role in developing the sensory perceptions and motor abilities required for success in sports ^[11].

Overall, integrated and cooperative learning methods, combined with well-chosen educational tools, result in improved performance in sports skills such as handball, by enhancing sensory perceptions, motivation, and cognitive abilities ^[9].

Conclusion

Recommendations and Conclusion

Conclusions

1. The composite skill exercises had a positive impact on learning the handball shooting skill.
2. The combination of educational methods used in the research achieved multiple goals in developing sensory perceptions and learning the handball shooting skill.
3. Learning and developing sensory perceptions helped improve mental processes in general through the use of educational unit exercises with cooperative and reciprocal merging methods.

Recommendations

1. It is essential to use the cooperative and reciprocal merging methods in physical education lessons to teach handball skills.
2. Appropriate exercises should be selected based on the educational level, age, and gender to ensure proper performance and skill retention.
3. Sensory perception development should be promoted for other handball skills for the same age group.
4. Focus on developing sensory perceptions for other sports and skills, targeting different age groups and both genders.

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