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Cognitive efficiency exercises and their impact on learning some ball skills for rhythmic gymnastics

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Abstract
The study aimed to build a scale and exercises for the cognitive efficiency of female students of the College of Physical Education and Sports Sciences to learn some football skills. The researcher used the experimental approach by designing the experimental and control groups. Week for a period of 12 weeks, and the exercises were carried out during the main part of 45 minutes, and the experimental group showed superiority over the control group in the skills researched. It recommended the use of cognitive efficiency exercises in rhythmic gymnastics with different tools.

Keywords: Cognitive efficiency, rhythmic gymnastics ball skills

1. Introduction
As a result of scientific progress in studies and research specialized in learning, it has become one of the basic requirements for lessons to invest time and effort in accelerating the learning process. And the speed of their learning of the skill, and the various exercises lie in moving the students from a state of stagnation to a state of flexibility, and those concerned in the field of learning point out that the process of tackling For information that represents an organized and harmonious series of mental activities starting from sensation and passing through perception, attention and other mental processes.
This is considered the cornerstone and pavement for learning various gymnastic skills that require special awareness of motor performance. When performing any sports movement, especially rhythmic, it is wise to make the learning environment suitable for cognitive competence and direct it in learning some ball skills in rhythmic gymnastics (ball), developing skills and preparing for work afterwards. Chains of these skills and if the student performs a skill correctly through physical and mental compatibility and not neglecting any aspect It would be easy for her to perform different chains or other skills with different tools.
The studies of cognitive abilities are important because they are considered one of the necessary purposes for the educational entrance, and they are important for students to learn some simple and complex rhythmic gymnastics ball skills that need the nervous system to give instructions to the body's systems. Hence the importance of research on preparing a scale and exercises for cognitive efficiency to study its impact on the development of some ball skills for rhythmic gymnastics.

1.1 Research problem
Since the researcher works as a teacher of rhythmic gymnastics, she noticed that there are no exercises linking the cognitive (mental) side with the physical (skillful) side, especially in rhythmic gymnastics (the ball), which develops the level of students and makes learning faster and better by linking the mental and physical side, so the researcher prepared a scale and exercises of cognitive efficiency and studied its effectiveness on some ball skills in rhythmic gymnastics.

1.2 Research aims
1. Constructing a measure of the cognitive efficiency of the students of the second stage, College of Physical Education and Sports Sciences, Al-Mustansiriya University.
2. Preparing exercises with the cognitive efficiency of some ball skills in rhythmic gymnastics for the research sample.

3. Identifying the difference between the results of the pre and post-tests of the control and experimental groups in cognitive competency exercises with some ball skills in rhythmic gymnastics for the research sample.

1.3 Research hypotheses
1- There are statistically significant differences between the pre and posttests of the control and experimental groups in the scale and exercises of cognitive efficiency of the students of the second stage of the College of Physical Education and Sports Sciences, Al-Mustansiriya University.

1.4 Research areas
The human field: A sample of female students in the second stage in the College of Physical Education and Sports Sciences at the University of Baghdad and Al-Mustansiriya for the academic year 2022-2023.
Time range: The period from 1-29-2023 to 5-14-2023.2-5-1
The spatial field: The indoor gymnastics hall for girls in the College of Physical Education and Sports Sciences at my university (Baghdad, Al-Mustansiriya).

1.5 Definition of Terms
Cognitive competence: These are primary abilities that depend on motor information that is transmitted through the nervous system with its sensory, peripheral, and internal receptors of the central nervous system to interpret it, then issue a set of motor reactions, and then implement them through the nervous and peripheral systems. (Amin Anwar and Osama Kamel Ratib: 1982. p. 16) [1].

2. Research methodology and field procedures
2.1 Research Methodology
The researcher used the experimental approach by designing the experimental and control groups with a pre and posttest.

2.2 The research community and its sample
The research community was determined by female students of the second stage in the College of Physical Education and Sports Sciences in the universities (Baghdad and Al-Mustansiriya) for the morning study for the academic year 2022-2023, whose number is 125, divided into (100) students to build a measure of cognitive competence from the University of Baghdad and (20) students. From Al-Mustansiriya University for the purpose of conducting the main experiment (10) control and (10) experimental, while the exploratory experiment is (5) female students from Al-Mustansiriya University.
The researcher took the element of homogeneity among the sample, as they were all of one sex and one age group, and were close in physical measurements in terms of (height, age, and weight), thus achieving the condition of homogeneity.

2.3 Means of collecting information, devices and tools
Foreign and Arabic references and sources - personal interviews - the assistant work team - a personal computer - a measuring tape (5) m long, metal number (1) - balls - a stopwatch - indicators - hp
A plastic table measuring (80 by 80) cm - a plastic stick 2 meters long - a rug - a floor ladder.

3. Field research procedures
3.1 Steps for building a scale of cognitive competence
After looking at Arab and foreign studies and literature that dealt with issues of cognitive competence and personal interviews with specialists and experts in the field of motor learning and psychological tests and measures, the researcher did not find a scale that fits the environment and age under study, so a scale of competence was built cognitive competence.

3.2 Discriminatory ability
1. Determine the two extreme groups with a ratio of (27%) of the higher scores and (27%) of the lower scores of the questionnaires, because this ratio achieves two groups with the maximum possible size and distinction, as the sample in each group reached (27) students, to identify the discriminatory ability For each paragraph of the cognitive competency test by adopting the t-test of differences (t) for two independent samples using the statistical bag for social sciences SPSS to measure the differences between the scores of the upper group and the lower group for each of the test paragraphs.
2. Comparing the calculated value of (t) with the value of (Sig) and it turns out that all the paragraphs are distinct because the value of (t) is greater than the value of (Sig) under the level of significance (0.05) and as shown in Table (1).

Schedule 1: Shows the discriminatory ability of the cognitive competency test items

Table 1: Show the statistical significance, degree sig, the calculated value t, lower group, senior group and test number

Statistical significance	Degree Sig	The calculated value t	Lower group		Senior group		Test number
			ع	سَ	ع	سَ	
characteristic	0.000	22.946	0.320	1.11	0.320	3.11	1
characteristic	0.000	11.992	0.643	2.48	0.480	4.33	2
characteristic	0.000	16.530	0.465	1.70	0.641	4.22	3
characteristic	0.000	15.278	0.616	2.07	0.577	4.56	4
characteristic	0.000	13.850	0.506	1.56	0.572	3.59	5
characteristic	0.000	16.750	0.480	1.67	0.602	4.15	6
characteristic	0.000	11.891	0.483	2.81	0.501	4.41	7
characteristic	0.000	24.537	0.192	1.96	0.447	4.26	8
characteristic	0.000	13.770	0.609	2.30	0.492	4.37	9
characteristic	0.000	21.544	0.362	1.85	0.465	4.30	10
Characteristic	0.000	18.190	0.465	1.70	0.506	4.11	11

Counted, internal consistency was made to correlate the paragraph score with the total score of the scale, as shown in Table (2).

Schedule 2: It shows the internal consistency coefficient of the correlation of the paragraph score with the total score of the cognitive aptitude test

Table 2: Show the statistical significance of sign, person and it's test number

Statistical significance	Sig	Person	Test number
Moral	0.000	0.435**	1
Moral	0.000	0.355**	2
Moral	0.000	0.384**	3
Moral	0.000	0.347**	4
Moral	0.000	0.357**	5
Moral	0.006	0.210*	6
Moral	0.001	0.295**	7
Moral	0.000	0.568**	8
Moral	0.000	0.419**	9
Moral	0.000	0.343**	10
Moral	0.000	0.454**	11

After that, the fields were identified, and the researcher set tests for each field, and one test was taken for each of the fields, according to the agreement of the experts and the relative importance, and the scale was calculated according to the tests for each test, the highest score (10) and the lowest score (1).
The researcher conducted the scientific foundations of the scale, which are honesty, reliability and objectivity

3.2 Characterization of cognitive competency tests

Test name: Imitation test
The aim of the test: Performing the skill correctly and identifying the working parts
Tools: Ground rug, legal person.

Description of the performance
Describes the tester in the arena and asks him to imitate the skill shown on the laptop and the skill is among the ball skills in rhythmic gymnastics.

For registration: The testee is given two marks for each correct performance and she is asked to have five skills, a total of ten.
Second: The spatial orientation test
Test name: Ball test
Test objective: To measure trends
Tools: Six colored balls, table

Description of the performance
A table is placed five meters away from the starting line, and the tester stands on the starting line, with six balls near it. When a command is heard, place the ball on the right side of the table. The experimenter takes the ball and runs to the table, puts the ball in the right direction, returns, and takes the left command, then behind, and then in front, above and below.

Registration
The tester is given two marks for each correct cube and half a mark for each of the above and below, and the total score is (10), and errors are deducted from the total score.

Synergy testing
Test name: The ball over the head
Test objective: To measure eye-hand coordination
Tools: A tennis ball, a one and a half meter stick, or a rope.
Performance description: The experimenter stands in the hall and fixes a stick or rope above the tester's head, at a height of two and a half meters from the ground and horizontally with the ground. To ten attempts for each hand five.

Recording
The experimenter is given a score for each correct throw.
Test synergy between the eyes and the feet
Tools: A laptop calculator, a four-colour mat.

Description of the performance
The laboratory stands and in front of it is a rug measuring (1 by 1) meter, divided into four colors. At the top is red, measuring (50 by 50) cm, next to it is (50 by 50), blue, and at the bottom (50 by 50). Green and 050 by 50) yellow, and then the calculator is placed on a table at the level of the test's vision, and the program is in the same order of colors. At the beginning, the program is run, one color appears, so the test woman jumps with both feet on the rug of the corresponding color, and the color appears every 2 seconds and randomly forward or to Back or to the right or left side or in front of the diagonal or rear diagonal and it is programmed to ten jumps.
Scoring: Each correct jump is given a score, for a total of ten.
Fourth: Balance test
Test name: Stability on the cylinder
The objective of the test is to measure static balance
Tools: A compact cardboard cylinder with a diameter of 10 cm and a length of 50 cm, a stopwatch.

Description of the performance
The experimenter stands in front of the cylinder at the start, jumps over the cylinder, and with the help of assistants, tries to remain stable. After stability, she is given a time of 10 seconds and given two attempts.

Recording
When he settles on the cylinder for 10 seconds, the number of touches on the ground is calculated for him, and each touch drops a score out of ten.
Test name: Balance beam
Objective of the test: The mobile balance scales
Tools: Legal balance beam, length 5 meters, width 10 cm, device thickness 15 cm, device height 1.25

Description of the performance
The experimenter walks on the balance beam for ten steps.

Fifth: Perception of the sense of motor rhythm test
Test name: jumping the mathematical ladder
Test objective: To measure motor rhythm
Tools: Floor ladder

Description of the performance
The ladder is spread on the ground with ten boxes, and the tested woman stands in front of the first box, and the tested woman jumps inside it with both feet forward, then jumps to the second box in front and claps, then jumps back to the first box, then forward to the second box, jumps to the third box, clap, and then returns by jumping to second successor. That is, two digits jump forward and clap, then one digit back, and this rhythm continues to the end of the ladder.
Registration: A score is given for each two digits forward and applause and one digit backward, and any error is deducted from the total of ten marks.
Sixth: Precise muscle control test
Test name: Spin the ball with your feet
Test objective: To measure fine muscular control of the foot.
Instruments: Three flat cones, percussion ball
Performance description: The three cones form an equilateral inverted triangle. The tester stands at the head and rests on one foot and the other foot on the ball. He tries to push and pull the ball around the triangle. After completing that, he turns to the other foot and performs the same work.
Registration: The tester is given five points for each foot, the total is 10 degrees, and one point is deducted for each error that occurs during passing, from not controlling the ball to touching the cones.
Test name: Rolling the ball around the body in the form of an 8.
Test objective: To measure fine muscle control of the hands
Tools: Legal rhythm ball

Performance description
The experimenter sits tall with the knees bent upwards The ball is next to it, and at the start signal, it rolls the ball with the right hand around the feet, hands the ball over to the right hand, rolls the ball around the back and hands it over to the left hand, then rolls it and passes it from under the raised knee and hands it over to the right hand, and the work continues in the form of an 8

Registration: The experimenter is given 10 points for each of the hands, and errors are calculated for each error that drops a degree.
Seventh: Visual discrimination
Test objective: to measure auditory discrimination
Tools: laptop calculator.

Description of the performance
The experimenter sits in front of the person conducting the test and makes her hear the sounds that are the auditory discrimination skill, which is five skills.

1. Distinguish the sounds by displaying five sounds, and a name must be given to each sound
2. Distinguish between the sound of the word, so the tester is given two similar words, so he says yes and two different words, so he says no, and the words have one weight, so that it is difficult to distinguish them
3. Distinguishing the pitch of the voice The tester gives five different sounds and asks the tester which sounds are high and which are low
4. Distinguishing related sounds. Five groups are given to the experimenter, each group contains three sounds. Two sounds are related to one thing, and the third sound differs from them.
5. Distinguish the meaning the experimenter is given five voice commands and must be executed.

Recording: Each voice in the skill is given (2) degrees and zero if you do not recognize it, and the total for each skill is (10) degrees, so the total is (50) degrees for the five skills divided by five, so the final score is 10.
Eighth: Visual discrimination
Test objective: To measure visual discrimination
Tools: A laptop calculator.

Description of the performance
The testee sits in front of the calculator, and the visual discrimination skills, which are five skills, are presented and consist of:

1. Distinguish similar and different forms, i.e. show him things and ask about which things are different and which are similar.
2. Distinguishing colors displaying a number of colors and asking about a specific color, so the tester determines it as quickly as possible
3. Distinguish between lengths and sizes, i.e. show them a set of shapes and choose what suits the displayed shape
4. Distinguish between letters and numbers
5. The differences between the two pictures.

Registration: The testee is given a score for each correct answer, and there are 10 questions. As for the differences between the two pictures, a time of 30 seconds is given for the purpose of extracting 10 errors, and the total is 20 degrees, divided by 2, so that the result is 10.

3.4 Determine the rhythmic gymnastics skills
After examining the vocabulary of the curriculum for the subject of rhythmic gymnastics for the second stage in the College of Physical Education and Sports Sciences, Al-Mustansiriya University, the researcher chose three skills that she considered appropriate for the study under study, namely:

1. The skill of rotating the ball around the body.
2. Throwing and receiving by making a forward bow.
3. Plump the ball

The skills were presented to the experts to assess the skills from (1-10) after photographing them in the pre and post-tests.

3.4.1 The exploratory experiment: The researcher conducted the exploratory experiment in the closed gymnastics hall for girls in the College of Physical Education and Sports Sciences, Al-Mustansiriya University, on 1/22/2023.

3.4.2 Pre-tests: In order for the tests to be specific and according to correct scientific foundations The researcher did the pre-tests on 12/2/2023 and made two introductory

units on the skills under research on the two days (29-30)-1-2023

3.4.3 The main experiment (the educational curriculum)
After the pre-examinations were completed, work was directed to apply the cognitive competency exercises on 2/19/2023. The duration was 12 weeks. They were implemented in the main section, and the duration was (45) minutes.
The exercises (Appendix 1) were conducted in the main section under the supervision of the researcher. It includes the main section (educational and applied) and was prepared according to the areas of the cognitive scale and the ball skills of rhythmic gymnastics according to the following weeks.
The first week: To develop the physical self.
The first week included the skills of rotating the ball around the body with its different types around the body, the wrist, the elbow, and around the body in terms of stability and movement. The students are asked during the performance on the working joints during the performance of the skill.
The second week, repeating the previous skills of stability and movement, and the students are asked about the working muscles during the performance of the skill and creating an atmosphere of competition among the students.
The third week: To develop spatial awareness and balance
The lesson included the skill of throwing and receiving with all kinds of stability and movement with the right hand, then the left, and with both hands above the head. And linking it to the spatial orientation, so that the spatial orientation is of two types, internal, including right and left, while the external includes directions and their levels, high, medium, low, And linking it with skills in terms of the level of throwing and receiving the ball, the place of hitting it, balance in performance during movement, and stability in performance.
Fourth week: Repeat for the third week

The fifth week: To develop visual discrimination and accuracy in terms of following up on throwing and receiving between the eye and the hand, and succeeding in throwing and receiving at the required level, especially if the skill is complex in terms of performing throwing, receiving, and jumping a cat, for example, and from here we notice the synergy among the students.

The sixth week: To develop precise muscle control, meaning that any movement takes a period of time in which the exchange occurs between the strength of movement and the weakness of movement
And linking in restoring all of the above skills, making small formations, and working according to the areas of cognitive competence.
The seventh and eighth week developing the motor rhythm and linking it to the rhythm of the motor formations.

The ninth and tenth week: To develop auditory discrimination through the instructions received by the researcher and the students' performance of the skills and modification of the performance through the auditory feedback, and to teach the students the skill of tapping with all its types of stability, movement, walking and running with one arm and two arms from the brook and with different jumps.

The eleventh and twelfth week: Repeating all the skills and focusing on the skills under study, in addition to the areas of cognitive ability, and through returning the skills, making movement formations.

3.4.3 Post-tests: After completing the implementation and application of the exercises according to cognitive competence on the experimental group, the researcher subjected the experimental and control groups to the post-tests, and they were carried out on 14/15/5/2023 for two days.
The first day of the ball skills in rhythmic gymnastics and the second day of cognitive aptitude tests

3.5 Statistical methods
The researcher used the statistical bag SPSS

4. Research results

Table 3: It shows the results of (t-test) for correlated samples in the pre and post tests for the research variables and for the two research groups.

Statistical significance	(Sig)	The calculated t value	ع ف	فَ	Post test		Pre-test		Gropes	Search variables
					ع	سَ	ع	سَ		
Moral	0.000	17.709	0.316	5.600	0.568	7.90	0.823	2.30	Experimental	Spinning the ball around the body
Moral	0.000	9.798	0.327	3.200	0.667	6.00	0.789	2.80	control	
Moral	0.000	17.076	0.316	5.400	0.675	8.30	0.738	2.90	Experimental	Throwing and receiving
Moral	0.000	12.040	0.307	3.700	0.738	6.90	0.632	3.20	control	
Moral	0.000	16.688	0.342	5.700	0.422	8.80	0.994	3.10	Experimental	Plump the ball
Moral	0.000	13.341	0.307	4.100	0.568	6.90	0.789	2.80	control	
Moral	0.000	43.424	1.511	65.600	3.308	96.50	3.446	30.90	Experimental	Cognitive competence test
Moral	0.000	18.749	2.256	42.300	4.667	74.30	2.539	32.00	Control	

Shows the results of the (t-test) test for the independent post-tests of the two research groups in the post-post-test to learn some ball skills in rhythmic gymnastics and the cognitive competency test

Schedule 4: It shows the results of the (t-test) test for the dimensional independent samples of the two research groups

Table 4: Show the statistical significance, sign, the calculated t value, control, experimental and search vaiables

Statistical significance	(Sig)	The calculated t value	Control	Experimental	Search variables

			ع	سَ	ع	سَ	
Moral	0.000	6.862	0.667	6.00	0.568	7.90	Spinning the ball around the body
moral	0.000	4.427	0.738	6.90	0.675	8.30	Throwing and receiving
Moral	0.000	8.497	0.568	6.90	0.422	8.80	Plump the ball
Moral	0.000	9.432	4.667	74.30	3.308	96.50	Cognitive competence test

4. Discussing the results

For the purpose of proving the research hypothesis, which states that there are statistically significant differences between the pre and post-tests of the experimental and control groups in the rhythmic gymnastic skills using the ball tool and the cognitive competency test of the students, the researcher used the mean difference, the standard error, the standard error ratio, the t-value, and the score of six since it is less than 0.5 As the results are insignificant and the researcher attributes this to the fact that the control group used the usual approach to learn the skills in the commanding way and repeat the skills according to the directives of the subject school and without any flexibility in thinking, so there will be learning, but the percentage of learning and retention varies compared to the experimental group, which the results showed that learning them at a faster rate and keeping them higher, and the researcher attributes The researcher attributes this to the cognitive efficiency exercises that linked the mental aspect through all mental processes, including performance, ending with implementation that reflects the skillful aspect. During repetitions, the effect is enhanced, and the effect is like a pin line dug into the brain during repetitions, in addition to physical skills, so the instructions moved from mental operations to physical (skillful). This perceptual linking in the mathematical field raises the level of the learning process, and this is what was indicated by (Qasim Hassan: 1990).

As the process of sensation and perception in the sports field is a priority for learning and raising the level in order to achieve motor performance or duty. Through repetition, learning and training, it is possible to develop the ability to feel and perceive, as the possibility of controlling motor performance, and this can be noticed by the emergence of skills in performing movement in a distinctive way.

As for some indicators of cognitive efficiency, and by examining the exercises adopted by the researcher and applied to the experimental sample, they contained all indicators of cognitive efficiency and were linked to learning ball skills for rhythmic gymnastics, and there was harmony between ball skills for rhythmic gymnastics and cognitive efficiency, because rhythmic skills are complex.

And it needs realization, implementation, compatibility, balance, and fluidity in the performance of skills, and it needs an integrated work environment in terms of performance, musical, spatial, and temporal sense, and an integrated image at the end to produce an integrated artistic painting, and the opportunities and possibilities of learning rhythmic gymnastic skills increase as required in the use of opportunities in exploiting the correct learning that is based on the foundations Scientific and exploiting all capabilities and all of this is possible with the presence of a system linking mental, physical and skill processes.

Table 5: Show the notes, profiles, procedures, time and sections of the unit

Notes	Profiles	Procedures	Time	Sections of the unit
Keep calm	Xxxxxxxxxxxx	Recording the attendance of female students	45 m 3 m	Preparatory section The introduction
Maintaining calmness during performance, adhering to instructions, and performing exercises in the correct manner	Xx Xx Xx Xx xx	Giving comprehensive and general exercises, especially strength and accuracy exercises, and focusing on exercises for the feet and arms and preparing the body	17 m	Warm up
	Xxxxx	Explain the skill of throwing and receiving of all kinds, including the skill of throwing and receiving in front of the head In a detailed manner with all its details and focus on understanding the aspects and joints of the skill in terms of the height of the throw and the level of receiving, asking questions and answering, clarifying all the questions raised by the students, and clarifying the full picture for the students in terms of the theoretical aspect	15 m	The main department The educational part
	Xxxxx	▪ Training on the skill of throwing and receiving the ball with the hands from standing and pushing the ball high from standing and then receiving it with swinging hands and bending the knees ▪ Throwing the ball with the hands up in front of the body and receiving with the hands ▪ Throwing the ball with two hands and receiving it with one hand, once to receive it with the right hand and once with the left ▪ Throwing the ball with one hand and receiving it with the other ▪ Throwing and receiving the ball with a colleague by throwing the ball to a colleague with one hand and the colleague receiving it with both hands ▪ Throwing and receiving the ball with a colleague with two balls ▪ Throwing and receiving the ball from below and swinging the hand at the front level from below and then up and receiving it with the other hand or with the same hand ▪ Throwing and receiving the ball from walking with hands ▪ Throwing the ball with one hand and receiving it with the same hand ▪ Throwing the ball with one hand and receiving it with the other	35 m	Applied section
	Xxxxxxxxxx X	Calm down exercises, then salute and leave		Concluding section

5. Conclusions and recommendations

1. The study proved that cognitive efficiency exercises for some ball skills in rhythmic gymnastics were effective and contributed to improving and accelerating the learning process.
2. The use of small tools, suspense, competition and repetitions according to cognitive efficiency exercises has a very important impact on the research sample continuing to apply the exercises throughout the duration of the experiment.

5.1 Recommendations

1. The need to develop the cognitive and intellectual abilities of the age group under study and other groups.
2. The need to adopt the exercises prepared by the researcher in learning the ball skills in rhythmic gymnastics for the purpose of learning and retaining the skills.
3. Using exercises with different tools for different skills in rhythmic gymnastics, such as (the figure, the rope, the hoop) and other games.

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