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Construction and Validation of a Cognitive Engagement Scale and Its Relationship with Ball Movement Sequence Performance in Rhythmic Gymnastics

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Abstract

The research aims to: build and record a measure of cognitive participation among second-year female students at the College of Physical Education and Sports Sciences, University of Baghdad. The researchers used the descriptive approach in the survey style for the research sample. The sample was selected from female students and divided into: (10) female students for the survey sample, and (80) female students for the construction and codification sample. The data were statistically analyzed by the researchers using SPSS, the T-test for independent and correlated samples, Pearson's simple correlation coefficient, Cronbach's alpha, Chi-square, and Spearman-Brown. They were recruited for the samples. The study concluded that constructing a measure of cognitive participation for students in the second stage could be applied through the ease and difficulty of its expressions that are appropriate to the research sample, as well as the grades and levels that were reached, which showed that the sample fell within the rating (good and acceptable), and on the other hand the sample was characterized by participation. Cognitive through the results of the scale and its four axes. In conclusion, cognitive participation plays a positive role in performing the ball movement sequence in rhythmic gymnastics.

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1- The research Introducing

1-1 Introduction and the importance of research

The College of physical education and Sports Sciences is one of the faculties that must be promoted because it is concerned with the study of sports education, which is based on many sciences, including testing and measurement, which has a role in researching and investigating tests and metrics in sports psychology (Fadil & Mohammed, 2022). Testing and measurement are important means of determining the level of performance, being an assessment tool through which to determine the degree of individual progress in the field of the game he practices, as well as judging the effectiveness of the teaching or training curriculum (Khalifab & Jabbar, 2023). All this is in the interest of the educational process, which is also concerned with students through the process of continuous communication and various support carried out by this institution in the search and investigation of variables that contribute to improving the educational level of students (Khaled Jasem, 2024). Knowledge sharing is one of those variables that contribute effectively to increasing student communication among themselves and increases the amount of knowledge and information acquired by students. there is also a set of skills that students of the College of physical education and sports sciences must possess to achieve interaction between him and the teacher in a positive way, such as interactive skills, answering questions, mutual respect, tolerance and rational dialogue (Mohammed, 2019), (Mohammed et al., 2020). Self-esteem and self-respect experience an increase when an individual perceives a sense of affiliation, proficiency, merit, approval, and elevated self-efficacy (Jasem et al., 2023) The successive changes have forced the university to look for new ways to enable them to face the challenges of life and possess various skills that enable them to develop their abilities in learning rhythmic gymnastics skills, especially if we know the difficulty of his skills for female students (Ahmed Obaid et al., n.d.) Rhythmic gymnastics is one of the games that needs many requirements in order to accompany the skill performance to the tools, including the ball, and its performance is only through knowledge sharing and knowledge exchange with others. Knowledge management works to enable students to acquire knowledge sharing skills with others as a source of excellence (Hassoun & Jassim, 2019), (Hummadi et al., 2024). Therefore, through the above, the researchers found the importance of studying this variable and finding out the extent of its role in the performance of the ball Movement Sequence in rhythmic gymnastics in order to provide chances of success by designing a tool, a measure of cognitive sharing, to give the correct and objective picture in revealing the weakness and strength of cognitive sharing and giving a healthy picture of it to overcome weaknesses and enhance strengths.

According to (Abdulrasool et al., 2024). special exercises have an important role in the development of cognitive abilities and the performance of ball movement in rhythmic gymnastics.(Mukhlif & Maleh, 2019)

And in the (Kadhim et al., 2024) study. The most important conclusions pointed to the effectiveness of the electronic program used in the study in the development of the level of performance of the skills installed in rhythmic and creative gymnastics for physical education students and the impact of the learning environment on the development of creative motor and behavioral performance.(Ghazi et al., 2024)

The objective of the study was to develop and standardize a cognitive participation scale specifically for female students enrolled in the second stage of the College of Physical

Education and Sports Sciences at the University of Baghdad. Furthermore, the study aimed to analyze the performance of the ball Movement Sequence in rhythmic gymnastics among these students, and to explore the correlation between cognitive participation and the execution of the ball Movement Sequence in rhythmic gymnastics among female students in the second stage of the College of Physical Education and Sports Sciences at the University of Baghdad.

Material & methods

The descriptive approach was employed by the researchers utilizing a survey method. The female students in the second stage of the College of Physical Education and Sports Sciences at the University of Baghdad were deliberately chosen as the research population, consisting of a total of (116) students divided into three groups (A, B, and C). In order to meet the research requirements, all students in the population were included in the research sample. The sample was divided into (10) students for the pilot sample, (80) students for the construction and standardization sample (from which the researchers obtained the criteria and levels), and (26) students for the main experimental application sample. The division of the sample is presented in table (1), providing the specific details.

Table 1. shows the details of the survey samples, construction, standardization and application samples.

No	Sample Type	Number	Percentage
1	**Pilot Sample**	**10**	**8.62%**
2	**Construction and Standardization Sample**	**80**	**68.96%**
3	**Application Sample**	**26**	**22.41%**
	Total Sample	**116**	

Procedures for implementing Field Research steps:

Procedures for building a knowledge sharing scale:

The researchers built a knowledge sharing scale for second-stage students, and the construction procedures included some steps that must be followed in order to reach a scale that meets the scientific conditions.

First: define the idea of the scale:

The identification of the idea is through giving a procedural definition adopted by the researchers in the construction of the scale, as the identification of the idea or phenomenon helps to identify the main ideas adopted by the researchers in the construction of the scale, by familiarizing the researchers with previous studies and research and being teaching as well as personal interviews they have come to the idea of the scale through a procedural definition clarifies the idea of the scale.

Second: determining the goal or purpose of building the scale:

As it is the main pillar and the first step that needs to be done when building scales, the researchers have come up with the purpose of building a knowledge sharing scale for second-stage students at the College of physical education and sports sciences.

Third: identification of areas for the scale

The researcher identified the proposed fields and gave a theoretical definition of each field and was interested in giving the fields a meaning to the phenomenon or concept to be measured through a special questionnaire for the purpose of determining the most important fields or axes and the extent and suitability and was presented to a number of

experts and specialists in the field of testing, measurement and sports psychology, numbering (13) experts, the researchers adopted the test (chi-square) to accept the fields of the scale as shown in the table 2.

Table 2. Shows the agreement of experts and specialists on the areas of the knowledge sharing scale after using (chi-square)

No	Candidate Domains	Number of phrases	Agree	Disagree	The value of (chi-square)	Sig
1	Knowledge sharing among students	5	11	2	6.231	0.013
2	Sharing knowledge with others	9	12	1	9.308	0.002
3	Barriers to knowledge sharing	13	13	0	13	0.000
4	The general direction of knowledge sharing	10	13	0	13	0.000

Fourth: preparing the initial version of the knowledge sharing scale paragraphs

After that, the researcher decided on the areas of the scale, drawing up a questionnaire with items for the selected areas. The elements were distributed in the axes of measurement, and each element was named based on the theoretical definition of the field in which it was placed. The researcher also presented the answer options for the proposed question. The original scale covered 37 elements in a multiple-choice format that were distributed over 4 scales. Experts used a five-point scale (Likert) scale to measure the variables. The scale consisted of the following response options:

When formulating the paragraphs, the researcher took into account the following points: (Munaf et al., 2021)

- Every paragraph should be just about one specific message.
- The paragraph should be in language that is accurate and natural.
- Phrases that are vague, or lack detailed explanation, can be best avoided.
- First person should be used for the paragraphs.
- It is needless to use words with more than one meaning.

Finally, the researchers assessed the suitability of the items for the scale after having the preliminary version of the scale presented to a group of specialists in the area of tests and measurement, sports psychology, rhythmic gymnastics, and statistics. The group had 13 experts. In conformity with the participants' suggestions, the researchers used the "chi-square" test to keep each item separately or just accept, modify, or delete it due to similarity or redundancy. As shown in Table 3.

Table 3. shows the paragraphs that remained and the deleted paragraphs according to the opinions of experts and specialists for the knowledge sharing scale after using (chi-square)

No	Domains	Paragraph Numbers	Number of Paragraphs	Agreements	Disagreements	The value of (chi-square)	Sig
1	Knowledge Sharing	1-5	5	12	1	9.308	0.002

	Among Students						
2	**Knowledge Sharing with Others**	**6-14**	**9**	**13**	**0**	**13**	**0.000**
3	**Barriers to Knowledge Sharing**	**15-27**	**13**	**13**	**0**	**13**	**0.000**
4	**The Attitude of Sharing Knowledge in General**	**28-37**	**10**	**13**	**0**	**13**	**0.000**

Exploratory experience:

On the 13th of December 2022 Wednesday the researchers conducted a pilot test of the scale in the gymnasium of the College of Physical Education and Sports Science which is located at the University of Baghdad. The pilot study was conducted with a sample of ten which included female students. The pilot study results showed that the scale had a positive outcome among the sample group. The instructions were step-by-step, the items were simple to follow, and there weren't any major obstacles that faced the researchers or the research staff. The average scale time to perform it was (7-10) minutes.

Main Experiment for Constructing the Knowledge Sharing Scale:

Following the completion of the prototype knowledge sharing scale, the researchers, in collaboration with the research team, applied this scale to a sample from the second stage of the College of Physical Education and Sports Sciences at the University of Baghdad (80) female students. The experiment was conducted on Thursday, 18th January 2024, to Thursday 25th January 2024.

Overall, after there was main experiment done, the scientists were sorting the scale forms, correcting them and put down results for statistical analysis. Characteristics of frequency distribution of the sample of (80) students were identified. The results clearly resolved that the sample members are distributed in the scale, as shown in the Table 4.

Table 4 shows the descriptive characteristics on the construction sample

No	Statistical characteristics	Knowledge sharing
1	**Arithmetic mean**	**128.0250**
2	**Median**	**127.5000**
3	**Standard deviation**	**8.05672**
4	**Skewness**	**-.280**
5	**Standard Error**	**.269**

Statistical analysis of the paragraphs of the knowledge sharing scale:

The researchers analyzed the results of the construction sample for the knowledge sharing scale of the construction sample, and this step is one of the most important steps and procedures for building and modifying the scales, so the researcher performed the following procedures:

Discriminative ability:

It is a useful tool for situations where the total sample is to be divided into two or more groups which are mutually exclusive and collectively exhaustive, on the basis of a set of a predictor variable. To achieve the responses of the sample of 80 forms, the data were collected in a descending manner, and then the two groups were identified in each group, 27% of the construction sample, i.e. (22) students from the upper group and (22) students from the lower group, and the middle group included (36) students and were extracted using the (T-Test).the researchers adopted paragraphs whose significance value is less than the approved significance level (0.05) and for a degree of freedom (42) and Table (5)shows this.

Table 5. shows the discriminating ability of each paragraph of the linear performance level scale

No	Lower Group		Upper Group		T-test	Sig
	M	SD	M	SD		
1	2	0	4.8636	0.35125	-38.24	0.000
2	2	0	4.8182	0.39477	-33.484	0.000
3	2.3636	0.49237	5	0	-25.115	0.001
4	2.3636	0.49237	5	0	-25.115	0.000
5	2.0909	0.29424	4.9545	0.2132	-36.965	0.001
6	2.4091	0.50324	4.9545	0.2132	-21.845	0.000
7	2.0909	0.29424	4.8182	0.39477	-25.981	0.000
8	1.8182	0.50108	4.8636	0.35125	-23.343	0.000
9	2.0455	0.2132	5	0	-65	0.000
10	2.0909	0.61016	5	0	-22.363	0.000
11	2	0	4.9545	0.2132	-65	0.000
12	2.2727	0.45584	5	0	-28.062	0.000
13	2.0455	0.2132	4.8182	0.39477	-28.987	0.000
14	2.0455	0.2132	4.9091	0.29424	-36.965	0.000
15	2.1364	0.35125	4.7727	0.42893	-22.305	0.000
16	1.8636	0.46756	5	0	-31.463	0.000
17	2.0455	0.2132	5	0	-65	0.000
18	2	0	4.7273	0.45584	-28.062	0.000
19	1.8636	0.35125	4.8182	0.39477	-26.226	0.000
20	1.8636	0.46756	4.8182	0.39477	-22.646	0.000
21	1.7273	0.45584	4.8182	0.39477	-24.042	0.000
22	1.7273	0.45584	4.9091	0.29424	-27.507	0.000
23	2.0455	0.2132	5	0	-65	0.000
24	2	0	4.7273	0.45584	-28.062	0.000
25	1.9091	0.29424	5	0	-49.271	0.000
26	1.9545	0.2132	4.5455	0.50965	-21.998	0.000
27	1.9545	0.48573	5	0	-29.408	0.000
28	2	0	4.8636	0.35125	-38.24	0.000

29	2.3636	0.49237	4.8636	0.35125	-19.388	0.000
30	2	0	4.9545	0.2132	-65	0.000
31	2.0455	0.653	5	0	-21.222	0.000
32	1.7727	0.42893	5	0	-35.291	0.000
33	1.7727	0.42893	4.5455	0.50965	-19.524	0.000
34	1.7727	0.42893	5	0	-35.291	0.000
35	2	0	4.9091	0.29424	-46.372	0.000
36	2	0	4.6818	0.47673	-26.386	0.000
37	1.8636	0.35125	4.7727	0.42893	-24.612	0.000

The level of significance is deemed to be statistically significant if it falls below the threshold of 0.05, taking into account the degree of freedom which is equal to 42.

Internal consistency coefficient of the scale: the internal consistency coefficient is used to determine the degree of homogeneity of the paragraphs in measuring the phenomenon or behavioral dimension and the ability to highlight the interconnection between the paragraphs of the scale, and the researcher used two types of internal consistency:

First: the relationship of the paragraph degree to the total degree scale:

The aim of this procedure is to find the correlation relationship between each paragraph and the total score of the scale for all the sample members. The aim of this procedure is to find out whether the answers in their entirety for certain paragraphs are reasonably consistent.

Second: the relationship of the paragraph degree to the total degree of the field:

It is one of the necessary indicators that show the truthfulness of the test or measure in measuring the behavioral dimension to be measured in the field that belongs to the measure or test as shown in Table (6) and (7).

Table 6. shows the correlation coefficient between the paragraph score and the total score of the knowledge sharing scale

No	Pearson's r	Sig
1	0.364**	.0000
2	0.336**	0.004
3	0.294*	0.012
4	0.368**	0.001
5	0.375**	0.001
6	0.408**	0.000
7	0.434**	0.000
8	0.360**	0.002
9	0.440**	0.000
10	0.562**	0.000
11	0.461**	0.000
12	0.414**	0.000
13	0.315**	0.000
14	0.548**	0.000
15	0.370**	0.000
16	0.470**	.0000
17	0.364**	.0000
18	0.353**	0.000

19	0.384**	0.000
20	0.393**	0.000
21	0.424**	0.000
22	0.240*	0.016
23	0.346**	0.000
24	0.322**	0.001
25	0.312**	0.002
26	0.270**	0.007
27	0.443**	0.000
28	0.138	0.170
29	0.425**	0.000
30	.396**0	0.000
31	.215*0	0.031
32	0.375**	0.000
33	.439**0	0.000
34	0.588**	0.000
35	.567**0	0.000
36	.224*0	0.025
37	0.470**	0.000

Table 6. shows the correlation coefficient between the paragraph score and the total score of the knowledge sharing scale

* is used to represent a statistically significant difference at the 0.05 .

** is used to represent a statistically significant difference at the 0.01.

Table 7. shows the correlation coefficient between the paragraph score and the total score of the field

No	Pearson's r	Sig
Knowledge Sharing Among Students		
1	0.815**	0.000
2	0.728**	0.000
3	0.814**	0.000
4	0.791**	0.000
5	0.674	0.000
Knowledge Sharing with Others		
6	0.573**	0.000
7	0.465**	0.000
8	0.518**	0.000
9	0.411**	0.000
10	0.588**	0.000
11	0.233*	0.019
12	0.355**	0.000
13	0.506**	0.000
14	0.478**	0.000
Barriers to Knowledge Sharing		
15	0.355**	0.000
16	0.506**	0.000

17	**0.478****	**0.000**
18	**0.242***	**0.015**
19	**0.571****	**0.000**
20	**0.436****	**0.000**
21	**0.364****	**0.000**
22	**0.496****	**0.000**
23	**0.580****	**0.000**
24	**0.379****	**0.000**
25	**0.564****	**0.000**
26	**0.420****	**0.000**
27	**0.283****	**0.000**
The Attitude of Sharing Knowledge in General		
28	**Rejected**	
29	**0.296****	**0.003**
30	**0.428****	**0.000**
31	**0.383****	**0.000**
32	**0.361****	**0.000**
33	**0.356****	**0.000**
34	**0.364****	**0.000**
35	**0.496****	**0.000**
36	**0.580****	**0.000**
37	**0.296****	**0.003**

* is used to represent a statistically significant difference at the 0.05 .

** is used to represent a statistically significant difference at the 0.01

It was found that all paragraphs of the knowledge sharing scale are statistically significant except for paragraph (28), which is not significant at the significance level (0.05), so it was rejected, so that the number of the remaining paragraphs of the scale is (36) statements.

Stability :

To check the stability of the Cognitive Sharing Scale, the researchers used the following methods:

A. Split-half method: The researchers divided the scale paragraphs into two halves, a first half and a second half, and the correlation coefficient between the total scores of the two halves was extracted according to Pearson's method for the scale, and that the correlation coefficient here indicates the stability of half of the scale and then full stability according to the Spearman-Brown formula for correcting stability.

B. Cronbach's alpha: Cronbach's alpha is the internal consistency of the scale and is one of the most common stability coefficients Table (8) shows the Cronbach's alpha coefficient for the Cognitive Sharing Scale.

Table 8. shows the stability coefficients

Scale	**Semi-segmentation**		**Alfa cronbach**
	Stability of the half-scale	**Total stability**	
Sharing	**0.553**	**0.653**	**0.575**

Objectivity: Objectivity is achieved through the stability of the correction process according to the special alternatives of the Cognitive Sharing Scale, and the arbitrators will not interfere in the correction of the answers.

The final version of the Cognitive Engagement Scale: The knowledge sharing scale for female students represented (4) domains, namely (knowledge sharing among students, knowledge sharing with others, obstacles to knowledge sharing, general trend of knowledge sharing,) The scale included (36) phrases in its final form, distributed in four domains, respectively (5), (9), (13), and (9) As described in Appendix 2.

Ball movement formation in rhythmic gymnastics: the researchers tested the female students with ball movement formation in rhythmic gymnastics and obtained a score representing the student's level through the evaluation of the subject teacher, which is from (10 point).

The main experiment: after the construction of the scale was completed and the selection of the ball movement configuration in rhythmic gymnastics, the researchers distributed the scale to the application sample of (26) students and after the answer, the researchers arranged the forms for the purpose of processing them statistically and then obtaining the results of the ball movement chain for the purpose of extracting the results.

Statistical methods:

The researchers used the SPSS statistical package

Results

Standard scores of the knowledge sharing scale:

The criteria are a set of scores derived by certain statistical methods from raw scores and are used to compare the performance level of a particular individual with the performance level of the group to which he belongs, as shown in Table (9).

Table 9. The standard scores (Z, T) of the cognitive sharing scale.

No	raw score	Z	T	Repetition
1	106	-2.73374	22.66	1
2	108	-2.4855	25.14	1
3	113	-1.8649	31.35	2
4	116	-1.49254	35.07	1
5	117	-1.36842	36.32	2
6	118	-1.2443	37.56	4
7	120	-0.99606	40.04	1
8	121	-0.87194	41.28	3
9	122	-0.74782	42.52	3
10	123	-0.6237	43.76	5
11	124	-0.49958	45	4
12	125	-0.37546	46.25	4
13	126	-0.25134	47.49	7
14	127	-0.12722	48.73	2
15	128	-0.0031	49.97	3
16	129	0.12102	51.21	2
17	130	0.24514	52.45	3
18	131	0.36926	53.69	2
19	132	0.49338	54.93	4
20	133	0.6175	56.17	2

21	134	0.74162	57.42	3
22	135	0.86574	58.66	5
23	136	0.98986	59.9	4
24	137	1.11398	61.14	2
25	138	1.2381	62.38	5
26	140	1.48634	64.86	1
27	142	1.73458	67.35	2
28	143	1.8587	68.59	1
29	144	1.98282	69.83	1

The researchers selected (6) levels for the cognitive sharing scale and when distributing the standard scores on the approved levels, the standard levels appeared to us as shown in Table (10).

Table 10. The levels and the percentage specified for them in the normal distribution, the raw and Standard score (Z, T), the number of practices and the percentage of the knowledge sharing scale.

The prescribed ratio in the normal distribution	raw score	Z-class limits	T-class limits	Sample Number	Percentage
2.14% Very Good	-	-	-	-	% 0
13,59% Good	137 -144	1.113 - 1.98	-69.83 61.14	12	%15
34.13% Average	129 -136	0.12 - 0.98	51.21 -59.9	25	%31.25
34.13% acceptable	120 -128	-0.003 - 0.996	– 49.97 40.04	32	%40
13.59% weak	113 - 119	-1.24 - 1.86	-37.56 31.35	9	%11.25
2.14% very weak	112 - and under	2.4855 - and under	25.14 - and under	2	2.5 %

View the results of the knowledge sharing scale

It is clear from the Tables (11, 12) that there are significant differences in favor of the arithmetic mean, which means that the sample has cognitive participation, and this is also indicated by the fields of the scale, except for the first component, which is facial expressions, as the researchers attribute this to the activation of communicative means of knowledge that allow the accumulation of knowledge and be usable in the context of contemporary daily life, and their use in supporting society and its progress in all fields**(Connelly & Kevin Kelloway, 2003)**

Table 11. Shows the mean, standard deviation, skewness, value (T- Test) and the significance value of the knowledge sharing scale

variables	Test value	M	SD	skewness	T-Test	Sig
knowledge sharing	108	122.1154	9.42052	.076	7.640	0.000

The value of the signifier is significant if it is < from 0.05

Table 12. Shows the mean, standard deviation, value (T- Test) and the significance value of the knowledge sharing scale

variables	Test Value	M	SD	T-Test	Sig
Knowledge Sharing Among Students	**15**	**18.1154**	**2.91653**	**5.447**	**0.000**
Knowledge Sharing with Others	**27**	**31.1154**	**3.16641**	**6.627**	**0.000**
Barriers to Knowledge Sharing	**39**	**43.1154**	**4.75249**	**4.415**	**0.000**
The Attitude of Sharing Knowledge in General	**27**	**29.7692**	**4.06259**	**3.476**	**0.002**

The value of the signifier is significant if it is < from 0.05

Presentation of the results of the relationship between communicative intelligence and ball Movement Sequence in rhythmic gymnastics:

Table (13 and 14) shows the results of the correlation values between cognitive sharing - Movement Sequence with the ball in rhythmic gymnastics. The results showed a significant and direct relationship, which means that the female students have a degree of cognitive sharing, which had a positive role in the performance of the Movement Sequence with the ball, because the nature of performing movements in gymnastics needs to use information and knowledge, exchange and share with colleagues, which in turn works to overcome the difficulties facing female students by performing Movement Sequence with the ball in rhythmic gymnastics, One of the reasons students work together to share knowledge is the level of exchange they need to achieve.

Table 13. Shows the mean, standard deviation and skewness of the Movement Sequences with a ball

variables	M	SD	skewness
the Movement Sequences with a ball	**7.0238**	**.84068**	**0.046-**

Table 14. Shows the correlation coefficient between communicative intelligence and Movement Sequences.

variables	Correlation	Sig
communicative intelligence - Movement Sequences	**0.643**	**0.000**

Discussion

Through Table (9) and (10), the researchers explain that the level of the sample, as well as the academic level, being university students with good and distinguished levels, came in proportion to the levels derived from applying the scale to them, as the results were centered between a (good and acceptable) level, the results also show that there is no very weak level, which means that knowledge sharing between students is based on a good ground of cooperation, because physical education lessons are interspersed with practical lessons, which leads to continuous understanding and knowledge exchange, especially in the gymnastics lesson, which is one of the most important lessons, but one of the most difficult for students, knowledge sharing is part of knowledge management systems that aimed at securing the correct knowledge of the place and timing A lot of studies have shown that interaction between individuals who possess diverse and

different knowledge enhances their ability to improve their performance(Sabah & Jasem, 2023)

From the observation of Tables (11and 12), the researchers emphasize that the support of female teachers for female students, as well as the support of the University, which provides courses, lectures and means that help to communicate and share knowledge, "that creative institutions are those that support the process of knowledge sharing among their members and encourage them to exchange ideas and experiences. Which provides them with the necessary skills to keep up with the new construction of knowledge, keep up with modern branches of science, and cognitive and cultural preparation of female students by preparing them to carry out their school assignments, including rhythmic gymnastics lesson. "Knowledge sharing is currently receiving great attention by various institutions as an important element in the development of these institutions in keeping with the age of knowledge, as these institutions realized that knowledge sharing brings an advantage to students in general and female students in particular (Mohammed et al., 2023)

The learning process is carried out through the exchange of ideas, knowledge, experiences and information and is related to the individual's ability to transfer his apparent and implicit knowledge to others. knowledge sharing is an appropriate mechanism for mastering knowledge management. others see it as a communicative process in which knowledge is discussed and exchanged through direct interaction via the internet in order to increase the value of existing knowledge (Haseeb & Laith, 2022**)**

Table (14) summarizes that female students have a degree of knowledge sharing, which had a positive role in the performance of the Movement Sequence with the ball. among the reasons why university students interact to share knowledge is the amount of sharing they have to do, and the time spent by the student explaining something he already knows to someone he does not know, on the other hand, one of the determinants of sharing is the type of information necessary, which is an advantage for the participant, so knowledge hoarding also occurs when students feel when they exchange knowledge and share among themselves that time has a moral value, and this means that in order to overcome the student's tendency to Hoarding knowledge requires a good understanding of the pattern of knowledge sharing they have The necessary effort is made by higher education institutions to promote knowledge sharing(Naser & Jasim, 2021**)**

Also, from the researchers 'point of view, the experiences of success and failure in testing the Movement Sequence with the ball due to an increase in students' belief in the likelihood of failure as a result of physical and Movement weakness, on which skill success depends, as well as the degree of practical testing is greater than the degree of the theoretical exam, in which the probability of success increases, this led to increased communication with the performance of Movement Sequence with the ball, and this is what cognitive sharing did to increase the returns of Movement skill.

Conclusion

The study concluded that the construction of the knowledge sharing scale for second-stage students was possible to apply through the ease and difficulty of its phrases that fit with the research sample, as well as the standard grades and levels were reached, which showed that the sample falls within the estimate (good and acceptable), and on the other hand, the sample was characterized by knowledge sharing through the results of the scale and its four axes. In conclusion, cognitive sharing plays a positive role in the performance of ball Movement Sequence in rhythmic gymnastics.

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Conflict of interest

The authors declare that there are no conflicts of interest

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Appendices

Appendix 1

The scale in the initial image:

The first area is knowledge sharing among students: individuals with diverse knowledge collaborate among themselves

The second area is sharing knowledge with others: a set of behaviors that involve sharing information or helping others **(Connelly & Kevin Kelloway, 2003)**

The third area handicaps knowledge sharing: lack of culture of knowledge sharing, lack of understanding of what can be shared with those who share it, limited appreciation of knowledge sharing, fear of providing false information

The fourth area is the general trend of knowledge sharing: no one should hesitate or be afraid to spread knowledge

No	The Terms	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
1	Discuss class projects and required meals in each lecture					
2	Clarification and discussion of exam-related issues					
3	Solving problems related to studying among female students					
4	Clarify and discuss some of the concepts learned in the lecture					
5	Re-explaining some lectures to absent students					
6	Discuss class projects and required meals in each lecture					
7	Clarification and discussion of exam-related issues					
8	Solving problems related to studying among female students					
9	Clarify and discuss some of the concepts learned in the lecture					
10	Re-explaining some lectures to absent students					
11	Discuss class projects and required meals in each lecture					

12	Clarification and discussion of exam-related issues					
13	Solving problems related to studying among female students					
14	Clarify and discuss some of the concepts learned in the lecture					
15	Not having enough time to share knowledge					
16	Lack of a culture of knowledge sharing and Exchange in college					
17	Lack of depth in relationships between female colleagues					
18	Fear of providing false information					
19	Lack of voluntary initiatives for information exchange					
20	Exchange knowledge only with students who are ready for it (Benefit Exchange)					
21	Fear of being outclassed by others					
22	Fear that the difference of opinions spoils the relationship with female colleagues					
23	Lack of appreciation for knowledge sharing					
24	Don't know what knowledge to share					
25	There are few opportunities for face-to-face interaction with other students					
26	Distrust among female students					
27	Shyness among female students					
28	Students should share knowledge with their					

	peers when communicating with them					
29	**Female students should voluntarily share knowledge with their peers**					
30	**It is better to avoid exchanging information with female students as much as possible**					
31	**I am ready to share information with my colleagues**					
32	**My colleagues are ready to share information with me**					
33	**My classmates are ready to share lecture notes with everyone**					
34	**Knowledge sharing is a waste of time**					
35	**Knowledge sharing reduces competitiveness among students**					
36	**Knowledge sharing is generally good**					