



## Preparing a scale for sports knowledge management and standardizing it for employees in student activities departments in Iraqi universities

*Preparar una escala para la gestión del conocimiento deportivo y estandarizarla para los empleados de los departamentos de actividades estudiantiles de las universidades de Irak*

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### Abstract

**Introduction:** The importance of the research lies in the need to exchange sports knowledge between principals and their assistants and all workers in the field of extracurricular student activities, especially in the sports field.

**Objective:** Preparing and standardizing the measure of sports knowledge management for workers in student activities.

**Methodology:** The descriptive approach was adopted on a sample of (740) workers in student activities, where it was divided into (an exploratory experiment sample, a building sample, and a unification sample).

**Results:** (57) items were prepared, (34) of which were validated by factor analysis of the validity of the test. The stability of the test was verified by the half-hash method with a value of (0.783) and by the chi-square method with a value of (0.744) at the level of significance (0.05) achieving raw grades ranging from (100 - 134) corresponding to (2.5236 to -3.0546) Z°, (75.24 to 19.45) T.

**Discussion:** The validity and consistency of the measure of mathematical knowledge in its dimensions including mathematical knowledge, discovery, possession, application and communication has been verified. The measure of mathematical knowledge contributed to finding realistic solutions according to standard scores from raw data processing. All those in charge of student activities have an acceptable average view of the mathematical knowledge management scale.

**Conclusions:** The possibility of preparing and standardizing the mathematical knowledge management scale for workers in student activities in Iraqi universities and the ease of applying the mathematical knowledge management scale to the construction and standardization sample.

### Keywords

Standardization; sports knowledge management; student activities.

### Resumen

**Introducción:** La importancia de la investigación radica en la necesidad de intercambiar conocimientos deportivos entre los directores y sus asistentes y todos los trabajadores en el ámbito de las actividades extraescolares de los estudiantes, especialmente en el ámbito deportivo.

**Objetivo:** Elaborar y estandarizar la medida de gestión del conocimiento deportivo para los trabajadores en las actividades estudiantiles.

**Metodología:** Se adoptó el enfoque descriptivo en una muestra de (740) trabajadores en actividades estudiantiles, donde se dividió en (una muestra de experimento exploratorio, una muestra de edificio y una muestra de unificación).

**Resultados:** Se elaboraron (57) ítems, de los cuales (34) fueron validados mediante análisis factorial de la validez de la prueba. La estabilidad de la prueba se verificó por el método de medio hash con un valor de (0.783) y por el método de chi-cuadrado con un valor de (0.744) al nivel de significancia (0.05) logrando calificaciones brutas que van desde (100 - 134) correspondientes a (2.5236 a -3.0546) Z°, (75.24 a 19.45) T.

**Discusión:** La validez y consistencia de la medida del conocimiento matemático en sus dimensiones incluyendo el conocimiento matemático, Se ha verificado el descubrimiento, la posesión, la aplicación y la comunicación. La medida del conocimiento matemático contribuyó a encontrar soluciones realistas de acuerdo con las puntuaciones estándar del procesamiento de datos brutos. Todos los responsables de las actividades de los estudiantes tienen una visión media aceptable de la escala de gestión del conocimiento matemático.

**Conclusiones:** La posibilidad de elaborar y estandarizar la escala de gestión del conocimiento matemático para los trabajadores de las actividades estudiantiles en las universidades iraquíes y la facilidad de aplicar la escala de gestión del conocimiento matemático a la muestra de construcción y estandarización.

### Palabras clave

Normalización, gestión del conocimiento deportivo, actividades estudiantile



## Introduction

Sports management is a major factor in the success or failure of any sporting activity, which means that the success of a sports organization is related to the success of its administrative axis (Y. A. Khalaf & Waga, 2019). Modern management helps coordinate various institutions and organizations in their respective fields and areas of expertise to promote development and progress, solve problems, manage conflicts, provide solutions to deficiencies (O. A. Ali et al., 2022), and improve the efficiency of individuals. "Universities participate in various sports events yearly through tournaments organized by the Ministry of Higher Education and Scientific Research in stadiums and gymnasiums" (Adham Ali et al., 2022). Each university publishes an annual evaluation after the tournament, which, in addition to the organization of the tournament, also shows the number of participants and the results achieved.

Sports knowledge management is an important tool for institutions to invest in their intellectual capabilities (Saeed, Khalaf, et al., 2024). "Sports knowledge management plays an important role in colleges and universities in achieving good results in competitions. Administrative work is like a link that complements each other" (Mohammed Hammood, Hussein Rashid, & Adham Ali, 2025). Sports knowledge management needs to be spread among managers, their assistants, and departmental and unit officials through conferences, workshops, seminars, etc., involving everyone in the field of student activities at the university so that "this knowledge will be conveyed to college students who represent the university in sports competitions to develop new ideas and plans to serve the set goals" (H. H. Khalaf et al., 2018). The researchers found that the creation and standardization of a sports knowledge management scale are necessary for those who work in the field of student activities while also finding out the factors or reasons that do not allow employees to be creative in their work field to highlight the positive points and address the negative aspects of the obstacles faced by those working in the field of student activities through the sports knowledge management scale.

Several studies have investigated sports knowledge and how to build specific measures for it. The study (Duclos-Bastías et al., 2021) stated the validity and reliability of the Competency Scale for Sports Managers (COSM) in the Chilean context. The COSM was adapted to Spanish according to international methodological standards. A pilot version was then applied in Spanish. The original instrument consists of 31 items grouped into six dimensions. At the same time, the adapted instrument grouped its indicators into three dimensions, including 22 items, namely organizing the use of sports facilities (12 items), budget management (5 items), and communication skills (5 items). It is compatible with standards and literature, so this instrument contributes to the process of diagnosing the competencies of sports managers).

The study (Guidotti et al., 2023) tested the validity of the knowledge, competencies, and skills framework designed for sports managers and explored the importance, experience, and need of managers for training in knowledge, competencies, and skills. The results showed internal consistency and high consensus agreement regarding the proposed competency framework and the crucial role of soft skills in the sports management profession in primary, middle, and senior management positions. A significant lack of possession of elements belonging to the technical and cognitive domains appeared, and there was a need to design sound educational programs based on the specific career stages of the participants, educational backgrounds, and training needs).

The study (Amaral et al., 2024) came to build an assessment tool that concerns the duties and competencies of sports managers in Brazil and validated it by experts' evaluation of clarity and relevance according to the content validity index, then conducting an exploratory factor analysis (AFE) to evaluate the validity of the duties and competencies of managers. It resulted in the "Sports Manager in Brazil" (GEB) tool, consisting of 58 questions (closed and open) and validating the content related to 32 of the 33 responsibilities and competencies of sports managers. The assessment tool concluded with 57 questions, confirming the validity of the content and construction).

The researchers found that the creation and standardization of a sports knowledge management scale are necessary for those who work in the field of student activities while also finding out the factors or reasons that do not allow employees to be creative in their work field to highlight the positive points and address the negative aspects of the obstacles faced by those working in the field of student activities through the sports knowledge management scale.



The student activities in Iraqi universities have their own characteristics and goals that they always seek to achieve at the level of the university itself or at the level of the rest of the universities (Burgos Angulo et al., 2024), so they must have several components that qualify them to reach their goal represented in achieving championships and organizing them in the best possible way (Furegato Moraes et al., 2024), so those in charge of them must have several qualities, perhaps the most important of which are administrative duties that if studied correctly and applied according to correct scientific foundations will lead the workers to achieve the goals mentioned above, and that the management of sports knowledge for all joints of student activities in Iraqi universities has its role in the success of administrative work and holding workshops and courses is only components for its development, so it has become necessary to reach the levels of sports knowledge management among workers in departments, branches and units, which necessitated studying sports knowledge management from all its fields in order for it to become a study that has its impact on the level of student activities in Iraqi universities, as the many variables facing administrative work need continuous development from time to time and the acquisition of knowledge, so the researchers decided to study sports knowledge management in addition to identifying Strengths and enhancements, weaknesses and avoidance to achieve integrated sports knowledge management.

Research objective: Preparing and standardizing a sports knowledge management scale for student activity workers in Iraqi universities.

## Method

### Participants

The research group consisted of representatives from (33) universities, and the number of student activities was (1140). Table (1) shows the details of the research group. Either the research sample consisted of all members of the group because the requirements of the research required that in order to obtain objective results, the researcher could ignore some unanswered forms and those who gave up answering for some reason, so the sample was (740) people, that is, h. (400) people were expelled due to the above reasons. Subsequently, the researcher considered scientific conditions while selecting the sample and included them in the sample of the exploratory experiment (10) people. The sample size was (350) people, and the sample ratio was (380) people. Table (2) shows the distribution of the research sample.

Table 1. shows the details of the research community

Universities	Governorate	Total number	Universities	Governorate	Total number
Baghdad	Baghdad	71	Muthanna	Muthanna	29
Al-Mustansiriya	Baghdad	63	Samarra	Salah al-Din	21
Basra	Basra	49	Sumer	Dhi Qar	31
Mosul	Mosul	51	Al-Qasim Al-Khadra	Babylon	22
Technological	Baghdad	35	Nineveh	Mosul	26
Kufa	Najaf	39	Fallujah	Anbar	25
Tikrit	Salah al-Din	34	Jaber Bin Hayyan	Najaf	33
Al-Qadisiyah	Qadisiyah	36	Tal Afar	Mosul	25
Anbar	Anbar	33	Basra Oil and Gas	Basra	24
Iraqi	Baghdad	36	Al-Hamdaniya	Mosul	29
Babylon	Babylon	49	Information and Communication Technology	Baghdad	21
Al-Nahrain	Baghdad	37	Al-Karkh for Science	Baghdad	26
Diyala	Diyala	48	Ibn Sina	Baghdad	23
Karbala	Karbala	39	Northern Technical	Mosul	24
Kirkuk	Kirkuk	36	Southern Technical	Basra	23
Wasit	Wasit	35	Central Technical	Baghdad	26
Maysan	Maysan	37			1140

Table 2. Shows detailed information about study groups, sample size, study standardization, and exploratory experiments.

	Sample Type	Number	Percentage	Total Number
1	Survey Sample	10	1.35%	1140
2	Preparation Sample	350	30.70%	
3	Rationing Sample	380	33.33%	
4	Excluded	450	39.47%	
5	Total Sample	740	64.91%	

## Procedure

### Research Methodology

The researchers used the descriptive method with the survey method to suit the research (Saeed, Sabti et al., 2024).

### Methods and research tools

"Arab and foreign sources, Field visits to collect information, A special questionnaire for the purpose of identifying the most important areas and paragraphs for the Sports Knowledge Management Scale, "The International Electronic Information Network (Internet), Assistant work team, A personal computer (laptop) type (hp) made in China, An electronic calculator type (sony) made in China, A stopwatch type (casio)" (O. A. Ali et al., 2024), .

### Procedures for implementing the field research steps

#### Procedures for Preparing the (Sports Knowledge Management) Scale

After reviewing it, the researchers found no studies that, to their knowledge, addressed the research variables. Therefore, they created a scale (Mathematical Knowledge Management) for staff members of student activities in Iraqi public universities. The creation procedure included some steps that must be followed in order to achieve a scale that meets scientific conditions.

1- *Defining the idea of the scale*: "Defining the idea or phenomenon to be measured, which may be (a trait, characteristic, ability, or skill) in an accurate, clear, appropriate, and measurable manner, is done by giving a procedural definition that researchers adopt in constructing the scale, as defining the idea or phenomenon helps in identifying the main ideas that are adopted in constructing the scale" (Mohsen Latif Ahmed, 2006).

2- *Defining the goal of the scale (management of mathematical knowledge)*: "The goal of the scale must be clear, understandable, achievable, and consistent with the nature of the scale and its characteristics, which differ according to its goals, as it is the basic pillar and the first step that must be taken when constructing the scales, which is (management of mathematical knowledge) for those working in student activities in Iraqi government universities."

3- *Defining the scope of the scale (sports knowledge management)*: The researchers proposed and identified (5) domains and provided theoretical definitions for each domain (Appendix (1)). The researchers who were interested in the phenomena or concepts to be measured by these domains prepared a questionnaire and submitted it to many experts and specialists in the field of sports management, testing, and measurement. (17) Experts were asked to give their opinions on the validity of the fields and their definitions, as well as the possibility of adding or merging areas that they thought were appropriate and deleting or modifying inappropriate areas. They used the  $(K_a)^2$  test and accepted the domain scale, knowing that the  $(K_a)^2$  value and significance level (0.05) are shown in Table (3).

Table 3. shows the experts' agreement on the scopes of the sports knowledge management scale after using  $(K_a)^2$ 

	Areas	A number of experts agree	Number of experts who disagree	Calculated chi-square value	Significance value	Significance
1	Defining mathematical knowledge	17	0	17	0.000	moral
2	Administrative tasks and skills	16	1	13.23	0.000	moral
3	Employee participation in decision-making	17	0	17	0.000	moral
4	Information and communication technology	17	0	17	0.000	moral
5	Application of mathematical knowledge	17	0	17	0.000	moral

4- *Preparing paragraphs of the (Sports Knowledge Management) scale:* After determining the domains of the scale (mathematical knowledge management), the researcher developed a set of paragraphs for each domain and inserted them into the questionnaire; each paragraph expressed the inserted domain and according to the theoretical definition of the domain in which the paragraph was inserted, and determined the alternatives of the proposed answers to the scale, reaching the number of paragraphs in the initial form (57). Using the five-option selection method (Likert), a five-point scale with a gradient (strongly agree, agree, neutral, disagree, strongly disagree) was developed, and a ladder with positive paragraph scores of (5-1) and (1-5) was developed to set negative paragraphs, the content of which is as follows (4,17,36). Table (4) shows the Ka square test of the scale, indicating that if the significance value < (0.05), the significance value is significant.

Table 4. Shows the validity of the paragraphs of the Sports Knowledge Management scale

no	Paragraphs	Appropriate	Inappropriate	Ka2	Value of significance	Significance
1	1	11	6	1.47	0.225	Non-moral
2	2	17	0	17	0.000	moral
3	3	17	0	17	0.000	moral
4	4	17	0	17	0.000	moral
5	5	17	0	17	0.000	moral
6	6	17	0	17	0.000	moral
7	7	17	0	17	0.000	moral
8	8	14	3	7.11	0.008	moral
9	9	17	0	17	0.000	moral
10	10	17	0	17	0.000	moral
11	11	17	0	17	0.000	moral
12	12	14	3	7.11	0.008	moral
13	13	17	0	17	0.000	moral
14	14	13	4	4.76	0.029	moral
15	15	17	0	17	0.000	moral
16	16	14	3	7.11	0.008	moral
17	17	17	0	17	0.000	moral
18	18	14	3	7.11	0.008	moral
19	19	17	0	17	0.000	moral
20	20	17	0	17	0.000	moral
21	21	17	0	17	0.000	moral
22	22	9	8	0.05	0.808	moral
23	23	14	3	7.11	0.008	moral
24	24	14	3	7.11	0.008	Non-moral
25	25	14	3	7.11	0.008	Moral
26	26	9	8	0.05	0.808	Moral
27	27	17	0	17	0.000	Moral
28	28	17	0	17	0.000	Moral
29	29	14	3	7.11	0.008	Moral
30	30	14	3	7.11	0.008	Moral
31	31	17	0	17	0.000	Moral
32	32	17	0	17	0.000	Moral
33	33	17	0	17	0.000	Moral
34	34	17	0	17	0.000	Moral
35	35	17	0	17	0.000	Moral
36	36	17	0	17	0.000	Moral
37	37	17	0	17	0.000	Moral
38	38	16	1	13.23	0.000	Moral
39	39	16	1	13.23	0.000	Non-moral
40	40	16	1	13.23	0.000	Moral
41	41	16	1	13.23	0.000	Moral
42	42	13	4	4.76	0.029	Moral
43	43	17	0	17	0.000	Moral
44	44	16	1	13.23	0.000	Moral
45	45	17	0	17	0.000	Moral
46	46	9	8	0.05	0.808	Moral
47	47	17	0	17	0.000	Moral
48	48	17	0	17	0.000	Moral
49	49	17	0	17	0.000	Moral
50	50	17	0	17	0.000	Moral
51	51	17	0	17	0.000	Moral
52	52	17	0	17	0.000	Moral
53	53	17	0	17	0.000	Moral
54	54	17	0	17	0.000	Moral
55	55	17	0	17	0.000	Moral
56	56	17	0	17	0.000	Moral
57	57	17	0	17	0.000	Moral

### The main experiment for preparing the (Sports Knowledge Management) scale

After the researcher came up with the initial formula for the scale, he applied it to the members of the numerical sample, which was (350) people, with the help of the assistant work group. After completing the main experiment, the researcher arranged and modified the scale shape and recorded the results in preparation for statistical analysis. In addition, the descriptive characteristics of the sample and the response values of the (350) people were determined. This confirmed that the sample members in the research scale were naturally distributed and showed feasibility (5).

Table 5. Showing descriptive characteristics of the sample used to create the "Knowledge Management in Sports" scale

Characteristics	Mean	Median	Standard Deviation	Skewness	Standard Error	Lowest Score	Highest Score
Knowledge Management	167.205	168.000	11.291	.0870	.1300	137.00	203.00

### Statistical analysis of the scale items

The researchers analyzed the results of the sample of preparing the (Sports Knowledge Management) scale. The statistical analysis included several procedures, including:

#### 1- Discriminating ability (strength):

Table 6. The ability of each item in the "Sports Knowledge Management" scale to distinguish between the upper and lower groups is shown.

no	Lower group		Top Group		Calculated value of (t)	Significance value	Result
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
1	2.520	.6835	4.722	.4497	-26.091	0.000	Moral
2	2.273	.6784	4.542	.5008	-26.050	0.000	Moral
3	2.581	.5756	4.627	.4860	-26.284	0.000	Moral
4	2.644	.5624	4.570	.4970	-24.871	0.000	Moral
5	2.520	.6346	4.402	.4933	-22.710	0.000	Moral
6	1.000	.0000	2.071	.7792	-13.368	0.000	Moral
7	2.751	.4791	4.530	.5014	-24.824	0.000	Moral
8	2.573	.5386	4.445	.4997	-24.704	0.000	Moral
9	1.000	.0000	2.000	.7758	-12.493	0.000	Moral
10	1.000	.0000	1.871	.7067	-11.964	0.000	Moral
11	1.988	.7256	4.265	.4441	-25.934	0.000	Moral
12	2.445	.6326	4.530	.5015	-25.032	0.000	Moral
13	2.275	.5754	2.275	.5754	-27.210	0.000	Moral
14	2.147	.5670	4.403	.4932	-28.505	0.000	Moral
15	2.562	.5966	4.233	.4255	-22.266	0.000	Moral
16	2.137	.6151	4.286	.4548	-27.172	0.000	Moral
17	2.318	.5903	4.211	.4113	-26.361	0.000	Moral
18	2.403	.5548	4.413	.4952	-26.871	0.000	Moral
19	2.094	.6402	4.477	.5021	-26.996	0.000	Moral
20	2.328	.6287	4.265	.4441	-26.684	0.000	Moral
21	1.977	.6041	4.541	.5007	-29.924	0.000	Moral
22	2.360	.5456	4.371	.4860	-27.005	0.000	Moral
23	1.945	.2255	4.413	.4952	-34.074	0.000	Moral
24	2.296	.5452	3.020	.2061	-27.157	0.000	Moral
25	1.945	.2255	4.286	.4548	-28.903	0.000	Moral
26	1.935	.2456	3.041	.2900	-41.967	0.000	Moral
27	2.000	.6045	3.000	.0000	-30.239	0.000	Moral
28	2.147	.5670	4.445	.4997	-29.469	0.000	Moral
29	2.137	.4993	4.445	.4997	-30.931	0.000	Moral
30	1.935	.2456	4.340	.4762	-36.862	0.000	Moral
31	2.084	.5418	3.020	.1450	-30.172	0.000	Moral
32	2.137	.4993	4.265	.4441	-30.971	0.000	Moral
33	1.935	.2456	4.350	.4797	-39.085	0.000	Moral
34	2.084	.5418	3.010	.1030	-30.182	0.000	Moral
35	2.000	.0000	4.254	.4382	-37.295	0.000	Moral
36	2.000	.0000	4.000	.0000	-39.721	0.000	Moral
37	2.000	.0000	3.807	.4700	-45.023	0.000	Moral
38	2.000	.0000	3.860	.4542	-39.481	0.000	Moral
39	2.000	.0000	3.839	.3962	-34.672	0.000	Moral
40	2.000	.0000	3.977	.4858	-52.291	0.000	Moral
41	2.000	.0000	3.860	.5204	-65.880	0.000	Moral
42	2.000	.0000	4.062	.3825	-59.917	0.000	Moral
43	2.000	.0000	4.105	.3098	-65.881	0.000	Moral
44	2.000	.0000	4.073	.3355	-69.917	0.000	Moral
45	2.000	.0000	4.105	.3098	-72.061	0.000	Moral
46	2.000	.0000	4.062	.2860	-26.975	0.000	Moral





47	2.520	.5021	4.084	.2804	-53.480	0.000	Moral
48	2.073	.2638	4.052	.2255	-68.685	0.000	Moral
49	2.000	.0000	4.062	.2456	-70.610	0.000	Moral
50	2.010	.1030	4.094	.2957	-39.744	0.000	Moral
51	2.158	.3680	4.073	.2638	-68.380	0.000	Moral
52	2.030	.1766	4.094	.2957	-88.230	0.000	Moral
53	2.000	.0000	4.052	.2255	-47.947	0.000	Moral

Significant < 0.05 at (186) degrees of freedom.

## 2- Internal consistency coefficient:

*First:* The relationship between the paragraph score and the total score of the scale:

Table 7. Displays the correlation coefficient between the paragraph score and the total score of the Mathematical Knowledge Management Scale

Paragraph No.	Simple Correlation Coefficient	Significance Value	Result	Paragraph No.	Simple Correlation Coefficient	Significance Value	Result
1	.185**	0.001	Moral	28	.188**	0.000	Moral
2	.150**	0.005	Moral	29	.366**	0.000	Moral
3	.225**	0.000	Moral	30	0.032	0.549	Non-moral
4	0.011	0.455	Non-Moral	31	.172**	0.001	Moral
5	.147**	0.006	Moral	32	.358**	0.000	Moral
6	.154**	0.004	Moral	33	0.029	0.585	Non-moral
7	.124*	0.002	Moral	34	.172**	0.001	Moral
8	.193**	0.000	Non-Moral	35	.145**	0.001	Moral
9	0.019	0.725	Moral	36	.299**	0.000	Moral
10	.239**	0.000	Moral	37	Moral	Moral	Moral
11	.333**	0.000	Moral	38	Non-moral	Non-moral	Non-moral
12	.329**	0.000	Moral	39	Moral	Moral	Moral
13	.325**	0.000	Moral	40	Moral	Moral	Moral
14	.324**	0.000	Moral	41	Moral	Moral	Moral
15	0.022	0.541	Non-moral	42	Non-moral	Non-moral	Non-moral
16	.397**	0.000	Moral	43	Moral	Moral	Moral
17	.267**	0.000	Moral	44	Moral	Moral	Moral
18	.341**	0.000	Moral	45	Moral	Moral	Moral
19	.254**	0.000	Moral	46	Moral	Moral	Moral
20	.255**	0.000	Moral	47	Moral	Moral	Moral
21	.309**	0.000	Moral	48	Moral	Moral	Moral
22	.183**	0.001	Moral	49	Immoral	Immoral	Immoral
23	0.063	0.24	Non-moral	50	Moral	Moral	Moral
24	.269**	0.000	Moral	51	Moral	Moral	Moral
25	0.079	0.139	Non-moral	52	Moral	Moral	Moral
26	.345**	0.000	Moral	53	Moral	Moral	Moral
27	.342**	0.000	Moral				

Significant at a significance level > 0.05

Table 8 shows that most of the paragraphs of the sports knowledge management scale are significant except for paragraphs (4, 9, 15, 23, 25, 30, 33, 38, 42, 53), so they were excluded from the scale, so the scale became (43) paragraphs.

*Second:* The relationship of the paragraph to the field:

Table 8. shows the correlation coefficient between the paragraph score and the total score of the field for the sports knowledge management scale

Paragraph No.	Simple Correlation Coefficient	Significance Value	Result	Paragraph No.	Simple Correlation Coefficient	Significance Value	Result
First domain: Defining mathematical knowledge				22	.488**	0.000	spiritual
				23	.782**	0.000	spiritual
1	0.069	0.196	Non-moral	Fourth field: Information communication technology			
2	.413**	0.000	Moral	24	.155**	0.006	spiritual
3	.236**	0.000	Moral	25	.377**	0.000	spiritual
4	.369**	0.000	Moral	26	.581**	0.000	spiritual
5	0.024	0.659	Non-moral	27	.663**	0.000	spiritual
6	-0.049	0.364	Non-moral	28	0.019	0.725	Non-moral
7	.335**	0.000	Moral	29	.690**	0.000	Moral
Second field: administrative tasks and skills				30	.667**	0.000	Moral
8	<b>0.026</b>	<b>0.512</b>	Non-moral	31	0.063	0.24	Moral
9	.484**	0.000	Moral	32	.616**	0.000	Non-moral
10	.514**	0.000	Moral	Fifth field: Application of mathematical knowledge			
11	0.038	0.473	Non-moral	33	.487**	0.000	Moral
12	.598**	0.000	Moral	34	.481**	0.000	Moral
13	.533**	0.000	Moral	35	.497**	0.000	Moral



14	.546**	0.000	Moral	36	.447**	0.000	Moral
15	0.094	0.08	Non-Moral	37	.358**	0.000	Moral
16	.482**	0.000	Moral	38	.372**	0.000	Moral
17	.441**	0.000	Moral	39	.465**	0.000	Moral
Third area: Employee participation in decision-making				40	.404**	0.000	Moral
18	.252**	0.000	Moral	41	.515**	0.000	Moral
19	.475**	0.000	Immoral	42	.455**	0.000	Moral
20	0.093	0.083	Immoral	43	.465**	0.000	Moral
21	.546**	0.000	Moral				

Significant at a significance level > 0.05

From the above table, all the paragraphs in the knowledge management scale, except paragraphs (1, 5, 6) in the first area, paragraphs (8, 11, 15) in the second area, paragraphs (20) in the third area and (28, 32) in the fourth area are statistically significant at the significance level (0.05).

*Third:* The relationship between the domain score and the total score of the scale:

Table 9. Displays the correlation coefficients between the domains and the total score of the Mathematical Knowledge Management Scale

Domain number	Scope	Simple Correlation Coefficient	Significance Value	Result
1	Defining mathematical knowledge	.379**	0.000	spiritual
2	Administrative tasks and skills	.603**	0.000	spiritual
3	Employee participation in decision-making	.502**	0.000	spiritual
4	Information and communication technology	.544**	0.000	Moral
5	Application of mathematical knowledge	.562**	0.000	Moral

### Reliability:

#### 1. Split-half:

Applying this method to the Sports Knowledge Management scale, a correlation coefficient (0.783) was obtained, indicating a correlation of half the paragraphs. The researchers then determined the Spearman-Brown coefficient, which resulted in a value (0.589) that represents a high stability value.

#### 2. Cronbach's alpha coefficient:

When the Sports Knowledge Management Scale was applied to a sample of (350) student activity employees, the stability coefficient was determined to be (0.744), which is a relatively high stability value.

#### Final preparation of the scale

After completing the construction process and finalizing the final form of the scale, the Sports Knowledge Management Scale (34) contains paragraphs divided into five domains, as shown in Table (10).

Table 10. Shows the scale in its final form

	Domain Name	Number of phrases
1	Defining Mathematical Knowledge	4
2	Administrative Tasks and Skills	7
3	Employee Participation in Decision Making	5
4	Information and Communication Technology	7
5	Application of Mathematical Knowledge	11
	the total	34

### The main experiment to standardize the sports knowledge management scale

After the scale was ready for use, the researcher, with the help of a team of assistants, applied it to a standardization sample of 380 student activity personnel. Due to the situation mentioned by the researcher in the design of the experiment, the same method was used when distributing the forms. After completing the implementation of the main standardization experiment, the researcher organized the questionnaire forms, made corrections, and recorded the results in preparation for analysis.



## Data analysis

The researchers used the SPSS system to extract statistical coefficients and all the content that led to the study results (Awad et al., 2024),(Mohammed Hammood, Hussein Rashid, Adham Ali, et al., 2025).

## Results

### *Standardization of the scale (mathematical knowledge management)*

The data were unloaded and statistically processed, and some descriptive statistics were extracted, as shown in Table (11).

Table 11. The arithmetic mean, standard deviation, skewness coefficient, maximum and minimum values of the standardized sample sports knowledge management scale

Scale	Mean	Standard Deviation	Coefficient of Skewness	Median	Low	High
Sports Knowledge Management	118.618	6.095	-0.151	119.000	100.0	134.0

### *Standard scores of the mathematical knowledge management scale for the rationing simple*

Table 12. Shows the standard scores (z and t) for the mathematical knowledge management scale.

No.	Raw Score	Standard Score	Adjusted Standard Score	No.	Raw Score	Standard Score	Adjusted Standard Score
1	100	-3.0546	19.45	18	118	-0.1014	48.99
2	102	-2.7265	22.73	19	119	0.0626	50.63
3	103	-2.5624	24.38	20	120	0.2266	52.27
4	104	-2.3984	26.02	21	121	0.3907	53.91
5	105	-2.2343	27.66	22	122	0.5548	55.55
6	106	-2.0702	29.3	23	123	0.7188	57.19
7	107	-1.9062	30.94	24	124	0.8829	58.83
8	108	-1.7421	32.58	25	125	1.0470	60.47
9	109	-1.5780	34.22	26	126	1.2110	62.11
10	110	-1.4140	35.86	27	127	1.3751	63.75
11	111	-1.2499	37.5	28	128	1.5392	65.39
12	112	-1.0858	39.14	29	129	1.7032	67.03
13	113	-0.9218	40.78	30	130	1.8673	68.67
14	114	-0.7577	42.42	31	131	2.0314	70.31
15	115	-0.5936	44.06	32	132	2.1954	71.95
16	116	-0.4296	45.7	33	133	2.3595	73.6
17	117	-0.2655	47.34	34	134	2.5236	75.24

### *Standard levels of (Mathematical Knowledge Management Scale for Rationing Sample)*

Table 13. Shows the specified levels and percentages in the normal distribution as well as the raw and standardized values (Z and T) and the number and percentage of exercises for the Sports Knowledge Management Scale for the standardized sample

Percentage determined in the normal distribution	Raw score	z-score limits	Standard score limits T	Sample number	percentage
2.14% Very good	131- and above	2.03142 and above	70.31- and above	6	1.75%
13.59% Good	130- 125	1.867-1.047	68.67-60.47	60	15.78%
68.27% Average	124-113	0.882--0.92	58.83-40.78	256	67.36%
13.59% Acceptable	-107112	-1.906-1.08	- 30.9439.14	49	12.89%
2.14% Poor	106 - and below	2.07028- and below	29.3 - and below	9	2.36%

## Discussion

### *Standard scores of the mathematical knowledge management scale for the rationing sample*

The validity and reliability of the mathematical knowledge scale with its dimensions, which include mathematical knowledge, its discovery, possession, application, and communication, were verified by verifying the validity and reliability of the tool, and thus, it becomes ready for application in scientific



research to work on finding realistic solutions according to standard scores that come from processing the raw primary data with accurate scientific methods.

The standards are a set of scores derived by specific statistical methods from the raw scores and are used to compare the performance level of a specific individual with the performance level of the group to which he belongs by deviating any score from the arithmetic mean of that group (Al-Alwani & Ali, 2023). "As the score that an individual obtains in a test of a scale (raw score) has no meaning in itself and is not suitable for comparison with his score in other tests and scales or with the score of another person on the same test or on other tests unless it is converted into standard scores. The standards are therefore important because they express how others perform on the test, thus providing a basis for comparison" (Douglas N. Hasted & Alan C, 1998), (Gómez-Barrios et al., 2024)

The researcher extracted the standard scores of the Mathematical Knowledge Management Scale by converting the raw scores into standard scores (Z scores, adjusted T scores) as shown in Table (12) because the Z score is derived according to the law used (Z value) (raw value-arithmetic mean/standard deviation) and then the standard is converted into Z score according to the following equation (standard  $\times 10+50$ ).

The study (Hasan Alkhaldi,2022, pp. 1-10) points out that preparing and standardizing the mathematical knowledge scale will contribute to developing mathematical knowledge and exchanging it among sample members and using it effectively in a collaborative manner between them, which motivates them to perform in professional harmony according to standard grades that indicate the amount of mathematical knowledge as a basis for subsequent development.

It is clear from the study (WOHLFART. et al., 2022, p163-176) that the process of developing a tool for cognitive competence in sports management in higher education institutions with a scale that includes 46 elements, with its six dimensions of social competence, work competence, personal competence, digital competence, general management competence, and sports management competence within a table showing the average, variance, and reliability of the six dimensions calculated from raw and initial data for standards and standard levels that serve sports competence in an accurate and codified manner.

#### *Standard levels of (Mathematical Knowledge Management Scale for Rationing Sample)*

As can be seen from the table above, the percentage obtained for the mathematics knowledge management scale at level one (very good) is (1.75%), which is lower than its percentage in the normal distribution. The percentage that reaches level two (good) is (15.78%), which is higher than the normal percentage of the normal distribution; the percentage that reaches level three (average) is (67.36%), which is lower than the normal percentage specified in the normal distribution. He scored level four (acceptable) (12.89%), which is lower than the normal percentage, and scored level five (weak) (2.36%), which is higher than the percentage in the determined normal distribution.

This shows that those who are engaged in student activities have an acceptable average view of the scale of sports knowledge management "because knowledge represents a new production process that is realized through knowledge stored in the technical"(Hummadi et al., 2024), "human and material resources of individuals or organizations or local communities"(Nusri et al., 2024). Knowledge is mixed, and each member of the student activities has his own ideas about the type of knowledge he likes and his professional experience"(O. A. Ali et al., 2023).

The researchers attributed these levels of standards to the fact that the management of student activities in modern times, especially at the general education stage, is affected by technological progress and development and its variables, and its application relies on modern scientific theories, "which is why in the management of student activities, it is always more urgent to apply sports knowledge management and make it the basis of management processes" (O. Ali & Hamid, 2021). Therefore, "student activities require the constant availability of data and information and the transmission of this data in a clear and correct way, which contributes to the development of their performance" (Picardo et al., 2024).



## Conclusions

- The sports knowledge management scale has proven its validity in measuring what it was designed for.
- The ease of applying the sports knowledge management scale to the construction and standardization sample.
- The standard grades and levels for the sports knowledge management scale for student activity workers in Iraqi universities were reached.
- Acceptability of sports knowledge management for the research sample.

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Appendix 1  
Sports Knowledge Management Scale Fields and Definitions

- Knowledge Management: Knowledge management is the backbone of institutions and a contemporary administrative means to adapt to modern development. Knowledge management is defined as "the balance that is formed from the results of scientific research, thinking, field studies, and the development of innovative projects and other forms of human intellectual production over time" (Abdul Sattar Al-Ali & Amer Qandalaji, 2006).
- Diagnosis: "The process of diagnosing knowledge is considered the first stage of knowledge processes, as through this process it becomes possible to identify the type of knowledge available to the organization or its human resources in order to determine the gap" (Salah Al-Din Awad Al-Kubaisi, 2006).
- Generation: "The process of finding innovations, creativity, experiences and skills that produce knowledge through the collaborative process of work within the organization" (Hani Hijazi, 2005)
- Administrative skill: "It is the ingenuity and cleverness that enables managers to perform the administrative tasks and functions required of them in a sound and distinguished manner" (Ali Gharb & Ismail Qira, 2007).
- Information and communication technology: "The process by which the behavior of groups within organizations is modified by means of messages and information necessary for the continuation of the administrative process in a way that enables all concerned parties to be aware of the issues" (Salah Al-Shanwani, 1983).
- Knowledge application: "It is considered the most important knowledge management process. Organizations work to apply it in order to produce new knowledge that the organization uses when it is needed" (Gamal Badir, 2010).

Appendix 2  
Sports Knowledge Management Scale in its final form

Mr. ....  
Respected

Greetings ...

The researchers aim to conduct the research entitled (Preparing a Sports Knowledge Management Scale and Standardizing it for Employees in Student Activities Departments in Iraqi Universities) and since you represent the research sample, the researchers kindly ask you to answer the attached scale paragraphs and choose one alternative for each of the following paragraphs and take care not to repeat or cross out the scale by placing a mark ( ) inside the box that parallels the paragraph and under the appropriate alternative for you:

- 1- Note that the answers will be confidential.
- 2- There is no correct or incorrect paragraph.

With thanks and appreciation

Signature /  
Name /  
Academic achievement /  
Academic title /  
Specialization /  
Place of work /

No.	Paragraphs	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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- 1 Communications with other scientific departments contribute to the spread of the concept of sports knowledge management
- 2 The department provides channels for electronic communication with its members
- 3 The department's keeping pace with technological development facilitates the receipt of sports knowledge for its employees
- 4 The latest Internet system in the department provides easy ways to access information in the sports field
- 5 The extracurricular student activities departments apply sports knowledge in order to form the creative abilities of athletes
- 6 The student activities departments are interested in conducting intensive communications to obtain general and specific sports knowledge
- 7 The departments encourage their employees to develop and apply their knowledge through the use of new methods and techniques
- 8 Sports knowledge management contributes to discovering the capabilities and experiences of the department's employees
- 9 The department has an appropriate mechanism that facilitates the acquisition of sports knowledge for its employees
- 10 An atmosphere of trust and cooperation prevails among the employees in the department.
- 11 The university presidency has the information that makes it easy for those who join it to obtain knowledge.
- 12 The department's management has the experience and competence to help spread the concept of sports knowledge management to any athlete.
- 13 Including scientific seminars, workshops, and meetings within the annual curriculum prepared by the department's management
- 14 Universities encourage their employees to communicate with each other to exchange knowledge of sports and physical sciences.
- 15 The inability of the department's management to determine its future vision in sports information and knowledge
- 16 The application of knowledge in general and sports, in particular, is linked to the strategic plan of the university and the department of extracurricular activities.
- 17 The workers in the department of extracurricular student activities interact with each other in order to apply sports knowledge to their activities.
- 18 Universities spread a culture that supports the effective application of knowledge in students' sports activities.
- 19 The success of the work of the student activities department depends on the extent of the application of knowledge management in general and sports in particular.
- 20 The department is interested in applying the new knowledge generated in the field of sports and sports sciences.
- 21 The department takes into account the evaluation of its members through their culture in using modern technologies.
- 22 Knowledge management is applied to solve problems facing sports work and its sciences.
- 23 Making sound sports decisions, the administration, as a result of its possession of scientific sports knowledge
- 24 Universities use incentives and rewards to exchange sports knowledge among workers in sports activities.
- 25 Student activities departments encourage their workers to participate with their knowledge in sports activities.
- 26 The university has experts to follow up on how to apply sports knowledge in each department concerned with the field of Athlete.
- 27 I receive support from higher officials to apply and disseminate sports knowledge among my colleagues in various sports activities.

- 28 The scientific and sports experience possessed by those working on disseminating and applying knowledge contributes to sports performance.
- 29 Student activities departments rely on the competencies and experiences of those working in physical education and sports sciences.
- 30 The departments do not rely on precise scientific foundations in training to preserve sports knowledge.
- 31 Scientific teams or committees are prepared within the departments that contribute to obtaining sports knowledge in physical activities.
- 32 The department management is interested in identifying precise scientific information that contributes to achieving sports goals.
- 33 Knowledge is collected on the physical and sports side, which contributes to the advancement of the departments in an organized scientific manner.
- 34 Individuals within the department can exchange sports knowledge.
-