Modern Sport

Volume 24
Issue 3 *Special Issue of the Third International Scientific Conference, Titled (Artificial Intelligence and Its Role in the Cognitive Creativity of Sports Science)*

Article 6

7-25-2025

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Recommended Citation

Eidan, Hind Basim and Ali, Intisar Awaid (2025) "Cognitive Representation and Its Relationship with the Performance of the Side Kick and Back Kick Skills among Taekwondo Juniors Aged 12–14 Years," *Modern Sport*: Vol. 24: Iss. 3, Article 6.
DOI: https://doi.org/10.54702/2708-3454.2077

MODERN SPORT 2025;24:312–319

SPECIAL ISSUE ARTICLE

Cognitive Representation and Its Relationship with the Performance of the Side Kick and Back Kick Skills among Taekwondo Juniors Aged 12–14 Years

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Abstract

Taekwondo is considered one of the athletic activities that contribute significantly to the holistic development of the individual by fostering the acquisition of knowledge and experience. Contrary to the common misconception that it is merely a form of combat or physical confrontation; taekwondo involves movements that engage both physical and mental activity. This interplay supports the balanced and comprehensive development of the practitioner, thereby enhancing individual efficiency and performance. The aim of the present study was to investigate the relationship between cognitive representation and the performance of the side kick and back kick skills among junior taekwondo athletes aged 12 to 14 years. The researchers hypothesized that there would be a statistically significant correlation between the results of the cognitive representation scale and the outcomes of the skill tests for the side kick and back kick in this age group. A descriptive correlational approach was adopted, as it aligns with the nature of the research. The researchers utilized the Cognitive Representation Scale developed by Al-Shuwaili (2018). The research population consisted of 110 junior taekwondo athletes aged 12 to 14 years, registered with clubs in Baghdad Al-Rusafa for the 2024–2025 season. Data analysis was conducted using SPSS software. Pearson's correlation coefficient, Cronbach's alpha, arithmetic means, and standard deviations were employed for statistical processing. The results indicated a statistically significant correlation between cognitive representation and the performance of both the side kick and the back kick among junior athletes. In light of these findings, the researchers recommend the incorporation of educational strategies aimed at enhancing and developing cognitive representation within the field of taekwondo. And this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

Keywords: Cognitive representation, (Side kick, Back kick) in taekwondo

1. Introduction

Taekwondo has been practiced since ancient times and is considered one of the most prominent individual combat sports. It is a martial art practiced by people of all ages and by both genders. Taekwondo follows specific rules and regulations, which enable the practitioner to perform techniques effectively and gain an advantage over opponents during competition (Jabari, 2018).

Taekwondo is distinguished by a set of fundamental techniques from which various derived skills branch out. Each technique has its specific applications during matches, and the use of these techniques varies depending on the context of the bout "Each technique has its own importance and specific purpose. Some techniques are aimed at scoring winning points, while others focus on executing defensive and offensive strategies, such as surprise attacks, feints, or forcing the opponent to open openings that allow for the execution of strategies and point scoring." (Zahran, 2004, p 23).

The cognitive representation and storage of information is a critical issue that has captured the interest of researchers throughout the ages. In the field of motor skill learning, researchers have

Received 4 March 2025; revised 24 March 2025; accepted 4 April 2025.
Available online 25 July 2025

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https://doi.org/10.54702/2708-3454.2077

made extensive efforts to study how information is cognitively represented and stored, in order to understand the nature of the format, structure, form, or configuration through which knowledge is represented and the researchers in the field of motor skill learning have made extensive efforts to investigate how information is cognitively represented and stored, in order to gain a deeper understanding of the nature of the format, structure, form, or configuration through which knowledge is mentally represented, In addition, it involves explaining the processes through which knowledge is represented, and how individuals organize and restructure their cognitive mental representations whether sequentially, simultaneously, or through a combination of both. It also examines how the execution of cognitive processes can be harmonized with accuracy, speed, and coherence in a manner that 'reflects a degree of differentiation and integration in the patterns of processing these operations (Al-Zayyat, 1998).

Cognitive representation is a fundamental aspect of all types of human knowledge, as the information derived from sensory experiences is encoded in a way that links it to the content stored in the brain. It is a process of extracting information from sensory input and integrating it with what is already stored in memory "Each individual represents environmental stimuli differently from others, which can cause some difficulties in the communication process. However, the degree of similarity in how we represent environmental elements is sufficient to help us coexist with one another." (Mohammed & Issa, 2011, p. 29).

To study the process of cognitive representation, it is essential to discuss cognitive structure, as they are two sides of the same coin. The cognitive structure represents the outcome of the representation process and the forms shaped by different mental processes of the represented information. learning is also considered to be closely linked to all cognitive processes, as it often requires the learner to engage in attention, imagination, thinking, and other mental functions. However, one of the factors that hinders effective motor learning is the low efficiency of cognitive representation "It becomes difficult for the learner to connect new information with the content already existing in their cognitive structure which leads to difficulty in identifying relationships between new and prior knowledge. As a result, the learner's use of that information becomes inappropriate and their processing of information is consequently weak." (Dania & Alwan, 2023, p 6).

Therefore, the significance of the study lies in the need for coaches to give attention to mental aspects, including cognitive representation, during instructional units this is because it plays an important role in developing the practical aspect of organizing and processing stimuli whether they are visual or perceptual, as well as encoding and symbolizing them in a meaningful way, in order to help the player with regulation and guidance to enhance both skill and cognitive levels in understanding techniques and increasing performance effectiveness,Therefore, the two researchers aimed to study the relationship between cognitive representation and the performance of the side kick and back kick skills among Taekwondo juniors aged 12–14 years.

The research problem lies in the fact that failure or underperformance in Taekwondo may be attributed to internal factors that exceed the athletes' abilities and capacities, or to external factors beyond their control. These circumstances can lead to failure, surrender, and a cessation of producing the appropriate responses required for correct motor performance. This is primarily due to a weak ability to cognitively represent and process information in this sport and to deal with it effectively. Accordingly, the current research problem is shaped by the need to answer the following question:

Is there a relationship between cognitive representation and the performance of the side kick and back kick skills among junior Taekwondo athletes aged 12–14 years?

The study aimed to identify the relationship between cognitive representation and the performance of the side kick skill among junior Taekwondo athletes aged 12–14 years. This study hypothesized that there is a statistically significant correlation between the results of the cognitive representation scale and the performance results of the side kick and back kick skills among junior Taekwondo athletes aged 12–14 years.

The scope of the study included the following:

- **Human Domain:** Junior taekwondo athletes aged 12 to 14 years from clubs located in Baghdad Al-Rusafa during the 2024–2025 season.
- **Temporal Domain:** The period from December 19, 2024, to February 27, 2025.
- **Spatial Domain:** Taekwondo training halls within clubs in Baghdad Al-Rusafa for the 2024–2025 season.

2. Methodology and procedures

"The nature of the research, its hypotheses, and its plan which control the steps of its implementation and the selection of tools such as the necessary tests (Liqaa et al., 2024, p. 344). The research population was determined as Taekwondo juniors aged 12–14 years from Baghdad Al-Rusafa clubs for the year

Table 1. Distribution of the Research Population and Samples.

No	Centers and Clubs	Total Population	Excluded People	Research Sample Distribution		
				Preparation Sample	Pilot Study Sample	Main Experiment Sample
1	National Center for Sports Talent Care / Baghdad	24	6	_	_	18
2	National Center for Sports Talent Care / Bismayah	16	2	14	_	_
3	Baghdad Specialized Sports Center	15	2	13	_	_
4	Olympic Champion School	15	4	11	_	_
5	Al-Arabi Sports Club	12	1	11	_	_
6	Al-Hashd Al-Shaabi Club	11	2	9	_	_
7	Amanat Baghdad Club	9	3	6	_	_
8	Bismayah Club	8	2	_	6	_
	Total	110	22	64	6	18

Table 2. shows the homogeneity of the research sample in the variables (height, mass, age, training age, Raven's intelligence level test).

No	Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness Coefficient	Distribution
1	Height	cm	155.111	155,500	7,226	0,542	Normal
2	Mass	kg	43,805	44,100	7,821	0,541	Normal
3	Chronological Age	year	12,944	13,000	0,872	0,116	Normal
4	Training Age	month	10,222	6,500	12,711	0,878	Normal
5	Intelligence	degree	99,111	102,000	19,241	0.129	Normal

2024/2025, totaling 110 junior players. The research sample consisted of 88 players (80%) who were committed to the tests. From this sample, 64 players (72%) were randomly selected by lottery to participate in the pilot experiment for conducting the scientific procedures required for the statistical analysis of the scale. Additionally, six players representing 6.8% were selected to form the pilot experiment sample. As for the main study sample it consisted of 18 players accounting for 16.36%. Thus, the total percentage of the sample drawn from the study population was 95.16%, as shown in Table 1. The homogeneity of the sample was verified in relation to certain extraneous variables that might cause outliers in the results of the dependent variable tests as presented in Table 2

Table 2, which presents the statistical descriptions, clearly indicates that all data related to the study variables are homogeneous, normally distributed, and free from skewness. The following tools, instruments, and resources were utilized to conduct the study: Arabic and foreign sources, peer-reviewed scientific journals, the World Wide Web (Internet), a regulation-compliant taekwondo hall with its necessary equipment, an electronic scoring device specific to taekwondo (electronic headgear), three electronic foot sensors, three electronic chest protectors, and a stopwatch.

The statistical description of the data obtained from the study sample pertains to the cognitive representation scale and the performance tests for the side kick and back kick skills among junior taekwondo athletes aged 12–14 years. After reviewing numerous scientific sources and references addressing cognitive representation, the researchers adopted the Cognitive Representation Scale developed by Al-Shuwaili (2018) (Appendix 2). The scale was reviewed by a panel of experts and specialists (Appendix 3) to establish content validity.

Internal consistency validity for the scale items was calculated, yielding values ranging from 0.709 to 0.845. Test–retest reliability was assessed after a 20-day interval, with correlation coefficients ranging from 0.46 to 0.501. Additionally, Cronbach's alpha values ranged between 0.658 and 0.778, indicating that the scale is capable of producing consistent results upon repeated administration.

As for the skill performance tests, the researchers selected the side kick and back kick performance assessments based on the work of Al-Hayali, 2015, p. 37) (Appendix 3).

The researchers conducted the pilot study on a sample of six junior taekwondo athletes drawn from the original population but excluded from the main research sample. The initial administration took place on Thursday, January 30, 2025, and was repeated on Thursday, February 6, 2025, with the assistance of the supporting team (Appendix 1). The purpose of the pilot study was to identify potential difficulties the researchers might encounter during the main experiment, determine the appropriate time required to complete the Cognitive Representation Scale, assess the clarity of the scale items for the respondents,

Table 3. Presents the mean, standard deviation, correlation coefficient for paired samples, test significance level, and statistical significance of differences between cognitive representation and side kick performance in taekwondo.

Research Variables	Mean	Standard Deviation	Correlation Coefficient	Significance Level	Type of Significance
Cognitive Representation	106.414	6.911	0.815	0.002	Significant
Side Kick Skill	9.666	3.000			

Table 4. Presents the mean, standard deviation, correlation coefficient for paired samples, test significance level, and statistical significance of differences between cognitive representation and back kick performance in taekwondo.

Research Variables	Mean	Standard Deviation	Correlation Coefficient	Significance Level	Type of Significance
Cognitive Representation	106.414	6.911	0.912	0.001	Significant
Back Kick Skill	6.888	1.033			

evaluate the execution of the skill performance tests, ensure the functionality and safety of the sports equipment, and verify the efficiency of the supporting team.

Subsequently, the main experiment was conducted with the study sample. The Cognitive Representation Scale was distributed at 4:00 p.m., followed by the performance tests administered one hour after the completion of the scale responses, on Sunday, February 9, 2025. The collected data were processed using the Statistical Package for the Social Sciences (SPSS), employing statistical procedures including percentages, means, standard deviations, medians, skewness coefficients, and the t-test.

3. Results

The results are presented according to Table 3 and Table 4, with the details shown as follows:

The Table 3 presents the mean, standard deviation, correlation coefficient for the paired samples, significance level of the test, and the statistical significance of the differences in cognitive representation and side kick skill in taekwondo for the research sample.

The Table 4 presents the mean, standard deviation, correlation coefficient for the paired samples, significance level of the test, and the statistical significance of the differences in cognitive representation and the back kick skill in taekwondo.

4. Discussion

Cognitive representation is considered of great importance as it helps learners in the learning process. Motor learning scholars pay special attention to the cognitive mental processes used in learning, as it provides a deeper understanding of these processes by linking the learning process to the foundations and systems of information representation and its efficiency. This is done by focusing on the internal cognitive processes, including the individual's ability to control these processes and their role in improving the efficiency and representation of information. (Al-Zayyat, 1998).

The findings presented in Table 3 and Table 4 indicate that junior taekwondo athletes aged 12 to 14 possess a good level of cognitive representation of information. This can be attributed to the developmental characteristics of this age group and the knowledge they acquire, both through formal education and general life experiences. Cognitive representation refers to the mental process by which external stimuli—real-world data—are internally processed and interpreted, giving them various cognitive dimensions. This process results from the accumulation of knowledge by the individual regarding those stimuli, ultimately shaping their cognitive representation.

Each individual constructs a unique mental image of environmental stimuli, yet the degree of similarity in how we represent these stimuli enables effective interaction and coexistence. Furthermore, the observed result may be explained by the athletes' motivation to achieve cognitive balance and satisfy internal needs, which in turn enhances their ability to represent information more effectively. This improved cognitive processing contributes to better performance of the side kick and back kick skills in taekwondo.

Such performance enhancement occurs through the athletes' engagement and active participation in self-regulation, control, and monitoring processes while acquiring new information and learning the taekwondo skills examined in this study. As Al-Shuwaili, 2018, p. 6) noted, "Cognitive representation of information plays a fundamental role in facilitating the learning process."

As Shalabi (2001) confirmed "Cognitive representation is a cognitive mental process based on the quantitative and qualitative accumulation of the learner's conceptual domain. It is a process of input, assimilation, and embedding of meanings, ideas, and mental images of values that are retained to become part of the individual's cognitive structure. This structure is cumulative, where the individual's information

interacts to provide a solid foundation for processing methods, thereby supporting the individual's ability to integrate information categories effectively, and subsequently enhancing their capacity for cognitive production" (Shalabi, 2001, p. 174). Also, the results also revealed what cognitive studies and literature have confirmed, that various cognitive mental processes such as attention, perception, recall, thinking, and problem-solving are fundamental to an individual's ability to solve problems or complete a specific task. This is primarily due to the strength of constructing appropriate cognitive representations for the information contained within such problems or tasks.

Medin and Ross (1997) indicate in this regard that the level of an individual's cognitive representation of a problem plays a significant role in reaching an appropriate solution. In order to understand the problem, one must internally represent it by visualizing certain relationships or connections in memory that are related to the task or problem. Then, external representations are constructed through drawings, shapes, models, or diagrams that resemble what was constructed in the internal representation of the problem. This allows the individual to understand the problem, reach a solution, and build mental models within their cognitive structures. This aids in understanding and perceiving the structure of the problem, making possible connections and combinations, and enabling the effective use of information.

5. Conclusion

The two researchers concluded the following based on the results of the experiment:

1. There is a correlational relationship between the cognitive representation scale and the performance of the side kick and back kick skills in Taekwondo.
2. Cognitive representation has a positive effect on the performance of the side kick and back kick skills in Taekwondo.

Recommendations

1. The necessity of developing educational programs and plans to enhance and improve cognitive representation in the field of sports.
2. Conducting research and studies on the variable of cognitive representation and its relationship to the performance of other skills in Taekwondo.
3. Conducting similar research and studies on other sports.

Conflicts of interest

Junior taekwondo athletes.

Authors' contributions

Contribution of the first researcher

- Formulating the research objectives and hypotheses.
- Designing the methodology and data collection instruments (e.g., questionnaires and interviews).
- Conducting fieldwork and collecting data in person.
- Drafting the initial versions of most sections of the research (abstract, introduction, literature review, and results).
- Structuring, editing, and preparing the manuscript for submission or publication.

Contribution of the second researcher

- Developing the research idea and title.
- Contributing to the literature review and refining the theoretical framework.
- Assisting the first researcher in developing and piloting the research instruments prior to formal implementation.
- Participating in data collection, including conducting interviews with experts and specialists.
- Supporting the data analysis process (data cleaning, entry, and reviewing results).
- Reviewing draft versions and providing linguistic and academic corrections and feedback.
- Supervising the writing of the methodology and the implementation of field procedures.

Ethical approval

This manuscript approved by University of Baghdad-College of Physical Education and Sport Science For Women on (December 16, 2024/1/15/7958).

Funding

This research received no external funding.

Data availability

The data that support the findings of this study are available on request from the corresponding author.

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Appendix 1: Supporting Team

Name	Specialization	Workplace
Abdullah Basim Aidan	Coach	Al-Arabi Sports Club
Sabreen Salah Al-Din	Master's Student	University of Baghdad / College of Physical Education and Sport Sciences for Women
Noor Al-Huda Fadel	Master's Student	University of Baghdad / College of Physical Education and Sport Sciences for Women

Appendix 2: Cognitive Representation Scale

No	Items	Always Applies to Me	Often Applies to Me	Sometimes Applies to Me	Rarely Applies to Me	Never Applies to Me
1	I have the ability to connect information related to learning motor skills.					
2	I find it difficult to understand an experience I did not participate in applying					
3	I link the information I want to memorize with certain situations.					
4	I pay attention to the sensory aspect (auditory – visual) of the words in the text I read.					
5	I have difficulty with practical lessons.					
6	I prefer that all academic subjects be linked to real-life elements from my surrounding environment					
7	I find it difficult when I'm asked to conduct an experiment in the lab.					
8	I prefer that most academic subjects be computer-based					
9	I try to make connections between the topics I read.					
10	I prefer information that I can test on my own					
11	I use shapes and diagrams to grasp the topics					
12	I create mental images for the information I want to memorize.					
13	I find it difficult to solve questions that require drawing geometric shapes					
14	I find it difficult to recall images of people and places during the lecture					
15	I organize images in my mind to represent the meanings of words					
16	I enjoy questions that require answering with diagrams					
17	I find it difficult to organize information in my memory in the form of horizontal sequences					
18	I focus on the overall meaning of the topic					
19	I find it difficult to answer questions that require diagrams					
20	I convert the information in the text from its verbal form into images, shapes, and diagrams.					

(Continued)

No	Items	Always Applies to Me	Often Applies to Me	Sometimes Applies to Me	Rarely Applies to Me	Never Applies to Me
21	I use new expressions for some of the words and terms in the text.					
22	I organize concepts in my mind in a logical manner.					
23	I link new ideas to previous ones					
24	I pay attention to information that I can benefit from in my daily life					
25	I use symbols and abbreviations to facilitate my memorization and recall process					
26	I replace difficult concepts in the texts with easier ones to memorize					
27	I memorize the information as it appears in the text.					
28	I have the ability to solve questions in my mind before answering on the exam paper					
29	I can easily shift from one perspective to another.					
30	I can express my point of view easily.					

Appendix 3: List of Experts and Specialists Consulted by the Researchers

No.	Academic Title	Name	Specialization	Affiliation	Consulted for Cognitive Representation Scale	Consulted for Skill Performance Tests
1	Prof. Dr.	Luma Samir Hammoudi	Motor Learning	University of Baghdad / College of Physical Education and Sport Sciences for Women	/	
2	Prof. Dr.	Mawahib Hameed Noaman	Motor Learning	University of Baghdad / College of Physical Education and Sport Sciences for Women	/	
3	Prof. Dr.	Warda Ali Abbas	Tests and Measurement	University of Baghdad / College of Physical Education and Sport Sciences for Women	/	
4	Assistant Professor	Liza Rostom Yaqoub	Training Science / Judo	University of Baghdad / College of Physical Education and Sport Sciences for Women	/	/
5	Expert	Adel Aneid Mansour	Taekwondo Expert	Director of the National Center for the Development of Athletic Talent in Taekwondo		/