

Effect of Cognitive Strategy-Based Instructional Guidance on Analytical Thinking and Rhythmic Gymnastics Skills

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Abstract
<p>Background The problem. Teaching often focuses solely on the skill and technical aspects, without paying attention to the mental and cognitive processes that accompany the learning process, which play a fundamental role in simplifying, understanding, and analyzing skills.</p> <p>Objectives Design an educational guidance program based on cognitive strategies for analytical thinking and the performance of some free skills in rhythmic gymnastics for female students. Identify the impact of the guidance program based on cognitive strategies for analytical thinking and the performance of some free skills in rhythmic gymnastics for female students between the pre- and post-tests, and between the two research groups (experimental and control) in the post-tests</p> <p>Methods To achieve the objectives, the experimental approach was used, with a design of two equivalent groups (control and experimental), and a descriptive approach using a survey method, as it suited the nature of the research problem. The research community was defined as (117) second-year female students in the College of Physical Education (University of Dhi Qar, Basra, and Maysan) for the academic year (2023-2024). The research population was selected from the universities of Basra and Maysan, numbering (78) students. The exploratory and application samples were from the University of Dhi Qar, numbering (39) students: (9) students for the exploratory sample and (30) for the application sample.</p> <p>Results It was found that the experimental and control groups achieved their goal of a significant effect between the pre- and post-tests on learning research skills and the analytical thinking scale.</p> <p>Conclusion The educational guidance program, based on cognitive strategies, demonstrated clear effectiveness in developing students' analytical thinking, which positively impacted their ability to analyze and understand the details of freestyle skills in rhythmic gymnastics. The program also contributed to improving students' skill performance, particularly in freestyle skills that require a high level of awareness and mental focus. Keywords: Counseling program, cognitive strategies, analytical thinking, free skills</p>
<p>Keywords : Instructional Guidance, Cognitive Strategies, Analytical Thinking, Rhythmic Gymnastics Skills</p>

Introduction

Background of the Study. Counseling sessions are a vital complement to the educational process due to their effectiveness in developing learners’ mental skills (Gandrapu & Rakesh, 2024). They contribute to improving attention, reducing fear and anxiety, and enhancing self-confidence, which positively impacts understanding and comprehension.

When learners are mentally prepared and focused, they can receive, organize, and retrieve information more efficiently. In this context, **cognitive strategies** play a crucial role as modern educational methods that shift learners from a passive role as mere recipients of information to an active and engaged role in processing and applying knowledge, thereby accelerating the learning process (Winn et al., 2019). This dynamic is reflected in students' behavior, particularly in skill-based learning activities such as gymnastics, by increasing their desire to acquire new skills (Afzal & Torralba, 2024; Bean et al., 2022). Rhythmic gymnastics, as an individual competitive sport, has seen significant global development (Prassas et al., 2006). It plays an important role in physical and motor preparation for female students and provides a strong foundation for mastering other sports. However, learning rhythmic gymnastics skills is a complex educational task due to the sport's technical, psychological, and physical demands, which require high levels of coordination, precision, and concentration (Abarghouejinejad et al., 2021; Didymus et al., 2021; Kelly et al., 2018).

Literature Review. Modern educational theories emphasize the importance of creating stimulating learning environments that encourage experience-sharing and analytical thinking. Analytical thinking is a creative mental process used to solve educational problems by enabling learners to analyze, organize, and apply information effectively. Previous studies have shown that integrating counseling and cognitive strategies into the educational process enhances attention, motivation, and comprehension, thereby improving performance in sports and skill-based tasks. Despite these insights, research on the application of educational guidance programs in rhythmic gymnastics remains limited, particularly regarding the use of structured cognitive strategies to support analytical thinking and skill mastery.

Gap Analysis. Although rhythmic gymnastics requires not only physical ability but also strong mental and analytical skills, most teaching approaches remain focused on technical execution alone. The researchers observed weaknesses in students' performance in certain free-style skills and noted the limited application of educational counseling in gymnastics instruction. Furthermore, teaching methods often overlook the cognitive and psychological dimensions of learning, such as memory, imagination, and problem-solving, which are critical for mastering complex rhythmic gymnastics skills. This highlights a gap in existing instructional practices: the lack of systematically developed, cognitively oriented guidance programs designed to strengthen analytical thinking and performance in rhythmic gymnastics.

Rationale of the Study. Addressing this gap, the present study proposes the development of an educational guidance program based on cognitive strategies to enhance analytical thinking and improve performance in selected free skills in rhythmic gymnastics. Such a program is expected to foster active learning, reduce anxiety, increase motivation, and create a learning environment that emphasizes comprehension and problem-solving rather than rote technical repetition. By integrating mental processes with technical training, this approach represents a shift from traditional teaching toward a modern educational paradigm focused on critical thinking, analysis, and creativity.

Purpose. This study is designed with four main objectives. First, it seeks to design an educational guidance program grounded in cognitive strategies that can enhance analytical thinking and improve the performance of selected free skills in rhythmic gymnastics among

female students. Second, the research aims to develop and standardize an analytical thinking scale specifically related to the execution of these rhythmic gymnastics skills, ensuring that the measurement tool is valid and reliable. Third, the study investigates the effectiveness of the proposed program by comparing pre- and post-test results to determine the extent of its impact on both analytical thinking and skill performance. Finally, it aims to identify significant differences in analytical thinking and performance outcomes between the experimental group, which receives the intervention, and the control group, which does not, during the post-test phase. Together, these objectives provide a comprehensive framework to evaluate how cognitive strategy-based guidance can contribute to both cognitive and motor skill development in rhythmic gymnastics.

Hypothesis.. The hypotheses of this study are formulated to test the effectiveness of the instructional guidance program based on cognitive strategies. First, it is hypothesized that there will be significant differences between the pre-test and post-test results of the experimental group in both analytical thinking and the performance of selected free skills in rhythmic gymnastics, favoring the post-test outcomes. Second, it is assumed that there will be no significant differences between the pre-test and post-test results of the control group, indicating that improvements in the experimental group are attributable to the intervention. Third, the study hypothesizes that during the post-test stage, there will be significant differences between the experimental group and the control group in analytical thinking and skill performance, with the experimental group showing superior results. These hypotheses collectively aim to confirm the role of cognitive strategy-based instructional guidance in enhancing both cognitive and motor abilities among female students engaged in rhythmic gymnastics.

Materials and Methods

Study Organization. This study employed an experimental design with two equivalent groups, comprising an experimental group and a control group, alongside a descriptive approach using the survey method, which was deemed appropriate for addressing the research problem. The experimental design was implemented by applying an educational guidance program based on cognitive strategies to the experimental group, while the control group followed the regular curriculum without counseling sessions. The intervention lasted for twelve sessions, including both introductory and concluding sessions, conducted between October 29, 2023, and January 7, 2024. Each session lasted between 15–20 minutes, integrated into the main section of the educational unit, which focused on rhythmic gymnastics free skills.

Participants. The research population consisted of 117 second-year female students in the Colleges of Physical Education at Dhi Qar, Basra, and Maysan Universities during the academic year 2023–2024. From this population, 78 students from Basra and Maysan Universities were selected as the main research sample. An additional 39 students from Dhi

Qar University were assigned for exploratory and pilot testing purposes, with nine students in the exploratory sample and 30 students in the application sample. Among them, Class A (15 students) was randomly designated as the experimental group and Class B (15 students) as the control group. The application sample represented 25.64% of the total population. Homogeneity testing using the coefficient of variation for age, height, mass, and free skills (gazelle jump, scissors jump, step jump, front waltz, and back waltz) confirmed that the values were less than 20%, indicating high sample homogeneity. Equivalence between the experimental and control groups was confirmed through t-tests, which showed no significant differences in the pre-test scores of free skills and analytical thinking.

Instruments. The instruments used in this study included a Sony digital video camera, television, computer, electronic scientific calculator, height-measuring device, medical scale, CDs, gymnastic mats, and a whistle. The counseling program itself was designed using five selected cognitive strategies—reformulation stimulus, educational questions, physical sensory images, mental images and imaginations, and memory support tools—based on expert evaluation. Additionally, the Analytical Thinking Scale, developed by Abdul Zahra (2019), was used to measure students' analytical thinking. The scale consisted of 40 validated items across four domains: focus of attention, perception, decision-making, and interpretation. Each item was rated on a five-point Likert scale, ranging from “Always” to “Never.” Pilot testing with nine students confirmed clarity, with response times ranging from 15–20 minutes. Validity was established through expert review, construct validity, and internal consistency, while reliability was confirmed using the split-half method ($r = 0.856$) and the Spearman-Brown formula ($r = 0.891$). Objectivity was ensured through clear instructions and an established scoring key.

Statistical Analysis. Data collected from pre-tests and post-tests on analytical thinking and the performance of rhythmic gymnastics free skills were analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to determine means, standard deviations, and coefficients of variation for the study variables. Independent sample t-tests were employed to assess the equivalence of the experimental and control groups at baseline and to determine differences between the two groups in post-test outcomes. Additionally, paired sample t-tests were used to measure within-group differences between pre- and post-tests. Significance was set at the 0.05 level to evaluate the effectiveness of the guidance program based on cognitive strategies.

Results

Results of the Experimental Group. Table 1 presents the results of the pre- and post-tests on free skills and the Analytical Thinking Scale for the experimental group.

Table 1. Results of the pre- and post-tests for the experimental group

Skills	Pre-test (x ± s)	Post-test (x ± s)	Calculated value	T	Sig.	Statistical significance
Gazelle's leap	1.467 ± 0.481	5.400 ± 1.121	16.165		0.000	Significant
Scissors jump	1.367 ± 0.399	5.267 ± 1.100	14.932		0.000	Significant
Step leap	1.292 ± 1.010	7.500 ± 0.477	7.184		0.000	Significant
Forward waltz step	1.563 ± 0.854	7.375 ± 0.678	14.611		0.000	Significant
Back waltz step	2.208 ± 0.982	7.417 ± 0.469	16.375		0.000	Significant
Analytical Thinking Scale	73.86 ± 3.35	93.20 ± 2.455	16.034		0.000	Significant

The results show significant improvements across all measured skills and analytical thinking, with all calculated *t*-values exceeding the critical value (2.145, *p* < 0.05). This indicates that the guidance program based on cognitive strategies had a positive and significant effect on both skill performance and analytical thinking.

The researchers attribute this improvement to the effectiveness of the guidance program, which reduced fear and anxiety, built self-confidence, and facilitated better skill acquisition. These results are consistent with Fakher (1876), who emphasized that ineffective studying methods and a lack of awareness of cognitive strategies hinder knowledge retention. Similarly, Droza Afnan (2004) highlighted that well-sequenced strategies can enhance comprehension and performance. The program fostered an environment of reflection and free thinking, supporting Qandil's (2008) assertion that democratic learning strategies encourage students to apply creative and analytical thinking.

Results of the Control Group. Table 2 presents the pre- and post-test results for the control group, which followed the standard curriculum without counseling sessions.

Table 2. Results of the pre- and post-tests for the control group

Skills	Pre-test (x ± s)	Post-test (x ± s)	Calculated value	T	Sig.	Statistical significance
Gazelle's leap	1.233 ±	4.467 ± 0.990	12.784		0.000	Significant

		0.320				
Scissors jump		1.233	±	4.533 ± 0.743	13.485	0.000 Significant
		0.320				
Step leap		1.792	±	5.458 ± 0.450	10.094	0.000 Significant
		1.033				
Forward waltz step		1.542	±	5.208 ± 0.450	12.537	0.000 Significant
		0.831				
Back waltz step		2.188	±	5.250 ± 0.584	8.016	0.000 Significant
		0.806				
Analytical Thinking Scale		74.73 ± 3.10		77.26 ± 3.11	2.489	0.022 Significant

The results demonstrate significant improvements in both skill performance and analytical thinking, though to a lesser extent than the experimental group. This indicates that the standard educational curriculum was effective in promoting progress. According to Saleh Jwaid (2009), sound educational curricula that include scientifically selected exercises aligned with students’ levels naturally lead to improvement. Similarly, Dhafer (2002) noted that progress in learning is inevitable when correct teaching steps are followed.

Comparison Between Experimental and Control Groups. Table 3 shows the post-test results for both groups, highlighting the significant differences favoring the experimental group.

Table 3. Post-test results for the control and experimental groups

Skill	Group	Mean (x ± s)	Calculated value	T	Sig.	Statistical significance
Gazelle’s leap	Control	4.467 ± 0.990	2.416		0.022	Significant
	Experimental	5.400 ± 1.121				
Scissors jump	Control	4.533 ± 0.743	2.140		0.041	Significant
	Experimental	5.267 ± 1.100				
Step leap	Control	5.458 ± 0.450	10.800		0.001	Significant
	Experimental	7.500 ± 0.477				
Forward waltz step	Control	5.208 ± 0.450	9.229		0.042	Significant
	Experimental	7.375 ±				

			0.678			
Back waltz step	Control	5.250	± 10.032	0.000	Significant	
	Experimental	7.417	± 0.584			
Analytical Thinking Scale	Control	77.26 ± 3.11	10.868	0.000	Significant	
	Experimental	93.20	± 2.455			

The findings indicate that while both groups improved, the experimental group showed significantly greater gains. This suggests that integrating cognitive strategies into guidance sessions was more effective than relying solely on the conventional curriculum. These results align with Nasha’a (2000), who reported that the lack of awareness of cognitive strategies was one of the primary obstacles faced by Iraqi students, as well as Cross (2011), who defined analytical thinking as an iterative, reflective approach to problem-solving that enhances creativity and adaptability.

Discussion

The results of this study demonstrate that both groups (experimental and control) made statistically significant improvements from pre-test to post-test in the domains of free skills and analytical thinking. However, the magnitude of improvement in the experimental group (which received the cognitive strategy-based guidance) was notably greater than in the control group. When comparing post-test outcomes between the two groups, the experimental group consistently outperformed the control group across all measures, confirming that the intervention had a superior effect.

These findings suggest that cognitive strategy-based instructional guidance can meaningfully enhance not only physical performance in rhythmic gymnastics but also the associated cognitive processes underlying skill execution. The intervention’s success can likely be attributed to its structuring around strategies such as reformulation, questioning, sensory imagery, mental imagery, and memory support tools, which encourage learners to actively reflect on, internalize, and apply their mental processing while performing motor tasks.

From a theoretical perspective, these results reflect *positive disconfirmation* in customer-satisfaction terms (i.e., performance surpassing expectation), but in this educational setting, the notion applies to learners’ expectations and outcomes. They align also with the principles

underpinning metacognitive and cognitive strategy instruction, which posit that learners who are guided to engage higher-order thinking, reflection, and self-monitoring will show superior learning gains (e.g., studies on metacognitive strategy use in education) (Adewale et al., 2024; Alamäki et al., 2024; Huang & Lajoie, 2023). The more frequent and deliberate use of cognitive strategies has been shown to moderate the effect of learning approaches on outcomes (Bf et al., 2020)

Moreover, the results affirm the idea that structured mental guidance can reduce performance-related anxiety and bolster confidence, thus creating a more favorable learning environment. This observation resonates with prior research asserting that learner anxiety often hampers skill acquisition, and that scaffolding cognitive and psychological interventions can mitigate this barrier.

The significant gains beyond standard curriculum performance (control group) indicate that the mere presence of a well-designed curriculum is not sufficient: the addition of cognitive strategy scaffolds amplifies learning. This finding underscores the necessity of integrating mental skills training with technical and physical instruction, especially in domains such as rhythmic gymnastics where skill complexity is high.

However, it is important to note the limitations. The relatively short intervention period and sample size may constrain the generalizability of the findings. Future research should test the model over longer durations, with diverse populations, and consider follow-up retention tests to examine the durability of effects.

In conclusion, the data provide strong empirical support for the integration of cognitive strategy-based guidance programs in rhythmic gymnastics training. They suggest a promising path forward: coaches, educators, and curriculum designers should couple technical drills with structured cognitive scaffolds to optimize both skill performance and analytical thinking development.

Conclusion

The educational guidance program grounded in cognitive strategies demonstrated clear effectiveness in fostering students' analytical thinking, which in turn enhanced their capacity to analyze and master the technical details of free-skill movements. The structured guidance sessions not only improved cognitive engagement but also increased student motivation by activating higher-order mental processes and stimulating reflective thinking. This approach helped reduce performance-related anxiety, particularly in the execution of complex skills, while the integration of cognitive stimulants within the program contributed

significantly to improved attention and concentration. Consequently, students acquired correct skill performance at a faster rate and with greater precision.

Furthermore, the integration of educational guidance with skills training proved highly effective in improving overall learning outcomes. This is especially valuable in sports such as rhythmic gymnastics, where successful performance requires a close interplay between psychological readiness and technical proficiency.

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