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 8

7-25-2025

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Recommended Citation

Al-Jubouri, Mawaheb Hameed and Hassan, Odai Tareq (2025) "The Effect of Specialized Water-Based Exercises Accompanied by Music on Learning Freestyle Swimming Skills Among Female Students," *Modern Sport*: Vol. 24: Iss. 3, Article 8.
DOI: https://doi.org/10.54702/2708-3454.2079

MODERN SPORT 2025;24:329–335

SPECIAL ISSUE ARTICLE

The Effect of Specialized Water-Based Exercises Accompanied by Music on Learning Freestyle Swimming Skills Among Female Students

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Abstract

The present study aimed to design specialized water-based exercises accompanied by music for teaching freestyle swimming skills to first-year female students at the College of Physical Education and Sport Sciences for Women, and to examine the impact of these exercises on learning outcomes. The research problem centers on the need to enhance the learning process by adopting modern instructional methods that lead to more efficient and engaging learning in less time and with less effort. To address this, the researchers proposed using a novel approach involving aquatic exercises synchronized with music, noting the need to make swimming lessons more engaging due to the students' difficulty in adapting to the aquatic environment. Traditional methods were found to lack the elements of excitement and motivation necessary for effective skill acquisition. An experimental design involving control and experimental groups was adopted. The sample included 20 female students, intentionally selected as 38.461% of the total population of non-swimming first-year students enrolled in the 2024–2025 academic year. The students were divided equally into two groups. The experimental group received the instructional program for six weeks at a rate of two sessions per week. After completing the program, data were analyzed using SPSS software. Results indicated that the use of water-based exercises with music effectively enhanced the learning of freestyle swimming skills. Students in the experimental group outperformed those in the control group. The study recommends greater use of engaging and modern teaching methods, which provide motivation and reduce reliance on traditional instruction, thus facilitating more effective learning. And this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

Keywords: Aquatic exercises, Learning, Music, Swimming, Swimming skills

1. Introduction

In light of the diverse perspectives held by scholars and specialists regarding the precise and comprehensive definition of motor learning, Al-Jubouri (2000) emphasized that motor learning is a multifaceted concept encompassing numerous meanings, shaped by various influencing factors and its intersections with other scientific disciplines. Despite this plurality of interpretations, they ultimately converge toward a unified understanding that offers a holistic and accurate conception of motor learning.

In this context, some psychologists define motor learning as a process of acquiring, developing, and stabilizing motor skills, along with the ability to apply and retain them. This process is closely linked to the development and construction of the learner's personality, as well as the acquisition of various types of knowledge related to movement and the enhancement of coordination and physical abilities (Othman, 1987).

Swimming is one of the athletic activities practiced by humans, distinguished from other sports by the fact that it is performed in water—a medium far

Received 25 February 2025; revised 20 March 2025; accepted 30 March 2025.
Available online 25 July 2025

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https://doi.org/10.54702/2708-3454.2079

denser than air. As such, it requires a higher degree of physical effort. Learning to swim is not a simple task; it demands caution to avoid drowning and injuries that may occur in or around the pool, such as slipping. It also requires consistent practice to achieve mastery. A genuine interest in swimming and a strong desire to learn are among the most critical factors for success. Conversely, fear and anxiety during the learning process can make acquiring swimming skills extremely difficult.

It is well understood that music has a noticeable effect on human movement, as evident in the natural synchronization individuals exhibit when responding to specific musical compositions. Music plays an essential role in enhancing one's sense of movement, improving performance, and delaying the onset of fatigue. Moreover, it contributes to the fluidity and rhythm of physical activity.

Engaging with musical rhythm serves as a means of psychological release, increasing an individual's motivation and capacity to perform. It is often recommended that exercises accompanied by music be performed in group settings, as many individuals show heightened responsiveness to music, enabling them to overcome challenges encountered during physical activity. Aquatic exercises performed with music are not only useful in reducing fear of water or swimming but also serve as an effective method for addressing the broader difficulties associated with learning.

Accordingly, the significance of this study lies in the development of specialized water-based exercises accompanied by music to support the learning of freestyle swimming skills among female students at the College of Physical Education and Sport Sciences for Women, University of Baghdad.

The research problem lies in the need to adopt modern methods for teaching freestyle swimming skills in order to achieve more effective learning in less time and with reduced effort, thereby serving the goals of the educational process. It also seeks to identify the most effective strategies to enhance student engagement and motivation toward learning. In response to this need, the researchers proposed a novel approach involving specialized aquatic exercises accompanied by music.

They observed the necessity of making swimming lessons more engaging and stimulating by integrating musical compositions with the performance of aquatic exercises. This approach aims to help students overcome the challenges of adapting to the aquatic environment. The traditional methods, in contrast, may lack the excitement and motivation required for effective learning. The use of music-based water exercises is expected to ease students' interaction with the aquatic setting and facilitate a faster and more efficient learning process.

1.1. Research objectives

- To design specialized water-based exercises accompanied by music for teaching freestyle swimming skills to first-year female students at the College of Physical Education and Sport Sciences for Women.
- To examine the effect of these specialized aquatic exercises accompanied by music on learning freestyle swimming skills among first-year female students at the College of Physical Education and Sport Sciences for Women.

1.2. Research hypotheses

- There are no statistically significant differences between the pre-test and post-test results in learning freestyle swimming skills among the students.
- There are no statistically significant differences between the post-test results of the two groups in learning freestyle swimming skills among the students.

1.3. Research fields

- **Human Domain:** A sample of first-year female students from the College of Physical Education and Sport Sciences for Women for the academic year 2024–2025.
- **Temporal Domain:** From December 7, 2024, to January 25, 2025.
- **Spatial Domain:** The indoor swimming pool at the College of Physical Education and Sport Sciences, University of Baghdad, Al-Jadriya Campus.

2. Methodology and procedures

The researchers adopted the experimental method as it is best suited for addressing the research problem. Methodology is defined as 'the approach followed by an individual to achieve a specific objective' (Al-Amin & Hassan, 2009). An understanding of the problem's nature guided the selection of an appropriate design. Thus, the study employed an equivalent-groups design (experimental and control groups), offering the researcher flexibility in selecting design strategies, observation methods, and measurement and analysis techniques (Abdul Rahman, 2017).

The research population consisted of first-year female students enrolled in the College of Physical Education and Sports Sciences for Women at the University of Baghdad during the academic year 2024–2025. A total of 52 students were regularly attending swimming classes and were naturally

Table 1. Group equivalence between the experimental and control groups.

No.	Tests	Experimental Group		Control Group		Calculated (t) Value	Significance Level	Differences
		M	SD	M	SD			
1	Breath-Holding Test (10 sec)	2.9	1.595	2.7	1.159	0.320	0.752	Random
2	Horizontal Floating Test	1.9	0.875	1.6	0.843	0.780	0.445	Random

distributed across two sections, (B) and (C). A random sample of 20 students, representing 38.461% of the population, was selected. These were further divided into two equal groups of 10 students each (experimental and control).

Table 1 above shows that the significance levels for the research variables exceed the threshold of 0.05, indicating that there were no statistically significant differences between the experimental and control groups in the pre-tests. This confirms the equivalence of the two groups and establishes a common starting point for both.

Subsequently, one of the groups was randomly selected to serve as the experimental group, consisting of students from Section B, while the other group, Section C, was designated as the control group. This procedure was implemented to avoid bias in the assignment process. Additionally, from the remaining number of students in both sections, a sample of 10 students—representing 61.538% of their original population—was selected for the pilot study.

3. Field procedures

The researchers adopted freestyle swimming tests to assess student performance both before and after the intervention. These tests were reviewed by a panel of experts to validate the assessment process, and individual performance scores were extracted for each student. The researchers designed a series of exercises accompanied by music, integrating them purposefully into the instructional process to optimize learning outcomes—particularly within the main segment of the educational units. The program was implemented at a frequency of two sessions per week over six consecutive weeks, totalling 12 instructional units aimed at achieving the intended objectives.

- **Preparatory Phase (20 minutes):** This phase was identical for both the experimental and control groups. It involved attendance registration and the performance of general and specific warm-up exercises.
- **Main Phase (60 minutes):** This segment included both theoretical and practical components. The instructional (theoretical) part involved explaining the exercises, followed by practical application in the swimming pool. During this stage, students in the experimental group performed aquatic exercises for freestyle swimming skills accompanied by music, with the practical portion lasting approximately 40 minutes.
- **Concluding Phase (10 minutes):** This phase was also identical for both the experimental and control groups, serving to conclude the session with light recovery and organization activities.

4. Pilot study

The pilot study was conducted on Saturday, December 7, 2024, at 10:00 a.m., following the confirmation of appropriate timing, identification of potential obstacles, and assessment of the supporting team's readiness.

4.1. Main experiment

The implementation of the main experiment began on December 14, 2024. The final assessments for the research groups were conducted on Saturday, January 25, 2025, at 10:00 a.m. The intervention consisted of water-based exercises accompanied by music, administered twice weekly over a period of six consecutive weeks, totalling 12 instructional units, with the aim of achieving the intended learning outcomes.

The program was carried out at the indoor swimming pool of the College of Physical Education and Sport Sciences, University of Baghdad. Upon completion of the intervention and administration of the post-tests, the researchers analyzed the results using the Statistical Package for the Social Sciences (SPSS), Version 26. The following statistical measures were computed: percentage values, arithmetic means, standard deviations, independent samples t-test, and paired samples t-test.

5. Results

Table 2 shows that the mean scores for the pre-tests (breath-holding, horizontal floating, gliding, and technical performance) in the experimental group were 2.9, 1.9, 2.4, and 1.6, respectively, with corresponding standard deviations of 1.595, 0.875, 0.699, and 0.516. In contrast, the mean scores for the

Table 2. Means and standard deviations of freestyle swimming tests for the experimental group (Pre- and Post-test).

		Pre-Test		Post-Test	
Variable	Unit	AM	SD	AM	SD
Breath-Holding Test (10 seconds)	Seconds	2.9	1.595	9.6	0.516
Horizontal Floating on the Abdomen (10 sec)	Seconds	1.9	0.875	9.1	0.737
Streamlining Test	Meters	2.4	0.699	7.0	0.816
Technical Performance Evaluation – Freestyle	Points	1.6	0.516	8.4	0.699

*Table 3. Presents the differences in means, standard deviations, calculated **t**-values, and the significance of differences in the freestyle swimming tests between the Pre-test and Post-test for the experimental group.*

Variable	Unit of Measurement	MD	SDD	Calculated t-value	Significance Level	Significance of Difference
Breath-Holding Test (10 seconds)	Seconds	6.7	1.567	13.520	0.000	Significant
Horizontal Floating on Abdomen (10 seconds)	Seconds	7.2	1.229	18.521	0.000	Significant
Streamlining Test	Meters	4.6	1.349	10.775	0.000	Significant
Technical Performance Evaluation – Freestyle	Points	6.8	0.421	51.000	0.000	Significant

(*) Degrees of freedom (df = 10 – 1 = 9).

(*) The result is considered significant if the significance level (p) is less than 0.05.

post-tests in the same variables were 9.6, 9.1, 7.0, and 8.4, respectively, with standard deviations of 0.516, 0.737, 0.816, and 0.699.

Table 3 illustrates that the mean differences between the pre- and post-test scores for the experimental group in the breath-holding, horizontal floating, streamlining, and freestyle performance evaluation tests were (6.7, 7.2, 4.6, and 6.8), respectively. These were accompanied by standard deviations of (1.567, 1.229, 1.349, and 0.421). In contrast, the post-test means for the same tests reached (9.6, 9.1, 7.0, and 8.4), with standard deviations of (0.516, 0.737, 0.816, and 0.699), respectively. The calculated *t*-values were 13.520 for the breath-holding test, 18.521 for the horizontal floating test, 10.775 for the streamlining test, and 51.000 for the freestyle performance evaluation. Given that the significance level (p = 0.000) is lower than the accepted threshold of 0.05, the results indicate statistically significant differences between the pre- and post-test scores in favor of the post-test. These findings confirm the effectiveness of the intervention implemented with the experimental group.

Table 4 shows that the mean scores for the pre-tests (breath-holding, horizontal floating, gliding, and technical performance) in the control group were 7.2, 1.6, 5.2, and 5.1, respectively, with corresponding standard deviations of 1.59, 0.843, 0.707, and 0.527. In contrast, the mean scores for the post-tests in the same variables were 7.7, 6.3, 5.0, and 5.9, respectively, with standard deviations of 0.483, 0.823, 0.666, and 0.875.

Table 5 shows that the mean scores for the pre-tests (breath-holding, horizontal floating, gliding, and technical performance) in the control group were 5.0, 4.7, 2.5, and 4.4, respectively, with standard deviations of 0.707, 1.059, 1.247, and 0.843. The calculated *t*-values were 12.677 for breath-holding, 14.030 for horizontal floating, 11.180 for gliding, and 16.5 for technical performance. When comparing the significance level (0.000) to the threshold value of 0.05, it was found that there were statistically significant differences between the pre-test and post-test results in favor of the post-test in the control group.

Table 6 shows that the mean scores for the post-tests (breath-holding, horizontal floating, gliding, and technical performance) in the experimental group were 9.6, 9.1, 7.0, and 8.4, respectively, with standard deviations of 0.516, 0.737, 0.816, and 0.699. In contrast, the post-test mean scores for the control group in the same tests were 7.7, 6.3, 5.0, and 5.9, respectively, with standard deviations of 0.483, 0.823, 0.666, and 0.875. The calculated *t*-values were 8.497 for breath-holding, 14.030 for horizontal floating, 6.000 for gliding, and 0.557 for technical performance. When comparing the significance level (0.000) to the accepted threshold of 0.05, statistically significant differences were observed between the two groups in favor of the experimental group in the post-test.

6. Discussion

The tables above indicate statistically significant differences in the results of the freestyle swimming tests between the pre-test and post-test for both the experimental and control groups. Moreover,

Table 4. Presents the results of the means and standard deviations for the freestyle swimming tests between the Pre-test and Post-test for the control group.

Variable	Unit of Measurement	Pre-Test		Post-Test	
		Mean (M)	SD	Mean (M)	SD
Breath-Holding Test (10 seconds)	Seconds	2.7	1.159	7.7	0.483
Horizontal Floating on Abdomen (10 seconds)	Seconds	1.6	0.843	6.3	0.823
Streamlining Test	Meters	2.5	0.707	5.0	0.666
Technical Performance Evaluation – Freestyle	Points	1.5	0.527	5.9	0.875

*Table 5. Presents the differences in means, standard deviations, calculated **t**-values, and the significance of differences in freestyle swimming test results between the Pre-test and Post-test for the control group.*

Variable	Unit of Measurement	MD	SDD	Calculated t-value	Significance Level	Difference Significance
Breath-holding test (10 sec)	Second	5	1.247	12.677	0.000	Significant
Horizontal floating on the abdomen (10 sec)	Second	4.7	1.059	14.030	0.000	Significant
Streamlining test	Meter	2.5	0.707	11.180	0.000	Significant
Technical performance evaluation in freestyle swimming	Meter	4.4	0.843	16.5	0.000	Significant

(*) Degrees of freedom = (10 - 1 = 9).

(*) The difference is considered significant if the p-value is less than the level of significance (0.05).

significant differences were found between the experimental and control groups in the post-test results, in favour of the experimental group. The researchers attribute this outcome to the water-based exercises accompanied by music, which were structured in alignment with the instructional stages of freestyle swimming. These specialized aquatic exercises are considered the foundation upon which instructional units for developing swimming skills are built.

As Ali (2010) emphasized, such exercises should be aligned with the movements of the sport, serve the intended learning objectives, and be characterized by clarity and accessibility—avoiding complexity and excessive explanation. The use of appropriate music is essential, particularly when it introduces elements of excitement and engagement. The researchers were keen to ensure that the specially designed water-based exercises accompanied by music would enhance students' motivation through rhythmic patterns that stimulate a spirit of competition and contribute to achieving the intended educational outcomes (Tang et al., 2022).

The researchers ensured that the scientifically sound approach was followed in designing and implementing the water-based exercises accompanied by music, recognizing their positive role in facilitating the learning of freestyle swimming skills among students. The incorporation of music contributed to reducing both the time and effort required for skill acquisition. As noted in the literature, all music-accompanied exercises performed by learners must be based on specific objectives and adhere to correct movement pathways, with continuous correction applied wherever possible (Tate et al., 2012, pp. 3031–3034).

*Table 6. Presents the mean, standard deviation, calculated **t**-value, significance level, and significance of differences in the freestyle swimming tests between the experimental and control groups in the Post-test.*

Variable	Experimental Group		Control Group		Calculated t-value	Significance Level	Difference Significance
	M	SD	M	SD			
Breath-holding test (10 sec)	9.6	0.516	7.7	0.483	8.497	0.000	Significant
Horizontal floating on the abdomen (10 sec)	9.1	0.737	6.3	0.823	8.009	0.000	Significant
Streamlining test	7	0.816	5	0.666	6	0.000	Significant
Technical performance evaluation in freestyle swimming	8.4	0.699	5.9	0.875	7.055	0.000	Significant

(*) Degrees of freedom = (20 - 2 = 18).

(*) The difference is considered significant if the p-value is less than the level of significance (0.05).

Furthermore, studies have emphasized that water-based rhythmic exercises represent an effective combination of enjoyment and physical activity, involving various body movements performed in a rhythmic pattern (Epstein et al., 1996, pp. 1157–1164).

Scholars and researchers have also affirmed that the use of diverse instructional methods within the educational process significantly increases learner engagement. Nevertheless, the teacher remains the central pillar of instruction and cannot be replaced under any circumstances (Débrouillardise, 2001).

Instructional media have been defined as "any tool or communication channel that conveys information between the sender and the receiver." Educational professionals have recognized the importance of innovation and advancement in instructional media, which have significantly evolved to support the objectives of education and address pedagogical challenges, particularly those arising from the expansion of human knowledge (Sabah, 2013, pp. 155).

According to Sharaf (2000), instructional media have undergone various phases, each characterized by terminology appropriate to the period, including terms such as "audiovisual aids," "learning aids," "communication tools," "teaching and learning media," and eventually "educational technology."

Studies indicate that music enhances skill performance and technical proficiency. Exercises accompanied by music facilitate the acquisition of skills in a shorter time and serve as an effective and engaging motivational tool (Papadimitriou & Loupos, 2021, pp. 1148).

Studies have affirmed that "musical rhythm must align with the rhythm of movement in terms of force, tension, and relaxation—that is, the exerted effort. Undoubtedly, a specific movement can be harmonized with musical rhythm across various instructional stages, aiming for creativity and variation once the fundamental movements have been mastered" (Al-Abed, 1986, pp. 88).

Accordingly, it has become essential to utilize instructional media, including music, particularly in swimming—given its inherent difficulty due to the aquatic environment. Proper use of such media significantly contributes to teaching and enhancing students' ability to learn quickly and master skills. Moreover, it helps reduce the duration of the learning process and makes it more efficient and effective (Hume & Crossman, 1992, pp. 665–670).

7. Conclusion

Based on the presentation and discussion of the results, the researchers reached the following conclusions:

- The study demonstrated the effectiveness of water-based exercises accompanied by music in teaching freestyle swimming skills to female students.
- The experimental group, which followed the music-accompanied aquatic exercise program, outperformed the control group.

8. Recommendations

In light of the current study's conclusions, the researchers recommend the following:

- Adopting a curriculum that incorporates water-based exercises accompanied by music in the teaching of freestyle swimming.
- Conducting further research using specialized aquatic exercises accompanied by music to teach other swimming styles (butterfly, backstroke, breaststroke).
- Exploring the application of aquatic exercise-based programs in other sports disciplines.

Author's declaration

The authors formally declare that the content of this paper is the original work of themselves

Conflicts of interest

None.

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical-clearance

This manuscript approved by Prof. Dr Mawaheb Hameed Al-Jubouri and Prof. Dr. Odai Tareq Hassan on (10/03/2025).

Authors' contributions

Prof. Dr. Mawahib contributed 100% to the experimental component of the study.

Prof. Dr. Odai contributed 100% to the methodological framework, including source arrangement, data collection, tabulation, and manuscript formatting.

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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