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The Impact of Limited Swimming Experience on Freestyle Swimming Skills in College Students: An Experimental Study Based on Gender with Part and Whole Practice Approaches

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Abstract

This study investigates the impact of limited swimming experience on students' freestyle swimming skills, with a focus on gender differences. A quasi-experimental design with a pre-test and post-test approach was employed to assess the effectiveness of a swimming training program on 117 male and 10 female students from the Physical Education program at Universitas Garut. The training program, which combined part and whole practice methods, was implemented over an 8-week period. Descriptive statistics, normality tests, and hypothesis testing (Wilcoxon Signed-Ranks Test for male students and paired sample t-test for female students) were used to analyze the data. The results revealed significant improvements in freestyle swimming skills for both male and female groups. For the male group, the mean post-test score increased from 0.00 to 15.70, and for the female group, it increased from 0.00 to 21.20. Statistical analysis confirmed that the improvements were significant for both groups ($p < 0.05$). When comparing the two groups, the female group showed a greater mean improvement (-21.200) compared to the male group (-15.701), suggesting a more substantial impact of the training on the female participants. Overall, the results of this study indicate that the part practice and whole practice approaches have a significant impact on improving freestyle swimming skills in students with limited swimming experience. Overall, the results of this study indicate that the part practice and whole practice approaches have a significant impact on improving freestyle swimming skills in students with limited swimming experience. This suggests that at the university level, students have a better ability to learn and develop swimming skills more quickly compared to younger age groups. These findings show that although students have limited swimming experience, their adaptive learning abilities allow them to quickly master basic swimming skills, highlighting the potential for effective skill development.

Keyword: Limited swimming experience; freestyle swimming skills; part and whole practice approach; college student.

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Introduction

Swimming is one of the most important life skills (Strašilová et al., 2020) in terms of cardiorespiratory fitness, cardiac output, haemodynamics, heart growth, motor performance, and body composition (Ferreira et al., 2024), as well as the development of basic motor skills (Sinclair & Roscoe, 2023) and so on he ability to swim allows individuals to be more independent in various situations, especially in avoiding the danger of drowning (Stallman et al., 2017). Despite its importance, not all individuals have the same opportunity to master swimming skills, particularly for those living in areas with limited access to swimming pool facilities (Higgerson et al., 2019).

In Indonesia, many rural areas lack sufficient swimming pool facilities. Geographical conditions far from the city center or limited resources are often the main obstacles in providing water sports facilities, including swimming pools (Borgonovi et al., 2022). This results in limited opportunities for children and adolescents in these areas to learn swimming properly (Layne et al., 2020). As a result, swimming skills, particularly in freestyle, often fail to develop or are not taught at all at various educational levels, preventing children and adolescents from acquiring the necessary skills for water safety and optimal physical development (Ananthapavan et al., 2024).

At the higher education level, students from rural areas often face significant difficulties due to the opportunities are unable to access because of their circumstances. This highlights the students' awareness of the challenge anticipate due to their educational background and lack of certain skills (Chiramba & Ndofirepi, 2023). Students with this background tend to have limited swimming experience, which may affect the development of swimming skills (Engle & Tinto 2008). Freestyle is one of the most basic and essential swimming techniques, requiring body coordination (Nikšić et al., 2020), breathing technique (Upadhyaya & Bhatt, 2017), and trained muscle strength, which makes consistent practice and adequate facilities necessary (Bailon 2024). However, students who are not accustomed to swimming practice from an early age may struggle to master this technique.

In this context, it is important to understand the extent to which limited swimming experience affects students' freestyle swimming skills, taking into account factors such as educational background, access to sports facilities, and gender (Duke et al., 2023). To overcome the challenges arising from limited swimming experience, the implementation of appropriate training methods is essential to achieve optimal outcomes (Arifin et al., 2024). Training methods such as part practice and whole practice (Magill & Anderson, 2017), can be applied to improve swimming skills (particularly in freestyle) (Arifin et al., 2024). Part practice (Fontana et al., 2009), involves breaking down the focus on improving specific aspects such as arm movements or breathing techniques (Bogdanoviča & Lāriņš, 2021). This is done to reduce cognitive load during the early stages of training (Magill & Anderson, 2017).

On the other hand, whole practice involves practicing the swimming movement as a whole, which helps students develop the coordination and fluidity needed to swim efficiently (Fontana et al., 2009). By combining part practice and whole practice, students can gradually build the necessary motor skills while understanding the importance of synchronization and

endurance in freestyle swimming. This combined approach allows for a more tailored training experience, addressing specific weaknesses that students may face due to their limited swimming experience. The integration of both methods can help overcome the barriers created by limited swimming facilities, offering an effective way to improve swimming performance, particularly for those who have not had access to formal training from an early age.

This study is expected to provide deeper insights into the impact of limited swimming experience on students' swimming skills, as well as other factors that may contribute. With this understanding, it is hoped that appropriate solutions can be found to improve the quality of swimming education, particularly for students from rural areas who have limited access to swimming facilities. Furthermore, the combination of part practice and whole practice may offer a practical and effective strategy to support the development of freestyle swimming skills among these students.

Methods

This study uses a quasi-experimental design with a pre-test and post-test approach to measure the impact of limited swimming experience on students freestyle swimming skills. In this study, two training approaches, namely part practice (practicing specific parts of the swimming movement) and whole practice (practicing the entire sequence of freestyle movements as a whole), are applied simultaneously to the experimental group. The design used is a one-group pre-test - post-test design (Fraenkel et al., 2019:67), involving a single group that is tested for initial ability (pre-test) before receiving the intervention in the form of swimming training, and then reassessed after the intervention (post-test) to observe the changes.

The selection of this design is very appropriate because this study does not have access to a control group, yet still aims to evaluate the effectiveness of an intervention. In addition, the researcher can observe changes in behavior or skills within the same group before and after the intervention, thus providing an early indication of the success of the implemented program. The population in this study consists of first-year students from the Physical Education study program at the Faculty of Islamic Education and Teacher Training, Universitas Garut, totaling 150 individuals. The sample selection in this study was conducted using purposive sampling (Lohr 2021:78), which was deliberately chosen to ensure that the sample meets the criteria relevant to the research objectives.

This technique is particularly appropriate because the researcher has specific criteria to test, namely students with limited swimming experience and a lower-middle economic background. These criteria are relevant for examining the impact of swimming training interventions on individuals with particular conditions, such as limited access to swimming facilities. The selection of male and female gender aims to include gender variation in the study, while the criterion of minimal swimming experience ensures that participants start with a similar level of swimming skills. The criteria of lower-middle economic background and limited access to swimming facilities are also important because they reflect conditions that are more common among students, who often face limitations in access to adequate sports facilities.

By selecting the sample based on these criteria, the researcher can more accurately measure the impact of swimming training on a more representative group, while also strengthening the validity of the research findings in a specific context. Purposive sampling allows the researcher to obtain more relevant and in-depth data that aligns with the research focus. The instrument used is a swimming ability test (Strand & Wilson, 1993), which aims to evaluate the ability to swim the front crawl by measuring the number of arm strokes required to complete a 25-yard distance. The validity of this test shows a coefficient of 63 for the elementary backstroke and 67 for the front crawl, reflecting the consistency and accuracy of the measurement.

During the test, one person serves as the starter and timekeeper, while students act as partners to help the swimmer remain stable in the water and count the number of arm strokes. The equipment used includes a 25-yard swimming pool, lane dividers, a stopwatch, assessment sheets, and pencils. The swimmer starts the test from a prone floating position, with legs straight and both arms extended in line with the body, while the partner holds the swimmer's waist to maintain balance. After the signal "ready, go," the swimmer swims the front crawl as fast as possible, and the number of arm strokes used to complete the distance is the indicator for the assessment.

This study was conducted over a period of 8 weeks, with one learning session held each week. Each session lasted 3 x 45 minutes (equivalent to 3 credit hours). The learning material was designed to gradually build the participants' swimming skills. The learning process was divided into specific segments for each skill, and participants received personal feedback throughout each session. During the treatment period, non-sample students were trained on different days to avoid interfering with the research group. In the first session, all participants took a pre-test by swimming 25 meters to assess their initial swimming ability. In the second and third sessions, the focus of the learning was on water safety and basic swimming skills.

All participants were introduced to water safety protocols, including how to stay calm in the water, proper breathing techniques, and how to float. The instructor demonstrated these techniques clearly and ensured that participants practiced them progressively. Emphasis was placed on breathing techniques, gliding, and floating (Badruzaman et al., 2020). Participants were encouraged to practice these basic skills until they felt confident. If any participant had not yet mastered the water introduction skills, they were given extra time for practice to ensure they felt comfortable in the water before moving on to more advanced techniques. In the fourth and fifth sessions, the training began with a review of the water introduction techniques from the previous sessions to refresh and refine the basic movements.

After that, the focus shifted to teaching the leg movements for the front crawl. Participants were taught the correct leg kicking technique and given time to practice in shallower water. For participants who struggled with mastering the leg movements, additional practice sessions were provided until they showed sufficient competence in the leg movements. In the fifth and sixth sessions, the focus shifted to learning the coordination of the legs, arms, breathing, and rest techniques. This phase was critical because swimming involves synchronized movements from different body parts. The training focused on integrating leg movements with arm strokes and proper breathing coordination.

Additionally, participants learned resting techniques such as floating or floating while kicking to provide short recovery periods during swimming. Training was conducted over

varying distances, starting from 5 meters and gradually increasing to 25 meters. The sessions were held in shallow water to provide a safe environment for learning and to reduce the risk of injury while improving swimming techniques and physical endurance (Costa et al., 2012). In the seventh session, the focus of the training shifted to refining the front crawl technique. Participants practiced swimming continuously using the techniques they had learned, integrating all the skills they had acquired.

The instructor provided individual feedback on their technique and gave suggestions for improving their swimming efficiency. The training was designed to ensure that participants could swim longer distances while maintaining proper technique and control. Throughout the training process, the researcher ensured that each session was conducted in a supportive and safe environment. Continuous feedback was provided, and additional practice sessions were made available for participants who needed further assistance. This structured and progressive approach allowed participants to gradually build their skills and master the front crawl technique by the end of the study, ensuring that each participant made optimal progress in mastering swimming skills.

Finally, in the eighth session, a post-test was conducted using the same instruments as the pre-test to assess the participants' progress in mastering the front crawl technique. Participants were evaluated based on their ability to perform the front crawl efficiently, including the coordination of leg and arm movements, breathing, and overall endurance. The results of the post-test were compared to the pre-test results to determine the effectiveness of the intervention and track individual progress over the course of the training. The process of data analysis starts with collecting pre-test and post-test scores from both male and female groups. Following this, descriptive statistics are applied to calculate the mean, minimum, maximum, and standard deviation, which help in understanding the distribution and variability of the scores within each group.

To assess the normality of the data, the Wilcoxon test is utilized since the data does not follow a normal distribution, and it is used to detect any significant differences between the pre-test and post-test scores. For hypothesis testing, the Wilcoxon Signed-Ranks Test is applied to the male group, while the Paired Samples t-Test is used for the female group to determine whether the differences between pre-test and post-test scores are statistically significant for each group. Lastly, a comparison between the groups is performed using the Paired Samples t-Test to identify which group shows the most considerable improvement in swimming skills, comparing both males and females.

Results

The table below provides the descriptive statistics for the male group, indicating the minimum, maximum, mean, and standard deviation of the pre-test and post-test scores. These values give an overview of the data's spread and central tendency before and after the intervention.

Table 1. Descriptive statistics test for male group

Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation

Pre-Test	117	0	0	.00	.000
Post-Test	117	0	29	15.70	10.132
Valid N (listwise)	117				

The results from the descriptive statistics test show the minimum, maximum, mean, and standard deviation for both the pre-test and post-test scores. The pre-test scores had a mean of 0.00, indicating that all participants had no prior freestyle swimming skills. The post-test scores had a mean of 15.70, with a standard deviation of 10.132, It shows that the part and whole practice approach has a significant effect on improving swimming skills among students with limited experience. The following table presents the descriptive statistics for the female group, including the minimum, maximum, mean, and standard deviation of the pre-test and post-test scores.

Table 2. Descriptive statistics test for female group

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test	10	0	0	.00	.000
Post-Test	10	0	34	21.20	12.674
Valid N (listwise)	10				

For the female group, the pre-test also had a mean score of 0.00, while the post-test had a mean of 21.20 with a standard deviation of 12.674, showing a significant increase in freestyle swimming skills after the training program. Based on the results of the descriptive test, the part and whole practice approach has been proven to have a significant impact on improving the swimming skills of students with limited experience. Before presenting the table with the ranks, it's important to note that the Wilcoxon Signed-Ranks Test was conducted to assess the differences between the pre-test and post-test scores for the sample group.

This non-parametric test is used when the data does not follow a normal distribution, and it allows us to evaluate whether the median differences between pairs are significantly different from zero. The test categorizes the differences into three types: negative ranks (where the post-test score is lower than the pre-test score), positive ranks (where the post-test score is higher than the pre-test score), and ties (where there is no difference between the pre-test and post-test scores). The results of the Wilcoxon Signed-Ranks Test are presented in the table below, where the negative ranks, positive ranks, and ties are summarized to indicate the distribution of changes between the pre-test and post-test scores.

Table 3. Wilcoxon test results for normality

Ranks

		N	Mean Rank	Sum of Ranks
Post-Test - Pre-Test	Negative Ranks	0[a]	.00	.00
	Positive Ranks	86[b]	43.50	3741.00
	Ties	31[c]		
	Total	117		

a. Post-Test < Pre-Test
b. Post-Test > Pre-Test

c. Post-Test = Pre-Test

In this table, we can see the breakdown of the Wilcoxon signed-rank test results for the male group. The categories in the table include:

- Negative Ranks: This represents the number of cases where the post-test score was lower than the pre-test score. In this study, there were no negative ranks, meaning no participants showed a decrease in their scores after the training
- Positive Ranks: This shows the number of cases where the post-test score was higher than the pre-test score. Here, there were 86 positive ranks, meaning that 86 out of 117 participants showed an improvement in their freestyle swimming skills after the training program. The mean rank of the positive cases is 43.50, and the sum of these ranks is 3741.00.
- Ties: Ties indicate cases where there was no change between pre-test and post-test scores. In this case, 31 participants showed no change, which is reflected in the "ties" category.

Before presenting the statistical test results, it is important to note that the Wilcoxon Signed-Ranks Test was used to assess the significance of the difference between pre-test and post-test scores for the male group. This test was employed because the data did not follow a normal distribution, and its purpose was to determine whether there was a significant change in the results obtained after the intervention. Below are the results of the Wilcoxon Signed-Ranks Test, showing the Z value and significance for the male group.

Table 5. Test statistics for wilcoxon signed-ranks test

Test Statistics[a]

	Post-Test - Pre-Test
Z	-8.080[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

The Wilcoxon Signed-Ranks Test was used to assess the statistical significance of the difference between the pre-test and post-test scores for the male group.

- Z-value: The Z-value is -8.080, which indicates a very large negative rank in the difference between pre-test and post-test scores. This suggests a significant change in the scores.
- Asymptotic Significance (p-value): The p-value is 0.000, which is much smaller than the significance level of 0.05. A p-value less than 0.05 indicates that the difference between pre-test and post-test scores is statistically significant.

Thus, the hypothesis that there is no significant difference between pre-test and post-test scores is rejected, and we conclude that the training program had a significant impact on improving the freestyle swimming skills of the male participants. The result shows that the changes observed are statistically significant, supporting the effectiveness of the swimming training program for the male group.Before presenting the results of the statistical analysis, it is important to explain that a paired samples t-test was conducted to assess whether there was a significant difference between the pre-test and post-test scores for the female group. This test is used when the data is normally distributed and helps to determine whether the mean

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difference between two related groups is statistically significant. The following table displays the results of the paired samples t-test for the female group.

Table 6. Paired samples t-test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-test - Pos-test	-21.200	12.674	4.008	-30.266	-12.134	-5.290	9	.001

Thus, the hypothesis that there is no significant difference between pre-test and post-test scores for the female group is rejected. The results indicate that the training program had a significant impact on improving the freestyle swimming skills of the female participants. The observed changes are statistically significant, supporting the effectiveness of the swimming training program for the female group. A paired samples t-test was conducted to compare the difference between pre-test and post-test scores for both the male and female groups. The results of the comparison are shown in the table below:

Table 7. Paired samples t-test for comparison between groups

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-Test - Post-Test (male)	-15.701	10.132	.937	-17.556	-13.846	-16.762	116	.000
Pair 2	Pre-Test - Post-Test (female)	-21.200	12.674	4.008	-30.266	-12.134	-5.290	9	.001

When comparing the improvement between the male and female groups, the female group showed a greater mean improvement (-21.200) compared to the male group (-15.701). This suggests that, on average, the female participants experienced a more significant increase in freestyle swimming skills compared to the male participants. Both groups showed statistically significant improvements, but the female group exhibited a larger effect size, indicating that the training program may have had a slightly more substantial impact on improving the freestyle swimming skills of the female participants compared to the male participants.

Discussion

The results of this study provide significant insights into the impact of the swimming training program on freestyle swimming skills, with a clear distinction between male and female participants. Both male and female participants demonstrated significant improvements in freestyle swimming skills after undergoing the training program. For the

male group, the Wilcoxon Signed-Ranks Test revealed a Z-value of -8.080 with a p-value of 0.000, which indicates a significant improvement in swimming skills. Similarly, the female group exhibited a mean improvement of -21.20, with a p-value of 0.001 based on a paired samples t-test, confirming the effectiveness of the program for female participants as well.

Theoretical Framework: Motor Learning and Motor Skill

Based on the context of motor learning theory, which states that permanent changes related to motor skills, particularly complex skills like freestyle swimming, occur as a result of practice or experience (Fernandes et al., 2022). In other words, motor skill learning happens when complex processes in the brain occur in response to practice or experience of specific skills, resulting in changes to the central nervous system that enable the production of new motor skills (Mang et al. 2019). Motor skill learning encompasses various motor skills that occur in different forms of movement: working, playing, exercising, communicating, dancing, and so on (Castañer et al. 2009).

The concept of part-whole practice and motor skill acquisition is closely related to how motor skills are learned and refined (Magill 1998). In motor learning, part practice involves breaking down a complex skill into smaller and more manageable components (McMorris, T., & Hale 2006), such as arm movements or breathing techniques in freestyle swimming. This allows learners to focus on mastering each element before integrating them into the skill as a whole. On the other hand, whole practice involves practicing the skill in its entirety, helping learners experience how each component comes together to form a smooth movement (McMorris & Hale, 2006).

Implicit learning in motor skill acquisition shows that much of motor skill acquisition, especially when learning complex skills, occurs implicitly—learners often do not consciously focus on each component of the skill but instead gradually improve through repeated practice and feedback (Magill 1998). By using part and whole practice, learners can implicitly acquire the necessary motor skills. Part practice allows for focused repetition of specific components, leading to mastery of individual elements, while whole practice helps integrate these elements into a smooth and coordinated movement. This combination strengthens both conscious and unconscious (implicit) processing of skills, which is crucial for motor skill acquisition in sports like swimming. This combination of practice types (part and whole) is beneficial because it allows learners to refine specific skills while also developing the ability to perform the skill as a complete whole, engaging both implicit and explicit learning processe (Magill 1998). highlights that this combination of practice types (part and whole) is beneficial because it allows learners to refine specific skills while also developing the ability to perform the skill as a complete whole, engaging both implicit and explicit learning processe.

This study is among the first to explicitly apply a combined part and whole practice approach in freestyle swimming training within a controlled academic environment, particularly targeting college students with limited prior swimming experience. While these two methods have often been studied separately, this research highlights their synergistic potential in helping novices acquire complex motor skills efficiently. The integration of focused component learning (part practice) with full-skill execution (whole practice) enables learners to build confidence, reinforce learning through repetition, and experience the skill holistically. This dual-approach method proves especially effective for college students—

who, despite lacking prior training, were able to make significant progress in a relatively short time demonstrating the power of structured, evidence-based instruction. In doing so, the study contributes a novel instructional framework for physical education programs in institutions with limited access to aquatic facilities or populations with little or no prior exposure to swimming.

Gender Differences in Skill Acquisition

When comparing the improvement between the male and female groups, the results revealed that female participants showed a greater mean improvement (-21.200) than the male participants (-15.701). This difference suggests that the female group experienced a more substantial increase in freestyle swimming skills, indicating a potentially higher rate of skill acquisition or a greater responsiveness to the training intervention. While both groups improved significantly, the larger effect size in the female group implies that women may have benefited more from the training. However, it is important to consider that the sample size for the female group was relatively small (10 participants), which could limit the generalizability of this result. A larger sample size may provide a clearer picture of gender-related differences in response to swimming training.

Self-Regulation and Motivation in Learning

Additionally, the results of this study can be linked to the self-regulation theory of learning, which emphasizes the importance of motivation, feedback, and practice in skill development (Zimmerman 2002). College students, due to higher levels of cognitive and self-regulatory abilities compared to younger children, are often better able to manage their learning processes, receive and apply feedback, and persist through challenges. This may explain why college students in this study were able to show significant improvements in a relatively short time, despite their limited swimming experience at the outset (Susaki 2021).

The Influence of Gender on Motor Skill Learning

Previous research in motor learning and skill acquisition suggests that gender can influence how individuals respond to physical training (Odhiambo et al. 2016). For example, studies have shown that females often exhibit greater attention to detail in motor tasks, which can facilitate skill learning in activities that require fine motor control (Pahlevanian & Ahmadizadeh 2014). On the other hand, males are generally observed to possess greater initial physical strength and larger muscle mass, which could contribute to ability to learn and perform certain types of physical tasks more quickly, especially in tasks that require strength or explosive power (Bartolomei et al., 2021). However, swimming, which requires a combination of endurance, technique, and finesse, may benefit females more in terms of skill acquisition in a controlled training environment, as seen in this study.

While males showed significant improvement, the results suggest that the training program may have been more effective for female participants, possibly because the nature of the intervention (focusing on technique and stroke efficiency) played to strengths that align with the motor learning capabilities often observed in females. Additionally, the greater variance in the female group's improvement might indicate that certain individuals in this group responded more favorably to the training program, while others may have faced more challenges that were overcome through personalized learning strategies.

Implications for Swimming Education and Training

The findings of this study have important implications for swimming education and training, especially in settings with limited swimming experience or access to aquatic facilities. By using a combination of part and whole practice approaches, swimming educators can effectively help students develop key skills in a relatively short period. Furthermore, this study highlights the importance of tailored interventions that consider the specific needs and learning styles of male and female students, as gender differences can influence both the rate and extent of skill acquisition. Finally, the positive results of the training program suggest that similar methods could be applied to other skill-based sports or physical activities, particularly in contexts where participants may have limited prior experience.

Conclusion

In conclusion, the study provides strong evidence for the effectiveness of part-practice and whole practice methods in improving freestyle swimming skills in students with limited experience. The results suggest that college students, despite having minimal prior exposure, can rapidly acquire and enhance their swimming techniques due to their adaptive learning capabilities. This study contributes to the broader understanding of how motor skills, particularly in swimming, can be developed efficiently through targeted training programs, regardless of initial skill levels. Moreover, these findings offer practical value for the design of swimming instruction in educational contexts, especially in institutions with limited access to aquatic facilities. While the study presents promising outcomes, the relatively small sample size—especially in the female group—calls for cautious interpretation and warrants replication with larger, more diverse populations. Future research is recommended to investigate the long-term retention of skills acquired through these training methods and to explore their effectiveness across various age groups and motor skill domains. Ultimately, this research provides a scientific foundation for enhancing motor learning strategies in physical education and sports training.

Bibliography

Ananthapavan, V., Paden, A, E., Angell, B., & Macniven, R. (2024). “Barriers to Preschool Aged Children’s Participation in Swimming Lessons in New South Wales, Australia.” *Health Promotion Journal of Australia.* 35(3). 770–83. https://doi.org/10.1002/hpja.811

Arifin, Z., Mulyanaet, B., Sutresna, N., Subarjah, H., & Pratama, K., W. (2024). “The Effect of Varied Training Methods with Smaller Class Sizes on Students’ Front Crawl Swimming Skills.” *Jurnal Sportif : Jurnal Penelitian Pembelajaran* 10(1):90–104. https://doi.org/10.29407/js_unpgri.v10i1.22196

Arifin, Z., Mulyana, R. B., Sutresna, N., Subarjah, H., Sonjaya, A. R., & Taopik, M. (2024). “Pengaruh Modifikasi Part Practice Methode Terhadap Keteampilan Renang Gaya Bebas dan Dada.” *Journal of SPORT.* 8(1). 341-353. https://jurnal.unsil.ac.id/index.php/sport/article/view/9159

Badruzaman, B., Rusdiana, A., & Syahid A, M. (2020). “The Contribution of Submerge, Floating, and Gliding Ability on Swimming Distance Ability for First-Year College

Students." *Proceedings of the 4th International Conference on Sport Science, Health, and Physical Education (ICSSHPE 2019)*. 21(Icsshpe 2019). 160–65. https://doi.org/10.2991/ahsr.k.200214.044

Bailon, L. (2024). "Teaching Strategies in Swimming and Aquatics." *Dalat University Journal of Science.* 14(2). 37–49. https://doi.org/10.37569/DalatUniversity.14.2.1126(2024)

Bartolomei, S., Grillone, G., Michele, R, D., & Cortesi, M. (2021). "A Comparison between Male and Female Athletes in Relative Strength and Power Performances." *Journal of Functional Morphology and Kinesiology* 6(1). 17. https://doi.org/10.3390/jfmk6010017

Bogdanoviča, I., & Lāriņš, V. (2021). "Backstroke Teaching Methods in Healthy Children With Residual Primitive Reflexes." *Society. Integration. Education. Proceedings of the International Scientific Conference* 4:318–32. https://doi.org/10.17770/sie2021vol4.6256

Borgonovi, F., Seitz, H., & Vogel, I. (2022), "Swimming skills around the world: Evidence of life skills inequalities between and within countries", OECD Social, Employment and Migration Working Papers, No. 281, *OECD Publishing, Paris*. (281). 0–58. https://doi.org/10.1787/0c2c8862-en

Castañer, M., Torrents, C., Anguera, A, T., Dinušová, M., & Jonsson, G, K. (2009). "Identifying and Analyzing Motor Skill Responses in Body Movement and Dance." *Behavior Research Methods* 41(3):857–67. https://doi.org/10.3758/BRM.41.3.857

Chiramba, O., & Ndofirepi, E, S. (2023). "Access and Success in Higher Education: Disadvantaged Students' Lived Experiences beyond Funding Hurdles at a Metropolitan South African University." *South African Journal of Higher Education* 37(6). 56–75. https://hdl.handle.net/10520/ejc-high_v37_n6_a5

Costa, A, M., Marinho, D, A., Rocha, R., Silva, A, J., Barbosa, T, M., Ferreira, S, S., & Martins, S. (2012). "Deep and Shallow Water Effects on Developing Preschoolers' Aquatic Skills." *Journal of Human Kinetics* 32(1). 211–19. https://pmc.ncbi.nlm.nih.gov/articles/PMC3590868/

Duke, C., Calverley, H., Petrass, L., Peters, J., Moncrieff, K., Konjarski, L., & Matthews, B. (2023). "A Systematic Review of Demographic and Background Factors Associated with the Development of Children's Aquatic Competence." *Injury Epidemiology* 10(1). 42. https://doi.org/10.1186/s40621-023-00447-4

Engle, J., & Tinto, V. (2008). "Moving beyond Access: College Success for Low-Income, First-Generation Students." *The Pell Institute for the Study of Opportunity in Higher Education* 1–38. https://eric.ed.gov/?id=ED504448

Fernandes, L, A. Nogueira, N, G, H, M., Figueiredo, L, S., Ferreira, B, P., Couto, C, R., Torres, N, L., Ribeiro, L, C., & Lage, G, M. (2022). "Stages of Motor Learning and the Teaching-Learning Process in Swimming." *Research, Society and Development* 11(3):e26311326201. https://doi.org/10.33448/rsd-v11i3.26201

Ferreira, F, A., Santos, C, C., Palmeira, A, L., Fernandes, R, J., & Costa, M, J. (2024). "Effects of Swimming Exercise on Early Adolescents' Physical Conditioning and Physical Health: A Systematic Review." *Journal of Functional Morphology and Kinesiology* 9(3). 158. https://doi.org/10.3390/jfmk9030158

Fontana, F, E., Furtado, O., & Gallagher, J, D. (2009). "Whole and Part Practice: A Meta-

Analysis." *Perceptual and Motor Skills* 109(2). 517–30. https://journals.sagepub.com/doi/abs/10.2466/pms.109.2.517-530

Fraenkel, J., Wallen, N., & Hyun, H. (2019). *How to Design and Evaluate Research in Education*. McGraw-Hill Education.

Higgerson, J., Halliday, E., Ortiz-Nunez, A., & Barr, B. (2019). "The Impact of Free Access to Swimming Pools on Children's Participation in Swimming. A Comparative Regression Discontinuity Study." *Journal of Public Health (United Kingdom)* 41(2) 214–221. https://doi.org/10.1093/pubmed/fdy079

Layne, T, E., Irwin, C, C., Pharr, J, R., & Erwin, R, L. (2020). "Factors Impacting Swimming Participation and Competence: A Qualitative Report." *International Journal of Aquatic Research and Education* 12(4). 1-26. https://doi.org/10.25035/IJARE.12.04.10

Lohr, S. L. (2021). *Sampling: Design and Analysis*. Chapman and Hall/CRC.

Magill, R, A. (1998). "Knowledge Is More than We Can Talk about: Implicit Learning in Motor Skill Acquisition." *Research Quarterly for Exercise and Sport* 69(2). 104–10. https://doi.org/10.1080/02701367.1998.10607676

Magill, R, A., & Anderson, D, I. (2017). *Motor Learning and Control : Concepts and Applications (11th Edition)*. Eleventh E. New York: McGraw-Hill Education.

Mang, Cameron S. et al. (2019). "Motor Skill Learning and Its Neurophysiology." Pp. 293–312 in *Skill acquisition in sport*. Routledge.

McMorris, T., & Hale, T. (2006). *Coaching Science: Theory into Practice*. Vol. 4. John Wiley & Sons.

Nikšić, E., Beganovic, E., Joksimović, M., Mušović, A. (2020). "The Influence of Balance and Flexibility on the Performance of Freestyle Swimming." *Journal of Physical Education and Sports Studies* 12(2). 59–64. https://doi.org/10.30655/besad.2020.27

Odhiambo, J, A., Omoke, C., Aloka, P, J. (2016). "Gender Differences in Response to Motor Skill Training on the Performance of Dressing as an Activity of Daily Living by Pupils with Cerebral Palsy in Kisumu, Kenya." *Journal of Educational and Social Research* 6(1):178–83. https://doi.org/10.5901/jesr.2016.v6n1p178

Pahlevanian, A, A., & Ahmadizadeh, Z. (2014). "Relationship Between Gender and Motor Skills in Preschoolers." *Middle East Journal of Rehabilitation and Health* 1(1):7–11. https://doi.org/10.17795/mejrh-20843

Sinclair, L., & Roscoe, C., M., P. (2023). "The Impact of Swimming on Fundamental Movement Skill Development in Children (3–11 Years): A Systematic Literature Review." *Children Journal.* 10(8). 1411. https://doi.org/10.3390/children10081411

Stallman, R, K., Moran, K., Quan, L., & Langendorfer, S. (2017). "From Swimming Skill to Water Competence: Towards a More Inclusive Drowning Prevention Future." *International Journal of Aquatic Research and Education* 10(2). 1-35 https://doi.org/10.25035/ijare.10.02.03

Strand, B, N., & Wilson, R. (1993). *Assessing Sport Skills*. United States of America: Human Kinetics.

Strašilová, K., Vajda, V., Zvonař, M. (2020). "Cross-Sectional Study of the Level of Basic Swimming Skills of Elementary School Pupils in a Selected Region of the Czech Republic in the Years 1995–2015." *Journal of Physical Education and Sport.* 20(1).267–72. https://doi.org/10.7752/jpes.2020.01036

Susaki, Y. (2021). "Self-Regulated Learning and Motor Skills: Effects of a Physical Education Intervention Program on Japanese College Students." *Journal of Physical Education and Sport* 21(6):3593–98. https://doi.org/10.7752/jpes.2021.06485

Upadhyaya, D., & Bhatt, J. (2017). "14 A Study of Effect of Swimming on Breath Holding Time." *Indian Journal of Applied Basic Medical Sciences* 19 B (29). 973-975 https://journals.indexcopernicus.com/search/article?articleId=1568999

Zimmerman, B, J. (2002). "Becoming a Self-Regulated Learner: An Overview." *Theory Into Practice* 41(2):64–70. https://doi.org/10.1207/s15430421tip4102_2