



Management of Drills in Swimming for Athletes Ages 6-18

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Abstract

The management of drills in swimming for school-age athletes (6-18 years old) requires a very high level of precision with a minimum fault tolerance threshold of up to 1%. This study aims to determine the optimal management of drill exercises to improve the technical performance of athletes in a sustainable manner. The method used is a literature review of 9 relevant sources published between 2020 and 2026. The results of the analysis show four main pillars in the management of drill exercises: (1) integrating the coach's understanding of sport science and biomechanical analysis to objectively identify technical deviations; (2) selection of specific training programs according to the needs of individual athletes; (3) the application of undulating or non-linear periodization which has been shown to be more effective in maintaining performance consistency and preventing neuromuscular saturation in young athletes; and (4) the use of assistive devices such as pull buoys, fins, and buoys, as well as motion analysis technologies (such as Kinovea) to isolate technical weaknesses and improve movement efficiency in the water. Overall, the synergy between data-driven planning, rigorous operational standardization, and continuous evaluation is a key foundation in optimizing long-term swimming performance.

How to Cite

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INTRODUCTION

Exercise is physical activity that is carried out in a planned, structured, and sustainable manner with the aim of maintaining and improving a person's physical fitness, movement skills, health, and quality of life. Sports are not only oriented to physical aspects, but also have educational, social, mental, and recreational values, so they play a role in character building, sportsmanship, discipline, and cooperation (Pranata & Dedy 2022). In the context of education and achievement, sport is a means to develop individual potential through regular and meaningful movement activities. In achievement sports, there are various sports ranging from martial arts, athletics, to water sports. In water sports, there are also various sports, one of which is swimming (Indrayana et al 2020).

Swimming is a branch of water sport that is carried out in water by moving the limbs in a coordinated manner to move places or maintain the position of the body on the surface of the water. Swimming is done with certain techniques such as freestyle, breaststroke, backstroke, and butterfly style that require effective mastery of movement, breathing, and body coordination skills. In Indonesia, swimming is a sport that is quite in demand even from children to adults, this is because swimming is an individual sport and swimming pools are quite a lot, because swimming is a sport that has many enthusiasts, currently many parents are registering their children to participate in swimming training, this creates a surge in swimming athletes with the most categories in athletes who are still in the school phase starting from elementary school to high school seniors aged 6 to 12 years, it also supports many swimming events available in various regions, ranging from district, provincial events such as the provincial Sports Week (PORPROV) to national events such as the National Sports Week (PON), in addition to domestic events, swimming is also included in the sports that participate in the highest sporting event, namely the Olympics which takes place every 4 years. (Wiradihardja, 202)

In a competition, of course, all athletes who participate in the competition expect the best results, starting from breaking their own records from certain categories, getting the best time, to getting medals. However, to get this, it is necessary to implement exercises carried out by athletes. Exercise is a process that is carried out systematically, repeatedly, and programmatically with an increase in weight or intensity over time

to achieve a specific goal, such as improving physical fitness, skills, and performance in sports. This definition emphasizes that exercise is not just an ordinary physical activity, but is done in a planned and repetitive manner so that the body experiences the desired adaptation through a gradually increasing stimulus of exercise. In swimming, there are many training models, such as VO2MAX exercises to increase lung capacity, sprint exercises to increase speed, to drill exercises to improve training techniques drills help increase speed Suarjani et al 2025 , The effectiveness of even the form of swimming to match the most correct technique. Of the various training models, Drills are exercises that require concentration and the smallest possible error rate of up to 1%, Drills in swimming are a form of technical exercise that is performed in a structured, repetitive and specific manner to improve and strengthen the elements of basic swimming movements, such as body position, arm movements, leg movements, coordination and breathing techniques. Drills are designed to break down a single swimming skill into small pieces so that swimmers can focus on mastering certain techniques more effectively (Apriliani et al., 2024).

Due to the high level of concentration and very small fault tolerance, Drills must be carried out with qualified supervision and management by the coach to ensure the success of the Drills. Drills, especially if the athlete being trained is a schoolboy who has an age range of 10 to 18 years who has responsibilities at school and at the training ground. In drill training, not only the coach has the main role, but the athlete must also have a high attitude of responsibility and honesty to prevent mistakes that may occur (Setyawan 2025). From this research, this literature review was carried out to find out how the management of drills that require high concentration and very low error rates is given to school children who have an age range of 6-18 years. The novelty of this research lies in the development of a precision-based training management concept that integrates measurable planning, strict operational standards, and the application of sports science to minimize technical errors to a tolerance limit of 1% in order to improve athlete performance in a sustainable manner.

METHOD

The method used in this article is a literature review using 9 sources from the time range of 2020 to 2026 obtained from google scholar sources with special criteria, the cited article must dis-

cuss related to priodization because periodization is the foundation in training design, then research that utilizes media in training such as special sports aids or tools, the application of sport science as a foundation in the development of athlete potential and The last one discusses management in clubs that contain the management of coaches and athletes, the 9 sources will be analyzed as the basis for the development of the theory of management of Drill Exercises in swimming **Table 1.**

Table 1. (Litelature Articles)

Author	Title	Findings	Journal
Rubertus Nawang, Muhammad Afri-zaldi, Muham-mad Arief Mulya (2025)(Nawang et al., n.d.)	Improvement of Basic Swimming Techniques for Elementary School Age Children at Victory Sport Center Serpong through the Struc-tured Drill Method	The applicatio of the structured drill method is very relevant for use in swimming coaching because it is able to break down the complexity of movements into simpler and more systematic components. Through a progressive-ly structured approach ranging from gliding techniques to motion coordination, this method has been proven to significantly improve mechanical efficiency and techni-cal ability by 31% while building confidence and aquatic safety in swimmers. Thus, this training model becomes a very effective training management instrument for train-ers to ensure a solid and measurable mastery of basic techniques before moving on to the more complex stages of swimming.	Jurnal Har-moni Abdi Masyarakat (JUHAM)
M. Rezeky and Muhammad Syaleh (2025) (Rezeky et al., 2025)	Comparison of Linear and Non-Linear Periodi-zation Training Methods on Free-style Performance	Comparing the effectiveness of linear and non-linear periodization methods on freestyle swimming perfor-mance in adolescent athletes, showed significant results, in general both methods were able to provide meaning-ful performance improvements. However, the group that underwent training with the non-linear periodization method had a superior rate of improvement compared to the linear group because the variation in intensity and more dynamic exercise volume was able to provide more diverse physiological stimuli and prevent adaptation saturation in athletes. Therefore, the application of non-linear periodization is highly recommended for swimming coaches to optimize the time record and ability of athletes more effectively than linear or fixed training patterns.	Journal of Sport And Science 45
Unun Umaran and Iman Ima-nudin (2023). (Abstrak JTIKOR 2023, 2021)	Application of Pe-riodization of Un-dulating Exercises to Increase Muscle Endurance	Undulating periodization is a perodization that uses high and low training intensity with a period of time that tends to be short, The application of periodization of undulat-ing or wavy exercises has been proven to be able to signifi-cantly increase muscle endurance and power endurance in athletes. This method is very effective as a solution for trainers who have a short competition preparation time, as it is able to provide a more optimal variety of training stimuli and recovery periods for the muscular nervous system compared to an unplanned training program. Through manipulating the volume and intensity that varies in each session or week, this program succeeds in providing more meaningful changes in physical abilities to maintain consistency in performance and minimize the risk of injury during competitions.	(JTIKOR) Jurnal Terapan Ilmu Olah-raga
Abdul Hafidz, Martadi, Warju, Wijono, Dio Airlangga, Bayu Agung Pramono, and Tri War-dati Khusniyah. (2025) (Hafidz et al., n.d.)	Application of Sport Science in Physical Training Management to Improve the Qual-ity of Professional Athletes in Ngan-juk Regency	The application of Sports Science in training manage-ment enables coaches to design, control, and evaluate training programs with precision through objective meas-urement, continuous monitoring, and data-driven adjust-ments. This approach is effective in minimizing training errors, improving program efficiency, and optimizing athlete performance consistently	ABI-SATYA: Journal of Communi-ty Engage-ment

Sugito, Muhammad Akbar Husein Allsabab, and Rendhitya Prima Putra (2020)(Sugito et al., 2020)	Kediri City Swimming Club Coaching Management in 2019	The success of coaching swimming achievements in Kediri City is highly dependent on the effectiveness of organizational management which includes aspects of coaching, recruiting athletes, and providing infrastructure. Overall, the club's management has run in the category very well, especially in terms of coaching qualifications and the planning of a systematic training program. This article shows that the synchronization between the vision of the coach in compiling a work program and the support of adequate facilities is the main foundation in producing outstanding athletes. However, this study also underlines the need to strengthen the financing and utilization of sports science so that the coaching process can be more competitive and sustainable in the future. The integration of digital technology, especially Kinovea software, is a very crucial instrument in dissecting the complexity of technical movements in water sports. The use of video-based biomechanics analysis allows coaches and academics to identify movement details that are not captured by the naked eye, making the evaluation of athletes' performance much more objective and precise. This article emphasizes that a deep understanding of joint angles, pull phases, and body coordination through the help of technology can minimize technical errors early. In conclusion, the implementation of biomechanical analysis technology is no longer just an option, but an urgent need in modern coaching management to ensure maximum movement efficiency and systematic improvement of athlete achievements. The ability of the coach to analyze and identify the technical details of athletes' movements accurately, especially related to the adjustment of the angle of the body position. The essence of these findings suggests that training will only achieve optimal results if the coach is able to ensure that the athlete's body remains in an aligned position or zero degrees to minimize water resistance and maximize thrust. Without precise movement identification of the deviation of the body angle, the exercises are at risk of becoming inefficient because the athlete will waste more energy to counter the hydrodynamic obstacles that could actually be avoided. Therefore, the integration of biomechanical analysis in exercise management is an absolute necessity so that every instruction and correction given by the trainer is based on objective data that can guarantee a significant improvement in performance. The use of aids in the form of buoys and fins (swimming fins) has a very significant impact in optimizing the effectiveness of the drill method to improve freestyle swimming skills. The core of these findings shows that buoy media plays a crucial role in maintaining body position stability and providing safety for swimmers, while the use of fins in particular can increase thrust and help athletes feel more efficient coordination of movements in the water. With the support of this tool, drill exercises no longer feel monotonous and difficult but become more measurable in improving specific hand pull techniques and foot movements. In conclusion, the proper integration of tools in drill training management is a decisive factor that accelerates the mastery of basic techniques while significantly improving the speed performance of athletes.	Jurnal SPORTIF: Jurnal Penelitian Pembelajaran
Eka Purnama Indah, Norma Anggara, Mita Erliana, and Dewi Susilawati (2024) (Indah et al., 2024)	Implementation of Biomechanical Analysis Technology on Aquatic Sports Skills		Riyadhoh: Jurnal Pendidikan Olahraga
Wijono Sukaputra Agussalim and Trifena Ruth Clara (2025) (Wijono Sukaputra Agussalim & Trifena Ruth Clara, 2025)	Analysis of Swimmers' Movement Biomechanics for Training Optimization		Journal of New Trends in Sciences (JNTS)
Imam Ramadhan, Suaib Nur, and Ahmad (2023) (Ramadhan et al., 2023)	Improving Freestyle Swimming Skills Using the Drill Method with Buoyancy Media and Fins		Jurnal Porses (Jurnal Pendidikan Olahraga)

Vivi Miati Putri and Supriyono (2021)(Miati Putri et al., 2021)	Pull Buoy and Vest Training on the Swimming Speed of Tirta Tunggal Semarang Athletes	The use of aids such as pull buoys and weighted vests has a very significant impact on increasing the effectiveness of drill exercises to spur athletes' swimming speed. The use of pull buoys is very effective at isolating movement and keeping the body position stable on the surface of the water, so that athletes can focus all their energy on improving stronger and more efficient hand pull techniques. Meanwhile, the use of a weighted vest provides additional weight that trains endurance and muscle strength specifically when drilling. The integration of these two aids in training management has been shown to be able to create a measurable training load and a sharper focus of coordination, which directly contributes to an increase in the overall speed and performance of athletes compared to conventional training methods without tools.	Indonesian Journal for Physical Education and Sport
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RESULTS AND DISCUSSION

Swimming is an Aquatuk sport or a sport that is carried out in water environments such as rivers, seas and swimming pools, to achieve achievements requires intensive training and good management of the implementation of exercises, Drill is one of the exercises that can be given as an effort to improve achievement but drill training is a training method that has a very narrow level of fault tolerance, So that good exercise management is needed so that the athlete's process during training becomes mechanical. The results of the literature review conducted on the 9 referenced articles show that there are 4 main findings that can be made to manage drill training in swimming, first, the importance of the coach's ability and understanding of sport science and biomechanics in swimming, second, the importance of selecting or managing the training program given, third, the importance of determining periodization for long-term training, and fourth, the importance of using tools to help the implementation of exercises.

Coaches' understanding of sport science and biomechanics in swimming is fundamental especially for training athletes, sport science is the science of sports that contains scientific principles and motion biomechanics is the science of how the body moves and adapts in certain circumstances in sports (Gilardino, et al 2025), understanding of both things allows coaches to carry out training programs based on scientific principles. In precision drill training is the main thing, a few mistakes can have a bad impact on the athlete because it has the potential to result in injuries and results that are not optimal, in addition to an understanding of sports science and biomechanics can help coaches identify fatigue in athletes when performing exercises that are usually characterized by special characteristics. Furthermore, the

selection of an exercise program that suits the needs of athletes is one of the main things in exercise management, drill training is a method to break down specific movements in swimming into several parts, drill exercises have many variations ranging from foot drill exercises, hand drill exercises, to drill exercises for breathing. During the training the coach must be able to understand the weaknesses and advantages of the athlete, if the strength in the movement of the stroke butterfly style is wrong, for example the right hand is stronger than the left hand or vice versa the coach must be able to determine the exercises given to overcome the problem, in which case special drill exercises can be given according to the needs of the athlete. Furthermore, the selection of priodation for long-term training, periodization is a training map that is usually prepared for training with a period of 3-12 months, the selection of the right periodization can help provide an idea of the course of training and maximize the results or perfora of athletes, many types of periodization are used in sports, but undulating or non-linear periodization has advantages, especially if there are various cases of athletes having shortcomings so that it requires drill exercise. Undulating perio-dization has a wave pattern so that the load given during training will rise and fall in a short time, it is suitable for use as periodization for athletes who need drill training because the nature of the up and down load prevents neuromuscular saturation and gives time for body tissues to recover after training. Finally, the use of aids in training, in swimming there are many ghost tools used, such as buoys, finns, paddles, pull buoys and snorkels, drill exercises are exercises that break down specific movements into several simple movements that focus on that point only. The case of athletes in the pool is very diverse such as the strength of the hand that is weak, the strength of the hand is weaker than the legs, the left hand is weaker than

the right hand, to the rhythm of breathing that is not suitable and has the potential to slow down the speed of swimming and the angle of the hand that is not suitable when swimming, some of these problems can be overcome with drill exercises that require special tools such as the use of pull buoy as a tool to help wash the hands, buoys as a foot training aid, as well as the use of motion analysis software such as KINOVEA which can be used to help analyze athletes' swimming movements to be more optimal.

Overall, the results of this analysis show that proper drill training management is able to significantly improve the quality of athletes' swimming techniques. The integration of the coach's understanding of sport science and biomechanics, the selection of training methods, the selection of periodization, and the use of aids proved effective in reducing the rate of motion errors to a very small level. This approach not only impacts the improvement of athletes' performance in the short term, but also contributes to the formation of efficient and sustainable swimming techniques. The contribution of this article to the development of science lies in the strengthening of the concept of drill management in swimming. This article focuses on the application of coach understanding, determination of training methods, determination of periodization and the use of aids in the management of drill exercises in swimming. These findings can be used as a reference for swim coaches in designing and managing more effective drill exercises, as well as being the basis for further research in the development of technical training management models in swimming and other sports that demand high precision motion.

Management of Drills in swimming requires a very high level of precision as small errors in the execution of techniques can have a significant impact on the efficiency of movement and athlete performance. Drill exercises in swimming do not only serve as a repetition of movements, but as a means to form precise technical patterns with a very small degree of fault tolerance. Therefore, the success of Drill Drill is largely determined by how the trainer plans, implements, and evaluates the Drill in a systematic and controlled manner. This approach is in line with the concept of modern practice management that emphasizes error control through careful planning.

Drill training should be appropriately designed with clear and measurable engineering objectives. Each form of drill needs to be adjusted to the needs of the athlete, the level of ability, and

the stages of coaching that are being carried out. Non-specific planning has the potential to increase the variation of motion errors and decrease the effectiveness of exercises. The long-term athlete development approach confirms that a training program that is structured gradually and in accordance with the characteristics of the athlete is able to improve the quality of coaching and minimize technical errors in training (Lorenz et al 2015) In addition, systematic training planning allows the trainer to establish indicators of technical success that can be observed directly during the implementation of the exercise. The implementation of precision drill exercises also requires clear and consistent operational standards. These operational standards include the sequence of movements, implementation rules, and identification of common mistakes that athletes should avoid. The clarity of the implementation standards serves as a technical guideline that helps athletes understand the correct limits of motion, so that variations in errors during training can be minimized. Consistency in the application of training implementation standards is an important factor in maintaining the quality of swimming techniques and the effectiveness of overall training management Before drills are carried out, coaches have an important role in providing accurate technique demonstrations. Correct demonstrations, whether done in person or through visual media, help athletes build a proper understanding of movement from the start. The inaccuracies of the demonstration have the potential to cause movement misperceptions that are difficult to correct at a later stage. Therefore, accurate technical demonstrations are an integral part of drill training management as they serve as the primary reference for athletes to perform movements according to the expected standards. During drills, active supervision and direct feedback are key in controlling the level of motion errors. Coaches must be able to observe every detail of the athlete's movements and provide quick, brief, and specific corrections to errors that arise. The feedback provided directly helps the athlete immediately correct the movement so that mistakes do not repeat and do not develop into incorrect patterns of technique. This approach is in line with the application of sports science in sports management which emphasizes continuous monitoring and correction based on objective observations. The physical condition and level of fatigue of athletes are also factors that affect the quality of the implementation of drill training. Excessive fatigue can decrease the concentration and movement control of athletes, thus inc-

reasing the risk of technical errors. Therefore, coaches need to adjust the volume, intensity, and rest time appropriately so that the quality of the technique is maintained. Good training load management has been proven to be able to maintain athletes' technical performance while preventing movement errors due to physical fatigue (Indah Atifah Anwar et al., 2025)

After the implementation of the drill exercise, the evaluation and documentation of errors becomes an important part of the management of swimming drills. The coach needs to record the type and frequency of errors that occur as a basis for improvement in the next training session. Continuous evaluation allows the trainer to adjust the training plan and method so that the same mistakes are not repeated. This evaluation process serves as a training quality control mechanism that aims to keep the error rate very low and close to the minimum tolerance limit.

CONCLUSION

The management of drill training in school-age swimmers (6-18 years old) is not just a repetition of movements, but a technical management system that demands high precision with a minimum error threshold of up to 1%. The success of this system relies on the integration between the coach's deep understanding of sport science and the implementation of biomechanical analysis to dissect the complexity of each phase of the swimsuit into simpler and measurable components of motion. Through this approach, coaches are able to objectively identify technical deviations, provide accurate instant corrections, and ensure that each training session provides the right stimulus for the athlete's neuromuscular adaptation without the risk of burnout. The implementation of effective exercise management also requires synchronization between dynamic periodization planning and the use of technology and mechanical aids. The use of undulating or non-linear periodization has proven to be superior in maintaining the consistency of young athletes' performance because it is able to accommodate more flexible variations in volume and intensity than conventional linear patterns. Support for assistive devices such as pull buoys, fins, and buoys, as well as the integration of motion analysis software such as Kinovea, are crucial instruments in isolating athlete-specific weaknesses, minimizing hydrodynamic obstacles, and significantly maximizing movement efficiency in the water

Overall, this article confirms that systema-

tic drill management ranging from data-driven planning, rigorous operational standardization, to continuous evaluation of the smallest details is a key foundation in optimizing long-term swimming performance. The synergy between the coach's technical competence, the selection of the right training media and measured load control not only contribute to an increase in speed in the short term but also guarantee the formation of efficient and sustainable techniques. These findings are expected to be a strategic reference for practitioners in designing modern coaching models that prioritize movement precision and scientific integrity in sport.

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