Contemporary Technologies and Society: Innovations, Artificial Intelligence, and Challenges

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CONTEMPORARY TECHNOLOGIES AND SOCIETY: INNOVATIONS, ARTIFICIAL INTELLIGENCE, AND CHALLENGES

Collective Scientific Monograph

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PART 5

Advancements in Physical Education and Rehabilitation: Theory and Practice

5.1. TEACHING 7-8-YEAR-OLDS BREATHING TECHNIQUES WHILE SWIMMING FRONT CRAWL

Front crawl is a highly popular and widely practiced swimming stroke for several reasons: efficiency, speed, breathing ease, versality, muscle engagement, streamlined body position, race performance, accessibility for beginners, aesthetics, and mental relaxation. Several Ukrainian swimmers (Oleg Lisogor, Igor Borysik, Andriy Serdinov, Daryna Zevina, Viktoriya Solntseva) have achieved success in breaststroke events, both on the national and international levels, and have made significant contributions to the breaststroke discipline. The technique of breathing while swimming with a front crawl was developed and fully completed by a lot of swimmers (Gerald Molloy, Mark Spitz, Kosuke Kitajima, Adam Peaty, etc.), coaches and specialists in sport physiology (Joel M. Stager, David G. Atkinson) and biomechanics (Caroline G. Tourny-Chollet). Several swimmers and scientists focused on perfected breathing techniques while swimming, including the chest crawl technique (Forbes Carlyle, Tracey Cox, Michael Phelps, Mark Spitz, Terry Lawrence). The factors that contribute to the popularity of the front crawl among swimmers of all skill levels and backgrounds are efficiency, speed, versatility, and overall enjoyment make it a preferred choice for many individuals seeking to improve their swimming abilities or simply enjoy the water. On the other hand, the technique of swimming front crawl and breathing are both interesting for sport physiologists, swimming coaches and swimmers. This fact explains different techniques of breathing and, as a result, approaches to teaching breathing while swimming front crawl.

The purpose of this study is to analyze approaches to teaching breathing techniques while swimming front crawl and to check the effectiveness of proposed methodology for 7-8-year-old swimmers.

Material and methods. 24 children aged 7-8 years took part in training sessions in Mykolaiv sport complex «Zoria». Swimming sessions lasted 60 minutes and were held three times a week during two months. After swimming children also had training sessions in the gym, 30 minutes each training. Children were divided into two groups (group A and group B), 12 people in each group.

Based on personal experience as a swimming coach, the author suggests the following approach to teaching breathing technique 7-8-year-olds.

Methodology. When swimming front crawl, the athlete lies on the surface of the water in a horizontal position (the face is lowered into the water) and performs alternate strokes with his hands. While one arm, slightly bent at the elbow, strokes in the water from front to back, the other arm (also slightly bent at the elbow, but relaxed) moves forward above the water. To inhale, the swimmer turns his head to the side. After inhalation, the head turns face down again; the swimmer exhales into the water (Craig Jr., 1986).

Arm strokes are combined with continuous alternating movements with almost straight legs up and down near the surface of the water. During one complete cycle of arm movements (stroke left and stroke right), the swimmer manages to perform several movements (strokes) with his legs. According to the number of these strokes, there are two-, four- and six-stroke versions of the crawl. All options are rational; the choice depends on the tasks of training, individual characteristics of the swimmer, swimming conditions. The basis of most of the methods of primary education is the development of the technique of the six-stroke crawl. (Faelli et al., 2021)

There are many teaching aids and research focusing on teaching swimming. P. F. Lesgaft (1922) claimed that a child could learn the art of swimming only if he perfectly controlled himself and

skillfully performed all his actions. The skill of swimming is much harder and longer for adults to learn than for children or teenagers. This spatial skill should be cultivated from childhood, as it is controlled by different levels of the movement structure. (Pedersen, Kjendlie, 2006) Coordination of movements is carried out with the help of so-called sensory corrections, that is, processes of continuous correction of movements based on signals entering the central nervous system from the senses. Motor experience gained in different situations contributes to the manifestation of ingenuity, which is a component of dexterity. Dexterity, according to P. A. Bernstein (Nakashima et al., 2012), is the ability to cope with a motor task that has arisen correctly, quickly, rationally, and resourcefully. At some point, the ability to swim is realized immediately and is never lost again. These secrets of swimming skills do not lie in any special movements of the body, but in a special kind of sensations and corrections received by a person in the conditions of the water environment. It is necessary that the assimilation of new material must be based on the knowledge, skills and abilities that have been acquired earlier in the previous training. That is why swimming lessons are divided into several stages: mastering with water; learning to exhale into the water; sliding; elementary strokes; the work of legs during front crawl; the work of hands during front crawl; synchronize work of hands and legs; synchronize work of legs and breathing; synchronize work of hands and breathing; full synchronization (hands, legs, and breathing) during front crawl. (Nakashima et al., 2012). Difficulties usually arise when the coach must teach the correct turn of the head, to perform inhalation when swimming on the chest. Children cannot perform turning their heads correctly along the axis.

To begin with, we use exercises such as sliding on the side and sliding on the side with the work of legs in front crawl. The position of hands when performing these exercises: one hand (from below) is in front, the other (from above), is pressed against the leg. In this exercise, we must achieve a high and level position of the body in the water, as well as the correct position of the head, in which the head rests on the shoulder of the outstretched arm, where the chin looks at the shoulder. We recommend using imitation exercises on land, lying on mats. To make it easier to perform the exercises, sliding on the side, and sliding on the side with leg work, you can use a swimming board or a calabash, holding it in your outstretched hand. When performing the exercise, the child can be told to look at the shoulder of the hand that is on top. This is how we will achieve the correct position of the head when swimming on the side, with the help of leg work crawling on the chest.

Now, to perform the correct exhalation, we need to lower our face into the water. Lowering the face into the water, the task of the child is to maintain the position of the body on its side. When performing the next breath, the head returns to its original position, as when swimming on its side. So, we have achieved the correct position of the head during inhalation and exhalation, while maintaining the position of the body on its side. After making sure that the young athlete performs the correct position of the head when inhaling and the correct turn of the head (facing into the water) when exhaling, we use this skill and change the position of the body from the position of the body on the side, to the position of the body on the chest. Further, after pushing off and sliding with crawl legs on the chest, to inhale, the student turns the body on its side, turning around its axis, and to exhale, it moves to the initial position on the chest.

Next, we set the task for a child to inhale, but at the same time turn on his side not by 90º, but by 45º. After performing the correct inhalation and exhalation, when swimming on the front crawl, you can only use the turn of the shoulders.

When a child has mastered the inhalation and exhalation when swimming front crawl, we proceed to the next task of learning to coordinate the work of the legs, arms and breathing, performing the following actions: sliding on chest, front crawl leg work, stroke with one hand, leaving the hand at the hip, body turn 90º, inhaling, turning the body to its original position, exhaling into water.

After performing all these tasks, a child should do the following: slide on chest, add leg work,

stroke with one hand, leaving the hand at the hip, body turn 45º, inhaling, turning the body to its original position, exhale into water. You can teach the transfer of the hand over the water forward, but only after the exhalation is completed. Further, we can safely give exercises for synchronization of legs, hands, and breathing when swimming front crawl. Thus, we have completed the main task of teaching the coordination of legs and breathing, arms and breathing.

Figure 1 presents the correct head position when breathing in during front crawl.

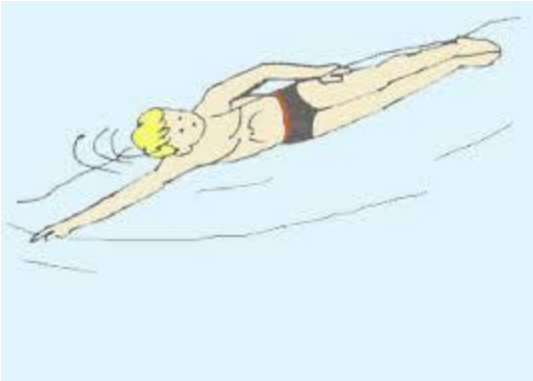

Fig. 1. The correct position of the head when inhaling

There are many exercises performed in the gym (the barre or the Swedish ladder is used) to teach certain techniques for correct breathing during front crawl. When performing the same exercises in water, unfortunately, they are not performed well enough. The first reason for that is uncomfortable position of a child's body and precisely the uncomfortable position of the head in the water. When a child's head is turned, water enters the ears. The most common mistake, which a child makes when trying to take a breath, is raising his head and pulling the chin forward, which later causes other mistakes when swimming front crawl.

Here are some more recommendations for the perfect breathing technique while swimming front crawl. A swimmer should try to keep the head turn as smooth as possible when he/she breathes. The neck should remain smooth with the head and spine joining the rotation of the shoulders. One side of the face should remain in the water and a swimmer may want to stretch your mouth to one side to keep it clear. A swimmer should not lift the head too much out of the water – the more the head raises, the more the feet and legs will sink in the water. After a sharp inhale, a swimmer turns the face quickly and smoothly back into the water in time with the rotation of the shoulders. Exhalation takes place in the water when the head is back to a neutral position and can be gradual or explosive. The regularity of breathing is not set in stone – it is better to simply inhale when necessary. A standard technique is to breathe every three strokes, thus alternating the side which the head turns and maintaining balance through the stroke.

Teaching front crawl swimming took place in sport complex «Zoria» (Mykolaiv, Ukraine) in June and July 2023. 30 children aged 7-8 years old were taught to swim front crawl by the coach and the instructor. After 6 training sessions (2 weeks) 6 children were transferred to the group of beginners because they were still afraid of water and showed low performance. The rest of children (n=24) were divided into two groups, 12 children in each group. Group A was taught synchronization of legs and breathing and synchronization of hands and breathing using a traditional approach to teaching these movements (turning the head while inhaling). Group B was taught according to the author's methodology (using side swimming). After swimming in the pool for 60 minutes both groups had training sessions in the gym for 30 minutes. The experimental teaching lasted 3 weeks. The obtained results are presented in Table 1.

Table 1. The results of the experimental teaching

Group	Performance after		
	1 week	2 weeks	3 weeks
A	8.3 %	33.3 %	83.3 %
B	41.6 %	83.3 %	100 %

After 2 weeks of teaching breathing when swimming front crawl according to the traditional approach 5 children (33.3%) out of 12 could breathe correctly while performing the task. In group B, where children used the author's methodology, 10 (83.3%) children mastered the task with excellence after two weeks of teaching breathing when swimming front crawl.

After 3 weeks of teaching breathing 7-8-year-olds in group A we managed to get excellent results in 5 more children, which made up 10 out of 12 swimmers. In group B another 2 swimmers showed the correct performance of breathing when swimming front crawl, which proved the effectiveness of the proposed methodology from the view point of performance and the speed of acquiring knowledge and building skills. Other 2 children from group A were taught breathing techniques with the help of author's methodology (swimming on the side).

The breaststroke breathing technique involves a specific pattern of breathing that is synchronized with the arm and leg movements in the breaststroke swimming style. This technique usually includes the following aspects inhalation and exhalation timing, breathing rhythm, and head position. Here's how the breathing technique typically works:

1. Inhalation Timing: During the glide phase, when your body is stretched out, take a quick, efficient breath by lifting your head slightly above the water. This should be done as your arms complete the out sweep and start moving in towards your body.
2. Exhalation Timing: As your arms pull in towards your body and your head goes underwater, exhale through your nose and mouth. This helps to prepare you for the next inhalation when you lift your head again.
3. Breathing Rhythm: In breaststroke, you take a breath with every arm pull cycle, which means you breathe every stroke. This is different from freestyle (crawl) where you usually breathe every two strokes.
4. Head Position: When you lift your head to breathe, try to keep your body as streamlined as possible. The chin should be lifted just enough to clear the water's surface, and your eyes should be looking forward, not down.
5. Maintain Momentum: The key to effective breaststroke breathing is to minimize any disruptions to your forward momentum. Your breath should be quick and efficient, and your head shouldn't stay out of the water for too long.
6. Practice: Like any swimming skill, mastering the breaststroke breathing technique takes practice. Regularly practice your breaststroke with a focus on your breathing pattern to improve your coordination and efficiency. (Lomax et al., 2022).

It goes without saying that some swimmers have individual variations in technique and adjustments may be needed based on the body's comfort and natural rhythm. Working with a qualified swim coach or instructor can provide personalized guidance to help you refine breaststroke breathing technique and improve the overall swimming performance. Besides coaches and swimmers many scientists annually perform research connected with physiological, psychological, biomechanical aspects of swimmers' performing to achieve better results during training ang in competitions.

Physiology research related to breaststroke breathing technique examines what physiological aspects affect breathing technique and how it can affect swimming and overall performance. For instance, some studies examine how breathing rate and breathing depth affect the oxygen exchange that occurs during swimming (Lomax et al., 2022). This may include studying oxygen consumption, carbon dioxide output, and lung function. Researchers investigate how breathing techniques while swimming affects the heart and blood circulation (Faelli et al). This may include analysis of heart rate, the volume of blood being pumped, and the effect of breathing on blood circulation (Pedersen et al). The energy expenditure was also measured while swimming. The influence of stress during competition or training and its effect on breathing technique and swimming performance was studied by sport physiologists and specialists in biomechanics (Craig, Motumu et al). Such studies are performed using specialized equipment to measure physiological parameters, such as heart rate monitors, breath analyzers, and other tools. They help reveal what aspects of physiology affect the breathing technique of breaststroke, and how this technique can be optimized to achieve the best results.

Biomechanics research on the breathing technique of breaststroke examines the interplay between body structure, movement, and breathing during this swimming style. They help to better understand how to optimize the breathing technique to increase the efficiency and speed of swimming. Several studies can examine the optimal angle of head elevation for breathing during swimming movements. They explore which neck and head movements promote better airflow and less water resistance. Synchronization of breathing and arm and leg movements is also an acute problem to allow for greater airflow without losing speed. Research of breathing depth affects buoyancy and swimming stability, as well as how it affects water intake during movements. Researchers also analyze the optimal breathing rhythm, which helps ensure the supply of sufficient oxygen to the muscles during swimming.

So, the results of group B, which used the innovative approach to teaching breathing technique when swimming front crawl, proved that it was easier for children to acquire the technique, they faster trained the skills, and performed better comparing to group A swimmers. The quality of performing this exercise improved significantly. Moreover, due to the high position of the body and the lowered head, we excluded errors that could occur in breathing technique when swimming front crawl.

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artificial intelligence systems, we can push neuroscience forward and unlock the mysteries of the human brain, one of the applications of which is the ability to identify neurological problems and detect neurotransmitters. The possibility of using AI to diagnose and treat neurological disorders is one of the most important prospects for neuroscience and AI development. Machine learning algorithms can be trained to recognize patterns in brain scans that may indicate the presence of diseases such as Alzheimer's, Parkinson's, or multiple sclerosis. This could lead to the detection of the disease at an early stage and the development of more effective treatment strategies, which would improve the quality of life for millions of people around the world. There is great promise in the detection and early neurocorrection of children with autism spectrum disorders. With the help of AI, certain deviations from the norm can be detected at an early stage and brought up for collegial discussion, and all possible measures can be taken to prevent the manifestations of this type of disorder from deepening.
Keywords: Artificial intelligence, neurodiagnostics, neurocorrection, machine learning, brain, EEG, rehabilitation.

4.7. Jevgenija Nevedomsjka. Advantages and dangers of artificial intelligence in medicine.

Artificial intelligence has rapidly entered the life of humanity, and of each person. This is because artificial intelligence and artificial neural networks are similar in the principles of information encoding and functioning to biological neural networks. Neural networks have absorbed the main features of a person – the ability to learn, the ability to adapt to different and changing conditions, draw logical conclusions from a large amount of information, practically think, having an unlimited, incomparably greater reserve of memory and knowledge, than even a professional in his case. The paragraph reveals the concepts of «artificial intelligence», «artificial neural networks», «neurocomputer», «chat bots» and makes a brief historical sketch of the development of artificial intelligence. The possibilities of artificial intelligence in medicine, as well as its advantages and possible dangers, are considered.
Keywords: artificial intelligence, artificial neural networks, neurocomputer, chat bots.

Part 5. ADVANCEMENTS IN PHYSICAL EDUCATION AND REHABILITATION: THEORY AND PRACTICE

5.1. Karen Abramov, Oksana Petrenko. Teaching 7-8-year-olds breathing techniques while swimming front crawl.

The purpose of the study is to analyse approaches to teaching breathing techniques while swimming front crawl and to check the effectiveness of proposed methodology for 7-8-year-old swimmers. 24 children participated in training sessions in Mykolaiv sport complex «Zoria». They were divided into two groups (A and B), 12 people in each, for swimming sessions, which lasted 60 minutes and gym trainings, which lasted 30 minutes. The trainings were held three times a week for two months. Group A was taught synchronizing legs with breathing and hands with breathing using a traditional approach to teaching these movements (turning the head while inhaling). Group B was taught according to the author’s methodology (using side swimming). The obtained results showed quicker acquiring of the technique and its better performance by group B swimmers.
Keywords: breath, body position, inhale, exhale, coordination of movements, axis.

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Part 5. ADVANCEMENTS IN PHYSICAL EDUCATION AND REHABILITATION: THEORY AND PRACTICE

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