Swimming Notes 2024/2025/1

Swimming is a sport that can be practiced competitively, but many also enjoy it as a recreational activity or for health maintenance purposes. It is one of the most effective forms of exercise, engaging most muscle groups simultaneously. The risk of injury and overexertion is low.

The body's oxygen uptake and usage are balanced, which improves the performance of the pulmonary and cardiovascular systems. It enhances both conditional and coordination skills. It thoroughly engages most muscle groups at once, providing strength, endurance, and flexibility. It plays an important role in improving posture, making movement in water beneficial not only for recreation but also for rehabilitation. Thus, it is suitable for therapy related to bone and joint ailments, cardiovascular diseases, spinal deformities, and recovery after accidents and surgeries.

History of Swimming

Swimming is likely as old as humanity itself. Several ancient finds indicate that it was a popular recreational activity long ago. For the ancient Greeks, swimming was a measure of human civilization. Those who could not swim were not allowed to engage in public affairs. The oldest swimming style is breaststroke.

Despite the fact that we cannot imagine modern Olympics without swimming, there were no swimming events in the ancient Greek Olympics. In the Middle Ages, swimming became part of training in the army of Emperor Napoleon.

The technique of swimming was first documented in a book by a linguist named Nicolaus Wynmann in 1538 (Der Schwimmer oder ein Zwiegespräch über die Schwimmkunst). Competitive swimming began to spread around 1800. The first German swimming club was established in 1837. Swimming became an Olympic event in 1896.

Since the first modern Olympics, there have been swimming events. In 1908, the international organization for swimmers, FINA (Fédération Internationale de Natation), was founded. The International Swimming Federation (officially known as Fédération Internationale de Natation, abbreviated as FINA, and from 2023, World Aquatics) is a sports federation recognized by the International Olympic Committee. It was established in London in 1908 at the initiative of Belgium, Denmark, Finland, France, Hungary, Great Britain, Germany, and Sweden to unify the rules of swimming and provide an international forum for organizing competitions. Its headquarters is in Lausanne, Switzerland. Currently, 207 national federations are members.

Initially, its primary task was to expand and regulate the disciplines of Olympic competitions. Since 1973, swimming world championships have been organized, and since 1986, Masters world championships for senior swimmers have been held, first in even years and then, starting from 2015, in odd years following the swimming world championships.

The Tasks of World Aquatics:

- To create uniform rules for swimming events organized in pools or open water, as well as for diving, high diving, synchronized swimming, and water polo.

- To organize and promote Olympic Games and other international competitions.
- To ensure the verification, record-keeping, and up-to-date traceability of newly established records.
- To promote and develop aquatic sports worldwide.
- To encourage developments and investments related to facilities for aquatic sports.
- To perform any activities deemed desirable for the promotion of the sport.

In Hungary, swimming became popular again during the Turkish occupation. The thermal waters discovered during the Turkish era were famous, with numerous travel descriptions promoting Hungarian thermal baths. The beginning of competitive swimming is marked around 1880, when the first competition was held between Siófok and Balatonfüred. The first swimming club was founded in 1893, and the Hungarian Swimming Federation was established in 1907.

Swimming is a core sport of the modern Olympic Games. The first three Olympics held competitions in open water, while since the first London Olympics, events have been held in pools. Initially, medals were awarded only for freestyle, but breaststroke was added to the program in 1900. Since 1904, backstroke and 4×100 meter freestyle relay events have also been organized. Butterfly stroke became an Olympic event in 1956, and individual medley was included in 1964.

The Hungarian team has a legendary performance in Olympic swimming competitions. There is hardly an Olympics in which our competitive swimmers have not won medals. This is particularly remarkable, given that Hungary does not have many enclosed competition pools, and there are few locations suitable for open water competitions in the country. The team was most successful in the 1950s and early 1990s. Among the swimmers, Kristina Egerszegi, who has five Olympic gold medals, stands out, along with Tamás Darnyi, who has won four Olympic titles, and Katinka Hosszú, a three-time winner who also holds the most national records.

Internationally, Michael Phelps's career is outstanding, as he has won 23 Olympic gold medals. He is followed by Mark Spitz, who has a total of 9 Olympic gold medals. Matt Biondi and Jenny Thompson each won 8, Kristin Otto won 6, and Amy Van Dyken, Tom Jager, Don Schollander, and Johnny Weissmuller each collected 5 Olympic gold medals.

Hungarian Olympic Champion Swimmers

Athlete Name	Olympics	Event
Hajós Alfréd (Guttmann Arnold)	1896 (Athens)	100 m Freestyle
Hajós Alfréd (Guttmann Arnold)	1896 (Athens)	1200 m Freestyle
Halmay Zoltán	1904 (St. Louis)	100 yd Freestyle
Halmay Zoltán	1904 (St. Louis)	50 yd Freestyle
Csik (Lengváry) Ferenc	1936 (Berlin)	100 m Freestyle
Gyenge Valéria	1952 (Helsinki)	400 m Freestyle
Littomeritzky Mária (Bognár Emilné)	1952 (Helsinki)	4x 100 m Freestyle
Novák Éva	1952 (Helsinki)	4x100 m Freestyle
Novák Ilona	1952 (Helsinki)	4x100 m Freestyle
Székely Éva	1952 (Helsinki)	200 m Breaststroke

Athlete Name	Olympics	Event
Szőke Katalin	1952 (Helsinki)	4x100 m Freestyle
Szőke Katalin	1952 (Helsinki)	100 m Freestyle
Temes Judit	1952 (Helsinki)	4x100 m Freestyle
Wladár Sándor	1980 (Moscow)	200 m Backstroke
Darnyi Tamás	1988 (Seoul)	200 m Individual Medley
Darnyi Tamás	1988 (Seoul)	400 m Individual Medley
Egerszegi Krisztina	1988 (Seoul)	200 m Backstroke
Szabó József	1988 (Seoul)	200 m Breaststroke
Darnyi Tamás	1992 (Barcelona)	400 m Individual Medley
Darnyi Tamás	1992 (Barcelona)	200 m Individual Medley
Egerszegi Krisztina	1992 (Barcelona)	200 m Backstroke
Egerszegi Krisztina	1992 (Barcelona)	100 m Backstroke
Egerszegi Krisztina	1992 (Barcelona)	400 m Individual Medley
Czene Attila	1996 (Atlanta)	200 m Individual Medley
Egerszegi Krisztina	1996 (Atlanta)	200 m Backstroke
Rózsa Norbert	1996 (Atlanta)	200 m Breaststroke
Kovács Ágnes	2000 (Sydney)	200 m Breaststroke
Gyurta Dániel	2012 (London)	200 m Breaststroke
Risztov Éva	2012 (London)	10 km
Hosszú Katinka	2016 (Rio de Janeiro)	400 m Individual Medley
Hosszú Katinka	2016 (Rio de Janeiro)	100 m Backstroke
Hosszú Katinka	2016 (Rio de Janeiro)	200 m Individual Medley
Milák Kristóf	2020 (Tokyo)	200 m Butterfly
Milák Kristóf	2024 (Paris)	100 m Butterfly
Kós Hubert	2024 (Paris)	200 m Backstroke
Rasovszky Kristóf	2024 (Paris)	10 km

Swimming Competition Rules (Excerpt)

SW.4. START SW.4.1. In freestyle, breaststroke, and butterfly swimming, the start is executed by diving. Upon the long whistle signal from the competition president (SW2.1.5.), the competitors step onto the starting blocks and stand still. At the starter's command "Take your marks," they must promptly take their starting position, with at least one foot at the front edge of the block. The positioning of the arms is not significant. When all competitors are still, the starter gives the starting signal.

SW.4.2. In backstroke and mixed relays, the start occurs from the water. Upon the first long whistle signal from the competition president (SW 2.1.5.), swimmers must immediately jump into the water and, upon the second long whistle, promptly take their starting positions (SW 6.1.). When all competitors have taken their positions, the starter issues the command "Take your marks." When all competitors are still, the starter may give the starting signal.

SW.4.3. For the Olympic Games, World Championships, and other FINA/World Aquatics events, the command "Take your marks" must be given in English, and the starting signal must be broadcast through a speaker system installed behind each starting position.

SW.4.4. Any swimmer who starts before the starting signal is to be disqualified. If the starting signal is given before the disqualification can take place, the event must continue, and the offender(s) must be disqualified after the completion of the event. If disqualification occurs before the starting signal, the signal must not be given, and the remaining participants must be recalled. The competition president must repeat the pre-start long whistle (the second for backstroke), according to rule SW 2.1.5.

SW.5. FREESTYLE SW.5.1. Freestyle means that the swimmer can use any swimming stroke of their choice, except for the strokes in the individual medley and the mixed relay. The term freestyle denotes a stroke that is different from breaststroke, backstroke, and butterfly.

SW.5.2. During freestyle, the competitor must touch the wall with any part of their body at turns and at the finish.

SW.5.3. During the race, some part of the swimmer's body must break the water surface, except for starts and turns, as well as the distance of up to 15 m following the start and turns. At this point, the head must have broken the water surface.

SW.6. BACKSTROKE SW.6.1. Before the starting signal, swimmers must position themselves in the water, at the pool's starting wall, with their hands on the starting grips. Standing in the overflow or clinging to its edge with their toes is prohibited. When using backstroke starting devices during the competition, both feet of the swimmer must touch the pool wall or the touchpad. It is not allowed to touch the touchpad with the toes.

SW.6.2. When using a backstroke starting device, each turn judge positioned on the starting side must set the starting device to the starting position and then remove it from the starting block.

SW.6.3. Upon the starting signal and after the turn, swimmers must push off the wall and swim the entire race distance on their back, except for the turn (SW6.4.). From the natural backstroke position, the torso may rotate sideways, but this turn must not exceed 90° horizontally. The head position is not significant.

SW.6.4. During the race, some part of the swimmer's body must break the water surface, except for turns and for up to 15 m after the start and each turn, at which point the body may be fully submerged. At 15 m, the head must have already broken the water surface.

SW.6.5. During a turn, the swimmer must touch the wall on their lane with some part of their body. During the turn, the shoulders may rotate through the vertical position to the prone position, after which a continuous arm stroke may occur with one or both arms to begin the turn. The swimmer must return to the back position after leaving the wall.

SW.6.6. At the finish, the swimmer must touch the wall in the back position on their lane.

SW.7. BREASTSTROKE SW.7.1. After the start and the turn, the swimmer may perform a complete arm stroke while submerged, while the swimmer is under the water. A dolphin kick is allowed anytime after the start and the turns, but before the first breaststroke kick.

SW.7.2. From the start and after the first stroke post-turn, the body must remain on the chest. At all times, turning onto the back is prohibited except during the turn. Once the competitor leaves the wall, the body must again be on the chest. From the start throughout the race, a stroke cycle must consist of one arm stroke and one kick. Both arms must perform each movement simultaneously and in the same horizontal plane, without alternating movements.

SW.7.3. The hands must be pushed forward under the water, at the water surface, or above it. The elbows must remain under the water, except for the last stroke before the finish and the turn. The hands must be brought back to their starting position at the water surface or below. The hands may not go beyond the hip line after the start and turns, except for the first arm strokes after the start and turns.

SW.7.4. During a complete stroke cycle, the head must break the water surface. The head must break the surface before the hands reach the widest point of the second stroke. Both legs' movements must occur simultaneously and in the same horizontal plane without alternating movements.

SW.7.5. The feet must be turned outward during the propulsive phase of the kick. Scissor, frog, or downward dolphin movements are prohibited, except as per rule 7.1. The legs may break the water surface, provided it is not followed by a downward dolphin kick.

SW.7.6. At turns and finishes, the touch must be executed with both hands simultaneously, either underwater, above water, or at water level. The last arm stroke before the turn and the finish is permitted without a kick. During the last stroke, the head may be underwater, provided it has broken the surface at some point during a full or partial movement cycle preceding the touch.

SW.8. BUTTERFLY SW.8.1. Starting from the first arm stroke after the start and turns, the body must always be in a prone position. Underwater, lateral position kicks may be performed. The back position is prohibited throughout except during the turn, but the push-off must already be in a prone position.

SW.8.2. The arms must be thrust forward above the water together and simultaneously. The arms must be pulled down underwater simultaneously throughout the race as per rule SW 8.5.

SW.8.3. All upward and downward movements of the legs must occur simultaneously. The feet and lower legs do not need to be in the same plane, but alternating movements are not allowed. Breaststroke kicks are not permitted.

SW.8.4. At turns and finishes, the wall must be touched with both hands simultaneously, underwater, above water, or at the water surface.

SW.8.5. After the start and turns, one or more kicks and one arm pull may be performed underwater, but thereafter the swimmer must rise to the water surface. The swimmer may go underwater for a maximum of 15 m, completely submerged after the start and each turn. At

this point, the head must have broken the water surface. The swimmer must remain on the water surface until the next turn or finish.

SW.9. INDIVIDUAL MEDLEY AND MEDLEY RELAY SW.9.1. In individual medley events, swimmers must complete the strokes in the following order: butterfly – backstroke – breaststroke – freestyle. Each stroke must constitute one-fourth of the total distance.

SW.9.2. In medley relay, swimmers must perform the four strokes in the following order: backstroke – breaststroke – butterfly – freestyle.

SW.9.3. Each stroke must be performed in accordance with the relevant rules.

SW.10. COMPETITION SW.10.1. Each individual event must be held separately for each gender.

SW.10.2. The swimmer must complete the entire distance alone for their result to be valid.

SW.10.3. The swimmer must compete and finish on the lane on which they started.

SW.10.4. At every turn, the swimmer must physically make contact with the pool end. The turn must occur at the wall; pushing off from the pool bottom or taking steps on it is prohibited.

SW.10.5. In freestyle events or the freestyle portion of individual medley, the competitor may stop at the bottom of the pool without risk of disqualification, but they must not step.

SW.10.6. It is prohibited to hold onto the lane divider rope.

SW.10.7. If a swimmer obstructs a competitor by crossing their lane or by any other means, the offender must be disqualified from the competition. If the obstruction was intentional, the competition president must report the incident to both the supervising body and the federation that registered the offending swimmer.

SW.10.8. Swimmers who achieve a new world record must submit a new world record application to FINA within 48 hours of the competition, and their times must be recorded according to FINA protocols.

SW.11. DISCIPLINE AND DISQUALIFICATION SW.11.1. If a swimmer is disqualified, they must not be allowed to compete in the subsequent events of the competition. If they were registered for team events, their teammates must continue with the remaining swimmers.

SW.11.2. It is prohibited to receive assistance from anyone during the race.

Technical Execution of Swimming Strokes
Breaststroke

Breaststroke is the oldest, most complex, and energy-demanding type of swimming, and its technique has changed significantly over the years regarding arm and leg movements. Experts have been striving to develop new techniques that result in further acceleration of breaststroke. The search for new methods in breaststroke is still ongoing today. In recent

years, the so-called "rolling technique" focuses on further reducing resistance; with a narrower arm and leg rhythm and a livelier cadence, results continue to improve. Technically, breaststroke has not yet reached its peak; there is still room for refinement. Further possibilities lie in streamlining body position, enhancing the propulsive power of the limbs, and improving breathing techniques.

The technique of breaststroke is continuously evolving within the framework of the rules. Athletes swim using different techniques that match their individual abilities. Breaststroke has continuously developed with the emergence of competitive swimming. Thus, in the history of the development of this stroke, we can distinguish four major eras: the orthodox, classical, delayed breathing, and the rolling technique.

Today's modern breaststroke is no longer characterized by the classic wide arm and leg movements. The movements have become more compact, and the swimmer rises higher above the water, throwing their arms forward over the surface. We can distinguish several modern styles of breaststroke. One is the flat style, where the swimmer keeps their body horizontal to reduce frontal resistance; the hips do not sink deeply, thus requiring less energy for the movement cycle. In the other technique, the wave style, the shoulders rise higher above the water, with less hip bending, as the body continuously changes in a wave-like manner, although the hips sink deeper. In breaststroke, we cannot speak of a constant body position. The body position is most similar to that of butterfly stroke, continuously changing in a wave-like manner. The body must lie on its chest in the water while both shoulders remain parallel to the water's surface. It is forbidden to leave the prone position at any point during the distance, except during turns.

The leg movement in breaststroke can be divided into several phases: a passive leg lift and an active kick movement. The passive leg lift begins with raising the lower leg. The foot is in a loose, extended position, moving upward within the hip line (to maintain streamlining). After this, the knees begin to move apart but remain within the shoulder line for streamlining. The first part of the backward kick movement is still passive, with the leg moving outward and backward while the hip continuously bends. The degree of this bending depends on whether the wave (30-35 degrees) or flat style (60-90 degrees) is being applied. At the end of the passive phase, the feet suddenly and dynamically turn outward, adopting a "flexed" position, entering the water-catch phase. From here, the propulsive part of the leg tempo begins. The forward-driving phase of the backward kick movement starts with the feet moving downward and outward, followed by both legs closing in a backward, slightly downward circular path, increasing in speed. This continues until the lower leg fully extends while the flexed feet turn toward each other. After the active phase of the legs, the swimmer raises their legs to achieve a streamlined position. The leg lift continues to the line of the torso, followed by a short glide. In breaststroke, the rules strictly prohibit scissor kicks, clawing, or downward dolphin movements. The legs may break the water surface as long as it is not followed by a downward dolphin kick.

The execution of arm movements in breaststroke is dictated by the rules, which state that the hands must be pushed forward from the chest, either on, below, or above the water's surface. The elbows must remain underwater, except during the last stroke before reaching the finish. The hands must be returned to their starting position at or below the water's surface. Except for the first arm stroke after the start and turns, hands cannot be taken behind the hip line. The arm movement in breaststroke consists of both active and passive phases, similar to the leg tempo. The arm movement begins with a passive outward pulling motion. The arm moves

outward and downward until it reaches the water-catch position, with the palm facing downward and outward. Following this, the propulsive part of the breaststroke arm movement occurs, which involves an inward pulling motion. The arm pulls backward in a semicircular motion, then downward and inward. The hands, forearms, and elbows come closer together while the upper arm approaches the torso. In the final phase of the inward pull, the arm begins to move forward. During the forward movement phase, the hands face each other, the arm rotates, and the hand moves forward and upward. The swimmer dynamically throws both arms forward beneath the chest and chin until the arms are fully extended. All arm movements must be performed simultaneously and on the same horizontal plane without alternating motions.

For effective, energy-efficient forward motion in breaststroke, the harmony between arm and leg movements is crucial. The most economical forward motion is achieved when speed remains constant, which is possible with a breaststroke tempo that ensures continuous propulsion, meaning the propulsive forces of the arms and legs alternate, providing consistent speed. There are several forms of harmony between arm and leg movements—continuous, waiting, and overlapping. The continuous technique means that the arm movement starts immediately after the legs are closed. In the waiting technique, the swimmer pauses between the leg tempo and arm movement, while in the overlapping technique, the arm movement begins at the end of the leg tempo's propulsive phase. The two tempos overlap, with the latter being the most effective, ensuring minimal speed decrease and consistent speed. Even with the most perfect overlapping technique, it is impossible to achieve a constant speed during breaststroke. This is because nearly 70% of the propulsive force comes from the leg tempo. Due to this imbalance, within a single breaststroke cycle, the body's speed increases during the leg movement and drops to one-fifth of the speed achieved during the arm movement.

Breaststroke breathing is among the easiest of all swimming strokes. The breathing technique can be linked to the arm tempo of the breaststroke. During the outward pull, the head rises, and the swimmer exhales. By the end of the inward pull, the head is elevated, and the mouth comes above the waterline, initiating inhalation. After inhalation, the swimmer tilts their head back between their arms to maintain streamlining. According to the rules of breaststroke, a breath must be taken with every arm stroke. (Tóth Ákos 2008)

Rolling Technique

This technique of breaststroke developed in the early 1970s. Both arm and leg movements differ from the delayed breathing technique. After a narrow leg lift, the leg movement in the forward phase is vigorous, with forces acting against the forward motion. The swimmer begins the arm tempo in a deep, underwater position. Due to the narrow arm and leg tempo, the entire rhythm of breaststroke has become faster, and the gliding phase has become smoother.

The technique of breaststroke continues to evolve within the framework of the rules, as evidenced by the continuous improvement of world records.

Backstroke

Backstroke is a cross-cyclic motion that allows for achieving a uniform speed. Nevertheless, it is one of the slowest swimming strokes. This is attributed to the sheltered body position. While swimming, the head is raised, and the gaze is directed toward the feet, with the

waterline below the ears. As the torso continuously rotates along the longitudinal axis, at an angle of 45 degrees, the head remains still.

The leg movement in backstroke resembles that used in freestyle, but due to the sheltered position, the movement is more extensive, with a greater degree of knee bending. The leg movement in backstroke consists of two important phases: a propulsive upward kick and a downward motion. The upward leg movement begins with the lifting of the hips. The knee is slightly bent, the foot is extended, and slightly turned inward. As the thigh moves upward, the lower leg and foot lag slightly behind. This lag produces the snapping, “whip-like” finish. Since leg propulsion plays a more significant role in maintaining a higher water position in backstroke than in freestyle, backstrokers perform a six-beat leg movement in all distances, unlike freestylers.

The arm movement in backstroke can also be divided into two main phases, similar to leg movement: underwater and above water. The underwater arm movement begins with the arm entering the water. The arm extends outward with the palm facing away, entering the water at shoulder level, starting from the little finger. The order of entry is: upper arm, forearm, hand. From here, a downward pulling motion begins, which leads to the propulsive phase of the arm stroke: the catch. After entering the water, the elbow continuously bends, and the arm moves downward and backward, then changes direction to move upward and inward. During the upward pulling motion, the hand moves in a semicircular path in line with the forearm. At the highest point of the pull, the hand rotates, with the palm facing downward and backward. The elbow gradually extends. This downward pushing motion continues to the hips. After finishing the underwater propulsion phase, the palm turns toward the thigh and begins to rise, marking the start of the above-water arm movement. The above-water arm movement begins with the recovery, followed by the forward movement of the arm. During recovery, the shoulder is elevated so that the arm can move forward high above the water without resistance. The torso's rotation, which is 45 degrees in both directions, also aids this. The arm lift starts with the palm facing inward, then turns outward so that the edge from the little finger side comes forward for re-entry into the water. In the forward movement, the hand is extended, with a constant speed, moving in line with the shoulder plane. The harmony of the arm movement means that while one arm is entering the water, the other arm is finishing its downward pulling motion. The harmony between arm and leg movement is characterized by six leg beats for each complete arm cycle.

Among the swimming strokes, backstroke appears to have the simplest breathing technique, as the face is freely above the water, but inhalation and exhalation must be timed to the appropriate phases of the arm cycle. Inhalation occurs during the above-water phase of one arm, from recovery to catch, while exhalation occurs during the underwater pushing phase of the same arm. (Bíró Melinda 2011)

Butterfly Stroke

In butterfly, similar to breaststroke, there is no fixed body position. The position of the body changes in a wave-like manner. The body must always be in a prone position from the first arm stroke after the start and turns, while the shoulders must remain parallel to the water's surface. The leg movement in butterfly resembles that of freestyle but involves a whip-like motion executed simultaneously with both legs. The simultaneous up and down movement of

the legs, feet, and shins occurs in a vertical plane. The legs do not need to be in the same plane, but alternating movements are prohibited.

The leg tempo has two phases: a downward kicking motion and an upward leg lift. The downward kicking motion begins similarly to freestyle, with the hip sinking, followed by the movement of the thigh, knee, and lower leg. The feet are slightly turned inward. The lower leg lags slightly behind the foot's movement. Finally, the foot snaps, completing the whip-like kick. The upward motion occurs by tightening the hips with extended limbs (the knees must not bend in this phase). The legs rise until they align with the hips.

The arm movement in butterfly, contrary to what many might think, closely resembles that of freestyle, but here the arms must be swung forward above the water together and simultaneously pulled backward underwater. The arm tempo can be divided into two major phases: above water and underwater. The butterfly tempo begins with the hand entering the water. The arms, slightly bent at the elbows, enter the water at shoulder width or within it, with palms facing outward from the thumb side. This is followed by an outward, downward pull until the catch position is reached. At the catch, the elbow is slightly bent, and the hands stabilize on the water, marking the beginning of the propulsive phase of the arm stroke: the inward pull. The arms pull downward and inward in a semicircular path. The elbow gradually bends, and the hands come closer together under the chest, with palms facing backward by the end of the phase. From here, the swimmer pushes upward and backward until the hands are extended. This is the pushing phase. During the underwater arm movement, the speed of the hands accelerates continuously within the phases and overall. The underwater movement is followed by the recovery and forward movement of the arm. The arm is extended, with palms facing the thighs. The lift of the shoulder and elbow initiates the motion; once the arm exits the water, it swings forward with a slightly bent elbow. At the last phase of the arm recovery, the hands turn outward, preparing for re-entry into the water.

The proper harmony between arm and leg movements is essential for butterfly. In this stroke, two full leg movements must be executed for one arm stroke. The first downward leg movement occurs when the arm enters the water and performs the outward pull, while the second downward kick should be timed when the arm is in the pushing and recovery phases. The second leg kick starts downward during the last third of the arm stroke's pushing phase. The first leg tempo typically lasts longer and is stronger, serving to propel the body forward and maintain a streamlined position. The second leg kick coincides with the arm lift phase, helping to prevent the hips from sinking. Among elite butterfly swimmers, there is no significant difference in the strength of the two leg tempos. The breathing in butterfly is linked to the end of the last (pushing) phase of the arm movement and the first phase of the recovery. Exhalation occurs from the moment the hand enters the water until the beginning of the first part of the push. (Bíró Melinda 2011)

Freestyle Swimming

Freestyle swimming is a natural, cross-over, cyclic movement. It has the least frontal resistance, making it the fastest among swimming styles. The most important aspect of the technique is the ideal body position. There are three conditions for establishing a favorable and streamlined body position: a favorable head position, a straight back and hip alignment, and finally, small leg movements. The head is positioned lowered between the hands. It should not be raised, as this increases resistance. The body position is not constant; during

swimming, the body continuously rotates sideways along its longitudinal axis, with an angle of 30-40 degrees.

The leg work in freestyle consists of small cyclic movements. It comprises a downward thrusting phase and a passive upward leg lift. This alternating motion is complemented by lateral movements that help maintain the body's balance. The degree of leg opening depends on individual characteristics (anthropometry), but is approximately 50-80 cm. The leg tempo is initiated by the sinking of the hips, followed by the movement of the thigh, knee, lower leg, and finally the foot. During the downward kick, the knee bends, and the lower leg lags slightly behind, catching up with a whip-like motion. Finally, the extended but relaxed foot finishes the movement. The upward leg movement also starts from the hip. The leg remains extended, with the foot relaxed and slightly inward. This phase does not have a propulsive role. Beginner swimmers often mistakenly believe they need to generate propulsion upwards as well, causing them to incorrectly bend their knees upwards (this is referred to as "bicycling"). Leg work alone consumes more energy. When swimming with just the legs, swimmers consume approximately four times as much oxygen as when swimming with just the arms. (Tóth 2008) The leg tempo during swimming is largely determined by the distance, but if someone's legs sink significantly (especially men), a six-beat kick is often more effective for them. To establish a good swimming rhythm, a proper harmony between the arm and leg tempo is essential. The first crucial component of this is that the leg work is always adjusted to the arm tempo. This means that for every arm cycle, the swimmer performs six leg kicks. Other variations include a two-beat, two-beat cross, or four-beat leg movement. Leg work not only has a propulsive role but also serves a stabilizing function, compensating for the body's lateral displacement caused by the arm tempo movement. The longer the distance, the less significant the role of the leg tempo becomes.

Freestyle arm movement has two main phases: underwater and above-water arm tempo. The underwater arm work consists of several parts: the hand entering the water, the pull, and the push. The underwater work begins with the hand entering the water. The hand enters the water in the sequence of wrist, forearm, elbow, and upper arm, positioned between the shoulder and head. Upon entering the water, the arm is slightly bent at the elbow, with palms facing outward, and the hand "slides" into the water from the thumb side. After the hand enters the water, the arm fully extends, reducing speed (waiting for the other hand's movement, which is in the push phase at this time). Hand entry does not equate to "catching" the water. The second phase of the underwater arm work is the pull. After hand entry, there is an outward and downward pull (which does not yet have a propulsive role), culminating in the catch. From here, the arm tempo becomes propulsive. Following the catch, an inward pull is executed, directed towards the body's midline. This movement aids in the rotation of the torso along its longitudinal axis and lasts until the shoulder line. Underwater pull patterns differ even among world-class swimmers (reversed "S" shape, question mark). It is essential that the hand is positioned as an extension of the forearm. The continuation of the underwater pulling phase, or the third major phase, is the push. The push occurs in a semicircular motion backward alongside the thigh, while the arm continuously straightens. The hand gradually bends back, then fully strikes back alongside the thigh. The hand relaxes and turns so that the palm faces the thigh (reducing resistance during hand exit), preparing for the release movement. After the arm completes its underwater work, the passive above-water arm tempo begins. This above-water part can be divided into two phases: the release and the forward motion of the arm. The release movement starts as a continuation of the push. The hand continuously bends, and the elbow rises. It is crucial that we begin the release with the elevation of the elbow. After elbow release, the arm is brought forward with a high elbow

position. The elbow continuously bends, the palm gradually turns outward, and then, from the line of the head, the elbow continuously extends, reaching the water again between the head and shoulder line, initiating the underwater cycle. The synchronization of the arms occurs as follows: while one arm enters the water, the other arm is in the last phase of the pull. When the entering arm fully extends, the opposite arm performs the push. The arm in front slows down and does not initiate the pull until the other arm has completed the push. This maintains even progress and consistent speed.

Breathing Technique

The fastest way to swim would be to avoid interrupting the movement with breaths. The technique of breathing is closely linked to the various phases of the arm tempo movement. In the last phase of the arm tempo, at the end of the push, the swimmer begins to turn their head sideways toward the releasing arm. This naturally coincides with the trunk's rotation. As the mouth line reaches the water, the swimmer slightly pulls their mouth sideways and inhales. At higher speeds, a wave trough forms, helping the swimmer to breathe more easily. The inhalation occurs during the release phase of the arm tempo and the first part of the forward arm motion. Once the swimmer has inhaled through the mouth, they turn their head back into the water in harmony with the body movement. As the swimmer's mouth returns to the water, they immediately begin to exhale. Exhalation occurs continuously through the nose and mouth simultaneously, and must be maintained until the next inhalation occurs. If the swimmer fails to exhale before inhalation, they must do so underwater. Exhaling above water shortens the inhalation cycle, which leads to movement distortion in beginner swimmers. In such cases, we often see children turning their heads toward inhalation, but since they don't have enough time, they lift their heads forward and only then put them back in the water. Inhalation can occur in threes, fours, twos, or even fives and sevens during training. Competitive swimmers develop their breathing rhythm according to the distance and their individual characteristics. Short-distance swimmers swim with breath-holding, or take a breath once or twice during 50 meters. Long-distance swimmers may use a two-beat or alternating breathing pattern. (Tóth Ákos 2008)

Hand Position

Wide Hand Position
In a wide hand position, the fingers and thumbs are spread apart. This creates a large gap between the fingers where water slips through. Little force is generated because the only solid paddle is the palm.

Tight Hand Position
In a tight hand position, the fingers are together. A common problem is a clenched hand position. It is more effective than a wide hand position.

Funnel Hand Position
The funnel hand position is a common mistake among swimmers. The funnel position reduces the hand's pulling surface.

Gap Hand Position
We refer to a gap hand position when there is a small distance between the fingers. The small gaps between the fingers create vortices that do not allow water to pass through, thus increasing the size of the pulling surface. The optimal distance between the fingers is 3-8 mm,

which is a natural distance during a relaxed hand position. With slightly open fingers, 5-10% more force can be generated than with wide or tight hand positions. The greatest force occurs when the thumb is held alongside the fingers.

Relay Race
In swimming, relays typically follow the strategy where the second fastest swimmer starts, followed by the third fastest, then the slowest, and finally, the fastest swimmer competes. Sometimes the first three distances have swimmers starting in a different order, but the fastest swimmer always remains for the last leg. The rules of the International Swimming Federation (FINA/World Aquatics) stipulate that the second, third, and fourth swimmers must not leave the starting block until the incoming teammate touches the wall. The starting swimmer may already be in motion, but must maintain contact with the block, gaining 0.6-1.0 seconds compared to a "normal" start. This is referred to as a flying start in swimming. Many swimmers perform better in a relay than in an individual race, which can be attributed to the team spirit. Consequently, the recorded times are generally 2-3 seconds faster than the sum of the swimmers' best individual times.

In mixed relays, each swimmer uses a different style: backstroke, breaststroke, butterfly, and freestyle (these four styles must be performed in this order). In freestyle relay races, of course, all swimmers use the freestyle stroke. (In individual medley events, where each competitor swims all four styles, the order is butterfly, backstroke, breaststroke, and freestyle.)

Event Types

Swimming competitions typically occur in 50-meter, 8-lane pools, while Olympics are held in 10-lane pools, and short-course championships are organized in 25-meter pools. There are a total of 17 individual and 3 team events for 50-meter races. There are also long-distance swimming competitions, usually held in open water.

Individual Events (Olympic pool events):

- Freestyle: 50, 100, 200, 400, 800, 1500 meters
- Butterfly: 100, 200 meters
- Backstroke: 100, 200 meters
- Breaststroke: 100, 200 meters
- Individual Medley: 100, 200 meters

Team Events (Olympic pool events):

- Freestyle relay: 4x100, 4x200 meters
- Medley relay: 4x100 meters

Long-Distance Swimming Events:

- 5 km freestyle
- 10 km freestyle (Olympic open water event)
- 25 km freestyle
- Pool marathon swimming: 3 and 5 km freestyle

Organizations and Their Abbreviations (in Hungary):

- IOC – International Olympic Committee
- HOC – Hungarian Olympic Committee
- FINA/ World Aquatics – International Swimming Federation
- LEN/ European Aquatics – European Swimming Federation
- MÚSZ – Hungarian Swimming Federation

To this day, swimming is one of Hungary's most successful sports.