Melinda Bíró

László Révész

Péter Hidvégi

SWIMMING

HISTORY

TECHNIQUE

TEACHING

MADE WITH THE ASSISTANCE OF THE INSTITUTE OF SPORT SCIENCE OF ESZTERHÁZY KÁROLY COLLEGE

EDITED BY

Dr. Melinda Bíró

WRITTEN BY

Dr. Melinda Bíró, Dr. László Révész, Péter Hidvégi

PROFESSIONAL PROOFREADER:

Dr. Bakos Magdolna Kristonné

Dr. habil Béla Szabó

HUNGARIAN PROOFREADER:

Mrs Judit Varga Vas

TRANSLATED BY

Krisztina Kaló

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TABLE OF CONTENTS

1. THE HISTORY OF SWIMMING

1.1. THE ORIGINS OF SWIMMING, SWIMMING CIVILISATIONS IN ANCIENT TIMES..... 3

1.2. SWIMMING AND SPA LIFE IN THE MIDDLE AGES 5

1.3. THE RENAISSANCE OF SWIMMING 7

1.4. THE ORIGINS AND THE EVOLUTION OF COMPETITIVE SWIMMING. 9

1.5. COMPETITIVE SWIMMING ORGANISATIONS ……..……..…….11

1.6. THE EVOLUTION OF WORLD RECORDS IN COMPETITIVE SWIMMING..... 12

2. THE BEGINNINGS, TECHNIQUE AND RULES OF SWIMMING STYLES..... 13

2.1. FREESTLYE..... 13

2.1.1. The history of freestyle 13

2.1.2. Freestyle technique..... 16

2.1.3. Freestyle start technique 19

2.1.4. Freestyle flip turn technique..... 22

2.1.3. Freestyle finish technique..... 23

2.1.4. Rules of freestyle..... 23

2.2. BREASTSTROKE..... 24

2.2.1. The history of breaststroke 24

2.2.2. Breaststroke technique 26

2.2.3. Breaststroke start technique *29*

2.2.4. Breaststroke turn technique..... 29

2.2.5. Breaststroke finish technique 30

2.2.6. Rules of breaststroke 30

2.3. BACKSTROKE..... 32

2.3.1. The history of backstroke..... *32*

2.3.2. Backstroke technique..... *33*

2.3.3. Backstroke start technique *35*

2.3.4. Backstroke turn technique 36

2.3.5. Backstroke finish technique..... 36

2.3.6. Rules of backstroke..... 36

2.4. BUTTERFLY 38

2.4.1. The history of butterfly *38*
2.4.2. Butterfly technique *39*
2.4.3. Butterfly start technique *41*
2.4.4. Butterfly turn technique (flip over turn) *41*
2.4.5. Butterfly finish technique *42*
2.4.6. Rules of butterfly *42*
2.5. MEDLEY 43
2.5.1. The history of medley *43*
2.5.2. Medley technique (start, turn, medley relay) *44*
2.5.3. Rules of medley *45*
3. THE BIOMECHANICS OF SWIMMING 46
3.1. BASIC PRINCIPLES OF BIOMECHINAICS OF SWIMMING 46
3.2. TYPES OF RESISTANCE 47
3.3. THE IMPORTANCE OF STEADY SPEED 48
4. INTERNATIONAL COMPETITIVE SWIMMING RULES AND REGULATIONS. 50
5. TEACHING SWIMMING 51
5.1. THE POSITIVE EFFECTS OF MOVEMENTS CARRIED OUT IN WATER .. 51
5.2. THE EFFECTS OF SWIMMING ON THE PERSONALITY DEVELOPMENT. 52
5.3. METHODOLOGICAL PROPOSALS FOR ORGANISING SWIMMING LESSONS 54
5.3.1. Water as unfamiliar medium – accident prevention *54*
5.3.2. Informing learners about the rules *55*
5.3.3. Other security aspects *55*
5.3.4. Forbidden and dangerous tasks *56*
5.4. THE SPECIFICITY OF SWIMMING LESSONS 57
5.5. WATER FAMILIARISATION 59
5.5.1. The role of water games in swimming lessons, water familiarisation games 60
5.5.2. The application of education aids for water familiarisation *64*
5.6. TEACHING SWIMMING STYLES 65
5.6.1. Teaching breaststroke 67
5.6.2. Teaching freestyle 70
5.6.3. Teaching backstroke 73
5.6.4. Teaching butterfly 75
6. BIBLIOGRAPHY 77

INTRODUCTION

Swimming is as old as Humanity, the ancient cave paintings testify that our forefathers also tried a variety of floating and swimming styles. It is interesting to look back to the past, and keep track of how the ancient bath life developed from the sacred immersion in water, how the medieval legend of sea monsters made swimming fearful and how the current versions of competitive water sports appeared in the 19th century. Man always found out new and new swimming styles and has been improving his technique up to the present day.

The present book presents the origins and the latest history of swimming, the stages of its development into a competitive sport and highlights its outstanding figures. We will analyze the different styles and the related technique of the starts and turns as well as the rules. We will present the specificities of this sport, its biomechanics and its impacts on the human body.

We recommend this manual to the representatives of certain athletic professions (physical education teachers, sports activity organisers, professionals of recreation) and to future sports professionals so that they learn about swimming and about the basics of swimming education. To do this, the authors intend to help with the present book.

1. THE HISTORY OF SWIMMING

1.1. THE ORIGINS OF SWIMMING, SWIMMING CIVILISATIONS IN ANCIENT TIMES

Our ancestors settled down next to the life-giving water, they fished, hunted, and it is likely that they also dared to enter the water. What technique did they use to swim? The answer to this question is given by the cavemen. They showed their swimming technique in the paintings on the cave wall. It is likely that they overcame water obstacles dog-peddling and doing propulsive arm movements similar to today's freestyle arm-stroke, or clung to logs and animal bladders. In some cave paintings from the stone-age we can discover some kind of swimming-like moves but it is not easy to identify the style. Some authors say it is breaststroke, some others say it is dog-paddling. On an ancient Egyptian clay tablet from 4000 – 9000 B.C. it is easier to identify the swimming style. The arm-stroke clearly shows the moving phase of the freestyle arm-stroke: one arm is depicted in the recovery phase above the water, while the other arm carries out the pulling action under the water (see Fig.2.)

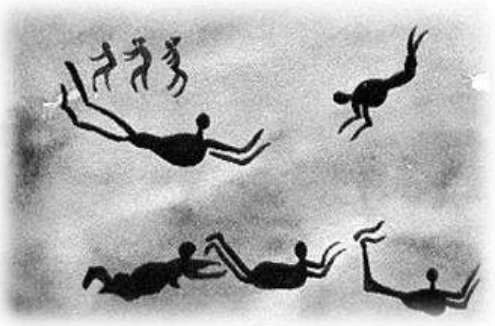


Fig.1: Breaststroke swimming figures represented in the Prehistoric era

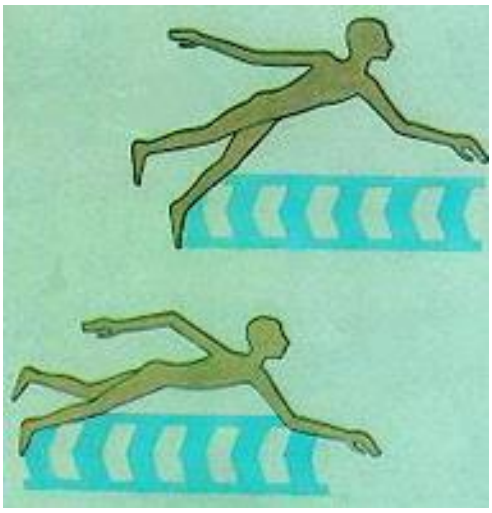


Fig.2:Freestyle swimmers in Ancient Egypt

While there are only a few records left for us from the Prehistoric era, we know a lot more about the developed swimming and bath culture of people in Ancient Times. Human civilisations, such as the Mesopotamian, Egyptian, Chinese, Indian and Greek were established beside waters, along rivers and seas, and this developed close ties with the life-giving water. Ancient thinkers, poets, lawmakers, general officers, doctors quickly realised the positive effects of swimming, and they applied them in military tactics and trainings as well as in education. In the advanced societies of the ancient world almost everywhere appeared the swimming and bathing culture.

For **the ancient Greeks** swimming was a measure of culture. *"Those uneducated who can neither swim nor read and write, cannot hold a public position",* said Plato. Although swimming was not included in the programme of the Olympic Games, it was an important part of education. In Athens, Solon made the acquisition of the science of swimming compulsory in 594 B.C., and Lykourgos, the lawmaker of Sparta, prescribed the same in a strict Act on education in the 9th century.

In Mesopotamia we can find swimming and the pictorial or written records hereof in almost every nation's culture from the Sumerian to the Assyrian. Their scientific achievements include water pools and swimming pools. Excavations in Syria revealed four-thousand-year old baths, the water temperature of which could be regulated as desired. Many records related to swimming remained from the Assyrians too. When exploring the ruins of Nineveh, several reliefs were dug out from royal tombs from 1200 B.C. which represented the swimming trainings of Assyrian warriors. Swimming was an integral part of combat training of the Assyrians as well as young people in Israel received obligatory swimming lessons. Herod the Great (73 B.C. – 4 A.D.), king of Judea, made swimming compulsory to all male children.

Fig.3: Representation of swimming Assyrian warriors from 1200 B.C.

In Mesopotamia as well as in Egypt developed a high-standard body culture, which was connected to water in many ways. Swimming and bathing in the Nile was also one of their religious obligations. They also had baths, not only the pharaohs but archeologists found pools for swimming at the dwellings of general people. The

Fig.4: A spoon from Ancient Egypt showing a swimming figure

oldest pictorial records of professional swimming can also be seen in Egyptian papyri from 3000 B.C. The ancient Egyptians knew a number of swimming styles. Freestyle, backstroke and breaststroke are depicted in the representations found in royal tombs, on vessels and vases.

The rest of the ancient people left us with less records of their bath culture, but we at least know that the Germanic peoples used swimming as a tactical exercise, and that the Finnish considered it as natural a movement as running. The Icelandic folklore also reports a number of swimming deeds, which shows that both men and women were excellent swimmers. In Japan, swimming had an important role in the training of the Samurai. It was one of the noble skills. According to the historical records the first known swimming competition was held in the isolated island country in 36 B:C., organized by Emperor Su Gui. In the remote India, the ancient records of swimming can also be found. One of the first pools used for swimming is located here, in Mohenjo-daro, dating back to 2800 B.C. and measuring 30x60 meters. Within the military caste it was mandatory to learn how to swim and fight in water.

In China, where body culture flourished under the reign of the third dynasty, the Zhou dynasty (11^{th} – 3^{rd} c.), historians account swimming across rivers. Of course, here as well swimming was part of the military training. In the 3^{rd} century B.C., the Chinese Imperial fleet officer training institutions have organised swimming lessons and swimming trainings.

Not everyone was known to be a good swimmer in the ancient world. Alexander the Great, for example, could not swim. Just as the Persian warriors did not know the mysteries of water. They were not allowed to learn how to swim for religious reasons, because they were not allowed to defile the holy water by entering it. The lack of swimming ability caused the demise of many of them. In the battle of Salamis, in 480 B.C., the Persians were heavily defeated by the Greeks. The Persians ships were sunk by the Greeks, who due to their lack of swimming ability could not escape to the nearby island of Salamis, and therefore most of them got drowned in the sea.

The ancient swimming and bathing culture rose to its highest level **in Rome**. The usefulness of swimming in entertainment and in public life, and its role in politics was quickly realised. Romans excelled in bath building, too. Augustus had a swimming pool built, big enough to simulate sea battles in it. Roman baths were also built in Hungary, such as the famous baths of Aquincum.

Swimming for the Romans did not only have health and "body exercising" function, but it was considered as indispensable also in military training. From the 3rd century B.C., warriors had to swim in attire and weaponry in order to improve their physical fitness.

1.2. SWIMMING AND SPA LIFE IN THE MIDDLE AGES

After the fall of the Roman Empire (476 A.D.), water has lost its popularity. Any contact with it was considered unclean and sinful. *"Everyday bathing and swimming in open water are extremely harmful to health",* they professed. This, of course, had some base as the plague and leprosy imported by the Byzantine troops around 542 reorganised Europe's population. Water may have been the source of diseases and illnesses, and it was better to stay away from it. Water is not a divine but a vicious legacy, spread the Christian missioners. Certain authors have even written that it is "disgusting" when a man lying on his abdomen, swimming with big and wide gestures, touches the water even with his mouth. Swimming was like a sexual pleasure, seducing like a sinful woman: "*as one of the sources of bodily pleasures it is synonymous with evil, sin and temptation"* [1].

The contempt of "bodily vanity", the de-emphasis of body culture and of the hygiene education characterized the man of the early Middles Ages. As *ascetic lifestyle* led to the purgation of the soul and to the gain f salvation, physical exercise, and so is swimming, was relegated. Due to the wide-spread of Christianity, swimming and bathing culture fully declined. The Church prohibited physical exercise, swimming and even bathing, as "*pure body covers impure soul".*

Fig.5: Medieval representation of a bath from a 15th century manuscript by a famous Flemish painter.(http://inpress.lib.uiowa.edu/feminae/DetailsPage.aspx?Feminae_ID=32501)

Medieval Christianity created a dual ideal of man. One is the self-mortifying *ascetic*, who

[1] Jenő Bakó (1986) Az úszás története. Budapest, sport, p.62.

scorned and afflicted his body and cared only about his soul; and the other is the particular figure of the secular Saint, the armed propagator and guardian of the faith, the *knight*. In the era of knights, knightly education claimed a high level of physical requirements to the zealot defenders of the period. Swimming was part of it as one of the seven knightly skills. As a knight's suit of armor became very heavy, knights' swimming was transformed, and did not mean free swimming any more but swimming on horseback. Knights had to learn the technique of horseback swimming in order to cross waters.

From the 12th – 13th centuries, in spite of the prohibitions bath life surged again all around in Europe. Until the 11th – 14th centuries in most of the towns, baths worked regularly. Civilian bath houses did not particularly become popular due to swimming but rather to entertainment. Baths became the centres of intimate social life, and often functioned as brothels. From the second half of the 1500s, the bathing of men and women together has not been banned, but because of the spread of infectious diseases and debauchery the Church began to stop bath houses in Europe. Due to the prejudices against swimming and bathing and to the closing of the bath houses, the education of water skills fell short, and as a result the number of drownings increased with a huge proportion. In order to stop it, public bathing and swimming were banned all over Europe: in 1643 in Vienna, in 1650 in Prague, in 1661 in Paris. Although at this time there was still a vivid bath life in Hungary, the restrictive measure has reached Hungary as well, and the ban entered into force at the time of the Habsburgs. Maria Theresa banned swimming in her Provision for education, the Ratio Educationis, and this was followed by another regulation in 1786, which prohibited bathing in Lake Balaton as well for reasons of life safety. As people could not resist the temptation of water, only a few respected the regulation, so the open waters went on taking casualties.

Fig.6: „Floating man" from the book by Bernard in 1685

To the ban of swimming faced up the humanist thinkers, who believed that drownings could not be prevented by prohibiting regulations but by swimming lessons.

Defying the Church and its prohibition, the first swimming manual written by Nicolaus Wynmann, a university professor in Ingolstadt, published in 1538, also encouraged the practice of swimming and emphasised the importance hereof. In his work entitled "The art of swimming", the author presents not only the swimming styles and how to teach them but also describes how to jump in the water, how to dive and how to save someone from drowning. He propagates the primacy of teaching breaststroke. This work by Wynmann was put on index by the synod of Trident. As an effect of Winnman's work, books on swimming were published one after the other. In 1587, Everard Digby wrote *De Arte Natandi*, and in 1696 Melchisédech Thevenot published "*The Art of Swimming Represented in Images, and Instructions for Useful Bathing*", a popular work of the author throughout Europe.

Fig.7: Representation of jumping into water. From "The Art of Swimming Represented in Images, and Instructions for Useful Bathing" by Thevenot 1696.

From the 17th century books on swimming or on physical exercise including swimming were published one after the other. In 1741, a book by the Dutch Jean Frédéric Bachstrom was published, which is perhaps the very first reference book on saving from drowning. Bachstrom also struggled for the integration of swimming lessons in the school curricula. His thoughts and ideas anticipated the Renaissance already: "*humans, like animals, can swim from birth, only the sufficient courage has to be added to make movements similar to the movements made by frogs*". In 1786, a work propagating similar humanist thoughts was published in Paris: "Art de nager". Its author says that a man can swim originally, only civilisation distorted him. As we got alienated from Nature, we have forgotten this inherent ability that animals (frogs, dogs) still use.

1.3. THE RENAISSANCE OF SWIMMING

The boom of the **Renaissance body culture** has overcome all the medieval prejudices against swimming. People in the Renaissance discovered the beauty of the human body and that of physical activity, returned to the ancient values of body culture. Swimming and bathing in open waters have become popular again. The scientific thinking of the period had its effects on the experts of swimming, too. Swimming figures appeared in the works of art. (Durer, Leonardo, Cranach, Gentile.) The majority of the humanist thinkers have committed themselves to swimming. John Locke, whose work was also published in Hungary, reasons as

follows: *"It is necessary, when a certain age is reached, to teach children how to swim", "which is useful to know, and often saves one's life and the lives of others".*

Fig.7: seaside bathing cabins drawn by horses

Fig.8: Bathing women coming out from a seaside bathing cabin

By the 18th and 19th centuries, open water swimming has become more and more popular. In default of swimming pools, bathing cabins were installed on the riverside and seaside, or mobile "ambulant cabins" were set up. In the second half of the 18th century swimming pools started to be built. The first facilities were wooden framed swimming pools on rivers. On the bottom, down to the bottom of the river, nets closed them from the river or the lake. They were fixed by chains and ropes, and they were moored due to the stream of the river.

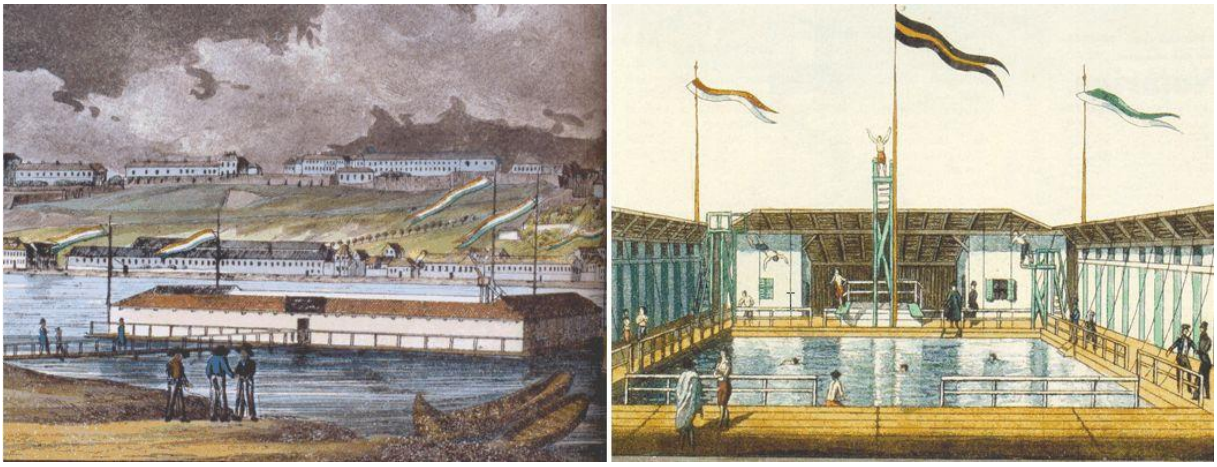


Fig.9: River swimming pool on the Danube

Due to the influence of the Philanthropists, organised mass swimming lessons took a favourable turn. The revolutionary new features of physical education in the 18th and 19th centuries became prevailing also in swimming lessons. Basedow (1723-1790) and Guts-

Muths (1779-1839) initiated swimming and water saving lessons in schools. They fought for that swimming lessons also become instituted by the State. This, however, did not happen at that time.

1.4. THE ORIGINS AND THE EVOLUTION OF COMPETETIVE SWIMMING

Great historical swims to promote swimming as a sport also took place at the end of the century. As a greatest event in the history of swimming, in 1875 Matthew Webb swam across the English Channel between Dover and Calais in 21 hours and 45 minutes. The distance was 34 kilometres, but he supposedly swam in zigzag, so he covered 64 kilometres by the end. Because of the 16-degree-cold water he slathered his body with grease. According to the records, he covered the whole distance swimming breaststroke. *(The first woman, Gertrude Ederle undertook the same distance in the English Channel in 1926, and cut Matthew Webb's time to 14 hours 32 minutes.)*

Captain Boyton was also considered to be a great long-course swimmer. In 1876, he drew attention to himself when he swam from Linz to Budapest in a specific way, lying on his back, with oars in his hands and a sail attached to his feet. He covered the distance in 52 hours. These long-course swims have primarily increased the popularity of swimming as a sport. For a long time swimmers were not motivated by the time or the speed, but by the distance they were able to cover. For a long time the stories of river, lake or, related to coastal peoples, gulf-crossing swims have been reported. The first competitions were also held in rivers, lakes or gulfs. Overseas countries have got ahead of Europe, as the first tournaments were held in Japan in 1810 and in Australia in 1846. The first official swimming competition in Europe was organised in the UK in 1869, the year of the formation of the British Swimming Federation. The competition was organised on the River Thames for the distance of an English mile (1609 m). The programme of the championship has expanded gradually, beside the long-

Fig.10: Swimming competition on the Danube

course swimming, swimmers competed on 100 yards (about 91 meters) in 1878, then on 500 yards, and from 1880 on 200 yards. At the beginning of competitive swimming distances were rated in in yards, and the longer distances in miles.

From the second half of the 19th century, in most European countries associations were created one after the other to undertake the tasks of organising competitions. Associations sprouting up formed the National Swimming Federations, which entailed the creation of an international swimming organisation. In 1908, the FINA (Fédération Internationale de Natation. In English: International Swimming Federation) was founded.

At the beginnings of the formation of competitive swimming, at the end of the 19th century, breaststroke was the only one swimming style. At the first competitions almost all the swimmers competing swam in breaststroke style or in a similar way. But in order to swim faster and faster, swimmers also experimented with other swimming styles. They realised that forwarding the arms over the water speeds up the tempo. Side swimming and overarm side-stroke was invented, and from this freestyle was born. At the first modern Olympics a champion was announced in this event.

From the first Olympic Games in 1896 swimming has been included in the programme of the Olympics. At the first Olympic Games in Athens swimmers competed only in four events: 100, 500, 1200 metres freestyle and the event organised for the Greek seamen, where everyone could swim in a style as he wanted or as he could. From 1900 backstroke, then from 1904 breaststroke and finally in 1956 butterfly were also included in the events of the Olympics programme. The individual medley only got into the Olympic swimming events in 1964 at the Tokyo Games.

At the first three Olympics participants still swam in open water. In Athens, the Games were held in the extremely cold water of 11-12 degrees of the Bay of Zea, at the second Olympics in 1900 in Paris, in the backwater of the Seine, the Marne River, while at the Games in St. Louis in 1904 on an artificial lake. Since the Olympic Games held in London in 1908, swimming competitions have been hold in a pool. In England, home country of water sports, the 100-meter-long swimming pool was built in front of the main box of the Olympic Stadium, which housed the event. This was the first Olympics where the events similar to those of our days became permanent: 100, 400 and 1500-yard freestyle, 100-yard backstroke, 200-yard breaststroke and the 4 times 200-yard freestyle relay. Although women had been admitted to the Olympic Games from 1900,

until 1912, only men were allowed to enter the competitions. Ladies then were allowed to enter the Games, but were only tolerated by the people. It was difficult for them to compete as they were to wear swim suits covering their whole body from neck to ankle, which were not suitable for swimming, even bathing was difficult in them. Ladies were allowed to swim first at the Olympics in 1912, and even then only in the events of 100 metres freestyle and of the 4 times 100-metre team relay. The outrageous backstroke style, which exposed the lady swimmers' belly and breasts, was banned until 1924. The 50-metre-long pool was used in Paris in 1924 for the first time. This was also the first time to use lane dividing ropes, which were made of coloured cork. At this Olympics the navigation helper lines at the bottom of the pool appeared as well for the first time. At the start, swimmers have started from the edge of the pool, but this was already a step ahead, since in 1886 they had to start from a boat, or later from a floating bridge. Starting blocks at the ends of the pool have been used only from 1936.

After World War II more and more events have been gradually included in the official Olympic programme. Olympic champions were announced eleven swimming events in 1936, in thirteen events in 1956, in eighteen events in 1964 and in twenty-nine events in 1972. In Beijing no less than thirty-four events were held.

1.5. ORGANISATIONS OF COMPETITIVE SWIMMING

The international organisation of swimmers, **FINA** (Fédération Internationale de Natation) was founded on 19 July, in London, in the Manchester Hotel. At the inaugural meeting, the swimming federations of eight countries, Belgium, England, Denmark, Finland, France, Germany, Sweden and Hungary were present. The current head office of FINA is in Switzerland, in Lausanne. FINA oversees the organisation of competitions in five aquatic sports *(swimming, diving, synchronised swimming, water polo, open water swimming)*. Its current president is Dr Julio C. Maglione (Uruguay).

On the initiative of the Hungarian Leó Donáth, the **European Swimming Association, LEN** was established in 1927. With the exception of the short-course European championship of swimming, that takes place each year , the LEN organises its competitions and tournaments every two years: the long-course European Championship of swimming, the water polo European Championship, the Masters Swimming Championship, the Junior European Championship of swimming and the open water European Championship. In addition to swimming, the rest of aquatic sports are subject to the supervision of the federation: water

polo, diving, synchronised swimming and long-course (open water) swimming. The current President of the European Swimming Federation is Paolo Barelli (Italy), its former Vice-President (2008-2012) and its current treasurer is the Hungarian Tamás Gyárfás.

Among the swimming competitions which are organised by FINA the most important ones are:

- ~ FINA Swimming World Cup,
- ~ Short-Course Swimming World Cup,
- ~ Junior World Cup,
- ~ Swimming World Cup,
- ~ Marathon World Cup (10 km or longer distance).

Fig.1: Logo of FINA

The first swimming World Championship was held in 1973, and since 2001 it has always been organised in odd years. Within the framework of the World Cup champions are announced not only in swimming events, but in the events of synchronised swimming, diving and open water long-course swimming as well. The water polo World Cup takes place at the same time. The "Aquatic World Cup" is formally known as "*swimming, long-course swimming, diving, synchronised swimming and water polo World Cup"*. The English name for it is *"FINA World Aquatics Championship"*.

The first European Championship was held in Budapest, Hungary in 1926. The 50 m pool The European Swimming Championship is usually organised every two years (in spring and in summer) in a 50-metre-long pool by the European Swimming Federation (LEN). LEN organises competitions in a 25-metre-long pool as well, which are held each year, during the winter (November, December). The first **Short-Course Swimming Championship** was held in Gelsenkirchende in 1991. Hungary has only once organised a European Short-Course Championship, Debrecen hosted the event in 2007. Before 1996 the name of the competition was **European Sprint Swimming Championship** because the contestants could only enter short-course events.

Within the framework of the European Championships swimming is not the only one sport, but there are events in synchronised swimming and the diver as well, furthurmore the open water Championship is held at the same time. Until 1999 the Europen Water Polo Championships were also held at this time, but the management hereof has changed, and nowadays another city has been hosting the event, although at the same time. It is known under the umbrella term of "European Aquatic Championships".

1.6. THE EVOLUTION OR WORLD RECORDS IN COMPETITIVE SWIMMING

The International Swimming Federation was founded only after the Olympic Games in 1908 in London, but the first world records in swimming had already been recorded earlier. The first task of FINA was the *post factum* verification of the performances. Upon the review of the swimming world records, a lot of interesting data can be observed. For example, most of the world records are in freestyle. Most of the men's world records are in the event of the 100-metre breaststroke, while most of the women's world records are in the 200-meter breaststroke.

The first record-holder of the 100-metre freestyle is the multiple Olympic champion, the Hungarian Zoltán Halmay, who set up the record in 1905 at 1:05,8. However, it was Weissmüller who managed to cross first the one-minute dream limit (57.4) at the Olympics in Paris in 1924. At the beginning of competitive swimming, distances were measured in yards (e.g. in 1904, Halmay won an Olympic gold medal in 50 and 100 yards). Longer distances were calculated in miles. Since traditional British distances (100, 200, 400 yards and 1 mile) were dismissed May 1st 1957, FINA abolished in 1968 all the world records set up in distances measured in yards, In 1969 the final list of the 31 events was determined in which one can beat a world record in a 50-metre pool (16 male and 15 female events). In 1972 the registration of the world records to the nearest hundredth was introduced. The change in the rules of certain events, and the development of the swimming technique promoted new world records. From 1964, at the turn in freestyle the walls of the pool were not to be manually touched any more, which accelerated swimming.

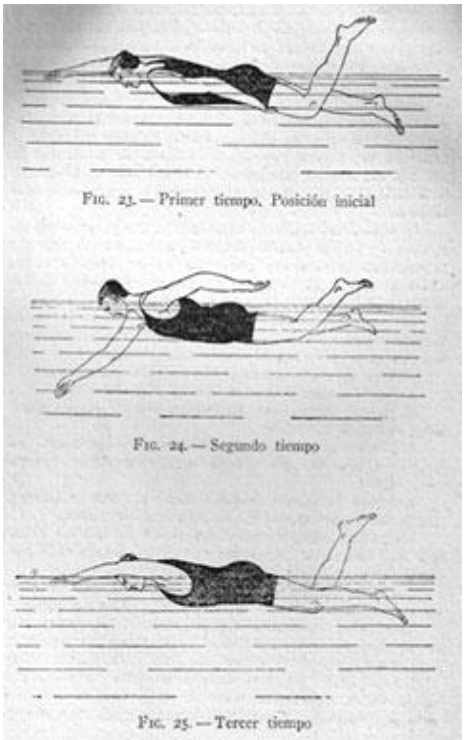
Over the years, the rules of the breaststroke have changed the most often; it's no wonder that so many world records were setup in the event. After the Olympic Games in 1956, FINA has banned underwater breaststroke swimming. Since then, the rules have changed several times, most recently a downward dolphin kick has been permitted after the start and the turns. The rules of the turns in backstroke were altered in 1991, permitting a turn similar to the freestyle turn technique. The short-course records have been registered since March 3rd 1991.

2. THE BEGINNINGS, TECHNIQUE AND RULES OF SWIMMING STYLES

2.1. FREESTYLE

2.1.1. THE HISTORY OF FREESTYLE

The surviving rock and cave paintings, as well as some other pictorial depictions also prove that freestyle swimming was present in the prehistoric times. It was given an important role in ancient times as well, in fact, its technique became more sophisticated. The predecessor of today's freestyle is mainly side-stroke, then overarm side-stroke and later the **English stroke**, which is considered to be a kind of transition between breaststroke and freestyle. Its most common technical element was the expansive scissors kick. One leg made a movement characteristic to breaststroke kick, while the other leg made freestyle stroke. Its technique can be described the best by one arm moved forward under water, by the flutter kick and by the head kept out of water, turning to the right and to the left alternately. At a swimming competition in London in 1844 where American aborigines were also involved, the audience could observe a strange swimming technique. While the English competed in breaststroke, the native Americans made a kind of freestyle stroke. The ancient technique of freestyle must come from American, West African inhabitants and from some Pacific Islands, where this knowledge went down from generation to generation. This technique was not known by the Britons at this time. The Americans have won the competition, as their technique, if not as refined as the English gentlemen's technique, it proved to be much faster. The Americans move their arms as a "windmill", while they make up and down kicks with their legs. This "splashing" style was considered barbarian, "un-European", said the English gentlemen, who continued to prefer competing in breaststroke, keeping their heads above water until 1873.



12. kép *a gyorsúszás váltott karú változata a század elejéről*

Thanks to human creativity the development of swimming technique stepped to the next stage. Swimmers realised that lying aside they can take only one of their arms out of the water, while lying on the abdomen they can take out both arms

alternately. The rotating arm movement for swimming, although it was already known earlier, in ancient times, was reintroduced by John Arthur Trudgen in 1873. This technique is named after him "Trudgen or Trudgeon stroke" (**Trudgeon stroke**). He learned it from native people during a trip to South America. He alternately raised his arms out of the water and pulled them to his waist under water, as a result, he turned forcefully on to the left or to the right side, keeping his head above the surface of the water. With this improvement arm stroke has become considerably more effective because of the longer pulling and pushing phases. Compared to today's modern techniques, it was still very rudimentary due to the use of the leg movement of breaststroke and the steep inclination of the body in the water. Trudgen's technique was further developed by the British-born Australian teacher, Richard (Frederick) Cavill, who studied then took over the flutter kick of native people on the Solomon Islands. It was far more efficient than the previous technique, because it excluded the site-oriented leg movements. In 1902, at a British International Championship, breaking Trudgen's record of 100-yard, a new world record of 0:58.8was achieved. It was Cavill, or according to some sources, one of his sons made it.

From the end of the 19th century Hungarian swimmers, namely Hugó Balogh, Alfréd Hajós and later Zoltán Halmay, played an important role in the development of the freestyle. Their technique was characterised by a strong arm pulling, and in order to prevent their body from twisting to the left and to the right, they used their legs for balancing. This technique was called **Hungarian stroke**. Due to the lifting of the head and the upper body, the posture was still too much vertical, and for arm stroke, they made mill-like movements. With this technique, Alfréd Hajós won two Olympic medals at the first modern Olympics in 1896: on the 100-yard run (1:22.2) and on 1200 yards (18:22,2). The other outstanding figure of the Hungarian style is Zoltán Halmay, who swam without leg movements, lying in a horizontal position, and rarely took a breath.

Subsequently, the Hungarian technique has been replaced by the so called "**Australian style",** the most outstanding representative of which was the Australian swimmer, C. Healy, who introduced the so-called crawling leg movement. The body lay almost horizontally, the hip did not move, and the arms have been somewhat bent.

The leg movement has been executed below the knees, the feet were straight and kept a distance of about 35-40 cm from each other. This was further developed by several U.S. swimmers, including Daniels, because they moved their legs from the hip.

Daniels, using crawl, won the Olympics (in 1908) before Halmay. Using the swimming technique of the Hawaii natives, Duke Kahanamoku, who has already made six leg strokes during one arm period, won the final of the 100-meter freestyle of the Olympics in 1912. In the 1920s, the freestyle technique has been revolutionized once again by an American of Hungarian origin, Johnny Weissmuller. His swimming technique was almost ideal. It was characterized by rhythmic arm strokes and six leg strokes, body raised high in the water, arm forward stroke with bent elbow and strong curved-armed underwater work. The five-time Olympic champion managed to swim the 100 m freestyle within one minute at the Olympic Games in Paris in 1924.

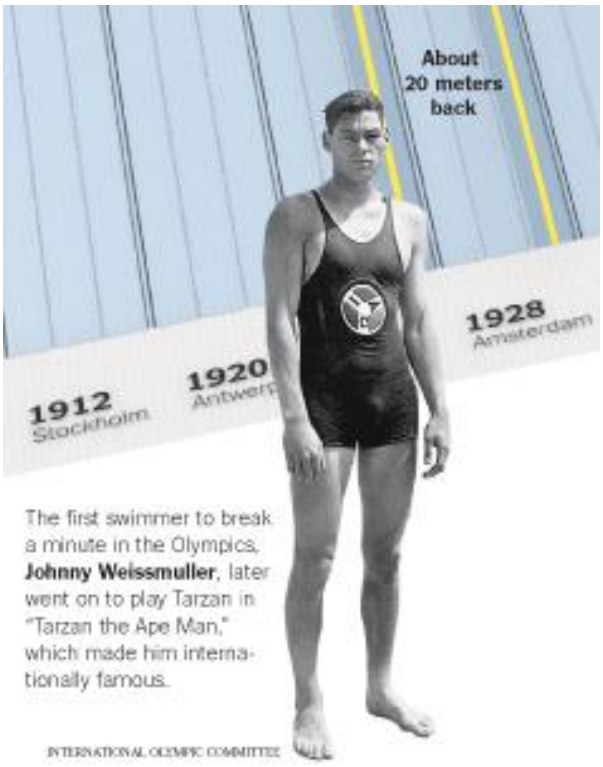


Fig. 13: *Johnny Weismüller, five-time Olympic champion*

At the Olympics in 1932 (Los Angeles) the Japanese male swimmers win all but one event thanks to the "**Japanese style**". This is a small step backwards in the development of the technique, since their way of swimming was inefficient, but despite this the slide or overtaking arm stroke that they have developed became popular in the 1930s. In the 1950s and 1960s, the classic freestyle conquered the world once again, and so did the Hungarian women swam for the gold medal at several freestyle events at the Olympic Games in 1952 in Helsinki. Katalin Szőke (100 m), Valéria Gyenge (400 m) and the 4 x 100-meter medley relay team, the members hereof were Katalin Szőke, Judit Temes, Ilonka Novák and Éva Novák.

At the Olympics in 1956 the Australian swimmers represented a special technique. This was characterized by the short plunge of the arms in the water in front of the head with a strong pushing phase and a string legwork. Swimmers also realized that the six leg strokes are not necessary all the time, and in longer term the use of 2 or 4 leg strokes might be more effective.

The most outstanding swimmer of the era was the Australian Dawn Fraser, who managed to win three consecutive summer Olympics (1956, 1960, 1964) in the same event, the 100-meter

freestyle. She was the first the lady swimmer to swim the world record of this distance within first minute.

Fig.14: *Dawn Fraser, Australian swimmer*

The hegemony of Australian swimmers was broken at the 1964 Summer Olympics in Tokyo by the American Donald Schollander. In addition to the six-phase dynamic legwork she used high elbow over water and strong underwater pushing phase, which did not allow her to win less than four gold medals. The Australian-born Murray Rose medium-distance swimmer applied the even-paced swimming and the Japanese Jamanaka used a powerful legwork in freestyle.

In the 1970s, women swimmers started to swim once again only with arm strokes. In the same year, the separation of the long-course technique and that of the short-course swimming started to be clear. Short distances were swum with the help of four or six-pace leg strokes, while long-course swimming was characterised by the two-pace leg stroke. Since that no significant change has occurred in the freestyle technique, not like in the forefront. Stars as Matt Biondi, Mark Spitz, Alexandr Popov, Ian Thorpe, Inge de Bruijn, Federica Pellegrini came one after the other.

2.1.2. FREESTYLE TECHNIQUE

Freestyle is a natural, cyclical cross movement. It has the least steep body position, so it has the minimum of front resistance, consequently it is the fastest style.

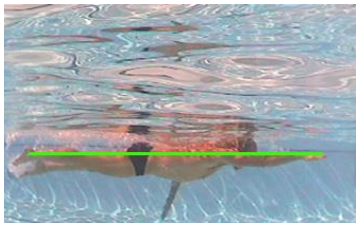


Fig.15: The right posture of freestyle

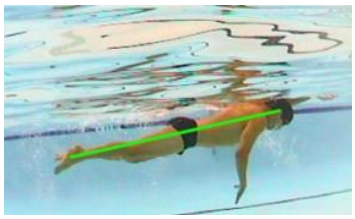


Fig.16: The too steep, faulty posture of freestyle

The first most important element of this technique, which mention should be made of, is the ideal **posture.** The three conditions of this ideal, streamlined body position, according to Ákos Tóth, are the proper head position, the straight back and hip position, and finally the small legwork. The head is bent down between the arms. It cannot be raised because it increases the resistance. For this reason, the legwork must also be minimal. The upper utmost point of the leg movement is the surface of the water, while its bottom point can leave the body line only a little bit. The position is not a constant one, because the body makes turns of about 30 or 40 degrees along its longitudinal axis while swimming.

Freestyle legwork consists of small cyclic movements: a downward propulsive phase and and a passive upward lift. This alternating motion is completed by lateral moves, which provide the balance of the body. The rate of how much the legs open depend

Fig.17: *During freestyle kicking, bend the knee for the down-kick and straighten the leg for the kick.*

Fig-18: *Feel resistive friction wrapping around the top of the foot to gain traction on the water when kicking.*

Fig.19: F*inish down-kick with straight tension for an accelerated thrust forward.*

on individual conditions (antropometria), but it is approximately from 50 to 80 cm. The propulsive phase of the kick is started by the sinking of the hip, which is followed by the movements of the thigh, and then the knee, the leg and finally of the foot. In the down-kick phase the knee bends, the leg legs behind slightly, and then a it catches up the foot movement with a fast whip-like movement. And finally, the stroke of the tense but still loose foot closes the movement cycle. The upward leg movement is also started from the hip. The leg stays in a straight position throughout the movement and the foot is in a loose position. This phase has no propulsive function. Novice swimmers often believe that they have to use a propulsive force upwards too, so their knees are bent incorrectly, (this is called cycling). With driving the water behind them the bottom of their foot they produce a significant whirling current. The excess power takes up extra energy, faster will come the fatigue. And this leads to further deterioration of the technique. The upward leg movement must be carried out with a minimum investment of power.

Legwork consumes more energy in itself. When swimmers use only their legs and feet, they consume approximately four times as much oxygen as when swimming with only arm strokes (Tóth 2008). For saving more energy, long-course swimmers apply less kicks. They use double, double crossed or four-pace legwork. When they use double-pace legwork, they do two downward kicks during an arm cycle, when they use four-pace legwork, they do for kicks, and when using double crossed legwork, they make four leg movements during an arm cycle: two larger downward movements and two crossed ones are carried out. Of course there are exceptions, and there are some long-course swimmers, who can cope with the sprinters legwork, which is six leg movements during one arm cycle. The number of leg movements mostly depends on the distance to swim, but if someone's legs really sink (mostly men's), it is more effective for them to use the six-pace legwork. It also recommended to swimmers with shorter legs, and to swimmers with outstanding vital capacity. However, with longer lower limbs, the double, four-paced or crossed legwork is more effective.

Fig.20: *The underwater curve of the freestyle armwork*

For the development of the proper swimming rhythm it is essential to create the right **consistency of the arm work and the legwork**. The first essential component of that is to always adjust legwork with arm work. It's no different than making six kicks

during one arm cycle. For further versions, double legwork, double crossed legwork and four-pace legwork, see above. Leg work does not only have a propulsive function but it also stabilizes the body, it compensates for the lateral turns of the body (due to arm work).

The most propulsive part of freestyle is the **arm work**, which has two main phases: *the underwater and the above-water arm work.*

Underwater arm work also consists of more than one parts, which are the *arrival of the hand in water, pulling and pushing*.

Underwater arm work starts with the **arrival of the hand in water**. The back of the hand arrives in water between the lines of the head and the shoulder. First the back of the hand arrives in water, then the forearm, then the elbow and finally the upper arm. When arriving in water, elbow is slightly bent, palms are open and face outwards, the back of the hand "slides" into water with its thumb side. After arrival in water, arm is starched out completely, so its speed is reduced (*awaiting the other hand's movement, which at that time is just in the pushing phase).* The arrival in water is not the same as catching water. The second phase of underwater arm stroke is **pulling**. After the arm enters the water comes *an outward and downward pulling* movement (*which has not got any propulsive function yet*) and the ending point hereof is *water catching*. From here, the point of water catching freestyle arm work is propulsive. After catching water comes an inward pulling movement as far as the center line of the body. This movement helps the turning of the body around its around its lengthwise axle. The movements ends at the line of the shoulder.

Fig.21: *Matt Biondi world classic swimmer's armwork in the air. The degree of the turn of the body can be well seen in the picture.as well as the breathtaking which accompinies this phase.*

The underwater pulling patterns differ from one world classic swimmer to the other (reversed S shape, question mark). It is essential that the hand should be positioned as the extension of the forearm. After the pulling phase of underwater arm work comes the third phase, i.e. **pushing**. Pushing is carried out following a half curve towards the thighs, while the arm straightens continually. The back of the hand bends backwards gradually and swings back fully next to the thigh, ending the propulsive movement. The hand relaxes, rotates so that the palms face the thighs (so that the resistance be less lifting out the hands) preparing it for the movement of deliverance.

After the arm has finished its underwater work, comes the **passive, above-water arm stroke**. The above-water part can be divided into two phases including *deliverance* and *forward arm movement*. The movement of deliverance is starts as the follow-up of the pushing phase. The arm bends gradually, and the elbow raises. It is very important to start the deliverance by raising the elbow.

This is followed by the **above-water arm work and the forward arm movement.** This phase is intended to minimalize the energy investment to move the arm in the active stage again. After the exit of the elbow, the arm is moved forward in a high elbow position. The elbow continually bends, the palm gradually turns outward, and then from the line of the head the elbow constantly straightens, and between the line of the head and the shoulders it reaches the water again, and then begins an underwater cycle again.

It is important not to be hasty, not to speed up the movement and not to give great strength to the arm when moved forward as it leads to the deterioration of the rhythm, and to the hasty under-water work of the other arm. While moving the arm forward attention must be paid to that the forearm and the back of the hand should not swing far from the shoulders.

The rhythmic movement of the two arms is essential to continuous swimming. **The consistency of the arms** happens as follows: while one arm enters the water, the other arm is in the last pulling phase. When the arm entering the water stretches out in the front, the arm on the opposite side is carrying out the pushing. The arm in the front slows down and will not begin the pulling until the pushing phase is not finished by the other arm. Thus, the progress will be steady and an even speed can be achieved.

We could swim the fastest, if we did not break the movement by breathing. Apart from short-course competitors, other swimmers do not really need it. For long-course swimming, the technique of proper breathing is essential. The **breathing technique** is closely related to certain movement phases of the arm stroke. In the last phase of the arm stroke, at the end of the pushing, the swimmer starts to turn his head sidewise, in the direction of the exiting arm. This, of course, is in line with the turn of the body. As soon as the mouth line reaches the water, the swimmer makes a side move with his mouth and takes a breath.

At a higher speed, a trough of wave is created, which makes breathing easier for the swimmer. Breathing takes place in the deliverance phase of the arm stroke and in the first phase of bringing the arm forward. Once the oral inhalation happens, the swimmer (in accordance with the body movements) reverses his head into the water. As soon as the swimmer's mouth is returned to the water, he immediately starts the breathing out.

The exhalation is carried out continuously and simultaneously through the nose and the mouth, which shall be continued as long as the following inhalation. If the swimmer failed to exhale the air completely, it shall be done into the water before the next inhalation. Approximately, swimmers use (inhale) half a liter of air when swimming. Excessive breathing, the increase of the volume of the air inhaled does not result in better air circulation, but the breathing muscles get tired if it. By the way, the freestyle breathing is the most difficult one out of the four styles. How often to breathe? We count it by the arm strokes. It may be three, four, two or even five or seven when training. Which is the best? The triple one.

Fig.22: *The breathing technique, the position of the mouth and the trough of the wave during breathing*

Its main benefit is that the technique is not distorted (this is also taught to beginners), it is symmetric, the swimmer can orient himself in either direction. Competitive swimmers develop their breathing rhythm in accordance with the distance and their individual abilities. Short-course swimmers swim holding their breath, or they breathe once or twice on 50 meters. Long-course swimmers also use the double or alternating breathing. This means that the swimmer swims with two breath takings, and then, after some strokes, he introduces a third one, so he changes sides.

2.1.3. FREESTYLE START TECHNIQUE

In swimming different start techniques are applied. Among the classic techniques, the *arm swing or arm circle* technique was considered the best for a long time. These techniques meant that before the jump, the swimmer made an arm swing or an arm cycle, which gave a greater impetus to the jump. Swimmers had been experimented constantly by speeding up the start, since they realized that it affects it their time result significantly. For example, 25% of the time needed to complete 25 m is the start time. On 50 meters it is 10%, and 5% on 100 metres. (Á. Tóth) The start time had to be reduced, which is led to the reform of the start technique. To speed up the start technique a new method, *the gripping start* was invented. Using this technique, swimmers can move their body in the direction of the water faster. One version of the gripping technique was the *front dive*, which resulted in a deeper dive under water, a faster and more streamlined entering into the water. Another version is the standing-start, which is a more stable start position, and as a result of the more horizontal (flatter) push it assured a faster entering into water.

In freestyle both the front dive and the standing start can be applied. Both share the following main stages: *start position, pulling, push-off, flight, entry into water, gliding, pulling-out to start swimming*.

The technique of front dive

When doing a front dive, **in the start position** swimmers stand in the front of the starting block, their feet turn slightly inside and their toes are clutched at the front edge of the starting block. For a more powerful kick the distance between the feet is at about the shoulder line. After bending the body, head is lowered, eyes on the water in front of the starting block. The elbows are slightly bent, both hands touch the front edge of the starting block either between the feet or outside of them. In order to ensure an effective jump knees are bent of about 30-40 degrees. The body's gravity center (from the point of view of the start speed increasing the speed of this is decisive) is behind the feet.

When the start signal is given, swimmers drag down their gravity center, which can be found at the hips, beyond the front edge of the starting block. Kness bend nearly 80 degrees. Meanwhile, swimmers move their arms upward. This is **pulling phase**. Arms are not to push away the starting block, they are only to let it go, because it slows down the jump. This move is followed by the **push-off** phase. After the previous knee bending, as its continuation, swimmers push off the starting block by a powerful hip and knee straightening, which is followed by the straightening of the foot at the ankles. This movement is complemented by forwarding the arms on a half-curve and by the raising of the head. The arms are bent, close to the body, swing forward under the chin, then leaving the head line they begin to move forward gradually in an extending position. In this position the head bends down. After the swimmer's body left the starting block, starts the **flight phase.** Swimmers fly in the air with a body slightly bent. At the highest point of the flight phase they move their arms downward and forward, and bend down their heads. After the body leaves the highest point of the flight phase, swimmers bring their legs into the line of their body to ensure a streamlined **entry into water.** The whole body is straightened, tight, the head is located between the arms and is bent down while entering water.

Fig.23: Front dive technique

The body enters the water through one point. The angle of the entry is 30-40 degrees from the water surface. This angle results in a deep diving, so after entering the water, swimmers move their legs downward, similarly to a butterfly leg kick, and meanwhile they raise their arms and head in the direction of the water surface. In the case of shorter distances this move is fast in order to reach in the water surface sooner, while in the case of longer distances, this move is slower, which enables a deeper dive. After the entry into the water swimmers insert a short **gliding** phases. This streamlined tight position shall be maintained until the movement speed is somewhat slowed down, and reaches the swimming speed. It is then that starts **to turn on swimming**. The swim is started by legwork. Before doing the freestyle leg kick, swimmers carry out butterfly kicks, and near the water surface they start the first arm cycle. The very first arm strokes are very powerful in order to raise the swimmer onto the surface. The first strokes after the start shall not be broken by breathing because it results in losing speed.

One version of front dive is the **start with bent knees**. When applying this technique, after the push-off phase, when the feet leave the starting block, a dynamic knee raising follows. Meanwhile the arms move forward and stops in the angle where it is supposed to enter the water. The trunk is tight, arms are straightened and point toward the water, knees and hips are bent to the maximum extent. At the highest point of the push-off, swimmers carry out a dynamic, fast leg straightening. At the moment of entering water the legs are completely straight. Because of the deep dive of entering the water, the bent knees technique is mainly used by breaststroke swimmers.

The standing start technique

When doing a standing start, **in the start position** swimmers stand in the front of the starting block with one foot, and their toes are clinging to the front edge of the starting block, while their other foot is further back as at the start in athletics. The body weight is on the back foot. The trunk leans forward, the head bowed, eyes on the water, hands touch the front edge of the starting block. The start position is stable, less likely to lose the balance. When the start signal is given, just as when doing a front dive, swimmers move their gravity center forward, while

Fig.24: The start position of the standing start.

Fig.25: *The moment of pulling andthe push-off*

doing a downward pulling movement by the arms. After the **pulling phase** comes the **push-off**.

This phase, however, differs significantly from that of the front dive. The hip keeps moving forward, and the swimmer straightens the back leg first, then the front leg. The legs provide greater pushing strength forward with this movement than in the front dive. Arms are thrown forward on a half-curve similarly to the other start technique. The angle of the push-off is, however, much smaller than in the front dive technique. The swimmer leaves flat the starting block. In the **flight phase**, the gravity center remains low, which ensures a faster start. Swimmers get into the water faster as their gravity center moves downward forward during the flight phase. *Although swimmers bend their hips slightly to increase the angle of the entry*, it is almost impossible to enter the water through one point because of the flat flight. The entry is flatter and less streamlined. After the arrival into the water begins the **gliding** phase, and then the **turn-on of the swimming movement**. The advantage of the standing-start comes from the fast, flat curve push-off, its disadvantage, however, is that the body is less streamlined when entering the water, so it slows down faster to the speed of the swimming movement.

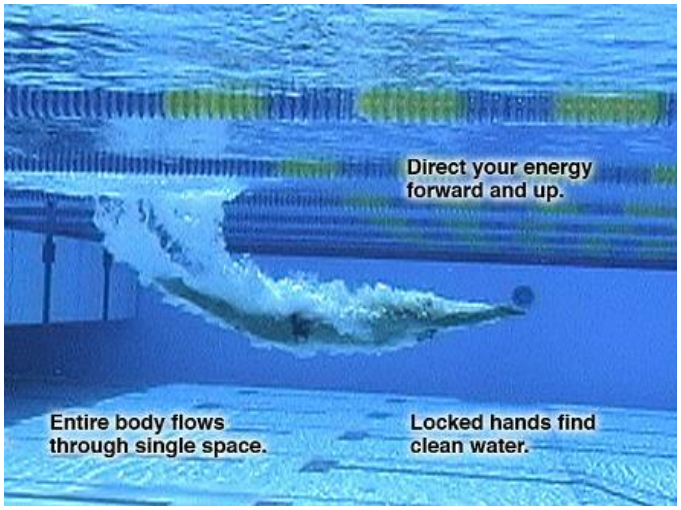


Fig. 26: Entry into thewater

2.1.4. THE FREESTYLE FLIP TURN TECHNIQUE

Just like the start, turning is a very important part of competitive swimming. This is proved the best by the fact that on short courses swimmers spend about 38% of the time required for the distance with the turns (Á. Tóth 1997). This is why it matters by what kind of technique the turns are implemented. The freestyle turn is almost like a somersault, or more precisely a three-quarter somersault forward along the axis parallel to the body, followed by a rotation along the

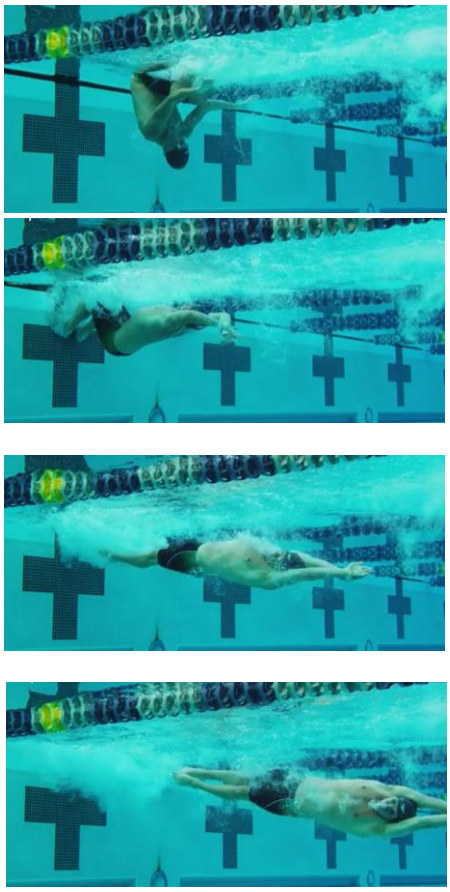


***Fig. 27: A series of photos** of Ryan Lochte's freestyle flip turn phases*

length axis of the body. There are two sorts of flip turns used in the freestyle. The difference is merely that at one swimmer carries out the last arm work with two arms and at the other with two arms. We can disconnect the turn into phases, which are as follows: *swimming-in, turning, pushing, gliding, switching on swimming after turn*.

Freestyle flip turn starts by a **swimming-in** phase. The swimmer approaching the wall, having his eyes on the wall, starts the movement, i.e. the **turn** at about 1,7-2 metres from it. The swimmer pushes one arm towards the hip, where he stops his arm, while he starts the underwater phase of the last arm stroke with the other arm. During the last stroke the swimmer performs a dolphin kick, which raises the hip over the water and then he starts the somersault. He continues the rotation along the width axis of the body until the head raises and reaches the line of the arms and meanwhile feet hit the wall. The swimmer reaches the wall with his sole, with toes facing obliquely upward.

The knees and the hip are approximately in a 90-degree angle. The swimmer helps the movement pushing water downwards with his palm. As soon as the swimmer's feet reach the wall, almost immediately begins the **push-off.** Legs protrude, starts the turn on the stomach, and then the **glide** phase until the swimmer slows down to the speed of swimming**.** After the glide the swimmer makes some crawling foot work, which raises the body close to the surface, and then he starts the **swimming movement.**

2.1.5. THE FREESTYLE FINISH TECHNIQUE

Regardless to the swimming style, finish is always preceded by a burst of speed. When doing it, swimmers usually withdraw their breath and swim with a more vigorous implementation of arm and leg periods. At the end of the distance freestyle swimmers will reduce the number of breath takings, carry out a more powerful leg work, and without reducing the period length they touch the wall with their fingertips. In freestyle the rule allow the competitors to touch

the wall at the finish line with any of their body parts, but they usually do so with their fingertips. If the swimmer cannot reach the wall with a full arm stretch, he must continue to stretch and powerful footwork must be performed to assist the fastest finish.

2.1.6. FREESTYLE RULES

1. Freestyle means that in an event so designated the swimmer may swim any style, except that in individual medley or medley relay events, freestyle means any style other than backstroke, breaststroke or butterfly.

2. Some part of the swimmer must touch the wall upon completion of each length and at the finish.

3. Some part of the swimmer must break the surface of the water throughout the race, but it shall be permited for the swimmer to be completely submerged during the turn and for a distance of not more than 15 metres after the start and each turn. By that point, the head must break the surface.

2.2. BREASTSTROKE

2.2.1. THE HISTORY OF BREASTSTROKE

This style can be considered as one of the oldest. Although we can see movements referring to freestyle in ancient representations, ancient authors mention breaststroke as the most important swimming style. However, due to the complexity of the movement, a lot of people have tried to simplify it. This is how dogpaddling and side-stroke, the predecessor of freestyle developed as a dead-end. In the first swimming manual, Wynman draws the attention on breaststroke. In the Renaissance swimmers preferred the movement which was similar to that of a swimming frog. People in the 19th century also prefered this style. At the beginnings of competitive swimming, almost everybody swam breaststroke. Among the first world record holders of breaststroke we can find Hungarian names: András Baronyi (1907), Ödön Toldi (1910), Márton Sipos (1922). At the first two Olympic Games it was not in the programme, but in the 3rd Summer Olympics in St. Louis, next to the next less defined swimming style (*hence the name, freestyle*), two more defined categories were included: one of them was backstroke included in 1900, and the other was breaststroke.

Fig.28: Orthodox breaststroke technique

In the history of this style several stages of evolution can be distinguished. The first one, from the 1880s, is the period of the so-called **Orthodox technique**. During this period, with today's eyes, the breaststroke was very primitive, a real "frog stroke".

It was associated with wide and large arm and leg movements, so it contained a lot of unnecessary movements resulting in energy loss. In the 1920s this Orthodox style was replaced by the **classical breaststroke**, which has not brought any change in the legwork, but from the technical and mechanical aspects of arm work it has been a huge step forward, since in a pulling nad a pushing phase the arm has gotten stretched down to the thighs. In the 1930s, however, legwork started to develop spectacularly, which meant that today's classic breaststroke leg movement – leg pulled up, a kick in cycle, feet hold in a 45-degree position – was formed. As the powerful breast leg movement had given more assistance to a much stronger, much stable, as well as higher-speed progress, the innovators' attention turned again

to the arm work. Since the other swimming styles, freestyle and backstroke, still proved to be faster, swimmers were experimenting persistently to accelerate the movement. Two specific technical innovations have appeared, one of them is the underwater technique, the other is the butterfly technique. The swimmers also discovered that in the cases where they do not break the breaststroke period with taking breath, they can be faster. If they do not take breath, they can swim under the water as well.

The **underwater technique** has developed. The active work of the arm work could be increased by not only pulling the water until the breast but also pushing it until the thighs. This is called *downward pull*, which was formed in this period, and is still used by swimmers today. But the rules have since been changed, so that now only one downward pull is permitted (at the start and after turns), and then the racers must break the surface of the water. For the audience this competitive technique must have been less spectacular, since swimmers could only been seen a couple of times when they during underwater swimming they had come up to the surface to breath air. In 1956, the FINA remove this technique by changing the rules.

Almost at the same time a different style developed. The **butterfly style** was born from the idea that the acceleration of the arms had to be solved somehow in order to bring them forward as fast as possible. As the water resistance makes it difficult to brig the arms forward underwater, it is easier to for the swimmer to do it above the water. In fact, because of the shift to the thighs the propulsive phase of the arm stroke can be maintained further, so arm work becomes more effective. Among the innovators the first was H. Myers, American swimmer, who was the first to apply the so-called butterfly arm stroke in 1933. More and more people began to adopt this technique, but not everyone was able to swim longer distances in this style. so certainly there have been some contestants who started the course in butterfly, and then when tired, switched to breast arm stroke.

Fig.29: *Éva Novák, breastroke swimmer's technique*

After the Olympics in London (1948) the International Swimming Federation has decided to regulate this technique of the breaststroke, and both styles were allowed, but the swimmer had to finish with the technique he started and could not change it during the course.

This butterfly technique lived relatively long, until 1953when the FINA decided to disconnect butterfly from breaststroke.

However, during this 20-year-long period the butterfly arm stroke was determinant in the development of the breaststroke. One of the most effective and the most famous representative of 'hybrid' swimming developing from the cumulative application of the butterfly arm stroke and the breaststroke leg stroke was Éva Székely, who won the gold medal in 200 m breaststroke using this butterfly arm stroke technique at the Olympic Games in Helsinki in 1952.

After the decision of 1953, breaststroke 'got rid of' butterfly and started to develop significantly. The next innovation was the application of the **delayed breathing technique**. The the Olympics in Rome in 1960, some swimmers experimented with this style, and left the others behind. This was so great a change that from 1961 one world record was broken after the other. The breaststroke really speeded up. The technical innovation primarily manifested in that breathing the was moved from the beginning of the propulsive phase of the arm stroke to the end, to the phase of recovery.

Significant technical improvement was introduced in the breaststroke in 1970s, which is known as the 'rolling' breaststroke. The rolling breaststroke the glide phase almost completely disappeared, the hip bends significantly, the swimmer executes a waving motion. For this reason, the technique is called surging breaststroke. The extracted leg stroke hardly moves out of the swimmer's plane, so the frontal resistance is minimized.

2.2.2. BREASTSTROKE TECHNIQUE

Today's modern breaststroke is no longer featured by the classic wide arm and leg movements. The moves have narrowed, the swimmer rises high above the water, and throws his arms forward above the water. There are several modern breaststroke techniques. One of them is the ***flat style***, when the swimmer, so that to reduce the frontal horizontal resistance keeps his body in a

Fig. 30: The above-water phase of breaststroke arm cycle

horizontal position, the hip does not sink deep, so less energy is needed to perform the movement cycle The other one is the surging technique when the shoulders rise higher above the water, the rate of the hip bend is less, since the body is constantly changing like waving, but the hip sinks deeper. Professionals provide reasons for and against both techniques.

In connection with breaststroke we cannot speak of constant **posture.** The position of the body is similar to that of the butterfly style, it keeps changing due to surging. The body must lie on the breast, while both shoulders shall be parallel to the water surface It is prohibited to abandon this position on the abdomen all along the course, with the exception of the turns.

The **leg work** of the breaststroke can be divided into several phases. It consists of a passive leg pull and an active kick move. The **passive leg pull** begins with pulling the leg upwards. Feet are relaxed and toes are pointed within the hipline (in order to keep streamline position they are not wider than this line) and move downwards. Then the knees begin to move away from each other, but in order to remain within the streamlined position they stay within the shoulder line. The first part of the **backward kick** is still passive, the feet turn outward, keep moving outward and downward, the hip bends continuously. This degree depends on the application of the wave style (30-35 degrees) or the flat style (60-90 degrees). At the end of the

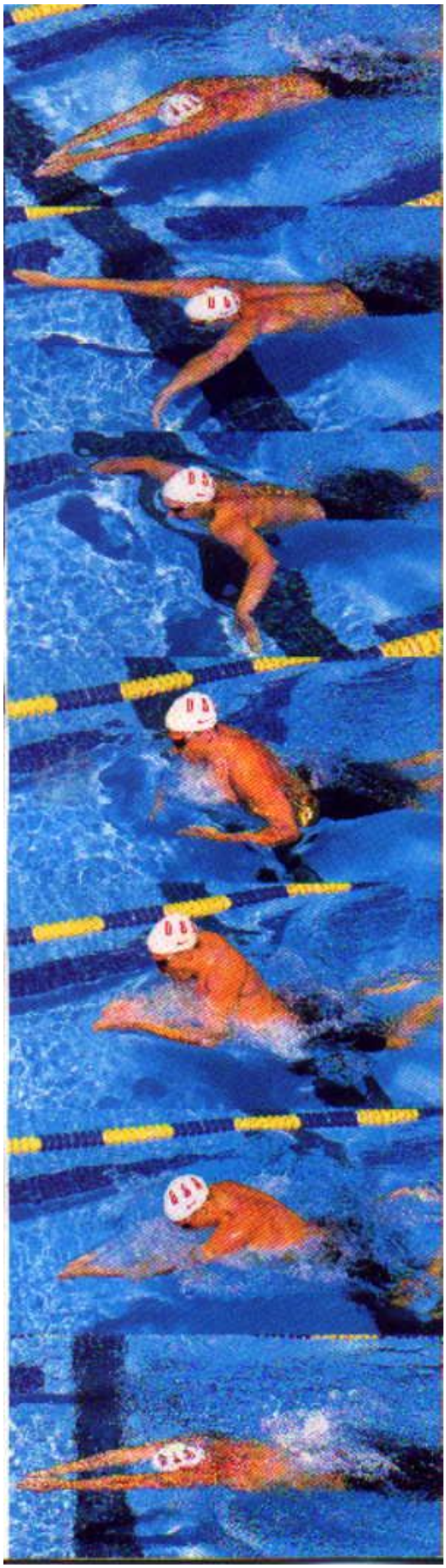


Fig.31: *Series of photos of the arm stroke phases of breaststroke*

passive the feet suddenly turn outward dynamically. At this point, the feet get into a pointed position, i.e. into a position suitable for catching the water. From here starts the propulsive phase of the leg stroke. The propulsive phase of the backward kick starts with the feet moving downward and outward, then legs are closed with an increasing speed on a slightly downward circular orbit. This continues until simultaneously with the legs getting in full extension the pointed feet with the soles turning toward each other protrude completely. After the active phase of the legs the swimmers lifts his legs in order to bring them in streamlined position. The **leg lift** ends at the body line, and that movement is followed by a short **glide**. In breaststroke the rules strictly prohibit the scissors, crawl or downward dolphin motions. The legs can break the water surface, if this is not followed by a downward dolphin kick.

The implementation of the **breaststroke arm work** are defined by the rules. In accordance with them, arms are to be pushed forward simultaneously from the chest under or above the water surface. Elbows must remain under water, except for the last but one stroke before the finish. Arms are to be moved backwards into their initial position either on or under the water surface. Arms are not allowed to be moved behind the hip line, except the start and the first strokes after the turn. The **breaststroke arm work,** just like its leg work, consists of active and passive phases. The arm stroke begins with a passive **outward pulling movement**. The arms move downwards and outwards until they reach the water catch position with the palm facing downwards and outwards. Then comes the propulsive phase of the breaststroke arm cycle, this is an **inward pulling movement.** The arms execute a semi-circular backward pull, and then downwards and inwards. The back of the hands, the forearms and the elbows converge again, and the upper part of the arm approaches the body. In the last phase of the inward pulling the arm already starts to move forward. In the stage of the forward movement of the arm, the hands face towards each other, the arm rotates inwards, the hand moves upwards and forwards. The swimmer throw the two arms forward dynamically under the breast and the chin, all the way to the full expansion of the arms. Every arm move must be carried out at the same time in the horizontal plane without any alternating moves.

In order to progress in an effective energy-saving way, the most important element in breaststroke is the **harmony between the arm and leg work**. The most economic progress can be achieved, if the speed is constant, and that is possible when propulsion is constant, i.e. the propulsive forces of the arm and leg work alternate “overlaying” and thus provide a steady speed. The consistency of arm and leg work has different forms, we distinguish ***continuous, delayed*** and ***overlap*** ones.. The ***continuous*** technique means that arm stroke starts

immediately after the closing of the legs. In the **delayed** technique the swimmer waits a little bit between the leg and arm cycles, while in the **overlap** technique the arm work starts at the end of the propulsive phase of the leg cycle. The two strokes overlap. The latter is the most effective, because this way one can ensure the minimum of speed loss, a smooth and steady speed. Even with the most perfect overlap technique one cannot ensure an even speed during the breaststroke. This is due to the fact that about 70% of the propulsion power comes from the leg stroke. Due to this disparity, the speed of the body during the breaststroke cycle increases during the leg work, and during the arm work it decreases to the one-fifth of the speed achieved during the leg work.

The breast stroke breathing is one of the easiest breathings among swimming styles. The breathing technique can be related to the breaststroke arm cycle. During the outward pulling phase the head rises, the swimmer blow off the air. By the end of the inward pulling phase the head is raised, the mouth is above the waterline, the inhalation begins. After inhalation in order to maintain the streamlined position, the swimmer bends his head back between the arms. In accordance with the rules of breaststroke, the swimmer must breathe at every arm stroke.

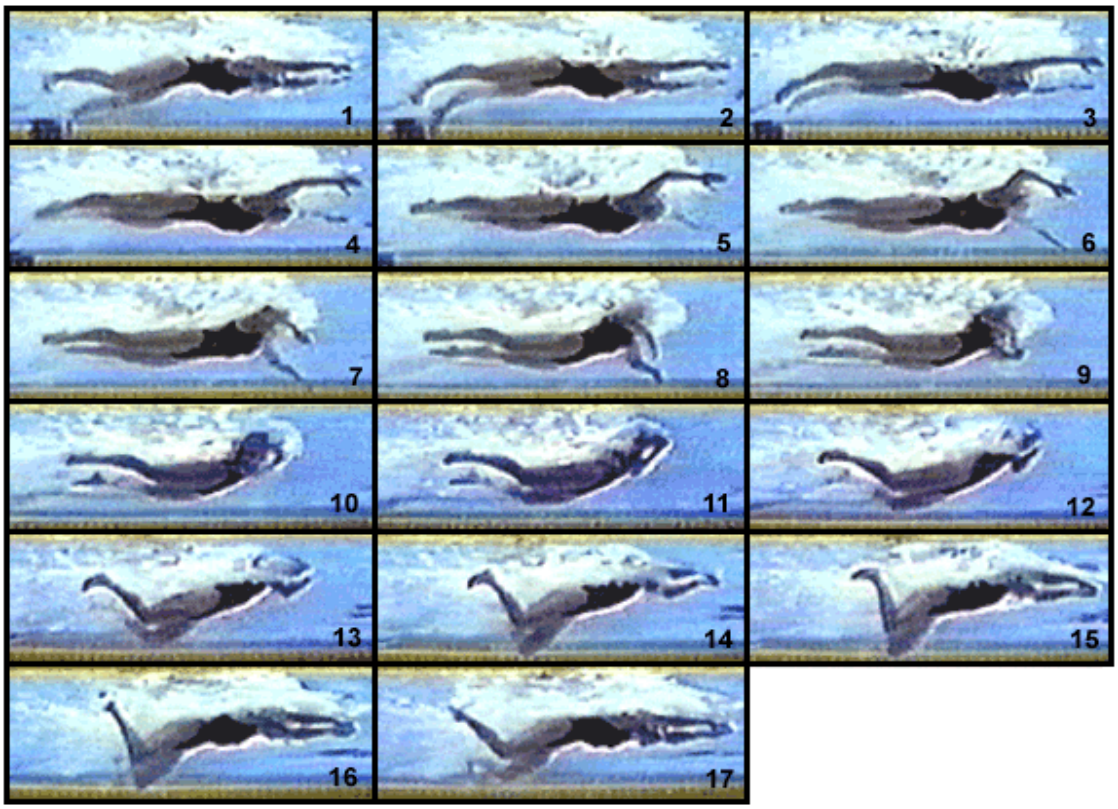


Fig.32: *Series of photos of breaststroke phases*

2.2.3. BREASTSTROKE START TECHNIQUE

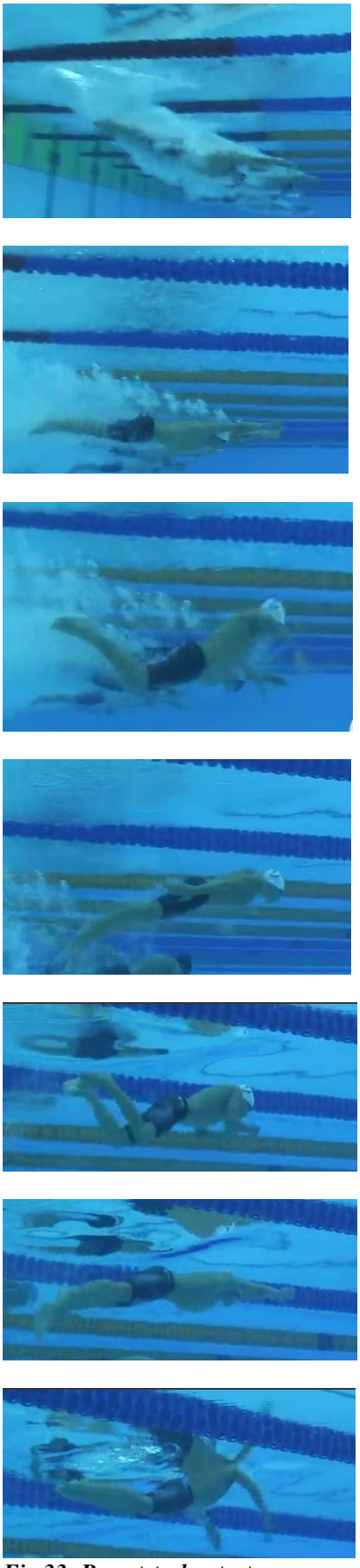


Fig.33: Breaststroke start

Due to the steeper entry into water, in breaststroke swimmers used front dive for a long time the swimmers, or applied the technique of pulled-up-legs, but today most world-class swimmers use standing start. The breaststroke standing start technique is the same as described here above up until the entry in water. The entry, however, is steeper in order that the swimmer could execute a **pull-down** and an underwater stroke before coming up and breaking the water surface.

After the glide phase swimming begins with an arm stroke. The arms execute a downward and outward pulling along a semi-circle orbit, and then switch to take a turn towards the direction of the body, and perform a pulling inward down to the shoulder line, and as a continuation of this a dynamic accelerating push is made until the thighs. The arm stroke is not yet completed here. The palms facing upwards push the water, helping the swimmer in this way in maintaining the ideal underwater posture. This will also be assisted by the slightly embossed back and the bowed head. The pull-down has a highly effective propulsive force. The first part of the pull-down, the knees are bent, and in the push phase of the pull-down the swimmer carries out a powerful kick downwards. (The dolphin kick can only be started after the pull-down is started.) One dolphin kick is allowed. From this strong leg stroke the swimmer gains an upward momentum, and rise close to the surface. After the the pull-down, the swimmer takes his arms forward under the body, elbows bent, under the least resistance. Bringing the a**rms forward** falls into the passive pull-up-leg phase of the leg stroke. When the arms are stretched at the front, legs can begin the kicking motion in a water catch position. The head is raised, and

the body is approaching the water surface. The head breaks the water surface before the end of the leg stroke, then the swimmer starts to swim.

2.2.4. THE BREASTSTROKE TURN TECHNIQUE

The butterfly and breaststroke turn is almost the same, with the difference of the push off the wall and the movements phases which come after that. The turn of the breaststroke begins with the **swimming-in**. The swimmer touches the wall with both hands at the same time, and then begins a **turn**. It would be most ideal if the swimmer reached the wall when the arm enters the water in the arm cycle. It is not always feasible, not even for pro competitors. For this reason, the swimmer has to execute a very powerful leg stroke, and then to stretch under water, if he is further away from the wall. Another option is to carry out a non-full arm stroke to reduce the distance to the wall. In accordance with the rules the wall is to be touched with both hands at the same time. After touching the wall, the swimmer releases it with one hand, and swings it in the opposite direction at high speed. At the same time, he bends his arm touching the wall, pulls his hips and legs to the wall, and raises his head from the water. The swimmer makes a turnaround along the longitudinal axis of the body. He then throws forward his other arm resting on the wall so far, and at the same time the head sinks back under the water, and the body takes a turn in the right direction of swimming. The swimmer dives into the water, feet resting on the wall, and then come the further phases of the turn: the **kick, the glide and the turn-on of the swimming movement.** The swimmer to begins to kick the wall lying on his side. The arms stretch, the swimmer kicks himself from the wall, and then turns onto the stomach, and executes a powerful downward kick (dolphin kick) (*see the video of this technique*). Breaststroke swimmers have to kick slightly deeper to be able to implement the process of the pull-down. After the glide, swimming starts as described in the section on breaststroke start.

2.2.5. THE BREASTSTROKE FINISH TECHNIQUE

In this swimming style the finish is performed by the simultaneous touch of the wall of the two hands. The last leg stroke of the finish is very powerful in order to speed up the swimmer's body. The arms are so to say thrown over the finish line above (or below) the water surface. If this reach-in were slightly cut short, the swimmer has to continue stretching and get close enough to reach the wall.

2.2.6. RULES OF BREASTSTROKE

1. After the start and after each turn, the swimmer may take one arm stroke completely back to the legs during which the swimmer may be submerged. A single butterfly kick is permitted during the first arm stroke, followed by a breaststroke kick.

The first arm stroke begins with the separation of the hands.

2. From the beginning of the first arm stroke after the start and after each turn, the body shall be on the breast. It is not permitted to roll onto the back at any time. From the start and throughout the race the stroke cycle must be one arm stroke and one leg kick in that order. All movements of the arms shall be simultaneous and on the same horizontal plane without alternating movement.

A pause after the separation of the hands is not a violation of the rule.

3. The hands shall be pushed forward together from the breast on, under, or over the water. The elbows shall be under water except for the final stroke before the turn, during the turn and for the final stroke at the finish. The hands shall be brought back on or under the surface of the water. The hands shall not be brought back beyond the hip line, except during the first stroke after the start and each turn.

4. During each complete cycle, some part of the swimmer's head must break the surface of the water. The head must break the surface of the water before the hands turn inward at the widest part of the second stroke. All movements of the legs shall be simultaneous and on the same horizontal plane without alternating movement.

5. The feet must be turned outwards during the propulsive part of the kick. A scissors, flutter or downward butterfly kick is not permitted except as in SW 7.1. Breaking the surface of the water with the feet is allowed unless followed by a downward butterfly kick.

6. At each turn and at the finish of the race, the touch shall be made with both hands simultaneously at, above, or below the water level. The head may be submerged after the last arm pull prior to the touch, provided it breaks the surface of the water at some point during the last complete or incomplete cycle preceding the touch.

2.3. BACKSTROKE

2.3.1. THE HISTORY OF BACKSTROKE

Backstroke is believed to have been known in ancient times as well, because Plato is mentioned this swimming style in two cases, though he did not really have a good opinion of it, because the swimmer cannot see the direction of the progress. The ancient poet, Manilius also made a reference to it in connection with an astrological belief.

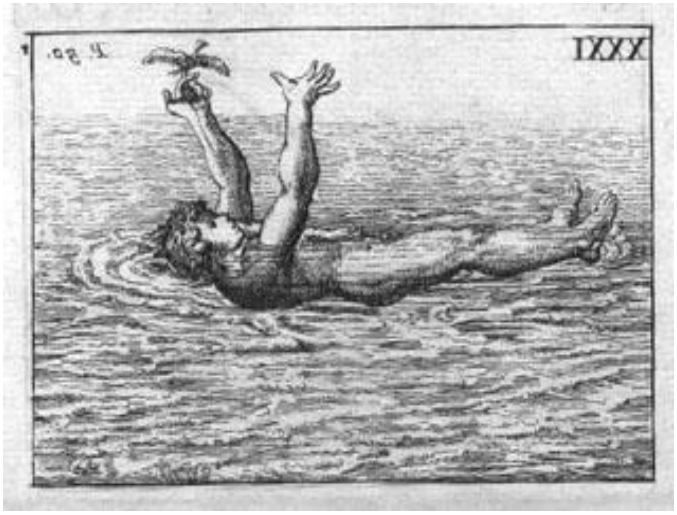


Fig.34: *Representaion of the backstroke in the book by* Thevenot

Ovid did not only write on the double arm stroke backstroke, but also mentioned its switched arm version, which is interesting, because this backstroke technique was unknown in competitive swimming until the Olympics in 1912. The German Guts-Muths (1798) was the first person to speak positively about backstroke, and because of the easier breathing technique he also proposes it to be the first when educating swimming. The Olympic Games have include the backstroke relatively early in the programme.

At the second Olympics in 1900, it has already been featured in the programme with a 200-yard course, which was won by Hoppenberg. It is important to mention that the backstroke at first was only men's sport as in 1847 in London the first women's swimming club declared that it was shameless for women to swim on their back and banned this style. This was adopted throughout the world as a rule to be observed until the Olympics in Paris in 1924.

Until the 1910s the backstroke was essentially based on a pair of rear arm strokes, which the swimmers completed with a breaststroke leg kick. The turning point was the Olympics in Stockholm in 1912, where Harry Hebner, applying a completely new technique beat all the other competitors. Instead of the pair arm stroke and the breaststroke leg kick, he swam applying alternate arm strokes and also alternate horizontal leg strokes. This Hebner-like swimming style could be seen at competitions until the late 1950s, but backstroke did not wait until this date, and new-style swimmers have appeared earlier. The American Adolf Kiefer

revolutionised backstroke in the 1920s and 1930s by taking his expanded arms backwards on the side and under water surface or very close to it. However, a more important improvement was that the American swimmer did not use the original sitting position any longer but raised his hips and floated almost entirely on the surface of the water.

In the 1950s, the shoulders turned slightly, the underwater phase of the arm stroke was executed deeper and was finished by the thumb facing down further away from the thighs. The next improvement was introduced by the Dutch G. Wielema, who had a bent arm in the underwater phase of the arm stroke. Significant evolution was also brought by he East-German Roland Matthes, who participated in three Olympics and set 16 world records, as well as by the prominent representatives of the Hungarian backstroke school, Zoltán Verrasztó and Sándor Wladár under the direction of Tamás Széchy.

By all means, we should mention the name of an exceptional swimmer, Krisztina Egerszegi, who at three consecutive Olympics (1988, 1992 and 1996) in 200 m backstroke. She won five Olympics gold medals, one silver and one bronze medal, she is a two-time world champion and one-time silver medalist, nine-time European champion, two-time European silver medalist, a member of the Hall of Fame of Swimming, and holder of many international prizes.

2.3.2. BACKSTROKE TECHNIQUE

Backstroke is a crossed cyclical motion, which allows even speed. Despite this, it is one of the slowest swimming styles. The reason for this must be the steep **posture.** The longitudinal axis of the body forms an angle with the water surface. This is due to the fact that the leg stroke cannot break the water surface while executing the upward kick but it should remain under water, and this in turn requires the steeper posture of the swimmer. While swimming the head is raised, eyes kept in the direction of the feet, the water line is below the ears, while the body rotates continuously along the longitude axis at about 45 degrees, and the head remains static throughout swimming.

The backstroke **leg work** is similar to that of freestyle, but here due to the steeper posture it is more expansive a movement, i.e. the knees are bent to a greater degree. There are two important phases of the backstroke leg work: the propulsive upward kick followed by a downward movement. In addition, some diagonal movements changing directions are also

included, which compensate for the torque. The upward leg stroke begins with the raising of the hip. The knees are slightly bent, the feet are pointed, slightly introverted. While the thighs move upwards, the lower leg and the foot follow the leg's upward movement with a slight delay. This delay results in a lashing, "whip-like" ending. Since in backstroke the leg work has a greater importance to ensure a higher body position in the water than in freestyle, backstroke swimmers apply the six-pace leg stroke at all courses, unlike freestyle swimmers. This means that three upward leg movements and three downward leg movements are executed for one arm cycle.

The backstroke **arm cycle** also has two important phases: *the underwater and the above-water phases.* The *underwater arm stroke* begins with the **entry of the arm into water**. The

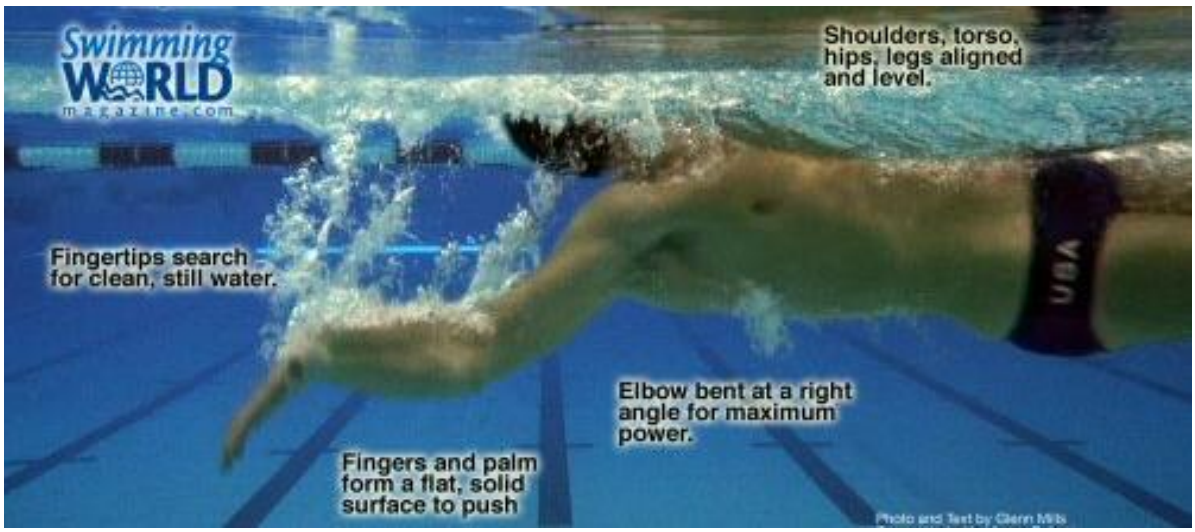


Fig.35: *Backstroke arm cycle phases*

arm is stretched out in the line of the shoulder with the palms turned outwards, and enters the water from the little finger. The order of the entry into water: upper arm, forearm, hands. From here starts a **downward pulling movement**, the end of which is the beginning of the propulsive phase of the arm stroke, the **water catch**. Having entered the water the arm continuously bends backwards, and moves downwards and backwards, then from the water catch the direction of the movement changes, and the arm moves upward and inward. When executing the **upward pulling movement,** the hand moves as the extension of the forearm on a half-circle orbit. At the highest point the hand turns over, and the palm moves facing downwards and backwards. The elbow is gradually stretched out. This **downward pushing movement** continues up to the hips. After the propulsive underwater phase have been completed, the palm turns towards the thigh and begins to rise. This the beginning of the *above-water arm stroke*. The above-water arm work begins with the deliverance, then comes

taking the arm forward. At the deliverance the shoulders are raised so that the arm could be put forward high, without water resistance. This is also helped by the turns of the body, which are in both directions of 45 degrees. The arm lifting begins with inwards-facing palm, and then the palm turns out to enter the water from the little finger side. When putting the arm forward the speed of the stretched arm is steady, the arm moves in the plane of the shoulder. The arm must work in perfect harmony so that the swimmer could progress in an even way. In

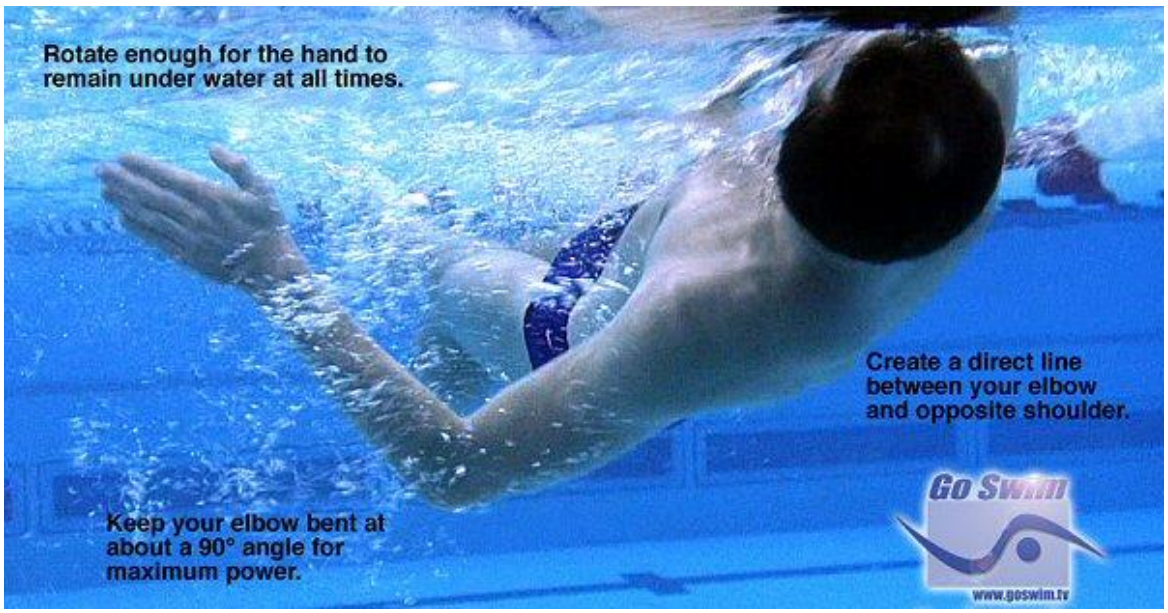


Fig.*36: . Backstroke arm cycle phases*

the **arm cycle** while one arm, the one which is performing the deliverance, enters the water, the other arm is about to finish the downwards pulling phase. The downward pulling phase of the arm entering the water must be timed with the pushing phase of the arm approaching deliverance. In this way the arm in the upper position gets into the water catch phase. The **harmony of the arm and the leg work** is created by the six leg strokes executed during one complete arm cycle.

From all the swimming styles, the **breathing** of the backstroke seems the simplest, since the face is above the water, but the appropriate phase of the inhalation and the exhalation should be scheduled. The inhalation takes place in the above-water phase of one the arms, from the deliverance to the water catch, while exhalation takes place during the under water pushing phase of the same arm.

2.3.3. THE BACKSTROKE START TECHNIQUE

In the backstroke start position the swimmer is in the water next to the wall, with his hands holding the handle, his legs are bent under the water surface, and his toe tips are placed on the wall. The feet may be side by side or athwart. To the call of 'ready', the swimmer pulls himself to the wall, bends his elbows, bows his head and raises his hips. When the 'go' sign goes off, starts the push-off. The swimmer begins the motion by swinging head and arms backwards. The arm swings upward and backwards, the body rises upwards and backwards, while the legs give a powerful push. The body bends backwards, and the arms stretch out from the slightly bent position and are placed above the head. In this position the swimmer begins the flight phase. The body flies tightly bent over the water. Because of the streamlined position and the resistance, the ideal is if the whole body is above the water. The more bent the body is, the higher will be the curve of the flight, and thus the more favorable (deeper) will be the entry into water. Upon entering the water, first the two arms enter, then the head, shoulders, trunk, and finally the feet. As soon as the feet enter, in order to reduce the resistance and to change direction (from the bottom upwards and ahead) the head rises, and a powerful dolphin kick must be performed.

Fig.37: The moment of the backstroke start

Fig.38: The push-off and the arm swing in backstroke start

Fig.39: The flight phase ofthe backstroke start

According to the rules, the dolphin kick is allowed on the first 15 meters, and then the swimming movements are to be started. The swimming begins with the leg stroke and the pulling movement of one of the arms. When the swimmer gets close to the water surface, he first blows out the air through the nose, then through the nose and the mouth gradually faster and faster.

2.3.4. BACKSTROKE TURN TECHNIQUE

The backstroke turn similar to the freestyle turn, it begins with the **swimming-in**. The swimmer, of course, approaches the wall in a back lying position. First, he estimates the distance from the wall, in which the flags are to help him (he makes two or three strokes counting from the flag), and then starts to turn a stroke from the wall. (He does not touch the wall.) He turns on his abdomen on the side of the pulling arm. Turned on his stomach, he carries out the turn similar to a freestyle turn. The rotation is helped by a dolphin movement, which should not be exaggerated according to the rule, it is only a leg movement as its function is to raise the hip. The swimmer also helps the turn with his hands. Having turned on the stomach, he pulls his arm next to the head beside the thigh, executes a freestyle underwater stroke, and leaves his arms next to the body while doing the turn. Then he stretches it out preparing the streamlined position for the push-off. The swimmer pushes himself off the wall lying on his back. However, after **the push-off** he dos not turn on his stomach as in freestyle but stays lying on his back and begins the d**olphin kick, and then the swimming itself.** Simultaneously with the start of the backstroke leg stroke, the swimmer starts the movement with one arm, and when the arms are reset to the basic position, he switches on the alternate arm work. During the turn exhalation is even, carried out through the nose, and when the swimmer gets close to the water surface, he blows the air out through nose and mouth gradually speeding it up in order to start the inhalation.

2.3.5. BACKSTROKE FINISH ETCHNIQUE

In order to reach the finish line as quickly as possible, swimmers exercise in advance to know the number of strokes needed to reach the wall. They can calculate the distance to the wall with the help of the flags. Accelerating the last arm stroke, the swimmer swings one hand towards the wall. The head is slightly bent backwards, the body is also bent backwards. If it is the perfect stroke, then the arm entering the water in a bent position, hits the wall immediately after stretching out. The hand is to touch the wall at the water level or slightly below with the tip of the fingers. If the swimmer arrives further away from the wall, he has to stretch out in the direction of the wall that is helped by an even more powerful leg stroke.

2.3.6. RULES OF BACKSTROKE

1. Prior to the starting signal, the swimmers shall line up in the water facing the starting end, with both hands holding the starting grips. Standing in or on the gutter or bending the toes over the lip of the gutter is prohibited.

2. At the signal for starting and after turning the swimmer shall push off and swim upon his back throughout the race except when executing a turn as set forth in SW 6.4. The normal position on the back can include a roll movement of the body up to, but not including 90 degrees from horizontal. The position of the head is not relevant.

3. Some part of the swimmer must break the surface of the water throughout the race. It is permissible for the swimmer to be completely submerged during the turn, at the finish and for a distance of not more than 15 metres after the start and each turn. By that point the head must have broken the surface.

4. When executing the turn there must be a touch of the wall with some part of the swimmer's body in his/her respective lane. During the turn the shoulders may be turned over the vertical to the breast after which a continuous single arm pull or a continuous simultaneous double arm pull may be used to initiate the turn. The swimmer must have returned to the position on the back upon leaving the wall.

5. Upon the finish of the race the swimmer must touch the wall while on the back in his/her respective lane.

2.4. BUTTERFLY

2.4.1. THE HISTORY OF BUTTERFLY

Butterfly stroke is one of the youngest swimming style. The butterfly arm stroke was perfected in 1933 by the American H. Myers, but at that time he still used breaststroke leg work with it. So, it has been developed as one of the breaststroke versions. How? When the potential of development of breaststroke started to be researched scientifically. In 1928, David Armbruster, coach at the University of Iowa, made underwater shots about his breaststroke swimmers and analyzing the he realised that the biggest problem with breaststroke is that when the swimmer brings his hands forward, because then the speed is significantly slowed down. He proposed that the hands should be taken forward over the water somehow. But how? Jack Sieg, one of Armbruster's swimmers also began to experiment (1935), and he moved his legs as the moves its tail fin. Armbruster and Sieg combined the two techniques, and the butterfly stroke was born. Using this technique Sieg was able to swim the 100 yards at 1:00.2. Despite the fact that the new method has proven to be much faster than the traditional breast stroke, the "fishtail" that is today known as the dolphin kick, was irregular, so the FINA did not allow to use it until 1952.

Fig.40: *Mark Spitz, the best butterfly*

The first Hungarians to experiment with butterfly arm stroke were Csík Ferenc and Sándor Baróczy in 1935. The dolphin kick was used for the first time in Europe in 1948 by a Hungarian swimmer, Zsolt Fejér, therefore he was regularly expelled from competitions. As I mentioned before the International Swimming Federation separated the two swimming style in 1952, lending credence to it from 1953 and marking it as the fourth swimming style. The most interesting technical innovations for us, without entering into details, took place twice. The first one could be seen from the mid-1950s and can be related to the name of the Hungarian György Tumpek. He carried out the butterfly stroke with the entire body, whereas the dolphin movement had been performed only with the feet until then. The outstanding butterfly swimmer of the 1970s is the nine-time Olympic champion, Mark Spitz, who along with his nine Olympic gold medals

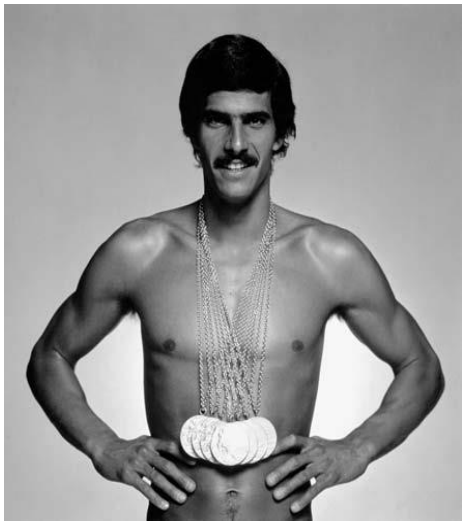


Fig.41: Nine-time Olympic champion, Mark Spitz

between 1965 and 1972, also collected a silver and a bronze medal, and set 33 world records. In 1972, in Munich, he won 7 gold medals (100 m freestyle, 200 m freestyle, 100 m butterfly, 200 m butterfly, 4x100m freestyle relay, 4x200m freestyle relay and 4x100m mixed relay). The professionals had thought for a long time that this record would never be beaten by anyone. But Phelps succeeded in it.

After that, the next spectacular change in the technique of the butterfly stroke was observed in the 1990s, when during breathing butterfly swimmers took their head out of the water, and turned it aside. They did not breath in ahead but they did so as in freestyle. This technical innovation, however, has brought only a couple of tenth seconds in speed improvements, so certainly it was not as important an advantage for the innovators as had the previous innovations.

2.4.2. BUTTERFLY TECHNIQUE

Fig.42: The butterfly arm stroke in the water-catch position

Similarly to breaststroke, in butterfly style we cannot speak of permanent **posture**. The body position is changing wave-like. In order to reduce the resistance, in the most propulsive phase of the butterfly stroke the body must be streamlined, so preferably horizontal. The body – from the first arm stroke of the start and of the turns – must be always on the abdomen, while the shoulders must be parallel with the water surface.

The butterfly leg stroke is similar to that of freestyle in many regards, but here both feet carry out the whip-like stroke at the same time. The upward and downward movement of the legs, feet and lower legs take place together at the same time in a vertical plane. The feet do not have to be in the same plane but alternating movements are prohibited. The leg stroke has two phases, one of them is a downward kick, the other is an upward leg lifting. In the **downward kick** phase, the movement of the leg begins with the lowering of the hips, like in

freestyle, which is followed by the movement of the thigh, the knee and the lower leg. The feet are slightly turned inwards. The leg follows the feet movements with a slight delay. Finally the feet swing, and close the whip-like kick. This leg stroke phase is propulsive. The upward motion is carried out with tight hips and straightened limbs (knees are not to be bent at this stage). The legs rise up to the line of the hips.

The butterfly arm stroke, although many people do not think, is very similar to that of the freestyle, with the difference that the arms are to be brought forwards together above the water, and to be taken back both at the same time, under water. The arm cycle can be divided into two major periods, one of them is the above-water phase, the other the under water one. The butterfly arm stroke starts when the arm **enters the water**. The arms are slightly bent in

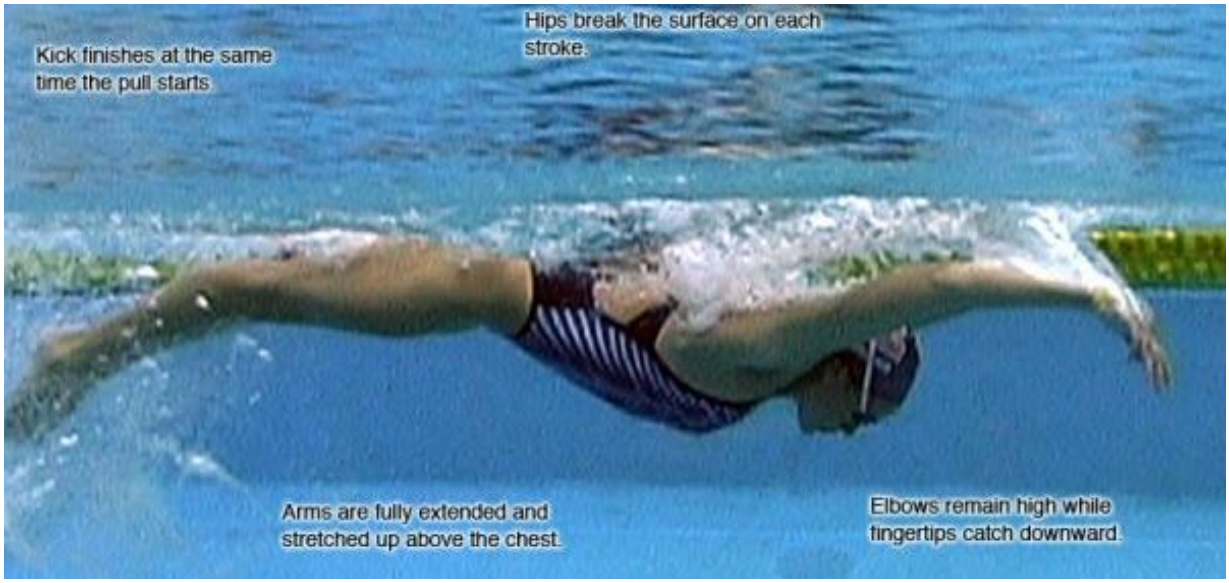


Fig 43: Butterfly stroke *(the end of the active phase of the first kick and the the moment of starting the pulling)*

or within the width of the shoulders, palms facing outwards, enter the water form the thumb side. This is followed by a **downward pulling movement,** all he way to the position of water catch. When doing the catch, the elbows are slightly bent, the hands resist the water, and then begins the propulsive part of the **inward pulling**. The arms pull along a semi-circle orbit downward and inward. The elbows bend gradually, the hands get close to each other under the thorax, the palms look backwards at the end of the phase. From this point the swimmer pushes upwards and backwards as long as the arms extend It's **the pushing** phase. During the underwater arm stroke the hands' speed is constantly accelerating within the different stages and overall. The underwater movement of the arm is followed by **the deliverance and the forwarding of the arms** into their initial position**.** The arms are straight, with the palms facing the thighs. The raising of the shoulders and the elbows starts the movement after the

arms get out of the water and thrown forward with slightly bent elbows. Tin the last phase of the arm forwarding movement the back of the hands turn outwards, preparing for the entry into water.

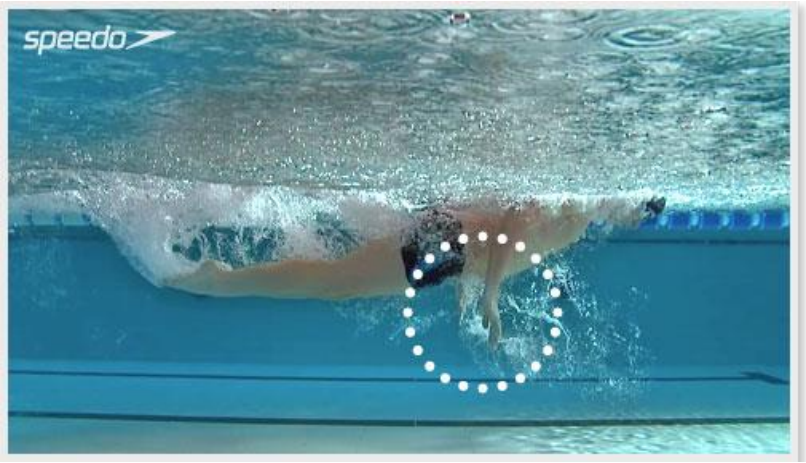


Fig.44: The beginning of the pushing and breathing phase

The proper consistency of the arm and leg strokes is essential for the butterfly stroke swimming. In this style, during one arm cycle two leg cycles are to be completed. The first downward leg stroke is to be done when the swimmer's arm enters the water and carries out the outward pulling. The second downward kick is to be scheduled to the time when the arms are in the pushing and delivering phase. The second kick starts downwards in the final third of the arm's pushing phase. The first kick tends to take longer, it is also stronger, its function is to carry out the forward propulsion and to maintain the streamlined body position. The importance of the second kick, as it falls on the arm's deliverance phase, is to prevent the hips from sinking. For the classic butterfly swimmers there is no significant difference between the power of the two kicks. The b**utterfly breathing** is linked to the end of the last phase (pushing) phase f the arms and to the first phase of deliverance. The exhalation takes place from the entry of the arms into water to the first part of the pushing phase.

2.4.3. BUTTERFLY START TECHNIQUE

The butterfly start is the same as described in the section on the standing-start. The major phases of the technique: *start position, pulling, push-off, the from the starting point, flight phase, entry into water, glide and turn-on of the swimming motion*. After the swimmer's body slows down to the competitive speed, it has to start the dolphin kick. The swimmer begins the first arm stroke when he gets near the water surface and the head breaks it. The arm stroke must be very powerful to raise the swimmer on the surface while maintaining the speed. The competitive momentum achieved after coming up to the surface must not be broken by breathing. The most ideal is to breath during the second arm stroke.

2.4.4. BUTTERFLY TURN TECHNIQUE (FLIP OVER)

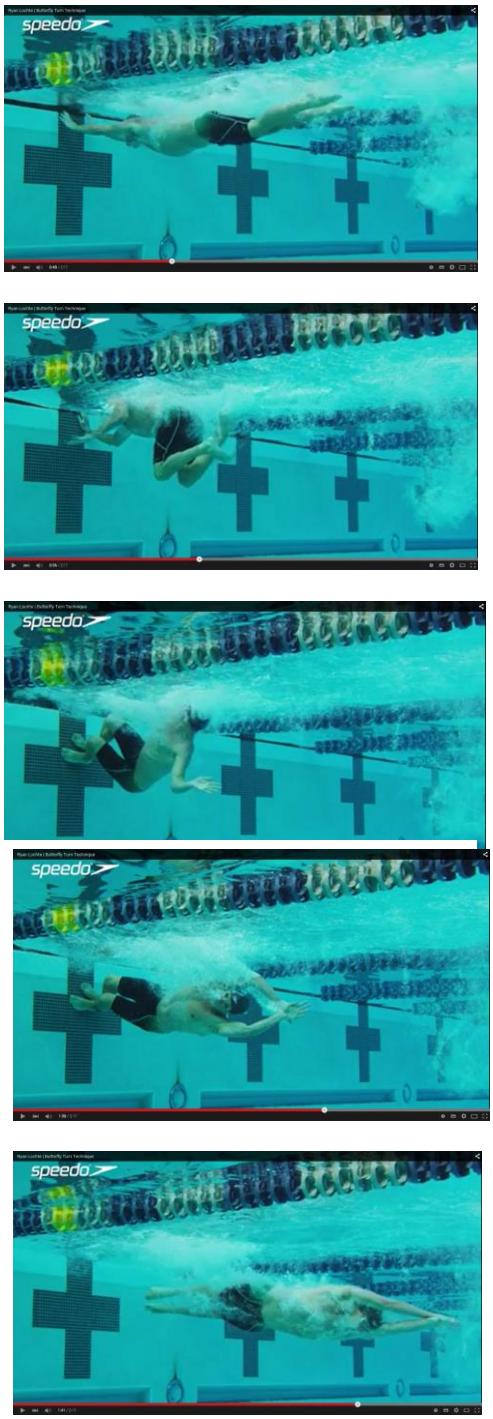


Fig. ***45: The flip over turn***

The butterfly and breaststroke turn share many features, in particular in the implementation of the turn. Fundamental differences can be seen in the swimming-in, in the depth of the push-off, and in the turn-on of the swimming motion. The turn begins with approaching the wall (**swimming-in**). The last leg stroke has to be carried out with much power in order to gain a greater speed upon arrival. This will help the speed of the turn, and the faster kick off the wall. The swimmer must schedule the arm stroke in advance so that in the final phase of the expansion he could reach the wall with both hands at the same time above or below the water's surface. After touching the wall, the swimmer releases the wall with one hand and swings it at high speed in the opposite direction. At the same time, he bends his arm on the wall, pulls up hips and legs to the wall, and raises his head out of the water. The swimmer implements the turn on the side. He swings his arm resting so far on the wall, the eyes follow this arm movement, so the head and the arms enter the water at the same time. The side position is maintained as long as the feet leave the wall. This is the **turnabout**. This is followed by the **push-off**, which is begun in the side position with both arms expended far ahead. After the push-off the swimmer turns gradually into an abdomen position. Butterfly swimmers have to push off the wall higher under the water surface than breaststroke swimmers. The glide after the push-off last as long as the body slows down to the competitive speed. Then butterfly swimmers carry out one or more dolphin kicks before turning on the swimming motion. The swimmer is allowed to cover 15 m maximum under water. At that point the latest the head must break the water surface.

2.4.5. THE BUTTERFLY FINSIHE TECHNIQUE

The finish in butterfly is to be carried out by both hands. During the competition the last few strokes must be the most powerful, and the swimmer must accelerate the forward move of the arms. Arms are moved forward with bent elbows to shorten the distance that the arm has to cover up to the wall.

2.4.6. RULES OF BUTTERFLY

1. From the beginning of the first arm stroke after the start and each turn, the body shall be kept on the breast. Under-water kicking on the side is allowed. It is not permitted to roll onto the back at any time.

2. Both arms shall be brought forward together over the water and brought backward simultaneously through-out the race, subject to SW 8.5.

3. All up and down movements of the legs must be simultaneous. The legs or the feet need not be on the same level, but they shall not alternate in relation to each other. A breaststroke kicking movement is not permitted.

4. At each turn and at the finish of the race, the touch shall be made with both hands simultaneously, at, above or below the water surface.

5. At the start and at turns, a swimmer is permitted one or more leg kicks and one arm pull under the water, which must bring him to the surface. It shall be permissible for a swimmer to be completely submerged for a distance of not more than 15 metres after the start and after each turn. By that point, the head must have broken the surface. The swimmer must remain on the surface until the next turn or finish.

2.5. MEDLEY

2.5.1. THE HISTORY OF MEDLEY

Medley means the four styles, butterfly stroke, backstroke, breaststroke and freestyle, performed one after the other. In terms of the structure of the event of the individual medley it begins with butterfly, then backstroke, breaststroke and finally comes freestyle. It is a very impressive and interesting event, especially the tactical and physical aspects make it difficult for the swimmers. It is also considered to be one of the hardest events, because all the four styles must be performed by the best possible technique. This event started from the United States in the 1930s, thought at first it only meant three styles. In 1937, in Hungary as well a medley event was announced in a 300 m course (backstroke, breaststroke, freestyle). Later on,

with the acknowledgement of butterfly stroke, the distance has been increased. The 400-meter-long course was introduced for the first time into the Olympic programme in 1964. From 1984, it is also performed on a shorter course, on 200 m. Among the best medley swimmers Gusztáv Kettesy, the early holder of the medley world record (400m – 5:32,1 – 1953), Gary Hall (1972), and the Hungarian world record holders, András Hargitay (400m – 4:28,89 – 1974) and Zoltán Verrasztó (400m – 4:26,0 – 1976) must be mentioned.

Fig. 46. King of the individual medley, the four-time Olympic champion, Tamás Darnyi

The greatest star of the 1980s is the four-time Olympic champion in medley (1988, 1992), Tamás Darnyi. In 1991, he reset the world record in both medley events: that of the 400-metre course to 4:12,36 and that of the 200-metre course to 1:59,36. He was the first swimmer in the world to swim the 200-meter course medley within two minutes.

The most successful swimmer of all times is Michael Phelps. In Athens at the Olympic Games in 2004, he won eight medals out of which six were gold. Four years later in Beijing, he won eight medals, all of them gold. With this performance he broke Mark Spitz's record of the number of gold medals won at one Olympics. Spitz won 7 gold medals in Munich in 1972. In 2009 in Rome, Phelps won the 100 m and the 200 m butterfly events with world records, which have not been reset ever since. In addition, he holds several world records both in individual and relay events. He won four gold medals and two silver medals at the London Olympic Games in 2012. He has been the most successful Olympic champion of all times and the most outstanding swimmer of all times.

Fig.47: *Michael Phelps,* the most successful swimmer of all times.

2.5.2. MEDLEY TECHNIQUE (START, TURN, MEDLEY RELAY)

The medley is one of the youngest and one of the most complex event, in which competitions are organised in 200 and 400 meter courses. The medley consists of the sequence of the four styles in the following order: butterfly, backstroke, breaststroke and freestyle. In relay 4 x 100-meter-course competitions are held. In the medley relay the styles follow each other in the following order: backstroke, breaststroke, butterfly stroke, freestyle. The order is different than in the individual medley, because the first member of the team must start from the water.

The **individual medley start** is the same as the start of the butterfly, its finish is the same as the freestyle finish, however, the turns differ from those of the others mentioned here above. There are three turns in the medley: a *turn from butterfly to backstroke, from backstroke to breaststroke and from breaststroke to freestyle.*

The swimmer makes a turn from the first style, from ***butterfly to backstroke***. Its technique is as follows: the swimmer touches the wall in the width of the shoulders simultaneously with both hands. He raises his head, bends his legs and pulls it under the body in the direction of the wall. While one arm remains on the wall, the other arm flips back under the water. At about the same time, the arms are bent and get behind the head, while feet stay against the wall. At this moment the feet, hips and shoulders are in one horizontal plane. The elbows are still bent, but gradually expanded. On order to create a streamlined posture the swimmer closes his arms over the head, he stretches them, and then begins the push-off. The swimmer pushes off the wall in a slightly sidewise position, and turns entirely into the back-lying position during the gliding phase. When the swimmer regained the back posture, he is allowed to execute dolphin kicks.

At the second turn the swimmer turns from **backstroke to breaststroke.** In this turn the swimmer touches the wall lying on his back, and then he can perform the turn in various ways, using either a flat turn or a flip turn. For a flat turn the swimmer reaches the wall lying on his back, and after actually touching it, he pulls his legs towards the wall, while flips his head and shoulders in the opposite direction. The push-off begins after the arrival of the feet on the wall. After the push-off, the swimmer turns gradually on his stomach. The flat turn has the advantage that the swimmer can breathe during the turn, and therefore loses less energy to execute the pull-down after the push-off. The flip turn means that upon arrival on the wall, the swimmer submerges downwards at the end of the last arm stroke without the swimming-in

disrupting the rhythm of swimming. The arm arriving to the wall flips further and stretches deep down. The swimmer bends his head rearwards, and throwing his feet over the head he does a backward somersaults. Legs stay on the wall.

The third turn of the individual medley is from ***breaststroke to freestyle.*** The technique of the turn is identical with that of the turn of the breaststroke, except for the turn-on of the swimming motion. The swimmers begins the push-off on his side, and then carries out dolphin kicks.

2.5.3. RULES OF MEDLEY

1. In individual medley events, the swimmer covers the four swimming strokes in the following order: butterfly, backstroke, breaststroke and freestyle. Each of the strokes must cover one quarter (1/4) of the distance.

2. In medley relay events, swimmers will cover the four swimming strokes in the following order: backstroke, breaststroke, butterfly and freestyle.

3. Each section must be finished in accordance with the rule which applies to the stroke concerned.

3. THE BIOMECHANICS OF SWIMMING

3.1. BIOMECHANICAL PRINCIPLES OF SWIMMING

Biomechanics studies the mechanical movements of living organisms. The biomechanical research of movements is extremely important in swimming. Indispensable for top-level competition sports, some principles are also helpful in teaching elementary level swimming. Knowledge of the principles of physics and biomechanics not only helps in developing the right technique, but also in its teaching. In polishing the swimming technique and correcting flaws, knowledge of certain principles is essential, as this is how we understand the cause of the error, so that we can fix it. If the swimmer's leg sways to right or to left in freestyle or backstroke swimming, this has a simple physical explanation. Newton provides the answer. In case that someone keeps swimming into the ropes, the solution should be found in the arm movement, in the biomechanics of pulling, or pushing. There is a number of simple physical items, which affects the swimmer's performance. Let us start at the beginning.

Fig.48: 3D body scanning, 17-camera biomechanical device

Various forces act on a body immersed in water. The body is under pressure from all directions (bottom, top and sides). The reason for this is that the layers of fluid situated over each other press down on those below due to their weight. This is called a **hydrostatic pressure**. Downward weight force is exerted on the immersed swimmer and buoyancy in the opposite direction. As a result of the hydrostatic pressure force **buoyancy** is obtained, which according to Archimedes' principle equals the weight of fluid displaced by the swimmer. A swimmer with lower **density**[2] has greater buoyancy, thus it easier floats on water, has better

[2] The swimmer's density will depend on the density of the tissues, so it matters what the body composition of the swimmer is. Density of the tissues is different. Bone tissue has the highest density, the muscle has smaller and the fat the smallest. With changing of age an asymmetry occurs in the quantity of tissues. Advanced instruments exist today for measuring the body composition.

posture on water. Density can be changed, especially by breathing in. For favourable posture on water, swimmers with great vital lung capacity, do not blow out air in the short run, thus buoyancy will be more favourable. If the swimmer's density is lighter than water, i.e. less than 1.00 g/cm^3, the swimmer floats on water, able to stay on the surface without much effort. In case of greater density, will sink deeper, swimming will be less effective, because part of the propulsion is used up on staying afloat.

What speed the swimmer will move along, - beside the helping aid of buoyancy – will be determined by two main forces. One is **propulsion**, which means a propelling force, and the other is **resistance**, meaning a retaining or retracting force. While swimming we are trying to advance ourselves in the water with our hands and legs, while our progress is slowed down by the water, as we encounter the water's resistance. The science of hydrodynamics deals with this subject in greater depth.

With **propulsion Newton's 3rd law of motion, the law of action and reaction** must be mentioned. The law of action – reaction states that every action has its equal reaction of the same force in the opposite direction. All this means that if a swimmer moves the water backwards with their arms and legs, they will move forward with the same force. In case of effective propulsion the driving force approximately derives from the work of hands in 56-57%, of the forearm in 28-29%, and of the work of legs in 15%.

The efficiency of propulsion force in turn depends largely on the length of the arm stroke. This means the distance covered by the hand during an underwater arm stroke. In technical terminology this is called **tempo length**. The tempo length of professional swimmers is approx. 2.5 metres. If the swimmer wants to swim faster, it's not the number of strokes that should be increased, but the tempo length should be evenly maintained. If a beginner swimmer moves the arms twice as fast as before, the *resistance will increase fourfold*, the hurried arm stoke will lead to the shortening of tempo length, deterioration of the technique, and the loss of swimming rhythm. Fatigue will be faster, since, if the speed of their tugging arm is doubled, *energy consumption increases eightfold*. It is no coincidence that swimmers strive to achieve *a steady speed and pace arrangement* (see this later on).

Movement of the hand most resembles a ship's propeller. Swimmers often change their hand posture, searching for a still or low-speed water. The reason for this is to gain more propulsive force.

3.2. TYPES OF RESISTANCE

1. Drag, or frontal resistance. Swimmers are impeded by the medium in which they are moving, with a particular strength, resistance is exerted against displacement, this is called a drag. The laws of flow determine the impact of resistance. The magnitude of force *(called frontal resistance, because it reaches the swimmer from the front)* of opposite direction to the swimmer's velocity exerted by the medium depends on: *the body shape, the fluid density, the extent of swimming speed, and the surface size in the path of the flow.*

The following is an important conclusion: in the event whereby the swimmer doubles the speed, the drag increases fourfold. Of the resistances this is the resistance that holds back the swimmer the most. It is no coincidence that the swimmers have sought to develop a technique to minimise the frontal resistance. Whenever the swimming technique is not ideal, the frontal resistance can slow down the speed very much. For example, if a fast swimmer raises his head, due to the unfavourable posture of raising the head and sinking the torso, the resistance is increased by 20-35%.

2. Wave resistance

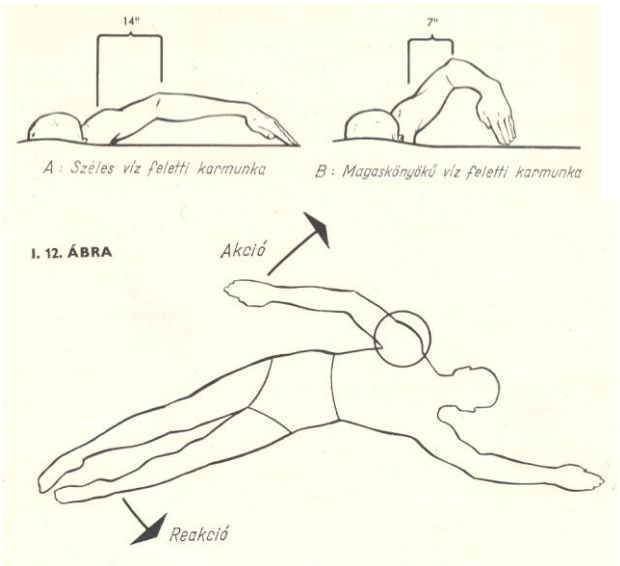
The retentive force due to the unevenness of water surface is called wave resistance. The water piles up in front of the swimmer and forms a trough behind, for this reason forming a wave system. At higher speed the resistance forming in front of the swimmer will be significant. Taller swimmers are in a more favourable position. The taller the swimmer not only would s/he be able to achieve a higher speed, but their wave resistance is also more favourable. This applies even more for short distance swimmers.

3. Skin friction or frictional resistance. Friction occurs between the body and the liquid (water) particles. The liquid clings to the moving body, so swimmers carry a lot of water molecules with them along their bodies. It is not scientifically proven that this resistance would play too big role among factors slowing down the swimmers. Indeed, the speed of athletes is too small for example compared to a ship or an aircraft. This latter type of resistance is very significant; it is no accident that tail sections of ships and aircraft are built streamlined, so as to thereby reduce resistance. Given that the measure of friction is determined by the size and roughness of the surface, hence swimmers reduce this by shaving their body and using professional shark swimsuits.

4. ***Rear suction power or vortex resistance.*** When moving, swimming in water, vortices are formed. These vortices slow down the swimmer. Hydrodynamics research shows that at higher speeds behind the body there is strong vortex formation, which is approximately proportional with the fluid density and the square of the velocity.

3.3. THE IMPORTANCE OF STEADY SPEED

Let's see what else swimmers still need to pay attention to in order to swim effectively and quickly. We mentioned earlier the steady speed, which is an important factor in determining performance. Let us illustrate its importance with a simple example. When we drive in the city, the car consumes more petrol than if we evenly drove on the highway with a speed of 50 km/h. Why? Because we slow down traffic light after traffic light, stop, accelerate, and continue in this manner. When we set off and accelerate from zero to 50 km/h, our vehicle 'eats' more than if we were to keep a steady speed. The same applies with swimmers. *Accelerating requires more energy than maintaining a steady speed.* Consequently, to save energy swimmers strive to advance at a **steady speed**. This is not only to be understood for the distance swam, but plays an important role within individual swimming styles too. In swimming freestyle and backstroke it is easier to maintain an even speed, because when one arm has finished the push (forward driving force) the other arm is already beginning to pull, so steady propulsion can be maintained. As a counter-example, let us consider the butterfly stroke. The swimmer exerts a powerful propulsive force with two arms, but once it finishes the underwater tempo and performs the passive part above the water, the body slows down, so the speed will be wavering fast – slow – fast – slow. The same can be observed with breaststroke too. Consider the part about the concord of arm and legwork. Three forms are known, the continuous, the delayed and the overlapping. So, there is no doubt why the overlapping form is the fastest. The deceleration period is the smallest here, here can steady speed be sustained best.



70. kép *Newton III. törvényének érvényesülése úszás közben*

4. INTERNATIONAL RULES OF COMPETITIVE SWIMMING

The rules of competitive swimming prescribe the following:

1 MANAGEMENT OF COMPETITIONS

2 OFFICIALS

3 SEEDING OF HEATS, SEMI-FINALS AND FINALS

Rules describe in details each swimming style and the start:

4 THE START

5 FREESTYLE

6 BACKSTROKE

7 BREASTSTROKE

8 BUTTERFLY

9 MEDLEY SWIMMING

The rules also fix timing, the conditions to set a record and the requirements in respect of different age groups.

10 THE RACE

11 TIMING

12 WORLD RECORDS

13 AUTOMATIC OFFICIATING PROCEDURE

Age Group Rules

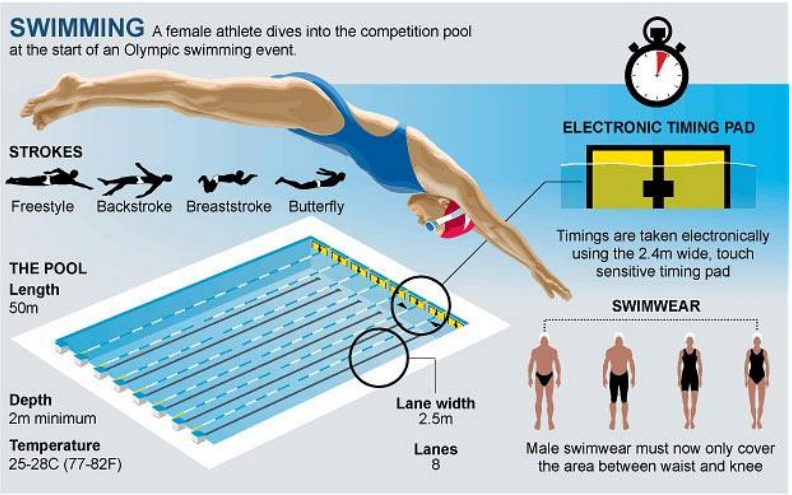


Fig. 49: *Comprehensive picture of swimming*

We do not present the rules here in details. We presented the rules concerning each swimming style int he techncal sections. The other rules are available at the webpage of FINA, or by clicking on the link given hereabove in the list: http://www.fina.org/H2O/index.php?option=com_content&view=category&id=82:swimming-rules&Itemid=184

5. THE TEACHING OF SWIMMING

5.1. Positive effects of movement performed in water

Movements performed in water, whether it be swimming or other water sports, have a positive effect on the human body, the effect being exerted in a versatile way. By the action of movement performed in water favourable biological changes take place in the nerve, muscle, skeletal as well as in the functional properties of the other organs, organ systems. The medium of movement, depending on the water temperature itself has a refreshing, invigorating effect when it is cold or cool, and a refreshing, relaxing effect when warm. It increases blood circulation, improves vascular tone, and stimulates vegetative reactions. Change in temperature, can be considered as excellent training for blood vessels. In *healing and rehabilitation* a prominent role is also assigned for movement in water. It plays a significant role in the preventive treatment of allergic, asthmatic disorders, orthopaedic disorders, injuries, heart and circulatory diseases. Physiological functions are accelerated, the *immune system* more efficiently defends against diseases. The breathing technique improves, respiratory muscles strengthen. In water with a lower temperature than the body temperature, blood vessels constrict, thereby accelerating the blood flow, resulting in improved cardiac function. The consequence of this is improved capillary blood flow.

Due to overcoming the medium of water (resistance) more intensive work can be performed than on land, while it is less stressful. In water, heat dissipation is easier and there is less sweat. Buoyancy in turn reduces the body weight, so it is easy on the joints. The bodyweight of a man on land is only just 3.6% in water, therefore much less weight falls on the joints, sparing them. Any form of exercise, traditionally performed on land - such as running, walking, aerobics or even dancing - can likewise be done in water without straining the joints. There is less risk of injury in water, since water resistance slows the movement, so injuries caused by sudden action, strains, sprains can be prevented.

Actions performed in water are favourable for all ages, from newborn babies to the elderly age group.

Actions in water play an important role in development of the *muscular system*, in the improvement of musculoskeletal disorders. They help in shaping the spine's physiological curvatures (baby swimming tasks, or certain foot tempos) in fortifying the deep back muscles of the lumbar spine, in strengthening the muscles of the trunk, abdomen and buttock. They

improve bone strength and its mineral content, increase its load capacity. By immersing in water to relieve the spine, we increase its flexibility and strengthen the muscles involved in supporting the spine. It is no coincidence that swimming and special therapeutic swimming practices are one of the most effective means of prevention and correction of flaws in posture. With the actions performed in water, as well as the medium's positive impact on *circulation* it should be mentioned that by gravity decreasing in water, the heart's work is easier. After expiration the negative pleural pressure exerts suction on the veins, helping venous reflux that is reinforced by hydrostatic pressure as well. Under strain, during muscle work the blood circulation accelerates, the waste products are discharging. By swimming the heart's capillary network multiplies, reducing the likelihood of heart attack, recovery after a heart attack is faster. Blood distribution changes. In the long run, swimming can result in a hardy heart, which may prevent the development of heart diseases. The risk of cardiovascular diseases can be reduced by regular physical activity, swimming. Regular swimming slows cardiac and vascular aging, reduces the risk of developing arteriosclerosis.

Swimming has an exceedingly positive effect on the *respiratory function*. Hydrostatic pressure by making inspiration difficult and aiding expiration contributes to the development of the muscles involved in breathing, and the muscles of the thorax. The clean, dust, and smoke-free, humid air directly above the surface of the water is advantageous for those suffering from asthma and allergies. Regular swimming contributes to optimally developing respiratory organs, lung ventilation increases the volume of air inspired, the number of breaths per minute decreases. With people swimming regularly it can be observed that less oxygen is needed than for those leading sedentary lifestyles.

Of the beneficial effects, the positive effects exerted on the *psyche* should not be omitted. Adequate and joyful exercise also provides protection against the development of psychosomatic diseases (stress-relief, improving self-esteem and body awareness) The physical activity improves quality of life, increases confidence, improves the mood, stress-tolerance and sleep.

5.2. EFFECT OF SWIMMING ON PERSONAL GROWTH

Beyond its ***health protecting*** and ***development function*** swimming has a number of important effects, which can primarily be implemented within organized framework (swimming lessons, training). The easy requirement and demand for harmonious, orderly, implementation of

swimming movements helps develop the *aesthetic sense* as well. Knowledge of the sport and its rules, familiarity with national and international level sporting achievements, as well as expertise are important physical-culture values, the tool of *mental education*. In addition, when swimming we can successfully develop the *motivation, activity, self-discipline, perseverance, courage, willpower, ability to fight, confidence, pain tolerance, furthermore we can develop realistic self-assessment too*. All of these personality traits are absolutely **necessary for integration into contemporary society** and for creating optimal conditions for our individual lives, prosperity.

Perseverance, self-discipline and fighting ability is a complex physiological-psychological phenomenon, which is based on endurance (**tolerance of monotony**, lasting interest, positive motivational base, sustained attention). And for swimming wall to wall all these are greatly needed. Among conditions for the development of conscious discipline training, literature mentions **self-control**, **correct self-esteem**, knowledge and **acceptance** of rules and requirements, **ability to adjust** to the community. All these can be developed efficiently.

The role that movement, sporting activities, including regular swimming play in the function of personality development is no longer disputed today. Personality development is an elaborated, multifactorial process of complex nature, where sport has its specific place and role, and it cannot be uprooted from this system.

Previously, swimming tuition was to mean the learning of a range of movements and the learning of arm or leg tempo of a certain swimming style. Sándor Nagy (1984) talks about movement learning, behaviour learning in a wider sense, while Ákos Tóth (2002) about personality and character forming activities.

How is personality shaping realised in the course of swimming lessons, training? Let us see: The ‘activity is the basis of the educational process’ - says Bábosik (1999), if that activity, i.e. the children's activity is purposefully and resolutely directed in the education process, then such "behavioural-regulation" will be developing that could result in valuable ‘autonomous activity’ from the aspect of both the individual and the society. To what extent is the autonomous activity of internal control able to develop, is largely determined on how well the heteronomous regulated activities are pedagogically managed. Among activities with heteronomous regulation, the specialist literature classifies social regulation and authority regulation. ‘In swimming lessons the training instructor (as authoritarian leader) and the community (as a medium exerting social regulatory impact) essentially play a determinant

role not only in the efficiency of movement learning, but in regulating the activity, in the educational process too. During swimming lessons, regular training the students enter a community in which they act, play with their mates, provide help to others, observe, evaluate the movements of their mates, thus evaluating their own performance, trying to surpass themselves, and then trying to beat others, therefore with their mates they mutually shape each other. The student activity thus takes place in the peer group, while interactions developing between them represent the '**social control** factor'.

Children entering education - whether school education, swimming lessons, or higher level competitive sports - accept the teacher's, the swimming instructor's, the coach's leadership role, authority, so they come under '**authoritarian control**'. *The period of authoritarian control is age-dependent; its development coincides with the beginning of the swimming lessons. Since swimming lessons, starting with accustoming to water already begins at kindergarten, primary school age, this is a sensible period of authoritarian control, when students begin to accept the leadership of the swimming instructor.* Referring back to Bábosik, to the beginning of the chain of ideas, we can conclude that during swimming lessons, training, if the activities of the students comes under proper authoritarian and social control, it results in personality changes, and thus plays a significant role in personality shaping.

Teaching swimming – learning to swim is more than just teaching the execution of successive swimming movements, it is a complex pedagogic system of action, whereby the complex personality development effects of teaching the movement activity prevails.

5.3. TRAINING METHODOLOGY PROPOSALS FOR SWIMMING

5.3.1.Water as unfamiliar medium - accident prevention

The first and perhaps most important difference of water games compared with land games is the location the game takes place in, which is no other than water. The aquatic environment is highly dangerous, therefore organization and arrangement of the games requires great attention and caution. In order for the water to bring pleasure and to avoid accidents, or even tragedy, we should be aware of the various sources of danger, and of the steps of their prevention. The house rules of the pools govern in detail the rules of conduct that apply in the swimming pool area. In order to acquaint the bathing public with its contents, the house rules are posted up in the swimming pools. The content of the house rules may vary from pool to

pool, but in terms of essential rules they are similar. These house rules already contain such accident prevention and hygienically important warnings, which may be important for us too. Such hygiene rule is that entering the showers and swimming pool area in street shoes is prohibited. Before using the swimming pool showering is required. Eating in the swimming pool is prohibited Jumping into the pool is not allowed. It is forbidden to run around the pool area. The deep-water pool can only be used by swimmers, children under 6 years of age can only enter under adult supervision. In many cases, the use of implements is also restricted, e.g. as rubber mat, rubber float, ball and other inflatable devices, boat, games, tools not related to the teaching of swimming, diving equipment is prohibited or can be taken into the pool exclusively with authorization. Pools have stringent house rules, which supports the prevention of accidents. In addition to these swimming pool rules the leaders of swimming sessions must pay increased attention to certain things. First and most important rule is to keep in mind the safety of the participants with each task. The risk of slipping should be mentioned among the first ones, which often causes injury, especially to children. The risk of slipping is greatest in the dressing rooms and in the pool area. If the flooring is not rough enough, the coefficient of friction decreases over the wet rocks, which can lead to accidents involving loss of balance. The kids in the heat of the game, especially with catcher games often try to 'flee ashore' and in the meantime even forget about the rules. We should increasingly call their attention to the risk of slipping and prohibit running on the pool bank!

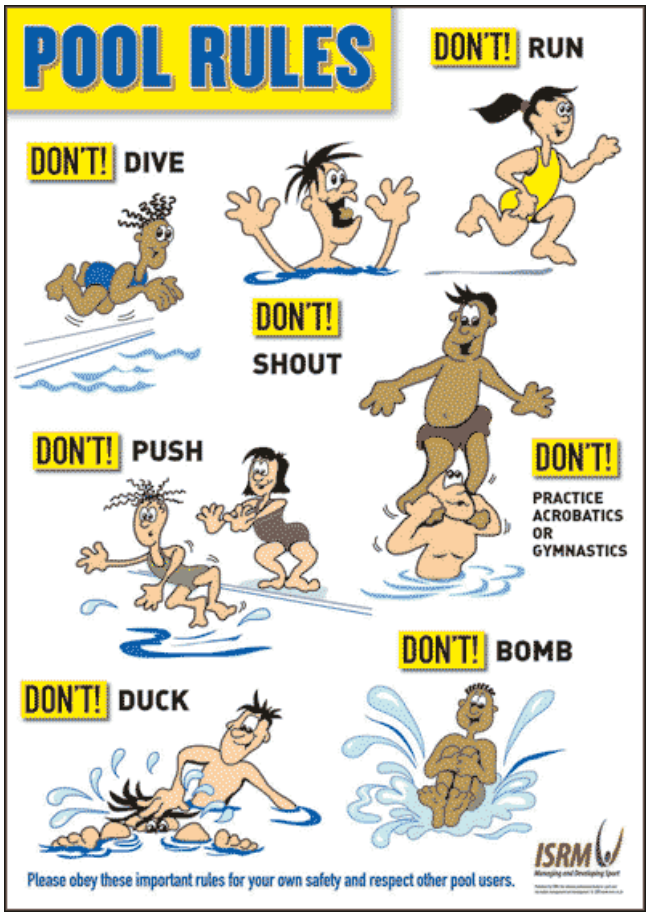


Fig.50: *Illustration of swimming-pool rules. Source*:

Often the pool stairs, guard or tiles can be damaged, which is good to be aware of to avoid an accident, what we should signal to the swimming pool masters. It is worth knowing that soaked palms, soles are more easily damaged. Already from the fact that kids are walking a

lot in the pool, and minor injuries, wounds may occur on their legs, it is good to be prepared for in advance.

5.3.2. Informing students about the rules

In order for the rules to be upheld, the children should also be aware of them. It is expedient to tell the relevant rules before the first session. Lengthy explanations should be avoided however. The younger the children the more concise and informative the rules should be presented to them, comprehension can be aided even with attention drawing small illustrations, because visual information is more easily noted. These can be prepared according to the age by ourselves. We may encounter many forms of this abroad, unfortunately in our country, these informative, attention-drawing small illustrations have not spread yet.

5.3.3. Other safety considerations

For security reasons it is important to continually monitor the number of children before, during and at the end of the session. It does not matter whether the water is shallow or deep, children should never be left alone! It is also essential to check the equipment, implements and supplies. The track partitioning ropes may be cracked after some time, and may cause external scratchy injury. There are implements that require special attention, which ***would be safer if*** the students didn't use them alone**.** Examples include large-scale polyfoam mats, surfboard, a mattress or similar large surface area objects. In the heat of the game these can be turned over those under water unnoticed, hence it is recommended that their use is allowed only under supervision.

Beyond these, it is necessary to pay attention to other safety aspects as well, which are as follows:

- The teacher leading the session or the swimming instructor should enter the pool first and leave the pool last.
- No one can leave the pool and the pool area, and no one can go in there without his/her knowledge. Children should be made aware that they must ask the teacher for permission to go into the water, or to leave it.
- The instructor should organise the sessions in such a way to be able and see everyone at all time. A child should never get behind their back.
- The instructor should organise the sessions so that the number of entrusted children comply with efficient management of the session and with the accident prevention

rules. The instructor should always choose the depth of the water complying with the children's progress.

- In deep water increased attention should be devoted to organisation! Safety should always be first.
- A child should never be left alone. If we must leave the pool area, then we should always arrange for supervision! A child must never be supervised by another child! A child cannot be responsible for another child's life!
- At least 2 hours should pass between lunch and the water session! Taking a child to water to teach swimming immediately after a meal is hazardous! Besides, it is good to know that 33% of child injuries usually falls between 11-12 hours, and around 17 hours. The reason on the one hand was explained due to the lack of concentration arising from a lower blood glucose level.

5.3.4. Prohibited and dangerous tasks

Since the waterfront is an increasingly dangerous area, when organising and arranging for aquatic games a high-degree of attention is required by the game organiser. Into prohibited and dangerous games category belong all those tasks that put a child's life or physical safety at risk**.** The rules should always be made clear with the children, including the prohibited tasks too, so they know what they need to comply with**.** Prohibited tasks should always be compiled by us, according to age, knowledge level, material and personal factors. Such prohibited practices may for example be the following:

- It is prohibited to run on the bank.
- It is prohibited to push your partner into or under the water.
- It is prohibited to enter or leave the water without the permission of the teacher.
- It is prohibited to jump in the pool with your back without the teacher's permission.
- It is prohibited to dive into small, shallow water.
- The somersault without the teacher's permission is prohibited.
- It is prohibited to running jump in the pool without the teacher's permission.

The teachers' prudent supervising attention may prevent all accidents.

In any accident, however, if necessary, the ambulance, the school management and the parents must be notified immediately.

5.4. THE SPECIFIC FEATURE OF SWIMMING LESSONS

Swimming, an activity involving movement differs in many ways from the movement material of other sports. These are the specific features: - the specific nature, the specific medium of the movement, the teachability age of the swimming action, unusual stimuli affecting the body and specific responses of the body.

The first and perhaps most obvious difference of swimming action compared to other land sports is the **specific medium** of the movement. The student immersed in water is exposed to such physical effects, which they have not experienced during land movement. In this medium specific biomechanical principles prevail. Among them the buoyancy and the hydrostatic pressure. In this medium, the degree of gravity decreases, so the students according to their specific weight can easily, airily move, and float in the water. It takes time to feel the equilibrium conditions, postures different from the terrestrial. For the student wishing to advance in the water, a propelling force must be exerted to overcome the water's drag and other forces holding back the body.

It is also a feature of swimming lessons that the **teachability age of the swimming motion** in relation to other sports (except for gymnastics) starts at a younger age. In the vast majority of sports technical training begins at the age of 10-12, in teaching swimming the basic techniques can be taught at the age of 5-6. The ideal teaching age of swimming by most people is placed at 5-6 or 6-7, or at the age of 6-8 years the latest. One of the reasons is that simple crossover cyclical movements, as in the movement structure of freestyle and backstroke swimming, resemble a toddler's creeping - climbing movement, so its teaching can be started earlier. Since the teaching of swimming motion is preceded by accustoming to water, the tuition can start in the early age of 4-5. There are some who, consider that the teaching of swimming may be started as early as at the age of 6-8 weeks. This age is more suitable for playing in the water rather than for teaching the swimming styles.

Submerged in water the **senses** also **operate differently**. The student gets most of the information by vision and hearing from movement information to the instructions of the tutor. Experts claim that the majority of information reaching our body affects our sensory organs. **The significant part of the information, 8**7% arrives through the eyes, 9% through the ears and the remaining 4% through the other senses. At the outset of learning, when the moving image needs to be developed, the information recording capacity of sensory organs is

impeded by the water and other factors. The water prevents the reception of both the acoustic and the information perceptible in sensory way. Water getting into the children's eyes interferes with vision and leads to a decline in concentration. Without swim goggles underwater vision gets blurred, with goggles however – over water – the spatial orientation ability changes, spatial vision is reduced. Underwater the hearing is blunted, above water the swimming cap, water getting into the ear, the noise of the drain, water splashing, high noise levels in the pool also impede the hearing. We often see beside the pool, teachers 'swimming' with arms and legs, imitating the swimming motion. Our research into this (Hernádi and Bíró 2003) corroborates that due to specific nature of the training medium the **application of certain communication channels is changed**. Water inherently **impedes the acoustic-type communication**, while it conducts the sound well, it makes speech incomprehensible. The teaching instructors continuously communicate in verbal and non-verbal fashion almost over the entire swimming session. When students do not receive the verbal information (cannot hear the teacher's instructions), the instructors often try and aid understanding by increasing the volume, by '**shouting'**. This, however, may develop fear and bad experience in the learners. Water therefore is a confounding factor, with a negative impact on the senses of hearing and seeing.

Beside the negative effects we have to mention the kinaesthetic perception of swimmers, which plays a very important role in movement learning. As a result of much practice and moving experience, water sensing of the swimmers develops, in which muscle sensing plays a key role. In development of higher level swimming skills (especially for competitive swimmers) **the sense of pace, distance detection, detection of water and the sense of swimming motion rhythm may develop**. These senses are the essential components, movement skills and characteristics of world-class swimmers. In water perception mainly the tactile analyzer receptors play a role, which can be found in the skin. Swimmers perceive the resistance of water against their movement by touching Thus, the swimmer learns about the position of palms, forearms, feet (once the possibility for visual control is small) based on the sense of motion, specially on water detection.' It is apparent what changes occur under the impact of water as distracting factor (in communication, knowledge acquisition, transfer) in swimming lessons.

The additional features of swimming lessons that should be taken into account when teaching swimming, the body's responses to unusual stimuli. The body of a beginner swimmer reacts to the unusual stimuli of water until it gets used to it. Due to the novel stimuli the body's **defence**

reflexes are triggered. When the student's body position is different from its habitual horizontal position on land and assumes a vertical position typical for a swimming action, the tonal neck and labyrinth adjusting reflex tries to correct the deviation. The student's head is raised from horizontal to vertical. Until the student manages to get used to the phenomenon it will impede the learning of movement, resulting in distortion of the technique and formation of a rigid muscle tone, being also an inhibiting factor for the correct technical implementation, acquisition of technique.

A similar defensive mechanism is the **eyelid-closing reflex**. An object approaching the eye, water in the eye, the pressure exerted on the eyeball under the water leads to the reflexive closing of eyes. It can be eliminated by simple diving tasks and special eye-opening exercises. The adaptation of the body to new conditions, the extinction of defensive reflexes is time- consuming. For this the professionals have developed the accustoming to water training.

The **position, nature of motion** is also different from the conventional on dry land. When swimming the body assumes a horizontal position on the abdomen or back, completely different compared to the land movements. For beginners this also takes time to learn. Searching for balance particularly characterises a beginner, a child, floating on the belly or back, rocking here and there. Even more different from land-based movements is the backstroke, where the heading is exactly there where neither the direction of heading, nor the target can be seen.

The characteristics of swimming action entail the features of movement teaching. While with other land sports, training begins with teaching the training material of the sport itself, with swimming before beginning the instruction of swimming actions, the objective is to familiarise with the new medium, develop the adaptation processes, tame the defensive reflexes and develop the liking of water. In specialist literature this instruction phase is called **accustoming to water**.

The essence of accustoming to water is full familiarization with the new medium, getting to know the laws, characteristics of this medium, and as a result perfect orientation, homely behaviour and a purposeful movement in the water.

5.5. ACCUSTOMING TO WATER

The first encounter with water, getting to know the medium in a playful way are important driving forces for children learning to swim. Swimming by many is associated with learning the swimming disciplines, however tuition does not start with the teaching of swimming action, but first should come familiarisation with water as unknown media and development of liking. When children can move about homely in the medium, know its features the teaching of various swimming styles may commence. The first phase of swimming lessons is thus called accustoming to water. During accustoming to water students are acquainted with a number of task groups, which are as follows:

Getting to know the water	**Advanced tasks**
The tasks of exhaling air	**Diving**
The tasks of opening the eyes	**Floating**
Exercises with submerging	**Gliding**

5.5.1. The role of games performed in water in teaching swimming, games for accustoming to water

With accustoming to water the most important thing is that the children consider the session as relaxation, while acquiring those tasks that are prerequisites for learning the swimming styles. They get to know the water, its properties and its laws, e.g. that they can move along more slowly due to the resistance, or that gravity does not predominate and therefore we are able to float in it. They learn to blow out air under water, which is very important for teaching movement later. To ensure safety and orientation they learn to open their eyes under water and master the tasks of floating and sliding. For teaching this the best tool is the game and playful exercises. Each step of accustoming to water – from submerging to sliding – can be taught with playful tasks and sportive methods.

Getting to know the water

The aim of these games is for the child to become accustomed to water, get to know its specific features, move in it homely, dip their face into water.

Example exercises: Walking and running forward, backward from one side of the pool to the other. Walk, run-time exercises, arm circling, collecting devices. Walk with finding treasures. Walking or running in water with an implement (holding and pushing forward then acquiring the implement). While advancing, transporting an item (ball, board, buoy, small size balls) in

different positions, holding in high posture, balanced on top of the head, balanced on hand as a waiter, balancing a different implement on a board. Variations on dribbling the ball (by chest, hands, head, feet, pushing with nose). Hopping, jumping in the water (by hanging to the wall, progressing forward, backward, while pushing the ball, with a board in hand). Drumming on a board (ball, or other device), 'splatter'.

Submerging exercises

With submerging tasks keeping the principle of gradience in mind, first the chin, mouth, face, and then the whole head is immersed under water. The objective is that children learn to submerge into the water without fear, and be able to perform tasks there.

Example exercises: Face washing. Putting face into water (by hanging on to the wall, with teacher's help). Submerging with help, holding the wall, or the teacher's hands. Driving the ball with head (nose, top of the head) so that the child's head dips into water. Ball passing variations in pairs (with head, thrown, fired from under water, etc.). Fire, water, aeroplane game in water, whereby with the aeroplane they hide under a floating board, then by using the hands and the head emerge from the water, but remain in cover all along. Firing a ball from under water. The goal may be for the ball to bounce as high as possible. Catching the ball popping out of water, or splattering a mate with the ball popping out. Submerging under a board floating on water and flipping it over to the other side. The same task, but the board needs to be raised so that it remains on the top of the head. Rocket launch. The children embracing the board crouch down under the water, then after countdown (3-2-1) jump out of the water like a rocket. The teacher holds a board (water noodle, surfboard) in the hand, the children stand in circle holding hands, the teacher drags around the board over the children's heads. When it gets to someone, then s/he must dive under to avoid being 'scalped' by the board. Getting into the hoop. The kids while walking (on their own, on a given signal, need to get into the hoop (hula hoop ring, rubber float)) without touching with hands, or raising it. As motivation we can playfully encourage, e.g.: 'Here comes the shark, get in the house!' Several kids may get inside one hoop.

The tasks of opening the eyes

The opening of eyes is required for orientation and a sense of security. In case where the water is excessively treated with chemicals and irritates the child's eyes, we can allow the use of goggles.

Example exercises: While clinging to the wall the student dives under the water and looks up the suction figurines glued to the wall. Treasure hunting. Treasures (submersible objects, action figures, rubber balls, keys, plastic bottles filled with water, cans, etc.) are hidden at the bottom of the pool, which students must find. It is important that everyone gets a treasure! Swim across the seaweed! The children should be slaloming through between seaweed. Since they don't swim yet, they can walk, or any way they manage. The aim is to get across it. Treasure hunt so that everyone throws in their own treasure from the shore, which they will then have to find. Find your mate! Select as many flops (piece) as the number of kids. We randomly hand them out so that everyone gets a piece. Everyone puts on that one flop and starts looking for the other half. (Flops should be cleaned in advance!) The students stand in a group in a small circle and one of them puts on a flop. One student stands in the middle of the circle with closed eyes, while the flops are put on. On a signal submerges under water to look up who has the flops on. If correct, they change place. It can be played with a board, or other implement, which the students can stand on.

The tasks of exhaling air

Breathing is instinctive, so blowing out air is worthy of being taught to the children. 'Take in orally, blow out on the nose and mouth' could be the motto. The children should learn the pace and way of blowing air out, so that later, when learning the breathing with the swimming styles they commit no technical error and that movement is not distorted.

Example exercises: Blowing of light balls (ping pong, little plastic balls, inflatable beach ball) or other light implement (bottle cap, balloon) from one side of the pool to the other. Sailing-ship (bottle cap or ball can also symbolise the ship) delivery to the port, so that the child generates the wind for the ship. Here and there the storm may take over the ship, besides if it should run aground and sink, the sea diver would bring it up to the surface again. The diver may be the child itself, or we can also select a few divers. In a way described at rocket launch the child is embracing the object crouches down under the water, then after countdown (3-2-1) jumps out then submerges again. On countdown exhales the air, then after the launch takes in air. Powerboat racing. The students are powerboats. Their mouths are the motorboat engines, which buzzes loudly during the race. It can be played from coast to coast, but it's perhaps even better if played round or over a designated track, or even by moving freely in the pool. Battle of ships. The children (4-5) standing around, with small light bottle caps or

balls in the middle. On a signal, everybody starts - at the same time - blowing the objects as far as possible from them. The winner is who will not have a ball (ship) nearby.

Teaching floating and sliding

Floating is a precondition of sliding, and sliding for teaching the swimming styles. It is very important that a child learns sliding perfectly face up and face down, before we begin teaching the swimming action.

Example exercises: Ride the board! Children should sit on the board, and by balancing try and stay on it! It can be performed with balls, water noodles, and other implement too. Float like an astronaut! The child holds a board in each hand! Places the boards on the water sideways, and tries slowly to lie on top of the water. Floats. Should be performed face up and down too! At first we should help, leaning against the child's hips, then a centre of gravity buoy can be placed between his legs to keep him afloat. We should have them play with ever-smaller objects, and eventually the children should try out weightlessness without an implement. Wizard! The teacher will be the wizard who 'under hypnosis' will conjure away the child, so that it floats on top of the water by itself! Places a small buoy into the child's hands, with one hand under the child's head lying the child on the back over the water, while working magic with the other hand, and putting a foot sponge between his legs and slowly starts releasing the person under the spell. Surfing. The children, while walking, jump onto the board clenched under their stomach and meanwhile 'surf a little' or slide. Surfing from the edge of the pool. The child while squatting jumps onto the board clenched under the stomach from the edge of the pool and slides as long as possible over the water. Are the curds dumplings ready yet? When the teacher asks: 'Are the curds dumplings ready?' the children clinging to the ball, curled around it try and subsist on top of the water, just like when the dumplings are actually cooked! Towing. The student is clinging to a hula-hoop ring, while the teacher drags him to the other side of the pool, just as with a ship towing its cargo. Of course it can be performed with other implement too. We mark out lanes in the pool, where children can put down their feet. It is forbidden to stop at other places, because there is a risk of sea urchins. From one lane to another one can get just by sliding. (This can be done first with the teacher's help, towing, then with an object, e.g. board.)

Diving

Jumping into water is the best way of developing courage. Observing gradualness it should be performed first from sitting, squatting and then from standing position. It is important that as long as the child needs it we provide help. Gradualness is also important when providing help: help first by holding the child's both hands, and then only holding one hand. Following this indirect support may be needed, e.g.: the child holds the board provided by the teacher.

Example exercises: Diving into the water from the board, with a board, above the board, with a board in hand. Jumping into water over an object floating on water. Jumping into a hula-hoop ring, rubber float. Jumping over an object held above the water by the teacher. Throwing the object into water, then jumping into water (after, over, onto). Jumping onto an object (board, ball, etc.). The children are very fond of it, but preferably it should only be carried out with help of a teacher, since it is dangerous.

Advanced tasks

Under the complex tasks we understand such games, where multiple tasks are carried out at once by the student, for example jumping into water, diving under and sliding. In a combined task perceived to be carried out (diving, submerging, sinking, eye opening).

Example exercises: After diving treasure hunt, then running to the other side. Jumping over the board, and then rescuing a pet from under the water (small animal figure) and its transfer to the animal hospital across the pool, depending on the condition of the pet by walking or running, or sliding. We place plunging rings at the bottom of the pool, with small plunging characters inside. The kids can only get from one ring to another by sliding. On reaching the rings they submerge to see what kind of treasure is hiding in the ring. Fire – water – aeroplane. On fire they must dive under water, on water climb out to the shore, on aeroplane take cover under any object floating on water.

5.5.2. The use of educational tools in accustoming to water

During the first step in swimming lessons, when accustoming our students to the medium, familiarise them with its characteristics, scope should be provided to educational tools, games. The use of implements, games in swimming lessons has a number of advantages. **Promotes, facilitates the implementation of tasks** - such as inducing exercises - **helps in creating easier situations starting from preparing simpler to more difficult exercises.** To illustrate

the previous thought with a practical example. Floating is a precondition of performing the sliding. If we give a board or ball into the hands of students, they start discovering the possibilities: what can they use it for. Push it under water, throw away, lie down on it, surf on it. Their feet leave the ground for a few seconds, which is the first phase of floating and sliding. Keeping in mind gradualness in the second stage, sliding may be carried out in pairs with a ball in hand - drawing on the assistance of a mate, who by holding the ball drags his mate to the other side, just like 'the ship and its cargo'. As a third practice sliding can be practiced on its own, but with the ball still in hand, which still significantly facilitates implementation. This may be followed by sliding after a dropped ball. From the exercises it is clearly perceptible that our students will gradually reach the intended goal, i.e. perform sliding unaided. During exercises the implement aids performance and facilitate its mastery.

A further advantage of the tools is that the student beginner focuses not on the contact with the water, for example submergence, but on the aid and the task assigned by the implement. If for example, on teaching diving into the water we give a ball into our student's hands, or throw it to them while jumping; they will be focusing on catching the ball and unconsciously forgetting – about a relevant educational momentum – the diving. Apart from a **distracting feature**, an object floating on top of the water, such as a ball, **provides security** and helps stay on top of the water, and can be hugged when jumping into water. During diving the ball held in hand, and its clasping **increases courage, a sense of security**; so for faint-hearted and timid children an increase in the sense of security will have a positive effect on self-confidence.

As mentioned above the aids have an important **preparatory and hinting role**, but their employment as a **compelling situation** must besides be stressed as well. Tracking an object moved under water by the teacher encourages the students to open their eyes under water. The game floating on top of the water in turn, to skip it. If the ball is given into the hands of our students they already face a series of compelling situations. Already by having to keep holding the object in hand makes the wiping of eyes more difficult, so step-by-step the unnecessary moments are extinguished and thus the child gets accustomed to the water.

The **pleasure making function of the object,** as a game should not be neglected either. While playing, tasks can be taught unnoticed that would otherwise sound dull and monotonous to a child.

5.6. THE TEACHING OF SWIMMING STYLES

After accustoming to water the second phase of swimming lessons follows: teaching of swimming styles Before introducing how certain swimming styles are taught, we should select which one to teach first. Shall we start the instruction with the breaststroke, freestyle, or backstroke? Many people are uncertain about the issue, but it is not so complicated. Let us see:

For a long time the breaststroke was exclusively taught as the basis for 'safe swimming' as the first swimming style. Then in the seventies based on the ontogenetic and neurological development, in its movement structure simpler and quicker freestyle and backstroke came to be the first taught swimming styles. Today, most people also emphasize the primacy of the freestyle, but naturally there are those who prefer the backstroke. Today, the majority of specialist literature suggests the order of **freestyle - backstroke - breaststroke - butterfly**. Most of the specialist literature also agrees that **in case there is scope only for teaching one swimming style, then it should be the breaststroke**.

How many swimming styles to teach at one go? Of course, the opinion of experts differs here too. There are some, who consider teaching one swimming style only, while others believe teaching several swimming styles together also to be effective. Regarding parallel teaching the opinion of experts is also different on which swimming styles to teach together. Bakó (1986) envisages swimming lessons broken down into three phases. In the first phase the joint tuition of freestyle and backstroke, in the second the backstroke and breaststroke, and in the third phase the breaststroke and butterfly are proposed. Within each of the three educational phases the emphasis being on the first of the two swimming styles taught together. Nagy S. (1974, 1984), considers the mastery of two, three, or even four swimming styles possible together. Based on the similarity of motion he suggests the possibility of parallel teaching freestyle and butterfly swimming.

A Hungarian survey has revealed that simultaneously taught swimming styles show a rather diverse picture. In our country of the swimming styles it was the freestyle – backstroke, and breaststroke – freestyle taught together most often. The attempts to teach the freestyle and backstroke side by side have shown that the results for backstroke fell short of freestyle swimming. It is interesting that this difference did not present when teaching sliding face down and face up. It follows that teaching backstroke - due to the development of correct

posture (bearing) on water - will take longer than freestyle. According to others, however, backstroke is the swimming style that can be acquired the fastest by young children.

'Neither swimming style can be privileged, our goal is movement teaching requiring versatile movement dexterity. It is not allowed to emphasize a particular swimming style against the others or to suppress one or two styles over the other.' (Tóth 2002. 129o.)

It can be seen, that the opinions are not only different regarding the tuition time and hardness of swimming styles, but regarding the number, sort of swimming styles too.

What can be drawn as a conclusion? There is no single way forward, which could be effective for every educational situation.
In order to declare about one (or more) swimming style(s) that it is the most advantageous to learn first, as well as to determine the number of swimming styles, types taught together with the parallel educational method, firstly it is necessary to examine what are the factors influencing the selection.

I. Movement structure

When considering the sequence of swimming tuition, the changes of the nervous system and its advanced state must be considered during the ontogenetic development. One of its characteristics is that simple crossover cyclical movements, as is the movement structure of freestyle and backstroke swimming, resemble a toddler's creeping - climbing movement, which 'goes together with ontogenetic development'. Therefore, the teaching of these simple cyclical movements (freestyle, backstroke) at a younger age is not only possible, but is much easier than the complicated 'acyclical' breaststroke. So, after accustoming to water the tuition of these swimming styles may be started as early as at 4-5 years of age. For other reasons, however, the age of 5-6 years is more advisable, which is ideal for learning these relatively simple movements. Analyzing the **breaststroke** by its movement structure, it is not natural movement, its arm action is relatively simple, the foot tempo is very complex however, the harmony of hand-foot action and swimming rhythm requires greater swimming skills, or the nervous system's higher degree of development, a higher age.

II. Age

Which swimming style is practical to choose at what age, follows from what had been described above. It is closely related to the movement structure of the swimming style taught, and the development of the nervous system. So, as already mentioned, at the younger age freestyle, later, when they are able to learn more complicated forms of exercise the

breaststroke is recommended as well. If the ‘student is past the adolescence’, teaching breaststroke first may be more favourable.

II. Preliminary training

If the students already know a particular swimming style, education can also be started on this basis.

IV. Number of hours

With higher number of hours it is possible to teach more swimming styles. In such case, however, if in school education the PE teacher is in advance aware of the limited opportunity to teach swimming throughout the eight years only once a week, and in few number of hours, then owing to its importance and usefulness breaststroke teaching is primary.

V. Other

For its usability, water safety and life protection reasons, breaststroke is the most important swimming style. If there is scope only to teach just one swimming style, it is practical to be the breaststroke.

5.6.1. Teaching breaststroke

Teaching arm movement in breaststroke

It is recommended that tuition is started on dry land. The instructor facing the students shows in slow, articulated movements the arm action for breaststroke swimming. During the presentation points out the essential technical elements. After this the student should implement it. Students assume a small straddle position, trunk slightly forward, holding their arms high, so that the palm is facing down. The head is slightly raised, sight looking forward slantwise. The students by starting with both hands simultaneously and bending the elbow following a circular arc lower their forearm, until the two palms face towards each other. On starting the movement, first the two palms face obliquely outwards, then at the end of turning in the forearms face each other. This is the first phase of arm movement. This movement should be repeated several times in succession by the students, while the instructor is watching every detail to correct the errors. Practicing the second phase of the arm movement starts from the previous position. The arm with gradual elbow stretching is slid forward, whereas the two palms face down again towards the ground. It is practical to combine and continually practice the first and second movement phase. It should be pointed out that

students should not stop the movement between the first and second phase. After ending the arm movement, the arms should be waiting a bit in upper position, at least a second or two.

After successful implementation on land, in the pool in upright position keeping the head above water the previous task should be performed, so the teacher can still give more information. This is followed by the head in the water exercise. The exercise performed advancing in standing position is replaced by implementation during walking. After sliding this is followed by a breaststroke arm tempo, without taking breath. For performing it continuously it is important for the student to always stop it on breathing. This can be followed by continuous exercise of the arm tempo with teacher's assistance, possibly using a foot sponge (not recommended, if it raises the centre of gravity too much).

Teaching breathing in breaststroke, harmony with the arm movement

The inhaling and exhaling point should be carefully, accurately marked by the instructor, both for exercises done on dry land and in water. The presentation of the arm stroke and breathing co-ordination should be first performed by articulated and continuous movement – in face and in lateral view. In the first exercise students assume a small straddle position, trunk slightly forward, holding their arms high, the palm is facing down. The head is folded between the two hands. Students begin the arm movement with simultaneously setting off both arms and bending elbows, then before turning in inhaling, and while bringing the arm forward exhaling. The arm should be stopped in front for a short time.

The previous exercise after a successful implementation on dry land is to be repeated in water, first in standing position, then while advancing. This is followed by performance with the teacher's assistance, starting with sliding.

Basic exercises for teaching breaststroke leg tempo

The leg tempo movements do not belong to the natural movements therefore their teaching requires particular attention from the instructor. Since the foot posture is crucial, as its position is different in the active and passive stages of the leg tempo, hence it is worth starting with a few land-based exercises. Illustrate to the students while seated, the twitching, tipping position of the foot. In long seat and foot locked up together practice the rising and stretching down of the foot in succession several times. Then by keeping together the two heels turn the toes outward, and then close them. This can be done by slightly raising the heels. Afterwards we continue in prone position. The teacher holding the student's inner ankle guides the execution of this movement. This latter exercise should be moved over to the water, so that

the student lies on the edge of the pool, with hips hanging in the water. The teacher by gripping the sole, or the ankle sets the correct technical implementation and position of the foot. A very good compelling position is the pool's vertical wall, since the student is unable to pull the knees below the belly. The instructor turns out the student's foot, so that the two ankles still remain closed, the knees, however face obliquely outwards, downwards. In the closing phase, the instructor guides the student's foot through the correct technical way. This exercise is also worth repeating several times for the proper technical implementation. In further developing this exercise the instructor may also present the leg rhythm to the student. The raising phase is slow-paced, the active part dynamic, then the passive phase after this is the delay. A further task may be that the students grip the edge of the pool, the instructor in turn the child's foot, helping the execution, and rhythm of the leg tempo. Following this after sliding the implementation with an aid can come. Sliding, then a foot tempo, and stopping. Then comes the next continuous breast foot tempo without taking breath for a few metres, watching the delay.

Combining the taking of breath in breaststroke with the legwork

Teaching this is only suggested to be started if the student can from sliding successfully carry out the leg tempo. First, we should check for awareness of the exhaling and inhaling point. Breathing out on the leg tempo during sliding, and breathing in while raising the leg. We can begin exercising this by hanging on to the pool wall with help, and then without it. To follow this is the implementation of leg tempo during swimming with an aid.

Teaching the harmony of arm – legwork and taking breath

The previous exercise completed for arm – breathing, or leg tempo - breathing was an example setting exercise for the purpose of combining the entire movement. Here the known movements will only need to be integrated together. The best way for this is the delayed breaststroke. The student starts with sliding. Exhales and starts the arm movement inhales and ends the arm tempo, folds the head into the water. This is followed by the leg tempo. After the correct performance of this exercise we can move on to, where the student does not wait the ending of the arm tempo, but on starting the arm movement begins to raise the leg too. So we have come to the continuous breaststroke.

Exercises to improve the breaststroke technique

~ Breaststroke leg tempo on every leg rising touching the palm with ankle.

~ Breaststroke leg tempo with swimming board, breathing on every second leg, and then breathing on every tempo.
~ Arm in high posture: breaststroke legwork, breathing on every leg tempo. The same exercise with low posture.
~ Breaststroke arm movement, buoy between the legs, breathing on every third arm tempo. The same, but breathing on every second, and every single arm tempo.
~ Breaststroke arm tempo with dolphin leg tempo. Two leg tempos on one arm, or one leg tempo on one arm tempo.
~ Delayed breaststroke: after legwork sliding for two-three seconds, then arm movement, breathing and sliding again.
~ Breaststroke with sliding: after legwork sliding for two-three seconds, then arm movement and breathing.
~ Continuous breaststroke, breathing on every arm movement. To aid the narrow, whiplash-like legwork, a buoy is placed between the two thighs.

5.6.2. Teaching freestyle swimming

Freestyle swimming does not include complex, technically difficult items. The difficult part is the breath taking, so it is important that it is precisely taught, because it can fundamentally change the tempo, technique of movement.

Teaching the crawl stroke footwork

It is worth starting the tuition of footwork on dry land. By the pool, on towels, on a bench or other appropriate implement providing support, seated with supported back, then in prone position the legwork should be practiced. Seated, since the student can sees the implementation, we can draw their attention to the posture of foot, to the relative opening of legs moving up and down and to the loose posture of the foot. When faced down it is important that the hips are supported, and that the spine is not lordotized. After the land-based exercises, the previous two tasks should be carried out by the water, first seated, and then in prone position, keeping the feet slightly below the water surface. Following this, the students holding on to the pool railings, or in absence of this clinging onto the edge of the pool, or leaning on the steps assume prone position easily moving their legs up and down, with a relaxed foot.

The following exercises are similar as before, but the students should practice first with the help of the ‘teacher', partner, and then with an aid, head dipped in water. First the implement is held in both hands, then in one hand, while the other arm is in held low position. Here they can feel the effect of propulsive footwork. Finally, the student should perform the legwork without help. With these tasks take a few metres swimming freestyle with legwork, and then stand up to take breath and swim a few metres again with legwork. The instructor should initially watch that knee flexion is not excessive; movement should rather start with stiffer knees so that the student can gradually reach the most appropriate leg opening. Particular attention should be paid to the laxness of the ankle and the correct foot posture.

Teaching the breathing

Teaching this should also start on dry land to eliminate the distracting factor of water, furthermore to help students hear the teacher's instructions. Students take up a narrow straddle position on dry land, the trunk leaning slightly forward, hands propped up on the thighs. Head and trunk turning to the right and to the left, with teacher’s assistance, counting and explanation. The exercise can be executed at a wall, with one hand leaning on the wall, and with the other on the hips, whither the practicing of taking breath is being trained. It is important that turning the head is concurrent with raising the shoulder. As a second step, the previous land-based exercises are performed in water, at the side of the pool. Subsequently, the task is performed in horizontal body position. Students opposite the pool wall, are positioned at arm's length. They spread out one arm, and with their palms lean on the edge of the pool. The other hand is squeezed to the thigh. After taking a breath they lie out on the water and start freestyle swimming legwork. After slowly counting to three, breathe out under water, turn to the side in the direction of the arm held deep and take a breath. They lay their ears, heads, onto their arms held in high position. After 5-6 exhalations and inhalations they stand up and continue practicing to the other side.

The teaching of breathing during legwork

The purpose of these exercises is teaching the co-ordination of leg movement and breathing. After successful execution of the tasks of taking breath described above, we can proceed to exercises during swimming. First the students work with a swimming board, or a similar implement. With one hand gripping the centre of the swimming board, they place the palm of the other hand on their thigh. They practice the technique learned earlier while walking. The next step is to start the legwork after sliding, then count slowly to three, breathe out, and turn on the side in the direction of the hand held in low position, take a breath, and then turn back

into prone position. Now stop. It should be performed once, then continually. Practice with opposite hand position too.

Teaching freestyle arm movement

Of course, it is also recommended to start teaching the arm movement on dry land. The instructor facing the students shows in slow, articulated movements the arm movement for freestyle swimming. During the presentation attention should be drawn to the high elbow posture of the forward moving arm, the direction of the pulling-pushing motion, the extent of elbow bending, the hand position at the moment of water catching, and during the pulling-pushing motion. The presentation should be repeated several times, stopping the motion at the relevant parts and so explaining. Also, make sure that the presentation of a movement or sequence of movements is always purposeful and expressive, the explanation short and understandable. It should be shown in lateral view too. Following this, start the exercises. Children should assume a small straddle position, with a trunk inclined slightly forward, leaning with one arm against the wall, the other held low. First, they should perform the exercise with one arm only. The palm of the arm held is to be placed on the outer surface of the thigh. They begin to raise their arms with bending the elbow, so as to stroke their thighs with the palm, and then, when their elbow is above the shoulders, halt. Then stretch out their arms, rise beside the head into high position. Perform the exercise twice, three times with the right, then with the left arm too. Conducting the exercise is by counting: raise on one, stretch on two, lower on three. The following exercise is performed at the same time by co-ordinating both arms, using three commands. The students should take up a similar position as earlier. (small straddle, trunk bent) One arm should be held in high position, the other in low position. In the first stroke release the arm held high into low position and touch the thigh. At the same time lift the arm in low position by bending the elbow and halt it above the shoulder line. In the second stroke raise the hand at the thigh above the shoulder line by bending the elbow, while stretching forward the opposite arm into water-catching position. In the third stroke the students stretching the arm from the raised elbow position carry it forward to the water-catching position, and in turn lower the arm on the other side touching the surface of the thigh. Then, the different strokes are combined and continuously practiced. This means that the right and left arm perform the water-catching, pulling, breathing, but there is a short stop after each water-catching. The instructor can control the co-ordination of the arms by counting, commands. The continuity of motion that there is no hitch or stop in succession of the underwater propulsion as well as the above water preparatory movements should be

emphasized. To illustrate the dynamics of motion we should employ commands well expressing the acceleration and deceleration.

Students should take up small straddle position in a training pool by the wall. They should lean forward and their trunk and head dipped in water until the ear level. One arm should be in high, the other in low position. They should perform freestyle swimming arm movement as practiced above, and stop at each water-catching. After completing every third arm movement, rise up and take breath. The exercise is performed first in a standing position and then while walking.

Teaching the harmony of breathing and arm movement

The inhaling and exhaling point should be carefully, accurately marked by the instructor, both for exercises done on dry land and in water. The presentation of the arm stroke and breathing co-ordination should be first performed by articulated and continuous movement – in face and in lateral view. In the first exercise, in accordance with the dry triple breathing perform the arm swap, so that after each water-catching the arm should be stopped for a short time. After the third arm swap bring both arms to halt in normal position. After completing the third arm movement simultaneously with the insertion the shoulders and the head should be turned out. The head, the ears should be on the arm in the water-catching position. Before turning on the side they should exhale, after swinging inhale, during swinging to the side the arms need to cling to the ear, and to the thigh respectively. After taking breath they should turn back again, now in the direction of the arm in high position. After this, they should again perform three arm movements and now swing out to the opposite side and take a breath. The previous exercise after a successful implementation on dry land is to be repeated in water, first standing and then advancing. While walking, finally starting with sliding.

Call the students' attention to the correct head position, which facilitates breathing, because in the wave trough caused by the head, the swimmer can breathe almost below water level. Inhalation should be short and fast, exhalation of longer duration. Inspiration is always done through the mouth, while expiration both through the nose and mouth at the same time.

Teaching the harmony of leg and arm movement

Students in water take-off from the wall, start legwork, and then the arm movement. They should wait a bit on each water-catching, after the third one turn to the side towards the arm in low position, and take a breath in the manner previously learnt. It is important for the leg to continuously move during the exercise, without stopping. The arm – leg harmony and

teaching the exact point when to take a breath together with the execution of the entire movement happens by a delayed freestyle swimming. The students perform the arm movement according to triple breathing, so that at water-catching they stop the movement, and wait. Three-arm movements - exhalation - inhalation - arm tempo. If students while practicing the delayed exercises perform perfect air exchange, the continuous freestyle swimming is only a step away. The delay following water-catching should be shortened and the point of exhalation precisely adjusted. All this should be in the pushing period of the underwater arm movement, and breathing should take place together with raising the elbow of the arm coming from low position.

Exercises to improve technique

- ~ Freestyle swimming legwork without taking breath, both arms in low position
- ~ The previous exercise, but in high posture.
- ~ Freestyle swimming legwork without taking breath, right arm in high, left in low position, alternating by phases.
- ~ As in the previous exercise, but arm posture changes every 2-3 seconds.
- ~ The previous exercise combined with breathing.
- ~ Freestyle legwork with swimming board, to grip device with one arm, the other in low posture. Swapping.
- ~ The previous exercise combined with arm tempo and breathing. One arm working, taking breath on 3. It can be practiced on 2, and even 1.
- ~ The previous exercise, but alternating the board and the breathing: 3 left arm, breathing to the left, 3 right arm, breathing to the right. Similarly, it can be 2 – 2, or 1 – 1. The arms in each exercise meet in high posture when gripping the board.
- ~ Sidestroke swimming (on release the hand strokes the side of the body from the thighs).
- ~ Freestyle shoulder touching (on release when bringing the arm forward the hand touches the shoulder).

5.6.3. Teaching backstroke

Teaching legwork in backstroke

It is worth starting the tuition of legwork similarly to freestyle swimming on dry land. The dry land exercises are the same as those used for freestyle swimming. By the pool, on towels, on a bench or other appropriate implement providing support the students nestle in long seat, with

arms supporting them behind the body. They should raise both legs and carry out exchanging scissors kick legwork up and down. They should slightly stretch their foot and turn slightly inward, but not raising too high. The exercise can be performed in supine position, but the hips need to be supported.

After the land-based exercises, the previous task should be carried out by the water, seated by the pool, keeping the feet slightly below the water surface. In the next exercise, the student embraces the swimming board, putting both palms on the board and holds it tightly to the belly. They stand facing the wall of the pool, placing one leg on the wall. After a slow backward tilt push away from the wall, and after a short slide, start the legwork. The teacher can help the set-off by holding the nape. They should hold the swimming board to the chest, and pressed to the belly too, so they could avoid hip flexion. In the next exercise the swimming board is placed under the nape, held with two hands aside. (We should make sure that the board does not raise the student's head too much, because the feet can sink and swimming becomes choppy. Then the student holds the swimming board at the lower edge with a stretched hand, then places the board on the water without having to bend the elbow.

The same exercise as before, but the student holds the board in one hand, while puts the other hand by the thigh. This is the basic position of backstroke. It should be also performed without an implement. At the start the student stands facing the wall, with one leg on the wall Holds both arms raised in high position to start. After sliding on the back and starting the leg tempo, lets down one hand to low position beside the hip. The exercise should be practiced with both arms. The last exercise in teaching backstroke leg tempo starts similarly to the previous task, but the arms remain in high posture all the way.

Teaching arm movement in backstroke, arm-leg harmony

The mill circling backwards, as inducing exercise is used to represent the extent and speed of the movement. The first tasks here too should start with dry land exercises. In small straddle various hand position exchanges should be performed with left and right arms, both separately and simultaneously. Before exercising in water the basic position should also be formed in straddle. One arm in high, the other in low posture, sight looking forward. The arms should be stretched! A ‘half mill circling’ backwards should be performed, forming the opposite arm position. The students stand in a small straddle, one arm in high, the other arm in low posture. The instructor counts to three, everyone remains still, on four arm posture change.

The student after taking off from the wall (breathing, head drawn back, ears below water surface, one foot kicks) starts leg swimming, one arm in high, the other in low position. Counts to three and then performs arm position exchange. The time of counting to three, thus the length of wait can be reduced by asking the students to count to one with small intermissions, after every water-catching.

The following exercise consists of three strokes again, but this time it is not the intermission that lasts to three, but three arm movements should be done in succession. In basic position the student should start the arm movement and in succession with the left –right – left arm make an arm posture change, stopping in basic position. In this situation, waiting until three, during which only the leg should move, then three arm posture changes should be performed again. From this delayed backstroke is the continuous backstroke swimming integrated, reducing the delay time, and increasing the number of arm posture changes and the swimming distance. The ultimate goal is to create the backstroke sextet footwork.

Exercises to improve technique

- ~ Back leg, both arms beside the thigh.
- ~ Back leg, arms on the nape.
- ~ Back leg, one arm in high, the other arm with bent elbow reaching below the nape holds the arm in the high position.
- ~ Back leg, one arm in high, the other in low position.
- ~ Back leg, both arms in low posture: left arm front, right arm front, left arm high, right arm elevation into high position.
- ~ Back leg, double arm back arm, the arms wait in low position for 3 seconds.
- ~ The same exercise, but the arms wait in high position for 3 seconds.
- ~ Back leg, arms in low posture: 10-12-metre backstroke just with left, then 10-12-metres with right arm. Delay in low posture (Low slide.)
- ~ The previous exercise can be performed in 2 left -2 right, 1 left -1 right variation.
- ~ Backstroke legwork, both arms in high posture: one right-one even-one left-arm in succession. Delay always in high position.
- ~ Backstroke in basic position (one arm in high, the other in low position) with legs after 6-8 metres arm posture change. (Backstroke with delay.)
- ~ Back leg, high posture: a small empty can is placed on the forehead.
- ~ On back dolphin leg, backstroke with both hands.

~ On back breast leg, both arms in high posture.

~ On back breast leg, backstroke with both hands with delay in low or high position.

5.6.4. Teaching butterfly stroke

Teaching legwork in butterfly stroke

Start the tuition with land-based exercise. The student with arms held in high posture, foot turned inward, performs wave movements in upright position. After this, the students should carry out dolphin leaps in water. In 80-90 cm water students with arms held in high position stand, jump forward upwards then with heads bent down arrive in water and perform a slide under water. The students put both their hands beside their thighs and face down perform a dolphin leg tempo. The students hold both arms in high position, bend their heads down under their arms, perform 3-4 dolphin tempos, then stop. Then follow 3-4 dolphin leg tempos, so that one of their arms is in high, the other in low position. Finally, dolphin foot tempo with a board in hand, head dipped, on 4 legs breathing, then the same task with hands joined together, without an aid on 4 legs breathing.

Teaching of arm movement

We start the tuition in narrow straddle double arm circling forward by the pool, so that when the student starts moving the arm downwards, touches the thigh, then the hand comes into high position, where lowering the head it goes below the arms. It is worth performing the previous exercise with slanted trunk for a short period. Similarly to the previous exercise, slanted trunk posture, arms in high position, the head under the arms. The student makes a full arm circle then stops, then performs a wave motion by the body. This is called a body wave. After this rests for for 3-4 seconds, and then performs the exercise again. The dry land exercises are performed in a training pool too. In shallow water small straddle, trunk bent, head in the water. Butterfly arm movement, at the end the head closing again. The student performs 2 tempos, then rises above the water and breathes. Then, after sliding the student performs a butterfly arm movement without taking a breath, then stops, and takes breath. Butterfly arm tempo with delay. After sliding the student carries out a butterfly arm movement without taking a breath, the head is closed, then after a small break a leg tempo with a big dolphin wave (performs a body wave).

Teaching of breathing in butterfly stroke

The known dry land exercises, so that we fix the breathing point. Student assumes a narrow straddle position, hands in high posture. Performs an arm tempo in the already practiced way,

but when the arm passes the stomach, starts from the hip raises the head and takes a breath. Then the arms swing forward and the head is quickly folded back under the arms. The same task can also be performed by a body wave.

Exercises to improve butterfly stroke technique

- ~ Dolphin leg tempo with a board in hand, on 4 legs breathing
- ~ Dolphin leg tempo with hands joined in front, on 4 legs breathing
- ~ Side dolphin with high and mixed arm posture (1 arm in high the other in low position)
- ~ Dolphin on back with hands joined
- ~ Butterfly stroke with one arm: 2x right-2x left arm
- ~ Playful butterfly: 1x right arm, 1x left arm, 1x double. Breathing only on 1 arm butterfly.
- ~ Playful butterfly: as above, but breathing for every tempo taken.
- ~ Playful butterfly, but breathing only on 1 arm stroke.

THE AUTHORS

Dr. Melinda Bíró, PhD – Head of Sports Science Institute of the Esterhazy Karoly College, Physical Education Teacher

Graduated as a Geography - Physical Education teacher in Eger at the Esterhazy Karoly Teacher Training College in 1996, she acquired two years later a Physical Education Teacher and high-school degree at the University of Physical Education (TF). Acquired her Education and Sports Science doctor's degree from the Semmelweis University Faculty of Physical Education and Sport Sciences in 2007. Works in the Esterhazy Karoly College since 1998, Head of Department of the Sport Science and Methodology Department since 2009, Director of the Sports Science Institute from 2014. Vice-president of the Eger Swimming Club (2012-), Board of Trustees Chairman of the Gifted Children Foundation (2014-). Main research topics: the sport selection, suitability, talent-nurturing pedagogic aspects analysis in the swimming sport, and examination of the specificity of interaction in swimming lessons.