

HEREDITY AND ENVIRONMENT AS DETERMINING FACTORS IN THE GAME OF WATER POLO

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***Abstract.** Heredity is the biological attribute specific to the human being, in conjunction with the environment, be it internal or external, but also with other dependent or independent factors of society such as family, education, political system, and religion. The literature review highlights two elementary stages, one during puberty when the family environment and its influences are more relevant and easier to observe (internal environment), and the second when the individual begins to absorb information from the external environment, thus creating a mixture between the family environment and the one encompassing the information acquired from the outside. From a genetic point of view, the human being inherits certain sets of predispositions or potentialities that are closely related to the environment in which the person lives and which can enhance them or not, depending on education. In the present paper, we aim to emphasise the importance of heredity and environment in the game of water polo correlated with other sports disciplines, as well as the importance of environmental factors and their significance in developing a culture of the game of water polo at the national level. Our analysis includes world-class water polo players and specialists whose activity is correlated with the water polo activity in Romania, regardless of gender, age or ethnicity. The conclusions drawn from the analysis show that Romania really has biological and environmental potential, but it can reach the world podium in the game of water polo only through a scientific development that takes into account all the factors presented above.*

Keywords: water polo, heredity, environment, performance.

Introduction

“Originating in the United Kingdom in the late 1800, water polo is one of the oldest team sports of the modern Olympic Games.” (Lupo et al., 2010, p. 223) Brooks (1999) also says that “men’s water polo was the first team sport in the Olympic Games, and since then it has continued to grow in popularity” (p. 313). “Water polo is a team sport that combines swimming with overhead throwing and wrestling.” (Stromberg, 2017, p. 363)

The present paper analyses, without pretending to offer an exhaustive perspective, two indispensable conditions without which competitive and elite water polo cannot generate added value: heredity and environment.

The property of all organisms belonging to a species to produce similar descendants or the ability of an organism to transmit particular genetic traits from parents to their offspring is called heredity. Through this process, genetic variation accumulates and certain phenotypes evolve by natural selection (according to Darwin’s theory of evolution). The study of heredity in biology is called genetics. The set of observable characteristics in the structure and behaviour of an organism is called a phenotype. These traits are the result of the interaction between genotype and environment. Therefore, many aspects of an organism’s phenotype are not inherited. Inherited traits are passed on to the next generation through deoxyribonucleic acid (DNA), the molecule that encodes biological information (Heckel et al., 2019).

An element of maximum importance is represented by education. Faure (1974) emphasises the importance of education by the fact that it can be defined as the specifically human specialised activity that mediates and diversifies the relationship between man and environment, favouring the development of man through society and society through man.

The environment refers to the setting in which people (athletes) carry out their daily activities.

Gherguţ (2013) highlights that the environment is represented by all the elements and living conditions with which the individual interacts directly or indirectly during their development in different stages of evolution; environmental factors act in the form of bioclimatic, socioeconomic and cultural influences, and involve the totality of conditions, structures and social norms starting with the family environment and continuing with the community environment, with society as a whole. Therefore, it is extremely important for the selection process in the specialised discipline to take into account these aspects in order to create added value in competitive and elite sports without very high costs. This is usually a decisive factor in achieving or not achieving top performance.

There are also other factors that contribute to an athlete's success in the game of water polo at any level. If sports performance is targeted, we must make sure that the selection in this discipline is made by looking for a tall and long-shaped body. This is certainly not a guarantee of success. Athletes can be successful without being tall if they have other skills and traits that compensate for their lack of height. However, very few are successful beyond the junior age without this special physical attribute.

The topic as reflected in the literature

Athlete selection is essential for many sports clubs and organisations (Den Hartigh et al., 2018). Talent detection and early development processes are crucial in any sports programme (Falk et al., 2004). "Training and coaching water polo players requires systematic and continuous work throughout the year. Given the specifics of water polo as a water sports game, in addition to training various elements of technique, tactics, and theory of the game, in the training process, special attention is paid to training specific locomotor movements in the water, as well as the development of all psychomotor abilities that stand out in that game." (Nurkovic et al., 2021) Swimming activities are aimed at producing an improvement in the children involved, especially from the social and emotional points of view, but also in terms of personal independence (domestic and social activities, free time), time management in everyday life (in the classroom and outside the classroom), improvement of school performance, communication skills and fundamental learning principles such as reading, writing, and calculations (Napolitano, 2018).

In the game of water polo, certain characteristics can be developed and enhanced through continuous training, but the most important thing is that the athlete possesses basic biological/anatomical characteristics, which are absolutely necessary for success. Thus, although biological traits do not ensure success, they are often very important and can have a major impact. Athletes can reach the highest level of performance if they develop in a proper environment. The importance of the environment is therefore critical for the development of sports culture and the creation of traditions at the local and later national level.

In this regard, we will present the differences and similarities between countries in terms of biological characteristics but also from a geographical point of view, as well as the importance of the artificial development of sports facilities in order to carry out competitive and elite activities.

The water polo player needs to train hard and have the right mental attitude to develop those physical attributes necessary for success. Teacher and coaches should not ignore the influence of genetics on success in the game of water polo. Genetics play an important role in achieving performance. Playing water polo requires important biological characteristics for success (body size, strength, flexibility, type of muscle fibres, endurance, reaction speed, mental toughness, ability to work hard, etc.). This does not mean that athletes who do not have the required biological characteristics cannot be successful; however, they need other traits to be able to compensate for the lack of what is indispensable to be successful in the game of water polo.

Topic Addressed

Heredity and its specificity in elite sport

In major competitions such the Olympic Games or World Championships, it is interesting to note the similarities in body size within each sports discipline. An extreme and clear example is the comparison between the physical appearance of gymnasts and that of basketball players. Many biological characteristics are evident in a number of sports, but others are hidden inside the body and are not visible (joint structure, flexibility, cardiovascular system, type of muscle fibres, etc.).

Genuine sprinters are born with more white (fast-twitch) muscle fibres that help increase speed, which is why they have an advantage over athletes with fewer white fibres. If two swimmers with different ratios of white muscle fibres and red (slow-twitch) muscle fibres do exactly the same exercise and use the same technique, the swimmer with more fast-twitch fibres should be able to swim faster in a sprint race. This is also true for endurance athletes with slow-twitch muscle fibres.

However, athletes with fewer white fibres can be trained to swim faster, although they will never reach the speed of those with more white fibres. An athlete's potential to swim fast depends on both the amount of fast-twitch muscle fibres and the body type they are born with. But athletes cannot simply jump into the water and suddenly start swimming fast. They must be trained with proper conditioning and technique to reach their full potential.

In the past, a controversial topic in the game of water polo was the importance of height to a player's success. We believe that height has become increasingly important in this sports discipline as the game has become more and more vertical. This is especially true at the higher levels of competition such as the Olympic Games, European Championships, and professional leagues all over the world.

While a shorter player can be successful at lower levels of age (where children have not yet fully matured), it is noticed that, starting with the U17 category, successful teams are mostly made up of players whose height exceeds 1.80 metres. We compared the lists of athletes performing in the 1990s with the current ones and found that, if the average height was 1.72 metres in the 1990s, nowadays it is over 1.80 metres.

The average height of the Croatian Olympic team, which won the gold medal in 2012, was about 1.96 metres with all players well over 1.88 metres tall. In contrast, the US Olympic team, which won the silver medal in 1984, averaged only 1.77 meters in height. Spain won the gold medal in 1996 with many players under 1.80 meters tall, including the best player in the world, Manuel Estiarte, who was only 1.75 meters tall. These are just a few examples of situations occurring in this sports discipline during the last 30-40 years.

The advantage of height in this sport is obvious when analysing the game of water polo played in countries such as Serbia, Montenegro, and Croatia. For example, the former Yugoslavia, a gold medal winner at the 1984 and 1988 Olympic Games, has split into three countries that are all ranked among the top 5 in the world. Nowhere is this more evident than in Montenegro, a country whose population is only 650,000 people. We can say that this is the clearest example of success in the game of water polo in countries with tall athletes.

As mentioned before, the game has become more and more vertical. This is the most obvious in the predominance of the extra-man 6 on 5 phases that require shot blocking and shooting over the opponents' outstretched arms, but also in the 6 on 6 zone defence, which requires the same shot-blocking and shooting techniques. The result is that more than 50% of the game takes place in a vertical position in the water. The extra-man attack has become the most important part of the game of water polo.

Perhaps the wrong terminology is used when talking about height in the water. What we really have in mind is length, more specifically, the length of the arms and the length of the torso. These are extremely important characteristics that cannot be trained but must be acquired from parents by heredity. It is clearly established that height (arm and torso length) is a hereditary characteristic that can be influenced very little. In addition to the above-mentioned shot blocking in 6 on 5 and 6 on 6 zone defences, there are also advantages in other areas of play. Thus, being able to shoot over an opponent's arm is an advantage for the athlete, but the whipping motion of the longer forearm when shooting gives more speed to the shot. Another advantage of the long arms in swimming refers to the longer pull underwater and the streamlining and less turbulence created by a longer body. A longer upper torso in swimming is more important in streamlining than longer legs. When jumping out of the water to gain height in order to block a shot, shoot the ball, or intercept a pass, the length of the torso and arm above the water is more important than the length of the legs. If two players can get up to their waistline when jumping up, the athlete with the longer torso and the longer reach has an advantage over their opponent. (Dettamanti, 2014)

Environment as a basic factor in elite sport

Tall athletes from the aforementioned countries play water polo for many reasons; one of them is that people from the Balkan countries are, on average, among the tallest in the world. We add to this the initiation into the secrets of the game of water polo from an early age, which is motivated by the fact that these countries are located next to the Adriatic Sea. If we look at many of the successful nations in the game of water polo, we will see that most of them are located near great bodies of water. The best players and the best teams live near the seashore, and we mention here Italy, Greece, Spain, Croatia, Montenegro, Australia, and the United States (California). If we travel along the coastlines of Montenegro and Croatia towards Italy

or along the coastline of Greece, we can see many floating water polo goals in various small harbours, as well as many swimming pools that are built into the seashore and are filled with salt water. Obviously, there are exceptions to this rule; for example, both Hungary and the top teams in Belgrade (Serbia) are in landlocked locations. This brings us to the other reason for the success of these countries in water polo. The competition for the tall athlete is less than in other countries such as the United States. The greatest attraction for most athletes living in these countries is soccer (football), a sport that does not require very tall players. Therefore, those who are tall and live near the seashore or grow up in a culture of the game of water polo that has been established years ago (Hungary, Serbia - Belgrade) have a tendency to play water polo rather than other sports. At the same time, the interaction with this sport occurs at a very young age, more precisely, at 5 or 6 years old. Even if Spain, Italy, and Greece are not known for having tall people, they can sometimes use the experience gained by the early exposure of their player to this sport and can have some success against the Balkan countries. However, most of their successful results date back to the time when teams still had very good players, and the vertical game was not as extensively used as it is nowadays. The Italians have been able to sustain this success until now, and this is probably also due to their professional league where there are many players imported from the Balkan countries. (Dettamanti, 2014)

A comparative analysis

In Romania, there are disadvantages when it comes to international success in the game of water polo. Most of our high school polo athletes are between 1.65 and 1.75 meters tall, which is an average height compared to that of football and handball players. In addition to football and handball, water polo can also be compared to other field sports such as basketball, volleyball, or rugby. Competition for the selection of children is fierce even at the young age of 6-7 years. Moreover, the number of swimming pools for the game of water polo is very small compared to that existing in countries such as Hungary, for example.

An aspect that proves the above is the following: starting in the 1980s and until 2008, the title of National Champion in this sport for both the senior and junior categories was won by the western part of the country, more specifically, by cities such as Oradea, Arad, and Targu-Mures, because the number of pools was much larger, and the proximity to countries such as Hungary, Slovakia, and Serbia facilitated travel to participate in competitions. Since 2008, the year when the construction of several water polo swimming pools was initiated in Bucharest (for instance, the Steaua Pool, the Dinamo Pool, the pools at the Faculty of Medicine and within various lower secondary schools), the title of National Champion in this sport has remained in Bucharest; the justification can also be the great number of children who have constantly taken part in the selection process and, obviously, the possibility of an adequate selection according to the specifics of the current game at senior level.

Another important aspect that deserves the full attention of Romanian specialists is the fact that, in cities with access to water, for example, Constanta, Galati, Oltenita, Tulcea, Braila, Calarasi, Giurgiu, and Drobeta-Turnu Severin, there are no specific pools for the game of water polo. However, it is worth mentioning that Romania has been in the top 10 teams worldwide for over 40 years, which can only be explained by the hard work and dedication of the specialists in the field.

The best thing that professionals can hope for is that a top athlete (or team) grows up in an aquatic friendly environment, and children (as future athletes) are exposed to sports such as swimming and water polo from an early age. The need for a specialised facility for water polo (namely, a swimming pool) is another disadvantage compared to field sports that only require a piece of grass, land or asphalt to be practised. Supporting the change in the rules of the water polo game aims to make it more attractive for young people who would like to choose this sport over other field sports.

“Water polo players require a high level of upper-extremity strength, flexibility and coordination to achieve a peak level of throwing performance.” (Hams et al., 2019, p. 2588) “Growth and physical maturation are dynamic processes encompassing a broad spectrum of cellular and somatic changes.” (Manna, 2014) At the same time, identifying and explaining the parameters that describe the effectiveness of young water polo players have a major importance (Hraste et al., 2014). According to particular micro-situations (Vila et al., 2011), effectiveness depends on developing a reasonable task allocation plan, which is the key point to win in the game of water polo (Jiang, 2014).

Conclusion

There are many factors that contribute to the success of a water polo player at any level. But if we want to achieve high performance, we need to make sure that we start by selecting athletes with a long and tall body, which develops from a young age (5-6 years) in an environment conducive to water polo competition. This is certainly not a guarantee of success. If there are athletes with other skills and traits that can compensate for their lack of height, they can be successful without being tall. But without this special physical attribute, few players go beyond the junior level to be selected for national teams in order to participate in world-class competitions and attain a podium place.

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