

HELPING CHILDREN TO DEVELOP THEIR MOVEMENTS - CARDIOVASCULAR ADAPTATION AND HEALTHY SPORT

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ABSTRACT

A health-conscious lifestyle is closely related to the possibility of a better and longer life. [1]. A health-conscious person can contribute to the preservation of health and the prevention of diseases with his lifestyle, healthy diet, and regular exercise, both physically and mentally. In order for the body to develop healthily, an active lifestyle is essential. The right amount of load, which we can influence through sports, also contributes greatly to the ideal development of the organ systems. These later affect both body weight and stress tolerance. The correct execution of the fundamental movements and the acquisition of the correct basics greatly contribute to the protection of the joints and muscles. It can be one of the basic pillars of a healthy life.

As a result of long-term regular training, the athlete's heart adapts to the load the "hardened heart" is formed, which includes the characteristics of cardiovascular adaptation. These signs can be morphological signs such as a thicker heart wall or better coronary artery supply also in gymnastics. Functional changes are better contraction and relaxation ability, richer metabolism. In terms of regulation, a trained heart is characterized by a lower heart rate and a lower resting cardiac output [2].

KEYWORDS

healthy sport, fundamental movements, cardiovascular adaptation, gymnastics

INTRODUCTION

Nowadays, more and more specialized literature and publications deal with the topic of how competitive sports and health should be treated as two separate concepts [3] [4] [5]. Competitive sports impose loads on the body that often go beyond the carrying capacity of individuals. This can be especially prominent in sports such as gymnastics, where not only the variety of equipment and joint mobility are a challenge, but also the high performance expectations associated with the development of competition rules and equipment. Nevertheless, I see that it is possible to find the common ground regarding competitive sports and health, which if we deal with in time and prepare the muscles well for this special load, we can avoid possible later injuries and problems [4].

"Health is a state of complete physical, mental and social well-being and not just the absence of disease and physical defects." The WHO definition articulates for the first time that a person's well-being is not the same as the state of health of his body, but also his mental and emotional balance. Recognizing this meant a new approach, since nowadays people have to deal with diverse economic and social challenges. Various educational and scientific researches help to develop a healthy lifestyle and health education. This constantly expanding field of research provides more and more opportunities to learn more about different methods

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and tools in the field of prevention and health promotion [6]. Currently, one of the major tasks of public health is to improve the health indicators of the individual, which is effectively influenced by the creation of community arenas and the introduction of various health promotion programs [7] [8]. There is an effort to bring about improvements in health behaviour through community interventions and conscious changes in structural and organizational factors [9] [10].

A health-conscious lifestyle is closely related to the possibility of a better and longer life. [11]. A health-conscious person can contribute to the preservation of health and the prevention of diseases with his lifestyle, healthy diet, and regular exercise, both physically and mentally. Among the leading causes of death in several countries of the world, including Hungary, are deaths caused by various cardiovascular diseases. These are mostly caused by degenerative, civilizational problems, such as a sedentary lifestyle and improper nutrition. Nutrition is the starting point for a healthy life, and the combination of nutrition and exercise is the key to success [12]. We must strive for health awareness to appear as an internal value in the life of the individual, so that it can accompany active physical activity and sports from childhood to old age.

Involvement of children in sports

Beyond this, we can find systems theory in the field of retraining and specialization, such as LTAD, which is particularly concerned with laying the foundation for the healthy movement of the younger generation. It is characteristic of Hungary that sports compete for the "favors" of children who do not want to play sports, so they start teaching them special movements at an early age. The essence of the LTAD program is to develop the athletes in the long term and get the most out of them. The goal of LTAD is to improve physical literacy, improve sports performance and increase physical activity [13]. This haste results in preventing children from learning about and trying other sports. This process is extremely harmful, because in many cases it can be attributed to children turning away from sports or dropping out [14].

That's why I think it's important to know the areas of use of basic movements within a sport, which can later be specially applied and transferred to both sports. Béki et al. [15] adapted these basic movements in the snow sport, which theory is found in the domestic and international literature in various fields of physical therapy and physical exercise [16] [17] [18] [19].

Following this theory, we connected the basic movements in the field of snow sports and gymnastics with the aim of how to build two such different movements on one basis and teach healthy movement based on similar principles, even if the two special movement cultures are completely different from each other [21] [22]. Long-term preparation is crucial for a successful sports career, and long-term sports are essential for health. In the case of better-known sports, such as team sports, the basics of preparation from childhood to adulthood have already been examined [13]. In the case of individual sports, which are more technical sports such as juggling, athletics, cross-country skiing or gymnastics, little research has been done.

In order for the body to develop healthily, an active lifestyle is essential. The right amount of load, which we can influence through sports, also contributes greatly to the ideal development of the organ systems. These later affect both body weight and stress tolerance. The correct execution of the fundamental movements and the acquisition of the correct basics greatly contribute to the protection of the joints and muscles. This is one of the basic pillars of a healthy life, but it is not enough by itself. The aforementioned cardiovascular load is just as important as correct posture or basic movements. The "engine" of our body, the heart, requires similar training as our muscles. Its task is to maintain blood circulation in the small and large blood vessels. The heart constantly performs cyclical work, which basically consists of two phases:

the contraction of the ventricles (contraction), which ejects the blood (systole), followed by the relaxation of the ventricles when it sucks in and receives the blood into the atria (diastole). The content of a complete heart cycle time depends on the heart rate. In a healthy person, the number of heartbeats is approx. 70-72/minute, so one heart cycle is approx. 0.8 s. As a result of exercise, the heart rate increases due to the increased demand for oxygen, and the duration of the cardiac cycle decreases [20].

The performance of the heart can be measured by the so-called cardiac output. The cardiac output is the amount of blood that the heart can pump out in 1 minute. The cardiac output is the product of the other two indicators of the heart, the sum of the pulse volume and the heart rate. The resting cardiac output is about 4.5-5.5 liters, so the entire body's blood volume passes through the heart in one minute. It can be felt that this "muscle" of ours is the heart, it does a lot of work in every moment of our lives [1] [23].

As a result of long-term regular training, the athlete's heart adapts to the load, the "hardened heart" is formed, which includes the characteristics of cardiovascular adaptation. These signs can be morphological signs, such as a thicker heart wall or better coronary artery supply. Functional changes are better contraction and relaxation ability, richer metabolism. In terms of regulation, a trained heart is characterized by a lower heart rate and a lower resting cardiac output [2].

Sports started in childhood thus ensure the existence of the right foundations, thereby protecting the muscles and joints, and the heart also becomes trained due to the impact of the load, which reduces the risk of various diseases.

Knowing this knowledge, the importance of exercise is unquestionable. Regular exercise is necessary for adaptation. In addition to a constant load, the human body is able to adapt and prepare for the next load, this is called supercompensation. The longer the load lasts (with a suitable load-rest ratio), the higher level of adaptation is created. Long-term adaptation (permanent) requires a minimum of 22-23 weeks, in the first phase of which the transition of homeostasis begins, in the second phase a general adaptation, and in the final phase a change at the cellular level is created, which has been perfected to withstand the load. As a result of this series of events, the special ability to perform is formed [24].

Gymnastics is a sport that increases the child's movement base

As a sport, gymnastics is one of the oldest Olympic sports, which captivates people with its elegance and special movement material. The sport requires complex skill development, and learning to move is very lengthy due to the difficulty of the elements of the exercise. Men's gymnastics takes place 6 times, while women's 4 times. In this research, I examine the workload of men. Each of the 6 agents uses a unique, special conditional ability, yet we can group them into 3 categories. These three categories separate the means from each other based on the body-object relationship, on the basis of which there can be "leg means" which is the ground and jumping, "support means" i.e. horse swing and railing, and "suspended means" which includes the ring and the stretching belongs. Based on this, the Olympic equipment order is "leg-support-hanging", so ground-horse swing-ring-jump-barrier-extension [25].

The technical elements of the sport are increasingly difficult, the difficulties of the various elements are indicated by the English letters "ABC", where the element "A" is worth 0.1, while the element "I" is worth 0.9. The higher the value of an element, the higher level of coordination and conditioning it requires on the part of the gymnast. This also means that a certain level of maturity is essential for mastering the elements, both mentally and physically (Fig Core Cod).

Nowadays, domestic gymnastics is catching up to the international top, thanks to which Krisztián Berki became the Olympic champion in vaulting at the 2012 London Olympics. Between 2012-2022: 2014 Junior Olympics 2nd place on hurdles, 2014 Nanning WC 1st place horse swing, 2015 Glasgow WC 5th place horse swing, 2016 Rio 9th place horse swing, 2017 Cluj EC 2nd place horse swing, 2018 Glasgow EC 3rd place, the Hungarian men's national team achieved 3rd place in the European Championship [26] as a team. Of course, this is not the complete list, these are individual highlighted results. (matsz.hu)

The technical catch-up of the sport is facilitated by the modification of the domestic competition system and competition practices, which affect an international standard. The new competition system includes an assessor to assess the technical elements, which also serves as a kind of guideline for practicing coaches. The assessment system also includes a conditional assessment, with values placed on a multi-grade scale. These tasks are mostly designed to assess special abilities.

As I mentioned earlier, the technical elements of the sport are based on maturity and existing skills. The sport specifically requires these in 6 different ways. According to my observations, currently, in the case of adolescent gymnasts, the development of conditional ability appears in general, later in youth and adulthood, strength development appears specifically on the ring.

Previous studies have been published to learn about the basic skills used in sports. In a 1998 research, cardiovascular capacity and lactic acid production were studied during individual exercises. It was determined what percentage of athletes reach their individual maximum heart rate on certain drugs. Based on this, the highest heart rate was produced during the stretching exercise, and the highest lactate was measured after the floor exercise. It was determined that the maximum heart rate measured at the end of the exercises was lower than the maximum heart rate measured during the individual test run. Based on the research, the movement material of the gymnastics is done predominantly in an anaerobic environment [27].

In a later study, the focus of the observation was not the individual heart rate and its rate, but the rotation of the drugs. The gymnasts performed the exercise in two different order of exercises (the order of exercises discussed above cannot be changed, only the starting place), and the changes in lactate and heart rate were examined based on this. 6 adult gymnasts participated in the study. In the first round, they started with a ground exercise (ground-horse-ring-jump-barrier-extension), and in the second test with horse swing (horse-ring-jump-barrier-extension-ground). Based on the results, the maximum heart rate (figure 1) was significantly higher in the 2nd rotation order. In addition, the blood lactate level is also higher if the competitor starts on a horse [28].

Descriptive statistics of the two types of the Olympic rotation order.

Variables		HR _{peak} (b·min ⁻¹) ¹⁾	HR _{rec1m} (b·min ⁻¹) ¹⁾	HR _{rec2m} (b·min ⁻¹) ¹⁾	BLa (mmol·l ⁻¹) ¹⁾	Score (point)
		M ± SD	M ± SD	M ± SD	M ± SD	M ± SD
Floor Exercises	R1	185.20 ± 11.67	142.40 ± 6.91	122.40 ± 7.19	9.90 ± 1.04	12.86 ± 0.90
	R2	190.60 ± 9.15*	149.40 ± 4.61*	127.40 ± 3.20	11.70 ± 1.51*	12.42 ± 0.94*
Pommel Horse	R1	157.80 ± 6.90	132.40 ± 6.80	113.80 ± 7.32	8.70 ± 1.86	12.02 ± 1.36
	R2	148.80 ± 5.24	130.60 ± 2.40	108.40 ± 2.70	7.40 ± 1.17	12.16 ± 1.27
Rings	R1	181.60 ± 12.74	147.40 ± 8.87	122.00 ± 2.91	8.68 ± 1.00	10.10 ± 1.02
	R2	184.40 ± 8.64	147.6 ± 5.03	123.00 ± 3.16	9.80 ± 0.97*	10.26 ± 0.99
Vault	R1	171.40 ± 10.06	124.00 ± 11.46	106.00 ± 10.19	6.16 ± 1.41	13.00 ± 0.78
	R2	176.20 ± 7.95*	119.80 ± 2.49	101.20 ± 7.01*	5.38 ± 0.51*	13.04 ± 0.79
Parallel Bars	R1	171.40 ± 6.18	129.80 ± 7.69	122.20 ± 9.68	5.28 ± 0.96	11.32 ± 0.59
	R2	174.40 ± 7.02*	136.80 ± 8.78*	116.40 ± 9.42*	5.44 ± 0.49	11.42 ± 0.67
Horizontal Bar	R1	183.60 ± 9.65	160.40 ± 6.50*	125.00 ± 4.41	9.04 ± 1.51	11.06 ± 0.80
	R2	185.40 ± 8.20	163.20 ± 4.08	127.60 ± 2.60	9.10 ± 1.07	11.02 ± 0.82

(R1) First order of rotation (floor exercises, pommel horse, rings, vault table, parallel bars and horizontal bar); (R2) Second order of rotation (pommel horse, rings, vault table, parallel bars, horizontal bar and floor exercise); (HR_{peak}) Peak heart rate; (HR_{rec1m}) Recovery heart rate after 1 min; (HR_{rec2m}) Recovery heart rate after 2 min; (BLa) Blood lactate concentration; (*) Significant at $p < 0.05$.

1. Figure: Heart rate and lactate values in different rotation order²

Studies are also being prepared in other aspects of the development of conditional ability. Such is strength development and its possible methods. The special strength conditions of the sport primarily focus on relative strength, since the gymnast must support her own body weight. For this reason, strength development is characterized by a duality, since the muscles must be strong, but the muscle mass cannot be large. An American study from 1996 refers to this important thesis. The thesis also covers the importance of resistance strength development, in addition to the development of special abilities. Resistance training can be used not only for maximum strength training, but also as a kind of preventive tool in preparing the joints [29].

Exercise is an integral part of public education, it has a beneficial effect on posture and the development of skeletal muscles, but we have little knowledge of its effect on the heart and circulatory system. The above-mentioned research, which examined the effect on the circulatory system within the sport of gymnastics, only examined the load at a specific moment during the competition. Sports started in childhood, which have already been discussed, and its beneficial effects on the circulatory system are indisputable. At the same time, the international studies seen above do not show how long-term the long-term burden of regular gym training is on a developing body.

The various sports and competencies included in the NAT all act in the direction that the child likes to move, it becomes an experience for the student, and thus he has an internal need for

² Source: Journal of Human Kinetics, 2018. <https://sciendo.com/it/article/10.1515/hukin-2017-0120>

physical exercise later on (National Curriculum). The primary goal is the correct didactic structure of the movements and the development of the correct posture, as well as the choice of sports. In the light of the results, in the long term, it would be worthwhile to review the teaching of gymnastics in the practice of school physical education. In international practice, we already find efforts to popularize the sport of gymnastics, but they are not supported by physiological studies [30] [31] [32] [33] [34].

DISCUSSION

In the course of my research work, I would like to examine how and to what extent regular gym workouts, in different preparation stages, strain the body of an adolescent child. When looking at the general background, the beneficial effect of sports in terms of health is clear. However, I have not found any sport-specific research that would support the fact that gymnastics provides an adequate load on the heart and circulatory system, in order for the child to develop a suitable adaptation.

The main goal is to understand the special conditioning capabilities of the sport of gymnastics [35], and based on this, establish basic theses that can affect the work of currently active coaches. Furthermore, it is a guarantee that the sport of gymnastics is not only primarily a form of movement that improves posture and coordination, but also provides an adequate circulatory load for the preservation of health.

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Magyar Torna Szövetség eredmények - <https://matsz.hu/matsz/jegyzokonyvek>

International Gymnastic Federation: Man Artistic Gymnastics Code of Points - http://www.fig-gymnastics.com/publicdir/rules/files/mag/CoP_MAG_2017-2020_ICI-e.pdf