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# THEORETICAL AND METHODOLOGICAL ASPECTS OF SPORT PREPARATION OF SELECTED CHILDREN AND YOUNG ATHLETES

# METODIČKI I METODOLOŠKI ASPEKTI SPORTSKE PRIPREME SELEKCIONIRANE DJECE I MLADIH SPORTAŠA

***ABSTRACT***

*Sport is an integral part of the educational process implemented on the level of pre-primary education (ISCED 0) and integrated basic education (ISCED 1 and 2). The children in primary schools (ISCED 1: grades 1-4, ISCED 2: grades 5-8) have the opportunity to partake in high-quality extracurricular sport activities organised in school sports clubs. Sport activities implemented in the course of basic education are instrumental in the development of physical abilities and acquisition of motor skills that are important for systematic sports training, as well as recreational, leisure time activities later in life. School sports clubs are organised forms of activity targeting a wide base of children, among which, only a few meet the criteria for becoming top athletes. Sport has a significant impact on the psychosomatic development of children and youth, i.e. the development of the abilities, characteristics and motor skills applicable throughout one's life. Aside from improving the child's motor and functional abilities and facilitating the acquisition of important motor skills, sport also holds valuable developmental, educational, preventive, socially-protective and rehabilitative potential. The development of habits related to regular physical activity in the childhood within the educational system constitutes a major impetus for the development of a healthy and active lifestyle in the future.*

***Key words****: primary school, exercise, training*

***SAŽETAK***

*Sport je integralni dio odgojno-obrazovnog procesa u predškolskom i osnovno školskom sustavu. Tijekom osnovne škole od 1-4 i 5-8 razreda djeci se pruža mogućnost sudjelovanja u kvalitetnim izvannastavnim sportskim programima u okviru školskih sportskih klubova. Vježbanjem u sustavu školstva djeca podižu razinu kondicijskih sposobnosti i stječu potrebna znanja i motoričke vještine za kasnije sustavno bavljenje sportom ali i za sportske i rekreativne aktivnosti sa vršnjacima u slobodno vrijeme. Školski sportski klubovi su organizirani oblik rada s ciljem okupljanja što većeg broja djece od kojih samo jedan dio zadovoljava kriterije za vrhunski sport. Sport značajno utječu na psihosomatski razvoj djece i mladeži, odnosno razvoj sposobnosti, osobina i motoričkih znanja korisnih za cijeli život. Osim što u cijelosti unaprjeđuju djetetove motoričke i funkcionalne sposobnosti i omogućavaju mu stjecanje važnih motoričkih znanja i vještina, sport je potencijalno vrijedan sadržaj u funkciji razvojnih, odgojnih, preventivnih, socijalno zaštitnih i rehabilitacijskih učinaka. Stvaranje navika tjelesnog vježbanja u djetinjstvu kroz ugrađivanje redovitog vježbanja u sustav školstva predstavlja značajan poticaj stvaranju temelja za zdrav i aktivan život djeteta u budućnosti.*

***Ključne riječi**: osnovna škola, vježbanje, trening*

## 1. Introduction

Sport is an integral part of the educational process implemented on the level of pre-primary education (ISCED 0) and integrated basic education (ISCED 1 and 2). The term “sport” encompassed extracurricular school sports club activities (for the chosen sport) and special sport programmes for the selected athletes (the experimental school sport programme). Sport has a significant impact on the psychosomatic development of children and youth, i.e. the development of the abilities, characteristics and motor skills applicable throughout one's life. Aside from fostering the child's motor and functional abilities and facilitating the acquisition of important motor skills, sport also holds valuable developmental, educational, preventive, socially-protective and rehabilitative potential.

In an adequate environment and when performed in an optimum way, sport activities allow the child to meet the basic and specific human needs: the need for physical activity and play, the need for security, belonging, order and organisation, respect and self-realisation. Sport activities also encourage communication and interaction across gender, age and status groups; build capacities for coping with stress and trauma, and, as a result of their preventive and protective effect, they have an important role in the prevention of addiction and different forms of socially unacceptable behaviour. In a nutshell, sport significantly improves the quality of life and has a positive effect on an integrated biological, psychological and social status of the children involved in sport programmes.

Under the multi-annual sport development programme, the first global goal is a multilateral (integrated) psychosomatic development, specifically focusing on the development of all coordination abilities, motor development through play and elementary forms of movement, and the accumulation of motor experience in multiple sport activities. In the middle stage of basic education, the second global goal of sport preparation is introduced. This goal involves targeted sport and motor development and sport specialisation with multiple objectives: acquiring the basic technique and tactics of the sport (multilateral TE-TA training), detailed motor learning in the chosen discipline, development of functional and motor abilities, mastering specific exercises and development of dynamic basis of the technique and tactics, as well as the early phase of setting and meeting competition standards in regular sport competitions (Milanović, 2013).

## 2. The selection of children for specific sports (steering and specialisation)

Mass inclusion of children and youth in sports involves the process of selection for the achievement of significant, even top sport results. Through the selection process the children with great potential for top sport performance are identified. The process takes into account the chronological and biological age of the child so as to avoid negative selection of children who lag behind in their biological development. The process of selection of potential top athletes involves the processes of steering and specialisation. The steering system is a process of the selection of children with identified talent for sports, whereas the goal of the specialisation process is to select talented individuals for a specific sport. Between these two processes, an inter-stage in the selection process is often employed: streaming towards a specific sport field (combat sports, team sports, etc.).
The success of the steering and specialisation processes depends on a number of factors: the relevance of the characteristics used in steering and specialisation; accuracy of measurements of all factors affecting performance; objectivity of performance evaluation; and representativeness of the sample of subjects used in the determination of the specification equation for the kinesiological activity. The role of experts in the selection process is very important since they must be able to adequately manage the training load and identify the child's aptitudes and inclinations from the earliest phases of their motor and sport development.

## 3. Methodology of training for primary school children

In planning the training process for children and youth, the biological development factors and the principles of an integrated effect of the training process should be taken into account. The training structure, modalities and loads should foster a dynamic development of basic and specific anthropological functions and results at competitions in accordance with clearly defined prospective, functional and result-oriented objectives.
Specific phases of conditioning should utilise the training means and modalities which are the most conducive to achieving the set goals. The same applies to load management, which should consider developmental characteristics of individuals and the demands of the specific stage of a long-term sport preparation.

Between 6 and 10 years of age, children should be involved in low-intensity training targeting a wide spectrum of abilities. In this age group, the cardiovascular and respiratory systems are sufficiently developed for an individual to engage in most activities, whereas the anaerobic capacities are limited due to low tolerance to heightened levels of lactic acid. In working with this age group the focus should be on a multilateral development of motor and functional abilities by employing a wide array of exercises, including running, jumping, catching, climbing, rolling, balancing etc. Between the ages of 10 and 14, a gradual increase in the intensity of training is introduced (building of an athlete). Strength and conditioning training for athletes of this age group should predominantly involve all-round and basic sport preparation, with gradual introduction of specific conditioning goals. As of the age of 15, athletes can cope with higher-intensity trainings as a result of more favourable hormonal conditions for the development of strength and power and a higher tolerance to lactic acid, i.e. anaerobic training.

### 3.1. Development of physical abilities

There has been a long-standing debate among sport experts and scientist concerning the determination of real effects of organised physical activity on the development of specific physical abilities. It is very often difficult to identify weather the improvements of specific abilities in a child and youth athlete are a result of the training process or normal developmental processes. An overview of the body of relevant scientific and expert work reveals that most information and

scientific contributions refer to different types and modalities of resistance training for children and youth. Therefore, the effects of such training are most often brought into correlation with various dimensions of strength. There are much fewer resources that address the training modalities for the development of endurance, coordination, flexibility, speed and agility. The most discussed and the most controversial physical ability in children athletes is strength. A lack of consensus on the purposefulness of the employment of strength training with pre-adolescent children opens the door to numerous questions. The results of two meta-analyses on the strength training effects on children shed some light on the issue (Falk and Tenenbaum, 1996; Payne et al., 1997). The studies showed that training programmes implemented over 8-12 week periods led to an increase in children's strength of 30-40 %. Several studies pointed to the possibility of achieving positive effects with resistance training, plyometrics and sprint training (5-20 week training programmes) on vertical and horizontal jumping ability, running speed and agility (Faigenbaum et al., 1996; Diallo et al, 2001; Matavulj et al., 2001; Kotzamanidis, 2006). Several studies showed that anaerobic abilities in children can be improved by means of anaerobic training (Rowland et al., 2006). However, the improvements measured in all of the mentioned studies were relatively small. Several paediatric studies into aerobic effects of aerobic training on children suggested that there is a relatively small possibility for improvement (Rowland et al., 2006), with the increase in the maximum oxygen intake ranging between 10 and 14 %. In a meta-analysis encompassing 23 studies, Payne and Morrow concluded that the average increase in the VO2max value in children is 5 %.

### 3.2. Aquisition and development of motor skills

For the optimum effect of training processes and long-term sport preparation it is necessary to utilise the process of acquiring and mastering technical and tactical skills from an early phase of the child's sensory and motor development. In early phases of sport preparation, technical and tactical skills are not acquired in their final form, but rather in a form that matches the developmental characteristics of the given age group and does not hinder the acquisition of basic movement structure. The process of technical and tactical skill acquisition, i.e. the structure of movement and the structure of situations, is implemented in four independent stages in the school context: 1) Early acquisition of elementary skills required for the structuring of motor programmes; 2) Advanced acquisition of solid skills for the performance of a motor task, finalisation of motor programme acquisition, and fine-tuning of motor task performance to the point where it is relatively independent of interfering effects of the environment, the opposing team or an individual athlete; 3) situational learning leading to stable movement patterns; 4) competition experience creating opportunities for quick reception and processing of motor impulses and fast and efficient performance of technical and tactical tasks on a reflexive level. These stages of motor learning are also implemented with selected athletes in sport clubs, but with a much higher number of practices and higher training and competition load. An expert approach to technique and tactic learning ensures a gradual development of athlete's skills, leading to a high-quality development of other abilities, integrated preparedness as well as peak sport results that will depend on the talent of an individual and the conditions for sport preparation implementation in sport clubs.

The learning process is assessed on the basis of the effects of learning, i.e. the performance level measured in the process of acquiring a motor skill. The common model for expressing the motor learning effects is the motor learning curve, reflecting the correlation between the performance measure and the learning period or the number of attempts. The motor learning curve usually displays a negative acceleration property. The typical application of the curve refers to the assessment of average performance in each learning stage. This facilitates the learning process assessment and provides more valuable information on the learner (the pace of learning, the effectiveness of skill acquisition in individual phases, fatigue onset, the final level of skill mastery etc.) than the effectiveness of learning expressed by the assessment of the final skill mastery or the average effectiveness of all the attempts. The dependant variable, the effectiveness of learning can

be assessed in several ways. One of the most common assessment methods is expert evaluation (Barić, 2006; Magill and Schoefendler-Zhodi, 1992; Ram and McCullagh, 2003; Zetou, Tzetis and Kioumourtzgolou, 2001). In laboratory conditions, the effectiveness is measured on the basis of the deviation of kinematic parameters from the professional model performance by geometric entropy or as an inverted measure of failed attempts (Al-Abod, Davids and Bennet, 2001; Boschker and Bakker, 2001; Anderson, Magill, Sekiya and Ryan, 2005; Shea and Wulf, 2005). A frequently used approach to measuring motor learning effectiveness is the assessment of motor learning using the retention test (Magill, 2007). This approach involves measuring the level of retention of a previously acquired motor skill after a period of time, i.e. forgetting of a motor performance.

## 4. Planning and programming of training for selected young athletes of the primary school age

Children with superior motor abilities, who were positively assessed in the steering process, are introduced to the universal youth sports school, which in most cases includes children between the age of 6 or 7 and 10. Children in the first two grades of primary school can be steered towards a group of sport disciplines (team sports, sprint disciplines, combat sports, cyclic endurance sports, aesthetic sports disciplines, etc.) through elementary sports programmes implemented in an adequate number of training hours and using adequate loads.
In the majority of sport disciplines, children in the fifth grade of primary school, i.e. children between the age of 10 or 11 and 14, who have met the selection criteria for inclusion in the systematic training process, attend the programmes of elementary sports specialisation. The objective of elementary sports specialisation is targeted sport and motor development and sports specialisation, or multilateral technical-tactical training, further detailed motor learning, all-round training, further development of functional and motor abilities, mastering of specific training drills and the early phase of setting the competition result standards.

The training plan and programme for children between the age of 10 and 14 should be focused on sport-specific training and should contain cumulative training parameters. This implies a precise definition of the number of training days and rest days, the number of training sessions and training hours, as well as the proportion of each sport preparation programme in the total training programme. Regular testing during the annual cycle should not be neglected. According to Sozanski (Milanović, 2013) (Table 1), the recommended number of training sessions for the age group 10-12 is 150-200 in the total duration of 300-400 training hours and 30 hours of competitions. These parameters are significantly higher in the training process of the athletes in the age group 12-14. Thus, 250 training days can contain 250-300 training sessions in the total duration of 500-600 training hours and participation in 40 competitions.

***Table 1*** *Cumulative load parameters in the process of sports preparation by age groups*

| Types and parameters of training | | Age group | |
|---|---|---|---|
| | | A | B |
| | | 10-12 | 12-14 |
| 1. | Training days | 150-200 | 250 |
| 2. | Rest days | 165 | 115 |
| 3. | Training sessions | 150-200 | 250-300 |
| 4. | Training hours | 300-400 | 500-600 |
| 5. | Competitions | 30 | 40 |
| 6. | Multilateral and basic preparation (hours) | 150 (100+50) | 200 (100+100) |

| Types and parameters of training | | Age group | |
|---|---|---|---|
| | | A | B |
| | | 10-12 | 12-14 |
| 7. | Specific and situational preparation (hours) | 50 (50+0) | 100 (75+25) |
| 8. | Technical and tactical preparation (hours) | 200 (150+50) | 300 (150+150) |
| 9. | Theoretical preparation (additional hours) | 10 | 20 |
| 10. | Diagnostics (testing) | 2× | 4× |

*Source: Sozanski, according to Milanović, 2013*

Several studies (Malina, 2010) showed that the development of the level of preparedness in children aged 6-11should be primarily achieved by means of multilateral and basic sports preparation (90-65% basic preparation, 10-35% specific preparation), which should result in increased primary motor and functional potential of future top athletes. Unfortunately, this is not always the case in practice since coaches are sometimes more focused on immediate results and they conduct more specific than basic training, causing early specialisation. It has been shown that the early specialisation does not produce desired results. Only a small number of children who have undergone early specialisation were able to achieve top results at the adult age. Out of 35,000 children in Russian sports schools, only 0.14 % have successfully reached the top athletic performance level. A study examining German athletes in seven Olympic sports showed that only 0.3 % of selected potential top athletes have reached that level. On the other hand, research has confirmed that multilateral training and involvement in a large number of sports in childhood contributes to the achievement of excellent athletic results at the adult age. A study examining 1,558 athletes in Germany showed that the most successful athletes engaged in more sports (2.4 ± 1.6 sports) before they chose the sport in which they won medals at top competitions (Malina, 2010).

In the latter stages of sport training (age group 12-16), specific training means are utilised in further improvement of the level of preparedness, since they effectively transform those specific motor and functional abilities which are essential in the achievement of results in the given sports branch (65-30 % basic preparation, 35-70 % specific preparation). It is therefore clear that, in a youth athlete training system, it is vital to precisely define the order in which certain sport preparation means will be utilised. In the early stages of sport training, the focus is on multilateral and basic sport preparation, while the specific and situational sports preparation means need to be emphasised in the latter stages.

## 5. Conclusion

In grades 1-4 and 5-8 of primary school, children have the possibility to participate in high-quality extracurricular sport programmes within school sports clubs. Physical activities implemented within the system of education improve the level of children's physical ability and facilitate the acquisition of motor skills required for a systematic sports training or participation in sports or recreational activities with their peers in their free time later in life. School sports clubs are organisations whose purpose is to attract a large number of children, only a small number of which meet the criteria for top sport. On the other hand, some children will continue to participate in sport and recreational activities in their free time. Developing habits of physical exercise in childhood through the implementation of regular exercise within the system of education constitutes an important incentive towards building the foundations for a healthy and active lifestyle in future life.

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