EQUATION OF SPORT'S ACTIVITY SPECIFICATION

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Review paper

Abstract

In accordance with the basic principles underlying the theory and mathematical modulation of sports training, which studies the anthropological, methodological and methodical principles of planning, programming and control of the sports training, for didactic reasons, within the scope of this study, we presented the simplest but maybe the most realistic model which will help us explain all the features of some sports activity. Model does not reflect realistic reality, but it's certainly very close. Linear additive model, presented in this paper, does not take into account the interactive relationships among the factors, even though they really exist and are very much acting. We selected such approach in order to, in the simplest and user friendly way, define the basic features of the anthropological status of athletes and encourage the reader to, in accordance with methodological and methodical principles of planning, programming and control of training, create systematic approach to sports they are involved in.

Keywords*: water-polo, sports theory, models, abilities, methodical aspects*

Introduction

Different motion structures dominate in various sporting activities, from quite simple to very complex, performed in the variable conditions in terms of cooperation with other team members and with the active interference with players of the opposing team (sports games). Each sports activity is defined by the rules that directly determine its complexity in the IT (techniques and tactics, strategies) and energetic (physiologically functional characteristics) plan. The theory of training analyses methodological and methodical principles of planning, programming and control of the sports training. The main objective of TT is to establish principles upon which it is possible to explain the functioning of the basic system comprised of athletes, sports activity and sports environment. The first task of TT is to define sports activity according to biomechanical principles, and determine its level of complexity accordingly. The next task is to establish principles upon which it is possible to analyze the skills of knowledge and attributes of the athlete, i.e. general and specific anthropological characteristics. The following task is to identify principles upon which it is possible to formulate the training process in order to achieve sporting form (shape) which will ensure top results. Then we need to establish principles related to the problems of selection, sports guiding and sports specialization. All of the above this discipline shapes through the equation of sports activity specification creating a theoretical base for successful practical work. The words training and learning are synonyms. Training is a classic educational process that takes place in accordance with the basic biological, psychological, didactic, psychological, sociological and other patterns typical for the learning process. Training is a transformational process which individual or a team joins in order to achieve top result. It is customary to set a goal like achievement at the Olympic Games, World or European Championships, but the goal can be defined as achievement at lower levels. The subject of transformation is a man- sportsman. The objective of transformation is to transform the athlete with planned processes and training, from healthy state one to a healthy state two that will be better and more effective for achieving planned sports results. Under the influence of exercises (operators in training), the athlete runs a series of illnesses, which have their symptomatology. These states represent feedback for the coach about the correctness of work and they are one of the elements of training control. Man-athlete is integral being that can be presented as a cybernetic system of extreme complexity. It is composed of a large number of subsystems that are mutually interactive. The change in the state of one subsystem changes its status, but because of interaction with other subsystems, it changes their interrelationship and the status of entire system as well. It is evident that the changes which occurred under the influence of training are both quantitative and qualitative; therefore both facts should be taken into account. Changes in subsystem status, as well as changes in entire system called man can be properly programmed, implemented and monitored only when we are perfectly familiar with its structure and function. Otherwise, the process is not under control and the results are generated randomly (Bompa, 2000; Clark, 2001; Cunha, Farinatti & Midgley 2011; Cutino, Bledsone & Dennis, 1976; Lozovina, 2009; Pavičić, 1991; Trninić, Jelaska & Papić, 2009). In operational terms, training is serial of distinct, mutually separated operations (exercises) according which, at any given time, but in terms of delayed transformation, we expect to achieve planned results. The effect of individual training from the standpoint of quantitative and qualitative changes is not measurable, but the cumulative effect of repeated training even in terms of delayed transformation, after a certain time, is visible and measurable. In order to properly schedule the training it is necessary to test the initial state of athletes (initial state). It is usually the matrix of the results obtained through testing of all the features and capabilities that are relevant to certain sports activity and these are the ones we want to change and advance into the zone of better results and by doing that also improve the total result of that exact athlete. In accordance with the theoretical discoveries the coach creates matrix of desired final state, determines the system of operators (exercises) which will help him to reach the final state at any given time. He also determines a few time control points where he will measure the effects of training (transitive states). If the transitive states do not deviate from the planned result this makes the greater possibility of reaching the final state. Programmed final state of the training process is always approached with a certain probability. Regarding overall requirements, sporting events can be divided into those with higher and those with less complexity in energetic and IT terms. IT requirements relate to the totality of the technical and tactical player skills and their theoretical knowledge.

Energetic requirements relate to psychomotor skills, physiologically functional characteristics, cognitive skills and conative traits. The goal we set in the long process of athlete's training is that the athletes master all technically tactical and theoretical knowledge in their discipline and reach the highest category in their domain (like in chess, class B, class A, expert, candidate master, FIDE master, international master, grandmaster, world champion). The task for the coach is to bring the player, with such theoretical knowledge and technically tactical skills in energetic domain, into such a shape where the player is capable to demonstrate his knowledge and formulate it into a positive result at all times in range of events in domain of his competition. Coach has to bring player in such a shape, that his output probability, i.e. positive result is from 95 to 99%, which practically means that out of 100 competitions he can maximally lose up to five times or just once in his rank of competing, but not more. This approach requires high coach expertise, technology training in working with calculating machines, and teamwork in terms of utilizing the services of experts of various profiles, without which it is impossible to make a correct diagnosis and prognosis in sport, which would enable training programming. (Bompa, 2000; Lozovina, 1981; 1983; 1984; 1986; Malacko, 1986; Opavsky, 1971; Trninić, Kardum & Mlačić, 2010). Success in each sport discipline, depends on many factors such as morphological structure and material, psychomotor skills, intellectual and emotional characteristics, motivational structures, physiologically functional characteristics, technical and tactical knowledge, theoretical knowledge and more. Therefore it is necessary to make the equation specifications of each sports game, or discipline, in order to get the closest approach to theoretical and scientific knowledge of certain discipline, which allows better and more efficient programming of sports training and positive changes in the results (Lozovina, 2009). The equation for certain sports discipline specification is a mathematical expression that combines all the factors that are relevant for success in this discipline with error included. The logic of a mathematical model should reflect the logic of reality and activity. The mathematical model should fully embrace the complexity of given sports discipline. Likely, the system of differential equations would make the closest approach to reality in analysis and presentation especially when we speak of more complex disciplines. It is possible that exponential, polynomial, or even productive model would also function well. In this paper, for didactic reasons, I have chose the simplest, and perhaps the least realistic model by which it is possible to explain all the features of some sporting activity, aware of the fact that the model does not reflect actual reality, but it is still quite close. This is a linear additive model that takes no account in the interactive relations of factors, even though they really exist and are very much acting. An integral part of the specification equation is the error that consists of two component parts. The general form of the specification equation can be defined as follows:

JSW = f(a1F1+a2F2+a3F3+... an-1 Fn-1+an +S + E)

Success in sports activity is some function of dependence f of acting factors F of (F1-Fn) with the specific factor S added which participates in appearance objectively, but we have no theoretical or practical knowledge of it. Coefficients from a1 to an denote the relative influence of individual factors on sports performance. Practically, they represent the percentage of participation of this certain factor in a creation of success and theoretically they represent the sum of the coefficients which equals 1 or 100%. Symbol E in the equation denotes an error in measuring which consists of two parts. The error may be induced by measuring instrument (poor calibration, failure in recalibration after a certain number of measurements, poor sensitivity of the measuring instrument, etc.) and measurer (not using the same technique, does not measure at the same time, is not familiar with the measuring procedure, does his job incorrectly or sloppily, etc.). It is considered that familiarization of all success components in sporting activity could solve the problems of selection, sports guidance, sports specialization and problems in training programming. Due to the complexity of the equation of sporting success specification, its resolution is usually only partial, and therefore gives incomplete answers to the basic question, which is "what makes a successful athlete?" The precision of the equation depends on the research methodology, and solutions will be of different quality considering the various approaches to particular study. If we decide to analyze success components in some sporting activity through specification equation of that activity, then it is necessary to conduct the study on the top athletes of selected sport. The main objective of this paper is, in the simplest way possible, to bring this issues closer to the reader, i.e. to make equation of sport activity specification in accordance with previous practical, technical and scientific knowledge in the field of theory and mathematical modulation of sports training. (Bompa, 2000; Malacko, 1986; Lozovina, 2009; Pavičić, Lozovina & Šimenc, 1987; Pavicic, 1991; Trninić, Kardum & Mlačić, 2010).

Equation of specification

The simplest form of the equation specification could look like this:

Uw = f (a1M + a2PM + a3FFK + a4KG + a5KO + a6MS + a7DMS+ a8TE-TA + a9S + E):

Uw = success in some sports discipline, f = some function of dependence, a1 do a9 = significance coefficients of certain dimensions or abilities, M = morphological structure and competitor's conformation in that discipline, PM = psychomotor skills, FFK = physiologically functional characteristics measured by heterogeneity of anaerobic-aerobic capacity, KG = cognitive sphere (intellectual characteristics) KO = conative sphere (emotional traits),MS = motivational structure, DMS = individual position within the group (in team sport), TE - TA K = technical and tactical characteristics of players, S = specific factor (specificity), which objectively participates in activities, can be quantitatively measured or estimated, but we have no practical or theoretical knowledge of it, E = factor of measuring error. Each of factors mentioned in the equation specification is of a great complexity, and it is necessary to define it through sub-factors that it is composed of, and sometimes even through the original variables (Lozovina, 2009).

Factor M

Morphological structure of man and his composition both have an important role in every sports discipline. The first attempt to classify people into constitutional types dates from the distant past. Hypocrite (460-390 BC) set a theory about existence of four structural elements in the structure of the human body by whose qualitative variations people differ. From early beginnings to the present, in literature, we can find numerous and different types of typology in the same anthropological domain, depending on criteria they are based on. So there are many social, philosophical, psychological, morphological, and within these last, sports and psychomotor typologies. The author who deserves special attention is Kretschmer (1921), who classified his types according to completely measurable criteria. His classification system was based on three main body types: leptosomic, athletic and pyknic type. In his type analysis the author takes into account skeletal, muscular and fat components.

The next great author is Konrad (1941) who attempts to assert the principle factor which resides in basics of constitutional type formation, assuming that the genetic criteria are creating conditions for the development of different constitutions. He creates three theories under which he defines the following types: Type with conservative tendency of growth (infantile form), Type with progressive tendency of growth, Type with hypoplastic tendency of growth and Type with hyperplastic tendency of growth. American author Sheldon (1939), starting from the assumption that certain organic systems, as well as branches of three sheets (endoderm, mesoderm and ectoderm) show different trends of growth and development, defines three types: endomorph, mesomorph and ectomorph type. Since most people are combination of all three types, the author has introduced a system of mixed type identification with three numbers that vary from 1-7. This kind of typology is still in common use. Following these authors generation of factorists appears and the most significant of them are Carter and Ross. In defining somotypes, in Croatia, dominates factor approach called "Zagreb school". In the basis of this approach there are anthropometric measurements carried out by the International Biological Program. It is common to measure a set of 24 genuine anthropometric variables which allow us to identify latent structures such as: longitudinal dimensionality of the skeleton (bone growth in length), transverse dimensionality of the skeleton (bone growth in width), circularity (muscles) and subcutaneous adipose tissue. Based on the factor i.e. taxonomic procedures, we discover the types easy to define. The results obtained like this are the basis for the primary selection and sports guidance i.e. specialization (Lozovina, 1981; 1986; 2000; 2009; Lozovina & Pavičić, 1999; 2004; Malina, Bouchard & Bar-Or, 2004).

Factor PM

Psychomotor athlete skills are vital for success in any sport. Their common characteristic is that the dimensions of personality are directly responsible for solving physical tasks In their basis lies the efficiency of movement. These skills provide a powerful, fast and long-term functioning of organ systems, particularly nerve-muscle that is responsible for the intensity, duration, and precise and coordinated execution of various motor tasks. According to previous research, psychomotor skills can be divided into a number of group-factors where each one of them can be defined and operationalized.

Endurance

Basic dimensions we can visualize in three-dimensional space are: force, speed (velocity) and endurance. If we multiply force and velocity we get power and we still operate with two dimensions. Now we have power and endurance, power or intensity of work or exercise and endurance as maximum exercise duration while using that force. If we change the force, endurance will change as well. Endurance is the function of force and the force is a flow of energy (amount of energy that comes out of the subject). If we observe an issue of endurance like this and we put it in a context of high demands of today's sport, endurance shouldn't be defined as some general feature. According to this approach the term "General physical training" would be senseless as well as such type of training. Endurance can and should be defined in only one way: as strictly specific psychomotor skill which presents ability to produce demanding force by type and size in a longer time for a given activity. In this context, the term "force" implies a manifestation of psychomotor force skill which appears as repetitive, explosive, or static. Marathon runner who ran 42 km, and is probably well trained and durable doesn't stand a chance against mini-marathon swimmer who is also well trained and durable.

Training for each of these athletes should be specific and congruent to basic activity in which the athlete competes. For example, analysis of player movement in water-polo indicates that horizontal component (swimming in water-polo) is present with about 35% during one game, while vertical component (bicycle water-polo and other activities in the vertical position) is present with about 65% during the game. Subtle analysis of work intensity and duration of action as well as rhythm in the first and the second phase i.e. position, it is possible to construct a situational tests for the assessment of specific water polo player's endurance. Tests and endurance itself will be different for different roles in the game because these roles do different tasks in the game, so the demands on endurance are specific and different, both in horizontal and in vertical phase of the game. The same principle can be applied in any sports event. (Bompa, 2000; Dick, 1997; Lozovina, 1984; 2001; 2009; Lozovina, Pavičić & Lozovina, 2003; Lozovina, Lozovina & Pavičić, 2010).

Power

In commentary about some movement characteristics it's not enough to explain it with working elements. It is necessary to introduce the term power (P), which presents the work per unit time. Two people can perform the same work but with different energy expenditure and with completely different effects. For example, a pedestrian who crossed 100m in sixty seconds, performed the same work as hard as a runner who ran the same track for 10 seconds. In order to explain mentioned differences we introduced the term power which presents the work done per unit time as follows:

$$P = R/t\ ;\ P = F\,s/t\ ;\ v = s/t\ ;\ P = F\,v.$$

The complex motions that require maximal score and where the dynamic component is emphasized, have to be performed efficiently which means the most powerfully. In order to meet this criterion we have to act with the most powerful force in the longest way possible in the shortest time possible. In sports movements of a man, the power is increased by activating the larger muscle groups in the performance and totally larger number of muscles in the work. The time of performance is shortened with rational order of muscle involvement in activity. The body is moved with the action of large muscle groups (stronger muscles), then less strong and weaker muscles are activated and finally the weakest muscles that participate in that motion. With such muscle functioning we avoid the action of the weak muscles in the first stage since they are usually not capable to start the movement on their own when the body is at rest or moving at a slower pace. When we overcome the inertia of resting with the action of stronger muscle groups, then we activate the weaker muscles and exactly with such sequence of actions we reach the highest movement speed possible which is a basic requirement for the manifestation of power. Muscular force, as the only internal force of a man, is manifested under the influence of muscle contraction: isometric, when the muscle contracts, strains (is working), and fibers during the activity will remain at the same distance (the muscle remains the same length). During such muscle action there is huge energy expenditure, hindered the flow of substances and energy into the muscle and fatigue occurs relatively quickly. Such muscle activity we call static and it is typical for all enduring when a muscle tension is static and active. Muscle can be in passive static tension which occurs when muscle fibers are in such a distance, assuming the muscle is distracted, that muscle firmness does not allow greater separation of muscle fibers., - isotonic or dynamic muscle activity, when the muscle contracts (the action makes it longer or shorter) and doing so, fibers lengthen i.e. shorten (the tension in the muscle remains constant despite a change in muscle length).

Muscle can perform dynamic work with a positive effect when, with its contraction, is acting to shorten muscle fibers. This type of contraction is called concentric contraction. We also distinguish dynamic activity with negative effect which occurs in a muscle when some other force, usually external, is performing movement while the force of muscle opposes to this movement. This type of contraction is called eccentric contraction and work is called ceding work. There is another type of muscle work, i.e. contraction, called ballistic, when muscle fibers shorten in the shortest possible time. The muscle can also expand in width. Due to the contraction muscle shortens in the length, but gains in the width and such action sometimes can be used for a certain work. Of all the psychomotor skills involved in different tasks, the most important are the ones that participate in motor tasks of overcoming certain resistance or performing some work. Such psychomotor skills in physical education theory are called power functions. It is necessary to distinguish the term power as personality dimension from a term power as physical quantity. Personality dimensions are traits that enable demonstration of power, can be physically measured and they are not physical but psychological i.e. physiological traits. Within manifestation forms that demonstrate power there is one which needs to exert maximal force in minimal time. The trait which participates in such task is called explosive strength. It's the ability to perform the jump, strong punch, any fast motion in general, brief but intensive. This manifestation of the force depends primarily on the amount of activated motor units and the amount of activated motor units directly depends on several factors in the CNS. We can say that explosive strength is centrally organized trait with high coefficient of connateness, therefore, relatively less developmental. It matures earlier than other forms of power, and its development curve reaches its maximum just after twenty years of age. Explosive strength is trait which decays rapidly and after thirty years of age it decays very rapidly. We have the possibility to influence this trait and to anticipate its development if we start the process of development between 5 and 7 years of age. If we begin this process later, e.g. between 15 and 16 years of age, the possibility for development it is very small. The tests that describe and measure this type of force are as follows: long jump from the spot, high jump from the spot, triple jump and some test type- punches. The term repetitive strength implies the ability to perform as many movements (usually stereotype ones) as possible with or without load. This trait is responsible for production of the largest possible amount of work in the longest time possible. Defined like this it almost looks like endurance, but it is not. Repetitive forces is involved in motor activities that last a long time, but not too long, have high intensity, in forced rate and forced rhythm. Coefficient of connateness of this trait is very small so the possibility of developing is large. This trait is not general in terms that the one, who has large repetitive power in the legs, does not necessarily have large repetitive power in the arms, even there is significant correlation between repetitive powers among muscle groups. Training improves repetitive power relatively quickly but vice versa tremendously quickly perishes without constant exercise. It reaches its maximum around the 30-years of age, declining only after the 40 years of age. Typical tests for the assessment of these features are as follows: push-ups, pull-ups, bents, backward bending, squats, etc. with or without load. All tests are performed to failure, or to the maximum number of repetitions for the time set. Static strength is the ability to hold a load without changing posture or position of body parts, which practically means to endure some isometric contraction as long as possible. This feature has a small coefficient of connateness which means we can improve it with training. Its development is relatively slow and reaches its maximum in the age of 32. This feature is significant even though in training we do not pay as much attention to it as we should. It's probably because of ignorance. In classic lifting method, this feature is used to fix what was previously done on the level of repetitive strength, and the results of this work are more than excellent, although there are certain prejudices about the usability of such exercises. Strength can also be sorted topologically, i.e. regionally. Usually it is divided through large muscle groups and accordingly in relation to the region where the movements take place. Thus the strength can be divided as follows: strength of the arms and shoulder belt, strength of torso and strength of legs and hips. Each one of these types of strength is responsible for particular motion structure and demanding at a certain level. Actually, the most significant thing to know is how to analyze motion structures and derive conclusion about what and how much of it is required for certain sport (Komi, 1998; Lozovina, Pavičić & Jeh, 2004; Lozovina, 2001; 2009; Malina, Bouchard & Bar-Or, 2004; Marković, Jukić, Milanović & Metikoš, 2007).

Speed

Psychomotor speed, which is the correct name for this feature, is also feature which practically participates in every motor action. In the physical sense the speed is ratio of an interval of time in the distance traveled. In terms of assigning psychomotor skills to this feature or to characteristics of a man it can be defined as the ability to perform high frequency of movement in a certain time, or to ability to perform one single movement as quickly as possible. Correlation between certain range of motion and speed of performing this motion within given range is such that we obviously speak of the same feature, so when we measure the speed it is irrelevant whether we measure frequency of motion for fixed amplitude or we measure the time needed to perform one motion within given amplitude. Coefficient of connateness for this feature is extremely high, according to some authors up to 0, 95%, which means this feature under influence of training is barely developmental. Previous studies indicate that this feature is centrally organized and directly dependable on the general state of excitation and inhibition in CNS. Practical experience indicates that this feature still is developmental but in younger age and later, working with top athletes, speed training reduces to adjustment of existing speed with optimal techniques which the athlete can use within framework of his sport (Cutino, Bledsone & Dennis, 1976; Lozovina, Pavičić & Jeh, 2004; Lozovina, 2009).

Accuracy

Accuracy as psychomotor activity can be defined as the ability to hit a certain target, whether to send some projectile (a ball) toward a given target or to hit the target by guiding some object into it (e.g. sword or a fist). This definition proves that accuracy as a feature contains two aspects; - aspect of the shooting, which implies ejecting projectile at the target and – the aspect of aiming which implies guiding projectile into the target. Such definition is not complete, especially when we speak of complex motion structures when coordination among group (team) members of (sports game) is in function of reaching the target i.e. scoring. It is interesting that this feature is largely congenital and very sensitive to the emotional states and inversely proportional to the amount of fatigue. The last two reasons, put it in a unique position in the system of training, where something, what can not be totally repaired, we put in relative position in relation to the opponent and related results (one is working and the other one isn't or one is doing good and the other one is doing bad) we create differences which directly affect the result.

Tests for this ability are relatively easy to create assuming the knowledge about the structure of given sports activity exists (Lozovina, 2001; 2009).

Coordination

Coordination is a feature of extremely high complexity, hard to define almost as hard as it is to measure it. It's the ability to perform complicated motions which implies that figurative points of motion describe trajectories of high complexity. In order to perform these motions it is necessary to coordinate motions in space and time. These motor programs are dependent on the functioning of the CNS, virtually at all levels, which gives us the right to declare this feature an act of thinking - motor thinking. In accordance with objective set it is often necessary to perform the motion as quickly as possible in a given form so that final result i.e. its efficiency depends on the speed of performing complex motion structure. The next aspect of this complex motion structure speaks of ability to learn and exploit some complex action in the shortest time possible, hence the aspect of learning and accepting complex motor tasks. Further aspect of this feature is the ability to perform a non-stereotyped activities or movements. It is a form of motor creativity where with completely new action of high complexity we solve some motor problem. The final aspect is the one speaking of the ability to choose the best coordinated reaction to the defined purpose, the most rational one as well as by coordination the most efficient one what is the ultimate act of the motor but also the broader thinking and reflection. Due to the high complexity of this feature and many different forms through which it is assessed, it is necessary to perform the conclusions based on more than one test. Motor information is a set of data stored in the CNS (central nervous system), which enables implementation of some changing. We can call it a program for performance of motion and motor programs located in CNS and they can be found in different levels: The first level where only initial impulse (signal) is sufficient after which the program automatically continues and finishes at all times. In the base of this level there is an unconditional reflex (e.g. patellar reflex). The second level is the one with information stored, so in order for a program to operate it is necessary to gain additional information, which can arrive in nervous system from the outside or from the other parts of nervous system. These programs which require additional information but do not reconstruct after receiving additional information are carried out to the end as completed programs. In order to accept some action on this level we have to repeat it at least 10000 times and doing so in nervous system we leave a trace creating dynamic stereotype. The third level is the one where motor functions are only half-structured. These programs require additional information. After we receive additional information the program reconstructs and continues aligned with the target. Dynamic stereotype presents a record in CNS matching programs from the first and second level. In the moment when we feel external stimulus the program activates and we respond with motor action. This act represents a very high degree of motor thinking. The fourth level is the one where program for motion performance does not exist, only information how to make a program. After receiving the signal, program is created and starts reaction. In order to gain some motor information at the level which allows it to be used, it is necessary to repeat it at least 10 000 times which is (the most elementary technique). If the number of repetitions is smaller, information is gained on the fourth level (the program is recognized and attempted, but not acquired). (Bompa, 2000; Lozovina, Pejčić & Katić, 2003; Lozovina, 2009; Metikoš et al., 2003; Miller, Herniman, Ricard, Cheatham & Michael, 2006; Verstegen & Marcello, 2001).

Flexibility

When we mention flexibility we allude to the ability to make a motion with greater amplitude, which is possible only when the condition of the joints allows it. We also imply this as the ability to make a motion with great amplitude as quick as possible, which resembles to the speed, except in the velocity amplitude is relatively small, while in flexibility, when the amplitude is extremely large, the critical thing is not how fast we make a motion, but how much of resistance joints make while performing this action. Flexibility in terms of overall mobility of joints depends on several factors. Primarily it depends on the type of joints (one, two or three-axle), joint structure, length of passive stabilizers i.e. ligaments and active stabilizers i.e. muscles. The second characteristic is joint firmness which is supported with joint hardeners i.e. passive and active stabilizers. Passive hardeners are joint capsule and joint attachments (ligaments) within and outside the joint capsule. The negative pressure within the joint capsule has its function in joint stabilization. The principle applies; the shorter and the stronger passive joint stabilizers, the stronger the joint. The role of muscles or active joint hardeners in joint stabilization is complex. Active function in joint stabilization requires the muscles to be short. It their length is normal, even longer, it is necessary that joints are strong. We distinguish two types of joint mobility and two types of flexibility. Functional mobility is mobility with smaller amplitudes in motion which occur during daily life and working conditions. There is an alternate mobility, i.e. trained flexibility, which allows motions of much larger amplitude with outcome of achieving better sports results. It is eligible and good only where it is rational. Relevance of flexibility is large in achieving good sports result. Joint is certainly the center of motion confirmed by a fact that if it's out of use for some time (e.g. sports injury) it quickly loses its mobility and leads to shortening of all stabilizers (contractures). The arrangement of motor and kinesthetic sensation receptors, which are concentrated around the joints, also proves the relevance of joints as the source of movement. They send a report to CNS about every change in the joint, about velocity and the force that performed the motion. We can conclude that flexibility is very important feature that we have to pay attention to, especially in professional sport. Tests that measure flexibility are usually backward bands, špagát and bents. (Lozovina, 2001; 2009; Roberts & Wilson, 1999).

Balance

Equilibrium or balance is the ability to maintain body in equilibrium position in such a way that with movement of body parts, hence active muscle activity, we prevent gravity force attraction on the arm of the force generated. We distinguish three types of balance: unstable (volatile), stable and indifferent. All positions with bottom support present unstable balance. Certainty of equilibrium position is defined with polygon of support and position of general center of gravity (GCG = the point where total mass of exerciser is hypothetically concentrated) i.e. medians in relation to polygon of support. The angle of equilibrium position certainty is closed by a median driven from CG vertically to the surface and the line which connects CG with endpoint on the surface of support on that side. In two legged stance (legs apart) we have four certainty angles and thus four options to perform movement, i.e. disturbance of balance (forward, backward, left and right). Any balance will be disrupted when median exits the polygon of support that is why in many sports, maneuvering certainty angles is extremely important. Stable support presents all the heights, i.e. upper supports and it is defined as equilibrium where CG is placed below the suspension point.

Indifferent equilibrium is such a position where CG of the exerciser is at the same point as the axis of rotation. The principles of balance disruption and thus establishment of the movement, or establishment of equilibrium when disrupted, in all forms of balance, are reduced to certainty angle maneuvering, i.e. use the force of gravity and muscle force in order to maintain or disrupt balance. Equilibrium conditions in the water, for example in water polo, are extremely important for successful completion of all tasks in water polo. These conditions are more complex due to the constant changes of quasi-vertical and quasi-horizontal positions where the type of balance and certainty of balance position is concluded on the basis of relation between metacenter (center of buoyancy) and CG (the point where the mass of water polo players is concentrated and where center of gravity acts). Proper taking of the position and thus the type of the balance, determines efficiency of operations and the problem becomes more complex under active actions of the opponent in contact sports (Lozovina, 2001; 2009).

Factor PFC (Physiologically function charact.)

This term implies bioenergetics athlete potentials, i.e. overall energetic skills. These skills will be interpreted through two capacities: aerobic and anaerobic. Energy is a property of all substances, just like the mass, which can not be created from nothing, nor can be destroyed, but it can change forms. All this substances possess two types of energy; potential and kinetic. Potential energy is the energy of the position and it is pure chemical energy, while kinetic energy or energy of movement is mechanical, electrical, thermal and electromagnetic. Muscle work is also energy derived from the chemical energy. A man has two sources of energy: the energy generated and consumed in anaerobic processes and the energy generated and consumed in aerobic processes. Anaerobic processes are degradation of ATP, creatine phosphate and anaerobic degradation of glucose. Aerobic processes are processes of substance degradation in the presence of oxygen. Anaerobic processes provide large amounts of energy for a short time and serve as a source of energy for activities that last longer. Anaerobic capacity of an athlete is his ability to work with energy obtained from anaerobic processes. Anaerobic capacity depends on the specific chemical substances and reactions in the human body and the body's resistance to changes in the internal environment. It is inbred and relatively unchangeable. Aerobic capacity directly depends on the amount of oxygen the body can receive per unit of time and training can significantly increase it. Level of aerobic capacity above average is important in all sports and remarkably high values of aerobic capacity are important in endurance sports, i.e. for those sports that take place continuously and last longer than 10 minutes and where absolute maximal oxygen uptake is important. Here occurs one functional measure defined as maximal level that can be "constantly" performed and it is expressed as %O2 from max O2. According to many authors, testing of aerobic athlete abilities can be conducted with direct and indirect methods through different protocols. Direct methods are more reliable and recommended in working with athletes. As far as the very protocol concerns it seems the best is the one where the load is successively and progressively increasing. Test is conducted on the motion path. Respondent is, with electrodes on the chest, connected to monitor so we could monitor cardiogram throughout activity. Respondent has a mask on his face which he breathes in and in every moment during the test his frequency of breathing is measured. The test consists of five runs four minutes each. Between the third and fourth minute total exhaled air catches in an impervious bag for further analysis. After each load respondent is resting for three minutes when his blood sample, collected from earlobe or finger, is analyzed.

Blood sample is taken and analyzed immediately prior to testing and a half an hour after the test. Before this test, it is customary put the athlete on heart echocardiography because of parameters which will be included in later analysis. Along with mentioned analysis we perform classic spirometry on the athlete and preferably estimation of diffusion capacity. During the test the following parameters are constantly monitored: BF – breathing frequency, MVB – minute volume of breathing, O2 – the amount of oxygen, CO2 – the amount of carbon dioxide, HF – heart frequency. The following parameters are obtained: O2 consumption, CO2 elimination, respiratory quotient (RQ) CO2 /O2, respiratory equivalent MVD / O2, oxygen pulse O2 / FS. From blood sample the following parameters are determined and analyzed: pH, pCO2, pO2, HCO3, BE, SAT O2, CO2%, O2%, DO2(a-v), DCO2(v-a), lactates, glucose. Prior to testing the blood is collected from veins and artery in order to calculate arterio venous difference. To estimate the anaerobic capacity of alactate component we use workload on cycle ergometer for 30 sec. Respondent is pedaling maximum speed. During the test the time of each turn is registered. For this purpose we use photocells installed on cycle ergometer and connected to PC. During the workload current intensity achieved during one turn is determined, as well as the time of reaching and the time of maintaining maximal intensity and the amount of performed work. The current intensity in watts (W) is calculated with formula: W = L1 / t, where L1 – work performed during one pedal turn at a given workload, and t = duration of a turn in seconds. The amount of performed work is calculated with formula: L = n . P. S where n = number of turns during the entire test, P = magnitude of a given workload, expressed in KP (1 KP 0 9.81 N) S = path distance of a point on the periphery of the wheel which is exposed to friction during one pedal rotation. To estimate alactate anaerobic work capacity we use following parameters: maximum intensity in W, the time to reach maximum intensity, time of maximum intensity, the amount of performed work. Lactate anaerobic component is estimated from the original test on motion path, based on analysis of blood samples collected immediately after each workload. From the obtained values we determine the value of anaerobic threshold, a very important parameter for how to organize training, we also provide general conclusions about this component. The total anaerobic work capacity is estimated by the maximum oxygen debt. After the last workload on motion path O2 debt is registered during 30 minutes of recovery. O2 debt is calculated with formula: O2 debt = VO2 in recovery – (VO2 resting per 1 min X 30) Results obtained are expressed as VO2 total debt and VO2 debt on 1 kg of body weight. This testing is laboratory type and can be conducted only in specialized institutions. It would be desirable that testing is conducted on the field in conditions of competing which requires additional sophisticated instruments. Testing of bioenergetics athlete potentials should be conducted at least once a year since without mentioned indicators it is not possible to organize coherent training and there is always possibility that poorly programmed training causes abnormal conditions in athletes. It is also necessary, in terms of athletes energetic, that trainer has insight into the athletes' nutrition, transport of fluids, vitamins and minerals with excellent theoretical knowledge in this domain (Clark, 2001; Cunha, Farinatti & Midgley, 2011; Farniatti & Monteiro, 2010; Lozovina, 1984; 2009; Lozovina at al., 2003; 2004; 2006; 2007).

Factor CG

Consideration of direct correlation of psychological factors and sports success enabled for psychological cognitions to be treated as indivisible part of complete athlete preparation.

The first step in the psychological work with athletes is the examination of the psychological dimensions that are relevant for success in sport, but also the ones that are significant for integral development and personality functioning which can be considerably influenced within pedagogical work. Psychologists are researching the areas of intellect (cognition), emotions (conation) and motive and are engaged in the assessment of the structure and dynamics of the sports groups which is normally in the field of sociology. Recently the emotional intelligence of the athletes is also tested.

Intellectual ability of athlete's assessment

It is common that study of a certain field begins with the definition of that field. In the very beginning the disagreement of psychologists' starts related to their theoretical models, nature and structure of intellectual abilities and different definitions of the term. All definitions can be classified into three groups i.e. categories: biological definition where the intelligence is defined as the ability of adaptation and coping with new situations, pedagogic definition, which define intelligence as the ability to learn and to use previous experience and psychological definitions with emphasis on the ability to think and solve problems. None of the mentioned ways of defining the term "intelligence" is incorrect, but it's also not complete or comprehensive. The first theory about the factor analysis of intelligence set Spearman (1904). Later some more authors set their theories and we will mention significant ones as follows: Therstone (1936), Eysenck (1953), Bert (1949), Vernon (1950), Cattell (1971). In our surround best known and in standard use is a functional model of cognitive skills, cybernetic model of cognitive functioning by authors: Momirović, Wolf, Šipka & Đamonja (1978). In their studies cognitive skills were determined and functionally defined as four types of information processing or even five when cognitive response is required. Regardless of the authors and theoretical models, the fact is that the intelligence could be estimated and it is significant for top result achievement. The ability is predominantly influenced by the genetic code. It's increasing until age 40 and then declines. Testing the intellectual abilities of athletes is a job of a qualified psychologist (testing shouldn't be performed by experts of other profiles) and interpretation of results and possible interventions are a matter of coordination between coaches and psychologists. It is necessary for a coach to be familiar with factor analysis logics in order to conceptually discern factors of the first, second and third order within the sphere of intellectual testing of athletes. (Horga, 1982; Lozovina, 2001; 2009).

Factor CO

Conative skills or personality traits are of special importance for understanding and predicting human behavior in various situations, including situations in training, competition, communication with other athletes, coach, and in all situations related to sports. A common characteristic of conative factors is that they determine modalities of our behavior. This relates to how we act, hence stabile characteristics of response, not the intensity but the forms of response. Conative factors are affecting the efficiency and capability of adaptation in certain activity. If conative factors are such that modalities of our behavior and typical forms of response are in accordance with the tasks we are solving, then they should act favorably. They will act adversely if they are not in accordance with the tasks we are solving. Conative factors can be divided into two groups: normal conative factors, which are the traits normally distributed through population where medium intensity, some average value, has neither positive nor negative impact in various activities. Extreme values can have positive or negative impact, but mostly negative on human adaptation.

In normal conative factors extreme values have negative impact and mean has neutral impact. In every sport, because of the default conative space structure, we choose certain techniques and tactics. Conative factors in some combinations are essential for success in certain sports and the same or similar combinations are adverse for some other sports. In terms of physiology some conative factors depend on the speed of acquisition of conditioned reflexes, while the other depend on the total intensity of excitation and inhibition in CNS, while the third depend on mutual coordination of various physiological centers. Sociologically speaking, they depend on the specific life experience of every man, his experiences, habits acquired over a lifetime, type of upbringing and education, especially on the value system which a man accepts as his own. Cattel and Eysenck in their studies well defined normal conative factors of the first and second order. The authors of "Zagreb school" came up with similar data on our population; pathological conative factors are represented by such personality dimensions where increased intensity always decreases the degree of adaptation. The higher value of conative pathological factor is the smaller possibility of adaptation. Another feature of the pathologic conative factors is that their distribution is not normal. Conative pathological factors have a physiological basis, but they are causing disruption in personality integration. This type of disorder is created by disruption in balance between process of excitation and process inhibition. In the studies of our authors entire pathological area is made of factors of the first and second order. Model of six mechanism factors was discovered in the area of the second order and creates theoretical base of these factors. Conative factors are: 1. mechanism for the regulation and control of defensive reactions(reg. of defense ALPHA); 2. mechanism for regulation and control of organic functions (regulator of attack SIGMA); 3. mechanism for regulation and control of organic functions (reg. of organic functions HI); 4. mechanism for regulation of excitation-inhibitor processes (regulator of activity EPSILON); 5. mechanism for homeostatic regulation (system for conative function coordination DELTA); 6. system for conative function integration – ETA. Coach must be armed with basic theoretical knowledge, and psychologist is the one who conducts the testing, interpret results and give operational recommendations for interventions (Eysenck & Eysenck, 2003; Hanin, 2000; Horga, 1982; Lozovina, 2009).

Factor MS

When we speak of motivation we usually talk about what motivates a person to be active and determines the direction of that activity. Many psychologists believe that motivation is a set of complex individual factors without which the knowledge and ability factors in certain activities will be poorly expressed or even not expressed at all. This certainly refers to success in sport. There are two motive groups:

1. Large-primary or biotic motives
derived from physiological disposition of a man can be divided in: - specific organic needs, the needs that have to be fulfilled for a man to stay alive i.e. in order to keep his physical integrity. This includes the need for food, drink, and demand for thermoregulation, the rejection of byproducts and the need for movement. These requirements have different intensity, but the fact is they all need to be satisfied. The - non-specific organic needs, or libido motives include the need for pleasure, or sexual needs. Situational needs (general organic needs) include the need to escape, to fight, need for beautiful things and for humor. All this needs are tied to certain emotional states (emotions), because emotional states are only periods in the life of a motive.

If a man is able to experience positive goal, he will be associated with the state of pleasure and vice versa, if a positive goal cannot be accomplished, he will experience the state of discomfort. Experiencing discomfort, or negative emotion or frustration means to be in psychological field where a man is only influenced by negative goals. There are four basic emotional states which can be identified as: the state of joy, state of sadness or sorrow, state of anger and state of hate. The necessity to fight is usually associated with the emotion of anger. The need for escape is followed by fear emotion. The needs for beautiful and for humor are biologicaly congenital and followed by emotion of joy. All biotic needs in their development go through process of socialization because in their development they are influenced by different social backgrounds (let's just think about the differences between Western and Eastern world in food intake in quantity and timely, and through the ritual of feeding)

2. Secondary or social motives

Some of social needs are: the need for affirmation, domination and the need for group identification. The need for affirmation means that a man wants to be recognized and famous. The need for domination does not mean that person wants to be better than someone, but that he wants to know exactly where his place is in the hierarchy of society. Group identification means the need of a man to act in accordance with a group he is the member of. It is usually accomplished through the mechanisms of imitation and sympathy. There are also economical needs which enable for a man to satisfy all other needs. Biotic motives are stronger than social, but in exceptional circumstances (natural disasters), social needs tend to be stronger than biotic. In sports we have direct application of motivational structure. The term structure means that all the above motives are acting not as a simple sum, but as a separate entity, which is the structure. The overall result depends not only on the size of individual goals, but also on their organization. The goal already achieved is no longer acting as a motive and it is necessary to change the balance of such position in order to initiate repetition in behavior. If there is an obstacle on the way towards the goal in this situation the fulfillment of motives is prevented and we usually have two ways out of this situation. One way is aggressive behavior and desire to break through barriers and the other one is to be satisfied with current situation. A special problem is the conflict of double attraction. If we find ourselves between two positive goals on the same distance, the problem is to decide which goal we should adjust to (Buridan's Ass – hungry donkey standing between two huge haystacks). When we speak of a human being one motive is always stronger then the other and he will go after satisfying that motive. There is a realistic relation between the strength of the motives, the intensity of motives and the target distance. Goals that are too far have very small motivational value. This is the reason why, in sport, we always have to set intermediate targets but reachable ones. Motivation can be divided in conscious and unconscious motivation. Conscious motives are the ones whose contents can be verbalized, i.e. shared with others. Unconscious are the ones that cannot be verbalized, appear in a dream or in free associations and mistakes of everyday life. Very often our behavior cannot be explained with conscious motives, but at glance irrational actions, we explain with unconscious motives which we discovered analytically. For any type of action, our decision to perform this action is responsible. Reaction depends on two facts: utility (efficiency) of a specific goal and probability this goal will be achieved /R = U x P (result = utility x probability). The multiplication ratio is realistic, but the choices in certain situations do not depend only on the mere multiplication and bigger final result but also on individual behavior where great impact have unconscious motives, hence the ones that are not directly present in this formula. Many times utility and probability are not objective, but subjective, since we speak of an individual behavior where large role in the decision plays unconscious motives, not realistically present. They are not even present when we communicate with each other, but located deeply in our consciousness, present in a dreams and psychoneurotic symptom states and always present in mistakes of our everyday life. Conflict situation occurs when we find ourselves between two goals of equal value or we are unable to remove negative goals we are surrounded with and we have to escape. If we are facing negative goal, or obstacle we speak of frustration or deprivation. This state of discomfort is particular because it lasts longer and results with neurotic symptoms and conditions. Each conflict situation can not be declared as negative, especially in young age, because it can help young man to practice, to be active and train for later adaptations. The states of frustration (deprivation) are the states of constant failure and have far reaching consequences. There are defensive mechanisms that help to overcome this situation. Some of them are useful, some are harmful, and it is necessary to know them. The mechanism of repression is functioning in a way that a conflict situation is repressed into deeper layers and conflict is simply forgotten. Mechanism of compensation or attaching, functions in a way that we transfer from actual conflict to a new field, where spending energy on this new field we experience success. Mechanism of sublimation functions in a way that motives which are socially inferior, like sexual and aggressive needs, transforms into activities for which the responsible motives have a higher value. Mechanism of overcompensation functions in a way that in the area where we experienced failure, and we have negative emotions and frustration, we activate all the energy and achieve success. Mechanism of rationalization (making excuses) means searching for smart reason instead of the right reason. Mechanism of fantasy brings a man into position to take a creative attitude toward conflict situation and find a solution. This mechanism functions in imaginary world and often even in irrational. Such defensive mechanism is bad since it doesn't create action, but satisfies with imagination. Mechanism of identification, identifying with others usually with the authority, can be positive if we identify with realistic authority. Mechanism of projection functions in a way that a person doesn't recognize his own disabilities (faults) as his own but projects them to the others. This is very harmful mechanism, usually defensive mechanism. Mechanism of regression shapes behavior in a way that a person acts same as he was acting as a child. This is a sign of disorder and it is extremely harmful mechanism. It is believed that the regression is a result of dissociation, and dissociation is the loss of connection with reality. In our opinion within the frame of psychological analysis of athletes, this factor is the most important (Horga, 1982; Lozovina, 2009).

Factor DMS

The dynamics of micro-social environment is a factor of particular importance in team sports. It is determined by an individual in closed group and the response of the group to his position and it is tested and analyzed by sociogram method. With testing of the group and analyzing the results we create cognition about collective since mutual relations of group members are not negligible whether the relationships between them are positive or negative. Theoretically and practically the group can be homogeneous or heterogeneous. Homogeneous groups usually have better work and sport results. Testing technique is quite simple. The members of the group have three simple questions to answer.

Respondent's task is to answer each question choosing three members of collective, i.e. writing their names under ordinal numbers 1, 2, and 3. Each respondent gives nine answers, three for each question. Then we make a spreadsheet of obtained data where we write all the choices of all collective members. Based on this data, graphically, with simple circles, they draw all members on the paper and with straight lines mark all choices. Bonds in choices can be single, double (dyads) and triple (Triad), one-way and two way. Theoretically one collective can be a single-centered, if he recognizes one individual as a leader and such collective is homogenous. The other members of collective are practically acting the same as the leader. If a collective is double-centered (bipolar) and recognizes two individuals who have approximately the same number of votes, it is the bipolar group and such a collective is heterogeneous. Such collective can still function if the mutual choice of two leaders is a returning triad. If the mutual choice of the leaders in such group equals zero one of them has to leave the group, now based on external coach criteria about bigger benefit for the group functioning. The group is definitely heterogeneous if it recognizes three or more leaders. This is collective which is not manageable. This simple method is very useful in team sports and enables the coach to efficiently manage his team. (Lozovina, 2001; 2009).

Factor TE-TA

The factor of technically- tactical abilities of athletes is not easy to assess because these are the actions of large complexity. There are two possible approaches to this problem. One possible way is to, in accordance with analysis of sports game, we determine repertoire of activity elements which define all possible behaviors of athletes during the game. The set of elements containing all the elements of individual behavior of players is defined as the repertoire of techniques, and all the elements of the behavior of two or more players as a group cooperating, is defined as a repertoire of tactics and strategies. The set of elements of techniques we call repertoire of techniques. It can be divided in mutually overcovering subsets. Elements of subsets are directly determined by situation and tactics. For subset determination, criteria which generate the subset, are defined and can be as follows; possession of the ball, movement of the players, player's position, emplacements of the player, phase of the game during offence, phase of the game during defense, type of the player, element complexity, energetic requirements for element performance, necessary experience etc. Such approach in practical work is very demanding as well as methodology and gathering data for analysis. It is also necessary to be familiar with some nonstandard mathematical procedures which will be used for data analysis. Another approach, practical, is based on empirical experience of practitioners and trainers and is easier in practice. In this approach starting point is a fact that each element of individual technique is also an element of individual tactic which has strictly determined and specified tactical usability. Each element of individual tactic is also an element of group tactics, because the game is coordinated by many players who obviously conduct some group tactics, which is actually the sum of individual effects in both offence and defense. Team tactics in offence and defense is set for current game. Registering events in the game from the official record of the game and the special forms where we register all the events for each player in the game, we have created the possibility to analyze them after the game, certainly in accordance with the set tactics. Based on data analysis, with quite simple statistical methods we evaluate each player with grades from 1 to 5. On the same scale the coach gives subjective assessment of the remembered events for each player.

The total score is obtained as the arithmetic mean of these two evaluations. Based on the large number of the games for one monitored player it is possible to make a good assessment of his technically- tactical skills. One is certain, there is no situational test which would assess technically-tactical value of a player in team sports and help to predict their behavior during the game. (Lozovina, 1970; 2009; Lozovina & Pavičić, 1999; Pavičić, Lozovina & Šimenc, 1987; Pavičić, 1991).

Factor S

Factor S or specificity is an integral part of the specification equation and clearly affects the activity. Unfortunately it can not be defined except in terms of percentage (%) of success, because we have no theoretical or practical knowledge of it. The smaller this factor in some activity specification equation is the greater our theoretical knowledge about this activity.

E (error)

E, error or failure is an integral part of each measurement procedure. The error is usually composed of two component parts: the error of the measuring instrument and the error of the measurer which is more explained in introduction of this study.

Conclusion

Success in each sport discipline depends on a number of interrelated Each one represents one area of human activity, and total and mutual interaction of all of them during the sports activity is responsible for the result in that certain activity. The equation of specification is presented as a simple linear additive model, which in the simplest way describes complexity of some sports activity. My intention was, in the simplest way, to define all the factors relevant for success in each sports activity. I have tried to synthesize the principles upon which it is possible to explain the functioning of the system comprised of athletes, sports activity and sports environment. Through the factors of specification equation, I have described all skills, knowledge and features of the athletes as well as their general and specific anthropological characteristics which enable them to achieve top sports results. The data mentioned in the study serve as the basis for the planed selection, guidance and training. They are also the basis for planning and programming of athlete's training. Training planning is a complex management action, which shall specify the objectives and tasks in the training process. Training plan must be based on achievable assumptions adjusted to athlete's abilities and must be based on qualitative and quantitative measurable quantities, since only this kind of approach allows an objective evaluation of the working effects. Trainnig programming is based on the set objectives and tasks in a given real time, with material and financial conditions upon which we determine the procedures which contain: selection and arrangement of resources, loads, training methods, competitions etc. Regardless of whether the planning is short term, medium or long term, the coach must be familiar with all elements of the specification equation, has to be able to interpret the original test results of the athlete as well as technology of training programming. The coach who is not familiar with this is producing random results and does not meet the requirements of today's top sport. The coach is offered with infinite resources (physical exercises), equal to the summation of freedom of motion degrees across the joints in entire human body. It is certain the coach will make a rational and comprehensive choice of the exercises in accordance with activity he is training. Each of applied exercises is aimed at changing one or more psychomotor traits which are usually interrelated.

Under the influence of training there will be changes of that or those psychomotor traits which are quantitatively measurable. Because of the interactive relationship between the psychomotor traits, cosine of the angle will change between the traits that quantitatively changed under the influence of exercise and the ones who didn't change which means the structure will change as well. Any change in kinesiology activities is always both quantitative and qualitative. Professional trainer, for mentioned reasons, has to be familiar with "what goes with what, how and why" or in simple terms how will quantitative change of one psychomotor trait reflect the change of the structure. Occurred changes will change energetic status of the athlete as well, measured with mixed aerobic and anaerobic capacity, which is also measurable, and finally overall psychosomatic status of the athlete as an integral personality. All this have to be monitored, strictly programmed and controlled by the coach. This part of a trainers job is, in fact, manipulation with the form (shape) of player or a team which is subject to the principles of sports training theory, based on which we determine the volume of work but in function of energetic athlete's capacity development. Informatics component (techniques, tactics and strategies) is processed for a long time and in accordance with the analysis of the sports game, we determine repertoire of activity elements which will define all possible behaviors of a players during the game. The set of elements which contains all the elements of individual player's behavior is defined as technique repertoire and all the elements of two or more players as a group, cooperating, as repertoire of tactics i.e. strategies. The coach leads the player, i.e. the team to the maximal level of acquired technique, tactics and strategy for the level of competition in which he competes which on the other hand is a subject to different principles of sports training theory, i.e. learning and improving. It is also important to mention that in each training both energetic and informatics component is being processed simultaneously only their ratio is different for different types of training.

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JEDNADŽBA SPECIFIKACIJE SPORTSKE AKTIVNOSTI

Sažetak

U skladu s temeljnim načelima koji određuju teoriju i matematičku modulaciju sportskog treninga, koja uključuju antropološke, metodološke i metodičke principe planiranja, programiranja i kontrole sportskog treninga, iz didaktičkih razloga, unutar cilja istraživanja, predstavljen je najjednostavniji ali možda i najrealniji model koji može pomoći objašnjenju svih mogućnosti neke sportske aktivnosti. Model ne odražava baš potpunu realnost, ali je sigurno jako blizu. Linearni aditivni model, predstavljen u ovom radu, ne uzima u obzir interaktivne relacije među faktorima, iako iste stvarno postoje i imaju utjecaj. Izabran je takav pristup zato što, na jednostavan i "user friendly" (blizak) način, definira temeljne mogućnosti antropološkog statusa sportaša i ohrabruje čitatelja, da sukladno metodološkim i metodičkim načelima planiranja, programiranja i kontrole treninga, kreira sustavni pristup sportu u koji je uključen.

***Ključne riječi**: vaterpolo, sportska teorija, modeli, sposobnosti, metodički i metodološki aspekti*

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