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Development Management Model of Elite Athletes in Team Sports Games

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A B S T R A C T

The scientific and expert approach to defining a model of managing the development of top-level athletes in team sports games is oriented toward the challenging values that mark a certain position and role in a team sports game. A hypothetical dynamic model of development management of top-level athletes in team sports games, which explicitly shows the order of procedures in the process of multidimensional development of athletes using the concepts of the dynamic systems theory has been suggested. The hypothetical model of management shows that the athlete's development is primarily under the influence of genetic potential, sports preparation process and the competition format, as well as the management of their lifestyle. In the process, the athlete's development is seen as a dynamic and plastic process under the influence of selective procedures and training programs that enable a continuous change in the level of the athlete's performance and sports preparation process.

Key words: *model, managing, development, athlete, team sports*

Introduction

Team sports games and managing the development of athletes can be explained on the basis of the dynamic systems theory[1]. Dynamic systems represent the systems whose group of functions determines the way in which their variables change in the function of time[2]. Probably all directions in sports kinesiology introduce the dynamic systems theories where the mechanisms of self-organization are extremely important. For instance, an athlete as an individual can be seen as active and goal oriented, with unique cognitive, affective, motorically functional and morphological characteristics that possess a progressive dynamics based on the theory of complex dynamical processes (dynamic systems theory).

From the viewpoint of the dynamic systems theory, a sports team can be seen as an open, dynamic system that has to possess the ability of self-regulation. This means that a team has to form its game tactics model according to the characteristics of the whole team and individual players, as well as adapt the choice of tactical formations with respect to the level of cooperation and playing quality of the opposing team's players. Also, in the sports preparation process, according to the dynamic systems theory, mastering motor skills, the systems of defense and offence, the systems of communication and the criteria of tactical decision making encompasses the acquisition of ever more complex performance systems in a certain team sports game. The stability of the whole performance system is determined by the level of automatization reached and by employing the above-mentioned factors, which means that the motor development of athletes is primarily determined by their genetic potential and training process. Of course, the sports preparation process has to enable the conditions for the athlete's development, and the game tactics model has to facilitate the optimum of his/hers technical-tactical performance and situational efficiency in the game. One must develop specific abilities, characteristics, skills and habits for each position in team sports games[3]. This means that the selection of athletes must be grounded in a certain scientifically determined system of criteria[4,5,6]. However, the system of criteria used for evaluating players in a certain sports game needs to be permanently worked on. Having this in mind, the coaches can help athletes by showing them how to use their strongpoints, as well as how to

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hide them. For instance, coaches in cooperation with an athlete can, according to the athlete's motor development, select individual efficient actions for the athlete in question.

Development of actions in team sports games is a consequence of the situational and motor movement between the opposing teams, as well as cooperation between team-mates. In team sports games, the activity, i.e. the pattern of the team's performance, develops in the form of cooperation and opposition[7].

From the point of view of expert coaches and players, team sports games can be seen as a regulated series of assignments which each player has to accomplish according to his position and role in the team during the game phases[1,4,5]. Therefore, to program and realize an adequate model of managing the development of athletes, it is vital to possess the knowledge of technical-tactical activities, as well as the internal and external strain put on individual players[7].

During the game, the roles are constantly intertwined, so naming athletes and roles by numbers should be seen only as a beginning position from which the dynamic system of the game develops[8,9]. The importance and content of the roles changes according to the current formation of athletes and the position of the ball in the playground[10].

The development of the athlete's performance and success in a sports contest

Expert and scientific results and the coach's experience, as well as his leadership abilities are the basic prerequisites for managing the development of performance and successfulness in sports contest of both individuals and groups. In the process, the expertise and creativity of the coach are necessary to efficiently acquire and apply knowledge, but also for athletes to be successful in individual sports games. Gambeta[11] claims that top sports results today are achieved by extremely talented athletes on account of a continuous training process over a period of several years, with the help of highly competent coaches and with every available material, organizational and scientific support. Piewcewicz[12] states that new methods of building scientific accomplishment into everyday sporting practice should be constantly sought.

The selection of technical-tactical skills that are learned and applied throughout an athlete's performance and the way in which his full potential is optimally realized demand that his weak points are compensated for in a satisfactory way. It also requires a selective enhancement of the development of the athlete's potential and roles in the game tactics model, as well as selective corrections of perceived mistakes. The basic demand of modern development of athletes in team sports displays itself in the systematic and gradual learning and training, as well as in accepting high demands within one and/or more positions in the game[1]. This approach is a prerequisite for encouraging the development of polyvalent dispositions, as well as enhancing the actual quality of athletes, which presupposes that an athlete can play two or more positions and that greatly increases the choice of tactical systems of helping both in defense and offence within the game tactics model in team sports.

It is thought that, according to sport-specific variables[13] and the level of developed polyvalent dispositions, an athlete's performance or success in a high-level sports contest can be predicted. The intrapersonal factors that are evaluated at a certain age can probably be applied to the evaluation in the diagnosis of the athlete's potential for top-level sports accomplishments in senior selection[7]. It should be pointed out that the evaluation of sport-specific variables, polyvalent dispositions and the real athlete's quality should never be used to establish differences between athletes of the same team because that can disrupt the relations in the team[14,15]. By way of gaining insight into the over-all quality of athlete's in your own team[4], it is constructive to perform parallel analysis with athletes who play the same positions in other teams.

The development of polyvalent dispositions, which are genetic, is a prerequisite for a multi-dimensional, multidirectional and very plastic development[16]. The division of roles and assignments (which is found in the concept of senior selections) cannot be applied to beginners, since in the process of teaching/learning and training it is paramount to achieve the ability to understand the game with regard to each position. The structure of knowledge in the memory, the interaction between technical-tactical data and the speed and flexibility of new technical-tactical information and how quickly will it be processed and interlinked with the existing knowledge, depends on the way, timing, amount and order in which the technical-tactical data, skills and habits in the training process are acquired[1]. Therefore, the course of motor learning and training must be gradual, since heritage is very plastic, and only by suitable, dosed learning and training can different relevant specific game abilities, characteristics, knowledge, skills and habits be developed. In the development of polyvalent athletes, their specific adjustment to different positions and the development of recognition, anticipation, selective decision-making and reacting during the game is encouraged in situational trainings[17,7]. The changes in the overall actual quality of athletes during their sports career are caused by the combined effects of biological, kinesiological, psychological, sociological and cultural factors.

In the process, motor learning can be seen as a prerequisite for polyvalent disposition development and the athlete's performance and competition efficacy. This applies to the set of processes directly linked to the practice and experience that lead to relatively permanent changes in the capability for movement (»...motor learning is a set of processes associated with practice or experience leading to relatively permanent changes in the capability for movement.«)[18]. According to the dynamic systems theory, new motor skills are acquired by combining existing skills into ever more complex systems of actions.

The Connection of the Orientation, Teaching/Learning, Training, Selection and Role Specialisation Processes in Team Sports

One of the most important factors that determine an athlete's performance and competition efficacy in team sports is not only the athlete's potential and actual quality, but also the team structure (athlete selection!) and the »inner chemistry« of the team[13]. Athletes are bearers of the game tactics model, the individual and collective efforts to outmaneuver the opposing team and, therefore, the result of the competition[19,20,21,7]. An individual athlete can be evaluated by grading the state of development of his anthropologic characteristics (current possibilities) and/or by evaluating his overall game efficacy[1,17]. The athletes' potential and actual quality can be structured differently because of the great complexity of sports games and the diversity of the roles that athletes play[22]. This means that athletes manage to achieve the same complete grade of their potential or total efficacy in the game in different ways. The specific structure of the athlete's potential factors conditions the specific structure of factors that determine game efficacy. That is why not only the final values of potential or the overall game efficacy grades are important, but also the profiles of their individual factors[23,24]. The values of potential are stabile. Their changes mostly depend on the influence of the orientation, teaching/learning, training, selection and role specialization processes. Using one's potential depends on more factors. The compatibility of the role with the athlete's potential, the quality and characteristics of his/hers own team's game, and the quality and way in which the opposing team is playing are the strongest influences[23,24].

The main view held by top-level experts and scientists who research the development of top-level athletes and teams is that the selection's efficacy, an adequate game tactics model and a systematic sports preparation process determine the athletes' and team's development and their competition efficacy[25]. However, the adequate selection of athletes does not depend only on the expert subjective and objective evaluation, but also on the strictness of the selection[4].

This strictness is displayed in several aspects: how close did an athlete come to the present model values for a certain age and position in the game and those model values that are foreseen for the future; who can successfully play against high-quality teams or representative team selections; how usable is an athlete in different game tactics models and how consistent is his/hers situational efficacy, especially in high pressure competitions[1]. It is known that high-quality and low-quality athletes are least inconsistent, and average athletes the most[23,24]. In the end: as the correlation between the selection criteria[3] and predictors[7] is greater, the more successful the selection is.

In sports education over a period of several years, athletes go through five mutually interlinked processes: a) detection and recognition of player's potential, b) orientation and selection, c) teaching, learning and practice, d) roles selection, e) roles specialization (Figure 1). The result of the five interlinked processes is performance, which is connected with the teaching, learning and practicing processes, as well as with time and the level of athlete's competence. If the volume of work is increased, a higher level of athlete's competence is achieved in a shorter amount of time. The athlete's specialization process is the central concept of the development model because it generates changes in the function of development and realization of the athlete's potential. Systems cybernetic approach and with it connected training and athlete's development determines the level of performance quality[3].

The importance of the orientation, selection and specific competence procedures in the development of top-level athletes in team sports

From the point of view of athlete and teams' development, the following procedures or operations are important:

- **Orientation**. There are two levels of orientation: the orientation of children talented at certain sports and the orientation of athletes to a position and role in the game that he/she is suited for. After orienting children to a certain sport, the most successful ones, i.e., the ones who display their genetic potential to a high degree are further selected. At the first level, the orientation takes place before a systematic sports education begins, and exclusively on the basis of evaluation of the children's partial potential (motor and morphological characteristics), so that can be called preliminary orientation or pre-selection. Weineck[26] claims that first orientation to a certain sport is based on the level of motor abilities developed, firstly speed, explosive and elastic-reactive strength and agility, on antrophometric characteristics. At the second level orientation is

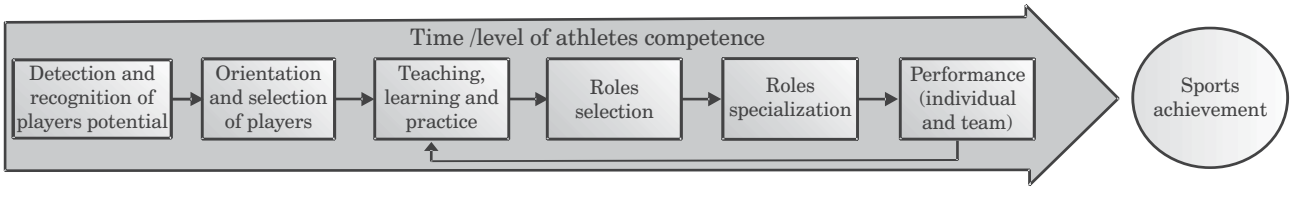

Fig. 1. Representation of mutually connected processes (orientation and selection of players; teaching, learning and practice; roles selection; roles specialization; performance) needed for sports achievement accomplishment in team sports games.

realized during a gradual sports education, and it involves orienting players to positions and roles in the game. The second level of orientation denotes selecting the most suitable position and role for individual players based on monitoring the condition of development of his/hers abilities, characteristics, competence and skills important for successful performance of game assignments characteristic for one or more positions. Weineck[26] calls this level interselection.

- **Selection**. It is defined as a group of procedures by which the most suitable individual in a team is selected for a particular position in the game. Top-level coaches try to choose athletes who can make the difference in quality with respect to the opponents in a particular competition system. It is based on a system of criteria which represent the total actual quality, but also on the genetic potential of a particular athlete[4,5]. It is because the instruction for an athlete's organism to develop and function is contained in the genes, which are inherited, and they define every characteristic of an athlete. Implemented adequately, professional selection shortens the time needed for development of an athlete and enables the coach a higher productivity in creating top-level athletes[7].
- **Specific competence of athletes**. It is defined as a long-term, systematic, continuous, gradual, measured and selective process of athlete's education and timely specialization in a particular team sports game. Trainings and training matches cannot be used to systematically enhance the athlete's competence and development if his/hers abilities, characteristics, competence, skills and habits necessary for successfully performing assignments and roles in individual positions in the game[1]. In the process, the teacher and/or coach must know which abilities, and how, help or make more difficult, i.e. speed up or slow down, gaining position-specific technical-tactical competence and skills, and, indirectly define the real athlete's quality. On the other hand, high levels of knowledge, skills and correct game habits always facilitate competence development and enhance the usability of the whole potential. Form the viewpoint of using potential, it is important to continuously work on gaining knowledge and developing technical-tactical skills and correct game habits as a senior[7]. Also, the profile of factors that define the whole potential and total quality of athletes in particular positions play an important role in rationally managing the sports preparation process (Figure 2). At the same time, multiannual cycle of sport preparation is imperatively oriented toward transformation of his/her actual quality in team sports games.

The Progress Dynamics Process in Top-Quality Athletes and Teams

In the sports preparation process, the development of athletes and teams is a multi-dimensional, multi-directional, very plastic and continuous process. Considering that in top-level sports it is not the potential that plays, but successful performance[27], the coach's encouragement for the actual quality of the athlete to develop is crucial for his performance in a particular sports game. Learning and development in athletes must be gradual.

Trninić[7] states that there are four general phases (Figure 3) that determine the progress dynamics in athletes and teams:

– The first learning phase is specific in fast progress in regard to individual and team potential, under the condition that an adequate sports preparation and social environment exists, which also determines the possibilities of change.
– The second phase is marked by a slower progress that can be the result of both internal and external limitations. The coach must differ between those two aspects of the second phase, because if he does not, he/she can misjudge the current and future abilities of the athlete and the team.
– The third phase is marked by a learning plateau, which is defined as the every periodical stability in the process of acquiring knowledge, skills and habits when there is no visible progress in the actual quality level of a particular type of athlete and the whole team.
– The fourth phase is marked by breaking the plateau based on capacity stimulation for changes. For the plateau to be broken, sophisticated systems of teaching and training in all types of preparations are necessary. Therefore, integral preparation, which is oriented on individual and team performance progress, can have a direct effect on breaking the plateau. The application of selective contents, adequate methods and encumbrance that enable positive and specific adjustment processes, makes breaking the plateau possible. That is why the flexibility, adjustment and variation in the

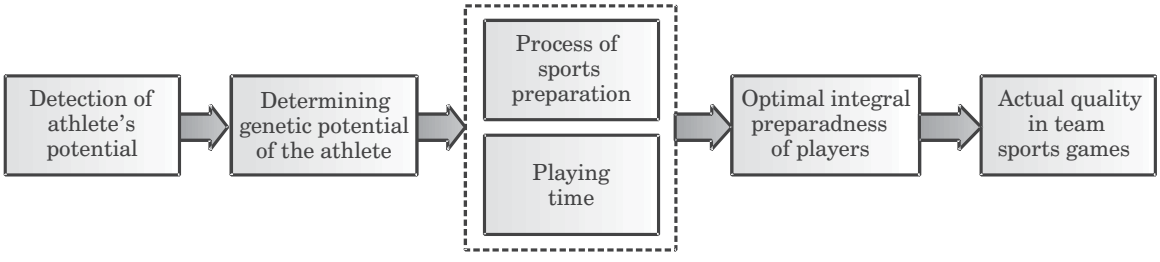

Fig. 2. Multiannual cycle of sport preparation oriented toward transformation of athlete's potential into her/his actual quality in team sports games.

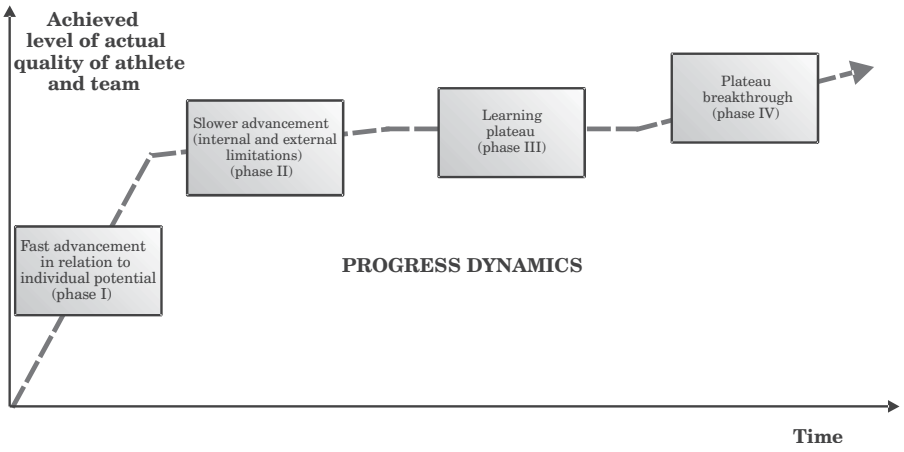

Fig. 3. Process of top-quality athletes' and teams' progress dynamics.

athlete's reactions is necessarily enticed by the methodology of integrated sports preparation where there is no one-sided influence on adaptation processes, no matter whether on a local or central level. Probably, varying the intensity of the stimulus enables the enhancement of adaptation processes within the athlete's organism.

It is important to know that the possibility of breaking through the plateau is determined by the level of the athlete's whole potential, the level of influence that motor learning methods and training have and by emergency psychological programs that are applied regarding the aim and state of the athlete's preparation[28].

Breaking through the plateau demands individualized and specific training systems, as well as emergency programs in psychological preparation for each athlete. Surpassing existing abilities ask of experts to choose selective contents, methods and optimal dosage and distribution of strain. Selecting successful training methods should coincide with the method of varying conditions and competitive-controlling method, which enable the start of adequate adaptation mechanisms responsible for breaking the plateau. In sports kinesiology there are no guarantees for plateau breaking, but there are selective procedures that enable the actual player's quality to transform.

During the early phases of the training program, the performance quality can be significantly improved. As the sports preparation process goes on, the improvement rate slows down[29]. As the training continues, further changes in the performance quality become increasingly difficult and the plateau is reached. The plateau could be determined by the genetic potential of the athlete and by the pretraining status (Figure 4), which indicates that the performance quality at this level is limited by the physiologic profile of the individual[30,31]. For example, Hoffman[29] states that physiologic limitations can influence the athlete's speed improvement ability.

Every athlete in team sports has to be prepared to get different feedback, from those that that come from understanding the performance of the task, result and the internal feedback link, whose function is anticipation[32]. As a result of this, the athlete knows when and why he/she made a mistake and what he/she should correct in his game reactions. In the sports preparation process, after numerous repetitions of technical-tactical skills, certain motor answers organize themselves into complex motor programs that adapt under the influence of sensory feedback without conscious control because sensomotor skills that athletes train transmit, under the influence of numerous repetitions, from the higher to the lower levels of the nervous system. Different hierarchically lower nerve circuits can function parallel and simultaneously, without interfering[18]. Neural circuits can be activated even before a previous game reaction ends[33], on which successfulness, progress and self-realization of every athlete is based on in competition conditions, which is then important for the team as a whole. Therefore, in the process of sports preparation, encouraging the development of speed and precision in performing a sequence of technical-tactical activities (motor programs) is crucial for clearing the athlete's cognitive functions for selective decision-making and game reactions.

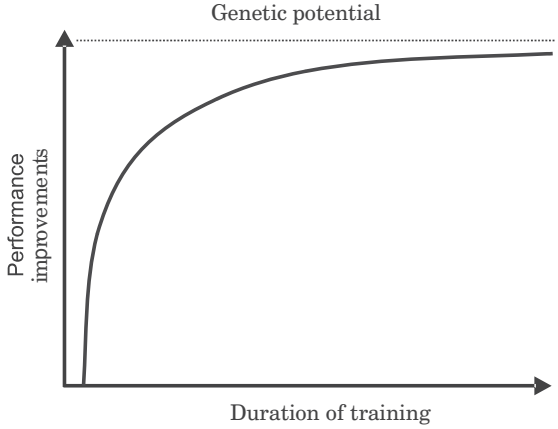

Fig. 4. Theoretical training curve[36].

The Components of Managing the Process of Optimal Development of Top-Level Athletes in Team Sports

The sports preparation process demands expert coaches for specific activities they teach, who have skills and techniques necessary for successfully transferring knowledge. Encouraging, orienting, changing and managing the development of top-level athletes according to set goals is determined by the characteristics of the coach, the whole team and by the type of the situation.

Managing the sports preparation process is based on a predetermined sequence of mutually connected procedures (e.g. reaching a high level of preparedness and sports form), while regulation of the sports preparation process applies to the procedure of setting a certain size to a desired value with a necessity of feedback in a closed loop (e.g. keeping the level of preparedness and sports form). In order to realize the rational model of managing the development of top-level athletes, it is necessary to monitor the level of preparedness (measuring and representing relevant parameters in a sport) and to understand the process of their interaction.

Encouraging the development of individual and team performance and competition efficacy lasts throughout the athlete's career. The athlete's development is a pedagogic and psychological process where the athlete's cooperation with the coach is a basis for the mutual and reciprocal effort in bettering both individual and team performance. This reciprocity in mutual effort in the structure and dynamics of a rounded process can be crucial in the effectiveness of the sports preparation[25]. We take the view that the total efficacy in a particular athlete's game can be on a high level regardless of insufficiencies in parts of the athlete's actual quality because the possibility of compensation and selective optimization of the development of the potential and role of the athlete, selection of the technical-tactical activities within the game tactics model is the strategy of procedures that need to be applied by an expert coach in the development of the athlete's performance. Compliance and adaptation of the athlete to the above-mentioned, with a selective correction of noticed mistakes is a prerequisite without which a continuous development of athletes cannot be realized. We hold that it is possible, in team sports, to continuously develop athletes by maintaining balance between selective correction of noticed mistakes in the game, selective compensation and optimizing the development of potential and roles of each athlete and the intensity of the training and competitive strain. The selection of exercises, methods and the adequate dosage and distribution of the training strain has to be in the function of developing the athlete's actual quality and both the individual and collective effectiveness of the team[7].

Trninić[7] states that many researches show that sports skills in certain team sports reach their peak between the ages twenty and thirty, and then start to diminish. During the past century, absolute performance in many sports has improved, which indicates that methods of teaching, learning and exercising have been improved. In scientist-practitioner circles the general opinion is that athletes who train the technique in competitive and above the competitive intensity, break the biological borders that determine technical-tactical and conditioning preparedness. Continuous training that is directed at improving selective technical-tactical skills and activities, selective correction of noticed mistakes and selective compensation of weaknesses and optimizing the develop-

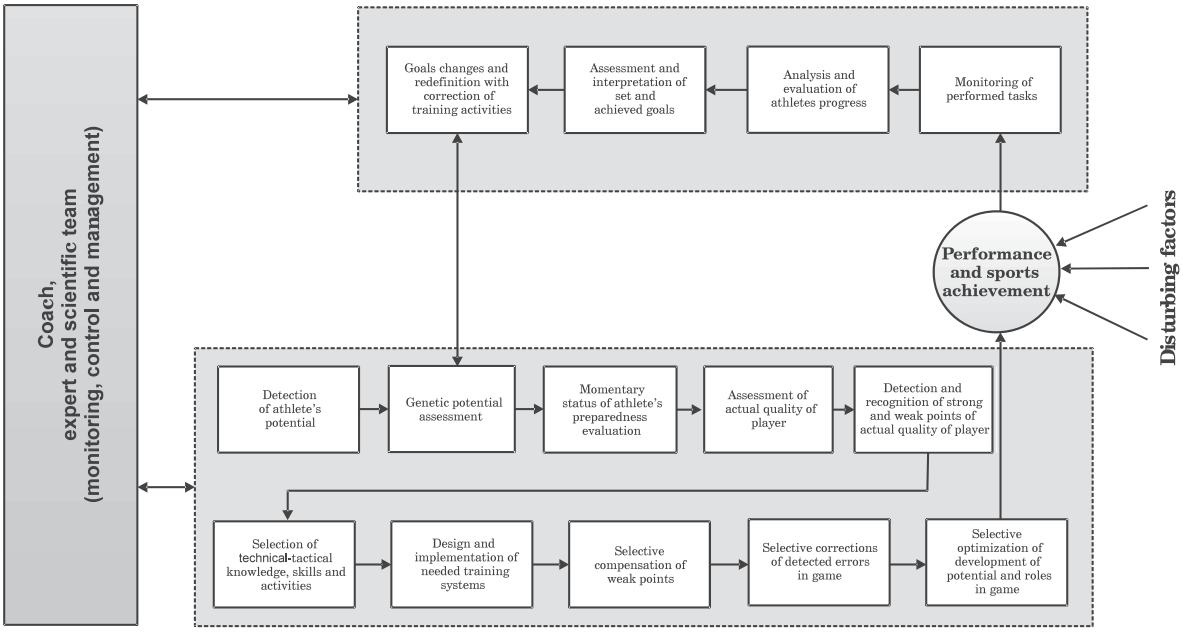

Fig. 5. Proposal of dynamical model of monitoring, control and management in development of top-quality athletes in team sports games.

ment of the athlete's potential and roles in the game leads to encouraging the usability of the genetic potential and improving the total actual quality of the athlete.

Figure 5 shows the suggested sequence of connected actions, which leads to development of top-level athletes in team sports. In the process, the coach, the expert and scientific team are responsible for complex managing actions that are primarily used for determining goals and the sequence of procedures. Managing the development of top-level athletes in team sports includes interplay of different procedures and goals in the framework of the dynamic systems theory. It is obvious that the model of monitoring, regulating and managing the development of top-level athletes in team sports is multi-dimensional, i.e. contained of a number of components. The model consists of two basic groups of modules, which enable capacity stimulation for changes, the continuous development of the usability of the athlete's potential, performance improvement and competition efficacy.

The first group is comprised of the following modules: detection of the athlete's potential, establishing the genetic potential, establishing the state of the integral preparedness of the athlete, the evaluation of the athlete's actual quality, identifying the strong and weak points of the athlete's actual quality, selection of the technical-tactical knowledge and activities in the motor learning and practicing process, forming and applying needed training systems and the mode of training, selective compensation of weaknesses, selective correction of perceived mistakes, selective optimizing of the development of potential and roles in the game as determinates of the athlete's performance and competition efficacy. The other group of modules consists of procedures that rely on information received on the basis of the level of the athlete's performance and competition efficacy. Figure 5 evidently shows the existence of feedback through the athlete's interaction with the coach, expert and health teams, but between redefining and changing goals and the established state of the athlete's preparedness, which is the corrective parameter in forming the training activity. In the process, performance and competition efficacy are two sources of information that enable monitoring individual athletes in the game and their assignment performance, situational effectiveness and effort invested, as well as he analysis and evaluation of the athlete's advancement[4,5,22]. Apart from that, reappraisal and interpretation of the set and reached goals and, in accordance with it, redefining and changing goals with correcting training activity are an important source of information for managing the sports preparation process rationally. The system just described can be operationalized and represented by the following dynamic equations:

$$INU(t+\Delta t)=f_1(x(t), D_P(t))$$

$$x(t)=f_2(G_P(t), INU(t), D_P(t))$$

$$INU(t+\Delta t)=f_1(f_2(G_P(t), INU(t), D_{PI}(t), D_P(t)) \quad (1)$$

where

$INU(t+\Delta t)$= – performance and sports achivement (competition efficacy) at the moment $t+\Delta t$

$x(t)$ – a governing size between the upper and lower groups of modules (two-way arrow) at the moment t

f_1 – function of synergy of the governing size x and the lower group of modules D_P in the moment t

f_2 – function of synergy of actions of the upper group of modules, performance, sports achivement (competition efficacy) and the module of establishing the state of athlete's preparedness at the moment t

The Description and Explanation of Required Specific Procedures in Managing the Development of the Athlete's Performance and Competition Efficacy

In the proposition of the model for monitoring, regulating and managing the development of top-level athletes in team sports, different selective procedures that enable changes in the athlete's performance were pointed out. The differences in the application of these procedures, as well as in the biological structure of athletes (e.g. genetic potential) probably lead to individual differences in the level of the competition efficacy of athletes.

In accordance with the above-stated, it is necessary to describe and explain the four required specific procedures of the first group of modules, which are the prerequisites for the athlete's performance to develop. The first procedure refers to the kinesiological concept, selection of technical-tactical knowledge and activity of a particular type of player within the game tactics model and is primarily determined on the basis of potential and athlete's actual quality[4,17]. The application of the selective procedural technical-tactical knowledge for a particular type of player is very important for the competition efficacy of the athlete and the whole team. The optimal selection of technical-tactical knowledge increases the efficacy of resolving realizing certain situations in the game. In team sports games each athlete should perfect his/hers most efficient actions.

The other procedure encompasses selective compensation of weaknesses of an athlete in the sports preparation process. It refers to the effort of just hiding or compensating for the lack of relevant abilities, characteristics, knowledge and skills[7].

Selective compensation can include certain components of preparedness, relevant abilities and particular characteristics of the athlete's actual quality that are at a low level of development. However, selective compensation has its limits. For example, to compensate for an athlete's lack of motor speed and agility in the sports preparation process, it is necessary to encourage the development of selective hypertrophy in fast muscle fibers[34,35]. Also, speed development is necessarily connected with power development. In the process, enhancing speed endurance, speed-power endurance can compensate for insufficient motor skill and agility because their high development level is a prerequisite for the development of the sports-specific speed constancy. So, the dimensions that determine the intensity of motor activity

(speed, agility, explosive and elastic reactive power) can be partially compensated by an extremely high advancement in stated variables, but also by developing functional balance, leg coordination, motor and cognitive skills, perceptive speed, recognition and anticipation speed, selective decision-making and reacting in a particular sports game. Naturally, lower level of motor speed and agility can be »hidden« with the development of the athlete's technical-tactical preparedness.

In the process, the tactical aspect of speed (e.g. the development of the athlete's ability to be fast at the right time) can be a stabile compensating parameter in competition conditions. The correct position of defense and offence, as well as readiness to react to a stimulus (situation), enables a greater usability of motor potential, but also developing the ability to simultaneously perform assignments in all game phases. It can be a basis of specific speed in a particular sports game because the stated factors enable decrease of cyclic and acyclic time programs in individual athletes. Weak results in a game quality criterion and in one or more motor abilities can be compensated by very good results in other game quality criteria. On the other side, motor-functional and/or morphological optimizing can compensate for inadequate technical-tactical preparedness of athletes. It is important to recognize the athlete's critical sides in the sports preparation process in order to realize selective compensation of weaknesses of the athlete's potential by using an integrated approach to training.

The third procedure refers to the selective corrections of mistakes perceived in the game. In the teaching and training theory this process consists of a group of procedures and techniques with the goal of correcting the perceived mistakes that enable a successful (fast and precise) performance of assignments and roles of individual players in the game[1]. It is necessary to recognize the critical sides of an athlete's quality because that is the prerequisite for selective corrections. The basic goal of knowledge transfer is to help the athlete to learn how to manage and control his own mistake correction. Selective corrections of perceived mistakes demand cognitive effort and learning motivation on the part of the athlete, as well as an optimal number of stopping training activities with the purpose of correcting the most important mistakes. In the process, the coach and the expert team should know how to set the priority scale in perceived mistakes correction, as well as deciding on the amount and form (e.g. video feedback) of information conveyed to the athletes. Case study method, which consists of a thorough analysis of an individual athlete's motor activity, is also applied for examining changes in the athlete's performance. In the sports preparation process, the athlete is required to recognize, correct and forget about the mistake. The basic goal of the selective correction of perceived mistakes in the technical-tactical preparation process is to improve the simplicity, speed and effectiveness in resolving game situations. In the athlete and team's sports preparation, selective corrections are oriented to using both the athlete and team potentials, which directly influences team's competition result. That is why selective corrections should necessarily be adapted to both the athlete and team potentials. In the sports training process a coach must know what he can efficaciously correct in individual and team game. A great number of mistakes cannot be efficaciously corrected in a single training, which is why only one or two priority goals should be chosen. It is known from sports practice that teams that make fewer mistakes win, so the importance of selective corrections in technical-tactical preparation is great. It is especially important that a coach knows why particular game elements are necessary to correct in order for the individual and/or his/her team to play more simply and efficaciously. In the sports preparation process it is probably most important when and who of the expert team corrects the perceived game mistakes. In the process, it is better if one coach implemented selective corrections in the offence phase, while the other realized the selective corrections in the defense phase. One of the crucial functions that selective corrections of perceived mistakes have is that athletes realize the importance of it and accept the correct performance of technical-tactical details, which enable timely and accurate situation resolution in all game phases[1]. In the process, expert coaches must be able to recognize the causes of mistakes (motor deficiency, incorrect technique application, psychogenic factors,...) because perceiving the causal mechanisms is a prerequisite for correcting the perceived mistakes.

The fourth procedure includes selectively optimizing the development of the athlete's potential and his/hers actual qualities. It refers to the application of methodology of integrated sports preparation that demands optimal ratio of program application of condition, technical-tactical, psychosocial, competitive and theoretical preparation[7]. For example, morphological, motor-functional optimizing and developing new skills is possible to achieve by rationally managing the sports preparation process. Apart from that, an adequate game tactics model can be the decisive factor in optimizing an athlete's role. Also, a selection of actions efficient for a particular type of player can optimize his performance and situation efficacy in a sports game. A successful development and assignments adaptation in all game phases, improving orientation and attentiveness on the game tactics model application and encouraging the development of the ability to simultaneously perform several assignments depend on the situation training strategy that minimizes the inadequacies in potential and optimally develops the actual quality of the athlete and the whole team.

Integrating those four specific procedures influences the usability of the athlete's potential, the athlete's improvement in performance and consequently increases the sports accomplishment of individual players and/or the whole team. That is why it is important to synchronize procedures and apply the transdisciplinary approach in the sports preparation process. Neglect or discoordination in the above-mentioned procedures can lead to an inadequate development in the athlete's individual and team performance.

Wylleman[37] states that when researching development of a sporting career, one shouldn't focus solely on athlete's development from scratch or in terms of a particular sport, but also on other areas of their lives (e.g. Academic, psychosocial and professional). Stimulating athlete's development includes overcoming problems and challenges of each career period. Also, successful adaptations from one category competition to another, and adaptations on the progression of the training and competitive load are a precondition to reaching the master phase that is chronologically different among sports. Thus, for example, the master phase can easily end at the age of 18 or 19 for gymnasts, and on the other hand can be just the beginning of the master phase for a rower[37]. Finally, expert coaches have a goal to form self-managing, selectively decision-making, self-tutoring, self-training and self-motivating athletes. Managing athlete's career demands the coach to cooperate also with the sports psychologist who has the knowledge and the competence in the area of lifestyle management[38–40].

Conclusion

Managing the development of top-level athletes is a complex and dynamic process that demands the application of dynamic systems theory. It is one of possible paradigmatic frameworks for researching the development theory of potential top-level athletes, which is based on the order of dynamic procedures within the sports preparation process. The athlete is a dynamic system whose structure of actual quality, dynamics and development can be determined and explained on the grounds of the dynamic systems theory. The consequence of the rapid development of team sports games is a constant shift in success standards for all positions in a particular sports game. That is why the theory of the athlete's multi-dimensional development is multi-directional and primarily based on transforming his polyvalent dispositions. This is also evident in encouraging the development of the ability to play multiple positions in a sports game. So, the athlete's development is a multi-dimensional and plastic process that is under the influence of the genetic potential, the sports preparation process and the competition system, as well as the social and sports environment. It is supposed that the estimate of the genetic material and the application of methodology of integrative sports preparation are necessary for rationally managing the development of top-level athletes. The entire sports preparation is a transformation process, which primarily has to be based on the determined genetic potential, the athlete's preparedness state, the evaluation of the athlete's actual quality and recognition of his weak and strong sides. These four sources of information are prerequisites for the procedures of the technical-tactical knowledge and activities selection, selective compensation of the athlete's weaknesses, selective correction of perceived game mistakes and selectively optimizing the development of the athlete's potential and roles in the game. The stated procedures demand forming and applying necessary individualized and specific training systems and an adequate training mode. Encouraging the importance of the athlete's individual progress, developing motivation in order to continuously learn and perfect technical-tactical skills and game understanding are probably three most important behaviour aspects of successful teachers and/or coaches, which enable the continuous development of athletes.

For a continuous development of athletes and teams it is important to determine which athletes are capable to transform from one role to another, and which have distinctive polyvalent dispositions that are the prerequisite for developing polyvalent technique, tactics and game. Also, the process of gradual increase in abilities and skills relevant for a particular sports game can be crucial for he development of athletes in team sports.

In the process, selectively optimizing along with compensating and the selection of technical-tactical knowledge in the learning and training process and activities within the game tactics model, as well as selective corrections of perceived mistakes in a particular sports game demand forming and applying necessary training systems and a sequence of strategies which should be applied by expert coaches in order to realize the concept of continuously bettering the performance and competition efficacy of athletes and/or the whole team.

According to the stated facts, in the model of managing the development of top-level athletes in team sports, it is crucial to use methodology of integrated approach to athlete's preparation to optimize the development of potential and player's actual quality. The model of relations between particular programs within the integral sports preparation, the volume variables and the intensity of the training strain in both multi-annual and annual cycles, as well as cognitive and physical effort in learning and training can be the decisive factors in the development of elite athletes.

Sports diagnostics and prediction is a vast basin of statistical-mathematical methods which may be relevant not only in the process of the selection of players, but in the rational management of sports preparation and coaching of a team as well. Modern information technology is a great help in more quality data mining and processing. Algorithmic and system approaches offer instruments for an exact description of the monitored processes. The results are usable in quality planning, programming and the execution of sports preparation.

In top-level sport it would be advisable to use the assessing methodology based on the theory of time chains. This methodology will allow the processing of data of an individual player and/or of a whole team, collected by multiple measurements during certain time cycles to form a basis on which predictions may be founded of a player's actual quality and the total potential of a team. Successful sport prognostics cannot exist without the prediction of the actual quality of the players and of team play quality in a certain time period.

REFERENCES

1. TRNINIĆ S, Structural analysis of knowledge in basketball. PhD Thesis. In Croat (University of Zagreb, Zagreb, 1995). — 2. MARINIĆ D, Psihologijske teme, 17(1) (2008) 155. — 3. TRNINIĆ S, PAPIĆ V, VUKIČEVIĆ D, Acta Kin, Vol. 2(1) (2008) 24. — 4. TRNINIĆ S, PERICA A, Dizdar D, Coll Antropol, 23 (2) (1999) 707. — 5. TRNINIĆ S, DIZDAR D, DEŽMAN B, Coll Antropol, 24 (2) (2000) 431. — 6. HRASTE M, DIZDAR D, TRNINIĆ V, Coll Antropol, 32(2) (2008) 851. — 7. TRNINIĆ S, Selection, preparation and guidance of basketball players and team. In Croat (Zagreb, Vikta-Marko, 2006). — 8. LEBED F, Eur. J. Sport Sci, 7(1) (2007) 55. — 9. MCGARRY T, FRANKS JM, Eur. J. Sport Sci, 7(1) (2007) 47. — 10. TRNINIĆ S, PAPIĆ V, VUKIČEVIĆ D, Acta Kin, Vol. 2(2) (2008) 14. — 11. GAMBETTA V, NSCA, 4(3), (1989) 7. — 12. PIEWCWICZ J, Item No. 14, IOC, Lausanne, (1994). — 13. SILVA JM, STEVENS DE, Psychological Foundations of Sport (Pearson Education Company, Boston, 2002). — 14. RILEY P, The winner within a life plan for team players (New York, Berkley, 1993). — 15. TRNINIĆ V, PAPIĆ V, DIMEC T, Acta Kin, Vol. 2(2) (2008) 74. — 16. BERK LA, Psihologija cjeloživotnog razvoja, (Jastrebarsko, Naklada Slap, 2007). — 17. DIZDAR D, Evaluation of a set methods for the assessment of actual Quality of basketball players. PhD Thesis. In Croat (University of Zagreb, Zagreb, 2002). — 18. SCHMIDT RA, LEE TD, Motor control and learning: A behavioral emphasis (Champaign, IL, Human Kinetics, 2005). 19. GABRIJELIĆ M, Some team sports top athletes' manifest and latent dimensions in motor, cognitive and conative area. PhD Thesis. In Croat (University of Zagreb, Zagreb, 1977). — 20. PAVLOVIČ M, Structure of tactical thiinking of basketball players. PhD Thesis. In Slovenian (University of Zagreb, Zagreb, 1977). — 21. DEŽMAN B, Determining homogenous groups of young basketball players on the basis of some anthropometric and motor dimensions. PhD Thesis. In Slovenian (University of Ljubljana, Ljubljana, 1988). — 22. TRNINIĆ S, DIZDAR D, DEŽMAN B, Coll Antropol, 26(1) (2002) 199. — 23. DEŽMAN B, TRNINIĆ S, DIZDAR D, Coll Antropol, 25(1) (2001) 141. — 24. DEŽMAN B, TRNINIĆ S, DIZDAR D, Kinesiology, 33(2) (2001) 207. — 25. NIKOLIĆ A, Per aspera ad astra (Beograd, Playmaker Co, 1993). — 26. WEINECK J, Optimales Training (Erlangen, Perimed Fachbuch, 1988). — 27. WOOTEN M, Coaching basketball successfully (Champaign, IL, Leisure Press, 1992). — 28. CORNELIUS A, Intervention techniques in sport psychology. In: SILVA JM, STEVENS DE, (Eds) Psychological Foundations of Sport (Pearson Education Company, Boston, 2002). — 29. HOFFMAN JR, Norms for Fitness, Performance and Health (Champaign, IL, Human Kinetics, 2006). — 30. HOFFMAN JR, MARESH CM, ARMSTRONG LE, KRAEMER WJ, J Human Muscle Perform, 1: (1991) 48. — 31. HOFFMAN JR, KANG J, J Strength Cond Res, 17: (2003) 109. — 32. HORGA S, Psychology of sport. In Croat (University of Zagreb, Zagreb, 1993). — 33. TRNINIĆ S, Analysis and learning of basketball. In Croat (Pula, Vikta, 1996). — 34. TIHANY J, Leistungssport, 19(2) (1989) 41. — 35. TIHANY J, Muscle fiber and contractility properties of athletes in different sports. In: Proceedings (2nd Int. Scientific Conf. on Kinesiology, Dubrovnik, 1999). — 36. HOFFMAN JR, Physiological aspects of sport training and performance (Champaign, IL, Human Kinetics, 2002). — 37. WYLLEMAN P, The career development of elite athletes: a sport psychological perspective. In: Proceedings (4th Int. Scientific Conf. on Kinesiology, Opatija, 2005). — 38. LAVALLE D, GORELY T, LAVALLE RM, WYLLEMAN P, Career development programs for athletes. In: PATTON, W, MCMAHON M, (Eds) Career development programs: Preparation for life long career decision making (Camberwell, VIC: Australian Council for Educational Research Press, 2001). — 39. WYLLEMAN P, LAVALLE D, A developmental perspective on transitions faced by athletes. In: WEISS M, (Ed) Developmental sport and exercise psychology: A lifespan perspective (Morgantown, WV: Fitness Information Technology, 2004). — 40. WYLLEMAN P, ALFERMANN D, LAVALLE D, Psychol. Sport Exerc, 1 (2004) 7.

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OBLIKOVANJE MODELA UPRAVLJANJA RAZVOJEM VRHUNSKIH SPORTAŠA U TIMSKIM SPORTOVIMA

SAŽETAK

Znanstveni i stručni pristup oblikovanju modela upravljanja razvojem vrhunskih sportaša u timskim sportovima usmjeren je prema zahtjevnim vrijednostima koje obilježavaju određenu poziciju i ulogu u pojedinoj momčadskoj sportskoj igri. Predložen je hipotetski dinamički model upravljanja razvojem vrhunskih sportaša u timskim sportovima koji eksplicitno pokazuje redoslijed postupaka u procesu višedimenzionalnog razvoja sportaša na konceptima teorije dinamičkih sustava. Hipotetski model upravljanja prikazuje da je sportašev razvoj primarno pod utjecajem genskog potencijala, procesa sportske pripreme i sustava natjecanja te upravljanja stilom života. Pritom se sportašev razvoj promatra kao plastičan proces koji je pod uticajem selektivnih postupaka i trenažnih programa koji omogućavaju kontinuitet promjene razine sportaševe izvedbe i natjecateljske uspješnosti.