

CRITERIA OF ASSESSMENT OF SHORT TRACK RUNNERS' PROSPECTS AS MEAN OF PROMISING SPORTSMEN LOSSES' PREVENTION AT SELECTION STAGE

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Abstract. *Purpose:* to offer main criteria for assessment of short track runners' prospects. *Material:* 8 sportsmen of short track Ukrainian national team participated in the research. Influence of training means' volume on result, shown on competition distance, was determined. Both organism's functional and reserve potentials were assessed with the help of computer program D&K-test. *Results:* we have determined priority of functional indicators in selection of short track runners and for assessment of their prospects. Sportsman's potentials shall be assessed on the base of functional fitness indicators, analysis of competition practice and training process data of pervious stage of sport perfection. *Conclusions:* individualization of training process, considering physiological characteristics of definite sportsman, will permit to completely open the embedded potential. Absence of sportsman's progress with prominent functional system's characteristics points at demand in correction of training program for his sportsman.

Key words: assessment, prospects, short-track, sport selection.

Introduction

The main target of elite sports is achievement of maximal result in the chosen kind of motor functioning. One of the most characteristic trends of modern sport science is strive to transform sportsmen's training in controlled process. In this connection applied aspects of management and complex systems' analysis laws are developed. Specialists note [1, 4, 9, 10, 14, 22, 28], that clear ideas about structure of competition functioning and its components serve as a basis for working out of appropriate model characteristics and diagnosis systems for selection, control and management. Application of such approach is a positive factor in achievement of the highest result [10, 13, and 22].

Modern results in short tracking are on so high level that for their achievement it is necessary to have ideal run technique and complex of unique combination of morphological functional characteristics. It means that sport selection permits to find most promising sportsmen in due time. Then, in process of many years' sport perfection it is possible to prepare world class sportsmen and outstanding athletes [10, 12, 14, and 34].

Realization of sport selection takes place on the base of programs and test standards [12, 23]. As a rule, with assessment of sportsmen's prospects main attention of a coach is paid to quantitative changes of competition functioning's or test indicators. In most cases prospects of a sportsman are assessed on the base of visible changes. With it, the most informative indicators (medical-biological testing) about sportsmen's potentials are used minimally. In most cases this information is used by coaches not systemically, for controlling of sportsman's current health. In such cases promising sportsmen can be paid no attention to. Main reasons of this phenomenon are the following:

- Incorrect interpretation of data of medical-biological testing;
- Not compliance of training programs to sportsman's genotype;
- Absence of information about effectiveness of training tasks for definite sportsman;
- Coach's incompetence about physiological processes, which take place in sportsman's organism and their connection with results;
- Outdated information about training process;

Specialists [6, 12, 13, 15, 25, and 29] elucidated quite completely main selection criteria. However, information about priority indicators of sportsman's potentials assessment is described fragmentary. The presence of more complete information can permit for a coach to complexly assess potential of every sportsman.

It pre determined importance of our research. Solution of this problem will permit to make process of sportsmen's selection and their results' prognostication more clear and to avoid loss of promising sportsmen.

Purpose, tasks of the work, material and methods

Hypothesis: determination of main indicators of sportsmen prospects' assessment will permit to assess their potential at higher level and minimize the loss of promising sportsmen.

The purpose of the research is to offer main criteria for short track sportsmen prospects' assessment.

Material and methods:

1) Theoretical analysis and generalization of scientific and methodic literature were used in the process of the problem's studying, in setting the purpose of the research and in discussion of the received results.

2) Qualitative analysis and automated multi-parametric control of training loads in short track permitted to receive information about content and orientation of short trackers' training as well as to receive qualitative data about volumes of training means by groups and types.

3) Imitational modeling permitted to analyze physiological processes in short-tracker's organism during running distance.

4) Assessment of organism's functional and reserve potentials with the help of computer program D&K-test – permitted to register changes of functional potentials' indicators.

5) Analysis of multiple regression indicators permitted to find inter influence of results at different competition distances as well as influence of different groups of means on sportsmen's results. For determination of possible combinations of training loads we regarded the best models of multiple regressions. The best models have low values of erected in the square mean, low values of Mallows's Cp- criterion (close to number of coefficients in model, including constant) and high corrected determination coefficients.

6) Methods of logical analysis.

Results of the research

Analysis of training process data and competition results showed that partial indicators of training load influence differently on generalized and individual dynamic of sport results (see tables 1-2). To ensure comprehensive training of sportsmen for different competition distances (to make the “versatile persons”, who successfully perform in all programs) is rather difficult task. Sport achievements on all short track competition distances are determined to the largest extent by combined influence of volume of anaerobic a-lactate, anaerobic glycolytic and mixed works ($r^2=81.9-95.8\%$). With it for many sportsmen influence of aerobic work volume turned out to be significant.

Table 1. Influence of cyclic loads of different physiological orientation on averaged and individual sport results' dynamic of leading short trackers of Ukraine in 2000–2006 ($r^2, \%$)

Orientati on of training loads	Competition distances											
	500 m				1000 m				1500 m			
	M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»
AN a-lactate (A)	34.4	20.0	20.0	20.0	20.0	20.0	20.0	34.2	32.3	20.0	22.7	20.0
AN glycolytic (B)	37.6	20.0	20.0	29.2	20.0	41.4	20.0	45.1	20.0	20.0	20.0	20.0
Aerobic - anaerobic (C)	22.6	20.0	20.0	20.0	20.0	27.2	20.0	28.3	20.0	20.0	20.0	20.0
Aerobic (D)	40.9	38.8	28.9	43.9	20.0	46.4	20.0	46.1	20.0	20.0	20.0	20.0
ABC	93.4	60.0	60.0	95.6	90.4	60.0	64.3	95.8	81.9	84.1	78.6	86.0
ABD	60.0	98.8	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	80.8	60.0
ACD	60.0	99.3	62.3	60.0	60.0	60.0	60.0	60.0	60.0	60.0	78.7	60.0
BCD	70.1	96.1	63.5	85.8	73.4	60.0	93.3	79.2	60.0	60.0	60.0	67.4
Total: ABCD	96.1	99.9	80.0	95.9	98.2	80.0	99.9	99.9	94.2	87.2	81.1	93.4

Notes: in bold type indicators with highest determination coefficients (r^2) are shown.

Legend: A, B, C, D – registered indicators (kinds of loads) and their combinations from three and four variables; M – mean data of eight sportsmen for six years; «Ya.E.», «Ch.V.», «G.V.» – individual data of three team's leaders for recent 6 years.

Table 2. Influence of a-cyclic loads' main kinds on averaged and individual dynamic of leading Ukrainian short trackers' sport results in 2000–2006 (r^2 , %)

Orientation of training loads		Competition distances											
		500 m				1000 m				1500 m			
		M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»	M	«Ya.E.»	«Ch.V.»	«G.V.»
AN lactate (A)	a-	41.3	20.0	37.1	41.4	20.0	71.8	20.0	37.3	20.0	20.0	21.9	20.0
AN glycolytic (B)		58.8	20.0	20.0	35.0	25.9	34.5	20.0	59.2	40.6	20.0	20.0	20.1
Aerobic anaerobic (C)	-	63.9	20.0	20.0	41.7	62.5	20.0	40.4	56.5	78.5	69.4	25.8	66.4
Aerobic (D)		21.2	28.8	20.0	20.0	20.0	38.4	20.0	20.0	20.0	20.0	20.0	20.0
ABC		94.6	84.3	93.8	84.5	68.9	77.0	60.0	82.6	79.6	77.4	60.0	81.9
ABD		79.9	93.5	60.0	69.1	70.1	99.3	60.0	89.9	90.8	88.1	67.0	60.0
ACD		96.2	97.0	70.8	87.4	76.4	87.7	60.0	86.2	81.3	87.7	60.0	78.3
BCD		90.4	75.6	60.0	74.6	81.6	63.2	60.0	94.0	89.7	89.9	60.0	72.0
Total: ABCD		96.5	97.2	97.9	87.4	81.7	99.9	80.0	94.2	95.7	98.6	80.0	82.0
Technique (imitation) (A)		20.0	98.2	68.2	35.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Coordination (B)		72.7	21.0	56.5	86.6	67.8	20.0	64.0	61.5	40.4	24.7	20.0	88.1
Dexterity (in game) (C)		78.4	20.0	36.0	81.5	86.6	20.0	73.7	69.5	67.2	56.7	20.0	99.7
Flexibility (D)		20.0	26.1	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
ABC		78.8	99.4	82.8	90.1	89.3	69.2	77.9	69.5	82.6	95.4	96.8	99.7
ABD		75.5	99.0	97.2	88.0	72.9	60.0	85.8	63.0	60.0	60.0	60.0	90.8
ACD		79.3	98.6	95.4	88.9	93.8	60.0	91.0	70.7	79.3	65.4	60.0	99.8
BCD		79.5	60.0	67.0	88.2	95.6	82.7	77.9	70.5	84.0	98.9	94.0	99.8
Total: ABCD		80.0	99.4	100.0	90.1	96.2	83.3	92.2	80.0	87.0	98.9	99.5	99.8

Legend: see table 1.

Just by this reason we registered so substantial distinctions in individual regression models, which reflect degree of influence of one and the same volumes of differently oriented training loads on sportsmen's group.

Analysis of interconnections between fulfilled volumes of load and results of functional testing [5, 8] witness about demand in individual selection of means specifically for every sportsman (see table 3). For example, usage of glycolytically oriented training exercise will not always cause desirable result in all sportsmen's group. It is confirmed by found interconnection between volumes of training means and testing data and supplements the data of specialists [2, 4, 7, 8]

Table 3. Influence of cyclic differently physiologically oriented loads on individual dynamic of S.A. Kugayevskiy's functional potentials in 2000–2006 (r^2 ,%)

Orientation of loads	Indicators of capacity			Indicators of power			Indicators of efficiency		
	ANA MC	AMC	TMC	PCPh	PGL	PAE	W TANM	HBR at TANM	dGTF
AN a-lactate (A)	20.0	28.1	49.1	20.0	56.4	50.1	48.5	52.5	48.8
AN glycolytic (B)	28.9	49.8	70.2	20.0	58.6	56.0	48.5	58.7	38.0
Aerobic - anaerobic (C)	38.9	55.3	49.7	20.0	68.7	48.3	66.8	55.1	49.4
Aerobic (D)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
AB	40.0	51.2	70.2	40.0	62.5	58.1	52.6	60.9	49.1
AC	52.7	63.0	52.4	40.0	68.8	52.2	67.2	57.2	52.1
AD	40.0	40.0	70.3	40.0	65.4	59.1	56.6	63.0	59.4
BC	42.1	55.3	79.1	48.4	69.2	56.3	73.8	58.9	52.3
BD	40.0	55.9	71.8	40.0	58.8	56.1	48.6	58.7	40.0
CD	43.7	57.0	54.7	40.0	69.6	48.8	68.1	56.1	50.6
ABC	60.0	63.0	81.9	60.0	69.4	60.4	74.1	61.0	60.0
ABD	81.2	83.0	74.2	60.0	65.7	60.2	60.0	63.8	65.0
ACD	87.5	78.6	70.4	60.0	71.2	60.0	68.1	63.5	60.0
BCD	60.0	60.0	79.2	67.0	71.5	60.0	81.1	60.0	60.0
Total: ABCD	92.5	87.3	83.2	98.7	80.0	80.0	84.7	80.0	80.0

Notes: 1. the data were received on the base of six examinations during year.

2. In bold type indicators with highest determination coefficients (r^2) are shown. (r^2).

Legend: A, B, C, D – registered indicators (kinds of loads) and their combinations from three and four variables; MC – anaerobic metabolic capacity; AMC – aerobic metabolic capacity; TMC – total metabolic capacity; PCPh – power of creatine-phosphate energy supply source; PGL – power of glycolytic energy supply source; PAE – power of aerobic energy supply source; TANM – threshold of anaerobic metabolism; HBR – heart beats rate; threshold of anaerobic metabolism; W TANM – efficiency; HBR at TANM – effectiveness criterion in case of aerobic energy supply source; dGTF – general energy fund.

Specificity of competition short track functioning conditions existence of difference in structure of training loads. Besides, it is necessary to consider individual response to differently oriented loads. On the base of this it is possible to conclude that assessment of sportsman's prospects shall be realized in complex way. First of all – it shall be on the base of medical-biological control data, detected individual characteristics of a sportsman and analysis of training loads.

Discussion

Short track competition distances are considered to relate to zone of sub-maximal power. According to data of G.M. Panov [23] high achievements in all-round depend on level of aerobic and anaerobic energetic potentials, speed-power fitness and technical skillfulness. Factor of short tracker's specific abilities, which condition effective workability in unusual position, is also rather important [7, 12, 19, and 23]. When passing distance sportsman expends energy for fulfillment elements of technique, overcoming air resistance, friction and inertia on turns. Minimization of energy expenditure is possible at the account of optimal run technique and reasonable tactic. Every of the mentioned actions, providing their correct usage, gives increment of kinetic energy and prevent from loss of speed. The listed

above elements can be regarded as external characteristics of sportsman's model. But during realization of external characteristics in sportsman's organism physiological processes, ensuring their existence, take place.

Short track run technique's more detail analysis with the help of "imitational simulation" [3, 11, 12, 15, 16, 21] gives information about processes, which take place in organism during run. It permits to conclude that for this type of motor functioning mainly static-dynamic mode of muscular work is characteristic (maintaining of skater's posture and pushing). Such position gradually results in muscular blood circulation's disorders. During passing 1–2.5 rounds (9 – 20 sec.) in active muscular fibers sportsman expends reserves of andesine tri-phosphate (ATP) and creatine phosphate (CrPh). Then, power of these muscular fibers drops to 50% from maximum. Energy supply occurs at the account of aerobic and anaerobic glycolysis. Lactic acid accumulates and causes local fatigue. In process of passing distance new motor units (muscular fibers) start working for maintaining required posture and fulfillment technical actions. The also expend ATP and CrPh during 10-20 seconds. Power drops and is maintained only at the account of anaerobic glycolysis; local fatigue increases. Thus, in passing of distance organism has to successively recruit new motor units and more activate working muscles. Further increment of external power dictates involvement more high threshold motor units, which innervate glycolytic muscular fibers. Dynamic balance is broken. It is followed by further increase of lung ventilation, HBR and oxygen consumption. On achieving of lung ventilation and HBR extreme values oxygen consumption stabilizes and then starts to reduce. High level of $VO_2\text{Max}$ permits to avoid reduction of distance speed, which is possible owing to change of technique's dynamic stereotype and muscular fatigue.

With the help of "imitation simulation" we can conclude that result of sportsman is combination of indicators of functional fitness and high level of technical skillfulness. With it these sides of sportsman's fitness are closely interconnected. Technical mistakes in sportsman's run limit his maximal speed. Besides, for avoiding technical mistakes sportsman shall apply additional efforts for realization technical elements and it causes too early fatigue. Proper physical fitness and high level of functional fitness permit for sportsman to master optimal dynamic stereotype of run technique as well as to endure local fatigue without reduction of speed at distance. High level of run technique permits for sportsman to maintain maximal speed during long time. In this case functional fitness, with equal technical skillfulness of sportsmen, is the determining factor for achievement of positive result in competition.

Predisposition and development of organism's appropriate systems is the basis for further perfection. These data are confirmed by authors [12, 15, 16, 24, 26, 29, 31, 32], who write that development of organism's systems can not be infinite. For example, value of maximal oxygen consumption depends on the level of binding, transportation and oxygen usage system [12, 20, and 32]. As a result of training influence there happens increase of this systems functioning effectiveness. It should be noted that maximal increment for 6-10 year of training by individual training programs reaches only +20% [12, 20]. It also confirms the data that sportsmen must have certain predisposition for certain orientation of training influence, In case of absence of potentials for this orientation adaptation to increased training load can result in pathological changes. As a result there appears sportsman's inability to endure training and competition loads.

Basing on the above said we can conclude that main criterion for sportsman's potential assessment is assessment of his functional potentials. It means that it is purposeful to seek and select genetically gifted individuals, who have complex of proper indicators of organism's proper indicators even at initial stage of training (D Junioren).

When selecting children it is necessary to consider that most of morphological functional indicators as well as functional fitness indicators are inherited (see table 4). That is why at this stage coach's main attention shall be paid to children, whose parents were sportsmen in the past and specialized in kinds of sports for endurance [14, 25, 29, and 34].

Table 4. Inheritance of morphological-functional and functional fitness indicators

Property	Inheritance
Functional fitness	
Maximal oxygen consumption ($VO_2\text{Max}$)	Significant
Size of heart	Significant
Systolic volume	High
Content of muscular tissue	Significant
Muscular oxidation potential	Significant
Oxidation of lipid substrates	High

Mobilization of lipids	High
Morphological functional properties	
Length of body, upper and lower limbs	High
Length of torso, forearm and arm	High
Width of shoulders and pelvis	Significant
Body mass	Significant
Correlation of quickly contracting (QC) and slowly contracting (SC) muscular fibers	High
Anaerobic efficiency	Significant
Aerobic efficiency	Significant

With it at primary selection coach shall assess more critically progressing of one disciples' group in comparison with other, because it is rather difficult to recognize promising sportsmen among 8-11 years' age children by this property. At this stage of many years training technical elements are only embedded and the group of trainees is rather heterogeneous; that is why it would be incorrect to prognosticate future results only on the base of competition results and results of current testing. In the course of further sport perfection development of appropriate functional indicators will happen on the base of detected morphological functional properties (see fig. 1).

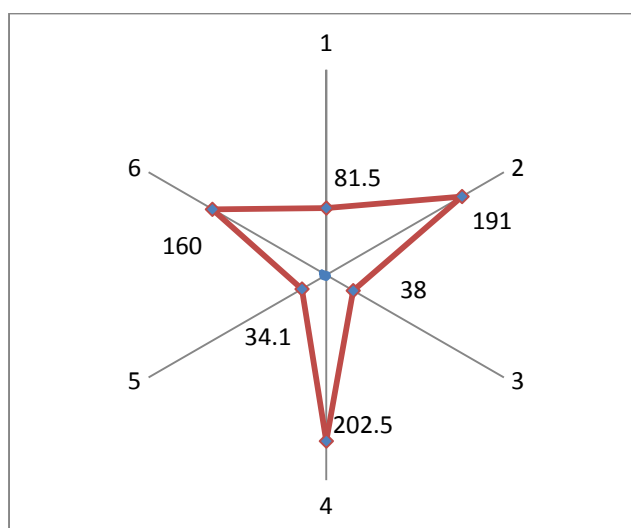


Fig.1. Averaged model of cardio-vascular and respiratory systems' indicators of elite sportsmen, specialized in kinds of sports, connected with endurance [12, 13].

1. MOC, ml*min*kg-1; 2. HBR in 1 min; 3. Minute volume of blood, l; 4. Stroke blood volume, ml; 5. Oxygen pulse, ml*b-1; 6. Lung ventilation, l*min-1

Combination of indicators of organism systems' effectiveness permits to assess with high degree of confidentiality and prognosticate level of one or another sportsman, his predisposition to one or another competition distance. These models are widely used in cyclic kinds of sports. In practice of short trackers' training they have been elucidated insufficiently as the present time.

Sportsman's technical mistakes or retention in achievement of result, with sufficient functional system's potential, is a marker, pointing at ineffectiveness of training program for the sportsman (see tables 1, 2). The conducted researches [7, 9] showed that influence of differently oriented loads on increment of competition distances' results is different for different sportsmen. It means that only individually built training, considering individual physiological characteristics of short tracker, can open embedded potential to the fullest extent. That is why the problem of selection of kinds of functioning and optimal individual loads' correlation, corresponding to functional potentials and abilities of every sportsman, is so important and urgent.

Conclusions

The materials of the research permit to make the following conclusions:

1) Analysis of the set problems permitted to conclude that modern level of biological knowledge about special endurance (main factors and mechanisms of its limiting) permits sufficiently accurately to determine the level of such systems' development for effective sport perfection as well as to create model characteristics, assess sportsmen's prospects, considering specificity of certain kind of sports. However, in practice of short trackers' training this direction is elucidated fragmentary.

2) The process of sportsman's potential assessment shall be realized on the base of functional fitness indicators, analysis of competition and training process data of preceding stage of sport perfection.

3) Individualization of training process, considering individual physiological characteristics of separate sportsman will permit to open embedded potential to the fullest extent.

4) Fragmentary character of data about required level of short trackers' organism's systems for successful competition functioning is a promising direction of further researches on this topic.

Main issues

Application of "imitation simulation" method permits to more reliably analyze the processes, which take place in sportsman's organism at time of technical elements' fulfillment. Assessment of short tracker's prospects shall be based on data of medical biological testing, medical control and only after it – on the base of competition functioning. Absence of sportsman's progress with prominent functional system's characteristics points at demand in correction of training individually for this sportsman.

The prospects of further researches: in process of further researches it is planned to construct averaged models of level of indicators, required for effective performance at every competition distance;

Determination of connection between volumes of differently oriented loads and changes of indicators will permit to more effectively plan training process and achieve required morphological-functional adaptation of organism;

Application of models will permit to more effectively realize sportsmen's selection for short tracking and minimize losses of promising sportsmen.

Conflict of interests

The author declares that there is no conflict of interests.

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