

Motor memory in sports success

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Abstract

The model of modern sports performance asks for certain graduation in the treatment of its efficiency. Besides the coaching model, what matters is the genetic potential of the child or junior, and particularly the selection of the young talented athlete identified at the proper time and included in a proper training system, in full harmony with the education process. The sports output is determined by the simultaneous action of several factors whose influences are different. At present, there is a tendency to improve those factors on which rely sports outcomes and that need to be analysed and selected. Psychic capacity is a major factor, and mental control – the power to focus, motor intelligence, motor memory, creativity, and tactical skills play a major role in an athlete's style. This study aims at showing the measure in which motor memory allows early and reliable diagnosis of future performance. The subjects selected are components of the mini-basket team of the Sports Club "Sport Star" from Timisoara, little girls that have played basketball since 1st grade in their free time (some of the girls have played it for four years). The research was carried out during a competitive year; we monitored the subjects both during coach lessons and mini-basketball championship. To assess motor memory, we used the "cerebral module" consisting in memorising a complex of technical and tactical elements and applying them depending on the situation in the field. The research also involved monitoring the subjects in four directions considered defining in the assessment of the young athletes: somatic data, physical features, basketball features and intellectual potential. Most parameters point out a medium homogeneity of the group, except for height and commitment (great homogeneity). Half of the athletes of the tested group are above the mean of the group, which allows guiding them towards higher coaching forms (allowing them to practice basketball at performance level).

Key words: *motor memory, performance, sports talent*

Rezumat

Modelul performanței sportive moderne impune o anumită succesiune în tratarea eficienței sale. Alături de modelul de antrenament se adaugă potențialul genetic al copilului sau juniorului, în mod deosebit selecția talentului depistat oportun și încadrat într-un sistem de pregătire, desfășurat în deplină armonie cu procesul de instruire. Rezultatul sportiv este determinat de acțiunea simultană a mai multor factori, a căror influențe sunt diferite. În prezent se manifestă tendința de a perfecționa acei factori de care depinde rezultatul sportiv și asupra cărora trebuie acționat analitic și selectiv. Capacitatea psihică constituie un factor principal, iar controlul mental – puterea de a se concentra, inteligența motrică, memoria motrică, creativitatea, capacitatea tactică au un rol important în exprimarea unui jucător. În studiul de față am urmărit în ce măsură memoria motrică permite diagnosticarea cât mai rapidă și fiabilă a capacităților de performanță viitoare. Subiecții selectați sunt componentele echipei de minibaschet a Clubului Sportiv „Sport Star” Timișoara, fete care practică jocul de baschet din clasa I, ca și activitate independentă în timpul lor liber, unele sportive acumulând chiar patru ani de activitate. Cercetarea s-a desfășurat pe perioada unui an competițional, urmărind subiecții atât în timpul lecțiilor de antrenament, cât și în campionatul de minibaschet. Pentru a evalua memoria motrică am recurs la utilizarea „modulului cerebral”. Acesta constă din memorarea unui complex de elemente tehnico-tactice individuale și aplicarea lor în funcție de situația de pe teren. Cercetarea a presupus urmărirea subiecților în patru direcții pe care le-am considerat definitorii în evaluarea tinerelor sportive: date somatice, calități fizice, calități baschetbalistice și potențial intelectual. Majoritatea parametrilor evidențiază omogenitate medie a grupului, excepție făcând doar înălțimea și dăruirea (omogenitate mare). Din colectivul testat jumătate dintre sportive se situează peste media grupului, ceea ce permite orientarea acestora către o formă superioară de pregătire, într-un regim care să le confere posibilitatea practicării jocului de baschet la nivel de performanță.

Cuvinte cheie: *memoria motrică, performanță, talent sportiv*

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Introduction

We are facing nowadays varied, gigantic, problematic and multifunctional performance sports. In this context, we believe that great performance in basketball can be obtained by identifying as early as possible talented athletes and systematically training them in accordance with the latest scientific developments. (1)

Basketball is the sport of complete athletes because it includes all sports: high jump, long jump, sprint, long-distance, hurdles, shooting – all are mixed and played by athletes with special features: resistance, force, dexterity, precision, attention, agility, and elasticity. (2)

Players' selection to make up performance basketball teams, their rigorous training, the changes operated by the International Basketball Federation in the game's regulation, as well as basketball training methodology improvements by specialists, in general, have all changed the high performance competition game. (3)

The model of modern sports performance asks for certain graduation in the treatment of its efficiency. Besides the coaching model, what matters are also the genetic potential of the child or junior, and particularly the selection of the young talented athlete identified at the proper time and included in a proper training system, in full harmony with the education process. The sports output is determined by the simultaneous action of several factors whose influences are different. At present, there is a tendency to improve those factors on which rely sports outcomes and that need to be analysed and selected. (4)

Study Hypothesis and Goal

This study aims at showing the measure in which motor memory allows early and reliable diagnosis of future performance.

Training children and juniors is nowadays a specific feature of performance sports. It aims at producing higher performances upon maturity based on specific models of organisation, instruction, and competitive activity. Thorough training during childhood and adolescence make up the premises for increasing the volume, intensity, and complexity of training in close relationship with the requirements of great competitions. (5)

In this context, we believe that great performance in basketball can be obtained by identifying as early as possible talented athletes and systematically training them in accordance with the latest scientific developments.

Material and Method

The research was carried out during a competitive year; we monitored the subjects both during coach lessons and mini-basketball championship.

The subjects selected are components of the mini-basket team of the Sports Club "Sport Star" from Timisoara, little girls that have played basketball since 1st grade in their free time (some of the girls have played it for four years).

Training was carried out four times a week and the basketball players also participated in trial games both in Timisoara and other cities (Arad, Oradea, Szentes – Hungary, Kikinda – Serbia), the National Basketball Festival in Brașov. We believe that, for a private club, the number of training sessions in this age category is satisfactory.

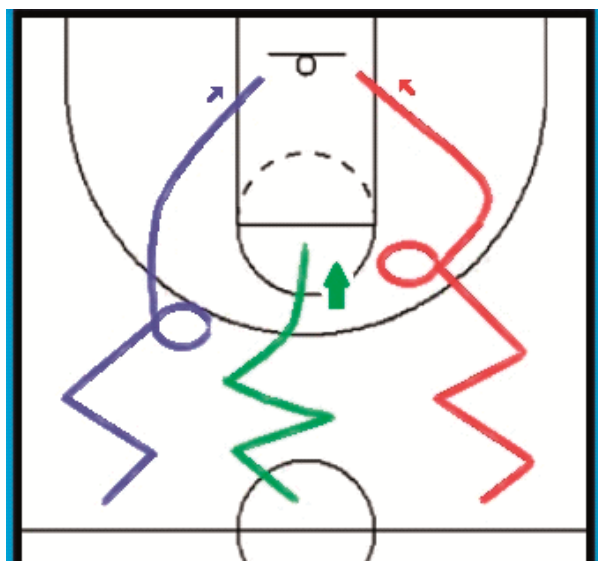
In designing and establishing the profile of the basketball players, we took into account three basic areas:

- *Physical features*: speed, force, detente, rapidity, explosion, and agility;
- *Individual technical and tactical level (basketball features)*: shooting, dribbling, pass, defence, game regulation;
- *Intellectual potential*: determination, diligence, respect, dedication.

Special attention should be paid to the factor "Cerebral potential of executing technical and tactical elements from memory" (visual and audio signs adapted depending on the changing game situations or at the basis of cerebral training).

Much emphasise is put on the training of the cerebral element. Often neglected, preparing a competition under stress has a specific weight that equals technical and tactical training.

In order to assess motor memory, we used the *cerebral module* consisting in memorising a complex of individual technical and tactical elements and applying it depending on the situation in the field.



Graph 1. Cerebral route

We marked the three paths with three different colours: blue, green, and red.

The basketball players have 3 minutes to memorise the paths and can repeat them before testing.

Step 1 – the paths are repeated mentally;

Step 2 – the paths are executed and mistakes in execution and interpretation are corrected;

Step 3 – the three paths are executed depending on the colour indicated by the coach:

- *Blue path*: dribbling with the right hand to the centre of the field – back cross-over – dribbling with the left hand – front cross-over – dribbling with the right hand – pirouette cross-over – dribbling with the left hand – throw from lay-up);
- *Green path*: dribbling with rhythm changes – throw from jump by stepping the free throw line;
- *Red path*: dribbling with direction and hand changes – front – back – pirouette – dribbling right shooting from dribbling with passing with the ball through two adversaries.

The individual assessment chart for the age level 11-12 focuses on four aspects:

1. *Somatic data*:

- height;
- weight.

2. *Physical features*:

- speed (all its forms);
- explosive force (detente);
- specific resistance;
- coordination capacity (space and time orientation).

3. *Individual technical and tactical level*:

- Throw from fixed position, throw from running from different positions, dribbling, pass, advance to hoop, triple-menace position, moving without basketball (marking, demarking), defence position, mutual help, recovery (instinct and desire).

4. *Intellectual potential*:

- Decision-making, determination, altruism, basketball player, emotional balance, leadership talent, specific talent, resistance to stress.

The parameters monitored were marked from 10 to 1, where 1 represents the minimum value and 10 represents the maximum value. These parameters were centralised for each basketball player and shown in Table 1, where 1=height, 2=weighty, 3=speed, 4=explosive force, 5=specific resistance, 6=coordinating capacity, 7=attack, 8=defence, 9=game knowledge, 10=dedication, 11=focus and resistance to stress, 12=contribution to team effort.

Results

The cerebral route is noted between 1 and 10 (1 is the lowest value and 10 is the highest value).

This test is meant to check the understanding, interpretation and use of individual technical elements under game conditions and the way they are used in the team game.

The parameters monitored in the individual assessment chart were also noted from 1 to 10, where 1 is the lowest value and 10 is the highest value. These parameters were synthesised for each basketball player and are presented in Table 1 - **Synthesis of parameters**, where 1=height, 2=weight, 3=speed, 4=explosive force, 5=specific resistance, 6=coordinating capacity, 7=attack, 8=defence, 9=game knowledge, 10=dedication, 11=focus and resistance to stress, 12=contribution to team effort.

Assessing the entire team depending on these parameters we can see that the mean is 7.59 points. Group dispersion is high, and subject assessment ranges on a scale of 36 points.

To point out the mean homogeneity of the team (12.99%).

Discussion

Due to its features, in this sport the process of selecting and training should take into account a series of somatic parameters such as size, weight, arm span, speed, and ability (6).

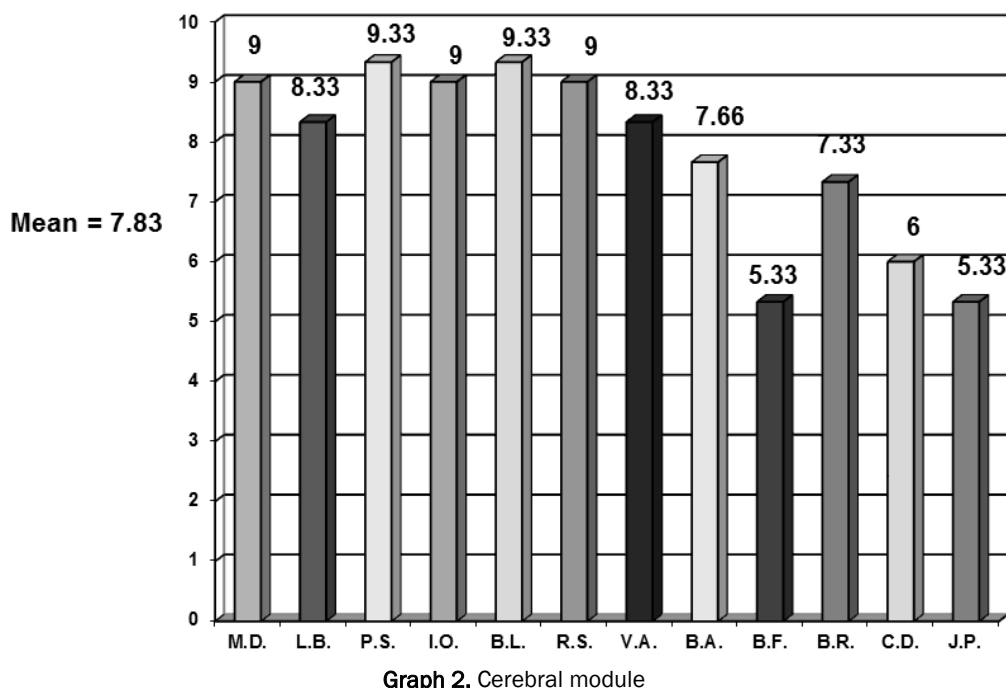


Table 1. Synthesis of parameters

No.	Subjects	Parameters												Total points
		1	2	3	4	5	6	7	8	9	10	11	12	
1.	M.D.	8	8	8	7	8	8	9	9	9	10	8	10	102
2.	LB.	10	6	7	7	6	6	7	6	7	8	6	7	83
3.	P.S.	10	10	9	9	9	8	9	9	9	10	8	9	109
4.	I.O.	10	5	8	8	8	9	9	8	10	9	9	9	102
5.	BL.	10	8	8	8	7	8	9	8	8	9	8	9	100
6.	R.S.	10	10	7	6	8	7	8	8	8	9	9	9	99
7.	V.A.	9	8	8	7	8	8	7	8	8	9	8	8	96
8.	BA.	9	8	6	6	7	7	7	8	7	8	7	7	87
9.	B.F.	9	6	5	6	6	5	7	6	6	8	6	6	76
10.	BR.	8	9	7	6	7	7	7	7	6	9	8	7	88
11.	C.D.	9	9	6	5	6	5	6	7	6	8	6	6	73
12.	F.P.	8	6	7	6	6	7	6	5	6	8	7	6	78
Statistic indices	\bar{x}	9.16	7.75	7.16	6.75	7.16	7.08	7.58	7.41	7.5	8.7	7.5	7.75	7.59
	W	2	5	4	4	3	4	3	4	4	2	3	4	36
	S±	0.83	1.65	1.19	1.13	1.02	1.23	1.17	1.23	1.38	0.76	1.08	1.42	11.84
	CV%	9.06	21.29	16.62	16.74	14.24	17.37	15.43	16.59	18.40	8.73	14.40	18.32	12.99

Besides these parameters, it is obvious that specific training is very important. Increasing performance is related to the type of training, to the repetitions during the training sessions and during the game. In this context, developing a cycle of shots to the hoop after dribbling increases precision in the volleyball players due to the motor memory developed in time. When a volleyball player practices properly the mechanics of shooting there should be repeated positive results. The goal of these exercises is to develop a natural shooting mechanics which develops proper muscle memory. Motor memory is confirmed by the study carried out by Angyan et al., which also demonstrates the dependence of this element on the visual factor (7).

To improve performances, they have also imagined and studied a series of mental processes in which a subject simulates movement without proper motor contribution. Psycho-physical experiments show that imagined movements have the same space and time features and obey the same motor and biomechanical regulations (8-13). Moreover, neurophysiologic studies show that simulated movement performed physically trigger similar motor representations and share overlapped neuronal substrata (14,15). Because they have repeatedly shown that motor image shaping improves motor performance (16-18), mental training is more and more used in sport to rehabilitate motor performance (19,20). For instance, mental training

improves muscular force (18) and arm kinematics (17,21) and reduces movement variability, thus improving serve in volleyball players (22).

Conclusions

Identifying talented children is capital in great athletes' success.

Team sports are particularly complex, and features and talents are essential in a basketball player's success. Our research aimed at monitoring the subjects in four directions that we believe defining in assessing young basketball players (girls): somatic data, physical features, basketball features, and intellectual potential. Most parameters point out the mean group homogeneity, except for height and commitment (high homogeneity) while weight points to lack of homogeneity.

Half of the basketball team are above the group mean, which suggest guiding them towards higher training forms in a regime that confers the possibility of practicing performance basketball.

Identifying talents concerns the process of identifying the most talented young athletes who, for better future results, should be trained long-term, progressively, and well organised.

Athletes' success is, ultimately, in the coaches' "sculptor" hand – the true creators of success.

Suggestions

The specialists carrying out such tests should use basic statistics to calculate mean group performance and then compare the results of each basketball player with mean performance.

In order to help the coaches who identify talents, we recommend the use of assessment grids with points for each feature and pointing out their importance in the moulding of a success basketball player.

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