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THE MANAGEMENT OF SOME OBJECTIVE PARAMETERS DETERMINATION USED IN PERFORMANCE SPORTS DIAGNOSIS

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Abstract

In performance sports, diagnosis is crucial in achieving all aspects of training management: setting educational and performance instructive objectives; preparing training to maximize the strengths of each athlete in the context of external environment opportunities and remedying weaknesses from the perspective of inherent threats; developing an individualized training strategy. The aim of the paper is to provide good practice models for our domain specialists in terms of determining objective parameters for diagnosis and prognosis in some branches and sports events. The paper proposes an investigation logistics with modern instruments, apparatus and techniques, a methodology for evaluation and appreciation of some parameters of the speed of reaction to different stimuli, the static and dynamic balance, general and segmental, explosive force, anaerobic power, reactive force, foot amplitude, in correlation with the objective parameters of the specific training. Thus, we emphasize the elements of the management of the sports diagnosis, depending on the particularities of the various sport disciplines and sports events in an individualized way. We used a complex modern logistics: the Sensamove balance platform, Opto Jump Next, the nautical conditions computer-assisted simulator for testing and training, logistics provided by the Laboratory of Research Center for Human Performance, University of Pitesti. The subjects of the research are performance athletes from two sports fields (Athletics and Bobsleigh) from CSU Pitesti, CSM Bucharest, SCM Campulung, LPS Campulung. The results confirm the working hypothesis and offer possibilities for technological transfer in other branches as well.

Keywords: Assessment, measurement , performance , training**.**

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Corresponding Author: Liliana Mihailescu
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1. Introduction

Athletes' training is a complex educational process due to the many plans that sports training require, plans that are intertwining and influencing mostly one to another (Nicu, 1993; Manno, 1996; Weineck, 1997; Dragnea, & Teodorescu, 2002).

In the management of sports training, we must take into account, on one hand, the performance's premises and, on the other hand, the structure of the performance capacity (Dragnea, & Teodorescu, 2002, p.155). A developed management should take into account the five functions of management: outlook, organization, coordination, leadership, evaluation-control and guidance (Colibaba, Evulet, & Bota, 1998, p. 48). In this context, the diagnosis seeks to obtain as complete information as possible regarding the present potential and the chances of the performance athlete development, based on his/her skills level, highlighted by objective means (Dragnea, & Teodorescu, 2002; Mihăilescu, 2017). The issue of scientific research in sports training is a competent and constantly updated one, depending on the performance evaluation in sport. The results of the scientific research in the field have also materialized in the production of apparatuses, installations and technologies for measuring-evaluation-appreciation of some important aspects of the aptitude domain, which are factors that favour or limit the human performance. The results of the scientific assistance are capitalized in the training and competition management.

2. Problem Statement

The paper answers to a natural question in sports training management - can we make an objective diagnosis of the level of specific psychomotor skills favoured in different sport disciplines and events?

The paper proposes an investigation logistics with modern instruments, apparatus and techniques, a methodology for evaluation and appreciation of some parameters of the speed of reaction to different stimuli, the static and dynamic balance, general and segmental, explosive force, anaerobic power, reactive force, foot amplitude, in correlation with the objective parameters of the specific training. Thus, we emphasize the elements of the management of the sports diagnosis, depending on the particularities of the various sport disciplines and sports events in an individualized way.

3. Research Questions

This research was conducted based on the hypothesis that by using instruments and apparatuses for measuring some parameters of the psychomotor skills we will be able to correctly assess and appreciate the specific physical training level of the athletes which will make the diagnosis more objective and provide objectives targets in the short and medium term sports outlook.

4. Purpose of the Study

The aim of the paper is to provide good practice models for our domain specialists in terms of determining objective parameters for diagnosis and prognosis in some branches and sports events.

In order to achieve the proposed goal we considered it necessary to achieve the following objectives: establishing the subjects that will be tested; the identification of measuring instruments and apparatus useful in determining the specific parameters that will be monitored; the elaboration of the technology structure

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regarding the use of the measurement logistics; establishing the methodology for measuring, evaluating and assessing the parameters approached in the research.

5. Research Methods

The main research methods approached in this paper were: documenting method, modelling method, testing method and statistical-mathematical method.

In our research we used a modern and complex measurement logistics that is part of Research Center for Human Performance laboratory, University of Pitesti. The devices that were used (the Sensamove balance miniboard, Opto Jump Next, the nautical conditions computer-assisted simulator for testing and training) is based on innovative, non-invasive technology that allows real-time data recording and offers the possibility of storing them as Notepad, Excel, and graphical files. The aforementioned measuring apparatus allowed us to perform tests that were focused on: the reaction speed to different stimuli, the static and dynamic balance (bipodal and unipodal), the explosive and reactive force, the anaerobic power and the amplitude of the ankle joint.

The selection of the tests was done in accordance with the specifics of the branches and sports events practiced by the subjects, the structure of the test battery being the following: 15 sec. jumps; Squat jump two legs; Squat jump left leg; Squat jump right leg; stiffness; March in place open eyes; March in place closed eyes; Acoustic reaction (http://www.optojump.com/What-is-Optojump); Static balance test; Proprioception balance test; Dynamic horizontal balance test; Dynamic vertical balance test (https://www.sensamove.com/en/sensbalance-miniboard); Extension amplitude measurement test (http://www.donnamaria.ro/suport/index.html).

6. Findings

From the working methodology conducting view, we considered that the tests should be done in an order that gives the subjects the opportunity to express their psycho-neuro-motor potential at maximum capacity, the measurements being carried out individually and in accordance with the training program. Thus, the first measurements were focused on the amplitude of the foot extension, the balance (static and dynamic), the ability to react to different stimuli (visual and acoustic) the experiment proceeding with the testing of the explosive force, the reactive force and the anaerobic power.

Due to the large data flow recorded in the tests, we chose present the results obtained by two of the subjects (S_1 and S_2) involved in the research.

In terms of ***measuring the reaction capacity to different stimuli*** (visual and acoustic), it was done by using the Opto Jump Next optical system that allowed us to identify the following parameters expressed in seconds and centimeters:TReac [s] - the reaction time; TFlight [s] - Flight time (the time the subject is not in contact with the ground); Height [cm] - the height at which the foot (sole) rises from the ground. Both stimuli were first applied to the right foot, then to the left foot.

The visual stimulus was given by the colour changing of a graphic item that could be viewed on the computer monitor. When the colour was changing (from red to green) the subject had to take off the foot from the ground as soon as possible while the system was measuring in real time the specific parameters Tables 01 and 02).

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Table 01. Visual reaction right leg

Reps.	TReac.[s]	TFlight[s]	Height[cm]	TReac.[s]	TFlight[s]	Height[cm]
S1				**S2**		
1	0.389	0.372	17	0.534	0.312	11.9
2	0.388	0.364	16.2	0.490	0.349	14.9
3	0.381	0.363	16.2	0.519	0.380	17.7
Avg	*0.386*	*0.366*	*16.5*	*0.515*	*0.347*	*14.9*
Std dev	*0.004*	*0.005*	*0.4*	*0.023*	*0.034*	*2.9*

Table 02. Visual reaction left leg

Reps	TReac.[s]	TFlight[s]	Height[cm]	TReac.[s]	TFlight[s]	Height[cm]
S1				**S2**		
1	0.452	0.299	11	0.496	0.309	11.7
2	0.451	0.300	11	0.466	0.289	10.2
3	0.428	0.296	10.7	0.449	0.334	13.7
Avg	*0.444*	*0.298*	*10.9*	*0.470*	*0.311*	*11.9*
Std dev	*0.014*	*0.002*	*0.2*	*0.024*	*0.023*	*1.7*

The acoustic stimulus was a sound emitted by the measuring system program to which the subject had to react by lifting the foot from the ground, the acquisition of the data being similar to the one presented above (Table 03 and 04).

Table 03. Acoustic reaction right leg

Reps.	TReac.[s]	TFlight[s]	Height[cm]	TReac.[s]	TFlight[s]	Height[cm]
S1				**S2**		
1	0.389	0.372	17	0.454	0.321	12.6
2	0.388	0.364	16.2	0.411	0.284	9.9
3	0.381	0.363	16.2	0.426	0.301	11.1
Avg	*0.386*	*0.366*	*16.5*	*0.430*	*0.302*	*11.2*
Std dev	*0.004*	*0.005*	*0.4*	*0.022*	*0.019*	*1.4*

Table 04. Acoustic reaction left leg

Reps.	TReac.[s]	TFlight[s]	Height[cm]	TReac.[s]	TFlight[s]	Height[cm]
S1				**S2**		
1	0.423	0.352	15.2	0.446	0.294	10.6
2	0.398	0.337	13.9	0.404	0.315	12.2
3	0.513	0.348	14.8	0.385	0.307	11.6
Avg	*0.445*	*0.346*	*14.7*	*0.411*	*0.305*	*11.4*
Std dev	*0.060*	*0.008*	*0.7*	*0.031*	*0.011*	*0.8*

We considered that we can use two measuring tools to ***investigate the balance capacity***, namely the Sensamove balance miniboard and the Opto Jump Next optical system. The balance platform has given us the opportunity to investigate foot balance capacity (unipodal and bipodal), and subjects were required to adopt the standard position for assessing this skill. The use of the Opto Jump Next system gave us the possibility of measuring the dynamic balance in a manner that was closer to the structural specificity of the practiced sports, the subjects performing an up knee-jog running into a given perimeter, first with visual feedback, and then without.

In terms of the data provided by the Sensamove device, they were focused on static balance, proprioception and dynamic balance, the latter being measured horizontally (left-right) and vertically

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(front-back). The results were obtained in graphical (Figure 01 - 04) and numerical form (Table 05), the values revealing performance levels expressed in percentage (%) and mean values of the four-way oscillations (front-back; left-right), expressed in degrees (^{0}). Bellow we can see the graphical results recorded by the subject S_1 and the data obtained by S_1 and S_2 in the bipodal measurements.

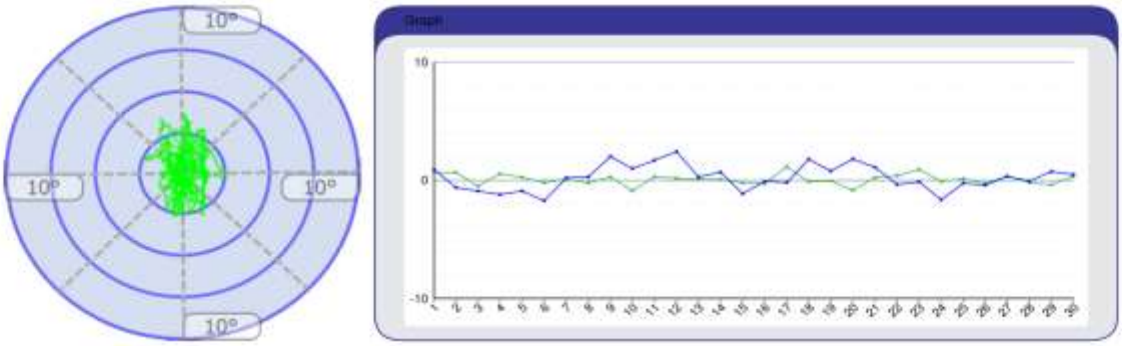

Figure 01. Static balance test S_1

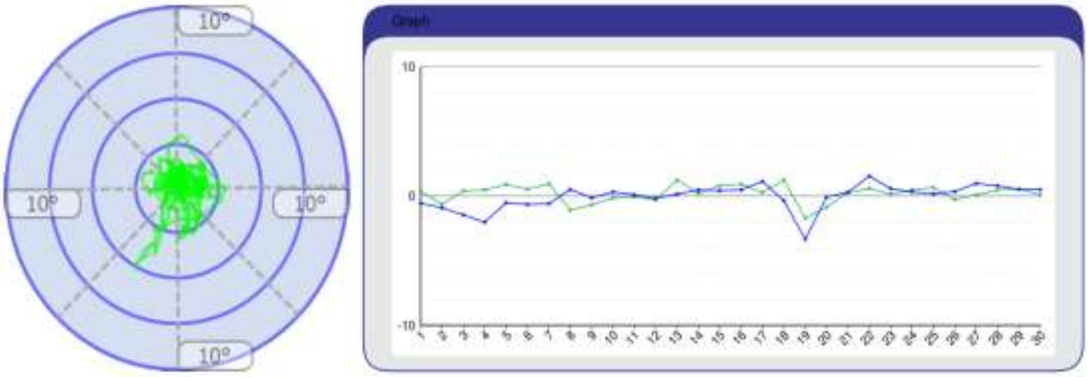

Figure 02. Proprioception test S_1

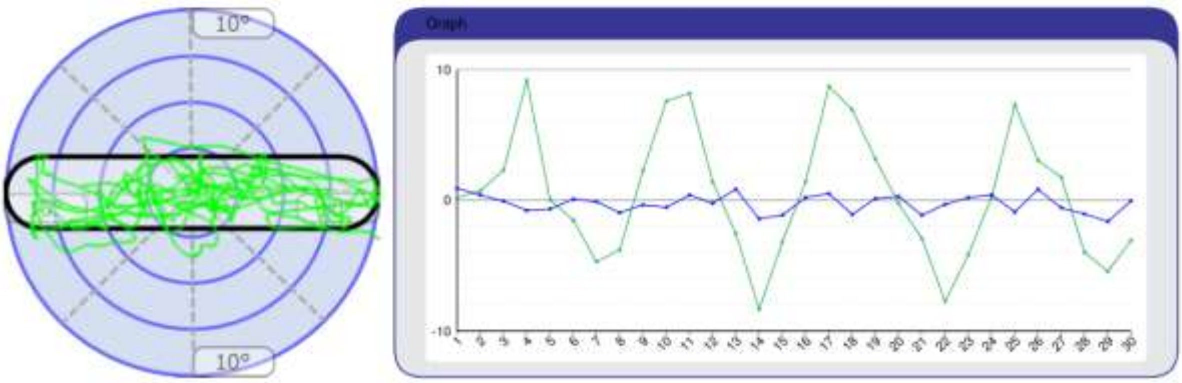

Figure 03. Dynamic horizontal balance S_1

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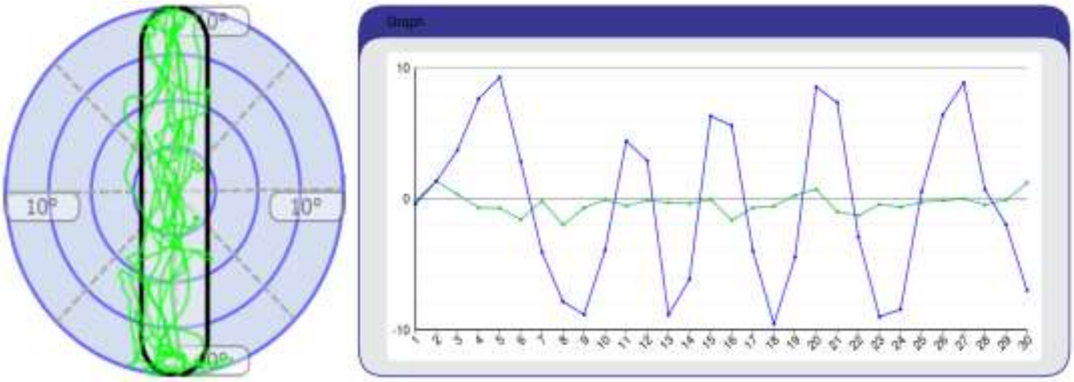

Figure 04. Dynamic vertical balance S_1

Table 05. Bipodal balance test scores

Scores/subjects	Static balance		Proprioception		Dynamic horizontal balance		Dynamic vertical balance	
	S_1	**S_2**	**S_1**	**S_2**	**S_1**	**S_2**	**S_1**	**S_2**
Performance (%)	87	80	88	81	87	74	89	86
Front, inside (%)	-	-	-	-	37	25	54	25
Back, inside (%)	-	-	-	-	49	49	35	61
Front, avg. deviation (^{0})	1.10	1.36	0.66	0.97	0.86	1.19	5.41	5.72
Back, avg. deviation (^{0})	-0.90	-0.97	-1.13	-1.03	-1.11	-1.33	-6.13	-5.32
Left, avg. deviation (^{0})	-0.51	-0.64	-0.62	-0.94	-3.78	-4.81	-1.04	-0.85
Right, avg. deviation (^{0})	0.59	1.49	0.80	1.44	4.38	4.48	0.86	1.20

Measuring the dynamic balance with the Opto Jump Next system with feed-back (table 06) and without feed-back (table 07) allowed us to record the following parameters: ground contact time, flight time (air), pace / cadence , the lateral displacement relative to the starting position of the test (negative values indicating a shift to the right, while the positive values signify a left shift), the lateral movement of the legs from one repetition to the other (the negative values indicating a shift to the right, while positive values signify a shift to the left), the distance between alternate contacts. Due to the large data volume, we have decided to present only the values of arithmetic averages and standard deviations for each parameter that was measured.

Table 06. March in place, eyes opened

Statistics	**TCont. L[s]**	**TCont. R[s]**	**TFlight L[s]**	**TFlight R[s]**	**Pace L[step/m]**	**Pace R[step/m]**	**Pace L[cycles/s]**	**Pace R[cycles/s]**	**Cycle L[s]**	**Cycle R[s]**	**Jumping Point L [cm]**	**Jumping Point R [cm]**	**Tendency L[cm]**	**Tendency R[cm]**	**Used Area L[cm]**	**Used Area R[cm]**
S_1																
Avg	*0.135*	*0.135*	*0.285*	*0.285*	*288.36*	*287.21*	*2.4*	*2.39*	*0.418*	*0.418*	*-0.811*	*-0.867*	*-0.05*	*-0.078*	*15.1*	*15.1*
Std dev	*0.008*	*0.007*	*0.021*	*0.017*	*14.5*	*16.28*	*0.12*	*0.14*	*0.023*	*0.023*	*3*	*2.9*	*2*	*1.6*	*2.4*	*2.8*
S_2																
Avg	*0.163*	*0.166*	*0.348*	*0.344*	*233.97*	*236.79*	*1.95*	*1.97*	*0.51*	*0.51*	*2.5*	*2.3*	*0.23*	*-0.017*	*14.9*	*15.4*
Std dev	*0.007*	*0.005*	*0.01*	*0.011*	*4.69*	*7.21*	*0.04*	*0.06*	*0.012*	*0.012*	*2.4*	*2.6*	*1.3*	*1.4*	*2.6*	*2.4*

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Table 07. March in place, eyes closed

Statistics	TCont. L[s]	TCont. R[s]	TFlight L[s]	TFlight R[s]	Pace L[step/m]	Pace R[step/m]	Pace L[cycles/s]	Pace R[cycles/s]	Cycle L[s]	Cycle R[s]	Jumping Point L [cm]	Jumping Point R [cm]	Tendency L[cm]	Tendency R[cm]	Used Area L[cm]	Used Area R[cm]
S_1																
Avg	*0.164*	*0.167*	*0.277*	*0.272*	*281.64*	*280.67*	*2.35*	*2.34*	*0.441*	*0.442*	*-3.9*	*-4.1*	*0.138*	*0.032*	*15.9*	*16.1*
Std dev	*0.089*	*0.096*	*0.057*	*0.035*	*32.1*	*37.42*	*0.27*	*0.31*	*0.092*	*0.096*	*7.1*	*7.1*	*3.4*	*3.1*	*5*	*4.1*
S_2																
Avg	*0.2*	*0.191*	*0.389*	*0.396*	*216.08*	*217.92*	*1.8*	*1.82*	*0.591*	*0.589*	*0.7*	*0.8*	*0.836*	*0.096*	*16.9*	*16.5*
Std dev	*0.07*	*0.048*	*0.209*	*0.235*	*33.84*	*33.39*	*0.28*	*0.28*	*0.22*	*0.241*	*8.5*	*9.2*	*4.8*	*5.7*	*7.9*	*4.9*

Explosive force measurements were made using the Opto Jump Next system using a five-jump Squat Jump test, first on in bipodal way (Table 08), then after a rest time, in bipodal one (tables 09 and 10). Applying the test gave us the possibility to determine the following kinematic and dynamic parameters for each of the five jumps: the time of contact with the ground (TCont. [S]), the flight time (TFlight [s]), the height of the jump (Height[cm]), power (Power[W/Kg]), cadence (Pace[step/s]) and reactive strength index (RSI [m/s]).

Table 08. Bipodal Squat Jump test

Reps.	TCont.[s]		TFlight[s]		Height[cm]		Power[W/Kg]		Pace[step/s]		RSI[m/s]	
	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
1	0,568	0,564	0,492	0,643	29,7	50,7						
2	1,039	0,563	0,549	0,627	36,9	48,2	25,96	31,83	0,9	0,84	0,65	0,85
3	0,591	1,129	0,546	0,59	36,5	42,7	20,03	29,05	0,63	0,87	0,35	0,76
4	0,603	0,569	0,547	0,633	36,7	49,1	25,32	23,75	0,88	0,57	0,62	0,44
5	*0,7*	0,706	0,563	0,661	38,9	53,6	26,17	34,35	0,86	0,81	0,64	0,94
Avg	*0,226*	*0,282*	*0,539*	*0,631*	*35,7*	*48,8*	*24,37*	*29,75*	*0,82*	*0,77*	*0,57*	*0,75*
Std dev	*0,603*	*0,564*	*0,027*	*0,026*	*3,5*	*4*	*2,92*	*4,55*	*0,12*	*0,14*	*0,14*	*0,22*

Table 09. Unipodal Squat Jump test – S_1

Reps.	TCont.[s]		TFlight[s]		Height[cm]		Power[W/Kg]		Pace[step/s]		RSI[m/s]	
	S_1 – left leg	S_1 – right leg	S_1 – left leg	S_1 – right leg	S_1 – left leg	S_1 – right leg	S_1 – left leg	S_1 – right leg	S_1 – left leg	S_1 – right leg	S_1 – left leg	S_1 – right leg
1			0,346	0,32	14,7	12,6						
2	0,577	0,484	0,383	0,352	18	15,2	15,32	14,62	1,04	1,2	0,31	0,31
3	0,588	0,502	0,37	0,375	16,8	17,2	14,49	15,75	1,04	1,14	0,29	0,34
4	0,583	0,514	0,345	0,356	14,6	15,5	13,2	14,49	1,08	1,15	0,25	0,3
5	0,613	0,502	0,351	0,343	15,1	14,4	13,27	13,88	1,04	1,18	0,25	0,29
Avg	*0,59*	*0,501*	*0,359*	*0,349*	*15,8*	*15*	*14,07*	*14,68*	*1,05*	*1,17*	*0,27*	*0,31*
Std dev	*0,016*	*0,012*	*0,017*	*0,02*	*1,5*	*1,7*	*1,02*	*0,78*	*0,02*	*0,03*	*0,03*	*0,02*

Table 10. Unipodal Squat Jump test – S_2

Reps.	TCont.[s]		TFlight[s]		Height[cm]		Power[W/Kg]		Pace[step/s]		RSI[m/s]	
	S_2 – left leg	S_2 – right leg	S_2 – left leg	S_2 – right leg	S_2 – left leg	S_2 – right leg	S_2 – left leg	S_2 – right leg	S_2 – left leg	S_2 – right leg	S_2 – left leg	S_2 – right leg
1			0,428	0,458	22,5	25,7						
2	0,637	0,697	0,425	0,455	22,1	25,4	17,03	18,08	0,94	0,87	0,35	0,36
3	0,494	0,584	0,456	0,44	25,5	23,7	21,08	18,55	1,05	0,98	0,52	0,41
4	0,525	0,547	0,435	0,466	23,2	26,6	19,12	20,75	1,04	0,99	0,44	0,49
5	0,583	0,572	0,43	0,462	22,7	26,2	17,96	20,08	0,99	0,97	0,39	0,46
Avg	*0,56*	*0,6*	*0,435*	0,456	*23,2*	25,5	*18,8*	*19,36*	*1,01*	*0,95*	*0,42*	*0,43*
Std dev	*0,063*	*0,066*	*0,012*	0,01	*1,3*	1,1	*1,74*	*1,26*	*0,05*	*0,06*	*0,07*	*0,05*

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The assessment of the ***anaerobic power and reactive force*** level was also done through the Opto Jump Next system using the 15 sec. test and Stiffness test, the parameter that were measured (Table 11 and 12) being similar to those recorded in the case of explosive force measurement (ground contact time (TCont.), flight time (TFlight), height (Power), the cadence (Pace) and reactive strength index (RSI).

Table 11. 15 sec. jumps test

Reps.	TCont.[s]		TFlight[s]		Height[cm]		Power[W/Kg]		Pace[step/s]		RSI[m/s]	
	S_1	S_2										
1	0.247		0.473	0.575	27.4	40.5						
2	0.252	0.376	0.54	0.621	35.7	47.3	41,37	39.59	1.27	1	1,45	1.26
3	0.295	0.337	0.57	0.603	39.8	44.6	44,7	40.44	1.22	1.06	1,58	1.32
4	0.242	0.393	0.559	0.605	38.3	44.9	38,91	36.94	1.17	1	1,3	1.14
5	0.283	0.311	0.585	0.648	42	51.5	48,06	48.04	1.21	1.04	1,73	1.66
6	0.23	0.345	0.583	0.632	41.7	49	42,89	43.03	1.15	1.02	1,47	1.42
7	0.252	0.305	0.589	0.645	42.5	51	50,42	48.3	1.22	1.05	1,85	1.67
8	0.31	0.313	0.585	0.646	42	51.2	46,71	47.59	1.19	1.04	1,66	1.63
9	0.254	0.315	0.582	0.636	41.5	49.6	40,26	46.16	1.12	1.05	1,34	1.57
10	0.273	0.343	0.585	0.641	42	50.4	46,46	44.21	1.19	1.02	1,65	1.47
11	0.278	0.276	0.583	0.65	41.7	51.8	43,95	52.43	1.17	1.08	1,53	1.88
12	0.273	0.266	0.574	0.638	40.4	49.9	42,29	52.13	1.17	1.11	1,45	1.88
13	0.292	0.32	0.586	0.627	42.1	48.2	44,33	44.61	1.16	1.06	1,54	1.51
14	0.239	0.299	0.55	0.646	37.1	51.2	38,13	49.09	1.19	1.06	1,27	1.71
15	0.235	0.298	0.56	0.647	38.4	51.3	45,01	49.33	1.25	1.06	1,61	1.72
16	0.25	0.264	0.564	0.659	39	53.2	46,1	55.39	1.25	1.08	1,66	2.02
17	0.316	0.276	0.542		36		41,28		1.26		1,44	
18	0.227		0.519		33		32,97		1.2		1,04	
Avg	*0.264*	*0.315*	*0.563*	*0.632*	*38.9*	*49.1*	*43.17*	*46.48*	*1.2*	*1.05*	*1.5*	*1.59*
Std dev	*0.027*	*0.037*	*0.03*	*0.022*	*3.9*	*3.3*	*4.18*	*5.1*	*0.04*	*0.03*	*0.19*	*0.24*

Table 12. Stiffness test

Reps.	TCont.[s]		TFlight[s]		Height[cm]		Power[W/Kg]		Pace[step/s]		RSI[m/s]	
	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
1	0.159	0.236	0.424	0.537	22	35.3	37.38	42.29	1.72	1.29	1.39	1.5
2	0.154	0.203	0.416	0.591	21.2	42.8	37.02	55.58	1.75	1.26	1.38	2.11
3	0.157	0.195	0.44	0.629	23.7	48.5	40.22	63.9	1.68	1.21	1.51	2.49
4	0.167	0.212	0.49	0.591	29.4	42.8	46.35	53.82	1.52	1.25	1.76	2.02
5	0.153	0.19	0.499	0.621	30.5	47.3	51.12	63.73	1.53	1.23	1.99	2.49
6	0.159	0.218	0.502	0.584	30.9	41.8	50.17	51.65	1.51	1.25	1.94	1.92
7	0.161	0.204	0.519	0.622	33	47.4	52.7	60.55	1.47	1.21	2.05	2.32
8	0.158	0.206	0.521	0.596	33.3	43.5	53.83	55.79	1.47	1.25	2.11	2.11
9	0.16	0.21	0.532	0.606	34.7	45	55.32	56.61	1.45	1.23	2.17	2.14
10	0.161	0.214	0.535	0.598	35.1	43.8	55.6	54.55	1.44	1.23	2.18	2.05
Avg	*0.159*	*0.209*	*0.488*	*0.598*	*29.4*	*43.8*	*47.97*	*55.85*	*1.55*	*1.24*	*1.85*	*2.11*
Std dev	*0.004*	*0.013*	*0.045*	*0.026*	*5.2*	*3.7*	*7.29*	*6.3*	*0.12*	*0.02*	*0.32*	*0.29*

The measurements concerning the amplitude of the foot extension were taken by using the nautical conditions simulator which provided us the possibility to identify the level of the ankle's flexibility expressed in centimeters. At the same time, the device also provided the level of the maximum force measured at the extension start moment, being expressed in daN. The subjects were tested alternatively, first on the right foot (fig. 05 and fig. 06) and then on the left one (fig. 07 and fig 08).

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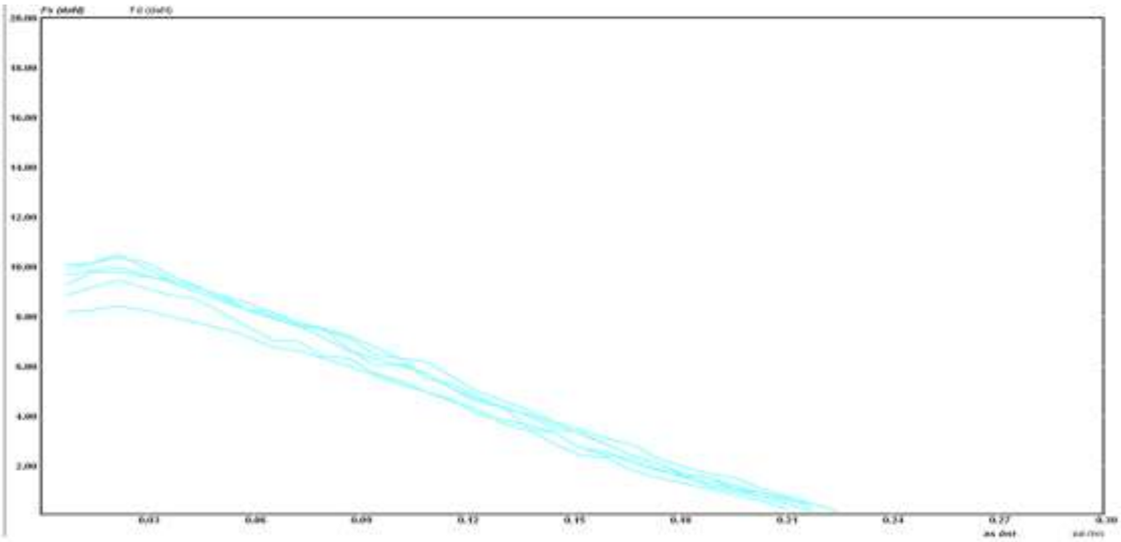

Figure 05. Right foot extension amplitude - S_1

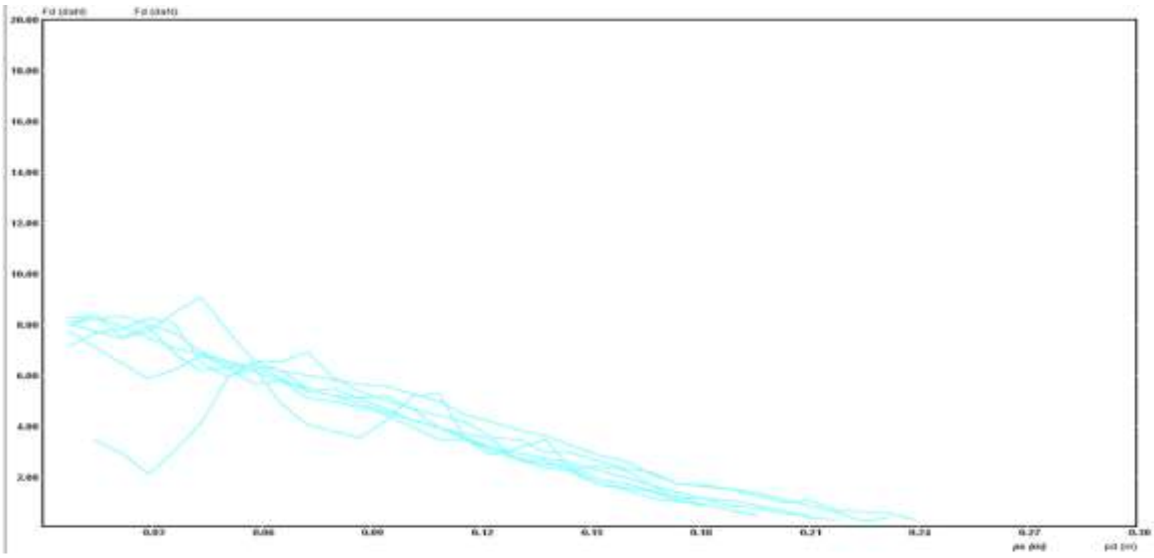

Figure 06. Right foot extension amplitude - S_2

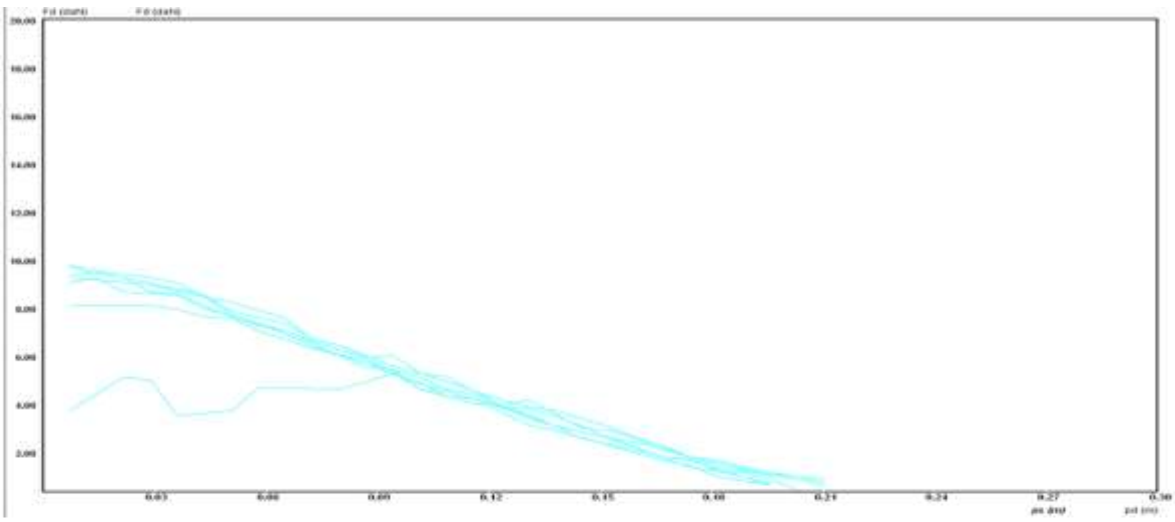

Figure 07. Left foot extension amplitude - S_1

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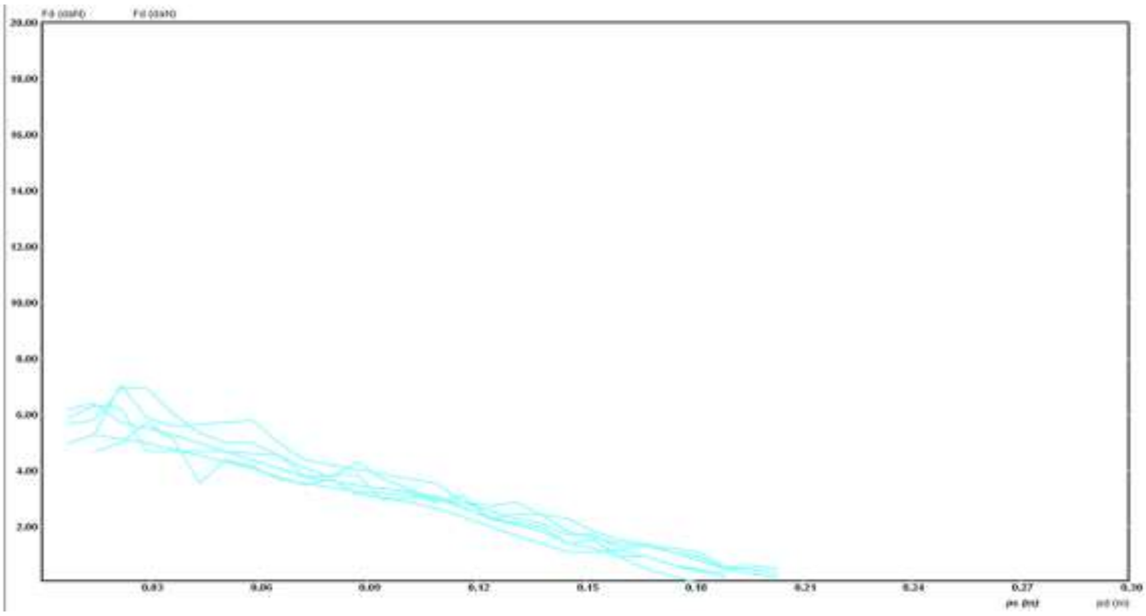

Figure 08. Left foot extension amplitude - S_2

The use of the methodology presented above allows an objective diagnosis to be carried out on the parameters, based on the appreciation of the recorded data. We have chosen to exemplify the presentation of the assessments related to the subject S1 for each of the tested indicators.

Thus, regarding to the static bipodal balance, the subject achieved a performance score of 87%, which can be appreciated as a good result, and the rating that can be attributed to it is good. In terms of proprioception, the subject has the same tendency, better in the side-to-side plane. In terms of dynamic balance in a horizontal sense, with a 87% performance score, the data signifies a good capacity (the left and right shifts in the graphics are represented in green), the dynamic balance being better on the right side. Regarding the dynamic balance in the vertical sense (forward and backwards represented graphically in blue), the performance score was 89%, which shows a steady to a very good balance. On the other hand, we can assume from the data analysis that the subject S_1 exhibits a lower degree of ankle mobility during the extension movement compared to the flexion.

Measurements related to the unipodal balance in the right leg can highlight the following considerations: the static equilibrium capacity reveals a performance score of 85%, which may be similar to a good standard; dynamic balance capability has a more efficient vertical balance trend with a 83% performance score, with an anterior-posterior mobility that is superior to the sagittal plane (performance score of 73%). In terms of proprioception data, they have a performance score of 84%, showing a more efficient control capability in the horizontal plane, toward left. Tests that focused on left-handed unipodal balance showed a better static balance capacity (87% performance) compared to the right foot, with a better balance on the lateral side. Proprioception showed a score of 83%, with lateral differences to the left but also anterior-posterior to the back. As for mobility (dynamic balance), the data signifies a sagittal mobility (greater amplitude to the right) with a performance score of 72%, while in the anterior-posterior plane the movement is controlled very well with a 92% performance score.

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The interpretation of the data that concerns the reaction speed test reveals a better response time on the right foot, both at visual and acoustic stimuli. Specific dynamic balance measured by the open eyes and closed eyes test - shows good values both from the point of view of the use of external feedback and from the use of intrinsic feedback. Regarding the amplitude of foot extension, measured by the condition simulator, we found that, at the right foot, the subject S_1 exhibits a degree of mobility slightly inferior to the subject S_2. It should be noted that the level of control, from the point of view of force and amplitude of executions of subject S_1, was superior. In the left leg, the subject S1 shows higher values than the subject S_2, both in terms of mobility and force control.

7. Conclusion

In conclusion, the working hypothesis according which by using instruments and apparatuses for measuring some parameters of the psychomotor skills we will be able to correctly assess and appreciate the specific physical training level of the athletes which will make the diagnosis more objective and provide objectives targets in the short and medium term sports outlook is confirmed. The methodology that was used allows the recording of objective, real-time data, which can be basic support elements in setting specific planning and monitoring parameters for training. At the same time, the logistics elements used can be implemented within the training methodology, and they can be integrated as testing and measurement means as well as tools for monitoring and conducting the training process.

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