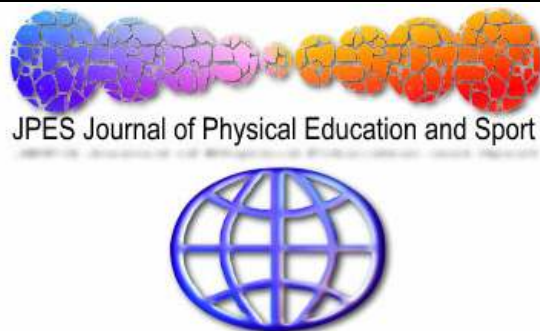




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ORIGINAL RESEARCH

STUDY REGARDING THE DYNAMICS OF THE EXPLOSIVE FORCE MANIFESTATION IN THE LOWER LIMBS, IN 8- 18 YEARS OLD BOYS

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Faculty of Movement, Sport And Health Sciences**Keywords:** correlations, take-off height, power**ABSTRACT**

The present study is an investigation of the explosive force in the lower limbs, in 8-18 years old boys. The study comprised 15 subjects, represented by the students, some of them being competitive athletes. We tried to emphasize the dynamics of the take-off height and the existent correlations between the age, weight and height parameters and the 10 indicators calculated with a specialized program. As evaluation drill for the spring, we used the “15 Jumps Test”, recorded with the “modified Miron Georgescu” sensor board. The results were recorded and analyzed with the “Microsoft Office Excel 2003” and “SPSS” (Statistical Package for Social Science) software. The conclusions of this study show that there are positive and stable correlations for each indicator represented by the average unit power, rise height, maximum height, accomplished maximum unit power, maximum possible unit power according to age, weight and height, having values between 0.514 and 0.846, thus confirming only partially the first hypothesis. Also, the average ground time and minimum ground time recorded negative values, between -0.366 and -0.233, close to -1, which indicates a reverse correlation to the age, weight and height, while the maximum unit power jump, as well as the energetic variability coefficient, has a value between 0.418 and 1.197, closer to 0, showing a lack of correlation between variable to age, weight and height. The take-off height does not depend mainly on age, thus the second hypothesis is confirmed.

I. INTRODUCTION

Considering that the height of take-off is the result of a maximum effort snapshot of a sudden enlargement, a rapid increase of force or a strong impulses and short, easy to emphasize its importance in sports-type explosive. The height of vertical separation, usually known and imprisonment meets in a more complex or simple, "can not be considered a secondary quality of speed, a simple variant of explosive speed, it came into action only in the second phase. The first phase, the slow training is of equal importance with the explosion. Added to this is "critical moment

of sudden transition from one phase to another. But the essential characteristic of it is "very discontinuous structure and achieve a perfect homogeneity between the two parties completely contradictory" (Gloria Rata, 2001, p. 30).

Outside normal control samples, used by coaches and teachers to evaluate the height of take-off is also used a complex sample, called the "modified Miron Georgescu drill" it was improved by I Stupineanu, O. Ciubotaru, and P. De Hillerin, quoted by M. Epuran 2005. This test has the great advantage that is achieved with a sensor plate and the indicators present some information that might be reference data for a certain amount in the preparation.

Target-force-power relationships, specifically expressed in the report of evidence of force to the main sporting gestures make possible that detention is placed on the curve of maximum power and maximum speed, closer to power than speed, an idea supported by Wilmore and Costil, 1998 which warns that "presenting the appearance of explosive muscle strength of the force produced by movement speed.

What speed is especially an innate quality, which is improved relatively by training, especially force is one that allows the improvement of power", but the power depends on the individual's age. Speed the transition from one phase to another in the achievement of the 15 lessons offers us very important data on the power of the high jump is' reporting height of take-off from body weight "(Mihai Epuran, 2005, p. 362) and is given by how quickly the work is carried out..

II. OBJECTIVES

In the present study, ascertaining transverse type, I aimed for the following objectives:

- Knowing the height of take-off event at boys aged between 8 and 18 years, the legs;
- Highlighting the correlation that exists between indicators of assessment resulting from the assessment by the control test carried out on the modified Miron Georgescu drill as the "15 jumps", age and anthropometric indices (height, weight).

III. HYPOTHESES

Analysis of indicators drawn from the evaluation of the take-off height can highlight important issues concerning the values of the indicators. In proceeding with this study, we started from the following hypotheses:

- Between the 10 indicators drawn from the evidence of jumps and age correlations are positive;
- Height of take-off is greater in older than younger subjects and depends on the average unit power.

Analysis of results indicators can explain the relationship between strength and speed and its importance for the preparation.

IV. RESEARCH PROCEDURES AND METHODS

The **subjects** in this research are 15 male students. They have been selected out of a group of 600. Besides being students, some of them practice sports professionally, and at that particular age they had the best results regarding the vertical take-off height.

Assessment methods

For this study we recorded data regarding their: age, anthropometrical development (weight, height), the „15 jumps test” - through the modified Miron Georgescu platform. The test comprised 15 take-offs from the platform, which was connected to a computer containing the recording and analysis software.

V. RESULTS OF THE RESEARCH – ANALYSIS, INTERPRETATION AND GRAPHICAL REPRESENTATION

The data recorded in the control drills was organized and analyzed through the „Microsoft Office Excel 2003” software and the „SPSS” (Statistical Package for Social Sciences) software. The data interpretation was based on the analysis of the arithmetical mean between the maximum and minimum values and the Spearman correlation coefficient. The Spearman correlation coefficient was calculated through SPSS.

V. 1. Results of the research – analysis, interpretation and graphical representation with Microsoft Office Excel 2003

Results from Table 1 highlight the evidence of indicators between certain values that have specific meanings.

Age (A) is between 8 and 18 years with an average of 13.33, standard deviation 3.04 stresses the value of a lack of uniformity, appearance already known.

Weight (W) has an average of 48.87 kg of extreme values of 80 and 30 kg. Individual values are normal.

Height (H) presents extreme values of 1.78 m and 1.35 m and an average of 1.60 m. The individual values are normal, in terms of anthropometric development.

Average unit power (PU) recorded an average of 4.36 wat group, but values between 3.25 wat and 5.18 wat. The difference between the maximum and minimum and average and the average is 0.81 wat respectively 1.11 wat, so an appreciation of the sea. It is noted that the power of take-off does not meet the age hierarchy. Boy of 14 years and an output greater than one unit of 17 years and 18 years and the highest value recorded a performance not a sport but a student of 16 years.

The take-off height (H_{flight}) expressed in centimeters minimum value is between 0.23 cm and a maximum of 0.43 cm, with an average of 0.32 cm. The differences are quite large between the maximum and minimum, but it is observed that subjects included in the groups performance would have better values than those who are not sports performance, or that babies that age have a lower value.

Time of remaining on the ground (V_{rep}) is the minimum value of 0.17 s and a maximum of 0.37 s, with an average group of 0.23 s. There is a large difference between the maximum and minimum time contact with soil, but that it affects the height of take-off.

Energy variability coefficient (CVE) recorded the lowest value 1.77, the highest value of 7.07 and an average of 3.92 per group. As we see large differences between minimum and maximum. It is interesting that the lowest value observed to the person making the highest average height of take-off and power unit.

Structural variability coefficient (CVS) is manifested between the value of 4.19 and 13.96 and an average of 8.43 per group.

The recorded values for the *minimum ground time (T. SOL.)* are between 0.31 and 0.14 s and an average of 0.20 s. It is noted that the average time on the ground corresponds to the best average height of take-off.

Maximum height (H_{max}) for each of the 15 subjects is between 0.26 cm and 0.47 cm. Also pointed out that the maximum height of take-off is directly proportional to the power unit against the maximum, but with average unit power in inverse relation to the duration of contact on the ground;

The *accomplished maximum unit power (RMP)* has values between 3.66 and, 5.55 wat, with an average of 4.74 wat.

The *jump accomplished with the maximum unit power (S. PRM)*, is between the second and 13 repeat. Not observed constancy in terms of achieving maximum separation after a certain number of jumps.

The *maximum possible power unit (PMP)* has values between 3.73 and 5.360 wat, with an average of 4.86 wat. It is noted that each subject is likely to improve the maximum achieved power unit, which makes us say that there is a chance that each of the subjects of inquiry can achieve a better separation height..

V. 2. Results of the research – analysis, interpretation and graphical representation with „SPSS” (Statistical Package for Social Sciences)

Statistical analysis based on correlation "Spearman correlation coefficient, the results in Table 1, is shown in Table 2 and highlights the correlations between age, height, weight and other indicators.

Rank correlation coefficient (Spearman) test the degree of correlation between 2 qualitative variables, is non-parametric alternative to "Pearson correlation coefficient, and can range between -1 and 1. Negative values close to -1 indicate an inverse correlation. A value close to 0 means correlation between variables. If non-parametric correlation coefficient values are high, close to 1 when there is correlation between variables and stability.

The values in Table 2 highlight the positive and stable correlations for each indicator represented the average unit strength, height of flight, maximum height, maximum achieved power unit, power unit relative to the maximum possible age (chart no.1), weight (chart no.2) and height (chart no.3).

Among other indicators of repetition rate, energy variability coefficient, the coefficient of variability structural minimum time on the ground, jump with the maximum achieved power unit and age, weight, height there is a correlation of variables.

Average time on the ground and the minimum time on the ground have negative values between - 0.366 and - 0.233 close to -1 which we show an inverse correlation with age, weight and height.

Maximum jumping power unit, as the coefficient of energy variability has a value between 0.418 and 1.197 so close to 0, which means to link variables to age, weight and height.

Structural variability coefficient has a value that indicates to link variables to age and height and inverse correlation to weight.

Table 2 - Correlations between age, height and weight and the spring assessment indicators

BOYS: Spearman correlation coefficient		Age		Height		Weight	
	N	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)
Average unit power (PU)	15	0.746**	0.001	0.599*	0.018	0.527*	0.043
Average jump height (H.jump)	15	0.811**	0.000	0.603*	0.017	0.514*	0.050
Average ground time (V_rep)	15	-0.295	0.286	-0.319	0.246	-0.233	0.403
Energy variability coefficient (CVE)	15	0.052	0.854	0.190	0.498	0.145	0.607
Structural variability coefficient (CVS)	15	0.072	0.800	0.002	0.995	-0.182	0.516
Minimum ground time (TSOLm)	15	-0.345	0.208	-0.366	0.180	-0.233	0.403
Maximum height (HMax)	15	0.846**	0.000	0.639*	0.010	0.576*	0.025
Accomplished maximum unit power (PMr)	15	0.824**	0.000	0.621*	0.014	0.529*	0.043
Jump accomplished with the maximum unit power (S.PMr)	15	0.418	0.121	0.322	0.241	0.197	0.481
Maximum possible power unit (PMp)	15	0.822**	0.000	0.640*	0.010	0.555*	0.032
Valid N (listwise)	15	**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).					

V. CONCLUSIONS

The analysis of the results shows that:

1. correlations are positive and stable for each indicator represented the average unit power, flying height, maximum height, maximum achieved power unit, power unit relative to the maximum possible age, weight and height, with values between 0.514 and 0.846, so the first hypothesis confirmed only in part;
2. average time on the ground and the minimum time on the ground have negative values between - 0.366 and - 0.233 close to -1 which shows an inverse correlation with age, weight and height;
3. jump with maximum unit power, and energy variability coefficient has a value between 0.418 and 1.197 so close to 0, which means to link variables to age, weight and height;
4. structural variability coefficient has a value that indicates to link variables to age and height and inverse correlation to the weight;
5. height of take-off does not depend mainly on age, so the second hypothesis is not confirmed;
6. the mean height of flight depends on the average unit power;
7. the most powerful jump is between take-offs 2 and 13.

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Rezumat

Studiul de față este o cercetare privind manifestarea forței explozive la nivelul membrelor inferioare la băieții de 8-18 ani. Studiul a cuprins 15 subiecți reprezentați de elevi, unii dintre ei practică sportul de performanță. Am urmărit să evidențiez dinamica manifestării înălțimii de desprindere și a corelațiilor existente între parametrii de vârstă greutate și înălțime și cei de 10 indicatori calculați printr-un program special. Ca proba de evaluare a detentei am folosit „Testul celor 15 sărituri”, înregistrat cu ajutorul plăcii cu senzori „Miron Georgescu adaptată”. Rezultatele au fost prelucrate pe baza programului „Microsoft Office Excel 2003” și cu programul de analiză statistică „SPSS” (Statistical Package for Social Sciences). Concluziile studiului evidențiază că există corelații pozitive și stabile pentru fiecare indicator reprezentat de puterea unitară medie, înălțimea de zbor, înălțimea maximă, puterea unitară maximă realizată, puterea unitară maximă posibilă raportat la vârstă, greutate și înălțime, cu valori cuprinse între 0,514 și 0,846, deci prima ipoteză se confirmă doar parțial. De asemenea media timpului pe sol și timpul minim pe sol au valori negative cuprinse între – 0,366 și – 0,233 apropiate de –1 ceea ce ne indică o corelație inversă față de vârstă, greutate și înălțime, în timp ce săritura cu putere unitară maximă, ca și coeficientul de variabilitate energetică are o valoare cuprinsă între 0,418 și 1,197 deci mai apropiată de 0, ceea ce înseamnă necorelarea variabilelor față de vârstă, greutate și înălțime. Înălțimea de desprindere nu depinde în principal de vârstă, deci a doua ipoteză nu se confirmă.

Chart 1 BOYS: Spearman correlation coefficient
Vertical take-off and indicators for the assessment of the muscular force – Age

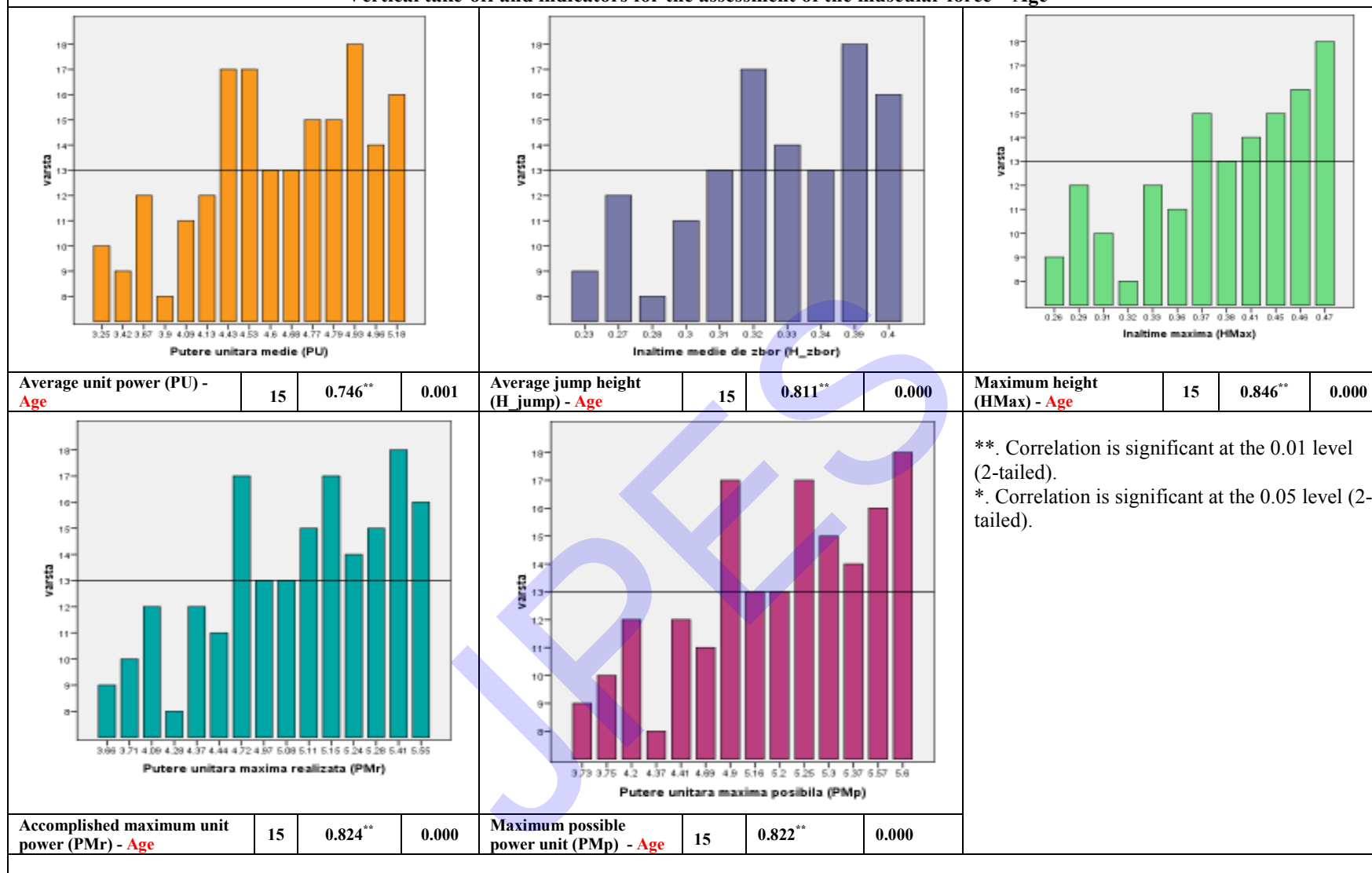


Chart 2 BOYS: Spearman correlation coefficient
Vertical take-off and indicators for the assessment of the muscular force – Height

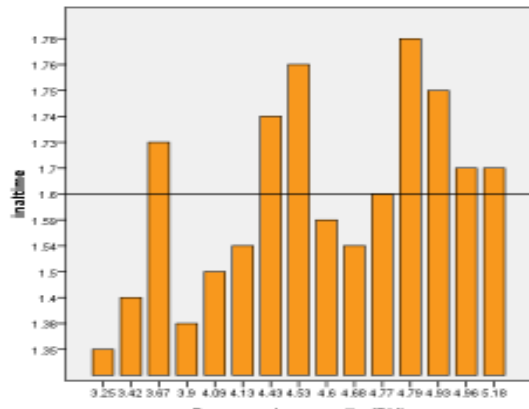
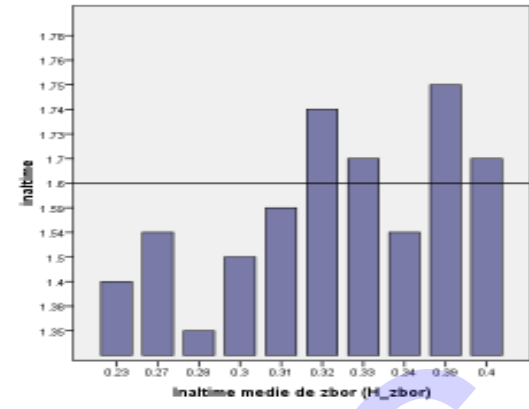
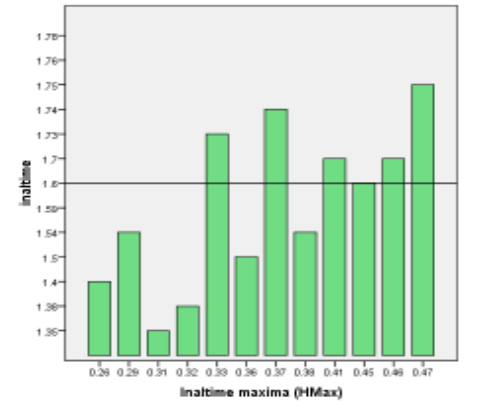
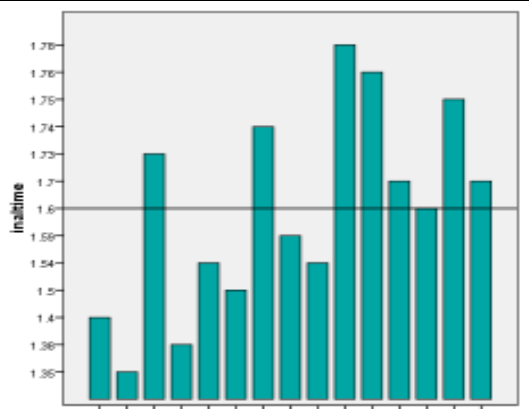
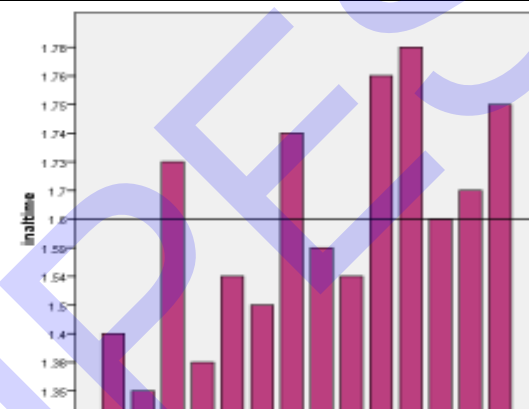
											
Average unit power (PU) - Height	15	0.599*	0.018	Average jump height (H_jump) - Height	15	0.811**	0.000	Maximum height (HMax) - Height	15	0.639*	0.010
								** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).			
Accomplished maximum unit power (HMax) - Height	15	0.639*	0.010	Maximum possible power unit (PMp) - Height	15	0.640*	0.010				

Chart 3 BOYS: Spearman correlation coefficient
Vertical take-off and indicators for the assessment of the muscular force – Weight

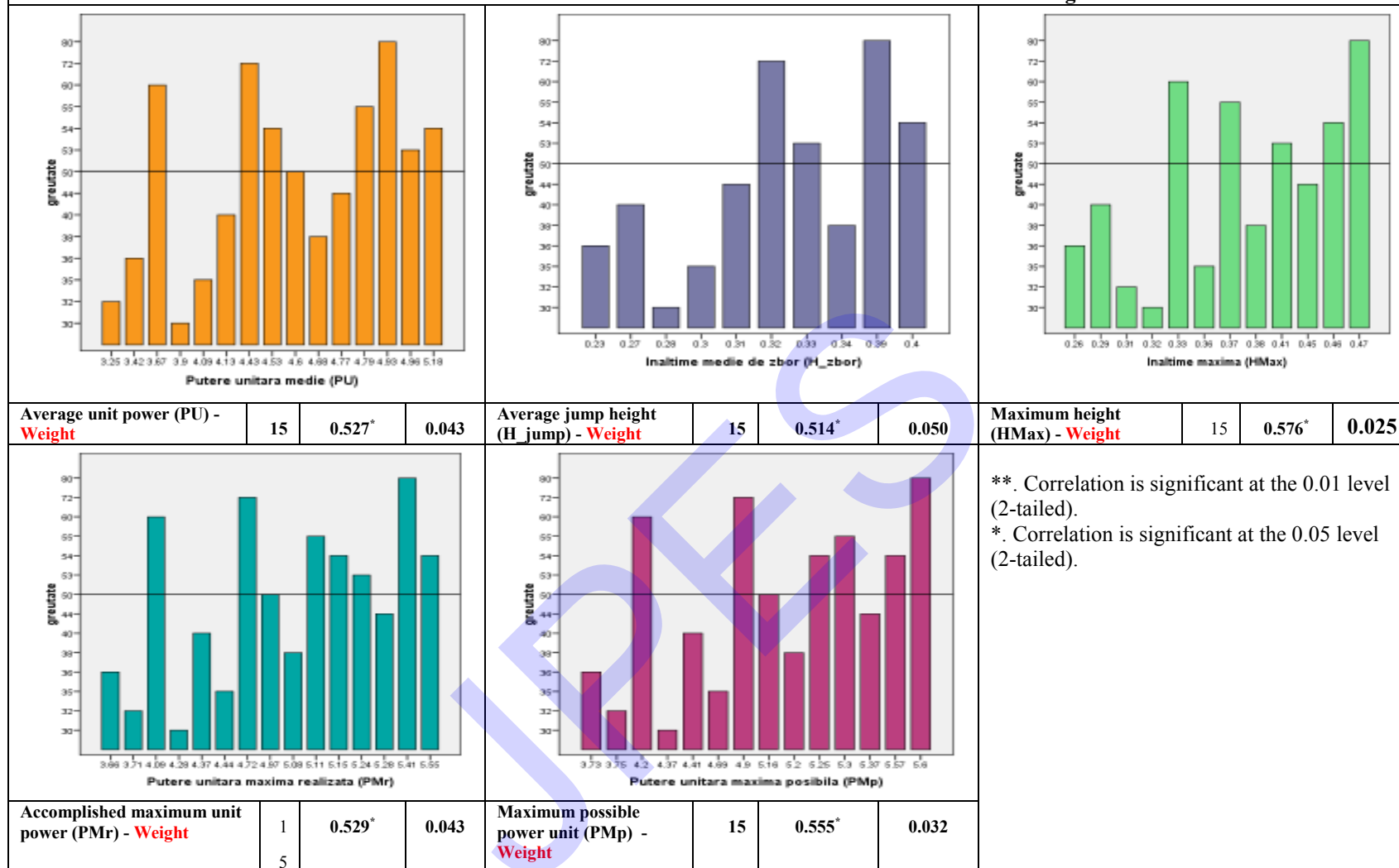


Table 1 Vertical take-off and indicators for the assessment of the muscular force in the 8 and 18 years old boys

	Unit	Initials	A.	H.	W.	(PU)	(H_jump)	(V_rep)	(CVE)	(CVS)	(TSOLm)	(HMax)	(PMr)	(S.PMr)	(PMp)
2	Ferd.	P.A.	9	1,40	36	3,42	0,23	0,24	3,57	4,19	0,22	0,26	3,66	2	3,73
3	Ferd.	U.E.	12	1,73	60	3,67	0,27	0,27	7,07	4,51	0,26	0,33	4,09	6	4,2
6	Bad O	D.M.	12	1,54	40	4,13	0,27	0,18	2,49	7,39	0,17	0,29	4,37	2	4,41
1	Oneş.J	A.R.	10	1,35	32	3,25	0,28	0,37	4,79	11,81	0,31	0,31	3,71	7	3,75
4	Ferd.	N.V.	8	1,38	30	3,9	0,28	0,23	3,05	10,49	0,21	0,32	4,28	3	4,37
5	OneşJ	G.A.	11	1,50	35	4,09	0,30	0,24	4,63	7,33	0,21	0,36	4,44	8	4,69
9	L. lib. O	B.E.	13	1,59	50	4,6	0,31	0,17	3,26	9,44	0,14	0,36	4,97	7	5,16
7	L. lib. O	P.A.	17	1,74	72	4,43	0,32	0,21	3,47	6,48	0,19	0,37	4,72	13	4,9
10	Bad O	T.A.	13	1,54	38	4,68	0,33	0,18	4,09	8,74	0,16	0,38	5,08	7	5,2
12	L. lib. O	P.S.	15	1,78	55	4,79	0,33	0,17	3,88	9,87	0,14	0,37	5,11	7	5,3
8	Ferd.	M.B.	17	1,76	54	4,53	0,34	0,23	5,50	13,96	0,19	0,41	5,15	10	5,25
14	OneşJ	C.C.	14	1,70	53	4,96	0,38	0,20	2,72	9,10	0,17	0,41	5,24	6	5,37
11	OneşJ	B.A.	15	1,60	44	4,77	0,39	0,25	3,82	4,99	0,22	0,45	5,28	10	5,37
13	Ferd.	H.B.	18	1,75	80	4,93	0,40	0,23	4,71	7,28	0,21	0,47	5,41	5	5,6
15	Ferd.	I.A.	16	1,70	54	5,18	0,43	0,23	1,77	10,86	0,20	0,46	5,55	5	5,57
Arithmetical mean			13,33	1,60	48,87	4,36	0,32	0,23	3,92	8,43	0,20	0,37	4,74	6,53	4,86
Standard deviation			3,04	0,15	14,53	0,59	0,06	0,05	1,31	2,78	0,04	0,06	0,61	3,02	0,63
Maximum value			18	1,78	80	5,18	0,43	0,37	7,07	13,96	0,31	0,47	5,55	13	5,6
Minimum value			8	1,35	30	3,25	0,23	0,17	1,77	4,19	0,14	0,26	3,66	2	3,73

Legend: Age (A), Height (H), Weight (W), Average unit power (PU), Average jump height (H_jump), Average ground time (V_rep), Energy variability coefficient (CVE), Structural variability coefficient (CVS), Minimum ground time (TSOLm), Maximum height (HMax), Accomplished maximum unit power (PMr), Jump accomplished with the maximum unit power (S.PMr), Maximum possible power unit (PMp)