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CHARACTERISTICS OF VERTICAL JUMP WITHIN BOYS AND GIRLS

(Preliminary communication)

Branislav Dragić[1], Katarina Herodek[1], Cvetko Simonović[2] and Dejan Cvetković[3]
[1]University of Niš, Faculty of Sport and Physical Education, Niš, Serbia
[2]High School for Educators, Gnjilane-Bujanovac, Serbia
[3]Ekonomic-Bussines School, Vranje, Serbia

Abstract

The aim of this study was to determine the potential of lower extremity muscle and has been made a comparison between the two types of vertical jumps with students of the first year of high school. The sample of examinees in this study were high school students and students of "9. May" in Nis. 37 students, aged 15 ± 6 months were divided into two groups according to gender. All subjects were divided into two subgroups: boys N = 14 and N = 23 girls. The variables of the jump to a half squat (CMJ) and jump from a squatting (SJ) are: the flying time (TF) sec, jump height (H) cm. On the basis of the realized research, it can be concluded the following: There was a statistically significant difference between the half squat vertical jump and a jump from a squat for the first grade girls. There was a statistically significant difference between the half squat vertical jump and a jump from a squat for the first grade boys.

Keywords: *secondary school students, maximum muscle power, vertical jump, coeficient of correlation, t-test*

INTRODUCTION

The capability of rapid body movements after the rest is especially important for achieving success in many sports. Based on Hill's mechanical model of muscle (Hill, 1938) the "explosive" ability is directly related to the mechanical properties of contractile components of muscle, especially at maximum output power.

Testing the maximum power of the lower muscles, stretching the limb was common practice during the warming up process. Maximum power output is estimated taking into account the different leg movements: sprint running (Jaskolska, Goossens, Veenstra, Jaskolski & Skinner, 1999.; Jaskolski, Veenstra, Goossens, Jaskolska, & Skinner, 1996) sprint cadence (Arsac, Belli, & Lacour, 1996.; Seck, Vandewalle, Decrops, & Monod, 1995.; Vanderwalle, Peres & Monod, 1987) or vertical jumps (Davies & Jang, 1984.; Rahmani, Dalleau, Viale, Hautier, & Lacour, 2000). Regardless of the type of the analyzed leg movements, the output power can be calculated as the product of force measurement speed. Measurement of power and speed with accuracy requires specific and/or expensive devices, such as ergometer (Arsac, et al., 1996), tenzo platform (Harman, Rosenstein, Frykman, Rosenstein, & Kraemer, 1991) or linear positioners (Cormie, Mc Bride & Caulley, 2007), who can still be impractical in the research.

Therefore, customizable, simple and accurate method for measuring the strength can be essential for the professional athletes. Vertical jumps are the most widely used because of their ease of movement (Lara, Abián, Alegre, Rubio, & Aguado, 2008.; Vandewalle, et al., 1987). Vertical Leap can be considered one of the most"'explosive" tests due to the short duration and the high intensity. Even, they are positively correlated or related to the maximum force (Davies & Young, 1984), the vertical jump height is a direct indicator of alternative „explosive" with lower extremities and has a dimension of mechanical work, and not of power (Vandewalle, et al., 1987).

Bosco, Luhtanen & Komi (1983), has proposed a simple method for measurement of mechanical power during the jump. Various calculations based on the contact (in this case, a rebound contact and landing) and the time of flight, and can be applied in practice jumps on the decline (landing) in order to obtain the maximum value of power. However, other characteristics of muscle

are also involved in this kind of a jump, especially those groups that are related to the stretch-shortening cycle. So Bosko's power meter test can not be used during the fall and counting jumps and can not be used to estimate the 'explosive' concentric capacity.

In addition, various formulas have been proposed to assess the output in the vertical jump and the body weight. Some of them are derived from the basic laws of mechanics (Gray, & Glenross, 1962), but the biggest challenge is that they have been developed from the biomechanical model. In fact, the discussion is about Luis's formula in which the potential energy is changed by the upward phase in the air, instead of during the rebound, not taking it as an influential component of the change in the potential energy (Harman, et al., 1991.; Vandewalle, et al 1987).

Graham's formula assumes that the vertical acceleration of the center of mass (CM) is constant during the rebound, which is in contrast with some experimental results presented in the literature (Cormie, P., Mc Bride J.M. and Mc Caulley, G.O. (2007). Cormie, et al., 2007.; Harman, et al., 1991).

Other formulas due to experimental regression equation created between the strength and biomechanical parameters as the statistics show that the maximum power depends on the height of the vertical jump and body weight (Canavan & Vescovi, 2004.; Harman, et al., 1991.; Johnson & Bahamonde, 1996.; Sayers, Harackiewicz, Harman, Frykman, & Rosenstein, 1999.; Lara, et al., 2008).

Limitations of such first prediction equations are due to the lack of theoretical explanations of rational relations of power and the other two parameters, it remains unclear whether all of the athletes that have the same weight and the same amount to height of the jump and achieve the same power output, but the rebound time is not taken into account.

Other limitations of this equation and the assumed regression relate to the broader application when it comes to the rest of the population, where the accurate assessment loses power (Canavan & Vescovi, 2004.; Lara, et al., 2008). The subject of this research has mechanical characteristics of vertical jump.

The problem of this study is to determine the causes of differences, and differences between the two types of vertical jump, a half squat and the squat.

The aim of this study was to determine the potential of lower extremity muscle and are compared between the two types of vertical jumps with students of the first year of high school.

METHODS

The sample of examinees in this study were high school students of the school „9. May "in Nis. 37 students, aged 15 ± 6 months were divided into two groups according to gender. All subjects were divided into two subgroups: boys N = 14 and N = 23 girls

The variables of the jump to a half squat (CMJ) and jump from a squatting (SJ) are: the flying time (TF) in sec, jump height (H) in cm, which was calculated by the formula h = g * TF2 / 8 (Asmussen & Bonde-Petersen, 1974. , manifested power (P) wat (Fox & Mathews, 1974) and initial velocity (V) m / s.

After the standard warm-up, testing was carried out using the Chronojump technology consisting of the Chronojump software, analog to digital converter Chronopic and the contact plates. The testing was made during the physical education classes held by Professor Nenad Disić, while the measurers were both specially trained for this type of measurement, and they were doctoral students at the University of Nis FSFV.

Description of measuring instruments:

1. Jump from a squatting position was carried out with hands on the hips to avoid the swing by the arms (Komi & Bosco, 1978),

2. Jump to a half squat is performed in the same way as jump squats while the examinees are instructed to perform a vertical jump from a natural standing position with the previous half squat (Komi & Bosco, 1978).

Both tests the subjects were performed three times and used for further analysis by their best result.

The statistical data analysis were consisted of determination of basic descriptive statistical parameters which will determine the mean differences by the t-test for small independent samples.

RESULTS

Descriptive statistics and differences of means for boys

The following Table 1. shows the parameters of the central dimensions and variability. It is observed that the values of the half squat vertical jump were higher than of the values of the vertical jump squat.

Table 2. analyzes the differences in arithmetic means tested techniques of the vertical jump. It is observed that all variables in the vertical jump, have statistically significant differences in the level of significance .00.

Descriptive statistics and differences of means for girls

The following Table 3. shows the parameters of the central dimensions and variability in the vertical jump techniques that are performed by girls.

It is observed here that the values of the half squat vertical jump have higher vertical jump values of the squat.

These results were expected, since the vertical jump with a half squat there is so-called elongation and shortening of the cycle, ie. the transient muscle contraction when the muscle contraction exceeds from the eccentric contraction and becomes a concentric contraction, by which the energy of the elongation of the muscles is accumulated and used in the rebound phase.

In Table 4. are given differences of means which were tested by t-test where we see that even here, in

Table 1. Descriptive statistics of variables vertical jump in boys

		Mean	Std. Deviation	Std.Error
Pair 1	TF CMJ	.422 92	.03991	.01066
	TF SJ	.4015	.03727	.00996
Pair 2	H CMJ	22.0832	4.0197	1.07433
	H SJ	19.9154	3.59351	.96041
Pair 3	P CMJ	762.4972	139.6853	37.33248
	P SJ	725.9081	141.4101	37.79343
Pair 4	V CMJ	2.0730	.19506	.05213
	VSJ	1.9687	.18 294	.04889

Table 2. t- test the significance of mean differences

		Correlation	Sig.
PAIR 1	TF CMJ & TF SJ	.903	.000
PAIR 2	H CMJ & H SJ	.907	.000
PAIR 3	P CMJ & P SJ	.977	.000
PAIR 4	V CMJ & V SJ	.904	.000

Gender = m

Table 3. Descriptive statistics of variables vertical jump among girls

		Mean	Std. Deviation	Std.Error
PAIR 1	TF CMJ	.3810	.04545	.00947
	TF SJ	.3608	.04462	.00930
PAIR 2	H CMJ	18.0304	4.21184	.87823
	H SJ	16.1718	3.98848	.83166
PAIR 3	P CMJ	511.0948	88.27837	18.40731
	P SJ	483.3188	82.03826	17.10616
PAIR 4	V CMJ	1.8682	.22271	.04643
	V SJ	1.7684	.21852	.04557

Gender = f

Table 4. T - test the significance of mean differences

		Correlation	Sig.
PAIR 2	TF CMJ & TF SJ	.839	.000
PAIR 2	H CMJ & TF SJ	.848	.000
PAIR 3	P CMJ & TF SJ	.917	.000
PAIR 4	V CMJ & TF SJ	.839	.000

Gender = f

girls, the differences in the variables in both rebounds are statistically different at the level of .00.

CONCLUSION

On the basis of the realized research, the group of first grade boys and girls and vertical jump measurements in relation to the two techniques, it can be concluded the following:

- There was a statistically significant difference between the half squat vertical jump and a jump from a squat for the first grade girls.
- There was a statistically significant difference between the half squat vertical jump and a jump from a squat for the first grade boys.

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Correspondence:
Katarina Herodek
University of Niš
Faculty of Sport and Physical Education, Niš, Serbia
Str. Čarnojevića 10a, 18000 Niš, Serbia
E-mail: rominaherodek@gmail.com