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STUDY ON EXPLOSIVITY PLIOMETRICAL AND NONPLIOMETRICAL CHARACTERISTICS IN CHILDREN 8-9 YEARS OLD

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Abstract:
Physical training is a decisive structural aspect of sports training and important content that makes the tactical and technical performance ability. Specificity increasingly pronounced biomechanical structures promoted by close of proof, means of influence, but also by the size appropriate physical and mental stress, looking decisive to the development of specific motor ability. Anaerobic metabolism and Visco-elastic properties of the component muscle in situations of "stiffness" (high tone and fast-acting capacity) and all modes of expression of force in relation to speed and storage capacity and re-elastic component of muscle are factors determinants in most sports. (S. Zanoni, 1984)
Keywords: muscle training, explosivity, pliometric, strength Bosco test

Introduction and research objective

The purpose of the paper is to highlight features in content explosivity pliometrical and nonpliometrical muscle training in children 8-9 years.Measurement and quality evaluation in neuromuscular explosive effort is non-specific lower level using a simple movement, vertical jump on two feet. One can appreciate and conduct orientation training for speed or power in relation to power - speed, but the overall control of the movement phases. The combination of explosive power, strength and coordination is carefully monitored and trained in all sports great efforts are made to find the most appropriate means of training and testing, highly specific and accurate measurement as the initial level of the achieved Following specific training and validation progress forecast (Bosco C 1999) Existing international statistics from thousands of tests on the protocol Bosco allow comparisons between the same athletes practicing sports, the levels of age, class or level of skill and gender. Forecasts can be compared with existing models for children, juniors, seniors but also national groups on sports. (Bosco C, Komi P.V., 1982) Measurement and quality evaluation in neuromuscular explosive effort moves through a simple, non-specific, vertical jump, can focus on preparing the muscle force-velocity relationship but also the general control of phase structure movement jump. Leg muscles, isolated by the arms folded position, with hands on hip, can characterize the whole conduct of the Athlete Driving tested by relatively high ratio that it has in relation to muscular total whole-body muscles, but also by analyzing phase and kinematic characteristics and dynamic impulses and soil detachment. (C.Bosco, P Mognoni., IF, Luhtanen 1993).

Hypothesis: We believe that the role of muscle training to develop specific strength, requires first understanding the mechanisms of muscle action and highlighting characteristics of pliometric or nonpliometric explosivity on children 8-9 years at the first stage of selection and muscle training in sports performance

Research methods and procedures

For performance evaluation of children selected for performance sports apply as a method of investigating the characteristics of muscle explosivity (VF) testing method, the Protocol Bosco applied force measuring platform type Kistler Quattro Jump 9290AD. The equipment is located in Pitesti CCPU testing equipment was carried out on a group of children 8-9 years selected for swimming practice at CSM Pitesti. It examines the evolution of the subject you as the representative for the group studied but performance and proper browsing of all tests

The Quattro Jump Bosco Protocol

The Bosco Protocol evaluates 6 different jump types and calculates a variety of parameters:

	Designation	Jump Type	Description
I	SJ	Squat Jump	Single jump starting from knees bent at 90 degrees
	SJbw	Squat Jump + Body Weight	Squat jump with an additional load of up to one body weight
II	CMJ	Countermovement Jump	Single jump starting with straight legs with a natural flexion before takeoff
	CJbref	Continuous Jump Bent Legs Reference	Series of 5 jumps with bent knees, used as reference to compare with CJb (15..60s)
III	CJs	Cont. Jump straight leg	Series of 5 jumps with straight knees
IV	CJb	Cont. Jump Bent Legs	Series of 15..60s jumping with knees bent

Bosco Protocol can evaluate the following by its componenets:

- Explosivity tests, detachment force, **non –pliometrical SJ** and **pliometrical CMJ**
- Hip force tests, CJbref, CJb
- Reactivity tests, CJs
- Additional tests SJBody weight SJbw, by use of the body weight or other tests of measuring force in special blocking actions or actions specific to the attack, with a platform take-off.

Results

Squat Jump (SJ)

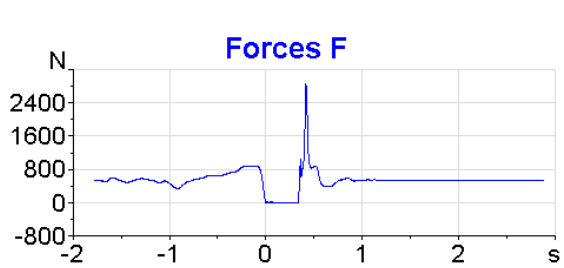
Description **-** Single jump with knees bent at 90 degrees. Performance in a squat jump describes jumping ability and explosive (maximal*) force production of the lower extremities*

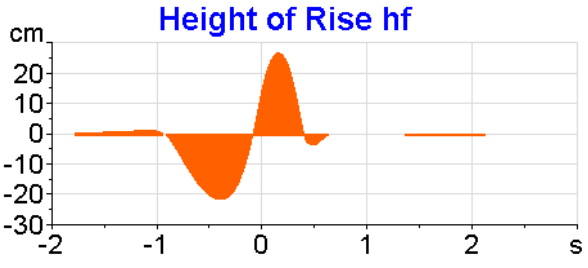
The Squat jump (SJ) presupposes doing a vertical jump from a semiflexed knees position, 90°, arms bended, palms on thehip. The lack of arm action makes the performance 10 cm shorter and that is why the results offered for orientation are apparently poorly justified, between 24 cm – 38 cm for females and 26 cm – 45 for male performances. The SJ describes the ability to jump and the explosive (maximal) force of feet, the ability of neuro-locomotive recruit, the quantity of fast fibre.

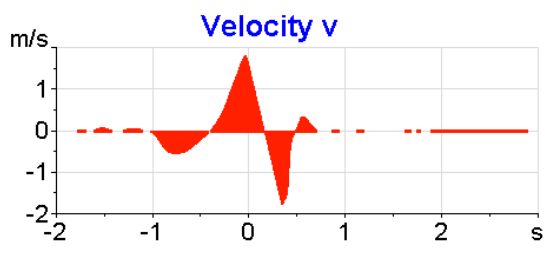
Squat Jump (SJ)

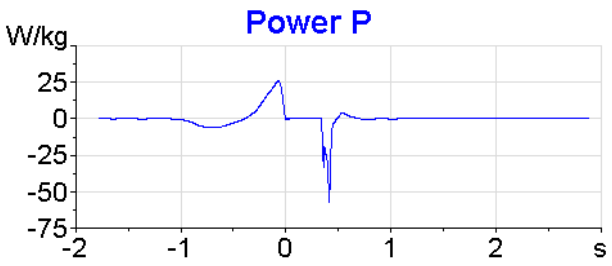
Kistler Quattro Jump Bosco Protocol Version 1.0.9.2
Name: Thomas Alexandrescu
Date: 3/10/2009 1:28:00 PM
Bilateral Deficit: n/a %

Legend	#	Leg	hf [cm]	hc [cm]	Pavg [W/kg]
Best		**Both**	**26.5**	**-15.4**	**6.2**
Avg.			26.5	-15.4	6.2
Stdev.			0.0	0.0	0.0









Measured parameters:hf - maximum height of jump in flight, 26.5 cm
hc - lowest center of mass of Squat, - 15.4, defines the position of Squat
Pavg - average muscle power, 6.2 W / kg, (Concentric) average (P (t)), since the v (t) becomes positive until take-off.**Bilateral deficit%** - was executed only jumping on both feet

Counter Movement Jump (CMJ)

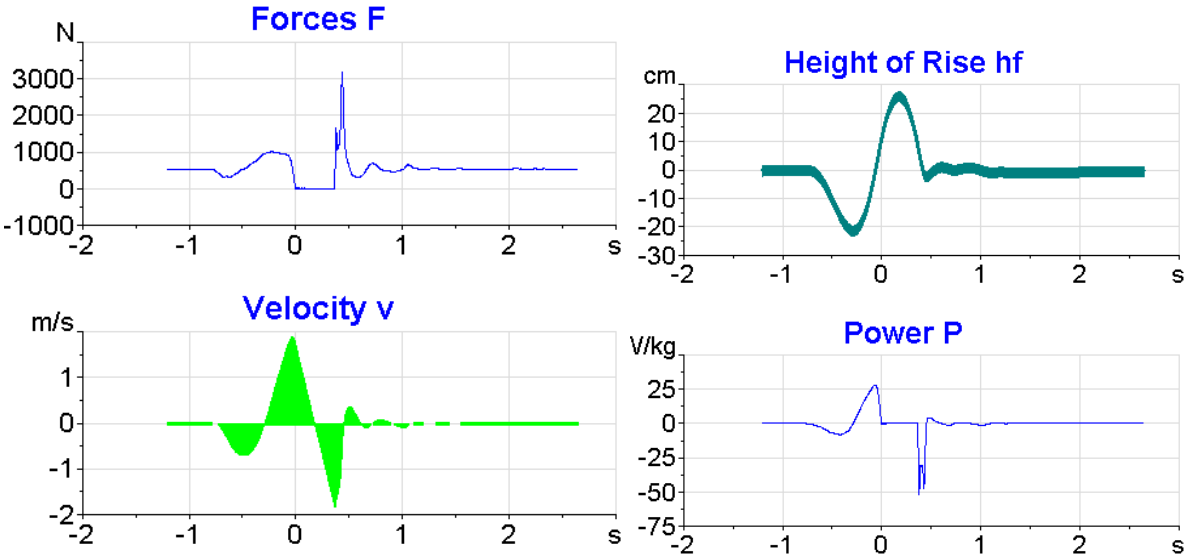
Description: the single jump starting with straight legs and performing a natural flexion before take-off. In the counter movement jump during the breaking phase elastic energy is stored in the muscles and tendons and then utilised in the following propulsion (concentric) phase.

The Counter Movement Jump (CMJ) presupposes doing a vertical jump which is identical to the Squat Jump test, but with take-off from standing.An energic flexion is executed, followed by an extension and a vertical jump. The differences between the two tests correspond to the sport players' „elastic" aptitudes. The CMJ describes the evaluation of the explosive (maximal) force FV of feet and the quality of reusing the muscular elasticity, the neuro-motric recruiting capacity, the ability to use the visco-elastic force from inside the muscular tissue.

Counter Movement Jump (CMJ)

Kistler Quattro Jump Bosco Protocol Version 1.0.9.2
Name: Thomas Alexandrescu
Date: 3/4/2009 1:30:25 PM
Bilateral Deficit (Pavg): n/a %
Fast Twitch Fibres (est.): 11.1 % FT
Effect of Prestretch: -1.5 %
(reuse of elastic energy)

Legend	#	Leg	hf [cm]	hc [cm]	Pavg [W/kg]	Fi [BW]
Best	**2**	**Both**	**26.1**	**-21.1**	**16.2**	**0.78**
Avg.			26.1	-21.1	16.2	0.78
Stdev.			0.0	0.0	0.0	0.00



Measured parameters:hf - maximum height of jump in flight, 26.1 do not improve the outcome by using momentum and muscle elasticity in native mode by comparison with SJ
hc - lowest center of mass of Squat, -21.1Pavg - average muscle power, 16.2 W / kg
FI - 0.78 Bw (relative to body weight is the force instantaneous transition from eccentric to the concentric contraction when the power is positive.**Bilateral deficit** - left, right, was executed jump on both legs
FT (Fast Twitch Fiber)% - 11.1%, and is estimating the percentage of fast fibers responsible for the issuance of **FV** (Bosco algorithm was shown to hundreds of records based on the report SJ - CMJ and muscle biopsies on age, sex, type of training) 25% = medium.**Muscle elasticity - (Effect of prestretch)** - 1.5%, very weak and is the contribution made by muscle elasticity and elastic energy reuse 11% optimal, 20% Excellent

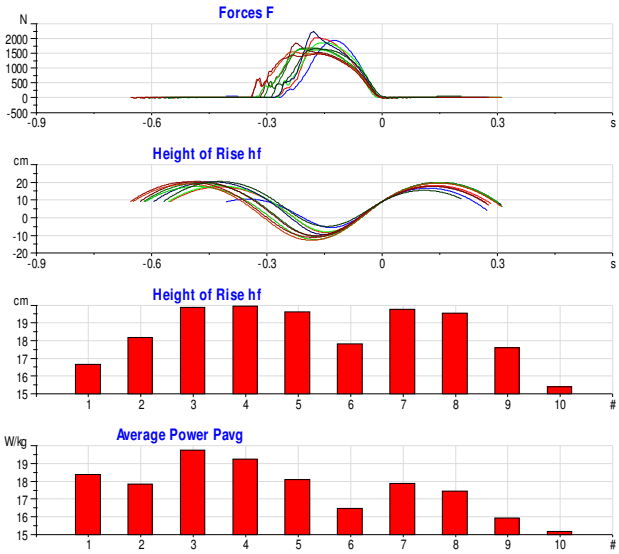
Continous Jump Straight Legs (CJs)

Continuous Jump with Bent Legs

Description A series of approximately 5 jumps with knees bent during the contact phase, used as reference to compare with the CJb over 15..60s. This jump is performed to set a baseline reference for other continuous jump trials.

Kistler Quattro Jump Bosco Protocol Version 1.0.9.2
Name: Thomas Alexandrescu
Date: 3/4/2009 1:33:35 PM
Leg Equilibrium Index: 1.35 Norm: 2.3

Legend	#	hf [cm]	Pavg [W/kg]	tcont. [s]	k [kN/m]
Best _	**3**	**19.9**	**19.8**	**0.272**	**12.48**
Avg.		18.4	17.6	0.304	10.49
Stdev.		1.6	1.4	0.032	2.78



Measured parameters:hf - maximum height from the center of mass rises in flight **hc** - lowest center of mass of Squat.**Pavg** - average muscle strength W / Kg **FI** - Instant Power.**Tcont** - contact time with soil

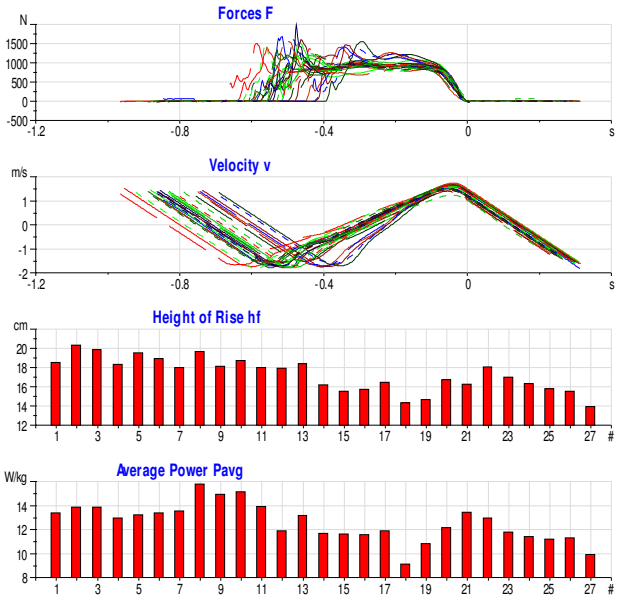
Continous Jump Bent Legs (CJb)

Kistler Quattro Jump Bosco Protocol Version 1.0.9.2
Name: Thomas Alexandrescu
Date: 3/4/2009 1:35:20 PM
Duration: 24.13 s
No. Jumps: 27
Speed Endur. Index: 82.3 %
Voluntary Effort Index: 100.5 %
Fatigue Index hf: 81.3 %
Fatigue Index Pavg: 82.6 %

Legend	#	hf [cm]	hc [cm]	Pavg [W/kg]	Fi [%BW]	tcont. [s]
Best __	**2**	**20.3**	**-23.1**	**13.9**	**0.74**	**0.642**
Avg.		17.3	-18.5	12.6	0.85	0.545
Stdev.		1.8	3.2	1.6	0.22	0.070

Continuous Jump with Bent Legs (CJb)

Description: a series of 15..60s jumping with knees bent. CJb evaluates the mechanical power of the lower extremities.



Measured parameters:

hf - maximum height from the center of mass rises in flight

hc - lowest center of mass of Squat

Pavg - average muscle strength W / Kg

FI - Instant Power

T contact - contact time

Duration - Total time

Number of jumps --

Speed indicator strength - the ability to develop maximum power versus time - CJB hf / hf CJbref

Indicator of voluntary effort - maximum performance relationship imposed by 5 jumps

Index of tiredness - (hf) - Comparison between the first and last 5 jumps 5 per h

Index tired - (P avg) - Comparison between the first and last 5 jumps 5 per P avg

Jump Summary

Kistler Quattro Jump Bosco Protocol Version 1.0.9.2

Date of Printout: 3/17/2010 11:43:40 PM

Protocol Configuration File (MTC):

Squat Jumps (SJ and SJbw)

#	Name	Date	hf SJ [cm]	hf SJbw [cm]	Bosco Ind. [%]
1	Alexandrescu, Thomas	3/4/2009	26.5	n/a	n/a
Avg.			*26.5*		
Stdev.			0.0		

Countermovement Jump (CMJ)

#	Name	Date	hf [cm]	Fi [%BW]	Pavg [W/kg]	Effect of Prestretch [%]	Fast Twitch Fibres [%FT]
1	Alexandrescu, Thomas	3/4/2009	26.1	0.78	16.2	-1.5	11.1
Avg.			*26.1*	*0.78*	*16.2*	*-1.5*	*11.1*
Stdev.			0.0	0.00	0.0	0.0	0.0

Continuous Jump (CJs and CJbref) — *CJs* | *CJbref*

#	Name	Date	hf [cm]	Pavg [W/kg]	k [kN/m]	hf [cm]	Pavg [W/kg]	Leg Equ. Index
1	Alexandrescu, Thomas	3/4/2009	19.9	19.8	12.48	22.1	14.7	1.35
Avg.			*19.9*	*19.8*	*12.48*	*22.1*	*14.7*	*1.35*
Stdev.			0.0	0.0	0.00	0.0	0.0	0.00

Continuous Jump (CJb) — *CJb Overview* | *CJb 0..15s*

#	Name	Date	Speed Endur. Ind. [%]	Voluntary Effort Index [%]	Fatigue Index hf [%]	Fatigue Index Pavg [%]	hf [cm]	Pavg [W/kg]
1	Alexandrescu, Thomas	3/4/2009	82.3	100.5	81.3	82.6	18.2	13.3
Avg.			*82.3*	*100.5*	*81.32*	*82.59*	*18.2*	*13.3*
Stdev.			0.0	0.0	0.00	0.00	0.0	0.0

Continuous Jump (CJb 15..60s) — *CJb 15..30s* | *CJb 30..45s* | *CJb 45..60s* | *Average*

#	Name	Date	hf [cm]	Pavg [W/kg]	hf [cm]	Pavg [W/kg]	hf [cm]	Pavg [W/kg]	hf [cm]	Pavg [W/kg]
1	Alexandrescu, Thomas	3/4/2009	15.9	11.4	n/a	n/a	n/a	n/a	17.3	12.6
Avg.			*15.9*	*11.4*					*17.3*	*12.6*
Stdev.			0.0	0.0					0.0	0.0

Disscusions Conclusion

Among the most important features and nonpliometriceal and pliometrical explosivităty characteristics we present the following indicators Effect of Prestretch (Re-Use Elastic Energy) (EP) indicate muscle elastic energy Reuse CMJ and SJ ratio indicates how much is the benefit produced by prestretch (CMJ compared to SJ) Effects of training stimuli will to increase capacity to learn and reuse of elastic energy muscle close to optimal values recommended.

AT athlete presents lower values devoid of ability to reuse elastic energy in muscle and poorly performing vertical separation of momentum in terms of execution pliometrics.

Fast Twitch Fibers Percentage (estimated) indicates the percentage of fast muscle fibers responsible for explosive force. Estimates indicate the percentage of fast fibers responsible for explosive strength development.

Estimated percentage of fast muscle fibers show a low value, below average due to lack of maturity and body couple found the process of growth and development, with an unstructured report age, gender, type of training.

Index Leg Equilibrium Equilibrium of the functional structure of the leg including three joints (hip, knee, ankle) and the lower and upper leg (thigh, calf) functional balance concerns Jump structure around the 3 main joints, ankle, knee, neuromuscular hip show that the operation of the upper leg muscles involved is in equilibrium with the lower the neuromuscular function of the knee, ankle and lower limb is weaker than the hip and thigh.

From this we concluded that leg muscle strength-training to be directed primarily at developing the muscles that strengthen the knee and ankle joints as well as neuromuscular control capacity at this level.

Maximum explosive power without enthusiasm, nonpliometrical is excellent, (SJ) for this age showing a great capacity for recruitment of neuro-motor equivalent 118% of normal for age, sex, sports volleyball, level.

In terms of maximum explosive muscular power boost, pliometrics (CMJ) have a low capacity for elastic energy muscle to re-coordination of movement on a Visco-elastic component of EP (Effect of Prestretch) low 1.5%.Athlete has a structural imbalance slightly LE (Leg Equilibrum) for triple extension (1.95) on the lower part knee, leg, ankle and upper thigh hip strain component.

References

BOSCO, C., KOMI, P.V. 1982, *Muscle elasticity in athlete, Exercise and Sport Biology* ed. By P.V. Komi, Champaine III, Human Kinetics Publisher pp 109 – 117, 1982

BOSCO C., MOGNONI P., LUHTANEN I.F., 1993, *Relationship between isokinetic performance and ballistic movement,* European Journal of applied Physiology 51, pp 357 – 364, 1993

BOSCO, C., 1999, *Strength assessment with the Bosco`s test*, Italian Society of sport, Rome, 1999

ZANON, S., 1984, *Pliometrie der Spruenge*, der Lehre der Leichtathletik 25 pp 549 – 522, 1984