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Il Metodo VBT: innovazione tecnologica al servizio dello Sport

The VBT Method: technological innovation at the service of Sport

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Abstract

Velocity-Based Training (VBT) is a training method that allows us evaluating the velocity of the concentric phase of a movement, managing to analyze and program training intensity and load. The method concerns the measurement of the speed of the ratio between the barbell/dumbbell and a limb, through the use of an accelerometer or tools suitable for this assessment, which are more and more accurate and marketed today. In consideration of the need in sports training to establish an optimal workload, this innovative methodology measures the speed of execution and proposes a hypothetical ideal training load, through a sensor that can be connected to the wrist or the bar in order to perform the exercises in the best way. The methodology used employs the latest-generation technological elements.

Keywords

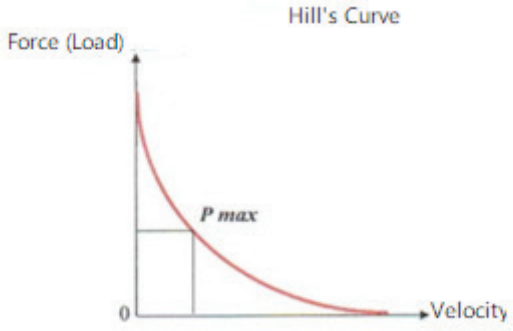
Velocità, Forza, Allenamento, Sensori, Valutazione
Velocity, Strength, Training, Sensor, Evaluation

Introduction

The basic concepts of force, the ability of the muscle to express tension with its characteristics (types of fibers, hypertrophy, intra/intermuscular coordination) and factors related to stretching, give rise to different types of training that, depending on it and on the type of load administered, give the possibility to develop different types of strength (maximum strength, power, resistance, fast strength).

According to the inverse relationship between Force and Velocity (Hill's curve), as the load on the balance increases, velocity will tend to decrease more and more until it reaches the value 0, and so vice versa. In graph 1, the X axis identifies the speed of movement in m/s, while the y axis identifies the strength expressed. Since the Force is the result of the mass product and acceleration placed on the latter, and the acceleration is a result of velocity, the relationship between force and velocity also identifies the production of power as a product of the two qualities.

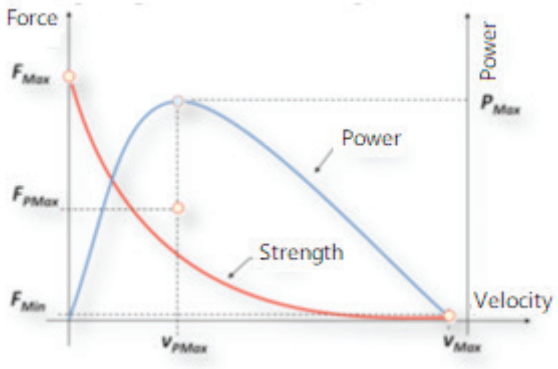
Graph 1: correlation between Force and Velocity



Training strength and speed in a given lift or a specific gesture allows developing and improving power production, as a fundamental component in the performance of team and individual sports.

The VBT is therefore proposed as a method used to train strength according to all its intervals, in relation to the speed expressed in the concentric phase.

Graph 2: Correlation between Force-Power

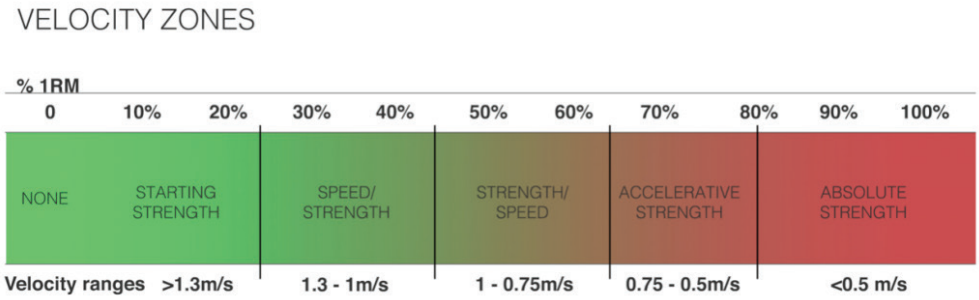


1. Methodological aspects of the Velocity-Based Training

The macro intervals that can be taken into account are:

- Absolute Strength: defined as the maximum strength that can be produced with a single gesture without time limit, which, in the weight room, represents the maximum load that can be lifted in a repetition. In practical terms, Absolute Strength provides for the use of loads between the 80-100% of the maximum load, with repetitions and series that vary from the training context but with a focus on achieving a speed between 0.50 m / s and 0.10 m / s in the concentric phase.
- Accelerative Strength: Trainings where the load percentages are between 65% and 80% of the maximum load, the execution speeds must be between 0.75 and 0.5 m/s in the execution of the concentric phase.
- Strength Speed: Range of the curve in which movements are very dynamic thanks to the excellent ratio between the lifted load and the execution speed. The loads used are between 50% and 60% of the maximum load at speeds between 1.00 and 0.75 m/s.
- Speed-Strength: A working method in which load percentages between 25% and 45% of the maximum load are used, with speeds between 1.3 and 1.0 m/s, in which rapid and sport-specific movements are performed.
- Strating Strength: This is the ability to apply a high amount of strength at the beginning of the movement in which very low loads are used, tending to be less than 25% RM, with speeds greater than 1.3 m/s.

Graph 3: Correlation between 1RM- Speed



Therefore, the VBT enables an improvement in the trend in the relationship between strength and speed, moving more and more the curve right and upwards at every point, so that the athlete can always express his/her power potential at his/her best.

2. Employing the Velocity-Based Training

First of all, it needs to underline the importance of the evaluation of the percentages with respect to the maximum limit, and to point out the use of the execution speed as a fundamental parameter from a methodological point of view. The monitoring of the execution speed of the concentric phase, through the use of accelerometers and speed monitoring tools, allow us objectively evaluating the execution speed of the lift, and therefore whether we are working or not in the range of strength we are looking for, succeeding in establishing the individual profile of the force-velocity curve.

Using accelerometers for the mere purpose of reading velocity data on a screen is the most limiting method to use. All subjects have a different trend in their force-velocity curve: it is

therefore essential, as a first step, to carry out a test by using the accelerometer, in order to assess the speed of the lift in the concentric phase, during all valid attempts.

The outcome will give us a value in m/s for each attempted lift, which reflects a point in our force-velocity curve. Then we will use the data obtained to set the training sessions and the various training progressions, recognizing which part of the curve to develop most according to the athlete's needs or the sport of reference. The possibility of the Daily Readiness is of great importance: it is the possibility of reading and interpreting the outcomes in real time. The most interesting element of this method is the evaluation of the neuro-muscular freshness during the session.

It is possible that, on a given day, the neuromuscular system is less efficient because of the fatigue accumulated for the various chronic loads, or can be more active because, at physiological level, one can have recovered better and be more performing.

Therefore, with the VBT, a certain percentage load can be associated not only with a quantitative parameter (in m/s) but also with a qualitative one, with respect to the lift performed.

This allows to not focus on the raised kg, but to increase or decrease them depending on the speed during the first training series, so that one can better focus on the session. The Velocity-Based Training seems to be an excellent method for training the athlete's strength, allowing quantifying the performance in acute conditions and the improvements in chronic conditions.

In addition, the VBT allows us also having information on the neuro-muscular status of the subject and qualitative information on the training, living us the chance to readjust and better focus on the training session.

3. Strength evaluation study through the VBT

The tools used for this study are: the "Beast" sensor, composed of an accelerometer, a gyroscope and a magnetometer, which can be used for more than thirty types of exercises; a common mobile phone connected to the sensor via Bluetooth, which, once the training session is over, automatically saves data on the site https://; finally, through a PC, there is the ability to transfer data to an Excel spreadsheet and create tables, comparing data over time. Another tool used is the isotonic machinery called "Bench press barbell" (stretching on a flat bench with a barbell) linear exercise in Tab. 1, used in almost all disciplines to increase the strength in the thrust exercise; the same goes for increasing the cross-sectional area (volume) of the pectoralis major muscle. In addition to the involvement of the pectoralis major, the thrusts on the flat bench require the direct intervention of stabilizer muscles such as the anterior deltoids, the coracobrachialis muscle, the serratus anterior and the triceps. The flat bench stretching, in addition to providing a more complete training in terms of stimulation of the stabilizer muscles, also provides a proprioceptive component. The specific study was carried out in a gym by positioning the sensor on the subject involved, and using only the bench press barbell, while always trying to respect the same performance times and methods. The loads used were 70% of the 1RM percentage, suggested by the sensor. The 1RM value, i.e. the maximum single repetition, could be calculated through a direct method. Each training session took place on different days, so as to allow the athlete to rest and restore his ideal status. On the first day, the 1RM took place on the bench press barbell through the direct method. Once the subject under examination positioned himself on the flat bench, after the right warm-up, the single repetitions were carried out by increasing the load from time to time until the last maximum execution, which was up to 120 kg. To understand the functioning of the sensor and what speeds to reach, the athlete performed liftings with a very light weight at 50kg. In fact, it can be seen that in the first series, from the second to the eighth repetition, very high speeds were reached (such as that of 0.83 m/s). During this study, useful data were collected for reading and understanding the outcomes; in table 1, for example, the most significant values taken from the performance of the exercise are reported on an Excel spreadsheet; in particular, the average of all the repetitions carried out for a training session was developed, with the conse-

quent possibility of evaluating and observing the way the values changed over time. The adaptation times and the increase in speed varied depending on the subject, the stress to which he was subjected and how the body reacted to the stimuli. It is also clear that the speed increased both because of the adaptation to the new methodology and also because of the increased maximum amount of weight (1RM), which can be found in the strength parameters detected.

Table 1: average number of repetitions per training session

	exercise	repetition	set	load (kg)	mean power (W)	max power (W)	mean velocity (m/s)	max velocity (m/s)	mean strength (N)	max strength (N)	time under tension (s)
2	beanch press w/barbel	1	1	50	98	158	0,2	0,31	495	565	0,44
3	beanch press w/barbel	2	1	50	378	633	0,72	1,11	528	825	0,64
4	beanch press w/barbel	3	1	50	354	649	0,66	1,06	537	959	0,64
5	beanch press w/barbel	4	1	50	452	883	0,83	1,32	543	966	0,6
6	beanch press w/barbel	5	1	50	332	560	0,64	0,98	520	883	0,66
7	beanch press w/barbel	6	1	50	346	632	0,65	1,04	531	981	0,6
8	beanch press w/barbel	7	1	50	370	705	0,72	1,13	516	996	56
9	beanch press w/barbel	8	1	50	382	686	0,72	1,13	532	943	0,64
10	beanch press w/barbel	1	2	90	138	216	0,15	0,24	902	1034	0,34
11	beanch press w/barbel	2	2	90	279	725	0,3	0,71	925	1405	0,58
12	beanch press w/barbel	3	2	90	259	708	0,28	0,69	919	1399	0,7
13	beanch press w/barbel	4	2	90	263	706	0,29	0,7	921	1366	0,68
14	beanch press w/barbel	5	2	90	249	733	0,27	0,72	925	1402	0,54
15	beanch press w/barbel	6	2	90	189	704	0,21	0,69	914	1423	0,58
16	beanch press w/barbel	7	2	90	188	1087	0,2	1,01	920	1440	0,5
17	beanch press w/barbel	1	3	90	394	954	0,42	0,89	937	1534	0,42
18	beanch press w/barbel	2	3	90	226	741	0,25	0,72	911	1499	0,62
19	beanch press w/barbel	3	3	90	218	866	0,24	0,81	914	1549	0,48
20	beanch press w/barbel	4	3	90	160	830	0,17	0,79	924	1482	0,64
21	beanch press w/barbel	5	3	90	176	812	0,19	0,78	926	1461	0,78
22	beanch press w/barbel	6	3	90	109	796	0,12	0,76	909	1483	0,7
23	beanch press w/barbel	1	4	90	143	238	0,16	0,25	898	1041	0,24
24	beanch press w/barbel	2	4	90	175	755	0,19	0,73	920	1450	0,4
25	beanch press w/barbel	3	4	90	462	825	0,51	0,78	912	1538	0,26
26	beanch press w/barbel	4	4	90	186	784	0,2	0,75	913	1539	0,34
27	beanch press w/barbel	5	4	90	396	703	0,44	0,68	898	1485	0,3
28	beanch press w/barbel	6	4	90	280	598	0,3	0,63	918	1439	0,66
29	beanch press w/barbel	1	5	90	258	423	0,28	0,44	908	1292	0,28
30	beanch press w/barbel	2	5	90	150	238	0,17	0,26	902	1037	0,28
31	beanch press w/barbel	3	5	90	362	621	0,4	0,63	906	1331	0,3
32	beanch press w/barbel	4	5	90	528	676	0,58	0,89	914	1615	0,26
33	beanch press w/barbel	5	5	90	319	543	0,35	0,56	910	1328	0,26
34	beanch press w/barbel	6	5	90	357	615	0,4	0,61	900	1441	0,24

Conclusions

The Velocity-Based Training allows us having information on the neuro-muscular state of the subject and qualitative information on the training, thus giving us the chance to readjust and better focus on the training session. The latter are carried out with the greatest attention to detail, such as the choice of load, which is never the same because our body is subjected to different stresses throughout the day. The method, which is focused on increasing the basic speed in training, can be employed in each exercise with a consequent increase in strength that can be transferred in each discipline. Through the use of a sensor able to detect the parameters of the athlete's conditional skills, the immediate monitoring of the speed with which an exercise is performed allows evaluating the athlete's fitness and developing individualized planning in order to improve performance.

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