

Impact of Using the Ballistic Resistance Training to Improve Elements of Physical Fitness and the Record Level of Triple Jump Race

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Abstract: The study aimed to determine the effect of ballistic training on some physical variables and the record level for second year students in the Faculty of Physical Education for Girls, Helwan University, Egypt. The researcher used the experimental method with using the design of two groups one is experimental and the other is control, size of sample was 30 students from the students of the faculty who have been divided into 15 students for each group, duration of program was 8 weeks (2 training unit per week). The research aims to investigate the effect of ballistic training method of the triple jump race on both elements of physical fitness and record level and percentage of improvement for the experimental group. The researcher used the method of interval training of its both types. Program has been divided into experimental group (16 weeks), 8 weeks of weights training divided into two periods (start-up period and prep period), then 8 weeks for ballistic training divided into 3 periods (creation and establishment period, prep-period, pre-competition period or exam). The results of the program led to improved all ballistic variables of physical and record level under study.

Key words: Explosive power • Muscular strength • Ballistic training

INTRODUCTION

Athletics is one of basic sports which is favorite to all sportsmen because it has a multi-skill and high level of skill in performance [1]. All have agreed that the special physical capacities of jump competition are characterized by the speed and maximum power speed and power [2-5]. The creation of the player to physically meet The requirements of the sports activity is considered as one of the main important duties during the training process [6].

The ballistic training is the nearly a modern way which join between pleomytric training with weights but includes nearly light weights with high speeds [7]. The ballistic training is one of the methods used to overcome the lack of speed in the traditional training through the full domain of motion [8]. We see that ballistic movement is defined as the movement which is performed by the muscles but it continues by the quantity of movement in parties [9].

The Ballistic Movement Has Three Main Stages:

- The initial phase of the movement and muscle contraction is done by default.

- The second phase is the phase of regression or landing, which is rely on the speed generated from the first stage.
- The third phase is a phase of decreasing speed, accompanied by muscular default (defibrillation) by lengthening [10].

Plastics training are a form of strength training to develop explosive power it operates on ligaments and joints when landing from jumping [11]. Hence the idea of research in a serious attempt to train students using training exercises similar to the original form of the same skill.

Research Objectives: The research aims to determine the effect of ballistic training method for the race of the triple jump on:

- Elements of physical fitness.
- Record level.
- Percentage of improvement for the experimental group.

Research Hypotheses: There are indicative statistical differences in the race of triple jumping for experimental group in:

- Record level.
- Percentage of improvement for the experimental group.
- Physical fitness.

Research Terms: Ballistic resistance training: it is a performance of explosive movements with the resistance and includes throwing the weight or the tool used as quickly as possible [11].

MATERIALS AND METHODS

Methodology: Researcher used the experimental method using the design of the two groups (experimental - control) in a measurement manner of before-and-after.

Research Community: Research community were selected by deliberate from second year of Faculty of Physical Education for Girls at Algaira, their number was 122 students from academic year (2008/2009) from first term.

Research Sample: Sample was chosen randomly by ballot between the 122 students, from the original community and the number was 20 Student, 15 for the experimental group, 15 for the control group. Deposits, frequent absences and non-dieters have been excluded and 5 students were chosen for exploratory experience, outside of the sample and within the research community.

Homogeneity of the Sample: The researcher has a homogeneity of the sample in the dependent variables which have an affect on the results of research, namely, (high - weight - age - ability muscle - muscle strength of the legs - muscle strength-to-back - speed motor - speed transition - speed - agility - flexibility - compatibility - dynamic balance - digit level) [9].

Honesty: The researcher used two types of truth in sincerity of the arbitrators, self-honesty [10].

Principal Study

Before Measurement: Measurement has been made to the variables of tribal research on a sample of 30 student at 9:00 a.m. on 01/10/2008 in the land of playground of triple jump in Faculty of Physical Education were it included physical tests (height - weight - age - ability to muscle - muscle strength of the two legs - the back muscle strength - velocity - transition speed - speed - agility - flexibility - coordination - dynamic balance - record level).

Progress in the Program: Program has been implemented on the experimental group on 5/10/2008, program has been divided into the experimental group to 16 weeks, 8 weeks of training with weights divided into two periods (start-up period, prep-period) then 8 weeks of ballistic training divided into 3 periods (creation and establishment period, prep-period and pre-competition period, or exam) (Annex 1,2) implementing the program taken in the college to the control group at the same time exactly at nine o'clock a.m. (Annex 3,4).

Annex 1: General physical preparing.

- Training of ABC.
- Running in place for 30 second.
- Ruining from 10m to 30m.
- Ruining 60m from high start.
- High jumping to front in short and fast.
- Jumping with one foot and change.
- Jumping from balls on the ground.
- Jumping from balls on the ground it's put in parallel way.
- Jumping from stick which it laying on ground in a circular form.
- Running around stick which it laying on ground in square form.
- Jumping from Swedish seats in the form of parallel.
- Jumping from cones lying on the ground in pa form.
- Jumping from cones lying on the ground in twisted form.
- Continuous Jump from barriers in both sides.
- Jumping inside hoops.
- Jumping with rope for 30second.
- Jumping from low barriers.
- Go up and down the stairs.
- Passing medical ball around center and feet.
- Bending body to front and stress on.
- Stab to front with change.
- Put the barriers and pressing to front.
- Sit down- long- open - and pressing to front.
- Sit down on back then lift the feet up and behind, then go down.
- Sit down- long- collect- and pressing to front.
- Stand up - collect- bending torso to left and right.
- Stand up - collect- bending torso to front and behind.
- Stab to front with change.
- Lying- collect-with bend right foot to front and stress.
- Put up barriers and pressing forward and then lie down with change.

Ballistic Training:

- Partridge on one foot with the switch with the other foot.
- High jump with collect feet together on the chest.
- Jumping in place with carrying a medical ball by feet.
- Stand, when a medical ball between feet.
- Stand, when a medical ball between feet and jumping to through a rope on ground.
- Stand, when a medical ball on each foot then running to go and back.
- Stand, when a medical ball on each foot then jumping up, go and back with open feet.
- Stand, when a medical ball on each foot then jump to touch back by hand and knees touch chest.
- Stand, when a medical ball on each foot then jump to front and two stop the through ball to colleague, then colleague does the same thing.
- Jump to front squatting position with hands carrying
- The weight of ½ kg.
- Jumping To back with carrying a weight 1kg by hand.
- Go up and down with carrying a weight 1kg by hand.
- Go up and down with carrying a weight 1/4 kg - attached by foot.
- High Jump to front with carrying a weight 1kgby hand.
- High Jump to front with carrying a weight 1/2kg - attached by foot.
- Jump up of rope on ground with carrying the weight of 1/k by hand.
- Jump up of rope on ground with carrying the weight of 1/4 k by feet.
- Jumping to through up cones with carrying the weight of 1/4 k by feet.
- Stand up at the front of cones and put a 1/4kg as weight between feet then jump by side through up the first cone then second.
- Attach a weight (1/4kg)on feet then stand up on box and jump to ground then back over box and so on.
- Go up and down with carrying a weight (1/4kg) attached with feet.
- Stand up on the front of seat and then put foot on another seat, carrying a weight with two hand then go up and down from seat with change feet.
- Stand up on the front of stair, carrying a weight (1/4kg) on feet then go up and down on the stair for three degree and back and so on.
- Stand up when putting weight (1/4kg) on feet then jumping to back from squatting position then jump.
- Go up and down on over box with explosion way when feet carrying weight (1/4kg).

- Go up and down on over Swedish seat, when feet carrying weight (1/4kg).
- Player is standing on box then jump as soon as he touches the grounds he turn round with angle 360° and jumping, feet carrying weight 1/4 kg.
- When feet carrying a weight 1/4 kg player jumping from the center of a hexagonal shape to the rib side and then back to the center of the hexagon again and then to the rest of the ribs in a hexagon.
- Jumping from a squatting position in front.
- Training of step and jumping with one foot, one after the other when it carrying weight of ¼ kg this to improve the length and frequency steps while running, this training will be in distance from 10 to 50m.
- Player collects between jumping and partridge, is considered the mixing stand jump (jump, broad) jump in place with rope or on one foot, in which The student switches between the jump and a partridge in a straight line or on the barriers or cones and feet with weight of 1/ 4 kg.

Annex 2:

First: Program of Weights for the Experimental Group: Researcher determined the maximum weight lifted for one time for each student and determine the ratio that start out with a 55% then increasing by 5% each week and divided into two times as follows:

The Principal Time Was Four Weeks: The aim of this phase is development of bearing strength, flexibility, training is at 2 times a week and recurrences of 10:12 in 5 groups included the Foundation to exercise as half squatting, bend the legs gravity, extension leg with weight, bending arms with weight, attraction of gravity from ground, back extension.

Value and intensity during training period

Week	Severity	Groups	Duplicates	Rest	Density
1	55%	5	10-12	2 min	2 times per week
2	60%	5	10-12	2min	
3	65%	5	10-12	2 min	
4	70%	5	10-12	2 min	

Preparing Period: This phase is four weeks it's comes after the last phase because of this the work is the more severe, so as to create the body for the next phase it will be using the training for muscles working to bounce triple and include, squatting, bend the legs gravity, extension leg with weight, bending arms with weight, attraction of gravity from ground, back extension and jumping to front.

Value and intensity during this period

Week	Severity	Groups	Duplicates	Rest	Density
5	75%	5	10	1.5 min	2 times per week
6	60%	5	4-6	1.5 min	
7	65%	5	4-6	1.5 min	
8	70%	5	1-3	1.5 min	

Second: Ballistic training:

Researcher set up trainings that take place in the program, which lasted for 8 weeks by 2 units per week divided into 3 periods, start-up period, a period of preparation, the period before the exam and perform training in by strongly way.

Period of Preparation for Three Weeks: It includes, creation of student to the training program, it will be a few tugs and rest periods, relatively large.

Value and intensity during this period

Week	Severity	Groups	Duplicates	Rest	Density
1	25%	3	10 for weights		
2	30%	3	&30 for speed		
3	35%		and jumping	90 second	2 times per week

Preparing Period for Three Weeks: Training in this phase will be on ballistic resistance with more than last training, focus on muscles training as fast as the speed of movement of a similar performance during training and are desperately high and the period of comfort relatively little.

Annex 3: Control training program

Weeks	Unit	Unit parts	Time	Contents	Repetition	Sets	Rest between sets	Intensity	Used equipments
First week	1	Preliminary part	15m	Worm up	5 Repetition	3	Performance	25%	
		Main part Basic physical preparation	20m	Jumping –running-trining cordenation-speed training -flexibility-muscular strength	5sec for spezz		time 1-5		
		S pecial physical preparation	35m	Jumping –running-trining cordenation-speed training -flexibility-muscular strength -training jumping,agility					
		Educational skills	35m	AS IT IS follaed in the college					
		Final part	10m	Attachment N (5)					

Annex 4: Arithmetic mean standard deviation (s.d.)

Variables	Unit	Control group			Experimenta groupl		
		SKE	STD	A	SKE	STD	A
Age		,660	,3555	19,693	,041	,373	19,593
Height	CM	1,102	4,171	162,6	1,476	2,604	161,233
weight	kg	,166	5,71	55,33	,351	5,021	56,73
Coordination	Sec	1,321	,85	7.8	,16	,850	7.6
Leg powar	Cm	1,358	,281	1,39	,842	,134	1,37
Agility	Sec	,185	,698	12,2	,201	,726	11,95
Flexibility	Cm	,280	2,353	14,0	,025	4,48	14,57
Speed of transition	Sec	,195	,4759	5,324	,709	,41713	5,24
Leg strength	Kg	,034	71,606	31,0	,173	7,98	32,3
Back strength	Kg	,306	4,169	22,3	,223	7,367	21,0
Balace	Repetition	,149	1.3	5.9	,13	2.09	5.67
The speed motion	Sec	1.2	4.03	36.4	,67	3.3	65.1
Record level	CM	,333	,547	5,98	,495	,434	6,10

Value and intensity during this period

Week	Severity	Groups	Duplicates	Rest	Density
4	35%	10 for weights	3	90 second	2 times
5	40%	&30 for speed	3	90 second	per week
6	45%	and jumping	3	90 second	

Pre Test Period for Two Weeks: In this period the students up to the top of the power and capacity and other physical attributes which is to act with severity the attic and low volume.

Value and intensity during this period

Week	Severity	Groups	Duplicates	Rest	Density
7	50%	2-3	10 for weights	60 sec	2 times
8	55%		&30 for speed and jumping2	30 sec	per week

The Program Foundations:

- Researcher took into her account all the follow:
- Training goes from simple to complex.
- Training is gradually in distress.
- Taking into account the safety and security factors.
- Taking into account the individual differences between members of the sample.
- Determination of the weights and carrying them ascending.

Used Training Method: Researcher used the method of interval training of both types of high interval training for development of muscle strength and explosive power and used low interval training during the preparatory period of weight training because this method is characterized by ideal exchange between Periods of exertion and comfort.

Components of Training Load:

- Medium loading of 50-75% of the maximum capacity of player and the pulse rate range of 120-145) pulse / m.
- High loading of 75-85% and the pulse rate ranges from 145-170 pulse/m.
- Loading sub- maximum of 85:95% and pulse rate ranges from 170-180 pulse/m.
- Loading maximum 100:95%, pulse rate ranging from 180 pulse/m or more.

Rest Periods: Rest periods were given adequate for return of pulse rate to 110-120 pulse/ m, students have been trained in measuring pulse Through the radial artery of the wrist for 6 seconds and then multiplied by 10 to calculate the pulse rate at rest.

Formation of Training Load: Researcher used the ripple method (1:1) in the formation of the degree of weekly loading, low loading for day followed by a high loading for another day.

Pre-Measurements: After completing the application of the proposed program, post- measurements were taken of all members of the sample on 05/12/2008 in the same manner as was done during pre - measurements and then recording results and measurements that have been reached.

Statistics Treatment: Researcher used the statistical program (SPSS) for the statistical results of coefficients as follows:

- Calculating the indication of differences t-test.
- Calculating averages, standard deviation and coefficient of torsion and splaying.
- Percentage of rates change in.
- Average for before and after measurements.
- Correlation coefficient to find the constant and the square root to get truth of Self confidence.

RESULTS AND DISCUSSION

The researcher will discuss the results in the light of data of research sample and statistical processing in accordance with the terms of reference.

Discussing the first hypothesis which states that there are significant statistical differences between the components of fitness in the race of the triple jumping for the experimental group:

It's clear from Table 3 the existence of statistical significant differences between pre and post measurements of experimental group in the elements of physical fitness in the favor of post measurement.

Table 1: Amount, intensity of load, rest period of the ballistic training

Week	Intensity	Set	Repetitions	Rest period
9	25%	3	10-30 second for running & jumping	90 second
10	30%	3	10-30 second for running & jumping	90 second
11	35%	3	10-30 second for running & jumping	90 second
12	35%	3	10-30 second for running & jumping	90 second
13	40%	3	10-30 second for running & jumping	90 second
Week	Intensity	Set	Repetitions	Rest period
9	25%	3	10-30 second for running & jumping	90 second
10	30%	3	10-30 second for running & jumping	90 second

Table 2: The temporal distribution of the program

Pieces of training unit	Contain	Time (120) mint
Pre-part	Works management - ready (heating)	15 Minute
Main part	Physical Training with weight 20 Minute Education skill 35 Minute Ballistic training 35 Minute	95 Minute
Final part	Calming	10 minute

Table 3: Significance of differences between the pre and post measures for the experimental group in the selected variables

Variables	Unit /m	Pre measurement		Post measurement		Difference	Value
		A	STD	A	STD		
Coordination	Sec	7.60	.850	6.300	.7200	1.320	9.56*
Leg power	cm	1.37	134.000	2.067	0.2202	0.706	9.564*
Agility	Sec	11.95	0.726	5.230	0.2288	6.720	33.78*
Flexibility	cm	14.95	4.084	19.000	2.7700	4.430	3.285*
Speed of motion	Sec	5.24	0.417	4.300	5.8360	1.100	3.9*
Leg strength	Kg	32.30	7.980	50.330	5.1640	18.030	6.647*
Back strength	Kg	21.00	7.167	30.670	5.6270	9.667	5.398*
Balance	Repetition	5.67	2.093	3.200	1.1400	2.467	8.488*
The speed motion	Sec	65.13	3.310	71.330	4.5100	6.200	7.375*
Record level	cm	6.10	0.343	7.273	0.6702	1.173	7.030*

Table 4: Significance of differences between the pre and post measures for the control group in the selected variables

Variables	Unit /m	Pre measurement		Post measurement		Difference	Value
		A	STD	A	STD		
Coordination	Sec	7.833	0.8510	7.1006	0.4950	0.773	3.385*
Leg power	cm	1.390	0.2810	1.7760	0.3670	0.386	4.057*
Agility	Sec	12.200	0.6890	5.6260	0.2350	-6.574	34.5*
Flexibility	cm	140.000	2.3530	16.1330	1.9590	2.133	4.6*
Speed of transition	Sec	5.424	0.4759	5.0100	0.4310	0.414	2.14*
Leg strength	Kg	31.000	7.6060	35.3300	5.8140	4.330	2.16*
Back strength	Kg	22.300	4.1690	24.0000	3.8720	1.700	1.43*
Balance	Repetition	5.930	1.0300	5.0000	1.5100	0.930	2.018*
The speed motion	Sec	63.400	4.0300	65.7300	5.4700	2.330	1.23*
Record level	cm	5.980	0.5470	6.2900	0.5759	0.310	2.86*

The researcher attributed this improvement in the level of physical fitness of the research sample to the ballistic training program developed by the researcher as it contained different exercises by the weight of small scale (30-50%) helps in increasing the speed during the performance, consequently helps in the improvement element of the capacity and velocity, where the results showed the positive impact on the development of muscular power of the two legs and also what is in the program of training, flexibility, agility, speed and compatibility and muscle strength. Also, what is encompassed in the program from the diversity of exercises using weights and medical balls and bar in addition to the small size of the weight of 50, 30% which helps in increasing the speed of performance. This agreed with what has been discovered by previous studies [7, 12]. The training ballistic leads to increasing speed as a result of using light weights. Also the Training includes accelerating gravity or body explosively to the highest speed commensurate with the nature of performance. The training ballistic leads to increase the speed as a result of the use of light weights and the training involves speeding up the gravity or the body explosively to top

speed that suits the nature of skill performance [7, 13]. The training ballistic increases the speed of the player and his ability to jump and also on developing an agility through the exercises that helps to show the highest capacity of the trainee and helps in creating an adaptation in the nervous system [14].

It is clear from Table 4 the existence of statistical significant differences between pre and post measurement of the control group in the variables selected and the researcher attributed this improvement to the program followed in the college, it is placed on the pure scientific principles and rules.

It is clear from Table 5 the significant differences between the telemetric for the two experimental and control groups in the variables selected where the results indicate that there are differences between the ABG control and experimental in favor of the experimental group where the researcher attributes that progress in favor of the proposed program and the training that it include which is close in the nature of the performance to the triple jump and in this regard [10]. The training ballistic increases the speed, it means that the power gained from this type of training leads to better performance of practiced activity through the similarity

Table 5: Significance of differences between the post measurement of the two groups, control and experimental group, in the selected variables

Variables	Unit /m	Experimental group		Control group		Difference	Value
		A	STD	A	STD		
Coordination	Sec	6.320	0.7170	7.100	0.4950	0.780	3.738*
Leg power	cm	2.076	0.2202	1.776	0.3670	0.984	2.882*
Agility	Sec	5.230	0.2288	5.626	0.2350	0.396	4.566*
Flexibility	cm	19.000	2.7700	16.133	1.9590	2.867	3.619*
Speed of transition	Sec	4.306	0.5836	5.001	0.4310	0.704	2.922*
Leg strength	Kg	50.330	51.6390	35.330	5.8140	15.000	7.937*
Back strength	Kg	30.617	5.6270	24.000	3.8720	6.667	3.839*
Balance	Repetition	3.200	1.1460	5.000	1.5110	1.500	3.25*
The speed motion	Sec	71.330	4.5140	65.730	5.4700	5.600	3.127*
Record level	cm	7.273	0.6702	6.293	0.5759	0.980	3.826*

Table 6: Percentage of changing rate in pre and post measurement of the control and experimental groups

Variables	Unit /m	Experimental group			Control group		
		Post	Pre	%	Post	Pre	%
Coordination	Sec	7.640	6.320	17.270	7.8330	7.1000	9.3570
Leg power	cm	1.370	2.076	51.532	1.3900	1.7760	21.730
Agility	Sec	11.950	5.230	56.230	12.2000	5.6260	53.885
Flexibility	cm	14.570	19.000	30.404	14.0000	16.1330	15.235
Speed of transition	Sec	5.240	4.306	27.510	5.4240	5.0100	7.6320
Leg strength	Kg	32.300	50.330	55.820	31.0000	35.3300	13.967
Back strength	Kg	21.000	30.667	46.530	22.3000	24.0000	7.6230
Balance	Repetition	5.667	3.200	43.400	5.9330	5.0000	15.600
The speed motion	Sec	65.130	71.330	9.500	63.4000	65.7300	3.6000
Record level	cm	6.100	7.273	16.128	5.9800	6.2933	5.2390

Table 7: percentage for change of pre and post measurement of two groups

Variables	Unit /m	Experimental group	Control group	Variables
Coordination		6.320	7.100	12.340
Leg power	Sec	2.076	1.780	47.390
Agility	cm	5.230	5.626	7.578
Flexibility	Sec	19.000	16.133	15.089
Speed of transition	cm	4.806	5.010	16.349
Leg strength	Sec	50.330	35.330	29.800
Back strength	Kg	30.167	24.000	21.730
Balance	Kg	3.200	5.000	56.250
The speed motion	Repetition	71.330	65.730	7.800
Record level	Sec	7.273	6.293	13.474

The tables' value of difference is 2.145 at the level (0.05)

exercises ballistic missile with the nature of the performance jump, in addition to that the training ballistic helps to increase the ability of muscles to contract at a faster rate over the long motor and this agreed with what indicated by previous researches [14], stating that training ballistic increases the speed of the player and his ability to jump and also works on the development of a fitness through the exercises that help to get the highest capacity of the trainees and an adaptation in the nervous system. This is consistent with the results of previous

studies [7] which proved the impact of training ballistic missile to improve muscular power, fitness, speed and mobility and agreed to these findings with results of previous studies [1, 12, 16-20] and the researcher also attributed this improvement to the training program ballistic for the development of muscular power of the legs and has affected positively the high level of muscular power of the two men and the principle of repetition of the physical training of the experimental group, has helped generating the growth level of the practitioners

within the group, which led to the rate of significant improvement in the digital level of the special physical capacity jump competition is the muscular power, speed, velocity [2-5]. The ballistic training affects the muscular power and Helps to develop them and, in turn, helps in the development of components of other physical fitness. This achieves the first hypothesis.

It is clear from Table 5 the further improvement of digital level of experimental group over the control group. The researcher says that the program of ballistic training has an active role in developing and improving the digital level among female students because of the different exercises which are far from boring and aimed at upgrading the capacity and training using light weights and characterized by high capacity affects different parts of the curves of power and speed, as the main objective of light weights is to increase the rate of production of the explosive power and this is achieved by training ballistic missile. In addition, the training, which is characterized by high speed leads to a quick athletic performance and thus to improve the digital level. Training using light weights along few weeks leads to an improved digital level, the results of capacity development is the application of a special program for the development of muscular power using the weights and light significantly affected morale on exercise capacity muscle used in the program which are similar in the performance with the track motor for jumping and thus to improve the digital level [1, 7, 12, 21] and this is what emphasizes the second hypothesis.

It is shown in Tables 6, 7 that the percentage of the rates of changing pre and post measurement for the two experimental and control groups were in favor of the experimental group, the researcher believes that the improvement under study is due to the ballistic program proposed and what is included of the training as close to the nature of the performance. The training of strength gained from this type of training leads to the performance of dynamic best in sports practitioner and through its similarity to training ballistic with the nature of the performance of dash as well ballistic missile that training helps to increase the ability of muscles to contract at a faster rate through the range of motion [1] and this achieves the third hypothesis.

CONCLUSION

The proposed program using ballistic training led to an improvement in the components of physical fitness for the experimental group.

- The proposed program led to improved Record level of the experimental group.
- ballistic training and training led to further improvement in the level of muscular power of the two legs.
- Ballistic training led to further improvement in the level of improvement of the motor speed.
- the proposed program led to learn the skill more quickly.

Recommendation:

- Using the proposed program to improve the fitness level of some other competitions in athletics.
- Re-conducting such research on larger samples in terms of number and different in age and sex.
- Making Comparative studies between the ballistic training and any kind of other Trainings

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