specific training series

How to improve your vertical jump

training methods and programmes

PEAK PERFORMANCE
The research newsletter on stamina, strength and fitness

About the author

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As a journalist John has been a regular contributor to Peak Performance. He has written three books on fitness and sports specific conditioning.

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Introduction

In this new PP series we provide athletes and coaches with specific drills, practices and training programmes designed to boost a specific aspect of sports performance or fitness. In this, the first in the series, we focus on how to improve vertical jump performance. The vertical (sargeant) jump test has become part of coaching folklore, with coaches eulogising over the 'potential' that a 100cm jump may offer. Whilst on the field of play the 'hang time' achieved by great basketball players, for example, may even make us question Newton's theory of gravity. The great news is that sargeant jump performance and hang-time can all be improved by the use of appropriate training means and programmes. With numerous e-clips (video footage), photos, calculators, and training programmes, this PP special will show you exactly how this can be achieved.

Section 1

Understanding vertical jumping

How high can you go?

The ability to jump high is dependent on leg power and a specific type of muscular action, known as a plyometric contraction. A plyometric contraction occurs when a muscle is put on stretch (an eccentric muscular contraction) and then recoils (shortens) with great force to produce power (through a concentric muscular contraction). It's a bit like stretching out an elastic band, and then releasing it; immense amounts of energy will be released in the split second the elastic band contracts.

Plyometric, and therefore vertical jumping, ability can be enhanced with the appropriate training (see section 2). However, it is crucial that athlete and coach realise just exactly what type of jump power they require and train accordingly. This is why the sargeant jump, although a great test for basic jumping ability, may not be the most appropriate means for assessing specific sport performance (of which more later).

Table 1 indicates the ground contact times achieved through various plyometric jumping actions. Study these for an indication of the importance of ground reaction times and realise that these should match your sport.

Table 1 – Ground contact time achieved via various types of jumps and sports activities

The ground contact times display just how fast the body must react to develop jumping power. Activities highlighted in red are vertical jump dependent.

Sport	Ground contact time (sec.)
Sprinting	.090
Bounding	.175
Long jump take-off	.110
High jump take-off	.130
Hop	.180
Depth jump 40cm drop	.200
Depth jump 100 cm drop	.300
Marathon	<.400

Adapted from Dintimen, Sports speed p220

Muscle fibre and vertical jumping

To develop explosive (plyometric) jumping power, training needs to focus on fast twitch (type 2) muscle fibre. This fibre type contracts up to three times more quickly than slow twitch (endurance, type 1) muscle fibre. To optimally recruit fast twitch fibres the athlete needs to be focused and 'in the zone'. This is necessary to generate the levels of neural (mental) activity required to optimally stimulate them. Simply going through the motions in training or in a competition will not be enough to switch on the optimum stimulatory response required.

Note: Too much of an emphasis on aerobic training (which targets slow twitch fibre) will have a detrimental effect on fast twitch fibres ability to dynamically contract, which will impair absolute jumping (power and speed potential). This means that the training programmes of field sport players, such as footballers, must carefully balance the needs for some aerobic conditioning against the needs for explosive power and speed (anaerobic activities).

Aerobic literally means in the presence of oxygen. A steady paced run, lasting 20 minutes upward, where oxygen demand meets oxygen supply, is a typical aerobic effort.

Anaerobic literally means without oxygen. This energy system produces energy for short periods (up to 90 seconds), before power is lost and a rest needs to be taken.

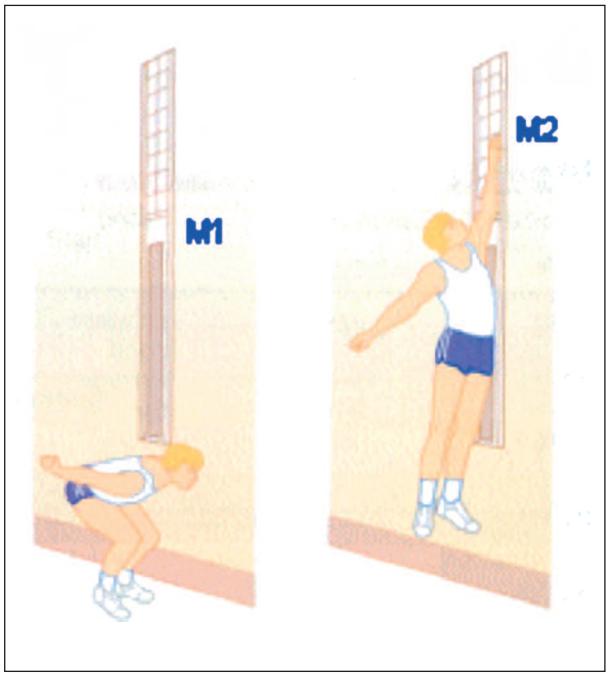
The Sargeant jump

CLICK HERE TO VIEW VIDEO CLIP

Sergeant jump

The Sargeant jump test is one of the most commonly used sports and fitness tests, although it may not be the most relevant (of which more later). It is likely you have performed this test at some point during your career.

How to perform the test



Sargeant jump – ready position
The athlete reaches up as high as they can with their hand and marks this spot on the wall with chalk (M1).

Sargeant jump – jump
The athlete then bends their legs and swings their arms to jump as high as they can marking the wall again in the process (M2).

The 'net' distance recorded will provide athlete and coach with information that can be used to assess jumping ability and training progress.

The Sargeant jump – see how you rate go to:

http://www.exrx.net/Calculators/VerticalJump.html

How to use the table: Enter information in the left column and select the appropriate menus and click 'calculate'. The table allows you to assess your vertical jump height against various populations, including young people (ages 10-17), adults (ages 18-29) and world class athletes. Body weight is used to calculate power.

Is the Sargeant jump sport specific?

Although the Sargeant jump can be seen as a useful measure of power and vertical jump ability, its direct relevance to sports performance can be over-rated.

Study the information in table 1: The ground contact times involved in all the jumping activities occur in a split second. They also all involve a plyometric muscular action. In comparison the Sargeant jump is initiated from a standing position and mainly uses a relatively slow concentric muscular action. It is more 'laboratory setting' than real world sports setting.

Further problems with using the Sargeant jump test as a determinant of vertical jumping sports ability

1) Few sports require a stationary jump to be made from two feet, from a balanced position.

2) All vertical jumps made in the sports setting will also involve a sports skill, such as a header, basketball block or shot or high jump bar clearance.

3) The Sargeant jump is performed from a double leg action whereas many jumps in the sports world are made from a single leg position.

4) Many sports involve multiple vertical (and horizontal) jumps performed in succession. These will often be interspersed with jogging and running and other sport specific movements and from the basis of fatigue – all factors that do not affect Sargeant jump performance.

I therefore recommend that the Sargeant jump is used only as a guide to vertical jump prowess and vertical jump training progress and that more sports specific tests be devised to measure 'real-world' sports ability.

An example of a 'real world' test of vertical jump performance:

Basketball

The player runs from the half way line to the backboard to dunk a basketball. They then run to the half way line collect a ball, turn and return to the basket to go for another dunk. They continue doing this for a set time *e.g.* 60 seconds.

The number of baskets scored is recorded. The coach should be able to assess the level of fitness possessed by the player, as well as being able to identify technical issues relevant to the specific vertical jump involved in a basketball dunk.

Section 2

How to improve vertical jump performance

Improving sport specific vertical jump performance relies on constructing an appropriate training plan. This should account for the age of the athlete, their level of training maturity, previous injuries and competitive ambitions and crucially the selection of the most appropriate training means.

Build an appropriate strength base

Weight training alone is unlikely to significantly enhance vertical jumping ability. This is because weight training exercises cannot be performed as dynamically as jumping exercises. I have summarised these shortcomings as follows:

1) Speed of movement
   It takes about half a second to perform a weight training exercise as fast as possible, whereas a high-jumper's foot will only be in contact with the ground for .130 of a second (see table 1).

2) Weight training emphasises concentric, rather than plyometric muscular action.

The squat, for example, emphasises the development of concentric muscular strength. This occurs when the athlete extends their thighs to lift the weight.

However, as indicated for the majority of vertical jumps performed in a sports specific setting, an eccentric contraction will precede this.

Consider a volley ball player moving into position to make a block; they will step forward into a two-footed jump to leap vertically upward. In doing this they will create the 'priming' eccentric muscular action (in their calf, thigh and hip muscles) that will fuel a more dynamic concentric action in the same muscles.

However, this does not mean that weight training should be neglected by those searching for enhanced vertical jumping ability. This is because weight training will provide a foundation for more specific jumping strength to be built on.

1) Weight training will pre-condition against injury by strengthening soft tissue – ligaments, muscles and tendon *(see table 2 for selected examples and rationale)*

2) By increasing muscle size and the responsiveness of fast twitch muscle fibres, greater potential power will be waiting to be released through more specific training means and practices. Everything else being equal a larger muscle will be capable of exerting more power.

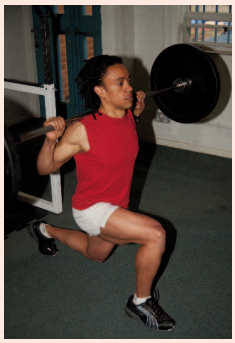
Table 2 – Selected weight training (and other) pre-conditioning exercises

Exercise	Pre-conditioning value	Sports applicability	Comments/tips
Leg extension (weights) 	Stabilises and strengthens the knee joint, useful for combating knee problems, such as runners' knee and Anterior cruciate ligament (ACL) strain	All	Suitable for independent left and right leg training for more balanced strength development
Backward and sideways running (body weight)	Improves agility, lower limb strength, flexibility and balance	All running/jumping based sports	Can be included as a regular warm-up element
Eccentric calf raise 	Strengthens calf muscles and Achilles tendons	All jumping and running sports	The eccentric calf raise emphasises the lowering phase of the exercise. The athlete should lower the weights to a 5 second count and the weight should be in excess of 70% of one rep maximum
Machine hamstring curl 	Strengthens the hamstring muscles	All jumping based sports	The hamstrings can help stabilise the knee joints when performing dynamic sports skills, such as vertical jumping. Female athletes are particularly prone to ACL strain. Research has indicated that developing increased hamstring muscle strength can combat this

Channelling

To achieve the best possible vertical jumping returns from weight training the most appropriate exercises should be selected, and the strength and power developed through these 'channelled' directly into sports performance. Table 5 provides examples of the channelling process for selected weight training exercises. For example, a basketball player could progress the strength developed via regular squatting, through the split squat, then through plyometric exercises, such as the split squat jump, or bounding. Following this process will produce specific strength for their sport. For best results, channelling should not be achieved via a 'block by block' approach. Instead the use and progression of exercises should be smooth and integrated. To further clarify the squat would have a greater relevance at the beginning of the training year for a high jumper and less as the season approaches (although it would still be performed), whilst plyometric exercises would be performed all year round, with the greatest emphasis in the training periods closest to the main competitive period.

Table 3 – How to channel weight training exercises to improve vertical jump

Vertical jump sport	General weights exercise	Specific weights exercise	Brief specific exercise description where needed	Explanation and vertical jump sports relevance
Basketball, high jumping, volley ball football, rugby	Squat 	Split squat 	The split squat is basically a single leg squat. The athlete takes a large step forward and places their foot flat on the floor. Their weight is supported through the toes of their rear foot. The chest should be elevated. The exercise is performed by lowering the hips toward the ground and bending at the knee of the front leg. Do not allow the knee of the front foot to move outside of or in front of the ankle.	The squat will provide a great foundation of leg power. The movement pattern and specific involvement of the leg muscles makes it highly relevant to vertical jump performance. The split squat, because it is performed from one leg, has a greater relevance to single leg jumping. This is enhanced by the need to maintain balance throughout the movement, a further requirement of all dynamic sports. *Variation:* It is also possible to perform a split squat with the front foot 'supported' on an unstable platform, such as a wobble board. This will further strengthen the jumping muscles and increase ankle and knee stability.

Vertical jump sport	General weights exercise	Specific weights exercise	Brief specific exercise description where needed	Explanation and vertical jump sports relevance
As above	Calf raise  	Single leg dumbbell calf raise	With dumbbells held at arms' length by their sides the athlete extends onto the toes of one foot, holds and then lowers. The other foot should be tucked up toward their butt.	As with the single leg squat, greater balance will be required when performing single leg calf raises as opposed to double leg ones. Single leg weight exercises have also been shown to recruit more muscle fibre than double leg versions, thus creating a greater stimulatory effect.
All running and jumping based sports	Leg press	Overhead barbell/ powerbag* walk	The athlete holds a light barbell/powerbag at arms' length overhead and steps forward with their right leg, cycling their left leg in an 'out and back' clawing motion under their body. They then place their left leg on the ground and step forward and cycle the right out and back as before. Continue over 15m. They are basically 'walking' through the running action	This exercise will develop a strong core – a necessity for optimising power transference between the upper and lower body when jumping. It will also promote lower leg strength and balance.

** Powerbags are sand filled vinyl tubes with handles, they can be thrown or carried and are used by numerous top sports teams and athletes in their conditioning – for further information contact: Performance Technology UK, on 07941 04 0 013 E-mail: mail@performt.com www.performt.com*

Plyometric drills and practices designed to improve vertical jumping

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Backwards running as a useful plyometric warm up drill

As indicated in section 1 plyometric exercises will enhance vertical and all jumping, speed and power activities. Their effect can be enhanced when combined with weight training in the same workout – see power combination training.

Plyometric training tips

1. Always warm up specifically. Jog, and perform some functional to your sport, movements and drills, such as high knees and walking lunges. Held, active and passive stretches should not be emphasised, as they can impair plyometric and other dynamic training/competition performance;

2. Train on a non-slip surface; a running track or sports hall floor are ideal, but a dry, flat grass surface will also do;

3. Wear well-cushioned and supportive trainers;

4. Maintain neutral spine position, where applicable – looking straight ahead will help achieve this. This means that as far as possible you should not overly arch or round your back;

5. Land 'light' toward your forefeet/foot, (not on tip-toes);

6. Don't bend excessively at your knees to absorb the impact of each landing; rather, react as quickly as possible to the ground, from a relatively straight-leg position, as this will maximise the plyometric effect;

7. Always progress gradually when starting a plyometric programme. Start with less demanding (but no less effective exercises) – see table 4. This will allow your bones and soft tissue (muscles, ligaments and tendons) to become used to the impact forces involved;

8. Don't perform intense plyometric workouts close to important competitions – keep at least 5 days clear;

9. Strengthen your body to avoid injury over time, by selecting relevant exercises and building foundation strength (see table 2). Weight training is crucial in this respect as it will strengthen soft tissue, making it less prone to strain and provide a base for plyometric power to be built on.


Walking lunges and high knee lifts make suitable warm up exercises for plyometric workouts

Selected plyometric exercises designed to enhance vertical jumping

I have provided a difficulty/intensity rating for each vertical jump enhancing plyometric exercise; this is indicated in table 4. Suggested repetitions and sets are provided, but these are for guideline purposes only. As a general rule those new to plyometric training should always underestimate what they think they can do.

Primarily lower leg plyometrics

Although often overlooked in terms of the contribution of the thighs, the muscles of the foot, ankle and calf also play a significant role in producing vertical (and all other 'leg' induced) sports power and speed.

Straight leg jumps – suitable for all running and jumping sports
Stand with feet shoulder-width apart. Take the arms back and bend the knees slightly. Predominately using the ankles and calf muscles jump into the air. Swing the arms down and past the hips at the same time to increase power. On landing react as quickly as possible to the ground. Again primarily use the feet, ankles and calf muscles.
Do 3 x 10 reps

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Side to side jumps

Variation: Stand to one side of a line/small hurdle and jump from side to side of it, with the lower legs providing most of the power. This exercise will pre-condition and improve lower limb and ankle agility – a useful attribute for field and racket sport players.
Do 3 x 10 reps

Upper and lower leg plyometrics

Most vertical jump actions require the interaction of the upper and lower legs to produce optimum power. These exercises fire these muscle groups in a very sport specific way.

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Depth jump

Depth jump for height
Stand on top of a strong step or box (40-80cm high). Maintaining a neutral spine position and looking straight ahead step off the box, to land on the forefeet and immediately spring back up into the air. Do not allow the upper thighs to bend too much on impact. The arms should be swung back, when stepping off the box and forward and up just before rebounding to aid speed, height and power.

The greater the height of the step or box (within the confines mentioned), the greater the strength component of the exercise; the lower the height, the greater the speed component. A vertical jump (speed/power) improving training programme for most sports should include examples of both. However, the athlete should always emphasise ground contact and speed of reaction. In doing this they will develop the ability to generate more power.
Do 4 sets of 6 repetitions



Variations

For basketball: The player holds a basketball in two hands as they perform the exercise. On landing they reach up toward a basketball ring to attempt a dunk.

For tennis: The player holds a racket and performs a depth jump; they land on one leg, to perform a simulated smash shot whilst in the air.

For sports with multiple jumping requirements, such as football, racket sports and basketball: These and other sports require numerous vertical and other jumps and movements to be performed throughout the match/training session. Fatigue will therefore influence how high the athlete will be able to jump. As well as other endurance building drills and practices the following specific to vertical jumping drills/workouts could be employed in the training programme. Note these are particularly intense and should not be performed close to competitions. They should also only be performed by athletes with medium to high levels of training maturity.

These workouts should use short recoveries (20 seconds or less). Consequentially, they are particularly intense and should not be performed close to competitions, or by athletes with low levels of training maturity.

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Series of vertical jumps

Series of vertical jumps using gymnastic forms

Six forms are placed in line with one another with a 1-1.5m gap in between each. The athlete jumps onto the first using a double footed jump action and reacts as quickly as possible to jump as high as they can. On landing they spring onto the next form and repeat a further jump for height, landing and progressing onto the next form, until they have jumped from all six. The number of repetitions used can be varied in regard to the time of the training year and the conditioning effect required. A similar exercise can be performed using track hurdles, with the athlete jumping over each in succession.

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Plyometric circuit training

Plyometric circuit training

Circuit training is usually thought of as including press-ups, sit-ups and other relatively static movements. However, it is possible to construct a circuit made up of solely or primarily of plyometric exercises, for example, straight leg jumps, jumps from side to side over a small hurdle, tuck jumps, and split jumps for height. The number of repetitions, rest and circuits would reflect the time in the training year and the conditioning of the athlete.

A detailed consideration of this type of workout is provided in section 3.

Intensity versus value

Just because a plyometric exercise is given a low intensity rating (see table 4) does not mean that it is of less value. A lower intensity exercise, such as side to side straight leg jumps, for example, has no less value, for example, than a higher intensity one, such as a depth jump. Athlete/coach should use intensity to refer to the amount of force and potential strain the exercise places on the body (see table 4). Using this information they can select the most appropriate exercises for the athlete in terms of their training maturity, time of the playing season, and proximity to competitions etc.

Table 4 – Plyometric drills ranked by intensity and suitability

Type of plyometric exercise	Examples	Intensity
Standing-based jumps performed on the spot	Tuck-jumps Split-jumps Squat-jumps Standing hop for height Standing jump for height	Low-to-medium
Multiple jumps from standing	2 x 6 'bunny' (double footed) jumps emphasising height as well as distance Double-footed jumps over 4 low hurdles	Medium/high
Depth jumping *(Recommended drop height 40-80cm – the greater the height the greater the strength component, the lower the height the greater the speed.)*	Jumps – down and up Short run (2-6 strides) to hop on to and off of low box onto one-leg landing, followed by jump for height	High Very high
Eccentric depth jump *(an eccentric contraction occurs when a muscle lengthens as it contracts. Concentrating on this part of the jump action can improve jump power. Research has indicated that it specifically targets fast twitch muscle fibre)*	Step or hop off the box, as with depth jump, but 'block' the impact – *i.e.* do not spring up or forward into another jump, try to absorb the landing without bending the knees	Medium/High

Power combination training – combining weights and plyometric exercise into one session to generate increased vertical jumping power

Power combination training variations

Complex training involves performing sets of related weight training exercises before sets of plyometric ones, *e.g.* 3 sets of 10 half squats, before 3 sets of 10 jump squats – these are the 'complexes'.

Contrast training involves performing one set of the weights exercise first and then a plyometric one after, for a given number of sets, for example 1 set of 10 half squats followed by 1 set of 10 jump squats, repeated over 3 sets.

Power combination training works

Pre-squatting significantly enhanced the vertical jumping ability of stronger participants by 4.01% and that of the weaker group by 0.45%.

J Strength Cond Res. 2003 Nov;17(4): 694-700

Potentiation

The key physiological vindication of these workouts revolves around what's called 'potentiation'. Potentiation refers to the influence that one training method (*i.e.* the weights or the plyometrics one) can have on the other in terms of enhancing fast twitch muscle fibres' ability to generate increased force. Note: the exercises involved are 'paired' relevantly to work the same muscle groups, for example the hack squat and squat jump.

How heavy should the weight be for complex/contrast power combination training?

Sports scientists recommend that the weights lifted for both complex and contrast training workouts be in excess of 70% of 1RM. This is seen to be necessary to 'hit' fast twitch muscle fibres sufficiently enough to create potentiation.

Note a great deal of research indicates that a good level of base strength will enhance potentiation. This means that it may be of more benefit to the training mature athlete. Newcomers to this type of training should therefore progress gradually and be carefully monitored.

How does the training variable rest affect the success of power combination training?

A power combination workout is designed to have an almost immediate potentiation effect. The rest between sets is normally kept to about 2 minutes and that between individual plyometric jumps 30 seconds. This is long enough to minimise fatigue and short enough to optimise power transference during the subsequent sets of exercises and between repetitions. Note some power combination workouts are designed to deliberately develop power endurance and use much shorter recoveries and greater numbers of exercises. These workouts are applicable to sports like, basketball and rugby and often involve a circuit style set up. *(see p18 and Workout 4, p24)*

Further thoughts on rest and power combination training

41 healthy men were divided into three training groups – all had had their maximum squat and vertical jump bests previously established. Group one performed weight training exercises only, group two plyometrics only and group three plyometrics and weights exercises on the same day, but crucially not during the same workout. This group performed their weights exercises first and then around three hours later their plyometrics. Could potentiation last this long over this 'extended' complex workout?

The team found that although all training methods improved vertical jump and squat performance, those that combined plyometrics with weights on the same training day experienced the greatest performance enhancement. These findings have positive implications for those embarking on power combination training, as separating the two training elements on the same training day with a greater recovery could avoid fatigue, yet still maintain potentiation.

J Strength Cond Res. 2001 Nov:14(4), 470-476

Section 3

Selected vertical jump enhancing training sessions

It is difficult to provide 'exact' training plans for athletes of different abilities from different sports at different times of the training year. Therefore the programmes that follow must placed against this context and be used as guides, rather than exact blueprints for vertical jump training improvement. I have indicated each workout's sports relevance, relevance to time in training year and indicated suitability for the performer in terms of their training maturity.

Vertical jump workouts

Workout 1

Sports relevance: basketball/volleyball/racket/sports/rugby and football
Time in training year relevance: Great for pre-conditioning and developing jump specific endurance
Athletes level of training maturity: medium/high

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Straight leg jumps

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Standing hops for height

Exercise	Number of repetitions	Rest/recovery
Tuck jumps	15	20 seconds between each exercise
Straight leg jumps	15	
Hops for height	10 on each leg	
Sit-ups	15	
Bench jumps* (double footed on and off)	20	
Split jumps	20	
Crunch sit up	15	

Number of circuits: 2 – 8

***Bench Jumps:**
Stand approximately 1m from a sturdy bench or gymnastic from, this should be 40-50cm high. Bend your knees, swing your arms forward and jump onto the bench to land two-footed. Pause, jump back down to the start position and repeat.

Comments:
This workout will provide a great foundation of jump endurance. It should be progressed carefully with sets kept low to begin with and gradually increased as the athlete's fitness develops. The abdominal exercises have been included to enable a slight respite for the legs during the workout. At all times the athlete should strive to maintain good exercise technique. If they become so fatigued that technique significantly suffers, then they should stop and/or take a greater recovery, before continuing.

Workout 2

Sports relevance: high jumping (volley ball)
Time in training year relevance: all year round
Athletes level of training maturity: medium/high

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Depth jump

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Single leg depth jump

Exercise	Number of sets and repetitions	Rest/recovery
Double foot landing depth jump for height (80cm box height)	3x6	30 seconds between jumps, 2 minutes between sets
Single leg landing depth jump (40cm box height)	3x4 each leg	As above
Straight leg jumps	2 x10	2 minutes between sets
1 stride approach to perform single leg jump for height	2 x 6 each leg	As above
3 stride approach to perform single leg jump for height	2 x 4 take off leg only	As above

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1 stride sergeant jump

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3 stride sergeant jump

Comments: The athlete should perform each jump at maximum intensity. They should be rested before performing this workout and, in-season particularly for high jumpers, it should only be used sparingly and not close to important competitions.

Workout 3

Contrast training workout

Sports relevance: all requiring vertical jump ability
Time in training year relevance: all year round (with variation *i.e.* reduction of reps and sets)
Athletes level of training maturity: medium/high

Exercises	Repetitions sets and loading	Rest and recovery
Squat and Squat jump	6 @80% 1RM 6 3 sets	1 minute between weights set and jump squats
Machine weights calf raise and Straight leg jumps	8 @75% 1RM 10 3 sets	As above
Barbell lunge and Split jump for height	6@ 80% 1RM 10 3 sets	As above
Single leg squats with dumbbells and Single leg hops on the spot	10 with light to medium weight 10	As above, but perform all weights and plyometric sets for the same leg, before swapping

Comments: This power combination workout will provide a great power base for more specific exercises and drills. It will potentiate muscles allowing them to generate greater power outputs over time which will enhance vertical jump (and other power aspects) of sports performance.

Workout 4

Sports relevance: basketball
Time in training year relevance: All, but with pre-season emphasis
Athletes level of training maturity: all (with suitable adjustment)

1. Dribble basketball full court – discard ball
2. 20 squat jumps to touch back board (or higher)
3. Run to half-way line and perform 20 straight leg jumps to touch back board (or higher). Run to half-way line
4. 10 tuck jumps
5. Run to other back board
6. Sprint full court, jog back to half way line
7. 10 single leg hops left and right
8. Jog to key and perform lay-ups (with or without ball) 5 from each side of key continuously. Support will be needed from another player feeding the ball to the player during the lay-ups

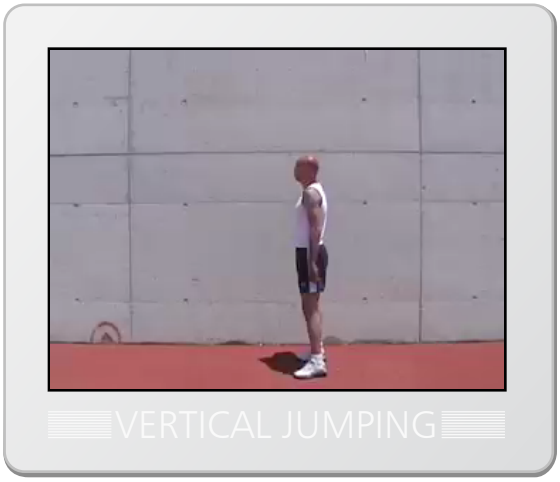
Comments: This specific jumping basketball workout combines jump conditioning with specific sports skill and adds the fatigue element. It will develop the power and spring needed to be a competitive player.

Thanks and credits

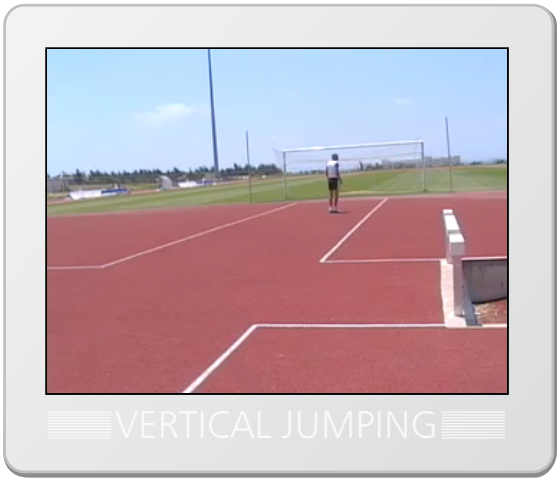
Thanks to photographer Michael Vincent who took many of the pics in this special. He can be contacted on 07956 840533.

Thanks to athletes Stanley Osudie and Nigel Moyce for performing many of the exercises.

VIDEOS



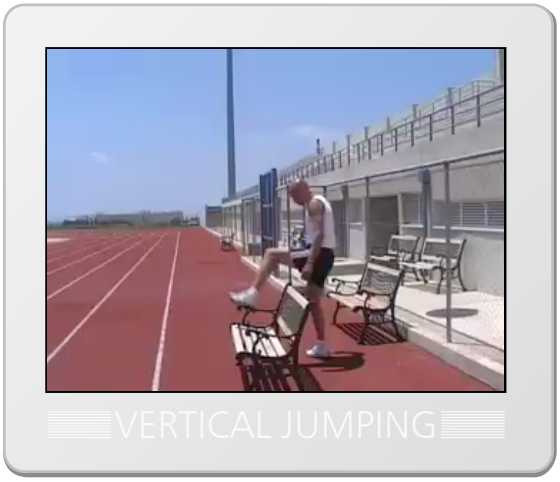
Sergeant jump (p7)



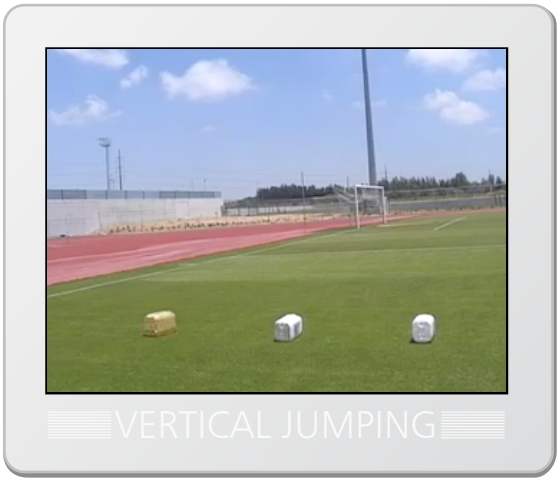
Backwards running as a useful plyometric warm up drill (p15)

Side to side jumps (p17)

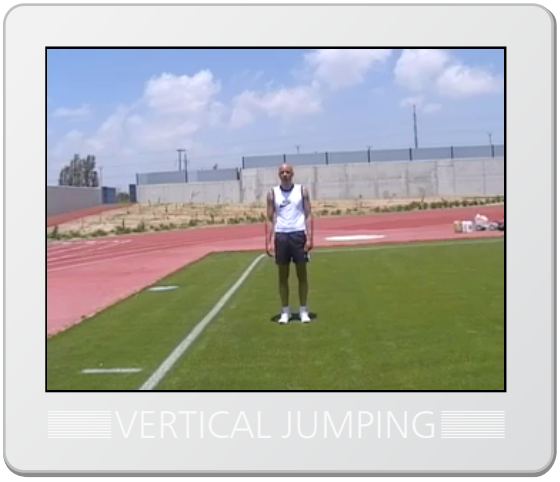
VIDEOS



Depth jump (p17)

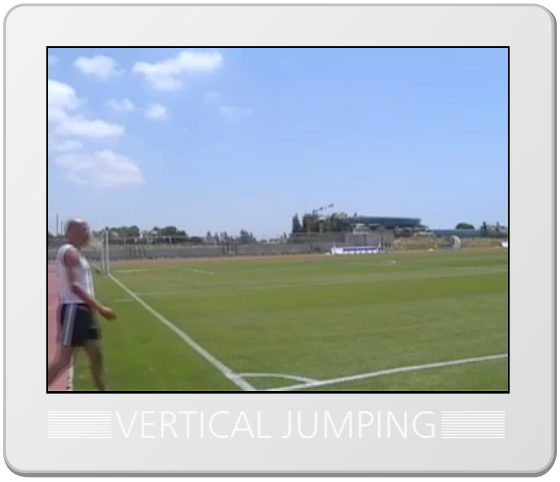


Series of vertical jumps (p18)



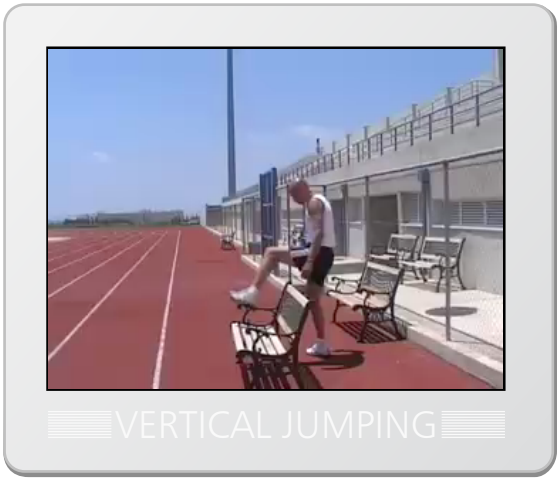
Plyometric circuit training (p19)

VIDEOS



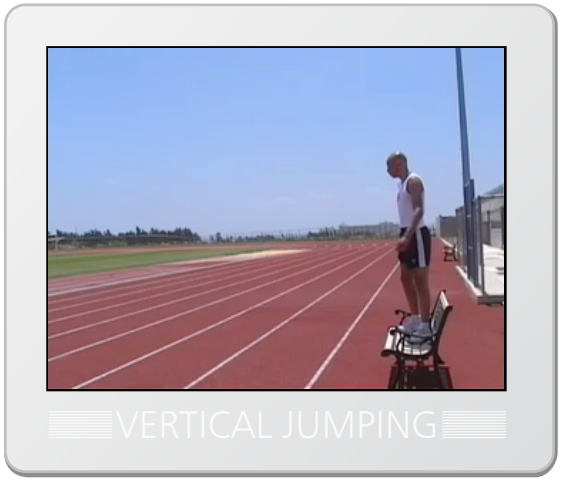
Straight leg jumps (23)

Standing hops for height (p23)

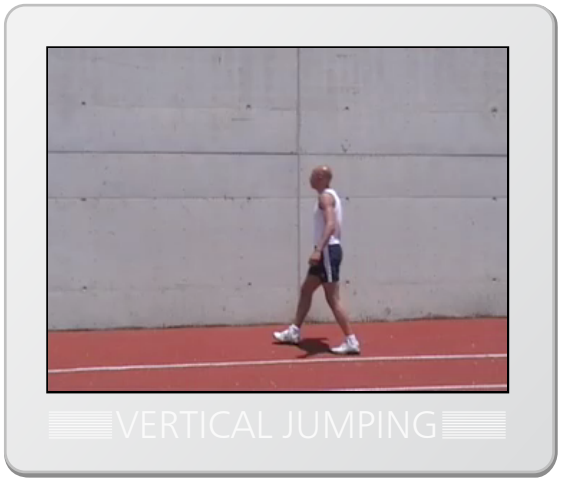


Depth jump (p24)

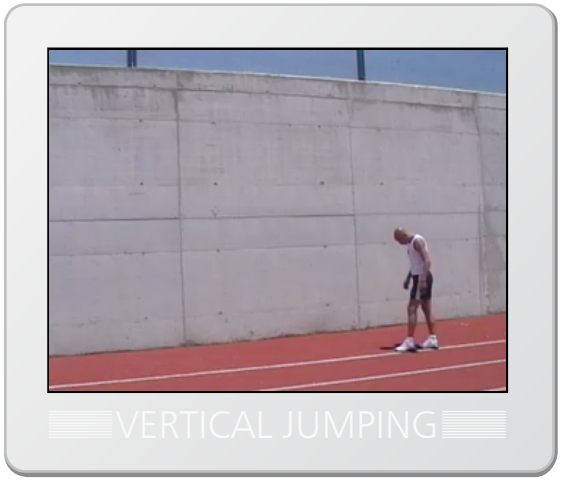
VIDEOS



Single leg depth jump (p24)



1 stride sergeant jump (p24)



3 stride sergeant jump (p24)