specific training series

How to improve your hitting and striking

special report

PEAK PERFORMANCE
The research newsletter on stamina, strength and fitness

About the author

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Look out for his other *PP* specials:
How to improve your acceleration
How to improve your vertical jump
How to improve your horizontal jump
How to improve your agility

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In this *Peak Performance* series we provide athletes and coaches with drills, practices and training programmes designed to boost a specific aspect/ aspects of sports performance or fitness. These specials are above all practical. They cut through the jargon and provide the information that will enhance sports ability.

Introduction

Hitting is a key component of a multitude of sports. The knock out punch supplied by a boxer is perhaps its most dynamic manifestation. But then 100mph tennis serves or 300-yard golf drives come pretty close. This *PP* special focuses on how you as athlete and coach can develop this dynamic hitting ability. Section 1 provides an understanding of the muscular actions and the energy systems involved in hitting. This will contextualise the specific conditioning and pre-conditioning (injury reducing) exercises provided in section 2 and the specific workouts provided in section 3.

Note: I use the term athlete (unless otherwise indicated) to refer to performers in any sport that involves hitting.

Section 1

Thoughts on conditioning improved hitting

Skill is crucial to anyone involved in a hitting sport. Golfers, racquets sport players, boxers and martial artists all require consummate mastery of their specific sports skills in order to produce winning performance. However, it is beyond the scope of the *PP* special to consider the myriad hitting sports skills; it's a given that to produce the best hit you must have technical mastery. What is, however, fundamental to this special is the way that you can develop the 'right' strength to have you hitting longer, harder and with a greatly reduced risk of injury regardless of your sport.

Table 1 summarises the dependency of selected hitting sports on specific hitting conditioning – this reflects the extent to which performing a conditioning exercise in training will directly benefit the power of a punch, forehand or golf drive (its sports application).

Note: 'general' conditioning (such as that designed to improve a specific energy pathway, see page 8) is obviously crucial to performance in any hitting sport. This is because improving court/ring speed and agility or the endurance required to go 15 rounds or stay on the tennis court for three hours plus will obviously improve the athlete's performance. This type of conditioning is not the specific remit of this *PP* special.

Table 1: The dependency of selected hitting sports on 'specific to hitting' conditioning

Sport	Selected hit	Selected specific conditioning exercise	Comments
Tennis	Forehand	Simulated forehand using light dumbbell	Moderate to good level of transference into actual tennis shot, but limited as no ball contact involved, plus limited foot work. Acts more as a pre-conditioner
Boxing	Jab	Bench throws	High transference – this exercise targets the same muscles involved in the jab (the chest and shoulders) in a very similar way to the actual punch. It is limited by the inability of the boxer to use their lower body and torso to generate power as is the case in the ring. Plus the bench throw is a two handed exercise whilst a punch is obviously not *(Bench throws are performed using an adapted Smith machine. They are a variation on the bench press. To perform them the athlete dynamically drives the bar away from their chest releases it and catches it and performs another throw. Note a similar exercise can be performed with a Powerbag/medicine ball or X-Bag)*
Golf	Drive	High to low wood chop using high pulley machine	Medium – the exercise provides the golfer with the opportunity to involve their legs, hips and torso in a synergistic way, similar to that required of the golf swing. However, the main limitation is the slow speed of movement that is generated with the weights exercise.

The speed of a baseball hit or golf swing makes finding an 'everyday' conditioning exercise very difficult

Researchers discovered that during a baseball hit the batter's hips rotate to a maximum speed of 714 degrees/second, whilst their shoulder rotation is even quicker at 937 degrees/second. These actions result in a maximum linear bat velocity of 31m/sec.

Other research has identified that the golf swing can take a mere 250 milliseconds to complete, while the sport's 'big hitter' Tiger Woods generates 125mph of club head speed at the point of impact.

Developing the specific 'wind-up and rotate' hitting power for these sports using conventional resistance exercises becomes virtually impossible. Increasing hitting power requires the development of powerful muscles and the channeling of improved power potential into improved performance by the use of much more specialised exercises, specific hitting skill practice and a carefully constructed training plan.

How to get the most from your hitting conditioning

Athletes/coaches must consider their hitting sport's requirements carefully and develop the most appropriate conditioning routine. I mentioned that, for most sports, developing improved hitting power using standard resistance exercises provides a limited likelihood of directly improved hitting – as with a tennis player using a light dumbbell to improve their ground strokes. Specific exercises using more specialised equipment are a much better option (see section 2). However, to get the most from conditioning, athlete/coach also need to understand the physiological requirements of their sports and how these relate to 'energy system training' and muscle fibre response.

A golfer does not have to perform hits under conditions of intense fatigue, as boxers or tennis players do. Instead they are reliant on immediate anaerobic energy to fuel their drives and approach shots. Commensurately the boxer and tennis player require local muscular endurance, aerobic and anaerobic fitness, of which the golfer requires less. The one common quality that any athlete involved in a hitting sport does require is power. This can be defined as the ability to apply force to an object, or opponent, as dynamically as possible. Developing this hitting power is the focus of section 2. However, I have to stress that without understanding all the physical components and requirements of your hitting sport and training specifically, you will not optimise your hitting power. For example, if a boxer trained solely for maximum punching power – by training exclusively with heavy resistance weight training – without developing sufficient endurance, they would in all probability end up as the losers in the ring. That is unless they landed a KO punch in the first 0-8 seconds of the fight (the length of time during which the immediate anaerobic energy system supplies energy – see Table 2)

The role of the legs in developing an enhanced hitting response

Although it is easy to focus on the point of origin of a hit – usually the upper body – this neglects the fundamental role that the legs (and torso) play in generating force. All upper body hitting power comes through the legs. Take, for example, the javelin throw. The ultimate 'hit' of the javelin, which for an elite male athlete will result in a throw in excess of 80m, will require the legs to transfer the run-up velocity up through the torso and into the throwing arm. Without powerful legs and a torso the javelin thrower will literally be in no position to produce the best throw.

All athletes in hitting sports require strong, powerful and dynamic legs in order to produce optimum hits.

Table 2: Anaerobic energy pathways and their application to selected hitting sports

Energy pathway	Brief description	Selected general hitting sport relevance	Specific hitting sport relevance	Comment (if necessary)
Immediate anaerobic	Provides energy for 0-8 seconds. Has no reliance on oxygen as an energy source. Instead relies on stored high energy muscle chemicals, such as creatine phosphate. Uses predominately fast twitch muscle fibre*	Tennis Golf Cricket batsman Baseball hitter	Tennis serve and short rallies Golf shots	The energy for a tennis serve or golf shot comes directly from this energy system
Short-term anaerobic	This system also provides powerful energy but for activities lasting up to 90 seconds. It also relies on stored chemicals, but has an increasing reliance on oxygen as the 90 seconds elapses. Again relies predominately on fast twitch fibre	Racquet sports. Boxing Martial arts	Tennis rallies Martial arts and boxing fights	This energy system, when used regularly as it is during a tennis match, is very taxing. Appropriate training will boost the athlete's ability to continue to make relatively short lived and powerful efforts. However, it is reliant to an extent on aerobic fitness, which will provide a base on which it can be built
Aerobic	This energy system requires oxygen to fuel and sustain the chemical reactions in muscles that produce sustained low to moderate intensity activity. It relies predominately on slow twitch muscle fibre*	Racquet sports, Martial arts Boxing Golf		For the majority of hitting sports aerobic fitness is only necessary as a foundation for anaerobic power and to allow for the continued application of this power, by enhancing the athlete's ability to recover between games, as in tennis, or rounds in boxing. Too much of an emphasis on aerobic conditioning can dull the responsiveness of fast twitch muscle fibre

** see Table 3 for a description of different muscle fibre types and their relevance to hitting sport*

The value of heavy resistance weight training to power generation

A tennis player would rightly assume that as their sport is primarily a short-term anaerobic one (see Table 2), due to its stop start nature and recovery periods and that their prime need is short-term anaerobic conditioning. This would be achieved by performing circuits and numerous court movement drills. They would probably think that lifting heavy weights would be of little benefit to them. Heavy weights (that's in excess of 80% of 1 repetition maximum, 1RM) are often associated with muscle building, rather than having specific sports benefits, such as improved forehands. However, it is argued that heavy weight training should form a part of the training of virtually all 'speed' athletes. And this includes the 'hitters'; tennis players, martial artists, boxers and even golfers. This is because a larger, stronger muscle is able to apply more force (coincidentally it will also be more fatigue resistant). However, it is crucial that this increased power potential is released through the use of more targeted conditioning methods – of which more later.

Muscles are made up of thousands and thousands of muscles fibres which are bundled together into motor units controlled by nerves. A signal is sent from the brain through the spinal cord to the nerves and on to the motor units where a chemical reaction takes place, causing the muscle to fire (contract). When lifting weights in excess of 80% of 1RM the largest most powerful muscle motor units are recruited (these are predominately made up of type 2b muscle fibre – see table 3). Note: it requires a considerable volume of neural energy to do this, ie the athlete must be psyched and 'in the zone'. If this is not the case then they will fail to recruit these power producing fibres.

To enhance the power production capacity of athletes it is argued that no significant increases will be made unless they increase their maximum strength.

Table 3 Muscle fibre types

Muscle fibre type	Brief description	Hitting sport comment
Slow twitch (type 1)	These fibres produce sustained relatively slow muscular contractions. Twitch rate 10-30 per second	For most hitting sports these fibres should only be trained to provide a base for anaerobic fitness. Prime training method: steady paced CV efforts in excess of 20 minutes
Fast twitch (type 2a)	This fibre type is also termed 'intermediate' as with the right type of training it can be made either more enduring or more powerful	Crucial for all hitting based sports lasting in excess of 8 seconds
Fast twitch (type 2b)	These are the absolute power producing fibres, the ones that, when recruited, can knock an opponent out or produce a tennis serve in excess of 100mph. Fast twitch fibres have a 30-70 twitch rate per second and rely on the anaerobic energy pathways to provide energy. Considerable mental input is required to fully recruit them	Crucial for tennis serves, athletic throws, boxers, martial artists and golfers

How to develop stronger muscles for enhanced power and speed generation and bigger hits

Ensure the athlete:

- is 'training mature' enough to handle the loadings involved
- has sufficient mastery of exercise technique to minimise injury
- uses compound (multi-joint/multi-muscle) exercises, such as squats, bench presses and lunges, as these recruit maximum amounts of muscle fibre and have the greatest anabolic (growth) effect
- is supervised/has a training partner on hand when performing their workouts
- allows sufficient recovery (24-48 hours) between workouts
- follows an optimum nutrition programme. As an example, the athlete should consume 2g of protein per kg of body weight daily.

Section 2

Specific conditioning methods to improve hitting

In section 1 I provided information that will enable coaches/athletes to contextualise the development of improved hitting power for their sport against energy pathways, muscle fibre types and the need for a specific understanding of their sport's playing requirements. In this section I provide specific conditioning exercises and methods.

Pre-conditioning

Pre-conditioning (or pre-training) is a relatively new concept in sports training; basically it refers to the need to 'train to train', thus avoiding injury. During pre-conditioning workouts the emphasis is placed on protecting and strengthening body parts in order to increase their tolerance and sports readiness. Pre-conditioning should form an integral part of the hitting sports athlete's training programme. Various drills and exercises should be performed throughout the training year and these should reflect the athlete's sport and their physical needs – for example, a requirement to strengthen a body part that has been previously injured.

I have provided in this section a number of body weight, resistance and plyometric (jumping) exercises designed to pre-condition and condition hitting athletes.

Golf – a case in point for pre-conditioning

Fifty-three per cent of male and 45% of female golfers suffer from low back pain, and 30% of all touring professionals play injured. Other common golf injuries include wrist problems.

It is therefore crucial that golfers (and other hitting sport athletes) pre-condition their core (stomach, back and arms) specifically to develop strength and flexibility. Golf requires a rotational movement and it is inevitable that due to the 'one-sided' nature of the game (in terms of muscle recruitment), muscular imbalance will develop. These imbalances will lead to potential over-use injuries and to weaknesses in muscles that could help stabilise the muscles involved in the swing.

Examples of pre-conditioning and conditioning exercises for hitting athletes

I have provided selected 'sports relevancies' for the exercises provided. However, it is up to the athlete/coach to select those that are most appropriate for them, the athlete's training maturity and the time in the training year.

Body weight exercises

There are myriad body weight exercises that are of benefit to the hitting athlete.

Crunch

Sports relevance
All – a pre-conditioner

This exercise targets the muscles that lift and lower the trunk. Lie on your back and bring your knees into your chest – your thighs should be perpendicular to the ground with the lower legs parallel to it. Take your elbows out to the side of your head and keep your fingers close to your ears. Incline your neck forward. Contract your abdominal muscles to pull your trunk from the floor. Perform the movement slowly and lift only 10-15cm. Maintain the same control as you lower back to the floor.

Sit up with left/right movement

Sports relevance
All – as a pre-conditioner

This exercise strengthens the muscles that rotate your trunk as well as those that bring it forward. Since most sports require the trunk to either twist or

withstand twisting forces, this and similar exercises are often more sport- and speed-specific than their linear counterparts. Assume the starting position as for a normal sit up, with your feet flat on the ground and knees bent to 90 degrees. Lift your torso and slide your hands up your right thigh, turning your torso in this direction as you do so. Complete your designated number of reps and repeat on the left.

The plank

Sports relevance
All – as a pre-conditioner

This exercise will strengthen your torso through what is known an 'isometric' (held) muscular contraction. This occurs when muscle groups work against each other with the result that there is no actual movement.

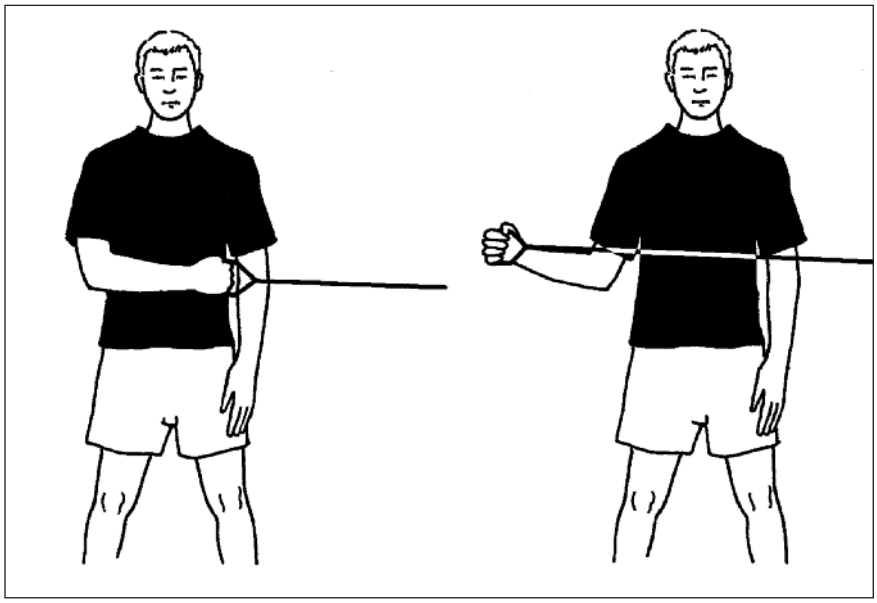
Assume a type of press-up position, but support your body weight on your elbows with your hands clasped in front of your body. Imagine that a straight line is drawn through your body from your head to your toes. Hold this position from 10-60 seconds depending on your fitness.

The cable external shoulder rotation

Sports relevance
Can combat the development of tennis elbow in racquet sport players

The athlete will need a training partner or coach to assist them and a short, medium strength dyna-band or similar rubber band type of exercise tube.

Stand in a 'ready' position with feet shoulder-width apart and left hand on hip. A towel can be placed between the upper arm and side to act as a pivot. Ensure the elbow is positioned directly below the shoulder. Grasp the handle of the dyna-band and flex the elbow to a 90 degree angle, holding the grip just in front and to the left of the navel. The training partner should be positioned to the athlete's left, just behind them, with a firm grip on the other end of the dyna-band (there must be tension in the band, so that when the



shoulder is externally rotated the athlete pulls against a resistance). The athlete rotates their shoulder externally (ie takes their hand away from their navel and out to the side) to stretch the dyna-band. The lower arm should be kept parallel to the ground and the hand position held constant. Perform to left and right sides.

Seated back-to-back wrestle

Sports relevance
All sports

Two athletes sit back to back with their legs outstretched in front of them. They should interlink their arms. To a command they begin to 'wrestle', trying to pull each other over to one side. Whoever pulls the other over is the winner. Athletes should be matched according to size and power when performing this exercise.

Weights exercises

I have chosen weights exercises that have a specific relevance to those involved in hitting sports – these invariably involve rotational movements. Linear exercises such as squats, lunges and bench presses should also form part of the conditioning and pre-conditioning of a hitting sports athlete in relation to generating increased power generation potential, as indicated, but a detailed consideration of these are beyond the scope of this special.

Russian twist

Sports relevance
Great pre-conditioner for all hitting and rotational based sports

This exercise mimics the torso/shoulder rotation employed in numerous hitting and throwing sports.

Sit on the floor with your knees bent to an approximate 90-degree angle. Get a training partner to hold your ankles. Hold a weights disc and lower your trunk to a 120-degree angle, then rotate left and right stopping the weight 10-15 cm from the floor.

Reverse trunk twist

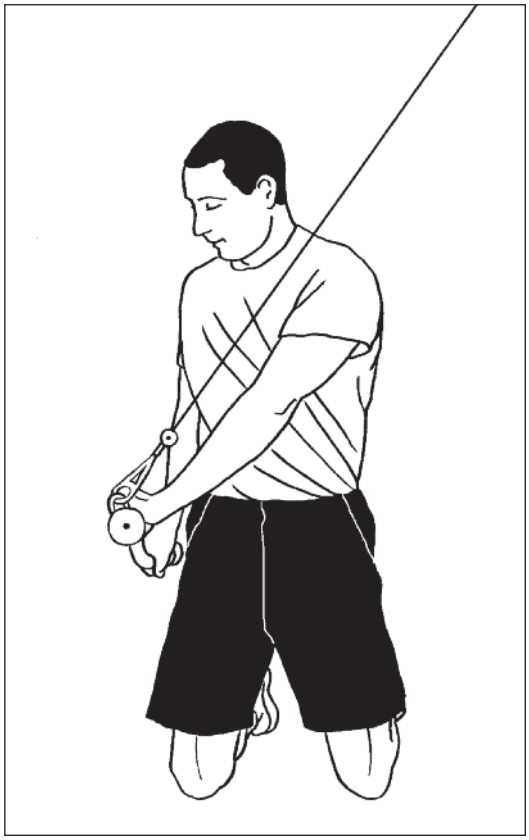
Sports relevance
Great pre-conditioner for all hitting and rotational based sports

Lie on a weights bench face down having positioned a barbell across the back of your shoulders. As with the previous exercise you'll need a training partner to hold your ankles down. Rotate your torso left and right whilst keeping your hips in contact with the bench. Some gyms may have specialist equipment designed for this exercise.

Cable chop

Sports relevance
Golf, tennis – also pre-conditioning value for all sports involving rotational movement

This exercise uses a high pulley machine with a triangular attachment and develops rotational power in the shoulders and trunk (note this exercise can also be performed with a Powerbag or similar). Stand facing forward with feet shoulder-width apart. Hold the attachment with both hands over your right shoulder. Pull the cable across your body ending with it just outside your left hip. Complete your designated number of repetitions and repeat on the left side. The exercise can also be performed from a kneeling position.



It is crucial that hitting athletes performing exercises such as the cable chop do so to both sides of their body while pre-conditioning in order to prevent muscular imbalances.

Wrist curl

Sports relevance
Specifically applicable to racquet sports players and golfers, as it strengthens the 'gripping' muscles

Sit on a weights bench or strong chair holding light dumbbells in each hand. Place your forearms on your thighs so that your wrists and dumbbells are beyond your knees. Using your wrists, lower and raise the dumbbells slowly.

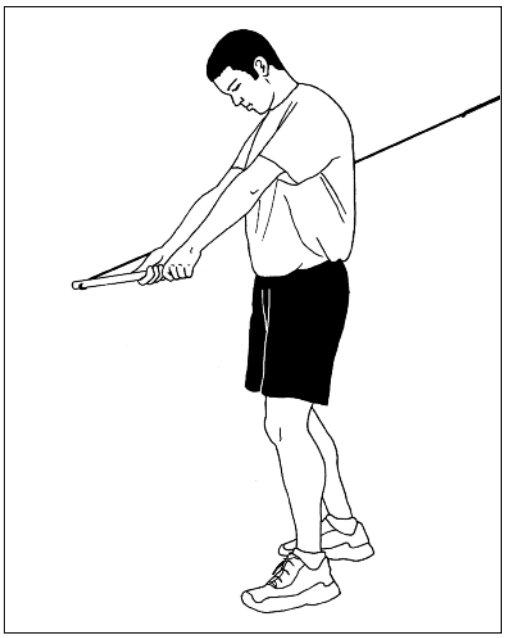
Variation: turn your forearms over so that their backs are on your thighs and curl the dumbbells using your wrists from this position.

Power bat resistance band exercise

Sports relevance
All racquet sports

This piece of specialist kit allows the racquet sport player to simulate various strokes against resistance. This will strengthen the hitting muscles.

For further information on the power bat go to: www.overspeeduk.com



Hitting pre-conditioning tip:
Note: it is important also to address the muscles not directly involved in the specific hitting motion. Failure to do so can result in muscular imbalances and potential injury – performing exercises such as the resistance band external cable rotation exercise (see page 13) can address this imbalance.

Plyometric drills

Plyometric drills are a crucial weapon in the hitting sports power-conditioning armoury. These exercises lead to explosive power development – they utilise the 'stretch/reflex' mechanism in muscles to release greater energy. To explain: a concentric (shortening) muscular contraction is much more powerful if it follows an eccentric (lengthening) contraction of the same muscle. During plyometric drills muscles operate a bit like an elastic band that is stretched (the eccentric contraction) and then released (the concentric contraction). Although it may not be readily apparent there are a number of plyometric exercises that can be employed to boost the trunk's power capability – some of these use specialist items of kit.

Medicine balls

Throwing and catching medicine balls can develop plyometric power in the torso, legs and arms (exercises involving holds or passes will develop greater core strength and serve a pre-conditioning purpose).

The Twister

Sports relevance
Racquet sports – also useful for pre-conditioning for all sports involving rotational movements

Place a small medicine ball between your legs. Take small hops and rotate your knees to each side. Your arms should be held parallel to the ground. The greater the amount of rotation the greater the amount of work the obliques (the muscles of outer abdominal area) will have to perform. These muscles play a key role in dynamic rotational hitting sports performance. The twist, react and rotate movement creates the plyometric response in the torso and legs.

Medicine ball sideways on throw

Sports relevance
Racquet sports, golf and general dynamic condition and pre-conditioning for all sports

Assume a two-footed side on stance toward a training partner or wall. Hold the ball in two hands and rotate to the right, turning through the ankle and hips. Turn back towards the wall and dynamically throw the medicine ball against the wall/to partner. This exercise will develop the plyometric stretch/reflex in the trunk as the athlete catches the ball (with two hands) and then rotates back and immediately forward to throw the ball again. For even muscular development, practise throwing the ball from the left and right sides.

Medicine ball sit up and throw

Sports relevance
Great as an upper body dynamic power conditioner for most hitting sports

Take hold of a medicine ball and assume a sit-up position, with feet flat on the floor and knees bent to an angle of 90°. Hold the medicine ball on your chest with your hands to the sides of it. Lower your back toward the floor,

then, using your abdominal muscles, pull your trunk forwards dynamically. Near the top of the movement, throw the ball dynamically to your partner using a chest pass action. Your partner should catch the ball and toss it back just as you are sitting back, ready to perform your next rep. It is the 'catch and move forwards to throw' part of the exercise that develops the plyometric response in your torso.

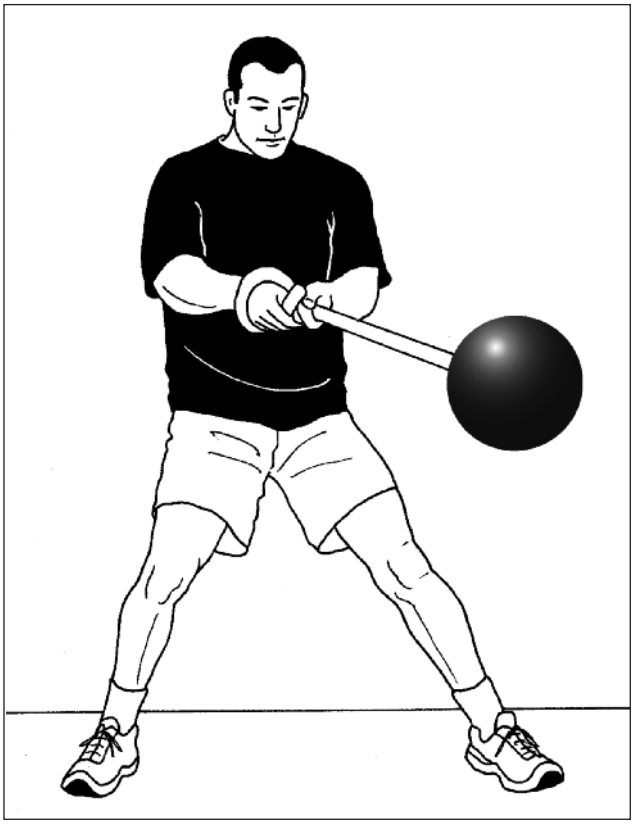
Medicine ball chest pass against a wall

Sports relevance
Boxing, martial arts, rugby (hand off). Also good for developing general upper body power and speed for virtually all sports

Stand close to a wall facing it. Hold a medicine ball as if making a chest pass, then press the ball dynamically away from you to throw it against the wall. Catch it and immediately throw it back against the wall (the plyometric aspect). Try to perform the exercise as fast as possible.

Tornado ball* wall chop

Sports relevance
All involving rotational trunk movements – golf, tennis, boxing, martial arts and so on



This piece of kit was specifically developed for generating rotational power. It's a polyurethane ball on a length of sailing rope. The 'wall chop' can be performed kneeling, sitting or standing and with varying angles of 'chop'. For the standing version position yourself approximately one metre away from a wall with your back to it. Rotate and swing the Tornado ball, either to your left or right, so that it hits the wall. It will spring back towards you with great force and you need to be braced and ready to control this, so that you can immediately swing back into another chop (the plyometric response).

Plyometric press up

Sports relevance
Boxing, martial arts, rugby players (hand-off). Will also build general upper body power for running-based sports

Assume a normal press-up position. Lower your body and then drive your arms upward to 'jump' your body from the floor. On landing, immediately push back into the next press-up. The plyometric response occurs in your chest and shoulders.

Variation: Kneel and pivot forward from your knees to 'fall' toward the floor. Use your hands, arms and shoulders to break your fall and push yourself back up.

Note: these exercises should not be performed if you have weak wrists or shoulders.

For more information on the Tornado ball go to: www.paulchekseminars.com
For more information on the X-Bag go to: www.exf-fitness.com

Power combination training

Power combination training describes a special type of power-developing workout – one that combines weights and plyometric exercises into the same session. This can be done in various ways, of which more later.

Potentiation

The key physiological effect of these workouts is 'potentation'. Potentiation references the effect one training method can have on another in terms of enhancing fast twitch muscle fibres' ability to generate greater force. The exercises must be relevantly 'paired'. This means that they must target the same muscle groups, for example, the bench press and the plyometric press up – which target the chest and shoulder muscles.

Power combination workout variations

- Complex training involves performing sets of related weight training exercises before sets of plyometric ones, for example, 3 sets of 8 bench presses, before 3 sets of 10 plyometric press ups – these are the 'complexes'.
- Contrast training involves performing one set of the weights exercise first and then the plyometric one after, for a given number of sets. For example, 10 bench presses followed by 10 plyometric press ups, repeated over 3 sets.

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

Sports scientists believe that to get the most from power combination training the weights exercises should use a loading in excess of 70% 1RM. This is because lighter weights are believed to be insufficient to 'hit' type 2b fibres with sufficient force to create potentiation.

Section 3

Specific hitting workouts

In this section I provide examples of workouts that could be used by hitting sports athletes. Please note that they are for guideline purposes only. Athlete and coach will need to decide which best suit their needs in terms of the training maturity of the athlete, the time in the training year and proximity to competitions.

Note: descriptions of the majority of exercises can be found in section 2, and repetitions and sets are provided for guideline purposes only.

Workout 1

General pre-conditioning torso-focused workout suitable for all hitting athletes

Exercise	Repetitions	Comments
Plank	4 x 20 seconds with 30 seconds' recovery	Develops isometric core strength
The twister	4 x 20m walk back recovery	Develops good all body pre-condition for rotational hitting movements
Sit up with left/right side movement	4 x 10 left and right sets with 30 seconds' recovery between sets	Targets the oblique muscles – the prime rotational torso muscles
Crunch	4 x 10 with 30 seconds' recovery between sets	Good general torso strengthener for hitting athletes
Reverse trunk twist	4 x 12 with 30 seconds' recovery using light weight	Strengthens back to withstand rotational hitting and other sports movements
Cable/Powerbag/ X-Bag chop	4 x 15 left and right sets with 30 seconds' recovery between sets using light weight	Pre-conditions rotational hitting muscles. Highly specific to golf

Workout 2

Explosive power developing upper body workout

This workout could be used by numerous athletes involved in sports that require powerful upper-body movements. With variation it will provide a foundation of power that can be channeled into sports performance.

Exercise	Repetitions	Comments
Medicine ball chest pass against wall	4 x 30 seconds with 15 seconds' recovery between sets	This exercise with the limited recovery, will develop 'power endurance' in the hitting muscles of the upper body. This is highly useful for martial artists, boxers and racquet sport players
Tornado ball standing wood chop	4 x 8 to the left and right with 1 minute's recovery between sets	This exercise will develop explosive torso power. Performing to the left and right will promote greater parity in terms of left/right side body development
Plyometric press up	3 x 6 with 30 seconds' recovery between sets	Ensure each repetition is as dynamic as possible
Medicine ball sideways toss	3 x 10 with 45 seconds' recovery between repetitions	Will develop enhanced rotational power – useful for tennis players and golfers
Tornado ball kneeling wood chop	4 x 6 (left and right) with 45 seconds' recovery between sets	The kneeling position cuts out the additional power that can be supplied by the legs, thus forcing the torso to work harder

Workout 3

Tennis conditioning/pre-conditioning

This workout could be used with variation (to set and rep number) to maintain condition and reduce injury potential throughout the playing seasons.

Exercise	Repetitions	Comments
Resistance tube internal shoulder rotation	4 x 20 left and right with I minutes' recovery between sets	This exercise will help stabilise and strengthen the ancillary/supporting muscles involved in numerous tennis strokes and reduce potential injury
Power bat resistance band exercise	6 x 20 second intervals with 20 seconds' recovery – player performs various shots with band, with control	This exercise will develop specific hitting, tennis muscle endurance. It is recommended that the player also performs the exercises with their non-playing arm. This will promote greater muscle balance.
Tornado ball standing wood chop	6 x 15 seconds alternate left/right chops, 30 seconds between sets	This exercise will develop dynamic core power
The twister	6 x 20m with walk back recovery	This exercise will develop rotational power across the body and contribute to enhanced agility – a key aspect of tennis play
Medicine ball toss	6 x 20 seconds left and right, with 30 seconds' recovery between sets	As Tornado ball chop
Wrist curl	4 x 20 repetitions with light dumbbell, both wrists. 30 seconds' recovery between sets	The exercise will strengthen the wrists

Workout 4

Improving punching/hitting power for boxers and martial artists and rugby players

This workout, although similar to workout 2, uses the power combination methodology to enhance the power output of fast twitch muscle fibre in the upper body.

Exercise	Repetitions	Comments
Bench press **and** **Plyometric press up**	6 @ 80% 1 RM 6 1 minute's recovery between exercises and sets – 4 sets	This follows the complex training methodology
Supine triceps pull-over **and** **Seated over-head medicine ball throw**	6 @ 80% 1RM 10 1 minute's recovery between exercises and sets – 4 sets	As above
Wood chop (using high pulley machine/X-Bag/Powerbag) **and** **Medicine sideways ball toss**	6 @ 80% 1RM 10 1 minute's recovery between exercises and sets – 4 sets, 2 to the left and 2 to the right for both exercises	As above
Crunch **and** **Medicine ball sit up and chest pass throw**	10 6 1 minute's recovery between exercises and sets – 4 sets	Note: this combination will have less of a potentiation effect, due to the body weight only nature of the crunch

Research suggests that medicine ball and similar upper body plyometric drills may be less effective at developing power than lower body plyometric drills (such as hopping and bounding) or certain selected upper body plyometric exercises (such as the plyometric press-up) due to the fact that they do not present as much force to be overcome.

Lower body plyometric exercises can produce huge amounts of force – at least three times body weight. However, the plyometric press-up overcomes only about 30% of the athlete's body weight, together with any additional force that has to be overcome as the height and speed of the movement increases. However, with medicine ball exercises much less resistance has to be overcome.

Coach implication: if an athlete is looking for an upper body power boost, for example, to improve their throwing, pushing and punching, and their wrists, arms, shoulders and back are pre-conditioned to stand the force, then the plyo press-up makes for the best choice.

Nevertheless, medicine ball drills do still have a role to play in speed and power conditioning; they can be highly effective at increasing an athlete's neuro-muscular response and reaction capability. A baseball pitcher or javelin thrower throwing implements of different weights can have a similar effect.