Speed Development for MASTERS

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PEAK PERFORMANCE
The research newsletter on stamina, strength and fitness

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John Shepherd has enjoyed a lifetime involvement with sport, health and fitness. He was a regular member of the Great Britain and England athletic teams as a long jumper in the 1980s and '90s. He still competes at Masters level and has won National, European and World championship medals. A sports centre manager for more than 10 years, John holds numerous professional, academic, sports and leisure qualifications, including a PE and masters degree. John is a regular contributor to the sports, fitness and health press and has written three books, including *Peak Performance* special reports on horizontal and vertical jumping and agility training.

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Foreword

I believe that performing a sport skill at speed represents the pinnacle of human capability. Think of a male 100m runner reaching speeds close to 30 miles per hour – or a 100mph tennis serve or cricket delivery. In the eyes of many people, speed is an attribute of youth alone; yet, there are many Master athletes in their 40s, 50s and even older who can outrun or perform a sport skill faster than people in their supposed prime.

These are incredible performances, achieved at a time in life when the body may be protesting just a little bit and when there are often many competing demands on time. Through my own experience as a Master track and field athlete, I know just how difficult it can be to train seriously for speed when most of your peers have put themselves out to grass. You need discipline, dedication and determination to keep going.

My main purpose in writing this book is to assure athletes past their youth that speed training is not just for young people. In the following pages, you will learn how to train effectively and safely for speed, with special emphasis on:

- preconditioning and warm-up
- working against the normal age-related decline in speed
- the crucial role of mental training
- the optimum diet for speed.

Finally, you will learn how to pull all this advice together into a special Masters' speed training plan. Good luck – I'll be with you all the way!

John Shepherd

Chapter 1

How speed declines with age

Let me start on a positive note by assuring you that that it is possible for older sportsmen and women to retain a high percentage of their speed capability, irrespective of the passage of time. In fact, judging by the performances of Master sprinters, Father Time has been left languishing in the starting blocks.

The world 100m record for men aged 40-45 is a staggering 10.42 seconds. It's held by Troy Douglas of The Netherlands. More incredible male and female master sprinting records can be found on page .....

Masters speed training tip *If you have had a long lay-off from speed training or are taking up a speed activity for the first time, you must be particularly careful to avoid injury, and preconditioning (training to train) is crucial here. A variety of preconditioning drills and strategies are set out in Chapter 2.*

Why age slows you down

There are various factors that conspire to slow you down as you get older. The main ones are set out below.

Muscles get smaller

A decline in muscle mass and the numbers of fast twitch fibres within your muscles (of which more later) are crucial

determinants of the age-related decline in speed. We all lose about 10% of our muscle mass between the ages of 25 and 50 and have lost up up to 45% by age 70. This decline may be even steeper if we do nothing to arrest it. To provide a specific example, the biceps muscle of a newborn baby has around 500,000 muscles fibres, while that of an 80-year-old has 300,000. With fewer muscle fibres and smaller muscles, we end up with a greatly reduced capacity to express speed strength and power.

These problems are compounded by the fact that the fast twitch muscle fibres we need for speed, decline much more rapidly with age than the slow twitch fibres used for endurance activity.

Less growth hormone is produced

The production of growth hormone (GH) by the pituitary gland declines with age. This means that:

- Your muscles lose some of their ability to gain in strength and size as a result of training;
- Recovery from training – and competition – takes longer;
- You tend to lay down fat because of a decline in blood levels of 'insulin-like growth factor 1', whose production is stimulated by GH.

But the good news is that exercise – particularly the intense training associated with speed development – can stimulate GH (and testosterone) production. See Chapters 4 and 5 for details of special GH-promoting workouts.

Energy supply slows down

Creatine phosphate (CP) is the premium ingredient in muscles for short bursts of physical activity lasting 6-10 seconds. It's one of the prime fuels for what is known as the 'immediate anaerobic energy system'. Like GH, the production of CP also declines with age, reducing your ability to tackle high intensity sprint-type workouts. However, as with GH, the good news is that speed training and some dietary manipulation can significantly offset this decline *(see Chapters 9 and 10)*.

Masters speed training tip *Master speed athletes should seriously consider supplementing with creatine to maintain and increase muscle mass* (see Chapter 9).

You lose flexibility

Flexibility, or range of movement (ROM), declines with age as soft tissue (muscles, ligaments and tendons) harden and joints stiffen. Unless you do something to arrest this decline, you can lose as much as 30% of your youthful ROM by age 70. It is crucial to work on ROM for speed activities throughout your training if you are to optimise your performance and minimise your injury risk *(see Chapters 2 and 3)*.

Your aerobic capacity shrinks

The ability of the heart and lungs to produce energy declines from age 20 – so much so that a 65-year-old may possess only 65% of his or her peak capacity. Speed activities tend not to challenge the aerobic energy system significantly (by relying on the anaerobic systems – of which more later). However, sports like football and tennis, where jogging, walking, low intensity running and recovery between faster efforts, are part and parcel of the game, do have an aerobic requirement. This means you need to train you aerobic energy system accordingly, although not at the expense of speed. See table 1, page 14 for an overview of the body's energy systems.

Masters speed training tip *A basic level of aerobic fitness is important for most speed activities. This is because it provides a foundation for the development of more speed/power-based anaerobic training. It is also good for your heart.*

Brain signalling slows down

To perform a physical task an electrical signal is sent from the brain through the spinal cord to the muscles. This process declines by 10-15% from age 30 to age 80, so that brain signals take longer to reach your muscles. This problem is compounded by the simultaneous decline in muscle mass

and fibre, with the overall effect that your body becomes less able to move as quickly as you want it to.

The importance of fast twitch muscle fibre

However old you are, speed activities are dependent on your fast twitch muscle fibres, which power up your muscles to produce dynamic contractions. They contract 2-3 times faster than slow twitch muscle fibres, producing 30-70 twitches per second.

There are two types of fast twitch fibre:

- **Type IIa/intermediate fast twitch muscle fibres** These are also known as 'fast oxidative glycolytic' (FOG) fibres because of their ability to become more or less enduring in response to the appropriate training. When trained aerobically, they become more adept at utilising oxygen as an energy source to maintain physical activity. When trained anaerobically, they develop an ability to buffer the effects of chemicals like lactate and lactic acid that build up in the muscles during repeated intense activity – like short-recovery interval training – and force you to slow down or stop.

  You can boost the speed and power output of type IIa fibres by such specific training methods as sprinting, weight training and plyometrics. Conversely, too much slow training is likely to have the opposite effect.
- **Type IIb fast twitch muscle fibres**. For speed activities like sprinting, these muscle fibres are the turbo chargers in muscles. They are also known as 'fast glycogenolytic' (FG) fibres as they rely almost exclusively on the immediate anaerobic energy system and stored chemicals such as creatine phosphate to fire them up. This energy pathway is used to create very dynamic sporting movement over very short periods of 6-10 seconds – think of a tennis serve or a 60m sprint – and has no reliance on oxygen. Speed training methods will increase the strength and power output of type IIb muscle fibres.

Masters speed training tip *The recruitment of type IIb fast twitch muscle fibres requires considerable neural (brain) input, and you must be in the right frame of mind to do this. For detailed advice on mental training, see Chapter 7.*

What about slow twitch fibres?

To put you fully in the muscle fibre picture, slow twitch/type I muscle fibres, which contract at the rate of 10-30 twitches per second, are designed to sustain relatively slow but long-lived muscular contractions. They are also known as 'slow oxidative' (SO) fibres, as they are able to function for long periods on aerobic (oxygen-dependent) energy. Slow twitch fibre is obviously crucial to people engaged in endurance activities.

As mentioned above, Master speed athlete should beware of training their slow twitch fibres significantly through steady state endurance runs or similar cardiovascular workouts if they want to maintain as much speed as possible. However, this type of training should not be completely eschewed because of its general health benefits; it is also useful for building a fitness bass, cross-training and preventing injury.

Table 1, overleaf, looks at the links between the three main energy pathways and different sporting activities. Two things to note are that:

1. The first 6-10 seconds of any activity rely on the immediate anaerobic energy pathway;
2. In reality, most sports are fuelled by a combination of all the energy systems.

Masters speed training tip *Whatever your age, you need to train your body's energy pathways appropriately for speed. This will provide your body with the best fuel for speed performance, enabling you, for example, to express speed for longer or impart great force in a split second.*

Table 1: Energy pathways and muscle fibre

Energy pathway	Reliance on oxygen, and energy source	Duration	Typical training/ sports activity	Effects when appropriately trained
Immediate anaerobic	None – relies on stored energy sources in muscles	6-10 seconds	Weight lifting, 10-60m sprints, gymnastic vaults, athletic field events	Increases availability of stored energy sources in muscles, notably creatine phosphate. Targets type 11 muscle fibre particularly. Can boost muscle size, strength and power
Short-term anaerobic	Relies on a mix of stored chemicals and oxygen. Oxygen is secondary since it can never be supplied in sufficient quantities to sustain the high power output needed for very long	10-90 seconds	400m running, martial arts, racket and field sports, interval and circuit training (because of their stop-start nature)	Targets both types of fast twitch muscle fibres and improves their ability to sustain repeated, powerful muscle contractions
Aerobic	Relies on consistent oxygen supply to working muscles and an accompanying chemical reaction to sustain muscular action	Indefinite – at least in theory	Marathon running, triathlon, distance cycling and ultra-distance events	Targets slow twitch muscle fibre and significantly boosts its oxygen-processing ability

Table 2, below, illustrates the contribution of aerobic and anaerobic energy pathways to selected track events.

Table 2: The energy pathway requirements of selected track events

Event (m)	Aerobic energy pathway contribution (%)	Anaerobic energy pathway contribution (%)
200	5	95
800	34	66
1,500	50	50
10,000	80	20
Marathon	98	2

Source: Dick FW Sports Training Principles A&C Black 4th edition

Masters speed training tip *It is important to consider the energy requirements of your speed activity when planning your speed training programme. To state the obvious, a 200m runner would derive little benefit from daily aerobic five-mile runs; rather he or she should be training the two anaerobic energy systems, with interval sprint-type workouts over 10-400m, with varying recoveries. The only concession Master speed athletes may need to make is in the number of intense workouts they perform. Recommendations for training loads and recoveries are given in Chapter 8.*

The effects of previous training

Many Master speed athletes will have been training since their youth. While this training will have offered them numerous positive health and sporting benefits, the constant loading on their bodies may also have had some negative effects, as outlined below.

Osteoarthritis: wear and tear on the joints

A great deal of research has shown a correlation between years of sport participation and osteoarthritis. This is a degenerative condition of the joints, which become painfully inflamed. If you have joint degeneration without pain, the condition is known as osteoarth*rosis*. With both conditions there is deterioration of the joint 'cartilage' – a smooth substance that covers bone endings, allowing bones to glide over each other with minimal friction. Cartilage also cushions force as it is transmitted through the joints. It serves a very similar function to the oil in your car engine, except that you can't top it up!

Osteoarthritis is very difficult to treat: in fact all doctors can really do is relieve the pain and stop the affected joint from becoming deformed. In extreme cases, they have no option but to fuse a joint together.

Unfortunately, most research on footballers and rugby players suggests that they are at increased risk of osteoarthritis around their knees, hips and ankles during and after their

playing careers. This risk is significantly increased if they have sustained an injury in those areas.

Although contact sports appear to carry the greatest risk of degenerative joint disease, sports like tennis and track and field, with their constant pounding of joints, can also lead to problems in later life, although these tend to be less severe and less likely to preclude sporting activity. Again, previous injury to a joint is a good predictor of future problems. Advice on how to improve the health of your joints through optimum nutrition is given in Chapter 8.

Masters speed training tip *If you played rugby or football in your younger years and now wish to compete in sports with a lesser risk of injury, Masters track and field, with National, World and European age-graded championships, may be the thing for you. Useful web contacts are:*

- *British Masters Athletics Federation: www.BMAF.org.uk*
- *World Masters Athletics: www.world-masters-athletics.org*

Eccentric muscle damage

Muscles can also be damaged by years of the repeated and dynamic contractions needed by speed (and other) sports activities. Research suggests that this is particularly true of eccentric (as opposed to concentric) muscular contractions, when a muscle lengthens as it contracts. The most obvious example of an eccentric contraction is the lowering phase of a biceps curls, when the biceps muscle extends as it controls the movement of the weight back down to the starting position.

Eccentric muscular contractions are a feature of numerous sporting movements. There are, for example, eccentric contractions at the top of the thighs (hip flexors,) the quadriceps and calf muscles when the foot strikes the ground during running. Failure to train your muscles (and ligaments and tendons) to withstand eccentric force can increase your risk of injury. Relevant training methods are described in Chapter 2.

The benefits of carrying on with sport

It is important to realise that your body need not decline significantly – especially between age 30 and 60 – as long as you continue to make it work! Exercise has been described as the elixir of life since it can reduce your risk of a variety of ills and even slow down the aging process. The specific benefits of speed training into later life include:

- **Keeping osteoporosis at bay** Osteoporosis is a degenerative condition of the bones, which become thin and fragile. Between the ages of 30 and 70, women lose 30-70% of their bone mass and men 15%, so increasing the risk of factures. However, continued weight-bearing exercise, such as running and weight training (both key aspects of speed training), strengthens bones and reduces the risk of osteoporosis;
- **Keeping muscles strong** Regular weight and power training keeps muscles strong for sporting and other activities. They can also promote increased production of growth hormone and testosterone, with numerous knock-on benefits *(see Chapter 4)*;
- **Improving joint health** A sensible approach to training can actually benefit your joints;
- **Maintaining fast twitch muscle fibre** Speed trainers hang on to far more of these precious fibres – and thus maintain more muscle mass – than their sedentary peers;
- **Strengthening soft tissue** Weight training, in particular, keeps muscles, ligaments and tendons stronger, making them less prone to injury;
- **Improving cognitive function** A growing body of research shows that active middle-aged and older people also have more active minds than their sedentary counterparts;
- **Helping to prevent heart disease** Coronary heart disease is the number one killer in the UK, with one-in-three people at risk of a heart attack. Although speed training won't benefit your heart quite as much as endurance exercise, it will still help;
- **Keeping you slim** Sedentary people gain weight with

age as their metabolic rate slows and muscle mass declines (since muscle burns up to three times more calories than other body tissue). Speed training will help you break this vicious circle;

- **Helping to prevent cancer** Exercise can reduce your risk of various cancers. For example, regular workouts can reduce older women's risk of breast cancer by 20%;
- **Reducing your risk of diabetes** Exercise significantly reduces your risk of developing diabetes in adulthood because it helps to normalise blood glucose levels;
- **Combating stress** Working out regularly is known to bolster self-esteem and reduce the negative feelings and hormonal responses associated with stress, anxiety and depression.

Masters speed training tip *If you take up speed activity in later life, your body may develop more resilience (once it is adequately conditioned) than that of someone who has been training for many years. This is because an older body that is fresh to sport is less likely to have suffered such sport-related damage as osteoarthritis or eccentric muscle injury.*

Aging and skill

Obviously the physiological factors that lead to the age-related decline in speed also affect the performance of sports skills. Numerous studies have shown, for example, that a sprinter's stride length declines significantly with the years – by as much as nearly 50% in the oldest Masters sprinters *(see Chapter 6)*. However, there are a number of strategies you can use to minimise these performance decrements *(see Chapters 4-7)*.

100m sprint v marathon performance – which one declines most with age?

The 100m records for ages 35-65 declines by 0.73%, while marathon records fall by 1.1% per year. This fact may come as a surprise, but is interesting for Master speed athletes to ponder.

Tables 3 and 4 below, listing the age-graded world records for male and female Master sprinters, show you just what feats the aging body is capable of mustering.

Table 3: Masters 100m world age records* – men

Age group	Time (secs)	Athlete	Age when record set	Country
35	10.03	Linford Christie	36	GBR
40	10.42	Troy Douglas	40	NED
45	10.72	Willie Gault	45	USA
50	10.95	William Collins	51	USA
55	11.57	William Collins	55	GB
60	11.70	Ron Taylor	61	GB
65	12.53	Paul Edens	65	AUS
70	12.77	Bobby Whilden	74	USA
75	13.61	Wolfgang Reuter	75	GER
80	14.35	Payton Jordan	80	USA
85	16.16	Suda Giichi	85	JPN
90	17.83	Donald Pellmann	90	JPN
95	21.69	Kozo Haraguchi	95	JPN
100	43.00	Philip Rabinowitz	100	RSA

Table 4: Masters 100m world age records* – women

Age group	Time (secs)	Athlete	Age when record set	Country
35	10.74	Merlene Ottey	36	JAM
40	11.09	Merlene Ottey	44	SLO
45	11.41	Merlene Ottey	46	SLO
50	12.50	Phil Raschker	50	USA
55	13.30	Phil Raschker	55	USA
60	13.89	Brunhilde Hoffmann	60	GER
65	14.29	Irene Obera	65	USA
70	15.16	Margaret Peters	70	NZL
75	15.91	Paula Schneiderhan	75	GER
80	18.42	Hanna Gelbrich	80	GER
85	21.18	Nora Wedemo	86	SWE
90	23.18	Nora Wedemo	90	SWE

**As at: 29 September 2006: Source: World Masters Athletics Association*

Chapter 2

Preconditioning against injury

Injury is a bond that unites all athletes, regardless of age or ability. The training we perform to strengthen our bodies can paradoxically weaken it in the very process, leading to both short and long-term problems. Sport scientists and coaches have developed the concept of 'preconditioning' as a way of reducing injury risk.

Preconditioning basically means 'training to train'. Preconditioning workouts emphasise the need to protect and strengthen areas that are prone to injury and sport specific stress in order to increase their tolerance and readiness for sport. It is true that this becomes more difficult with age; nevertheless concerted and consistent preconditioning is crucial for the longevity of Master speed athletes.

Your preconditioning routine should be a background to your main training programme, helping to keep you in prime training condition all year round.

Note that this chapter should be read in conjunction with Chapter 3 (warming up for speed), since the way you prepare for speed training and competition can have a very significant effect on injury prevention.

First analyse your previous injuries

Thinking about the injuries, aches and pains you have endured in the past makes a good starting point. Some of the injuries will have been beyond your control – such as slipping on a wet

Footnote: It is beyond the scope of this book to account for every injury risk, so do consult your coach, physiotherapist, or GP for further advice.

runway and straining the knee while high jumping, or being badly tackled during a football match. However, some of your aches and pains, such as Achilles tendon pain (one of the main problems for Master speed athletes), are more preventable. These overuse injuries are likely to result from incorrect strengthening or stretching, an over-emphasis on mileage or speed work, or simply failing to take account of your body's natural strengths and weaknesses.

My own experience of Achilles tendon pain

Like many older athletes, I suffer from regular Achilles tendon problems. This band of soft tissue connects the calf muscle to the heel bone. Over the years I have worked out that regular sprint training brings on soreness, often in both my tendons. This seriously compromises my athletic involvement at the time – although a good rest at the end of the track season seems to clear the problem up, at least until the next summer.

I try to employ the 'wise head on old shoulders' approach that I advocate throughout this book. Consequently, I don't over-emphasise speed work immediately before and during the track season so as not to overload my tendons and to give them plenty of recovery time. I also do many of my track workouts in training shoes in order to reduce the strain that spikes place on the tendons. At the same time, I follow a strict routine of specific stretches and (eccentric) strengthening exercises and I regularly ice and massage my calf muscles and tendon area.

As Master speed athletes, we need to be vigilant when it comes to injury and body management. A number of further remedial treatments are described in Chapter 9.

Masters speed training tip *The key to successful injury prevention is the continued application of preconditioning techniques and a circumspect approach to training.*

Understanding muscle action

Understanding how your muscles work is an important aspect of preconditioning. As explained in Chapter 1, sporting movements combine both concentric and eccentric muscular contractions, and muscle soreness is much more common after the latter.

A good example of a 'concentric' muscular contraction is curling a barbell to the shoulders when performing a biceps curl. With this movement, the muscle shortens as it contracts. By contrast, the act of lowering the barbell is a typical example of an 'eccentric' contraction, where the muscle lengthens as it contracts.

Many of you will have experienced sore legs that are painful to the touch soon after a bout of downhill running. This eccentric exercise soreness (also known as 'delayed onset muscle soreness', or DOMS) comes as a result of the quadriceps muscles at the front of your thighs lengthening as they contract to control your descent. Although this is a familiar phenomenon, the exact cause of the soreness is still not known.

However, the good news is that nearly all research on the subject shows that one bout of eccentric exercise can protect you against further similar eccentric muscle damage for *up to six weeks afterwards* – even if you don't regularly practise that form of exercise. Research also shows that you can increase your eccentric muscle tolerance with specific eccentric preconditioning exercises, as described below:

- **For running 4 x 100m** Downhill efforts at 70% of maximum speed as a prelude to more intense downhill runs – *ie* at greater speed, or over longer distances. Doing this will minimise residual soreness and the risk of more significant future strain. Note: the decline should be no more than 1-2 degrees;
- **For all speed activities** Depth jumps with the emphasis only on the landing and hold from the drop – *ie* you don't spring up into a jump for height or forward for distance but simply absorb the impact on landing. Depth jumps as a form of plyometric training are considered in Chapter 6;
- **Eccentric weight training** Here the emphasis is on the lowering (eccentric) phase of the exercise, *eg* controlling the weight as it is lowered to your chest during a bench press. Further examples of preconditioning eccentric weight training exercises are given on page 28.

Strengthening your soft tissue

A great deal of research shows that weight training is key to strengthening soft tissue – *ie* muscles, ligaments and tendons – that tend to deteriorate and become more injury-prone with age. In fact, you could argue that preconditioning is weight training's most significant contribution to speed training, since its direct relevance to improving speed performance is not as great as you may think.

Countering your imbalances

Since most speed activities involve repeated movements, it is almost inevitable that strength will be developed unevenly across your body. Although this uneven development is a performance necessity, it can put a strain other parts of your body, which increases with time. It is important to understand in this context that an exercise that seems irrelevant to your sport may play a significant role in preventing injury.

Self-testing and technical analysis, as described below, can also reduce your risk of imbalance injuries by identifying and training them out as much as is possible. If you were to discover, for example, a great discrepancy in strength between your left and right legs, you could instigate a training programme to promote greater parity. This would increase your ability to express power more evenly as well as reducing injury risk.

A good starting point is to establish your one-repetition weight training maximums (1RM) and/or plyometric bests – *eg* four hops on each leg, with individual distances recorded for each. These measures provide a very useful point of reference at the start of the training year and at various points during the year. For more on the training year, see Chapter 9.

Analysing the range of movement (ROM) needed for your sport

The dynamic nature of speed activities can force limbs into positions they might not be able to attain under normal circumstances – *eg* when kicking a football or throwing a javelin – and this can lead to injury, particularly for older

athletes who have lost some of their earlier flexibility. It is therefore crucial for you to achieve and maintain the optimum speed specific range of motion (SSROM) for your particular sport: sprinters, for example, need to concentrate particularly on their hamstrings and Achilles tendons.

As I will show in Chapter 6, reduced stride length is a key contributor to the age-related decline in sprint speed. Stretching and ROM analysis can help to offset this decline.

Masters speed training tip *For younger speed athletes, stretching is now often neglected, particularly during warm-up, in favour of more functional sport specific dynamic exercises. Although I recommend these newer techniques for Masters in search of speed (see Chapter 3), I believe that static stretching methods and exercise forms like yoga and pilates have an important role to play in maintaining ROM for health and sports purposes.*

It is true that establishing SSROM norms is a fairly subjective process; nevertheless, the process of working out where muscular tightness could impair performance and, at worst, lead to injury is key to successful preconditioning.

Possible signs of inadequate ROM include:

- Being unable to bring your heel close up to your butt from a standing position, with your knee pointing towards the ground. This shows tightness in the quadriceps muscles (front of thigh) and the hip flexors (top of thigh);
- Being unable to pull one leg back to or past a 90° degree angle at the hip when lying down with the other leg and back flat on the ground. This shows tight hamstring muscles (back of thigh);
- Being unable to lift both arms up behind your back to a position parallel with the ground. This shows tight shoulder muscles.

Masters speed training tip *Once your speed specific ROM is established you should regularly check to ensure that you maintain it throughout your training. This is because frequent intense training and competition can shorten muscles. For advice on specific and general stretching methods, see Chapter 3.*

Analysing your technique

However long you've been practising your sport, don't make the mistake of assuming that your technique is perfect. The older we get, the more likely we are to get into bad habits or compensate for muscular imbalances or injuries. For this reason, having a coach to advise you or using video analysis can be very useful.

An example of analysis: filming your running action from behind
When watching the playback, pay careful attention to your hip alignment, the recovery phase of the running action (when the grounded foot leaves the running surface and the heel travels up towards the butt before being pulled through to strike the ground in front of the body), foot strike, back and shoulder position. From this kind of study, you may notice a lazy lower leg return phase, which is often a problem for Master athletes. Your leg may not, for example, come very close to your butt. If this weakness is identified you can train to improve it.

Standing leg cycling is a particularly relevant exercise in this respect, since it will improve technical ability while preconditioning the hamstring muscles against eccentric strain in particular. For more on this exercise, see page 40.

Masters speed training tip *You may be older than your coach, but that doesn't mean you don't need one! While you may need less hand-holding than a younger athlete, you will certainly benefit from the experience of an expert, particularly when it comes to analysing your technique.*

Allowing for recovery

As a Master speed athlete, particularly after age 50, your body needs more time for recovery than it did when you were younger. This will also reduce your risk of overuse injuries. Here are some guidelines for speed training recovery:

- **For weight training workouts** Weight training breaks down muscle protein. To rebuild this protein and enhance the strength of your muscles, you may need as long as 48 hours' recovery after a workout. To aid this process, aim to consume 1.8-2.0g of protein per kg of body weight daily and make sure that 60% of your diet

Lactate and lactic acid: what's the difference?
Lactate, is a key energy source for both aerobic and anaerobic exercise. Although it is present in the body at all times, its levels in blood and muscle are significantly increased by speed work, such as 400m running and short-recovery interval training. Lactic acid is produced when the rate of lactate production fails to meet the rate of lactate clearance in your muscles.

comes from carbohydrate; (for more on diet and supplements, see Chapter 9);

- **For intense running workouts** Hard and fast short-recovery running workouts increase levels of lactate/lactic acid in your body and muscles. These substances are not at all harmful and, indeed, are key to generating sustained speedy muscular action. However, lactic acid in particular needs to be 'flushed out' of your system by a good warm-down after a workout in order to prevent muscle soreness. As with weight training, allow a minimum of 48 hours before training intensely again.

Note that you can still train on the days between intense workouts, but these workouts must involve significantly reduced loading. A dedicated stretching workout would be a very useful session for this purpose *(see Chapter 3)*. Over age 65 many master sprinters, for example, train specifically only once or twice a week, although they may fill the gaps with more general health-related activities, such as walking and yoga.

Why warm-downs matter
After a speed workout, your neuromuscular system is highly charged and you need a slower period of exercise to calm it down. Ideally, you should do some gently cardiovascular exercise and stretch the key soft tissue groups used in your workout. Because blood flow will have been increased by the workout, this is a good time to stretch your Achilles tendons. These tendons are made up of fairly inert tissue, which does not enjoy a strong blood flow. After a circulation-boosting workout they will therefore be more responsive to stretching, which can reduce Achilles injuries. A good warm-down will aid your recovery and hence your readiness for the next workout.

Table 5: Selected preconditioning weight training (and other) exercise

Exercise	preconditioning relevance	Applicable speed/sport activity	Comments/exercise pointers
Leg extension	Stabilises and strengthens the knee joint	All	Suitable for independent left and right leg training to balance strength
Lunge	Strengthens virtually all key running muscles	All	With a need to work both legs independently, the exercise suits the unilateral nature of most speed and sport activity
Eccentric calf raise	Strengthens Achilles tendons and calf muscles	All running-based sports	Develops eccentric strength in the calf muscles which can protect the Achilles tendons. See below for more about this exercise
Cable internal shoulder rotation	Aids stabilisation of shoulder joint strength	Rotational athletic throws, javelin, racket sports and martial arts	See text below for a detailed exercise description
Backwards and sideways running	Improves agility, lower limb strength, flexibility & balance	All running-based speed activities	Can be included as a regular element in the speed specific warm-up (see Chapter 3)
Hamstring curl	Strengthens the hamstrings against injury, especially if you emphasise the eccentric movement	All	More specific exercises, such as leg cycling (see page 30) should be combined with hamstring weights' exercises to protect these muscles from injury

Weight training preconditioning: how to do it

Table 5, above, demonstrates the relevance of selected exercises to particular sports. Here is some detailed guidance on how to perform them.

Eccentric calf raise: reduces the risk of Achilles tendon strain

- Using a standing calf-raise machine (fixed or Smith machine), concentrate on the lowering (eccentric) phase of the exercise by completing it to a four-second count;
- Then extend your ankles to push back up to a count of one.

Research shows that this exercise is as effective at curing Achilles tendon problems as many other forms of treatment, including ultrasound – and even surgery. For best results, the weight selected should be in excess of 75% of your 1RM, but it is important to progress gradually towards this loading.
Do: 4x10

Variation: free standing single leg calf raise
This variation will also improve your balance.

- Stand up on the toes of one leg;
- Gain your balance and lower your heel slowly to the floor;
- Pause, then extend your ankle to complete 1 repetition (rep).

Do: 3x10 repetitions on both legs

Cable internal rotation: strengthens and stabilises the shoulder
You'll need a training partner to assist you and a short, medium-strength dyna-band (or similar rubber type of exercise tube) to perform this exercise.

- Stand in a ready position, with your feet shoulder-width apart, with your left hand on your hip and a towel placed between your right upper arm and side;
- Grasp the handle of the dyna-band with your right hand and flex your right elbow to a 90º angle, so that your hand is just in front and to the left of your navel. Your training partner should be standing to your left side, just behind you, gripping the other end of the dyna-band firmly so as to create tension in the band;
- Move your hand away from your body and out to the side to stretch the dyna-band;
- Pause, then bring your hand back to the starting position;
- Keep your lower arm parallel to the ground at all times and do not change your hand position.

Do: 3x10 for both left and right shoulder

Hamstring exercises: reduce the risk of hamstring strain
The muscles at the back of the thighs are particularly prone to injury – and re-injury – for all speed athletes. One of the main reasons for re-injury is that the injured hamstring shortens; another reason is that the injured muscle, even when recovered, has a reduced ability to withstand force, particularly eccentrically. To precondition your hamstrings against injury, I recommend a programme of muscle testing, stretching and eccentric exercise.

- *Eccentric hamstring weights exercises* If you are doing this on a lying hamstring curl machine, lower the weights slowly; if you are doing it on the seated version, slowly push the machine's pads away from you. Use a four-second eccentric phase count and a one-second concentric phase count.
- *Standing leg cycling* Standing leg cycling is also a great exercise for developing specific speed sports hamstring (eccentric) strength. This is because it closely replicates the stresses placed on the muscle when running. (See page 40 for more on this exercise).

More general preconditioning exercises

It is beyond the scope of this book to describe all the exercises and drills that are available to precondition and enhance speed. Nevertheless, as well as the specific exercises described above, it is important to incorporate more general fitness-boosting exercises into your speed training to prepare your body for intense workouts. Here are some examples:

*Hamstring bridge: s*trengthens hamstrings

- Lie on your back with your feet shoulder-width apart and fold your arms across your chest;
- Lift your hips from the floor by pressing your heels into the ground;
- Hold for 2 seconds, then lower.

Do: 2 x 10 repetitions

Sit-up: strengthens abdominal muscles

It is crucial to develop great core (torso) strength to reduce the risk of injury to this area and also to optimise power transference between and through the upper and lower body. The sit-up strengthens the muscles that run down the front of your stomach.

- Sit on the floor with your feet flat on the ground and your heels close to your butt (with knees bent to an angle of 90°);
- Place your hands by your ears, keeping your upper arms at right angles to your trunk;
- Contract your abdominal muscles to pull your torso 10-20cm from the floor;
- Pause, then lower slowly to the ground.

Do: 4x10 repetitions

Masters speed training tip *Many Master speed athletes get into the habit of banging out abdominal exercises at high speeds. But to fully engage the stomach muscles, it is far better to perform these exercises with greater control. I recommend performing the majority of abdominal exercises to a 3-count lift and 2-count lower. You will need relatively few repetitions to tax the relevant core musculature.*

Sit-up-with-twist: strengthens the abdominal muscles that pull the trunk forward and rotate it

As most sports require your trunk to twist or withstand twisting movements, this exercise (and similar ones) is more sport and speed specific than the straightforward version.

- Assume the same starting position as for the sit-up, but on raising your body forward, take one elbow across to the opposite knee;
- Pause and lower, then repeat to the other side.

Do: 2 x 10 repetitions (left and right)

Weight training and other suitable strength training exercises for Master athletes are considered in more detail in Chapter 4.

Preconditioning workouts

Speed preconditioning should be emphasised at the beginning of the training period and on a regular basis throughout training to bolster the body against the rigours of speed work.

Masters speed training tip *preconditioning drills can be incorporated into your warm-ups and cool-downs.*

preconditioning workout 1

Warm-up: 5 minutes of easy jogging

Exercise	Duration/intensity	Comments/tips
Lunge walk	4x20m easy	Keep a steady rhythm
Leg cycle walk	4x20m easy-to-medium	Increase speed as you progess through the reps
High-knee walk	4x20m easy	Increase speed as above
Foot drill	4x20m easy-to-medium	Increase speed as above
Backwards running	3x30m easy-to-medium	Increase speed as above
Sideways skips	2 x 20m each side easy	Increase speed as above
Single leg squats	3x10 on each leg	With body weight
Calf raises	3x20	With dumbbells
Hamstring bridge	3x10 with 2-second hold	With body weight
Medicine ball sit-up and throw	3x10 medium intensity	Don't perform the throws at 100% effort – this is still part of warm up

For descriptions of most of these exercises, see Chapter 3.

preconditioning workout 2

This workout is based on the principles of circuit (CT) and circuit resistance training (CRT). These forms of training use multiple repetitions, using body weight and light weights (around 60% of 1RM), with short recoveries. The exercises selected would benefit any Master competing in a running-based sport.

While you may be familiar with the use of CT and CRT workouts for developing strength endurance (the ability to sustain repeated muscular contractions), you may be less aware that they are also great preconditioners for speed. This is particularly true if you choose the right exercises, maintain good technique and carefully monitor your intensity. When I say 'right exercises', I mean those that have transference into your sport speed – *ie* they mimic an action which contributes to performance improvement and/or strengthen body parts relevantly, thus increasing injury tolerance.

Warm up: 5 minutes of jogging or other suitable CV exercise

Exercise	Repetitions	Comments/tips
Press-up	30secs exercise time, 30secs recovery	Perform rhythmically. Keep your body straight when lowering
Hamstring bridge	10 reps, hold for 2secs	Try to stay relaxed
Sprint arm action	30secs exercise time, 30secs recovery	Keep shoulders down and relaxed
Sit-up	30secs exercise time, 30secs recovery	Emphasise the contraction of the abs to pull your torso upwards
Standing leg cycling	20 reps each leg	Perform with controlled speed
Sit-up with twist	30secs exercise time, 30 secs recovery	Perform slowly
Squat jumps	15 reps	Perform with controlled power, landing lightly
Dumbbell bench press	20 reps	Perform with control and symmetry, using a light-to-medium weight
Straight leg jumps from side to side	30secs exercise time, 30secs recovery	Maintain a slight knee bend. Land lightly and dynamically
Sprint running action with dumbbells	20secs on and off	Keep shoulders relaxed

Chapter 3

Warming-up and stretching for speed

The older we get, the more important it is to prepare our bodies properly for dynamic sports activity, because soft tissue loses resilience and becomes more prone to injury with age.

In recent years, there has been a huge shift in attitudes toward warming up, and particularly the role of stretching. The 'traditional' warm up that you may have learned in your youth – and are probably still following to this day – may not actually be the best way to prepare your body and mind for speed activities. However, there is still a place for traditional stretching methods, as I will demonstrate.

You have probably been taught to stretch for 10 minutes or more after jogging a couple of laps to warm up before your speed activity. Most of those stretches are probably passive in nature – *eg* the standing/seated hamstring stretch, where the end position is held for10-20 seconds. But recent research has questioned the validity of these held (active and passive) stretches as a means of preparing muscles for speed and power activities.

There are a number of reasons for this:

- First, while warmth is essential for loosening muscles, it is argued that a prolonged period of stretching will probably result in a loss of body temperature because the body moves around very little;
- Secondly, in practice held stretches have little direct relevance to actual speed and sport skill performance because they do not put muscles through the appropriate ranges of movement;

- Thirdly, a prolonged warm-up can impair mental readiness, effectively 'switching off' the neural stimulation required for optimum speed and power delivery.

In the light of these reservations, a different type of warm-up is now recommended for athletes of all ages engaged in speed (and power) activities. The new warm-up, described in the panel below, involves functional active/dynamic flexibility and is deliberately designed to get you ready for equally dynamic sporting movement. I call this the *speed specific warm-up*.

The speed specific warm-up

This warm-up should be used before any speed workout or competition.

1. Raise your body temperature with 5 minutes of easy CV exercise. It is best to use running, as most speed sports are based around it. If you are performing a weights workout, then it is fine to use another form of CV exercise, such as rowing;
2. Perform dynamic speed/sport specific stretches. The best way to stretch a muscle in preparation for speed activity is to move it through a range of movement (ROM) that relates to the movement pattern of the activity itself. You could, for example, simulate various tennis shots or martial arts kicks. The important thing is to gradually increase the speed of movement of these activities over a number of repetitions.

Specific warm-up stretches

Many specific warm-up stretches have additional preconditioning value because they specifically strengthen muscles. The exercises that follow are suitable for the majority of speed sports and skills.

Lunge walk: mobilises hips and hamstrings and strengthens butt and hamstring muscles

- Take a large step forward into a lunge, then step forward into another lunge;
- Keep your chest up and look straight ahead;

- Co-ordinate your arms with your legs – *ie* opposite arm to leg as you move forwards.

Do: 4 x 20m

High-knee lift: great for hip flexor and ankle strength and balance (which can also deteriorate with age)

- Extend onto the toes of one foot, while lifting the thigh of your other leg to a position parallel to the ground;
- Lower this leg, placing foot flat on the floor;
- Repeat the action with opposite legs;
- Co-ordinate arms with legs and keep your chest elevated as you move forwards.

Do: 4 x 15m. You can get gradually faster as the warm-up progresses

Elbow-to-inside-of-ankle-lunge: great for hip flexibility and hamstring strength

The forward lean involved in this exercise stretches out your lower back. It is very similar to the lunge walk, but on stepping into each lunge you should extend your trunk forwards over your front leg. So, if your right leg was in front of you, you would take your right elbow down to the inside of your right ankle; pause, then pull your trunk to an upright position, before steeping forwards into another lunge.

Calf walk: great for lower limb mobility and Achilles tendon resilience

- Keep your legs relatively straight and use a heel-to-toe action to move forwards in very small steps. Co-ordinate your arms with your legs and keep your chest elevated.

Do: 4 x 20m

Sideways and backwards skipping/running: great for lower limb strength, agility and flexibility

- Performing these drills can precondition against common running injuries as they will strengthen the knee and ankle joints. They will also improve your agility. When

performing these drills, always try to be 'light' on your feet, generating the movement from the balls of your feet.
Do: 4x15m for each of these

The relevance of stretching to speed

As explained, static stretches do little to prepare your body for speed sports activity. To illustrate this with an obvious example, a sprinter's muscles fire rapidly and do not stretch slowly or statically, as with a hands-to-toes hamstring stretch. Nevertheless, Master speed athletes should still emphasise relaxed held stretches in their speed training, performing these exercises twice a week as separate workouts. There are five reasons why:

1. To improve running ROM
Your running technique may be impaired by a limited ROM. You should therefore work on your 'tight' areas and those which could impair speed sport technique (*eg* the hips, hamstrings and quadriceps for sprinters) with more traditional stretching methods in order to lengthen your muscles and increase joint motion. As I will explain in Chapter 6, reduced stride length is the key factor in the age-related decline in sprint speed, so working on specific sprinting ROM in the hips and hamstrings can be of vital importance.

2. To improve your sport specific ROM
If you have a tight muscle/muscle group this can impair your sports technique in the same way as just described for the running action. Poor shoulder flexibility could impair your tennis serve or javelin throw, for example. Restricted movement could also lead to injury. Consequently, it is crucial to analyse the ROM requirements of your sport and stretch to optimally develop them.

3. To aid relaxation and recovery
Because of its dynamic nature, speed training can tighten muscle groups, but stretching will reduce this tightness and aid recovery. The fact that many Master speed athletes have years of training behind them makes the more remedial type of stretching even more important.

4. To increase the effectiveness of your warm-down
You should stretch gently for five minutes as part of your warm-down because this also aids recovery. Because of the increased blood flow to soft tissue, this can be a very good time to stretch.

5. To counteract the natural age-related decline in ROM
As mentioned in Chapter 2, ROM can decrease naturally by as much as 30% by age 70. Stretching helps you to retain as much ROM as possible.

Sideways running

- With your feet just beyond shoulder-width apart, bend your knees to a three-quarter squat position, lifting your arms up and out to your sides to a position parallel to the ground;
- Move to the left or the right by pushing off from the outside foot; land light on your inside foot a split second before the outside foot, then push off into the next side step;
- Do not go for large jumps.

Backwards running

To state the obvious, look behind you first to make sure you are not going to crash into something.

- From an upright position, with feet shoulder-width apart, push off from the ball of each foot in turn to push yourself backwards;
- Step back with your legs as you travel backwards, and co-ordinate arms with legs. Work at 50% effort until you get used to the movement, then increase your speed.

Variation: On pushing back into each step, lift your lower leg up, out and back over a bigger ROM, to literally run in reverse. This will open up your stride and is a great way to develop quadriceps and calf muscle strength.

Masters speed training tip: *Backwards running is a useful rehabilitation exercise for athletes with back and knee injuries as it places minimal strain on these areas. That's what also makes it a great exercise for preconditioning against injury.*

Walking leg cycling: great for specific running hamstring strength and ROM

This drill is similar to the high-knee walk, but after lifting each thigh parallel to the ground, you extend your lower leg in front of your knee, then sweep it back, down and under the body. When that foot strikes the ground, you do the same with the other leg. Basically this exercise mimics the running action at walking pace. It is important to pull the heel of the 'cycling' leg as close to the butt as you

progress forward, as this can improve/maintain the strength required for optimum sprint technique.
Do: 4x15m

Simulated running arm action: great for a technically correct and powerful running arm action

- Assume a balanced lunge position;
- Looking straight ahead, pump your arms backward and forward as if running;
- Maintain a 90° angle at your elbows throughout the drill and keep your shoulders relaxed.

This exercise can also be performed from a seated position, which will develop specific arm strength as well as greater core stability. You'll find that your torso has to work hard to maintain your stability, which is why specific core strength is so crucial for all speed athletes; a weakness in this area can lead to force being misdirected, so impairing sport performance.

Light dumbbells can be used to develop greater strength and speed for both versions of this exercise.
Do: either or both exercises (in alternate sets) for 15-60 seconds, altering your speed of movement over 2-4 sets

Monitor your lifestyle for flexibility

With age it becomes increasingly important to monitor and influence lifestyle factors that have an effect on general flexibility. Years spent hunched over a computer, for example, can round and tighten the neck and shoulders, while hours in the driving seat can shorten the hamstrings. These and other lifestyle considerations can obviously limit your speed sport's ROM, so it is worth carrying out a quick body check and working out where some carefully targeted stretching might play a useful role in easing tightness and tension and elongating muscles.

Leg drives: good for maintaining specific sprint form and strength

- Lean forward against a wall with your hands evenly spaced at shoulder level, feet shoulder-width apart and

about 1m from the wall. Look straight ahead and keep your body straight;

- Lift your right leg until your thigh is parallel to the ground;
- Now drive your leg from your hip back down towards the ground;
- As soon as your forefoot contacts the ground, pull the leg back up dynamically to return it to the starting position.

Do: 3 x 10 repetitions on each leg, gradually increasing the speed of the drive, then change legs

Leg cycling: good for developing specific hamstring strength and good sprinting form

Assume the same starting position as for the exercise above, but this time when you drive the leg back, sweep it back, up and behind you before pulling it through from the hip to the starting position. Perform this exercise slowly and with control before increasing your speed as you become more confident.

Do: 3 x 20 repetitions on each leg

Variation: you can also perform this exercise side-on to a wall, using the inside hand to provide balance and cycling the outside leg.

The importance of traditional stretching

The main static types of stretching methods are described here so that you can include them in your speed training. Always be careful to raise your body temperature before you stretch, and keep warm throughout the workout. Note, though, that going for increased ROM before a speed workout is not recommended as your performance will be impaired.

Masters speed training tip *Of all the physical aspects of sports performance, ROM is most easily maintained once improved. One stretching session a week should be enough to maintain training gains.*

Masters speed training tip *ROM begins to decline from age eight if you do nothing to retain it; but the good news is that regular stretching can improve ROM, whatever your age.*

Passive (static) stretching
With these exercises, you ease into the stretch without jerky or dynamic movements. A good example is holding the end position of a seated hamstring stretch. Gravity or external force (exerted by you, a training partner, a machine, belt or rope) supplies the means to stretch. Hold passive stretches for 15-20 seconds.

Active stretching
Active stretching involves holding a stretch. Although this may sound the same as passive stretching, it involves different muscular actions. A good example of active stretching is holding one arm straight up by your ear in alignment with your body for 10-15 seconds. This type of stretch has greater sports applicability than passive stretching, because muscles and limbs are moved and held in place by their own action, which is what happens during sports performance.

Try Yoga or Pilates

These increasingly popular exercise classes offer numerous benefits for Master speed athletes. Crucially, they provide a focus for stretching, while also promoting greater core strength and body awareness. You don't have to become expert at these disciplines; rather you should enjoy and learn from them and incorporate some of their concepts into your speed training.

Proprioceptive neuromuscular facilitation (PNF) stretching
PNF stretching is regarded as one of the best ways to improve ROM. Although it is possible to perform PNF stretches on your own, perhaps with the aid of a towel or a band, you'll get more from them if you work with a training partner. PNF stretching works on the principle of two-directional force, which boosts the stretch potential of your muscles.

The following PNF stretch for the hamstrings shows the principle in action:

- Lie on your back, relaxed, with arms by your sides;
- Keeping one leg flat on the ground, get your partner to lift one leg up and back towards your head, maintaining a slight bend at the knee, until the point where further movement becomes difficult;
- Hold this position for 20 seconds;
- Then push back through the leg against your partner, who should be braced and ready to offer resistance;
- Relax and let your partner push your leg back towards your head again for a further 10-15 seconds. You should find that your ROM has increased.

This type of stretch attempts to switch off the 'stretch/reflex' capacity of muscles, which leads to a knee-jerk reaction when a limb is inadvertently stretched beyond its normal ROM. The stretch/reflex is nature's way of protecting muscles, but it can be de-activated, particularly by PNF methods, allowing muscles to be stretched beyond previous limits.

Another important function of the stretch/reflex is to help develop and maintain speed and power. This is described in detail in Chapter 5, on power training.

Stretching – a personal perspective

I've never been a great one for stretching, probably because I was not blessed with the greatest flexibility in the first place. As a child I was unable to sit cross-legged in school assemblies due to my natural lack of flexibility; and as an athlete it took me a good year or so before I developed sufficient hamstring and lower back ROM to touch my toes!

Even now, as a mature trainer who should know better, I'm still guilty of not stretching enough, particularly away from my sports training. To counter this aversion, I occasionally join a Yoga class so that I can emphasise my stretching for a period in my training. These workouts elongate my muscles, help rid my body of tension and ease the lower back pain that I occasionally suffer.

Recent visits to the physio have also shown up specific areas of muscle tightness that have been hampering my speed training. I am now working on releasing these areas through a more focussed stretching programme.

Chapter 4

The role of weight training

Weight training is crucial for Master athletes in search of speed, but it doesn't do much to directly improve speed performance. Being able to bench press 120kg or squat 200kg, although great achievements in their own right, particularly for Masters, will not directly improve your sprint or tennis performance. Weight training, at best, provides a foundation for speed, strength and power, and gains in the weights' room have to be carefully channeled into speed performance.

This chapter shows you how to do this and also pinpoints the key strategies for getting the most out of your weight training as a Master. Note: It assumes you have a basic understanding of weight training methods and techniques.

As explained, valuable power-producing muscle is lost with age, and this decline affects fast twitch muscle fibre more significantly than slow twitch fibre. With a reduced muscle mass and fewer fast twitch fibres, your body will have a reduced capacity for power and speed; but whatever your age, you can still do a lot to counteract this decline

Research indicates that the body will respond to weight training irrespective of age. Studies involving 90-year-olds have seen them double their leg strength after an appropriate training programme. Such has been the improvement that the participants have literally been able to throw away their walking aids.

Weight training will also promote a positive hormonal response, with numerous knock-on benefits for Master speed athletes *(see overleaf)*.

Aging and power lifting (panel)

Power lifting is a sport that combines strength, speed and skill. A brief look at how strength declines with age at the upper echelons of this sport shows what you can expect – and what can be achieved by regular training.

An analysis of power lifting age bests over the 20-85 age range showed that:

- Men's records peak in their third decade, then drop by 3% by age 37, and then decline at a constant rate of 0.9% per year until age 85;
- Women's records also peak in their third decade, drop by 3.4% by age 37 and then decline at a constant rate of 1.2% per year until age 52.

As with running speed, performance decline is inevitable in power lifting for natural physiological reasons. However, regular training can offset that decline.

Weight training and your hormones

As explained in Chapter 1, growth hormone (GH) is crucial to sport performance. It is released by the pituitary gland and production is boosted during exercise, although this facility declines with age. The importance of GH to sport is that it is involved in numerous anabolic (growth-promoting) functions relating to cell proliferation and division throughout the body; more specifically, it stimulates growth of bone, cartilage and muscle and can have positive effects on your lean muscle-to-fat ratio. In short, it can help you build a leaner, stronger, more powerful body.

GH release through exercise is also augmented by a further chemical reaction because exercise suppresses other hormones that would block its production.

Research suggests that high-volume, moderate-to-high-intensity weight training, using short rest intervals and stressing a large muscle mass, produces the greatest acute rise in GH levels. By comparison, low-volume, high-intensity resistance training methods, using long rest intervals, produce nothing like the same response.

This offers plenty of food for thought for Master athletes. For it seems that, by boosting GH release, powerful, dynamic weight training workouts can enhance muscle growth (or at least maintenance) and recovery.

Higher GH levels can also improve general health and wellbeing. Some examples of useful hormone-boosting workouts are given in the box overleaf.

Training and testosterone

Testosterone is another powerful anabolic hormone, produced by the testes in men and the ovaries in women. Research shows that, like GH, testosterone production is also stimulated by exercise. This is important, since the primary role of testosterone is to augment the release of GH.

Masters speed training tip *Does muscle size matter? All things being equal, a larger, stronger muscle will exert more force and resist fatigue better than a weaker one. Weight training will reduce muscle mass decline and generate a positive hormonal response. However, to improve speed performance, strength gained in the weights' room must be specifically channelled into your speed activity (of which more later). This is because weight training exercises cannot be performed at the speeds required of most sporting situations, so limiting their transferability.*

Researchers from Finland* specifically considered the responses of testosterone and GH to weight training in Master athletes. The survey's participants – 42 middle-aged and elderly men and women – completed six months of heavy resistance training. The researchers found that training led to significant rises in testosterone levels in both male groups but not in the female groups. GH levels, however, increased in all groups except the oldest women.

In terms of overall training response, 1RM (the maximum amount they could lift once) values increased in the middle-aged men (average age 42) by 27%; in the elderly men (average 72) by 16%; in the middle-aged women (average 39) by 28% and in the elderly women (average 67) by 24%.

* *Hakkinen* et al, *J Gerontol A Biol Sci Med Sci. 2000 Feb;55(2):B95-105*

Women produce less testosterone than men but, as this research shows, the training response can be equally, if not more, impressive, resulting from a combination of progressive training overload and GH release.

Weight training workouts to boost hormone levels and lean muscle mass

To promote muscle maintenance and power:

- *Male Master athletes* should perform 4x8 fast repetitions @ 75% 1RM, with full recovery;
- *Female Master athletes* should perform 4x10 fast reps @ 70% 1RM, with slightly incomplete recovery.

Fast means powerful exercises which emphasise speed of movement during the lifting phase, but with control used throughout the exercise. Relevant exercises include squats, cleans, leg presses and bench presses.

Incomplete recovery means that recovery between sets and exercises should be slightly curtailed to increase workout intensity and so boost hormone production.

Intensity is the key

Master athletes should note that training intensity seems to be the key when it comes to stimulating hormone release through weight training. And this response is not limited to weight training. Most speed training methods will stimulate these same responses because of their high intensity.

Masters speed training tip *Correct nutrition is crucial for muscle mass maintenance at Masters level. Consequently, you must be sure to consume optimum amounts of protein and consider taking additional creatine supplements* (see Chapter 8).

Weight training and injury prevention

As explained in Chapter 2, weight training is key to successful preconditioning. This is because it can counter potential injuries by strengthening soft tissue and promoting better muscle balance. Key weights preconditioning exercises are described in Chapter 7.

To maintain longevity as a Master speed athlete, you need to make use of that wise head on your shoulders. If you have previously suffered from a bad back, you might be advised to avoid heavy squatting and power cleans in favour of less risky alternatives. The split squat or the leg press, for example, would make great alternatives to the squat, although it is less easy to find alternatives to the power clean and you may need to consider other resistance training options, such as medicine balls.

Standing medicine ball throw – an alternative to the power clean

Stand with your feet beyond shoulder-width apart and hold the medicine ball between your legs with your hands. Bend your knees to a three-quarter squat position and swing the ball backwards and forwards, moving your trunk in time with your swings, keeping your arms long. These preliminary swings will get you read to throw as far as you can. Now drive up with your thighs and throw the ball out in front of you, letting your body travel forwards with the throw, *ie* follow through. This exercise uses a leg and hip action very similar to that of the power clean. It also engages the arms and torso in a similar way, thus promoting all-over body strength and power.

Variation: Stand facing away from the direction of throw and release the medicine ball from overhead.

Channeling weight training strength into your speed activity

There is no point in weight training unless the strength you gain actually benefits your sports performance. In order for this to happen, some form of 'channeling' is needed, and this is best achieved by means of a targeted and focused training programme *(see Chapter 9)*. Specifically, weight training gains must be progressed, through increasingly sport specific exercises and drills (such as power combination training – see page 61) into actual sports performance. Table 6 overleaf shows you how to achieve this with selected weight training exercises.

Masters speed training tip *If you have a problem in a particular part of your body, whether caused by previous injury or by general wear and tear, try to use exercises that will not aggravate it. There is invariably an adequate alternative.*

Table 6: Channelling weight training strength into speed/sport specific power

Weights exercise	Progression resistance exercise
Split squat Support the barbell across the fleshy part of the top of your shoulders, using an evenly spaced over-hand grip and keeping your back in neutral alignment (*ie* not overly rounded or arched). Focus on maintaining the loading on your front leg. Bend your knees and hips, dropping your butt towards the ground to lower the weight. Extend the knees and hips of your front leg to push yourself back up to the start position	*Jumping split squat* From a split squat position, leap upwards, reverse leg position in the air, land and jump straight back up to perform another split jump. Co-ordinate your arms with legs. Keep your torso erect and look straight ahead. Light dumbbells held at arms' length can add further resistance
Partial single leg squat Stand on one leg and tuck the heel of the other foot up towards your butt, keeping your chest elevated. Bend your grounded leg to a three-quarter squat position, pause and push back up	*Hops on the spot* From one leg, hop 15-20cm forwards, backwards or to the side, always returning to your starting position. Land with your weight distributed towards the ball of your foot. Keep looking straight ahead and make the ground contacts 'light and quick'
Cable chop This exercise uses a high pulley machine and a triangular attachment to develop rotational power in the shoulders and trunk. Stand facing forwards, with feet slightly beyond shoulder-width apart. Hold the attachment with both hands over your right shoulder, then pull the cable across your body to just beyond your left hip. This exercise can also be performed from a kneeling position and should be repeated on both sides to develop symmetrical strength	*Medicine ball throw with rotation* Standing, kneeling or sitting, hold a medicine ball in two hands at arms' length. Rotate your body to the right, then turn dynamically and throw the ball against a wall or to a partner, releasing it with a 'lifting' action. A standing position will enable you to generate more power through the legs, hips and trunk

Note: the progression resistance exercise is not exclusive to the specific weight training exercise, although there is a close physiological match in terms of how muscles are recruited. You could use other suitable alternatives if you prefer.

Weight training programmes: key tips

- Always see the weights exercise as the starting point for speed/power development. They don't in themselves make you faster;
- For improved performance, choose exercises that have some relevance to your sport in terms of movement patterns;
- Use both specific and general exercises for preconditioning purposes;
- Avoid exercises that aggravate previous injuries;
- Always work to a training programme that allows the strength gained/maintained in the weights room to be channelled into specific speed/sport power and performance;
- Be aware of the overall contribution of weight training to your health and quality of life as you get older. It can, for example, counteract the effects of osteoporosis as well as improving general mobility;
- Consider combining weight training with plyometric training to boost your power potential. See power combination training, page 61.

Note that certain types of weight training workouts are great for stimulating a positive hormonal response. These should form a regular part of your speed training *(see page 48)*.

Chapter 5

Plyometric and agility training

Power is crucial to speed athletes of any age. As explained in the previous chapter, weight training only serves a peripheral function in terms of developing sport speed, although its preconditioning and muscle maintenance benefits cannot be overestimated.

To optimise speed performance, more specific training is needed, and from a conditioning perspective the most beneficial is plyometric training. Although experienced Masters are probably familiar with these hopping, jumping and rebound-type exercises, they may be less aware of the ways in which they can be adapted to minimise injury and enhance performance.

The principles of plyometric training

Plyometric training works on the principle that a concentric muscular contraction (shortening as it contracts) is much stronger if it immediately follows an eccentric contraction (lengthening as it contracts) of the same muscle. It's a bit like stretching out a coiled spring to its fullest extent and then letting it go: immense levels of energy are released in a split second as the spring recoils.

Unlike traditional weight training exercises, plyometric drills can be designed to closely mimic both the movement pattern and the speed of execution of actual sports performance. They also allow great force to be overcome.

This is why they are a crucial training tool for sportsmen and women of all ages.

Most standard weight training lifts, even when performed fast, take 0.5-0.7 seconds to complete; compare this with sprinting, where your foot may be in contact with the ground for as brief a period as 0.084 seconds, or even running at a moderate pace, when your foot strike time will be around 0.2 seconds. Even older Master sprinters are likely to attain stride rates of around 4 per second, and elite sprinters nearer five. With plyometrics you can match these ground contact times and quick-fire movements, while specifically targeting the fast twitch muscle fibres that are crucial for maintaining speed.

Plyometrics adapted for Masters

Even when performed by younger sportsmen and women, plyometric training places a great strain on the body, particularly the ankles, knees and back. Landing forces from jumping exercises, for example, can amount to many times an athlete's body weight, which increases the risk of injury. Plyometrics must therefore be approached with caution.

The panel opposite contains training tips to keep you as injury-free as possible, while table 7 on page 56 ranks plyometric exercises by intensity. Study this information carefully to make sure you choose the best exercises for your body as well as your speed sport.

Masters training tip *As advised in Chapter 2, it is important to conduct a 'risk assessment' of your body, taking previous injuries into consideration, before deciding whether or not to use particular exercises. This is especially true of plyometric exercises, which place great strain on your body.*

Plyometric training tips for Masters

- Always warm up specifically for these dynamic exercises *(see Chapter 3)*;
- Train on a non-slip surface: a running track or sprung sports hall floor is ideal, but dry, flat, grass is also okay;
- Wear well-cushioned trainers;
- Maintain a neutral (natural) curve of the spine where appropriate: looking straight ahead will help you achieve this;
- For leg exercises, land light on your feet, with your weight towards your forefeet, but not on tip-toes;
- Don't bend excessively at the knees to absorb the impact of each jump's landing, but try to react as quickly as possible to the ground;
- When using plyometrics for the upper body, perform the exercises with control and make sure you have learned and mastered correct technique before increasing the speed of these exercises. If you have weak shoulders or wrists, it is best to avoid them;
- If you are new to plyometrics, or returning to it after a long lay-off, always underestimate what you can do to begin with and start with less intense exercises. It will take a while for your body to become used to the impact forces involved;
- Don't perform intense plyometric (or power combination training) workouts within five days (minimum) of important competitions;
- Weight train to strengthen soft tissue and reduce the risk of injury;
- Carefully consider the value of a plyometric exercises for you and your sport. There is no point bounding over 30m if you are a tennis player, or have a bad back. In this scenario, lighter drills, such as straight leg jumps and/or the agility drills described on pages 64-66. may be more beneficial;
- Perform sensible plyometric workouts no more than twice a week.

Table 7: Plyometric drills * *ranked by intensity*

Type of exercise	Examples	Intensity
Standing-based jumps performed on the spot	Tuck-jumps Split-jumps Squat-jumps	Low
Jumps from standing – forwards	Standing long jump Standing hop	Low-to-medium
Multiple jumps from standing	Spring jogging	Low-to-medium
	5 consecutive bounds	Medium
	2 x 6 'bunny' jumps	Medium
	Double-footed jumps over 4 hurdles	Medium
	Speed bounds	Medium
Multiple jumps with run-up	3 x 2 hops and jump into sand pit with 10-stride approach	High
	2 x 10 bounds with 8 stride run-up	High
Depth Jumping *(Recommended drop height 40-80cm: the greater the height the greater the strength component; the smaller the height the greater the speed)*	2 x 6 jumps – down and up	High
	Run to hop off low box onto one-leg landing followed by 3 hops	Very high
	Bounding uphill	Very high
Eccentric depth jump	Step or hop off a box as for depth jump, but cushion the impact – *ie* don't spring immediately into another jump	Medium-to-high. Can be used for preconditioning
Arm plyometrics	Plyo press-up	High-to-very high
Torso plyometrics	Medicine ball seated throw	Medium

* *Descriptions of most of these exercises can be found on pages 57-60*

Intensity versus value

As a Master speed athlete, it is important not to confuse the intensity of a plyometric exercise with its value. A lower-intensity exercise, such as straight leg jumps performed on the spot, has no less value than a high-intensity exercise like a depth jump. Rather, you should use intensity as a guide to the amount of force that the exercise places on your body. All of these exercises develop the plyometric response and all, irrespective of intensity, will help to boost your speed.

When less is more

Plyometric training for Master speed athletes is subject to something of a law of diminishing returns. It is very unlikely that your spring will be as great as it was in your prime; and consequently you will need to work to levels that will optimise your speed while not taking you so far over the edge as to cause injury. It may do you more harm than good doing multiple repetitions in a workout when a set or two performed regularly over a number of workouts will keep you dynamic enough. The marginal return you are likely to get from doing more repetitions may not be worth the risk.

Masters speed training tip *Judge carefully whether it is worth using an exercise with a potential injury risk or whether you would do better to use a similar but less intense exercise instead.*

Technique guide to selected plyometric exercises

The plyometric exercises described below will be useful for most Master speed athletes. Please note that, although recommendations are given for repetitions, sets and recovery, these are for guidance only. Select only two or three exercises for any one training session, and only perform them when you are fresh.

Lower body plyometrics

Straight leg jumps

Intensity: low

- Stand with your feet shoulder-width apart;
- Slightly bend your knees and jump up into the air, land and 'bounce' back up, primarily using the muscles in your feet, ankles and calves. Swing your arms backwards and forwards to assist the movement.

Do: 3 x 10 jumps, with 30 secs recovery

Variation: stand to one side of a line and jump from side to side of it, primarily using the lower legs to provide momentum.

This exercise will improve power and agility in the lower limbs and ankles and is a great move for those involved in racket sports.

Spring jogging
Intensity: low-to-medium
This exercise will improve running foot strike. Start jogging, and after a few metres begin to generate more bounce on each stride, using your upper and lower legs to push yourself upwards and forwards. Maintain a running arm action.
Do: 4 x 30m, with walk back recovery

Depth jumps
Intensity: medium-to-high (for this particular variant)
Stand on top of a strong step or box (40-80cm high), maintaining a neutral back position and looking straight ahead. Step off of the box, land on your forefeet and immediately spring back up into the air. Swing your arms back as you step off the box, and forwards and upwards just before rebounding to aid momentum.

The higher the step or box, within the confines mentioned above, the greater the strength component of the exercise; the lower the height, the greater the speed component. Masters may derive greater benefits from dropping from the lower height. When familiarising yourself with this exercise, you should bend your knees to absorb some of the impact; subsequently it is best to react as quickly as possibly to the ground without undue yielding.
Do: 4 x 4 reps with 30secs recovery between jumps and 2 minutes between sets.

Masters speed training tip *Plyometric exercises offer a very specific way to improve your speed and power and are suitable for most Master speed athletes. Often they can be made even more specific, by adding in a specific sport movement, such as a real or 'ghosted' header after performing a depth jump – an exercise obviously particularly appropriate for footballers.*

Bounding
Intensity: high
Stand facing the direction you are going to bound in, then leap forwards onto one leg, land flat-footed and immediately leap forwards onto the other leg. Think about pushing the ground away behind you after footstrike. Try to stay in the air for as long as you can, maintain balance and don't look down. Coordinate your arms with your legs – *ie* opposite arm to leg.
Do: 4 x 8 bounds

Speed bounds
Intensity: medium-to-high
Speed bounds emphasise the push-back, driving phase of the bound and are performed with much greater horizontal velocity than normal bounding. You should aim to be as light on your feet as you can, spending less time in the air than when bounding. Speed bounds are particularly specific to sprinting and will help with the acceleration needed for this sport and also for racket and field sports.

Upper body plyometrics

Although it is less obvious, plyometric exercises can also be performed for the core (torso) and arms. These exercises will improve power and speed for all sports, but are particularly relevant for those involving throwing, hitting and punching.

Plyo-press-up
Intensity: high
- Assume a normal press-up position;
- Lower your body and then drive your arms upward to jump your body from the floor;
- Land and immediately push back into the next press-up;
- Your forefeet should remain in contact with the ground throughout the exercise.
- Don't do this exercise if you have weak wrists or shoulders.

Do: 3x6 repetitions, with 30secs recovery between sets

How 'springy' can a Master be?

The ability to spring – *ie* perform dynamic jumping movements – does decline with age, but with the right training a Master athlete can still achieve great performances. One of the most amazing examples from the world of Masters track and field is the current men's 45-50 triple jump world record. This now stands at an incredible 15.13m and is held by Germany's former international jumper, Wolfgang Knabe. To put this into context, you have to bear in mind that most 45-year-olds could not carry off one 5m long jump, let alone perform three in a row, as Knabe did with his record breaking leap.

Medicine ball sit-up and throw
Intensity: medium/high

- You'll need a training partner to perform this exercise;
- Holding a medicine ball, assume a sit-up position, with feet flat on the floor and knees bent to a 90º angle;
- Position the ball on your chest with your hands to the sides of it;
- Lower your back to the floor then, using your abdominal muscles, dynamically lift your trunk upwards;
- As your torso reaches your knees, throw the ball 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 forward to throw part of the exercise that develops the plyometric response.

Do: 3 x 10 repetitions, with 1min recovery between sets

Variation: assume the same starting position as described, but this time hold the ball over your head and throw and catch it from this position. Your partner should stand further away from you.

Do: 3 x 10 repetitions, with 30secs recovery between sets

Medicine ball chest pass against a wall
Intensity: medium

- Stand close to a wall, facing it;
- Hold the medicine ball as if making a basketball/netball

chest pass, then press the ball dynamically away from you to throw it against the wall;

- Catch the ball and immediately throw it back against the wall. The quick-fire action will develop the plyometric response in your chest and shoulder muscles.

Do: 3 x 15 repetitions with 1min recovery between sets.

Sample lower body plyometric workout for Master footballers, racket sports players, sprinters and middle distance runners

Note: if you are new to plyometric training restrict yourself to exercises 1-3, doing one set only. Do two sessions a week for six weeks, then move on to two sets of each exercise, introducing the speed bounds.

First warm up using the speed-specific warm-up described on page36.

Now do these exercises, with 2mins recovery between exercises and sets:

1. Straight leg jumps 2 x 10 with 40secs recovery between jump
2. Side-to-side straight leg jumps 2 x 10; 40secs' recovery between jumps
3. Depth jumps, from a height of 40 cm, land and spring straight up; 2 x 5; 30secs recovery between jumps
4. Speed bound, 3 x 20m; 90secs recovery between reps

Then warm down by jogging for five minutes and performing passive stretches *(see page 41)*.

Power combination training

Power combination training has been identified as one of the best ways to develop speed and power for athletes of all ages. Basically, it combines a plyometric exercise with a weights exercise in one set. The exercises selected must target the same muscle groups – *eg* the squat jump and the squat, which both focus on the quadriceps. Research has shown that the paired exercises trigger a heightened fast twitch muscle fibre response, manifested in an immediate capacity to express greater power. One piece of research showed, for example,

that pre-squatting enhanced vertical jumping ability by just over 4%. This effect is known as 'potentiation'. Examples of power combination workouts are described overleaf.

Masters speed training tip *Power combination training offers Masters an economical way to train, since two such sessions a week could be all you need to maintain muscle mass, power, speed and agility. Doing this kind of training could obviate the need for separate weights and plyometric workouts.*

Getting the most out of power combination training

- In most cases, the weights component should be in excess of 70% of your one repetition maximum (1RM). This level of loading is required to stimulate the necessary fast twitch muscle fibre response;
- As with plyometric exercises, rest is crucial to obtaining the optimum potentiation response. The gap between the paired exercises should be no less than 30 seconds and no more than two minutes. Two minutes' recovery should be allowed between each pair of exercises in the power combination set;
- Choose exercises that are relevant to your sport speed requirements;
- Perform no more than two workouts a week and allow at least 48 hours' recovery between each. Do not train hard on the intervening days;
- As with plyometric exercises, make sure that you are in the right frame of mind – *ie* mentally alert and ready.

Power combination workout: an example

The workout described here combines relatively high numbers of repetitions with light weights. It is suitable for someone new to this type of training and will also provide a foundation of speed and strength for subsequent, higher-quality workouts suitable for more seasoned masters. This would be a particularly suitable workout to include in phases 1 and 2 of a speed training pyramid (training plan) for a sprint athlete *(see Chapter 9)*.

To perform this workout:

- Alternate the weights exercise set with the plyometric set;

- Take 45 seconds' recovery between each exercise and 1 minute between each power combination pairing.

Sample power combination workout

Weights/body weight exercise – reps and sets	Plyometric exercise – reps and sets	Recovery/comment (where applicable)
Squat 3 x 12 @ 60% 1RM	Jump squat 3 x 12	
Calf raises 3 x 15 @ 60% 1RM	Calf jumps 1 x 10 straight up and down, 1 x 10 side to side, 1 x 10 straight up and down	
Single leg squats 4 x 10 (body weight, left and right)	Hops on the spot 4 x 10 (left and right)	Perform all your right leg squats and hops first before repeating on the left leg
Lunge 4 x 15 with light dumbbells	Split jumps 4 x 15	
Bench press 4 x 20 with light dumbbells	Standing medicine ball chest pass against wall 4 x 20	
Crunch	Medicine ball sit-up and throw (overhead throw)	

Agility and the Master

Agility has a significant effect on the performance of virtually every sport skill. However, being light on your feet and aware of your body in space becomes more difficult as time passes. Nevertheless, the right training can significantly offset this decline.

Agility is a crucial component of all sports performance. It can be defined as the ability to move your body swiftly, adeptly and as safely as possible in response to a given cue. A tennis player scrambling to return a drop shot or a discus thrower spinning to throw his or her implement are prime examples. Agility is vital to Masters in search of speed, whatever their

sport, although this may not be immediately apparent with some sports.

In Chapter 3, I described various speed specific warm-up exercises, such as backwards and sideways running. When regularly included in your training, such exercises will improve agility and foot/ground contact and speed as well as strengthening muscles, ligaments and tendons. Even more specialised agility drills can be performed through floor ladders or around cones. The stresses involved in these exercises are much lower than for some plyometric ones, making them great all-round training for Masters in search of speed. They're also great fun to do!

Masters speed training tip *Agility drills improve limb speed, reaction time, balance and power, while preconditioning against injury.*

Floor ladder drills

Floor ladders are available to buy, but you can make one by simply chalking or using tape to mark 40 lines (for the ladder rungs) onto a suitable surface. The gap between the rungs should be 35cm. You can then use the ladder to perform the following agility drills

1. Run through the ladder, one foot in each rung at a time, with a low-knee lift and 'dabbing' foot action;
2. Step sideways through the ladder, as above, first to the left and then to the right;
3. Perform light low hops through the ladder, one or two rungs at a time.

Do: 4-8 repetitions of each drill, with 30 secs' recovery between reps and 90 secs between sets. Limit runs through the ladder to about 24 in a workout. Ladder drills can also form part of a speed/sport specific warm up *(see Chapter 3)*.

You can use a huge range of exercise permutations with foot ladders. This form of training can be made very speed and sport specific by performing, where relevant, a sport skill during or after the drills. Examples include holding a rugby

ball, or tennis racket, or receiving a rugby pass while performing any of the drills described above.

Cone drills

Road cones or commercially available speed training cones offer another great way to develop and maintain agility, regardless of age or the requirements of your sport

1. Simply run in and out of cones placed at various distances 1-3 metres apart. This drill would be very relevant to field sports players, since it develops cornering and swerving ability;
2. **(compass drill)** Using five cones, place one in a central position and the others 3m away from the central one at the four points of the compass. From the central cone, sprint north, touch the cone, sprint back to touch the central cone and then sprint east. Repeat until you have covered all the points in the compass in order, finishing back in the centre.

Masters speed training tip *keep your body low and practice turning in both directions to fully develop your agility speed. Time your runs to monitor your improvement*

Standing agility drills

With increasing age, balancing can become difficult for sedentary people and falls become commonplace. Balance is also very important for Master speed athletes, as sport skills need to be performed without wasteful peripheral movements. To improve your balance and awareness of your body in space, practise the following exercises (which will also strengthen your joints):

One-foot balance

With this exercise, you have to work very hard to prevent movement, and this activates your smaller (stabilising) muscles, plus your ligament and tendons. These benefits will transfer into more powerful kinetic movements;

- Stand on one foot and look straight ahead, then bend

your knee slightly to lower your body;

- Once comfortable in this position, close your eyes and try to remain still for 20 seconds. You'll probably wobble quite violently until you find your equilibrium and become familiar with the exercise;
- Swap legs and repeat.

Do: 3 repetitions on each leg.

Tip-toe one-foot balance

This is a more advanced exercise, as the tip-toe starting position makes for even greater instability. You might have to do it with your eyes open at first to develop preliminary, balance, co-ordination and strength.

- Stand tall and rise up onto the toes of one foot;
- Close your eyes and try to remain steady for 20 seconds;
- Swap legs and repeat.

Do: 3 repetitions on each leg.

Chapter 6

How to achieve optimum sprinting technique

Sprinting is a skill that needs to be constantly honed for optimum results. At Masters level, technique can decline as a direct consequence of the aging process. It is therefore important to understand what happens and why, and what you can do to minimise any decline in performance.

The key elements of good sprinting technique are:

- Relaxed neck and facial muscles;
- High-knee pick-up, with thighs lifting to a position parallel to the ground in front of the body;
- Full drive of the leg behind the body to push the body forwards;
- Heel coming up close to the butt during the pull through (return) phase of the stride;
- Upright torso;
- Arms moving powerfully backwards and forwards in harmony with the legs, maintaining a 90° angle at the elbow joint throughout the arm swing;
- Each foot striking the ground just the right distance in front of the body: too far ahead will lead to braking;
- Pulling/clawing action back towards the body as the foot strikes the track (or other running surface);
- Foot striking the ground from a toe-up position: a toe-down position will inevitably lead to collapse of the ankle and a consequent loss of sprinting power;
- Ground contact made from the balls of the foot, although the heel will strike the ground during the support phase –

ie as your body passes over the grounded foot in a near upright position.

Masters speed training tip *Regardless of age, sprinters who 'try too hard' will end up wrestling against themselves as they progress down the track. Energy will be lost in this tightness and power will not be applied smoothly and effectively to the running surface. In short, they slow themselves down. This principle that trying too hard can impair performance applies to any sport skill. Smooth technical execution is therefore of paramount importance to the Master speed athlete.*

How sprint speed declines with age

Although you can do a lot to offset the age-related decline in sprint speed, some tail-off from your peak years is inevitable. How much deterioration can you expect? One of the major studies* to look at this question was carried out by researchers from Finland. They measured the performances of 70 finalists (males 40-88 years, females 35-87 years) at the European Veterans Athletics Championships in 2000, using high-speed cameras and distance markers at 10-metre intervals over the 100m sprint. These measurements included velocity, stride length, stride rate, ground contact time and flight time (FT) during the acceleration, maximum speed and deceleration phases of the race.

Not surprisingly, the researchers observed a general decline in sprint performance with age, which was particularly marked for the 65-70-year-olds. Through all the age groups and the different phases of the sprint, speed declined on average by 5-6% per decade in men and 5-7% per decade in women. Key

** Medical Science Sports Exercise. 2003 Aug;35(8):1419-28.*

Masters speed training tip *To promote sprint speed, reduce fatigue and create ideal conditions for mastering sprint technique, it is helpful to perform flat-out runs over 30m, with a 20-30m run-on and a full recovery between efforts. The easy acceleration phase (the run-on) will reduce the energy required to accelerate the body to maximum speed by comparison with a standing start. Once into the flat-out phase of the run, you can concentrate on technically correct sprinting form with relaxation and 'flow'.*

to this decline was a growing reduction in stride length, with an increase in ground contact time, and stride rate largely unaffected apart from in the oldest age groups.

This retention of stride rate is partly explained by the fact that neural factors, particularly nerve conductivity, decline less significantly with age than other physiological determinants of speed performance. Essentially this means that older speed athletes can still command their limbs to move at relatively high speeds, but with much reduced power output. It is this reduced power that progressively retards stride length and prolongs ground contact.

These findings have been confirmed by other research teams. For example, a team from the US, that compared 35-39-year-old runners with 90-year-olds, noted a 40% difference in stride length between the two age groups. Specifically, average stride length declined from 4.72m per stride (2.36m per step) to 2.84m per stride (just 1.42m per step*). What this means is that a 90-year-old sprinter needs to take nearly twice as many steps in the 100m as a 35-year old! The US researchers also confirmed the Finnish finding that stride frequency does not decline significantly with age.

**Stride length is often measured (as in the research given) over the left and right leg cycle,* ie *two steps*

Longer ground contact times could raise injury risk

Research on Master runners has shown that older legs and backs, in particular, are at increased risk of injury because of increased ground contact forces. Although this is likely to be less of a problem for Master speed athletes – whose running-based training tends to be performed at greater speeds, with shorter contact times, it is still important to bear in mind that:

- Training shoes (as opposed to spikes) should offer good support and cushioning;
- The running surface should absorb impact forces. Dry flat grass or an athletic track is ideal. Astro-turf is not recommended as it can increase the risk of strain injury;
- Master speed athletes should keep running on roads to a minimum. (Distance runners should watch their mileages and avoid too many runs over 16 miles, due to an increased risk of eccentric muscle damage).

Hill training to minimise sprint speed decline

The following hill training methods can be used to help overcome the physiological and technical problems that contribute to age-related speed decline. Suggested workouts are described in the box opposite.

Training to improve foot strike, stride length and technique

Hill training can help to counteract reduced stride length and increased contact time – two crucial factors that contribute to speed decline in older sprinters. To understand why, you need to consider the action of the foot and ankle on foot strike, and their contribution to horizontal velocity. Running up a gradient exaggerates the toe-up foot position on foot strike, and this makes the calf muscles work harder to drive the body forwards. The payback is enhanced stride length and reduced contact time when sprinting on the level.

Training to improve the free leg action and return phase

Key to the age-related speed deterioration in Master sprinters is the action of the free leg as it leaves the running surface and travels under the body in preparation for the subsequent foot strike. This 'return phase' is much less dynamic in older sprinters than their youthful counterparts.

For optimum speed transference from stride to stride, the lower leg should fold up towards the butt and be pulled through quickly and powerfully, as a short lever. This relies on hip, butt and hamstring strength. It also depends on range of motion at the knee which, unfortunately, has been shown to decline by as much as 33% – from 123° to just 95° – between the ages of 35 and 90. This means that in the oldest runners, the lower part of the leg attains a near right angle with the thigh at the point of maximum flexion on each stride – a position that dramatically slows the free leg's pull through, putting a consequent brake on sprint speed.

Hill sprints can be invaluable for overcoming this lower leg lethargy. By generating a greater leg drive, they increase the speed of the free leg's reaction to the ground, so conditioning

a more effective and dynamic sprinting action. (Note: the leg cycling drill described on page 40. can also improve the free leg pull action of the Master speed athlete).

Masters speed training tip *The gradient for uphill sprint work should be relatively slight – less than 10%. If the gradient is too steep, sprint technique will be compromised and a negative response conditioned*

Suggested hill training workouts

1. 2x3x30m sprints from a standing start to develop acceleration and leg drive. Full recovery between efforts and sets;
2. 2x80m runs at 70% effort, concentrating on good technique, particularly the action of the free leg. Think about pulling it up high behind your body and then through dynamically.

Weight training for powerful muscles

Weight training is vital for Master speed athletes determined to hang onto as much zip as possible, particularly after age 50, when the more significant decline in muscle mass begins. Training with weights around 75% of 1RM will significantly offset fast twitch fibre deterioration but not, unfortunately, the decline in numbers of fast twitch fibres. This is because the motor cells in the spinal cord that fire these fibres decline with age, leaving the fibres with no option but to wither away. See Chapter 1 for more on fast twitch muscle fibre and Chapter 4 for detailed advice on weight training for speed.

Plyometric training to maintain stride length

As explained in Chapter 5, plyometric exercises improve the elasticity and power of muscles. Additionally, these types of exercises are great for maintaining and enhancing stride length, although you need to be careful not to increase your risk of injury by doing too much. Suitable plyometric exercises for Master speed athletes are described in Chapter 5.

High-intensity training to trigger growth hormone release

As explained in Chapters 1 and 4, with specific reference to weight training, exercise stimulates the production of growth hormone, which is crucial for speed maintenance in later life. GH helps us hold onto more lean muscle mass, retain more energy and counteract some of the general effects of aging. The release of GH starts almost as soon as you start exercising – and the higher the intensity of the exercise, the more hormone is released.

Speed training to boost energy stores

Intense speed and power training can also combat the normal age-related decline in the muscles' stores of creatine phosphate – the body's prime fuel for short bursts of activity like sprinting. Research shows that anaerobic (and aerobic) training increases the production of creatine phosphate significantly, allowing for more and better quality repetitions.

One survey found that six weeks of cycle ergometer training boosted the creatine phosphate stores of 61-80 year olds to levels similar to those of younger adults.

J of App Phys 92:60-608 2002.

The benefits of taking creatine supplements

There's nothing wrong with giving mother nature a legal helping hand by boosting your muscles' fuel supply, which is the point of taking creatine supplements. Many studies have shown that this naturally-occurring supplement helps to maintain muscle mass. For more on creatine, see Chapter 9.

Generate more power with your mind

Fast twitch muscle fibre *(see Chapter 1)* is recruited (turned on) synchronously within its motor unit. Basically what this means is that the smaller motor units (amounts of fast twitch muscle) are recruited first and then the larger ones as they are needed to generate greater speed, strength or power. Recruiting the largest, most powerful fast twitch motor units requires a significant mental input and is also heavily dependent on sport skill learning.

Let's use sprinting to explain this. Carl Lewis had a wonderful, silky sprint action. His finely-honed technique allowed his fast twitch motor units to fire synchronously and apply power. The end result was championship and world-record-breaking form. In short, Lewis' neural mastery of sprinting allowed his fast twitch motor units to fire off smoothly, operating like cogs in a well-oiled machine. It also allowed him to recruit the largest motor units producing the most power.

Master athletes wanting to retain speed, whatever their sport, should focus on optimising their sports technique and applying their minds effectively. To sprint flat-out, lift near-maximum weights or hit a winning tennis serve, you need to be mentally alert – 'psyched' to do the job. If you are not in the right frame of mind (or the 'zone of optimal functioning', as sport psychologists know it), your performance will suffer and you may also increase your risk of injury by being sloppy and half-hearted. For more on harnessing the power of your mind, see the next chapter.

Masters speed training tip *Your body may not be able to do as much training as you would like, but there is nothing to stop you putting in more mental workouts – eg through visualisation. Research shows that a combined mental and physical training programme can optimise sport performance.*

Chapter 7

Boost your speed with mental training

Some Masters in search of speed think that they know it all. When it comes to sport psychology, they tend to adopt something of a Victor Meldrew attitude. I can just hear their comments:

- 'Never had sport psychology back in my day';
- 'It's all clap-trap';
- 'I don't need to think about performing. I just get on with it.'

But the reality is that Masters' greyer grey matter may actually be in need of a bit of a shake up, because years of doing the same training could have locked them into negative thinking and led to the replication of bad habits. It is also worth pointing out that mental training can make up for age-related reductions in physical training. This chapter offers you some useful strategies for using mental training to improve your speed.

Masters speed training tip *The great news is that you do not have to be a mastermind to put mental training strategies into practice. Repetition is all that it is needed to reap the rewards.*

Getting started

Your first task is to identify problems that have been hampering your performance and the areas you need to improve on. Performance profiling (PP) is a sport psychology tool that can do this for you. In fact, PP can be applied to all aspects of your training, not just the mental ones. It places you,

as athlete, centre stage in your own evaluation. You are not told what to do by a sport psychologist or coach – although these people can play useful a role in the PP process by helping you work through it and giving you the necessary prompts. Here's what to do.

First ask yourself what are the key mental attributes of a successful performer in your particular sport. You should spend 5-10 minutes reflecting on this question and writing down your answers. You may, for example, decide that the following attributes are crucial:

- Appropriate channelling of aggression;
- Ability to avoid distraction;
- Confidence;
- Relaxation;
- Dealing with pressure;
- Enjoyment.

When you have decided on your qualities give each one a mark out of 10 to reflect its importance to you. This is what we call the 'ideal profile' (IP).

Next, rate yourself on a scale of 1-10 for each of these qualities. This is known as your 'subject self-assessment' (SSA). This is set against an 'ideal self-assessment state' (ISA), in which you score 10 for each of these qualities.

A few calculations are now needed to identify the areas that you need to work on most. To determine your Discrepancy (D) score – the amount of ground you need to make up – you first subtract your SSA from your ISA then multiply this figure by your IP.

For example, if your IP for confidence was 9 and your ISA was 10, but your SSA was 2, your discrepancy score would be 10-2x9=72. Table 9 opposite gives an example of how this process might work for an elite sprinter.

You can see from the table that the sprinter's PP identifies high discrepancies for 'enjoyment' (70) and 'appropriate channelling of aggression' (60). These are therefore the attributes he or she would need to prioritise for improvement.

Table 9: Hypothetical elite sprinter's performance profile

Quality	Ideal Profile (IP)	Ideal Self-Assessment (ISA)	Your Self-Assessment SSA	ISA – SSA	Discrepancy score (D) (ISA-SSA) x IP
Appropriate channelling of aggression	10	10	4	6	60
Ability to avoid distraction	10	10	8	2	20
Confidence	9	10	8	2	18
Relaxation	10	10	8	2	20
Dealing with pressure	10	10	9	1	10
Enjoyment	10	10	3	7	70

Mind matters – sport psychology strategies to improve your performance

There are numerous other sport psychology strategies and techniques, outlined below, that you can use to improve your PP and thus your speed activity performance. Remember that to be successful you will need to work on them as much as you do on your physical training, since repetition is the key to success.

Success cycle and goal setting

What This strategy helps to improve your competitive performance by working on your feelings about yourself. If you are aiming to place in your sport's Masters national championships, you should start working on this strategy well before you sign your name up on the start list.

How First decide on your main objectives (using the PP method), then write down the workout goal/goals that will enable you to improve them. Here's an example for 'appropriate channelling of aggression';

'I will be confident and run my own race when I train with younger members of my group.'

You should then write down a key word/words that reflects this goal, perhaps on the back of your hand, to refer to when you are training. The obvious one to use is 'confidence', but you could also record something more sport specific, such as 'run at 75%' (to stop you running too hard and possibly risking injury). You should then look at this word or phrase from time to time during your workout or competition, to re-focus and remind you of your goal. Afterwards, rate on a scale of 1-10 how well you feel you met your goal and record your score. (See 'attribution' page 80, for a critical way to analyse your goals and below for a detailed consideration of goal-setting).

Note: as with PP, you do not just have to select mental goals to work on your success cycle. From a psychological perspective, the important factors are that you have:

1. consciously applied yourself to a given goal/goals and recorded your success (or failure);
2. begun to work on your success cycle – and your self-image – in a step-by-step fashion.

Speed goal-setting

Establishing one or more speed goals is crucial to the success of your training.

Good examples of speed training goals for Masters include:

- *For a sprinter* reducing your 100m time by 0.2 seconds in time for your main competition;
- *For a football goalkeeper* improving your shot reaction and jumping power before the season starts and maintaining it throughout the season;
- *For a racket sports player* improving your turning ability before the grass court season and maintaining and adapting it for the subsequent hard court season;
- *For a high jumper* improving your take-off ready for the outdoor season.

A very simple way of establishing a sport or fitness goal is to use the SMARTER set of principles.

Your goal should be:
Specific
Measurable
Agreed
Realistic
Targeted
Empowering
Revisable

Now let's look at these characteristics one by one.

- **Specific** It's no use just saying, 'I want to run faster', as this is the kind of vague aspiration that can either limit improvement or overestimate potential.
- **Measurable** You must be able to measure your goal. The 100m sprint goal mentioned earlier has an obvious built-in measure, but so too can the others. You need to be able to measure your progress towards this goal at regular intervals by means of specifically constructed workouts and tests (and secondary goals).
- **Achievable** It is self-defeating to establish an unattainable speed goal. Look at your training maturity and your training options and then fix a goal you believe you can achieve.
- **Realistic** In pursuing your speed goals, you must be responsible, not just to yourself but to others who might be affected by your training. It should compliment your everyday life not complicate it.
- **Targeted** This may seem obvious, but in fact many coaches and athletes don't actually line their training efforts up. The best way to do this is by:
  1. constructing a relevant and progressive training plan with a designated time frame;
  2. continuously asking yourself whether this training will really serve your speed training goals;
  3. using the success cycle and other sport psychology strategies outlined in this chapter.
- **Empowering** Going for and achieving your speed goal(s) should make you feel great.

- **Revisable** This is perhaps the most important SMARTER principle when applied to speed training. The goal or goals you establish should not be set in stone but should be capable of adaptation and revision in response to circumstances. If you get ill or injured, for example, you may need to extend the time frame of your goal; conversely, if you progress faster than expected, you will either need to revise your goal upwards or hold yourself back so that you don't peak to early. (For more on peaking see Chapter 9.

Masters speed training tip *Establish short-term and long-term goals to shape your speed training plans. These should meet all the various aspects of your training and competitive requirements.*

Attribution

What This strategy is about taking responsibility for your performances and not laying an undue amount of blame on external factors for your poor performances – or credit for your good ones. It is a technique that helps you to assess your performances objectively and puts you in control when it comes to developing your motivation and confidence. It should be used to analyse your success cycle goals and your competitive performances.

How Attribution involves reflecting objectively on why you were successful – or not – at a competition or in relation to a specific training goal. You should not use this technique with competitions until the immediate emotions (jubilation, disappointment, whatever) have passed. It is also best to attribute in the company of someone you trust: who knows you well but can also be as objective as possible. The role of this person is to confirm or challenge your attributions. Once these are agreed, you can then take steps to further improve your performance outcomes.

Let's assume, for example, that you have performed below expectation because of weather conditions. It is easy to say that the wind and rain affected your performance, but it is also true that the conditions were the same for everyone. A realistic

attribution and consequent goal might be: 'I did not prepare well enough for these conditions and will make sure that I do this in future. The conditions were the same for everyone.'

To reiterate, the purpose of this strategy is to put you in control – to make you feel that you can significantly determine your performance outcomes. Obviously, you will then need to put your goal into practice to build it into your success cycle. So, in relation to the example above, you would need to train yourself both physically and mentally to perform well in different weather conditions.

Visualisation

What This technique can help to improve all aspects of performance. It involves 'seeing' in your mind's eye a winning and/or technically correct performance. When you do this, your brain sends electrical messages to your muscles in much the same way as they would if you were actually performing the skill you are visualising.

How To get the most from visualisation you need to adopt a systematic approach. Set aside a specific time to do it in a place that is quiet and free from distractions. Simply run over in your mind, time after time, the skill or performance you wish to achieve. Make sure you visualise this performance in a variety of conditions to prepare you for all possibilities. If you are a sprinter, for example, you could run the race from all lanes, not just the one you know you have been drawn in. It is important to do this exercise in 'real-time' or faster, since visualising a speed skill at a slower pace can condition a slower response.

Getting in 'the zone'

What The 'zone of optimal functioning' (ZOF), as it is technically known to sport psychologists, is a mental space in which you are neither too relaxed nor too psyched up to compete, which should optimise your performance.

How The techniques of 'centring' and 'energising', both described below, can help you to get into 'the zone'.

Centring

What This is a way of relaxing and calming your nerves before competition. It uses a breathing technique developed by Tibetan monks more than 2,000 years ago. Sport psychologists believe that if you practise the skill, preferably in front of a mirror, for a minute a day for two weeks, you will have mastered it for life and will need to practise it only once a week thereafter to maintain the benefits.

How To reduce anxiety before competition:

1. Stand with your feet shoulder-width apart;
2. Relax your upper body, paying particular attention to your neck and shoulders;
3. Focus on the movement of your abdominal muscles;
4. Breathe in slowly and deeply and watch your abdomen distend;
5. Focus and relax. Let your body feel heavier as you continue centring.

Keeping in speed shape is good for your brain

Exercise can improve brain function and preserve your brain cells from decay: in other words, speeding your body up will slow down mental decline.

All brains decrease in size with age, but a good base of fitness can protect and enhance cognitive function. Maintaining fitness also benefits those the regions of the brain that are subject to degenerative illnesses, such as Alzheimer's.

In summary, your speed training will be achieving a great deal more than simply keeping your body in shape.

Energising

What This is a technique for increasing competitive aggression. It is possible to be too relaxed to be in the zone before you compete and you may need to 'psyche' yourself up. Remember that considerable neural stimulation is needed to recruit the fast twitch muscle fibres needed for optimum speed performance.

How Focus on something that will boost your adrenalin, such as the need to fight for a worthy cause or your dislike for a

particular person (even a fellow competitor – you don't have to hate them afterwards!). You can also talk yourself into a more 'fired-up' state by using positive statements, such as: 'I am stronger and faster than the other sprinters'. This is known as 'self-talk'.

Mental training can maintain strength and boost recovery from injury

It is becoming increasingly clear from research that neural/ mental factors have a role to play in developing/maintaining strength and speeding up recovery after injury. Studies have shown, for example, that:

- Focusing mentally on an injured limb can increase the speed of recovery. This focus may, for example, include visualising the injured part being flushed out with fresh blood and the damaged tissue being repaired;
- Focusing on developing strength and power in a muscle or muscle group can actually assist strength/power development;
- Training an uninjured limb when the another is injured can help to maintain strength in the injured limb, even though it is doing no training; this is a neural response.

Chapter 8

The best diet for speed

Careful planning, monitoring and modification of training are crucial to the development and maintenance of speed for Masters, and we have seen in previous chapters how the normal physical age-related decline can be minimised by appropriate training. Unfortunately, though, soft tissue damage, which is increasingly likely with age, is less easy to deal with, while recovery from injury or training can take longer. This chapter looks at how appropriate diet and supplementation can reduce the risk of soft tissue damage and boost your powers of recovery as well as benefiting your speed training and general health.

Masters speed training tip *Master speed athlete should seriously consider taking chondroitin and glucosamine sulphate supplements. Note, though, that it takes time for them to start working in the body (up to six weeks for pain relief) and that you need to take them constantly to improve joint health.*

Master speed athletes should aim to consume a whole, natural and unprocessed diet, including vegetables, fruit, complex carbohydrates (such as starchy vegetables, whole grains, beans, peas and lentils) and high-quality, low-fat proteins, keeping processed fatty and sugary foods to a minimum. Now let's look at these dietary constituents in more detail.

A diet to preserve soft tissue

The following nutrients have been shown to have beneficial effects on soft tissue:

Vitamin C This vitamin plays a vital role because it stimulates other body chemicals to construct collagen, a protein that forms the basis of connective tissue. It is also an antioxidant – of which more later. Vitamin C is found in citrus fruits, green peppers, leafy dark green vegetables and strawberries.

Omega 3 oils Omega-3 essential fatty acids (to give them their full name) are a source of fats. In terms of general health, they help to prevent inappropriate blood clotting and boost the immune system. They are particularly important nutrients for Master athletes because of the role they play in reducing inflammation. Omega-3 oils are found in seeds, such as flax and pumpkin, in nuts, such as walnuts, in soya beans and oily fish (such as, sardines, mackerel, salmon, trout and herring).

Bioflavonoids also have anti-inflammatory properties. They are part of a group of nutrients called phytochemicals, found in brightly coloured fruits and vegetables, and also in red wine. Bioflavonoids are also antioxidants (see page 89).

Glucosamine sulphate and chondroitin There is a growing body of research to show that glucosamine sulphate and chondroitin, taken as supplements, can improve joint health and relieve – and even arrest the progress of – osteoarthritis. One study found that people with osteoarthritis of the knee who took glucosamine sulphate supplements for three years suffered no further deterioration of their condition, while a control group who took a placebo continued to get worse. The glucosamine group also experienced significant reductions in pain, and improvements in joint function, by comparison with the control group *.

Glucosamine is used to make very large molecules found in joint cartilage. These molecules hold onto water rather like a sponge, and so provide cushioning for joints.

Chondroitin seems to head straight to the joints and lumbar discs when it is ingested. Research suggests that it also reduces pain and increases mobility and is particularly beneficial for people with arthritic conditions.

To build up working chondroitin and glucosamine levels in your body, try a combined supplement at a dosage of 1,500mg per day.

** Lancet 2001 357:251-256*

Masters speed training tip *Optimal nutrition and supplementation is as vital as training and preconditioning if you are hoping to enjoy a long career as a Master athlete.*

Basic nutrition – the macro-nutrients

Carbohydrate

Carbohydrate is the prime fuel for physically active people and should account for 55-60% of daily food consumption. Carbohydrate is stored as glycogen in our muscles and liver, but our bodies can only store it in limited amounts. These stores need to be constantly replenished to keep our bodies in optimum speed training condition, and this is achieved through carbohydrate consumption.

Masters speed training tip *To enhance recovery and re-stock your glycogen stores, you should consume 1g per kg of body weight of carbohydrate within two hours of finishing your workout. For optimum refuelling, you should consume a further 50g of carbohydrate every two hours until your next meal. Adding protein (perhaps in the form of a suitable sports drink) may be even better for your post-workout recovery, as it will kick-start and fuel muscle protein resynthesis.*

Fat

Fat should account for no more than 30% of your daily calorie intake. But it is important to be aware of the different types of fat.

- *Saturated fats* should make up less than 3% of your total fat consumption. These fats are found mainly, but not exclusively, in dairy and animal products and are the most 'harmful' as, taken in excess, they can raise your levels of 'bad' LDL cholesterol, and with it the risk of heart disease;
- *Monounsaturated fats*, found in olive oil, nuts and seeds, can reduce levels of this harmful type of cholesterol. They should make up no more than 12% of your daily food consumption;
- *Polyunsaturated fats*, found in most vegetable oils, oily fish, nuts and seeds, can also reduce levels of LDL

cholesterol. They should make up about 10% of your daily food consumption;
- *Essential fatty acids* (EFAs), including Omega-3 fatty acids are a sub-category of polyunsaturated fats. These are covered in more detail on page 86.

Protein

Protein should account for 10-15% of your daily food consumption. It is the body's most important building block, needed to repair and develop muscle tissue that has broken down through training. When digested, protein is broken down into amino acids, some of which are called 'essential' because they cannot be synthesised in the body. Non-essential amino acids can be made in the body as long as you have a good enough supply of essential amino acids.

Masters speed training tip *Master speed athletes should consume 1.6-2.0g of protein per kg of body weight per day. Although some authorities recommend higher amounts, current evidence suggests that these do not offer any additional muscle-building effects and are simple excreted.*

Micro-nutrients: vitamins, minerals and antioxidants

Minerals

Twenty two mainly metallic minerals make up 4% four percent of our body mass. Their main function is to balance and regulate our internal chemistry, so, for example, helping to maintain muscular contractions and regulate heart beat and nerve conduction. As with vitamins (below), consuming minerals in higher-than-recommended amounts does not enhance their effects.

Vitamins

Vitamins are crucial to facilitating energy release from food, but do not produce energy themselves.

Antioxidants

Antioxidants include selected vitamins and minerals – specifically vitamins A, C and E, beta-carotene and selenium. A diet rich in antioxidants helps to control levels of (bad) LDL cholesterol and defend your body against degenerative diseases like cancer and heart disease.

Antioxidants are especially important for athletes engaged in tough aerobic or anaerobic training, since a high rate of oxygen metabolism creates unstable molecular fragments known as 'free radicals', which can damage cells if left unchecked. Antioxidant vitamins, minerals and phytochemicals (which include bioflavonoids) all help to combat this cellular damage.

See Tables 10 and 11 for recommended intake of phytochemicals and other fitness- enhancing vitamins and minerals.

Masters speed training tip *To ensure a plentiful supply of antioxidants and phytochemicals in your diet, you need to eat a variety of plant foods, rice, bread, pasta and as many as 7-8 servings of fruit and vegetables a day, rather than the 5 servings recommended for the general population.*

Table 10: Health benefits of selected phytochemicals

Phytochemical	Source	Benefit
Allium compounds	Onions, garlic, chives, shallots	Can combat cancer and boost the immune system
Bioflavonoids	Rosehips, citrus fruits, berries, grapes, tea, red wine	These act as antioxidants. They also have some antibiotic properties and can help bleeding gums, bruises, and soft tissue injuries
Ellagic acid	Strawberries, grapes and raspberries	Can help to protect against some cancers
Phytoestrogens	Soya, tofu, citrus fruits, pulses, wheat and celery	Can help to protect against breast and prostrate cancer and alleviate some hormonally-induced menopausal symptoms, such as hot flushes and low energy

Masters speed training tip *A well formulated multivitamin and mineral supplement should contain 100-1,000 of the recommended daily allowance (RDA) for vitamins (but within the safe limit) and no more than 100% of the RDA for minerals.*

Table 11: Fitness benefits of selected micronutrients

Micro-nutrient	Function	Reference Nutrient Intake (RNI)*	Selected sources
Biotin (vitamin)	Assists glycogen manufacture and protein metabolism for muscle building	No UK RNI – 10-200ug/day is recommended	Egg yolk, nuts, oats and whole grain
Calcium (mineral)	Helps muscle contraction	Men 1000mg/day women 700 mg/day	Dairy products, seafood, vegetables, flour bread, pulses
Iron (mineral)	Can assist CV exercise through improved red blood cell oxygen transport capacity	Men 8.7mg/day women 14.8 mg/day	Liver, red meat, pasta and cereals, green leafy vegetables
Magnesium (mineral)	Boosts energy production and aids muscle contraction. May help to stabilise blood sugar, so maintaining energy levels	Men 300 mg/day; women 270 mg/day (Current research suggests these figures may need revising upwards)	Green leafy vegetables, fruit, unrefined whole grains and cereals
Zinc (mineral)	Zinc is an antioxidant. It also activates numerous enzymes that process amino acids, so helping to boost protein synthesis, muscle building and repair	Men 9.5 mg/day women 7mg/day	Oysters, lean beef, pumpkin seeds, peanuts, turkey, wholemeal bread and flour
Copper (mineral)	Copper assists with collagen formation and serves an anti-oxidant role	1.2mg/day	Beef liver, oysters, lamb, peanuts, baked beans, chick peas, wholemeal bread and whole grain cereals

** Reference Nutrient Intake (RNI) refers to the nutrient needs of some 97% of the population*

Masters speed training tip *Your body's thirst mechanism becomes less sensitive with age. This means that you may need fluids without feeling thirsty. Being dehydrated can significantly impair sports performance. To make sure you are adequately hydrated, drink enough to make you urinate every 3-4 hours. Your urine should be a light colour (not dark and concentrated) and odourless.*

Creatine: why it counts for speed

Creatine, like glucosamine sulphate and chondroitin, is a supplement that Master athletes in search of speed should seriously consider taking. Creatine is available naturally from herring, beef, tuna, pork, salmon, milk and prawns, and can also be made naturally in the body from three amino acids. It is stored mainly as phosphocreatine (PC) in muscles. This is used to produce the high-powered, short-duration energy needed for speed sports. Taking creatine in the form of supplements increases PC stores in muscles by 10-40% (on average by 20%). For Master speed athletes, this offers very important benefits:

- It can boost anaerobic energy, facilitating the performance of repeated short term power and speed efforts;
- It promotes the development of lean muscle mass (by enabling you to train more and for longer). The leaner you are, the more fat your body is able to burn;
- It enhances recovery.

Getting the best results from creatine

To reap the most benefits from taking creatine, you are recommended to start with a high 'loading' dose of 4x5g for five days. After this, you move onto a maintenance routine: normally 2g a day for four weeks. Once your muscles have received their fill of creatine, further loading offers no additional benefit.

Most creatine users 'cycle' their use of the supplement – *eg* by coming on and off of it every 4-5 weeks. When you stop

taking the supplements, your body will still continue to produce its own creatine. High-intensity power training will also boost your body's ability to use and produce creatine, although natural creatine production will be less effective than supplementation.

So far, no major side effects of creatine supplementation have been complained of, although a number of athletes do report more muscle cramps when they are taking it. The best way to combat this problem is to remain adequately hydrated.

Masters speed training tip *Make sure that your creatine supplements come from a manufacturer who is able to provide a 'certificate of analysis'. This certificate should show, among other things, that:*

- *Moisture content is less than or equal to 12.5%*
- *Yeasts and moulds are less than 50CFU's per gram*
- *Poisons/heavy metals are less than 10ppm for lead and mercury*

Chapter 9

Your speed training plan

Many Master speed athletes have years of training behind them and have learned a great deal about preparing their bodies for competition. This local knowledge should never be underestimated, whatever the latest training theories. You will know what has worked for you in the past and where you need to tread lightly in the present – because of previous injuries, for example. Those of you who are new to Masters speed activities will not have the benefit of such hindsight and experience, and this introduction to training planning is aimed largely at you, although some of the advice applies to all Masters looking to optimise their speed capability.

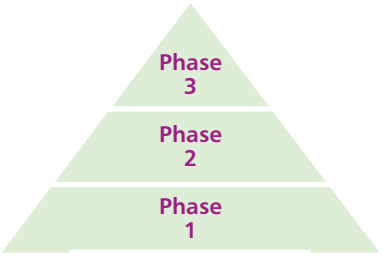
The training pyramid

One of the easiest ways to learn how to train for a speed goal is to view your preparation as a pyramid. The base of this pyramid provides the foundations on which more specific training can be built, while the apex represents the point in the training year/period when optimum speed/ performance is needed. For a sport with a definite peak, such as track and field, each phase should last a minimum of six weeks and a maximum of 16. Each phase has a distinct training emphasis – as you will see from the sample sprint training pyramid on page 95. Sport scientists call this process 'periodisation'.

I have given an example of a basic speed training pyramid for a sport with a single peak, such as sprinting. Study it carefully to develop your understanding of how to put training phases (the pyramid levels) together to optimise speed performance. Each phase should be designed to lift speed and fitness from level to level, safely and effectively. I have provided an overview of the type of training that should be performed during each phase, with suggested durations for each. Be aware that the workouts in each phase will themselves evolve as the phases progress: in other words, runs will get faster as the apex approaches, weight training exercises will become more specific and recoveries will increase to allow for greater speed expression.

Masters speed training tip *When you devise your own training plans you must take account of previous injuries and your level of fitness.*

The speed pyramid described opposite has three distinct training phases (1-3) and one rest and recovery phase (4). However, you could design a pyramid with more training phases if appropriate. All the information applies to speed athletes in general, whatever their age and sport; however, there are some important differences for Masters, of which more later. Note that most of the training methods included in the training pyramid are described elsewhere in this book.



At the top of the pyramid is your speed goal – in this case to improve 100m time by 0.2 seconds.

Phase 3: suggested duration 6-8 weeks

Key outcome This phase emphasises quality as you reach your speed goal. You'll be able to complete workouts at much faster paces than when you first started speed training. Power will max out and you will maintain strength and speed endurance, rather than specifically aiming to improve them. Competitions will be introduced, carefully selected to bring you to a peak. Too many can leave you tired, while too few can leave you 'ring rusty'.

Suggested workout options

- *Rolling 40m sprints* with full recovery (accelerate for 20m before 'hitting' the sprint);
- 1 x *power combination training workout* a week: 4 exercises, 6 repetitions x 2 (weight exercises at 75% of 1RM);
- *Sprint starts* 6 x 20m, with full recovery;
- *3 x 120m runs* @ 85% effort with emphasis on relaxed technique;
- *Sprint drills* session, using agility and fast feet drills
- *Preconditioning exercises* maintained as part of other workouts;
- 1 focussed *stretching session* per week.

Phase 2: 6-12 weeks

Key outcome You become more specifically fitter than in phase 1 and can handle more advanced training options and workouts. Duration and quantity of work are greatest at the beginning of this phase but normally decline as phase 3 approaches; conversely, quality increases as the phase progresses, with workouts performed at faster paces, interspersed by extended recoveries.

Suggested workout options

- *Weights:* increase the amount lifted, while reducing the number of repetitions. You should also introduce more sport specific and advanced training systems, such as power combination training. The weights component of these workouts should be heavier than in phase 1, but with fewer reps – *eg* 6 combinations of exercises with weights at 80% 1RM; 4-6 repetitions, plus 4 x 6 associated plyometric exercises;
- *Circuit resistance training:* number of circuits/repetitions reduced as the training phase progresses to allow greater quality, with more speed specific exercises included;
- *90/100/120/130/140/150m runs* @ 80% effort, with 3-4mins recovery between runs;
- *90m* split into 30 accelerate, 30 relax, 30 fast x 6; 4mins recovery between runs;
- *90% sprint acceleration runs* emphasising technique over 30m, increasing to 100% as the phase progresses, plus other acceleration training such as speed bounding;
- *Uphill sprints*, *eg* 2x4x40m from a standing start with walk back recovery; 5 minutes between sets;
- *Plyometric workouts* emphasising speed of movement and forward momentum;
- *Sprint drills* performed as part of session or as a complete workout in their own right; for progression introduce more speedy movements;
- *Preconditioning exercises* maintained as part of other workouts;
- 1 focused *stretching session* per week.

Phase 1: 6-18 weeks, depending on experience

Key outcome This phase is designed to build a suitable speed base. It normally emphasises the progressive development of training quantity, with quality increasing as the phase progresses. For those new to speed training, this pyramid level is all about getting used to training, slowly and safely at first, while developing sound technique. Subsequently, it can be extended according to need.

Suggested workout options and progression ideas

- *300/200/100m* at 60-70% effort x 2, with 3mins recovery between runs and 8mins between sets;
- *150m runs*, split into 50m accelerate, 50m relax, 50m fast x 4, with 4mins recovery between runs
- *Sprint starts* introduced toward the end of the phase, emphasising technique rather than speed;
- *Bounding and hopping* over 20-30m, with reps increasing as the phase progresses, but maintaining full recovery. (Use less intense plyometrics, if you need to – see Chapter 5;
- *Power combination training*, with endurance emphasis, *eg* 6 combinations of weight repetitions (15 at 60% 1RM, 4 sets) and plyometrics (15 repetitions, 4 sets, incomplete recovery);
- *Preconditioning workouts*;
- *Circuit resistance training* involving sports specific exercises, but with the emphasis on speed endurance (*ie* fast, speed-specific exercises);
- *Sprint drills* performed as parts of other workouts and as sessions in their own right. The emphasis here should be on developing technical perfection, rather than speed of movement;
- 1 focused *stretching session* per week.

Phase 4: 4 weeks (minimum)

Key outcome This phase is used before returning to phase 1. It is designed to give your body and mind time to relax, recover and regenerate.

Suggested workout options and progression ideas

During this phase you can involve yourself in different sports and recreational fitness activities, but always on a very low key basis. Speed activities are very taxing and can stress the body, so it is crucial for this phase to allow ample time for recuperation.

Training planning tips for Masters

1. Benefit from your fitness blueprint

Research suggests that people who have enjoyed a relatively sustained involvement with sport or fitness involvement in their past possess a physiological 'blueprint' that makes it easy for them to return to such activity. Master speed athletes should take this into account when putting together their training plans since it could mean that they will be able to reach higher fitness levels faster than people taking up a sport/fitness/speed activity for the first time.

2. Less can be more

Many Masters, especially those who have been training more or less constantly since their twenties, overestimate the amount of training they can do in their middle and older years, when most people's bodies are beginning to deteriorate. If this sounds like you, you need to ask yourself questions like whether one more training session a week is really going to make that much difference? I have often advised younger Masters to hold back on their training, but often they ignore me and continue to train five or six times a week! Sometimes this leads to quite serious injuries, or 'niggles' that don't seem to want to go away. Only then do they take my advice, cut out a couple of training sessions and start to feel better as their bodies recover.

The 'less is more' approach is founded on two crucial physiological premises:

- that fewer workouts, as long as they include enough quality work, give the body more time to recover and optimally adapt;
- that speed, unlike endurance, does not benefit from doing more and more work; to the contrary, sprinting every day in the hope of getting faster would eventually bring you to a mental and physical halt. The neuro-muscular system you need to harness for speed work benefits from much lower training quantities, where quality is emphasised.

It is also beneficial – for speed improvement and injury prevention – to alternate hard weeks of training with easy and medium weeks. This can be achieved in all the key phases of the training pyramid and involves adjustments to training quantity and quality.

Masters speed training tip *Three workouts a week may be all that is needed to reach and maintain a good level of speed, providing these workouts are carefully constructed. They should be performed at an average intensity of more than 75%. This refers both to speed of runs and to weight lifted. Plyometric training, by its nature, will always be performed at this and higher intensities.*

3. Precondition – and keep doing it

Preconditioning is useful for preparing and maintaining your body for speed and minimising your risk of injury *(see Chapter 2)*. Preconditioning routines must never be neglected at any stage of speed training, as the pyramid training plan makes clear. Be sure to work on preconditioning exercises that keep your body strong and resilient enough to withstand the rigours of speed activity.

4. Cross-train

Cross-training involves working on activities that are not specifically related to your speed sport. In Chapter 3, I pointed to the need to work more on flexibility as you get older and recommended Pilates and/or yoga for this purpose. This is an example of cross-training. Cross-training activities should be chosen to complement your chosen speed activity, but not significantly detrain you from it. Obviously, it would not be a good idea for sprinters to develop their cardiovascular capacities through long distance cycling, because this would develop their slow twitch muscle fibre at the expense of their fast twitch fibre, and ultimately slow them down. However, performing 20-second flat-out sprints on a cycle, with a full recovery, could be beneficial from a cross-training perspective because it would:

- develop leg speed;
- increase/maintain the body's ability to perform short-term anaerobic intervals;
- reduce impact strain on the body;

- enhance the hormone response to exercise;
- Increase creatine phosphate use and replenishment within muscles.

5. Prepare mentally

Mental workouts need no kit, no travel, just a quiet place for you and your thoughts; yet they can be as effective as physical training. As explained in Chapter 7, mental training can improve your fitness, competitive readiness, confidence and technical ability. It can also prevent injury and help you recover if you do get injured. In terms of training planning you should match your mental training to the physical training phase you are in by, for example, focusing on and visualising the training outcomes required in that phase.

6. Don't be afraid to ask for help

Many Master athletes have amassed a great deal of knowledge about their sport, but it is always useful to get a second opinion and, more importantly, to have a second set of eyes watch over you to aid technical improvement – even if that means holding you back every now and again!

You should always be open to new thoughts about training that might help to improve your performance. Sometimes doing something new – or something old you have 'forgotten about' – will give you an extra boost. You may have been doing the same workouts for many years, but your body needs to be stimulated in different ways if it is to keep on improving. Doing the same workouts day in, day out will not achieve this.

7. Use that wise head on your shoulders!

When planning your training, see your maturity as an ally, not an obstacle. Have confidence in your awareness that you shouldn't – and don't need to – do as much training as you may have done in your younger years. Many of the most successful competitive Masters are the ones that make it to competitions without injury! They have managed to develop effective training plans that get them into shape without sidelining them for long periods.

Masters speed training tip *Evaluation is key to producing a successful training plan, and this must be an ongoing process. Tests, where used, must be relevant, and you need to rest before doing them for the results to be meaningful. Tests such as time trials should be scheduled in to the training plan at appropriate intervals to assess progression.*

Speed adaptation and compensation

For maximum speed gains it is crucial to get the timing of your training workouts right, in relation both to each other and to your competitions. This becomes increasingly important with age, because your powers of recovery are reduced. However, regardless of age, the human body cannot keep on improving: at some stage you will inevitably reach a performance plateau. Nevertheless, a carefully constructed training plan can do much to move you on to a level where you can realise the optimum potential for your age. As mentioned earlier, flat-out sprinting every day will bring you to a plateau sooner rather than later, even if you don't burn out mentally or injure yourself in the process. Other training and – crucially – rest days need to feature heavily in your training plan if you are going to craft your way to optimum speed.

After a particularly hard workout, like a 100% sprint session or tough weight or interval workout, your body needs time to recover – ideally around 48 hours' rest. This doesn't necessarily mean doing no training, but it does mean reducing the intensity of training. The timing of the next intense session or competition should be scheduled for 48-72 hours after the first intense workout if you are to maximise training adaptation. This approach, which applies regardless of age, allows for what is known as 'overcompensation', whereby the body attains peak physiological output capability on a cyclical basis in response to training stimulation. It is the continued use of these overcompensation periods that produces optimum conditions for speed development.

Fast twitch muscle fibre and detraining

A period of 'detraining', either before competition or during an injury lay-off, can have a significant effect on fast twitch muscle fibre. The training down-time can actually lead to the production of more type IIb fast twitch muscle fibres, so boosting performance. It seems that type IIa fast twitch fibres can also take on more of a type IIb capacity during these times. It is important to consider this when you are looking to achieve your best speed results and not fall into the trap of thinking you need more training. Quality should always take precedence over quantity with speed training.

Recovery strategies

Recovery is even more important for Master speed athletes than their more youthful counterparts. We have looked at the amount of rest you need to recover from intense workouts and at dietary strategies for aiding recovery *(see Chapter 9)*. To these, you need to add the following helpful measures:

- *Sports massage* A regular massage from a sports therapist will aid soft tissue recovery. It is quite likely that your muscles will have developed sore spots in response to previous injuries. This 'scar tissue' can make muscles prone to further injury. Regular sports massage can rub these sore spots out, realign muscle fibres and aid the removal of toxins.
- *Regular warm-downs* Bringing your body back down to a more steady state after a workout will promote recovery and reduce the risk of subsequent injury. See page 41 for more on warm-down strategies.
- *Heat and ice treatment (contrast treatment)* Immediate recovery treatments, such as ice baths, are becoming a regular feature of professional sport. The benefits are speedier recovery and injury reduction. Master speed athletes should adopt a similar proactive approach, ideally completed within 30 minutes of exercise. If you don't have access to an ice bath – or don't fancy the idea – try alternate sprays of hot and cold water on your upper

and lower legs (or other exercised parts) when showering after a workout.

Repeat the following 3-4 times under the shower:

- Shower cold (10-16°C) for 30-60secs
- Shower hot (35-37°C) for 1-2mins.
- *A good night's sleep* Regular sleep will greatly assist your training. Although you may think you need less sleep than when you were younger, you should still aim for at least eight hours a night. Numerous regenerative processes, including growth hormone release, take place during sleep – particularly the deepest periods of sleep. Try to make your bedtime routine consistent and your bedroom a relaxing environment. Switch off when you switch off the lights and you will 'switch on' when you come to perform your speed activity.

Masters speed training tip *Increasing blood flow through soft tissue is crucial for general training recovery and faster recovery from injury. Hot and cold treatments and sports massage can both be beneficial in this respect.*