

SPEED

by Steve Manning Level 2 Athletics Coach

Speedwork is the most important element for competitive success. While many people understand that more mileage is important for improving performance, they often sacrifice quality in order to achieve greater quantity. This is a big mistake because speedwork has a much greater impact on running performance than weekly mileage. Another myth is that speedwork has a high injury risk. However, speedwork spurs the body toward recovery while mileage suppresses recovery. The best predictors of injury are actually: high mileage; a previous history of injury; and failure to include enough recovery. (*Owen Anderson, Runners World, April 94, p30*)

This is the third article in my training series after endurance and strength. Speedwork is certainly the most complex of all the components of a training program. There are many different types of sessions and different ways of running them. Basic training principles are consistent for individuals but each runner's innate ability makes them respond very differently.

THE VALUE OF SPEEDWORK

The importance of speedwork in adapting to progressive training loads can not be underestimated. Speedwork most closely simulates a race itself. Because of the level of intensity it is speedwork which determines and controls race fitness. Being 'FIT' is not the same as being able to race fast. A good motto is if you want to race fast then train fast. Train slow and all you will be able to do is run slow.

Speedwork actually improves recovery and decreases injury risk. It does this mainly because of the big increase in production of Human Growth Hormone after intense training. Other advantages for injury prevention are improved flexibility and increased strength out of the normal range of motion. Running form is also better when running faster so biomechanical problems are lessened and sometimes cured.

I believe that the most important benefit of speedwork is greater mental strength and confidence. Training in a group at race pace is good practice for controlling excitement in races. Developing pace judgement is as important as the physical benefits of speedwork. There is no better skill going into a race than knowing how to run the right pace regardless of what speed everyone else is running. Most people go out fast then crash and burn. Even pace will guarantee you a better placing as well as the best time of which you are capable. Speedwork is the way to achieve perfect pace judgement for races.

SPECIFIC SPEEDWORK ADAPTATIONS

Running faster is possible with the improvement of a combination of variables. The relative importance of each of these variables is dependent on ability, tactics and the distance of your goal race. Training too fast ever speed session is just as bad as not doing speed work at all. Training must simulate race conditions in order to be effective.

1. Increase Anaerobic Threshold.

The most important aim in distance running training is to increase your anaerobic threshold. Anaerobic threshold is the range of effort where there is a sudden increase in anaerobic energy production and the waste product lactic acid. Going above this threshold will cause a sharp increase in breathing rate and heart rate. After this occurs you can not maintain speed for very much longer. By training at or slightly above this threshold for extended periods you force your body to adapt. Then you can run faster before these changes occur, or you can make them occur at a higher heart rate. Because anaerobic threshold sessions most closely simulate racing conditions they are the most important type of speed sessions for distance runners. Anaerobic threshold pace is close to 10km race pace.

2. Improve Lactate Efficiency

Lactic Acid is produced when oxygen needs are greater than consumption. Lactic Acid then interferes in the effective and coordinated contraction of muscles. Speed sessions that



produce lactic acid but allow it to be reabsorbed improve lactate efficiency. This is your bodies ability to convert lactic acid back into energy. Kierin Perkins trained to be able to go out hard and break his opposition early and still be able to recover and perform at a continual high level. It takes about 3 to 4 minutes to completely clear lactic acid from the blood. It does not stay around until the next day as some people think. It is in fact a source of energy which can be used by those with high lactate efficiency.

3. Increase Max VO₂ and Aerobic Power

The Athletes with the highest Max VO₂, or maximum oxygen consumption rates per kilogram of body weight, are 3000M to 5000M runners. Marathon runners have lower oxygen consumption rates because of the amount of training they do at lower intensities. In the past Max VO₂ was used as the major indicator of distance running ability. Scientists now view Max VO₂ as one element in a formula which makes up performance. Max VO₂ pace is the speed at which the greatest amount of oxygen is consumed. By training at or slightly faster then this pace for repetitions of three to five minutes the body is forced to adapt by learning to consume more oxygen. Most initial improvements of Max VO₂ with training are because of a loss of body weight. True improvements in oxygen consumption will only occur at Max VO₂ pace or slightly faster.

Max Aerobic Power is achieved at shorter repetitions of 40 to 80 seconds run at 1500M pace. These sessions help to continue maximum oxygen consumption rates even while anaerobic energy production is occurring. They require greater recovery in order to keep out of anaerobic zones

4. Improve Lactate Tolerance

Sprinters are able to maintain form and maximum speed with high blood lactate levels. They train their muscles to perform in a highly acidic environment. Oxygen debt occurs towards the end of most races so improved lactate tolerance will help you to run strong through the end of a race. Better lactate tolerance will also give you the ability to kick and pick up the pace considerably in the last 100 metres of a race.

5. Improve Acceleration

Races can often be won and lost in response to a competitors move. With good acceleration you can learn to break away or cover a break. A sudden change of pace at the start of a kick is more likely to succeed than a gradual build up in pace. Increasing strength with short steep hill reps will help develop greater power for acceleration. Fartlek type of sessions with short sharp reps and recoveries will also improve acceleration.

6. Improve Maximum Speed

When people talk about having speed they usually mean maximum speed. It is actually not as important as the ability to run at close to maximum when tired. However if you can run 100 metres in 12 seconds it should be easier to run the last 100M in a 5000M race in 13 seconds if you have too. By improving maximum speed other paces will seem all that much easier.

7. Learn How to Kick

No matter how tired you are you should still be able to pick it up at the end of a race. Having a kick is the most important tactical skill you can have. If you know you can kick well, all you have to do is hang in there with your competitors until the last 100 metres and then kick by them. Having a kick is as much mental as physical. You can learn to kick by making the last repetition of each speed session the fastest. By learning to kick you can learn to defeat runners with superior speed. Prepare yourself mentally to kick at the end of every race. Tell yourself that pain is just a sensation that can be controlled and will not last long. There is nothing more satisfying then kicking away from everyone you have been running with during the race.

8. Specific Running Economy

Some training must be done at the exact goal pace that you want to run in your major goal race. These sessions should be over an accurately measured course with kilometre markings. It should have the same number and type of hills as your goal race. They can be time trials or repetitions. A good but difficult session is to run at marathon race pace at the end of a long

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run. These sessions try to exactly simulate race conditions. They also give you a good sense of the rhythm required in your race so that you learn pace judgement.

SPEED SESSIONS

There is an unlimited number of sessions you can run and many different ways to run them. Each of these sessions should have the aim of developing at least one of the adaptations described in the previous section. Some sessions should only be done at certain times of the season as either base development or competition phase sessions. How you run a particular session is more important than the description of the session. For example 10 repetitions of 1 minute can be done as a threshold session with a steady 30 second float recovery. This can be a fartlek session, or a hill session or a track session as 10 x 400M, with 200 jog recovery. By running faster with more recovery the session becomes a Max VO2 or aerobic power session. By doing the last rep fastest you can learn how to kick and by running at a specific pace eg. 4 min/km you will learn how to run at that pace ie. 5000M in 20 minutes.

The trick is to do the right type of sessions at the right time. You should first consider your experience and your goals. There is no one magic session or formula that will work for everyone. Experiment and maintain variety so that you do not get bored with what you are doing. There should be some sort of continuity over time so that you can see yourself improve. Progression is also an important element in structuring your sessions. Improvement is not linear so do not plan continued progression forever. Six weeks of improvement is about the maximum that most people can handle without breaking down. This can be extended to twelve weeks by doing a fortnightly cycle of sessions. Again variety is the key to improvement.

1. Repetitions

Repetitions are the best known type of sessions. They are also the simplest to understand. They can be any distance and number of repetitions for example 5 x 1km, or 8 x 500M, or 12 x 200M. By changing the recovery you can change the nature of the session. We build progression into our program for the 1km repetitions by starting with 1km jog recovery, then decreasing recovery to 2 minutes, then 1 minute, then 30 seconds, then back to 5 minutes for the power session. Progression can also be built into a session by increasing pace. For example 10 x 400M with a 200 jog recovery starting at 72 seconds then decreasing the average by 2 seconds each week for five weeks finishing with 64 seconds. Progression is obviously not unlimited.

2. Intervals

Intervals became popular after Zatopek won the 5k, 10k and Marathon in the one Olympics. He used to do up to 60 x 400M. Intervals get their name from the break between repetitions which is controlled and just as important as the fast part of the session. Often people get repetitions confused with intervals. An interval session might be 15 x 200M, 200 recovery with the fast 200 in 35 seconds and the recovery in only 50 seconds. Recoveries can either be a jog over a specific distance in a certain time or a specific timed recovery. Insufficient recovery slows you for the reps and turns the session into more of a threshold workout. Roger Bannister worked up to doing 10 x 400M in 60 seconds with only a 1 minute recovery leading up to breaking the 4 minute mile.

3. Hills and Strength work

Hills are best done in the beginning of a training season. They develop strength so that you have less injury risk when you want to run faster. It is also important to have some hill speedwork if you are planning to race over a hilly course. The hills then become a specific running economy session. Closer to an important flat race hills can be counterproductive.

4. Fartlek

Fartlek is the Swedish word for Speed-Play. It is best done over varied terrain and hills. Because it is unstructured and unmeasurable fartlek is an ideal session when you are in recovery mode. That way you are not comparing your times but just running how you feel. For the same reason Fartlek is not as appropriate in the competitive phase when you have to closely control your effort and pace.

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5. Tempo and Time Trials

Tempo sessions are extended Time Trials at anaerobic threshold pace. A popular session for elite athletes is 2 x 5km @ 10km pace with 5km recovery. The distance can be up to 10km but for most runners shorter races are the best type of tempo sessions.

6. Rhythm and Pace sessions

Developing pace judgement is one of the major goals of speedwork. Rather than do a very hard session the week of your major goal race it is better to do a pace session. In this session you are aiming for a particular time for your reps which is usually the identical pace you want to do in your race. Going too fast is just as bad as too slow in these sessions. The key to pace sessions is to be focused on the rhythm of your running rather than what everyone else around you is doing.

7. POWER sessions

Power sessions are one of the most fun sessions to do. After training hard for many weeks, it is now only 10 days to your major goal race. Training has been cut back and you are starting to feel fresher. We do 3 x 1km with maximum recovery at a faster pace than we have run all season. This contrasts with our base session of 5 x 1km. Most runners are amazed at how much faster they run for this session compared to what they have been doing. This gives them the confidence to know that they are capable of something great in their goal race.

8. Formwork

In the off season formwork can substitute or be added onto a speed session. Formwork involves drills and exercises designed to give strength and change form for greater efficiency and power. Besides making you faster better form can also help prevent injury. However, formwork such as plyometrics carries a high injury risk. It is best not to do it while training or racing hard. It takes surprisingly little time to get the benefits of formwork. Results can be seen within a few weeks and the benefits will last long after you have stopped form sessions.

9. True Speedwork

True speedwork has the aim of improving maximum speed. Repetitions are done at close to maximum pace over distances under 200M. Recovery is complete and number of repetitions few. Injury risk is often higher than the benefits. This is the type of training that sprinters do. Some coaches believe that some true speedwork should be done all year round because speed is lost easily and only gained through much hard work.

10. Combination sessions

Speed sessions can have more than one defined goal. If you create competitive situations similar to what you will encounter in the race you will have a better chance of running well in your goal race. Pyramid sessions like 1k,2k,3k,2k,1k force you to change the pace you are running each repetition. Sessions of short Reps followed by a threshold rep or time trial make you learn to run hard while fatigued. By running faster every repetition in a session you learn to pace yourself through a more complex exercise than a race. Recoveries can be determined by your falling heartrate rather than a specific time or distance.

TRAINING PROGRESSION

Progression is the most important factor in continuing to improve performance. In only four to six weeks the body adapts to the training stress, at this time an increased training load or type of stress must be initiated in order to get continued improvements. If no change occurs then performance will plateau.

Progression is not a simple formula of linear improvements. Because our bodies are biological organisms we respond in different ways at different times. By running an extra 400M repetition every week in your speed session you will eventually find your limits and break down. By running different types of sessions each week your body can adapt to do even more repetitions than by the linear progression method. The goal should be to increase quantity and intensity of training over the whole macrocycle. Do not get too worried about weekly gains. It is the longer term improvements that will make the greatest difference.

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Progression can be made in; the quantity of sessions (the distance of each rep.); the frequency of sessions (how many repetitions are run); the intensity of sessions (speed over a particular distance); the recovery of sessions (the increased pace or decreased distance or time of recovery between repetitions). Progression can also be made between microcycles by increasing the number of speed sessions/week.

Detraining occurs when runners are not consistent with their training. This is true for speed as well as endurance. While endurance gains can be regained quickly after a layoff, speed gains are much more difficult to recapture. It sometimes takes a whole season or year to regain the speed you had before even a short layoff. Speed can be maintained during a large decrease in training quantity by maintaining intensity, but gains will not occur unless the runner pushes beyond what they have done before.

Speedwork is not always easy, but it is necessary for runners to occasionally push outside their comfort zones to achieve improvement. This is often painful but you can be satisfied that improvements will then occur as long as you are not overtraining or pushing your limits too frequently. Long term adaptations often will surprise you. Suddenly you will find yourself running 20 seconds faster for your kilometre reps without even struggling. When this happens you can look back on the consistency of your speed sessions as being the major reason for your improvement.

BEGINNING SPEEDWORK

We have new people coming to the speed sessions constantly. Some of them only last one or two sessions before deciding it is too hard. They usually have not approached speedwork in the right way and have not given themselves enough time to adapt to its demands. The best way to begin speedwork is to run fartlek by yourself. This might involve surging about five times during a normal training run. The surges can be over different distances and at varied paces, but do not make the mistake of thinking that speedwork is sprinting. 100% efforts should be saved for races and power sessions. Most beginners run too fast before their body can cope with it.

Once you have had a few weeks of fartlek once a week then go along to a organised session. Running with others is very important for developing pace judgement. Getting advice from experienced coaches can also be vital to running with proper form and effort. There are many different ways to run a speed session and you have to make sure that you are running correctly, otherwise you will get injured.

Expect to feel sore the first few weeks. Your body breaks down as it responds to the speedwork. When it rebuilds it grows stronger, and better able to deal with the stress with less damage. After three or four weeks the sore muscles will no longer trouble you. Do not give up in the first few weeks because it is too hard, it will get easier.

SPECIAL FACTORS IN SPEEDWORK:

1. Age, speedwork and lean muscle mass

Speedwork becomes more important the older you get. As we age our lean muscle mass is eroded and it takes more effort to maintain muscle and keep off fat. Intensity has proven to be the major factor in maintaining strength and muscle. Mileage serves to catabolise muscle so that strength is lost. Just doing mileage as you get older is a certain way to get slower. In a study in America on elite athletes from the 1940's it was found that speedwork was the main distinguishing factor between aging of the athletes and their performance. Those who kept training and racing intensely were able to maintain performance levels very close to their original times. Those who only maintained mileage suffered dramatic loses in their performance indicators with a resulting loss in their health and longevity.

2. Speed and the Female Quotient

Female runners produce less testosterone. Their ability to build up muscle and strength is then affected. While they might be able to do quality sessions, their response and improvement will not be as great as a males. The difference between a females 1km time and their marathon

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time will not be as great as a males. A female who can run a 3 minute 1km may be able to break 3 hours for a marathon. An equivalent male who can run 3 minutes may be unable to run under 3:20 for a marathon. These variances are true between all runners but are more striking for women than men. Males must perform at a greater speed to get the same training effect of a female. Females at a certain performance level will be better runners than most of the men running around them. They have better pace judgement, better mental skills and are more likely to prevail in a race. The one advantage that males have is better innate speed so they may have a better kick if they are still around at the end of a race.

3. Current International Training Theory

In Australia De Castella and Monaghetti have succeeded using a continuous training theory. That is they train basically the same all year round with only small changes leading up to goal races. Mona's weekly speed session consists of 10 x 400M in 65 to 68 seconds with a very brisk recovery. He has not changed this session much in ten years. While this has worked very well for them for marathons current international training theory is very different.

The Africans and Chinese survive on a steady and frequent diet of high intensity and quantity speed sessions. The record books have been completely rewritten by runners who can run 5km at a pace just over 4 minutes/mile or 60 seconds for each of twelve and a half 400m laps. They are mixing speedwork with endurance doing up to five fast 5km surges in a 40km run. Sean Crighton recently broke Ron Clarke's Australian record for 10000M. He would have been lapped during the recent record set by Kenyan Paul Tergat.

It takes something new to be competitive on a world level but it is folly to adopt either system and expect that it will succeed for you. Each individual has a different response to training and will succeed with different types of training at different times. Elite athletes lead different lives from the normal person. To run a faster half marathon does not require you emulate their training but instead requires that you find what works for you.

4. Speedwork Training Principles

There are some things that are true for everyone. These training principles can be broken only at your own peril.

The easiest way to achieve injury is by combining racing and speedwork without enough recovery. Both are high intensity stressing the system in a similar way. You can be on a high after a good race and are capable of doing a hard session the next day. The resulting destruction is much greater than from an ordinary session because you are still recovering from the race. It is just as dangerous having a race after a hard session. It is best to look on races as types of speed sessions which require as much if not more respect as any other speed session.

Attempting a speed session after a long run is also risky as the long run suppresses coordination setting you up for injury. It is far better to follow a speed session or race with a long run because long runs are at a lower intensity.

The main speedwork training principle is that as you are tapering and preparing to peak for a race quantity and frequency of repetitions will decrease while intensity and recovery will increase. Even if you only follow this principle you will be certain of a better racing performance.

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INTRAINING speed sessions are designed with the aim of fulfilling all the requirements within this article. Major goals are the Brisbane and Gold Coast marathons and half marathons in the first half of the year and then improving 5km and 10km running during the second half of the year. The sessions are able to be adapted by individuals with different goals such as triathlons and interstate races. They can also be modified for different levels of ability and experience. All that is required is for you to talk to the coach in attendance.

Many people come to our sessions but run the speedwork wrong. The most common error is running too fast all the time. This means that they are getting the wrong training effect, training the wrong energy system. It also takes longer to recover from the session and the rest of their training week is compromised. Running too fast in the recovery is also not good because it will be too difficult to maintain proper intensity. Some people never run fast enough and their recoveries are often at the same pace as the fast part. This is a waste of time. You must learn to run fast. A good indication that you are running the session properly is when you are consistent through the session without slowing down and you are able to do the last rep fastest. You should feel tired but still able to do more if you really have to.

My next article in this training series will be on long term planning and balancing all the elements in a training program. The final article will be on peaking and racing. Contact the shop if you would like copies of the previous articles on endurance and strength training. There is a small fee for photocopying.

Speed is the most important element of running fast. Any effective training program must have regular speedwork. Running faster than race pace is the only way to run faster in your next race. Speedwork has more scope for doing different sessions which also makes it the most fun!

Tips on running better speed sessions:

Do not run as fast as you can all the time. Running faster is not effective if you are always training at a faster pace that you run in a race. You must train the energy system you need for racing faster. Anaerobic Threshold and Max VO2 are what is primarily needed for races. Doing all your sessions at anaerobic tolerance pace will train you to do better speed sessions but you will not race faster.

Improvements in ability only come while recovering from training. Hard sessions may take too long to recover and compromise the rest of your training week.

You may get a better training effect by increasing the amount of recovery as you go through a session. This will ensure that you are able to maintain intensity and not overtrain.

To develop good pace judgement guess what time you have done before looking at your watch. Learning to know the pace you are running can have a much bigger impact on race times than improving fitness.

Learn to run the last repetition of every session the fastest. This will help you develop the ability to kick at the end of races.

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