The Need for Speed

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Sport & Speed
- Speed is an integral part of every sport
- Very few sports require NO speed training
- Successful speed training can improve performance quicker than any other training method
- Most people training for speed use poor training methods

True Speed
- What is real speed?
  - Maximal speed
  - Elastic strength or power
  - Speed endurance
- Speed is influenced by
  - Athletes mobility
  - Strength
  - Technique
  - Flexibility

Physiology of Speed
- Energy for absolute speed is supplied by the anaerobic alactic pathway. The anaerobic (without oxygen) alactic (without lactate) energy system is best challenged as an athlete approaches top speed between 30 and 60 metres while running at 95% to 100% of maximum.
- This speed component of anaerobic metabolism lasts for approximately six seconds and should be trained when no muscle fatigue is present (usually after 24 to 36 hours of rest)

Speed Profiles
- Different sports require different amounts and types of speed
  - Baseball – pitchers in league throw at up to 160 km/hr
  - Sprinters take less than 10 sec to run 100m
  - High jumpers leap more than 2.4m off the ground
  - Tennis matches last for up to 5hrs but each point may last less than 5 sec on average
- Straight line speed is not the only speed related factor to train –
  - multi directional speed
  - repeated bout speed
  - acceleration
- In most sports the ability to accelerate over 2-10m is more important than max speed
Improvements over last 50 years

In the last 50 years, improvements per decade have been approximately:
- sprinting, 1%;
- distance running, 1.5%;
- jumping, 2-3%;
- pole vaulting, 5%;
- swimming, 5%;
- skiing, 10%.

Four Laws for Speed

- Movement pattern
- Contraction velocity
- Using correct/same contraction type
- Overloading the contraction force

(Kelvin Miyahira 2003)

Movement Patterns

- Must be as close as possible to required movement
  - You must train at same angles and speed as required for your throw, sprint or jump
- Strength training and stretch chord exercises for movement speed do not transfer well
- Training isolated joints will not transfer to complex patterns of movement under speed

Contraction Velocity

- To be fast you must train at high speeds
- Motor unit recruitment and their firing cycles are very specific to the movement required for speed
- Any load greater than 5% of the sports specific implement will in fact alter the recruitment pattern
- Improving your Rate of Force Development (RFD) is the means to developing speed
- Striking or throwing a ball requires a max velocity to be reached in 2-300 ms. Max strength and power is reached at 6-800 ms.

Contraction Type

- Type of contraction must be the same as that of the movements in the sport
- Utilise the SSC via Plyometric training
- Exercise complete movements in an explosive manner
- Traditional strength training should be replaced by Olympic lifts in most cases

Contraction Force

- \[ F = MA \]
- This is achieved by moving through an accelerated path and applying a high speed force
- A higher force can be achieved in training by either
  - increasing the mass via increased loads or
  - creating high levels of acceleration
- Training needs to reflect the high acceleration component in many sports rather than the max weight you can squat
Steps to Training Speed

1. Basic training – strength, endurance and body control/stability
2. Explosive power – train for speed strength
3. Ballistics – high speed movements in both concentric and eccentric pathways
4. Plyometrics – explosive bounding, hopping, hitting and kicking
5. Sport loading – load the sports movements and perform them at high speed, 85-100% of max speed
6. Form and technique – focus on movement technique and the amount of time you an perform this movement at required speed
7. Over speed training – apply systematic overloads that exceeds max speed by 5-10% using over speed techniques

(Sports Speed – Dintman, Ward & Tellez 1998)

Developing Speed

• Speed is power. Optimal power requires dynamic flexibility. Teach people how to stretch both statically AS WELL AS dynamically. Especially work on the dynamic flexibility of the shoulders and hips.
• Do some unilateral strength training. Single leg squats (with the free leg held in different positions) is a great way to develop unilateral strength and stability. Unilateral strength and stability is a MUST for good sprinters.
• Work on balance. Use games, un-stabilizing devices and anything you can think of to train the balance of an athlete.
• TONS of core strength. Train the core endlessly through both multi-joint and specific exercises.
• In order to develop good eccentric strength, perform both in-place as well as movement based jumps. Don’t get caught up in ‘plyometrics’ with beginners, leave that training for advanced athletes. Have athletes jump, gain their balance and then jump again. Be more concerned with body mechanics and execution than height, distance or speed.
• Teach people HOW TO RUN. Break down the mechanics and show them how to become fluid. Bad mechanics means wasted energy and reduced speed

Sprinting Speed

The fast fastest athletes have a
• significantly lower foot contact time,
• increased stride frequency and
• better knee extension,
• very little difference in stride length.

• All training for sprinting speed needs to reflect this with specific drills and training loads.

Speed is a function of

• Stride frequency
• Stride length
• Technique
### 100 Speed Demons

- Donald Lippincott  
  USA  Sat 06 Jul 1912  
  Time: 10.6

- Charles Paddock  
  USA  Sat 23 Apr 1921  
  Time: 10.4

- Percy Williams  
  Can  Sat 09 Aug 1930  
  Time: 10.3

- Jesse Owens  
  USA  Sat 20 Jun 1936  
  Time: 10.2

- Wilie Williams  
  USA  Fri 07 Aug 1936  
  Time: 10.1

- Armin Hary  
  Germ  Tue 21 Jun 1960  
  Time: 10.0

- Jim Hines  
  USA  Mon 14 Oct 1968  
  Time: 9.95

- Calvin Smith  
  USA  Sun 01 Jul 1983  
  Time: 9.93

- Carl Lewis  
  USA  Sat 24 Sep 1988  
  Time: 9.92

- Leroy Burrell  
  USA  Fri 14 Jan 1991  
  Time: 9.90

- Carl Lewis  
  USA  Sun 25 Aug 1991  
  Time: 9.96

- Leroy Burrell  
  USA  Wed 06 Jul 1994  
  Time: 9.85

- Donovan Bailey  
  Can  Sat 27 Jul 1996  
  Time: 9.84

- Maurice Greene  
  USA  Wed 16 Jun 1999  
  Time: 9.79

- Tim Montgomery  
  USA  Sat 14 Sep 2002  
  Time: 9.78

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**Event**  
**Speed Session**

- **100**  
  10 x 30 metres at race pace from blocks with full recovery
  3 to 4 x 40 metres at race pace with full recovery

- **800 metres**  
  5 x 200 metres at goal race pace with 10 seconds recovery
  4 x 400 metres at 1 to 3 seconds faster than current race pace with 2 minutes recovery

- **1500 metres**  
  4 x 400 metres at goal race pace with 5 to 10 seconds recovery
  5 to 6 seconds per 800 metres faster than goal race pace with 6 minutes recovery

- **5000 metres**  
  4 x 5 x 800 metres at 4 seconds per 800 metres faster than goal race pace with 2 minutes recovery
  3 x 800 metres at 5 seconds per mile faster than goal race pace with 2 minutes recovery

- **10000 metres**  
  3 x 2000 metres at 3 seconds per 200 metres faster than goal race pace with 2 minutes recovery
  Five 5 minute intervals at current 5km race pace with 3 minutes recovery

- **Marathon**  
  Six 1 mile repeats at 15 seconds per mile faster that goal race pace with 1 minute recovery
  3 x 2000 metres at 10km race pace with 6 minutes recovery

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**2003 Rome Golden League Reaction Times**

**100 m Sprint Time**

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**Male 100 m Sprint Prediction**

- Lefevre (1974)  
- Logsdon (91)
Guidelines for Speed

- It is important to remember that the improvement of running speed is a complex process which is controlled by the brain and nervous system. In order for a runner to move more quickly, the leg muscles of course have to contract more quickly, but the brain and nervous system also have to learn to control these faster movements efficiently.
- You should maintain some form of speed training throughout the year. This way your muscles and nervous system do not lose the feel of moving fast and the brain will not have to re-learn the proper control patterns at a later date.
- In the training week speed work should be carried out after a period of rest or light training. In a training session speed work should be conducted after the warm up and any other training should be of low intensity.
- As soon as you have a good mastery of a given technique or just an exercise—its form and timing of its phases—work on performing it faster. Speed should be developed first in simple, then in complex movements (Harre and Hauptmann 1991).
- Developing the ability to move fast in any movement, even in exercises that are not sport-specific, is useful in situations when natural movements are a part of the competition activity and makes learning the sport-specific speed exercises easier.

Common Errors in Speed Training

- Forcing it – trying to go too fast
- Toughing it out – don’t work on speed when you’re tired
- Too much speed training – a session does not have to be all speed training, technique training is vital for speed
- Rushing the session – need to have good smooth technique before quickness of movement. Control of technique determines potential
- Completing training methods too advanced for your level – such as weight training and plyometrics
- Incorrect training volume –
  - to improve speed a little daily,
  - During competition periods 3-4/week,
  - to maintain 2 session/week