STRENGTH TRAINING FOR HIGH PERFORMANCE SPORT
AN OVERVIEW OF THE ISSUES FOR PRACTICING COACHES
By Wayne Goldsmith

It was not all that long ago when the words STRENGTH TRAINING and GYMNASIUM conjured up images of muscle hulks and Arnold Schwarzenegger.

However, in recent years, strength and conditioning has gained acceptance as an applied sports science and is respected as a science in its own right in many high performance sporting systems around the world. It has become a fundamental and integral aspect of the training and preparation of elite athletes in a wide range of sports.

This article will cover some of the contemporary issues in strength training for high performance sport and suggest some practical applications for the practicing coach.

THE BASIC ISSUES
Strength training or not strength training?

There are many, many questions for a coach to ask about strength training.

These include...

• How many sets?
• How many reps?
• How much rest?
• What type of exercise?
• What is the best order to complete the exercises?
• At what speed should the exercises be performed?
• Should my athletes use machines or free weights?
• How many times per week should my athletes do strength training?
• Should strength training be completed before or after regular sports specific training?

Fortunately there are trained, qualified and experienced strength and conditioning specialists who can help coaches and athletes find the answers to these issues.

However, for every coach, the issue ultimately comes down to one key question...

Will the strength and conditioning activity my athletes are doing directly (through increased power, strength, the ability to apply force, etc.) or indirectly (through injury prevention, early season conditioning, etc.) contribute to the development of improved competition performances?

If the answer is NO, the coach may be better off looking in another direction for training and development activities to assist the athlete achieve their performance goals.

The key to answering this question is can the improvement in performance attributed to strength training be effectively isolated and measured?

For example, following a three month strength and power development program, a track sprinter has improved his 100 metre race time by 0.4 seconds.

The challenge for the coach is to identify where this improvement has come from. The improvement could be from anyone or combination of technical, physical, tactical or mental factors and accurate measurement of the impact of the strength and conditioning program in isolation could be difficult.

In this instance, an accurately measured START TIME of the first 10 metres done before and after the strength training program, may indicate an improvement in strength and power and an increased effectiveness in the athlete’s ability to apply force.

RECOVERY & STRENGTH TRAINING
The trap for the uninitiated!!
A successful coach told this story…

“*I remember the first year we tried strength training. We had purchased a lot of equipment, hired an experienced and well qualified strength expert. The plan was that the gym program would work oppositely to the running program. During micro cycles when we worked hard on the running program, the gym program was relatively light and easy. Micro cycles where the athletes reduced running loads were the times when the gym program was hard and tough. It seemed like a great plan, but we had our worst year ever*”.

Why?

**Because...**

**FATIGUE IS FATIGUE IS FATIGUE**

Coaches have often fallen into this trap. They mistakenly believe that fatigue from the sports specific training is very different to fatigue developed in the gym. As a result, in cases like the above example, athletes never have the opportunity to rest and recover.

It is essential that coaches manage the overall training loads that athletes experience and consider all training and competition activities when developing training and recovery programs.

**GOAL DEPENDENT STRENGTH TRAINING!!!**

The coach has many things to consider when planning an integrated training program. One of the first steps is the establishment of clear and precise training goals. From this one simple principle, even the most complex training programs can be effectively developed.

Once the goals of the training program have been established, the coach needs to make two more decisions...

How can I develop a program to help my athlete achieve the program goal? And how can I create an environment that provides the optimal conditions for the adaptations I am trying to stimulate?

The goal setting process establishes the overall philosophy of the program. This helps the coach determine many of the issues relating to strength and conditioning training. For example...

A coach determines that the key training goal for the micro cycle is the development of sports specific speed, and it is generally accepted that the optimal conditions for speed development are...

- A fresh unfatigued athlete
- An absence of neuro muscular fatigue
- A motivated athlete who can think “fast”
- Glycogen repletion
- Two (or a maximum of three) focus sessions where speed development is the goal ideally 48-72 hours apart to allow complete recovery.

Following the basic three step process for programming...

**STEP**

- **Set the goal:** Improve speed
- **How to achieve the goal:** Work with a fresh, unfatigued, motivated athlete.
- **Create the optimal environment**

In this instance, scheduling a gruelling gym session using heavy weights an hour or two before the sports specific speed development session is not logical. The gym session is likely to produce fatigue and other factors likely to impact negatively on the sports specific session.
However, strength training has an important role to play in general conditioning. In the early preparation phase of sports training it can assist the body's capacity to handle the demands of high training volume typically experienced during the general conditioning period.

**SKILL & STRENGTH**  
**How do skill and strength interact?**

One of the challenges for the coach, athlete and strength and conditioning expert is that of **SPECIFICITY** of exercise – how similar should strength training exercises duplicate the movements and skills of the sport itself.

Recent work has suggested that if the strength training activity is too similar to the actual sports movement the athlete may actually experience a negative impact on performance. The key to strength improvement is how effectively the athlete can apply force in their sport.

There is the danger that making less-skilled athletes very strong, may allow them to “MUSCLE THE MOVEMENT” – that is, use strength to try and overcome technical inefficiencies. The overall aim should be to enhance the athlete’s ability to effectively apply force and to learn to move more efficiently.

The body will, in times of pressure, fatigue and stress move to positions of strength. The body will favour movements and planes of movement that are physically advantageous.

By increasing strength in a movement which is close to – but not identical to – the actual sports movement, the athlete may in fact be increasing strength in a movement that will prove detrimental to performance.

**FATIGUE WILL FIND WEAKNESS!**

When large muscles fatigue, often smaller muscles, not really designed to do large workloads, have to take up the activities and actions of larger muscles. As a result, smaller muscles, which in normal circumstances would act as supporting or stabilizing muscles often take up the role as MOVING MUSCLES and end up overstressed and overstrained.

Coaches should focus on teaching efficient movement then develop strength and power to increase the athlete’s ability to apply effective force in that movement.

Or...

**INSPIRE THE MIND**  
**TEACH THE MOVEMENT**  
**STRENGTHEN THE MUSCLE**

**Core Training – Building performance on the “rock”**

Core stability, Swiss ball training, Pilates techniques, physio ball routines ... the terms (and marketing) are different but they all refer to the same principle.

As one leading German track and field coach put it recently...

"We spend a lot time trying to find optimal performance using strength and conditioning techniques. Strength training and sports specific conditioning exercises try to turn the upper body of athletes into IRON. Similarly, we try to turn athletes’ lower bodies into IRON through running, squats and other similar training activities. To be effective, we then need to ‘weld’ the two iron structures together through the development of a strong, stable muscular trunk”.

Or as John Carew, Coach of Australian Distance Swimming legend Kieren Perkins suggested ... “Create a PLATFORM then perform off the PLATFORM”.
The philosophy is the same. By creating a strong, stable trunk, athletes are able to develop total body movement more efficiently and effectively. There is the added bonus of decreasing the incidence of injuries to the lower back and pelvis by reducing lateral, inefficient movements.

Regardless of the strategy used to develop core stability, it has become an increasingly popular training activity in a variety of sports around the world.

However, as with other aspects of performance, core stability by itself has not been clearly demonstrated to improve competition performances.

One of the challenges to current methodologies of core stability is that in general, the exercises and strengthening routines are rarely performed at the same speeds or subject to the same accelerations and loads as athletes experience in actual high performance competitions.

In addition, along with core stability, athletes need to be able to maintain and develop other key aspects of performance – just adding a core routine and expecting miracles is not realistic.

Remember, as a coach there are several factors that need to be considered in the development of an overall strength and conditioning program...

**CORE STABILITY**

**MOBILITY**

**FLEXIBILITY**

**TECHNICAL QUALITY**

The Mental side of strength training – believe and you will achieve!

An interesting aspect of strength training is that of the role of the mind and the mental side of effective conditioning programs.

Several studies have supported the idea that strength training is most effective when the athlete THINKS strong and focuses on what they are doing in the gym. For example...

The exercise is bench press. The goal is to lift a weight which is 80% of the athlete’s maximum eight times, then rest and repeat the process three times or 3x8 reps at 80% IRM.

**Athlete A**

Performs the exercise with little or no breathing control, thinks about last night’s football game, has poor technical execution of the lifts and in the rest periods sits down and reads the paper.

**Athlete B**

Focuses on driving explosively with every lift. Concentrates on controlled breathing with an emphasis on a strong, powerful exhale on each lift. Thinks about and has a “key word” – DRIVE – that provides focus for each lift. In the rest periods the athlete stretches the key muscle groups being stressed during the lifting process and sips on a sports drink to replenish energy stores and re hydrate.

As with other training activities, the athlete’s approach to strength training can have a profound effect on the results.

Another mental aspect is that of FEELING STRONG. Several leading athletes have reported that an important performance factor is the feeling that they are strong and powerful.
In response to this, coaches have experimented with continuing to train in the gym during the taper phase of their programs – once thought to be a programming TABOO – to capitalise on this mental aspect of strength.

The nature of strength training in taper is to maintain strength, whilst allowing the athlete to reduce the overall residual fatigue normally experienced during other training phases of the program.

One top sprinter said recently…

“I want to go to the race knowing that I am the strongest I have ever been. If I can do a PB (personal best) lift in the gym a day or so before I have to race, I know I am going to go fast”.

Summary

Strength training can be a useful supplement to sports specific training. The key word is supplement. Intelligent strength training uses a wide range of techniques and skills to enhance the athlete’s ability to perform in competition.

Strength training needs to be effectively managed by the athlete and coach. It is ill advised to send an athlete to a strength and conditioning specialist without a thorough consultative process in place where coach, athlete and strength and conditioning specialist can develop an integrated, balanced and co-ordinated program.

Strength training is not a quick fix, a short cut, magic pill, a gimmick or the answer to all performance questions. It is an effective training and development tool that when used intelligently in a well designed and managed program can provide a performance edge to many athletes.

Sincere thanks to the Australian Institute of Sport’s Head Strength and Conditioning Coach Julian Jones and A.I.S. Physiotherapist Peter Blanch for their advice and input into the research for this article.