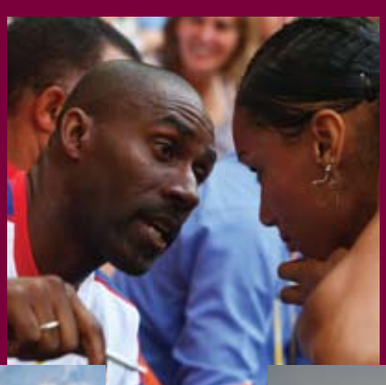
INTERNATIONAL ASSOCIATION OF ATHLETICS FEDERATIONS

INTRODUCTION TO COACHING





The Official IAAF Guide to Coaching Athletics

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INTERNATIONAL ASSOCIATION OF ATHLETICS FEDERATIONS

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The Official IAAF Guide to Coaching Athletics

Peter J L Thompson

IAAF Coaches Education and Certification System

Throughout the IAAF Coaches Education and Certification System "he", "him" and "his" have been used inclusively and are intended to apply equally to men and women. It is important in Athletics, as elsewhere, that women and men should have equal status and equal opportunities.

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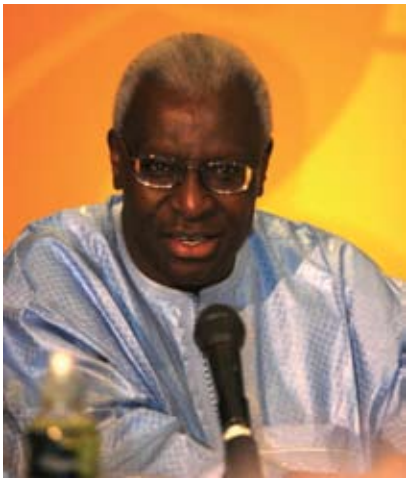
"Why would someone plant the seeds of a tree
the shade of which they will never see?"

Greek proverb

Dedication

This book is dedicated to all coaches who help athletes to achieve their potential and to those coaches who, additionally, find the time and energy to help educate the coaches of the future.

President's Message



I am very pleased to welcome the publication of *Introduction to Coaching* - the official IAAF guide to coaching athletics. I am convinced that this book, which contains the very latest understanding of the sport sciences and coaching practice, will have a very positive impact on the development of coaches. The innovative, competence-based approach taken through these pages truly moves coaching theory into coaching practice.

It is evident that the work of qualified coaches is vital for the development of athletics in all countries. It is also clear that the coach working in schools, clubs and other local organisations plays a key role in the identification, motivation and development of those athletes who go on to enjoy a long athletics career and achieve their potential. For this reason, the education of coaches has been an important and ongoing goal of the Development Programme of the IAAF since 1980.

I would like to thank the main author for his experienced input and conscientious work. I also would like to thank the specialists and consultants from all over the world for their contribution to this important publication and to the whole programme in general.

Finally, I hereby express my gratitude to the Member Services Department as well as the CECS lecturers and the coaches for their contribution to the success of the IAAF Coaches Education and Certification System.

Lamine Diack, IAAF President

Preface

It has been said that, "We stand on the shoulders of giants." This means on the shoulders of all the pioneers and leaders who have gone before us. I, truly, stand on the shoulders of many giants who have contributed to my being able to write this book. These 'giants' include athletics coaches, coaches from other sports, academics and researchers and, by no means least, athletes.

I have had the good fortune and privilege to come into personal contact with a great number of outstanding coaches. These have included former British national coaches such as John le Mesurier, Dennis Watts, Ron Pickering, Wilf Paish, Frank Dick, Norman Brook and Tom McNab. It also includes other coaches from the UK and around the world, such as Jim Alford, Bill Bowerman, Frank Horwill, Elio Locatelli, Bill Dellinger, Arthur Lydiard and Jack Daniels, who have also provided insights and inspiration. More recently, from 2000-2007, I worked with UK Athletics on a new, competence-based coach education programme. During this time I was fortunate to strategically plan, create and deliver with colleagues: Mel Curds, Linda Low, Penny Crisfield, Jeremy Harries, Maggie Still, Mike Johnston, Sarah McQuade and Clive Brewer. Their feedback was a constant and welcome source of growth and refreshment for me.

As a coach, I have always tried to gain an understanding of why I do, what I do, when I coach. But, firstly, I have experimented intuitively in training sessions, hopefully not to the detriment of the athletes, looking for immediate and long-term effects. Afterwards I have sought explanations for these effects, if they were available. This was, and is, a recognition of the fundamental truth expressed in Roger Bannister's

observation in 1955, after breaking the 4-minute mile barrier the previous year, that, "The human body is centuries in advance of the physiologist."

When I began my coaching in the early 1970s, watching the emerging Kenyans gave me a clue and direction to follow in structuring running training. Also, at this time, the 'human potential' movement was awakening. Reading the works of Hans Selye, Abraham Maslow, Timothy Gallwey, Mihaly Csikszentmihalyi, Albert Bandura, Edmund Jacobson and Gunnar Borg gave me an appreciation of the potential for a holistic, athlete-centred approach to coaching. More recently, the published works of Dr George Brooks and Professor Michael Apter have offered answers to fundamental questions in our understanding of metabolic energy production and mental states.

Much has changed since 1991 when I wrote the then IAAF CECS Level I text titled *Introduction to Coaching Theory*. Coaching practice is dynamic and has moved on, coach education is finally becoming competence-based and the IAAF has a new, five-level, global Coaches Education and Certification System, CECS. When first reviewing the changes to be made to the original book, with feedback from around the world, it appeared that only ten percent of the text might need changing. In reality, the work has proven considerably more extensive and the book you are now holding has been restructured and essentially re-written. The competence-based approach taken is designed to move coaching theory into coaching practice and provide the coach with an appreciation of both 'how to coach' as well as 'what to coach'.

The IAAF's aim is to provide what coaches need. The contents of *Introduction to Coaching* provide coaches with the following four things:

- An understanding of the cyclical nature of the process of coaching, the repeated passage from planning, to doing, to reviewing and on again to planning
- A recognition of the five basic skills of coaching and then application and practice of these skills within their coaching
- A basic knowledge and practical understanding and application of the sport sciences
- A focus to 'see' the athlete and make their coaching athlete-centred and appropriately coach-led.

The content of this book reflects the currently accepted views of coaches' education knowledge and competence in athletics world-wide. This was arrived at by an examination of coaches' education resource materials and practice gathered in cooperation with IAAF Member Federations, representing all six IAAF Areas and all levels of athletics development.

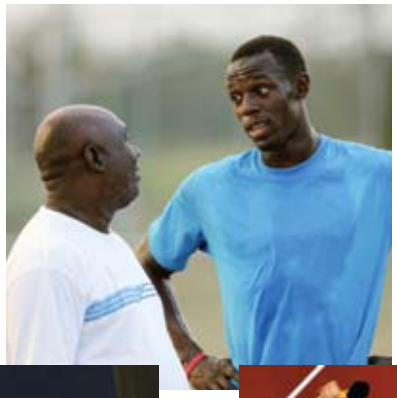
Acknowledgements

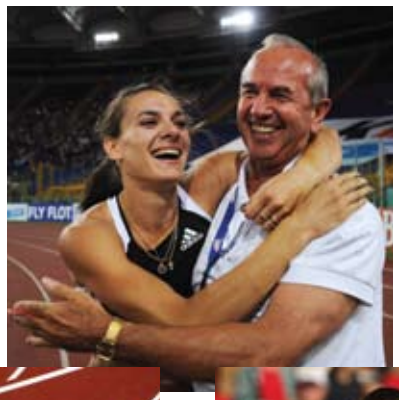
The completion of this book was made easier by the work and assistance of a great many expert colleagues around the world. In particular, the IAAF would like to acknowledge the contributions, in alphabetical order and not in order of contribution, of the following individuals:

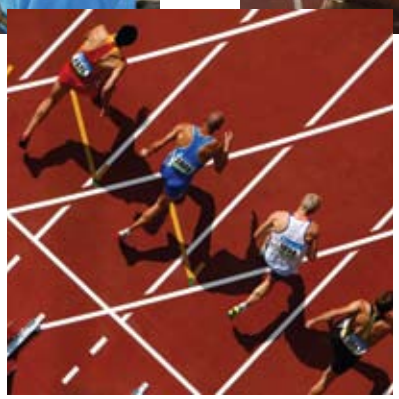
Clive Brewer (GBR), Penny Crisfield (GBR), Jim Denison (USA), Frank Dick (GBR), Oscar Gadea (URU), Antonio La Torre (ITA), Lenford Levy (JAM), Elio Locatelli (ITA), Victor Lopez (PUR), Linda Low (GBR), El Hebil Abdel Malek (MAR), Fletcher McEwen (AUS), Ralph Mouchbahani (GER), Tahar Righi (ALG), Wolfgang Ritzdorf (GER), Loren Seagrave (USA), Joel Severe (MRI), Alain Smail (FRA), Augustine Soga (NGR), Debbie Strange (NZL), John Velzian (KEN), Jorge Vieira (POR).

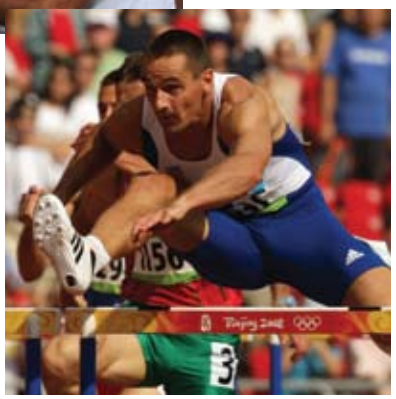
1

DEVELOPING A COACHING PHILOSOPHY









Developing a Coaching Philosophy

You may think it strange to start a practical book about coaching by talking about philosophy. Yet nothing is as practical as a well developed philosophy of life and of coaching. This philosophy determines every thought, every action and every decision you make. No matter who you are, from where you come or how you come to be in coaching you bring ideas, opinions and attitudes from a lifetime of personal experience. Take this opportunity to examine how well you know yourself and what you want to achieve as a coach. Without this knowledge it is difficult to have a well defined philosophy. Without a well defined coaching philosophy it is difficult to be a successful and effective coach.

What do we mean by Philosophy?

Philosophy is simply the way you see situations and experiences in your life. It is the way you view people and develop relationships with them. It is also the value you put on all of these. You already have a philosophy of life and this may be well developed. You may be aware of your philosophy or you may be unaware, behaving and doing things without giving much thought to the reasons for your decisions. Whether you are very aware of your philosophy, partially aware or completely unaware, this personal philosophy is always developing and will do so throughout your life.

What is Coaching?

The term 'coaching' is often used to cover a wide range of activities, usually to help someone prepare for something. Coaching in athletics has been described as the organised provision of assistance to an individual athlete or group of athletes in order to help them develop and improve.

Many people would claim to help in this way, for example, parents, teachers, officials and sponsors. So what does coaching really involve? Coaching involves teaching, training, instructing and more. It is not simply about helping people to learn sports skills, improve performance and reach their potential. It is also about recognising, understanding, respecting and providing for the other needs of athletes. These needs are many and cover a wide range such as social and emotional needs, as well as the more obvious needs related to athletics and competition.

As a good coach you should have a code of behaviour based on a code of ethics which places the rights and needs of your athletes before those of yourself. You will need to develop a caring and continuing relationship with the athletes you coach. Participation in athletics is a social process. Your coaching will therefore have great power to shape the lives of your athletes through this social process.

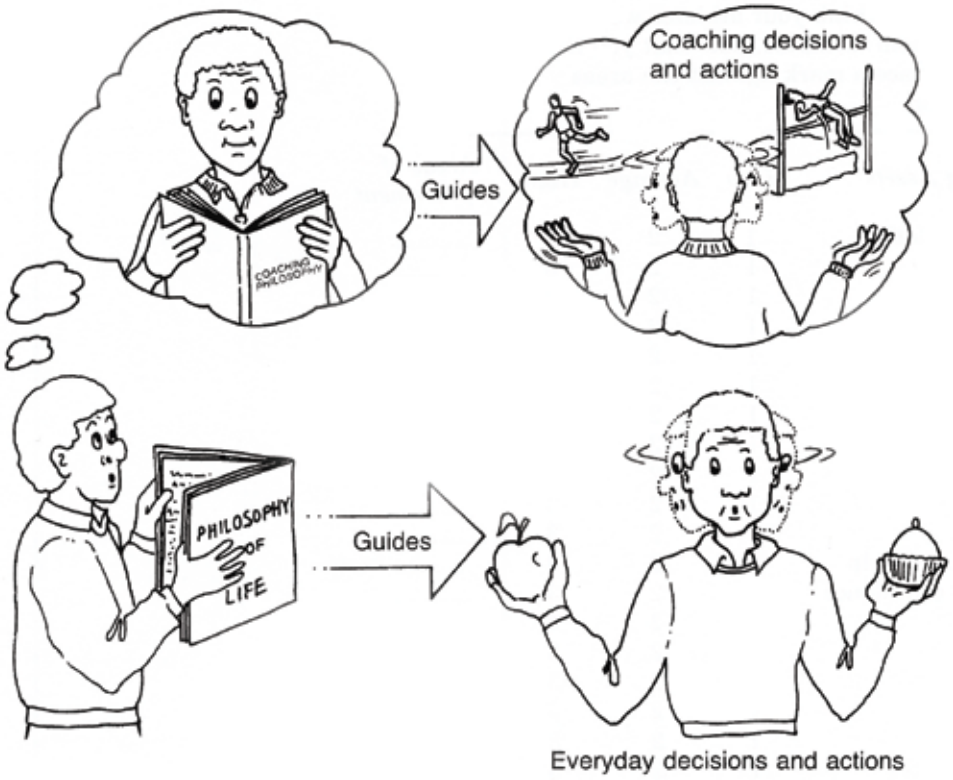
The Roles of a Coach

It is possible to see your only job as a coach in setting exercises and tasks to bring about changes in performance. Experienced coaches will point out that this is only part of the picture. As a coach you will have many jobs and functions. Some you will perform willingly, others will be less attractive to you, but are just as important. All these jobs or roles contribute to being a successful coach.

Ask yourself now, "Do I, or can I, play the role of a…"

teacher	- imparting new knowledge, skills and ideas
trainer	- improving fitness
instructor	- directing activities and practices
motivator	- generating a positive and decisive approach
disciplinarian	- creating an environment for each athlete's self-control
manager	- organising and planning
administrator	- dealing with the paperwork
publicity agent	- promoting athletics within society and possibly with the media
social worker	- counselling and advising
friend	- supporting
scientist	- analysing, evaluating and problem solving
student	- always willing to listen, learn and look for new knowledge

In most coaching situations any or all of these roles are combined and in all these situations you will need to make decisions. Your philosophy of life guides everyday decisions, while your coaching philosophy guides all the decisions you are faced with and encounter as a coach. So coaching calls upon many skills that are gained by experience and knowledge. This knowledge can be learnt but means little without practical application, that is the experience of coaching.



Philosophy guides your decisions and behaviour

Developing a Coaching Philosophy

The key to developing a coaching philosophy is knowledge. Knowledge of yourself and knowledge of what you want to achieve, your objectives. In the same way that it is difficult to make a journey if you don't know the destination, it is unlikely you will reach your coaching objectives if they are not clearly known to you.

Knowledge of Yourself – Knowing Who You Are

Why do you coach or want to coach? What do you value most in coaching? Are you, or will you be, proud of how you act as a coach? These and many more questions you could ask yourself. The following characteristics have been used to describe successful coaches and can be considered as 'coaching strengths'. Get to know yourself better by completing the following table and rating yourself on each of the following statements.

Coaching Strengths - a Self Evaluation

The following statements describe qualities and behaviours of effective and successful coaches. As you read each statement, fill in the circle ❍ you think your athletes would choose. This may not be what you would want them to choose, but should be what you think they would actually choose.

Place a check mark ✓ against all the areas you think you need to improve on.

	Poor	Average	Excellent	Areas of Improvement
Respects each athlete	❍	❍	❍	_____
Prepared and organised	❍	❍	❍	_____
Fair in the treatment of each athlete	❍	❍	❍	_____
Relaxed	❍	❍	❍	_____
Listens as much as 'tells'	❍	❍	❍	_____
Enthusiasm for all coaching roles	❍	❍	❍	_____
Provides a motivational environment	❍	❍	❍	_____
Knowledge of athletics	❍	❍	❍	_____
Adaptable	❍	❍	❍	_____
Patient with all - not just the best	❍	❍	❍	_____
Identifies and rewards effort	❍	❍	❍	_____
Builds each athlete's confidence	❍	❍	❍	_____
Behaves in a consistent manner	❍	❍	❍	_____
Makes training focussed and fun	❍	❍	❍	_____
Respects other coaches and officials	❍	❍	❍	_____
Encourages all	❍	❍	❍	_____
Provides a positive role model	❍	❍	❍	_____

Knowledge of Objectives - Knowing What You Want to Achieve

If you ask coaches what they want out of coaching the answers usually include:

- Winning
- Fun
- Athlete Development

You may think that all three are important, but which is most important?

An athlete's development is affected by the importance placed on winning or losing. Striving to win is always important. A 'win at all costs' attitude, however, ignores the development of the athlete. It is an attitude frequently used by those coaches who judge themselves by how well their athletes finish.

By contrast, the view taken by many successful and experienced coaches is to place the long term development of the athlete as the single most important consideration. An emphasis on the development of the athlete is more likely to produce better performance, greater consistency and more satisfaction for the athlete and coach than an over emphasis on winning. Competition then becomes merely a challenging and satisfying way of measuring personal development. This philosophy has been expressed many times as:

"Athletes First, Winning Second"

It means:

- Athletics is seen as one aspect of a person's life not his whole life
- There is respect and appreciation of the coach and his work
- Athletes decide with the coach the importance of performance and strive to meet their joint expectations
- There is respect for the laws and spirit of fair competition
- Athletes reaching their potential is seen as success
- There is respect for opponents, other coaches and officials

Athletes first, winning second is an easy philosophy to understand, but more difficult to put into practice. As a coach you must decide for yourself the relative importance placed on your athletes' development and winning. That decision should then be followed not just in words, but by every coaching action you take.

This applies when things are going well, but more especially when they are not going so well.

Philosophy and Coaching Styles - Becoming a Better Leader

In the past the often accepted role of the coach was to be a dominant, authoritarian leader with the athlete as a disciplined follower. In the modern world the athlete is exposed to wider views and his vocabulary has expanded to include the word "why?" This should not be seen as a challenge of the coach or his position, but a healthy curiosity and involvement with their learning on the part of the athlete.

Most coaches, who were athletes, tend to coach in the style that they were coached themselves. This is sometimes effective. To become a better coach you should look carefully at the coaching or leadership style you use most of the time. A good leadership style comes from your coaching philosophy and your personality and allows you to communicate more effectively with your athletes. In simple terms we can identify three distinct leadership styles, authoritarian, cooperative and casual. The characteristics of the three styles are compared in the following table.

	Leadership style		
	Authoritarian	**Cooperative**	**Casual**
Philosophy	Win centred	Athlete centred	No emphasis
Objectives	Task objectives	Social & Task objectives	No objectives
Decision making	Coach makes all decisions	Decisions are guided by coach, but shared	Athletes make most if not all decisions
Communication style	Telling	Telling, asking listening	Listening
Communication development	Little or none	High	None
What is 'winning'?	Judged by coach	Judged by athlete and coach	Not defined
Athlete development	Little or no trust in the athlete	Trust in the athlete	Trust not shown
Motivation	Sometimes motivates	Motivates all	No motivation
Training structure	Inflexible	Flexible	None

Comparison of Leadership Styles

The authoritarian and casual styles are extremes and unlikely to be successful methods of coaching. The cooperative leadership style gives guidance and structure but also allows the athlete to develop physically, psychologically and socially. This style is more in line with the philosophy of "athletes first, winning second". Sometimes the coach will need to move more towards the authoritarian style of coaching. This could be in a disciplinary situation or when safety is of primary importance, as in coaching the throwing events. Good coaches will be able to modify their style according to the athletes and their situation. The coaching style that is recommended for most situations is the cooperative style.

The Coach-Athlete Relationship

Is it possible to be successful in athletics without a coach, with no coach-athlete relationship? Certainly, there are some who think so. Do athletes really need coaches and do we need to consider the importance of coach-athlete relationships? Probably the first thing that decides whether an individual athlete 'needs' a coach is their age, their stage of development in athletics, what they want to achieve and their personality. It may also depend on the area of athletics they are most interested in.

There are probably more self-coached athletes in the endurance events than there are in the 'power' events of the throws, jumps, sprints, hurdles and combined events. And, within the endurance events, there are probably more self-coached athletes in road and cross country running than there are in middle and long distance track or race walking events.

In the distant past coaches were not as plentiful as now and many athletes were basically self-coached through necessity. Most of the 'coaching', when ever and where ever athletes met, was in the form of 'wisdom' passed down from the senior and master athletes in the group. But over the past twenty years, since the late 1980s, the numbers of qualified coaches has increased globally with the combined effect of the coach education systems of the IAAF and some National Federations.

When the coach and athlete in athletics have come together it has usually been through a chance meeting, frequently in a club environment. Together, the coach and athlete have built and developed a working relationship. This relationship has reflected that coaching is a complex social encounter with many roles and responsibilities for the coach. We have also seen that much of a coach's development is not on a course where knowledge and learning are delivered and assessed formally but through the actual practice and experience of coaching, over time.

This traditional model of coaching was the coach-athlete relationship in relative isolation. If we were to give this arrangement a label it would be 'the escort system'. In this relationship there is an assumption that the coach has, or can acquire faster than the athlete, everything to support the athlete's development. Given that an athlete's development from starting athletics to achievement of their potential in athletics may commonly cover the passage from eleven years of age to the late twenties, we are talking about a relationship of sixteen or more years.

Realistically, how many coaches can commit to a coach-athlete relationship of sixteen years, or more? There have to be alternatives to the escort system if athletes are not to drop out of athletics, should they out-grow the availability of the coach's time, knowledge and skills, or the coach stops coaching. With the increasing understanding within the sport of the need for long term 'Athlete Development', coaches are aware that they should prepare the athletes that they are currently coaching to either be transferred from them to another coach at some time, or to be still coached by them but in a partnership arrangement with another coach.

The coach-athlete relationship can be based on one of three models, or a combination of these as the coach and athlete move through their developmental pathways:

- **The Escort System**
  - the coach escorts the athlete from the moment the athlete commences in athletics to the athlete's retirement from the sport
- **The Partnership System**
  - the coach recognises that they cannot meet all the needs of the athlete and works together with a more experienced coach to meet the athlete's needs
- **The Transfer System**
  - the coach transfers the athlete to another coach as the athlete moves through the educational, institute or club system or when the coach recognises that they can no longer meet the needs of the athlete.

Some countries have an automatic, education-based transfer system for the coach-athlete relationship within their schools and colleges. In the United States of America, for example, a child starts their athletics in the Junior High School and receives coaching before moving to a different coach at High School. The athlete then moves to another coach as they compete at University, before the final transition to their post-

graduate situation with frequently another coach. In the United States that is simply the way the coach-athlete system is structured. No Junior High School or High School coach expects to keep coaching an athlete once they have left their school.

Athletes naturally moving, or transferring, from one coach to another may not be the perfect system but it does develop a flexibility of approach for both athletes and coaches. And it is not only the athletes who can 'transfer'. Coaches can easily choose to move their situations professionally.

There are, however, potential problems to having a transfer system for coaches and athletes. A coach may be the most knowledgeable ever, the coach might have the best technical skills ever but if they cannot build and develop a relationship with an athlete they cannot coach effectively. An effective coach has the skill and ability to nurture and grow the coach-athlete relationship, a relationship that has to be mutually acceptable. This relationship has to be the 'right fit'. It should not be imposed, if the long term needs of the coach and athlete are to be respected.

The coach-athlete relationship has to be the 'right fit'

Many coaches in athletics do their coaching in a volunteer capacity in their own time. It is possible that a coach can have a 'real' job, a 'real' career, and still provide a 'professional' role in their volunteer coaching. Athletics cannot afford to pay all coaches a salary, nor can athletics currently afford to employ enough salaried coaches to take over and 'produce' all the stars. Volunteer coaches have played, and will continue to play, a vital part in the development of athletes. As a foundation for success there should be mutual respect between coaches receiving financial remuneration and volunteer coaches.

In the IAAF 'athlete-centred' model, the coach-athlete relationship is at the centre of the athletes' support network. The IAAF's competence-based coach education scheme encourages coaches to work together and also to support each other. The way forward for athletics is to share coaching expertise with an open-minded, problem-solving approach.

All coaches should recognise that there are different personal coaching systems and that the effective coach knows when to move from one to another. The escort, partnership and transfer systems each have strengths and weaknesses, it is identifying which is best for a particular athlete and coach at a particular time that is the key to success.

The IAAF Code of Ethics for Coaches

In this chapter we have read that each coach is capable of developing their own coaching philosophy. This is true and all coaches are encouraged to take the time to identify and develop this philosophy. But the philosophy should also be consistent with what is acceptable within the 'community of athletics'. To help guide coaches, the IAAF has published a Code of Ethics for Coaches. A summary of this code is reproduced in the back of this book on page 215. All coaches should ensure that their personal coaching philosophy is not only allowed to develop but that it continues to agree with and is consistent with the IAAF Code.

Drugs in Athletics

One of the greatest threats to fair competition in all sports is the taking of drugs designed to artificially enhance performance. These drugs are banned world-wide by national rules, by all international sport governing bodies and by the rules of the World Anti-Doping Agency, WADA. Prohibited drugs are a form of cheating and can produce long term medical problems for the athletes who use them. Athletics is taking the most active measures to remove drugs from training and competition through education of coaches and athletes, testing of athletes and, finally, punishment of offenders.

Drugs are a symptom of the 'win at all costs' philosophy and of ignorance on the part of the coach and athlete. The majority of successful coaches around the world have a well developed, balanced philosophy and use well planned, long term training programmes. This philosophy places athlete development first and produces performances at the highest international levels without drugs. There would be no use of drugs if all coaches followed in words and actions the "Athletes first, winning second" philosophy.

Paula Radcliffe - Marathon world record holder and vocal opponent to drugs and doping in sport

Discussion Topics

Get together with another coach and ask each other the following questions. Try to answer briefly in one or two sentences.

- Why do you coach?
- How would you like your athletes to describe you?
- What coaching style do you think you mostly use?
- What is the most important area for you to develop to become a better coach?
- Give examples of the "Athletes first, winning second" philosophy at work in athletics.

Work together with another coach or group of coaches to discuss the following statements and questions. There are no absolute correct or incorrect answers and you should be open to the views of others.

- "The best way to control drug use is through better education of coaches and athletes."
- A new drug is discovered that is not on the IAAF list of banned substances. The side effects of the drug are not known, but it is said to give an athlete a 10% improvement in performance. Would you give this drug to the athletes you coach?
- "You cannot be successful in international competition without using banned substances."
- An athlete you have coached for five years has made great improvement this season. It is now one week before your national championships. A reliable friend of the athlete confides in you that they have been taking anabolic steroids for the past 8 months. What actions would you take?
- "The best thing for athletics would be if coaches and athletes could use any drug that they wished."

2

DEVELOPING THE SKILLS OF COACHING

Developing the Skills of Coaching

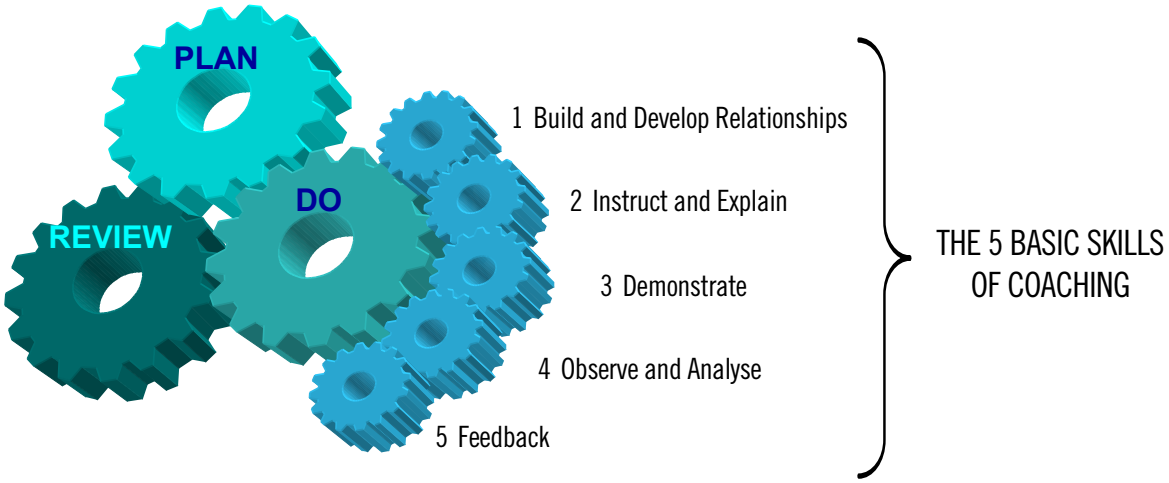
The process of coaching can be simply stated as a process of planning what you are going to do, doing what you have planned to do and then reviewing what you have done. This 'Plan-Do-Review' process of coaching is cyclical, repeated over and over, and involves the skills of planning, doing and reviewing. Many coaches when questioned say that they enjoy the 'doing' part of coaching most but all three areas combine to provide the coach and athlete with the best possible environment for progress and development.

The Cyclical Process of Coaching

In this chapter we will focus on the 'doing' of your coaching and look at the basic skills that the beginner or novice coach needs to develop.

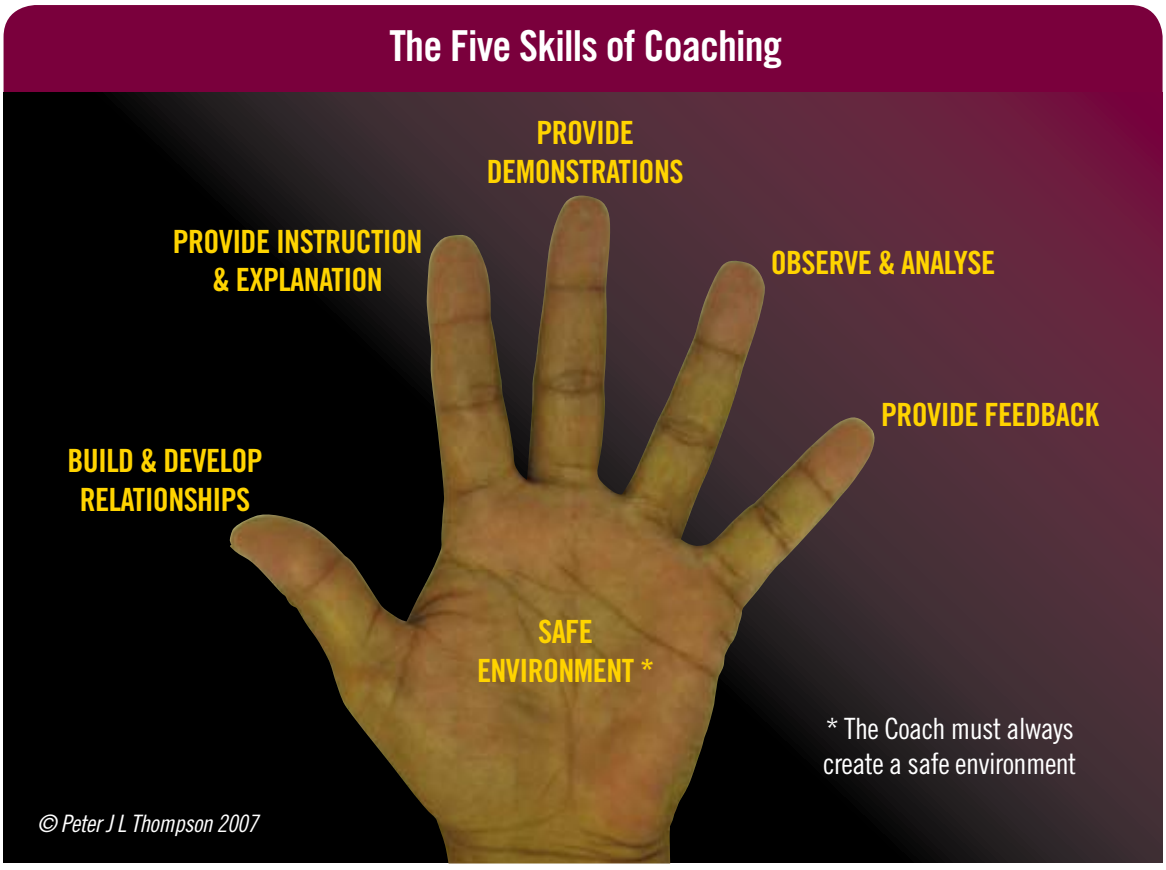
The Basic Skills of Coaching

When a coach first begins to work with athletes he tends to be initially focussed on developing his competence in the 'doing' of his coaching. With this competence comes confidence in working with athletes. This book focuses on the competence of 'doing' your coaching by identifying the five basic skills of coaching that all coaches should use as a foundation for their work with athletes. These are shown in the following diagram.



The Coaching Process and the place of the Five Basic Skills of Coaching

These five basic skills of coaching can also be represented on the fingers and thumb of a 'coaching hand'. In this section you will be introduced to additional 'coaching hands', one for each of the five basic coaching skills. The statements at each finger and thumb of these coaching hands will act as 'aide memoires' for the key points which contribute to the coach gaining competence in each of the five basic skills.



The Coaching Hand showing the Five Basic Skills of Coaching

Building and Developing Relationships – the Primary Skill of Coaching

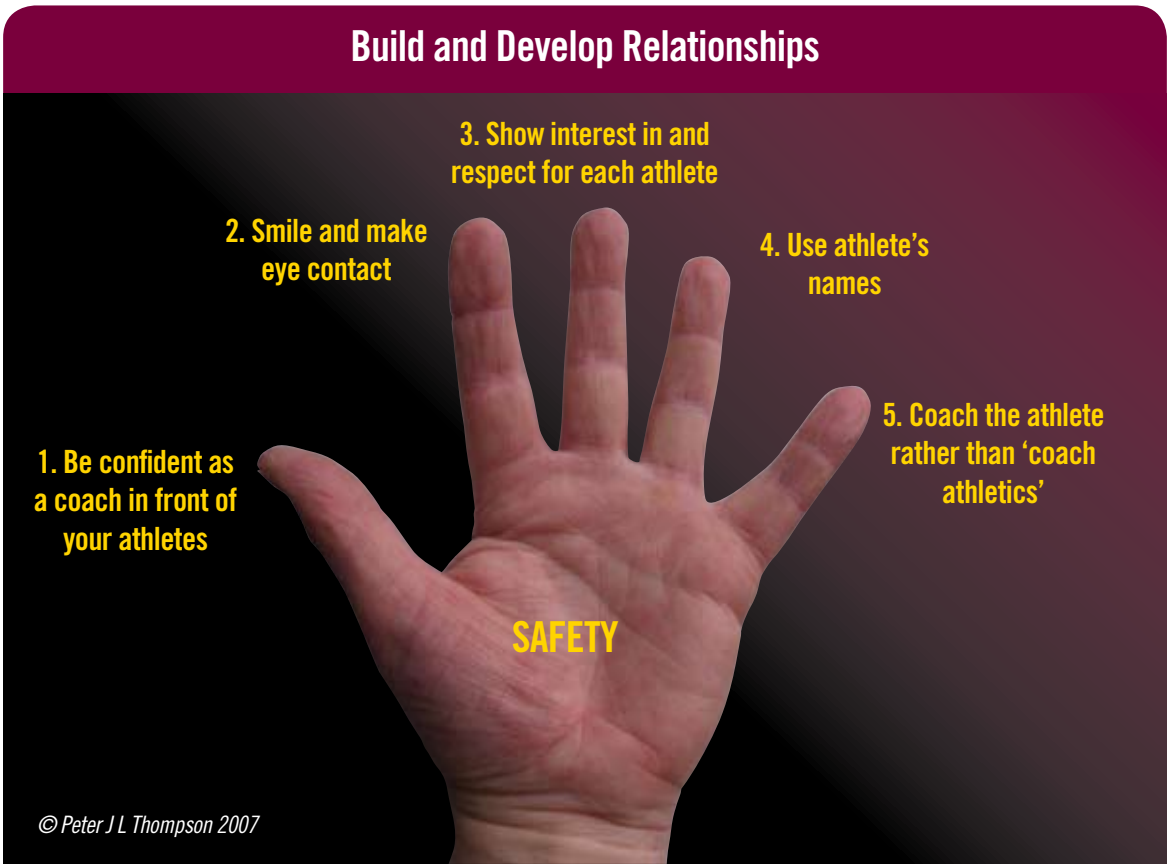
It does not matter how much knowledge a coach has, what qualifications they hold or what other skills of coaching they possess – if a coach cannot build and develop effective relationships with athletes, he cannot be an effective coach. This is the primary skill of coaching.

When you are in the presence of your athletes it is important that they view you as having an appropriate confidence at all times. This confidence will be reflected by the way in which you stand in front of them, communicate with them and how you are seen to communicate with others. If you are not familiar with the athletes you are coaching, it is important to smile and make eye contact. It is often beneficial to establish eye contact before making an important point, even if you know your athletes very well. If the sun is bright and you or your athletes are wearing sunglasses, it may be helpful to remove these sunglasses before speaking.

If you are working with a group of athletes it is very easy to fall into the trap of focusing your attention on one, or only a few, of the athletes in the group. This might be because it is always easy to identify and feel comfortable with the best performers in any group. But this approach is not consistent with the philosophy of 'athletes first, winning second'. Any athlete striving to win and not winning should be as valued, and feel as valued, as much as an athlete who can win with ease.

The coach should also understand that each athlete expects a different amount of attention. Some athletes in a group may seek all the coach's attention while others may seek none at all, due to shyness or lack of confidence. It is important then that the coach provides a balance. By showing interest in and respect for all athletes in any group the coach sends out a message that each individual is of equal worth. This helps the attention-seekers to understand the needs of others and builds confidence in the withdrawn or shy individuals.

A coach should, at the very least, know the names of each athlete that they are coaching. This is easy if you are regularly coaching the same athletes but less easy if you are working in a situation where you are continually coaching athletes who are 'new' to you. In these situations you can develop ways to remember the athletes by, for example, repeating their names in your head each time you look at them during a coaching session. If there are just too many or you simply cannot remember their names, then using name tags can be useful. Every individual likes to be recognised by their name and this is true for all athletes as well.



The Coaching Hand – Build and Develop Relationships

Beginner coaches have many areas to develop as they begin to coach. Some like to collect a great deal of knowledge about athletics and focus their attention on this knowledge – the 'what' of athletics. More effective coaches also develop their knowledge but use the knowledge as a foundation for the 'how' they do their coaching – the five basic skills of coaching. It is important that each coach sees and recognises the unique needs of each individual athlete in front of them. If the coach has a focus on the knowledge, the 'what' of athletics, they may miss identifying the needs of the athlete. That is why the effective coach uses their knowledge to meet the needs of each individual. They really do, "coach the athlete rather than 'coach athletics'".

Providing Instruction and Explanation – the 'Telling' Skill of Coaching

Coaches need effective communication skills. They need to be able to both give and receive information. Coaches need to do this with not just with athletes but with their parents, partners, other coaches, officials, administrators and all the other people who are involved in athletics.

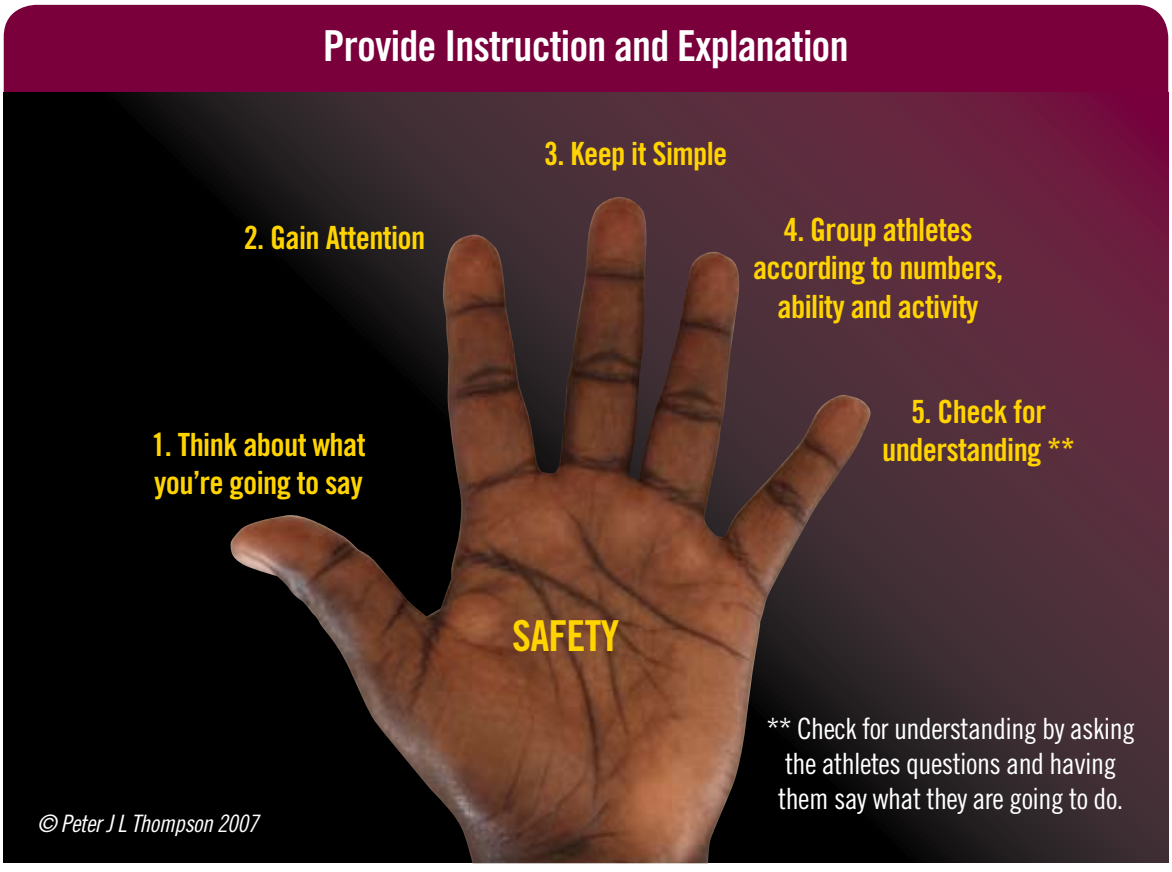
Providing instruction and explanation is, for the coach, the 'giving' or 'telling' part of communication and is necessary for conveying information and for organising people and groups. But coaches should never forget that good communication is always a two-way process.

When coaches want to convey information or organise they can 'tell' the information. This telling is very useful when time is limited, when something needs to be done in a specific way, when coaching a large or unfamiliar group and particularly when there are important safety considerations. Coaches use 'Instruction and Explanation' to organise athletes or to convey information, such as about the session to follow.

In providing effective instruction and explanation you should always start by planning in advance what you are going to say. This should be a brief, clear way to convey what you want. Try to plan what you are going to say using language that the athletes will understand easily.

Before you start speaking, gain attention. Athletes must be ready to listen to you before you start to speak. There are a number of ways of gaining attention such as a whistle, a raised hand or simply being silent as you look at all the athletes. Which ever method is used it is important to have the full attention of all athletes. For this reason, try to eliminate anything which will interfere or distract the listeners. To maintain this attention with a group you should make sure that they are placed so that all can hear and see what is happening. Face learners away from the sun and other visual distractions so that concentration is directed at you, the coach.

Keep what you are saying to a minimum and express the content in simple, jargon-free, language. Be sure that you are sensitive to the needs of differing cultures, genders and abilities. If you are working with athletes and need to organise them into groups, think about the needs and abilities of the athletes and the activity to be done and group athletes accordingly. For example, a single group of nine athletes long jumping would jump much less than three groups of three jumping from the side of the long jump pit. With three groups it might also be possible to have these grouped according to their stage of learning.



The Coaching Hand – Provide Instruction and Explanation

The final key point is something many coaches forget and only realise when the athletes do not do what the coach expected. Always remember to check for understanding. Do not simply ask the athletes if they understand for most will inevitably say, "yes", whether or not they have actually understood. Check for

understanding by asking questions and have them tell you what they are going to do, or to repeat what you have said.

Providing Demonstrations – the 'Showing' Skill of Coaching

For the coach, demonstrations can be a way of providing a visual picture of a technique or a drill. It does not mean that every coach should be able to demonstrate everything in athletics themselves. It does mean that every coach should be able to 'provide a demonstration', which may mean that they physically do it or that they provide the demonstration through other means.

Before using a demonstration it is important to decide:

- the purpose of the demonstration
- what type of demonstration you will use
- who should provide the demonstration

Demonstrations can be used for a number of purposes. They may be used with a new skill to introduce and show the whole skill. They may act as a 'cue' for an already learned skill. They may provide a simplified model of a skill or be used simply to motivate or inspire. They may also be used to illustrate a particular point. For example, instead of giving feedback after watching an athlete, the coach does the demonstration again but this time emphasising the correction to any observed fault.

Demonstration has been shown to be a very important tool for helping novices in the first stage of learning when they are trying to gain a picture of what is required. Also, young athletes who are learning a new movement tend to very good at imitating the movement if they can see it demonstrated. This demonstration must be both:

- accurate – provides a correct image, one that provides an accurate demonstration of the technical model
- appropriate – to the level of the athlete, one that provides an image that is possible for the learner to copy.

Checking the purpose of the demonstration is a good way of ensuring that a demonstration is the right coaching aid and also helps to determine the type of demonstration required.

Types of Demonstration

Demonstrations can be live, provided on video or by still pictures or photographs. All provide a visual image and each has advantages and disadvantages:

- A live demonstration can be quickly organised, can be viewed from different angles and can be adapted readily to the needs of the group. For example, just one part of the action can be repeated for emphasis.
- With a video you know exactly what image you are going to show but a live demonstration cannot be guaranteed in this way. It can also provide a more accurate image that can be replicated over and over again without fatigue. It can also be viewed in slow motion or 'frozen' to analyse a specific movement or position. However, it takes time to organise and is not always easy to have

available where it is needed.

- A still picture or photograph may be of limited value because it provides only a snap shot of the action. However, when used as a sequence of 'stills' they can be used as a quick and easy reminder of key positions. Wall charts have long been used in training facilities as an ever-present reminder of technique.

Video can also be used very effectively for providing feedback to both coaches and athletes but this use is not for 'providing a demonstration' and using video in this way should not be considered in this section.

If you decide to use a live demonstration, you need to consider who demonstrates, and can provide an accurate image. If you can confidently and competently demonstrate the action accurately in accordance with the technical model, you may choose to demonstrate it yourself. You can be sure of your own performance and can stress the necessary parts. As long as you provide an accurate image of what you are asking them to do, this is good.

Alternatively, you can choose to use an athlete. The athlete may come from within the group or, more usually, from outside the group using a more experienced athlete. Always remember to have the athlete demonstrate to you in private the skill you want to see before you bring the athlete in front of the group. The advantages of using an athlete is that it can be highly motivating, may be clearly achievable for the rest of the group and you are able to stand away from the action and identify the one or two key points. However, unless you have checked before, you may not have an accurate model and the athlete may not be able to reproduce it consistently for you when you ask. You need to decide the best option to meet the purpose of the demonstration.

The coach may use an athlete to provide the demonstration

A coach may provide a demonstration

The following table provides a summary of the advantages and disadvantages of different demonstration methods:

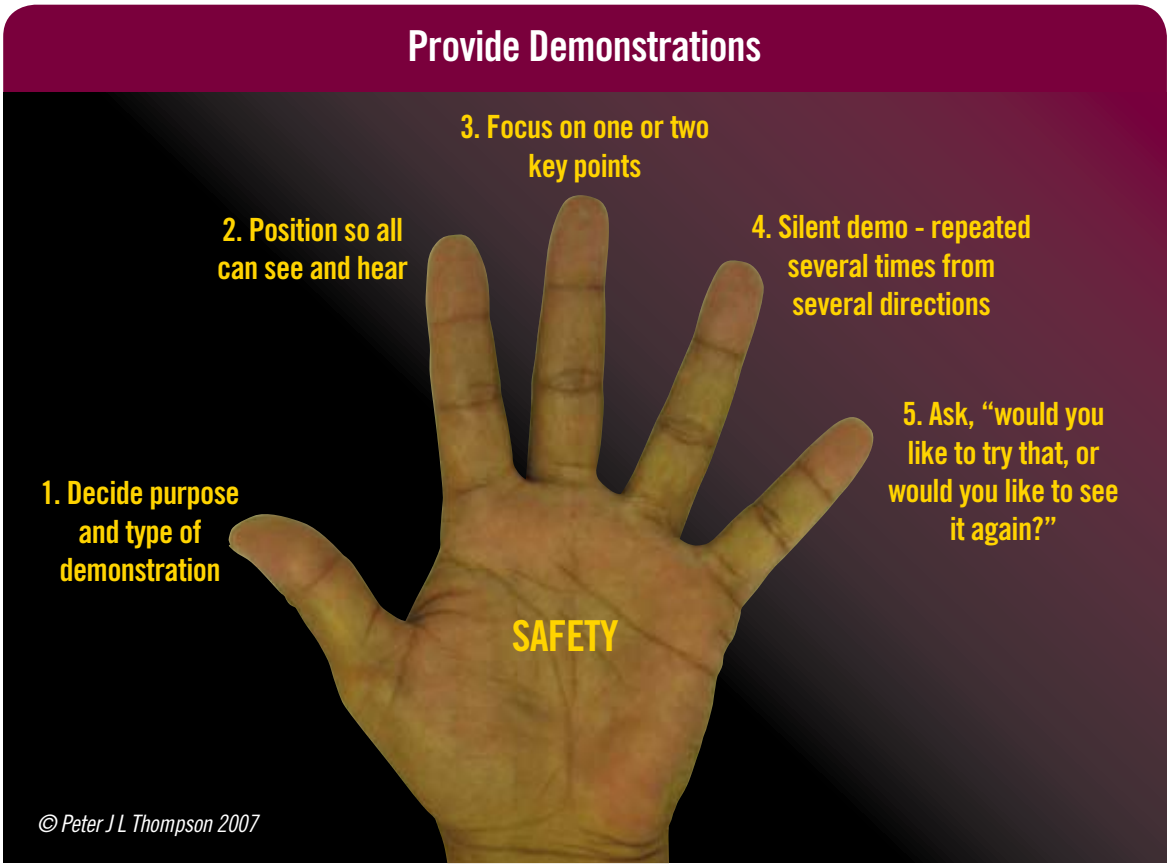
Demonstration Method:	Coach uses video	Coach demonstrates	Coach uses athlete to demonstrate
Advantages	☺ Unlimited replay ☺ Accurate, expert model ☺ Slow motion and freeze frame ☺ Consistent image	☺ Quickly set up ☺ View different angles ☺ Adaptable to group ☺ Trust and influence ☺ 'Coping' model	☺ Quickly set up ☺ Physically able ☺ Identification with and by athletes ☺ Experienced model ☺ View different angles ☺ Adaptable to group
Disadvantages	☹ Unrealistic model ☹ Passive involvement (physically) ☹ Two dimensional ☹ Only camera angle ☹ Takes time and equipment	☹ May not be physically able ☹ Possible inaccurate model ☹ Varies each time ☹ You are not in control of the group	☹ May intimidate – no identification ☹ Personality clash – no identification ☹ Possible inaccurate model ☹ Varies each time
When and with whom to use	✓ Can be used at all levels at all stages of learning. Usually before a session ✓ Use normal speed - slow speed - normal speed	✓ Very useful when introducing a skill to athletes in the earliest stages of learning ✓ During a session	✓ Using a senior athlete with junior/novice group ✓ Athlete from group to demonstrate learning – beginning /end of session

Comparison of methods of demonstration

Once you have carefully decided the purpose and type of demonstration and have begun the coaching session you will need to position the athletes so that all can see and hear the demonstration. It is important that the athletes are far enough away from the demonstration for them to see the whole movement. Inexperienced coaches tend to provide the demonstration too close to the athletes. Experienced coaches usually provide the demonstration at least 15 metres or more from the athletes.

The next step is to focus the athlete's attention on one or two key points. Be careful as you develop as a coach and are gaining more technical information about each event that you still need to provide only one or two key points for the athletes to focus on in the demonstration. The coaching skill now is to select the relevant one or two points.

Whichever type of demonstration is used, the coach should permit the athletes to view it in silence, without interruption by speaking to them. In a demonstration, athletes need to focus on one 'information receiving channel' and this should be the visual channel, what they are seeing in front of them. Also, if a coach is actually doing the demonstration themselves they will not be in the correct body position if they turn to speak to the athletes while doing the movement.



The Coaching Hand – Provide Demonstrations

Demonstrations should be repeated at least two to three times from several directions. The 'several directions' permits the athletes to see different things and the coach should identify the one or two key points for each direction so that the athletes are focussing their attention on these points. For example, it is difficult to view the head position and where the eyes are looking from the side. Watching from the front makes this easily visible to all. If possible, the demonstrator should move to provide the 'several directions'. If this is not possible due to equipment, such as in the hurdles, or safety, such as in the throws, then the group of athletes should move to different viewing positions.

When you provide a demonstration to beginners you cannot be aware of where their learning is and whether they have enough of a visual image to want to try it. Perhaps the best thing for the coach to do after having demonstrated several times is to ask the athletes a simple question, "Would you like to try that, or would you like to see it again?" The response of the athletes will tell the coach immediately where they are in their preparation to learn. If the response is, "Let me try it", they can move straight to practice the new skill. Frequently, however, an athlete will say, "Let me see it again please". From this response the demonstration should be repeated again, a few times, before the coach re-asks the question. An advantage of using this type of question is that it is athlete-centred and motivates the athletes because they are involved with the coach in setting the pace of their learning. If the demonstration is being used for a purpose other than introducing a new skill, such as a cue for an already learned skill, then this question need not be used as the athletes should already have a clear visual image of what they need to do.

It is also worth remembering that unplanned demonstrations can occur whenever you are coaching. All athletes, and particularly less experienced athletes, can learn a great deal by simply observing, copying and practising in the presence of more experienced and skilful athletes. Be careful though that the athletes they

observe show correct technique, as less experienced athletes will not be able to tell the correct movements from the incorrect ones.

Observe and Analyse – the 'Seeing' Skill of Coaching

Observation and analysis becomes increasingly important as your coaching skills develop and as your knowledge of the specific events and biomechanical principles develops. When this happens you now have detailed technical models which help you to focus your observation and provide a basis for your subsequent analysis. But even the beginner coach can begin to observe and analyse basic principles without knowing the specifics of an event. For example, was the athlete's movement from slow to fast, was it from low to high, which part of the body started moving first?

Focusing on a phase or body part can assist observations, whether it is a novice coach or an experienced coach who is watching an athlete. By breaking the action down in this way it is possible to see the parts in real time, at full speed. When you begin to learn about an event, the technical model for the event can guide your observations by identifying the phases and also the motion, or not, of the body parts through the action.

Technical models may include details on:

- how you might break down the action to improve your observation
- the biomechanical principles that permit the athlete to develop optimum force
- specific coaching points and tips on what to observe.

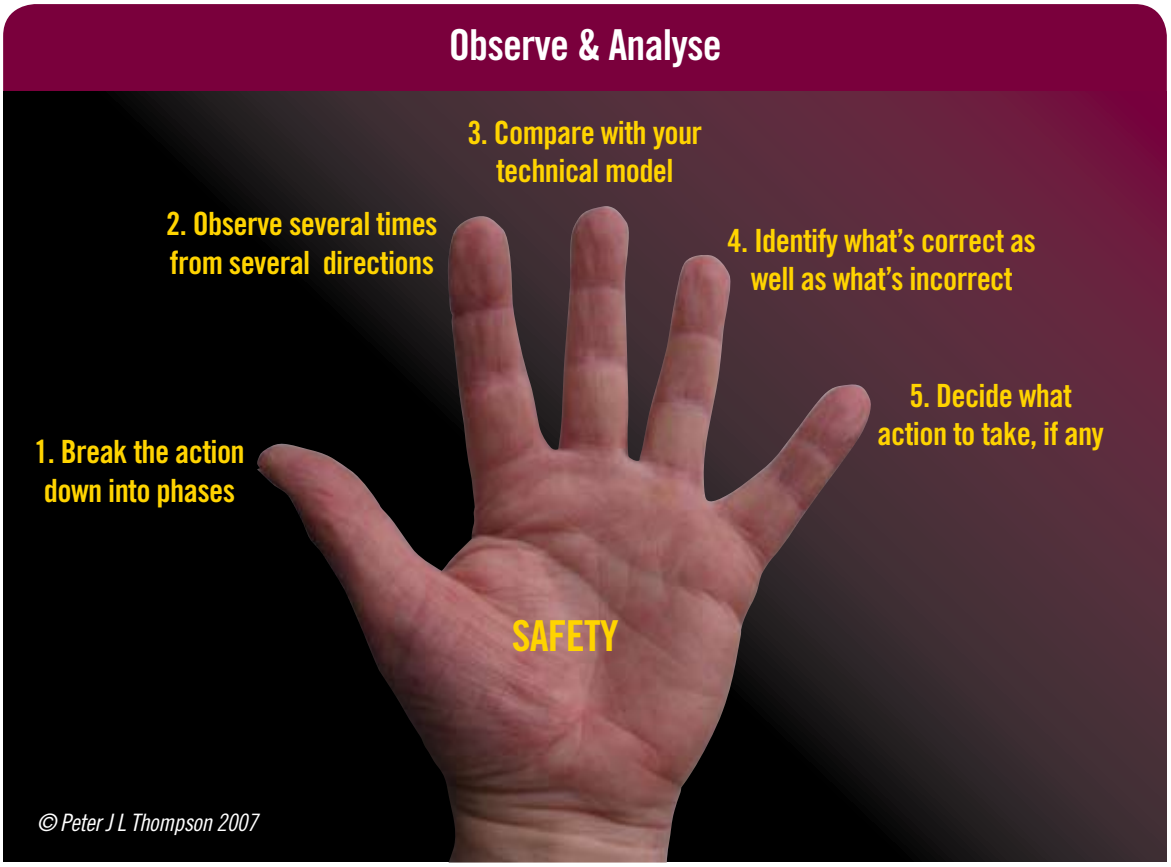
All this information assists your observation and analysis. For example, in biomechanics you may learn simple information on the 'Law of Reaction', Newton's Third Law of Motion which provides a clear explanation of the need to drive back forcefully against the starting blocks in order to maximise the speed forwards out of the blocks. Similarly, by understanding a little about projectiles and the importance of the speed and angle of release, you can focus your attention on this as the implement is released in any throwing event. Some knowledge of rotations in the air helps you to understand how to reduce forward rotation after take-off in the long and triple jumps. By studying the simple mechanical principles you will be able to focus your observation more easily on the key factors that will influence efficient movement whether it is in running, walking, jumping or throwing. The coaching points will also make better sense when you understand basic mechanical principles.

Think for a moment about observing any athlete carrying out a skill. Think, now, of an athlete who is learning a new skill. Is each attempt by this beginner likely to be same as the previous attempt or will there be great differences between one attempt and another? It is because there is this variation between attempts that a coach should always observe the action several times and possibly from several directions to view different things. If the athlete is very skilled it may appear that there is little difference between one, two or three repetitions of the skill but there will be small significant differences and a coach should still observe several times before proceeding. Always remember, the less skilled the athlete, the less likely the action will be consistent each time the movement is executed.

When you are observing think about how near or far you are from the athlete. Inexperienced coaches tend to stand too close to the athletes. Think for a moment about watching a jet aircraft flying high

in the sky. It appears to be moving across the sky slowly and yet it is moving at several hundreds of kilometres or miles an hour. Imagine now that same jet moving at the same speed just ten metres above your head. The speed now would seem incredible and you would hardly catch sight of the plane as it passed. The same principle is true as you observe athletes. The further you are from the athletes, the more the action is 'slowed down' and the easier you can see both the movement and the rhythm of their movement. For this reason, some experienced coaches will occasionally sit as far away as the top of the stands in a stadium to observe their athletes as they practice.

Always remember when you coach that you 'observe' with your ears as much as with your eyes. All of athletics is involved with rhythmic movements. You can see these rhythms of movement with your eyes but frequently it is the ears that really let you 'observe' and confirm whether the rhythm is correct or not.



The Coaching Hand – Observe and Analyse

Having now observed the athlete several times the coach must make a comparison with what they have seen and the technical model. It is as important for the coach to note what matches the model, what may be correct, as it is to note what is different from the model, what may be incorrect. Too often coaches focus their analysis only on 'faults' and 'fault correction', rather than identifying and building on what is correct. If the inexperienced coach only focuses on what is incorrect, the athletes often lose what they were doing correctly and become increasingly frustrated as they fail to progress. Experienced coaches frequently find that by focusing on what is correct the parts that are incorrect naturally rectify themselves. By focusing on what is correct the coach builds a solid movement foundation and, additionally, builds confidence and increases motivation in the athlete.

Having made your analysis and identified what is correct as well as what is incorrect, stop to decide what to do next. You may choose to either:

- Provide a demonstration emphasising the point you want the athlete to work on next, such as, "Watch this demonstration and note what my arms are doing." – This is particularly useful when the athlete is in the early learning stages and still trying to get a mental picture of what to do.
- Provide feedback – see the next coaching hand for 'Providing Feedback'
- Do nothing at present, perhaps ask to see it some more times, "Let me see it again."

What you decide to do will be based on your coaching experience meeting the needs of the athlete, taking into account their energy levels, motivation, concentration, confidence and skill.

Many people watch athletics as spectators, but coaches observe athletics in a different way. They want to help the athlete develop and so analyse their observations to understand the actions of the athlete. This combination of observation and analysis is given the term the 'coaching eye'. For a beginner coach you should practice observing before you analyse. As your coaching skills develop the combining together of these two actions of observing and analysing will become increasingly automatic. It is often said that good coaches watch and listen more than they speak - good observation skills are essential to the effective coach.

Providing Feedback – the 'Teaching' Skill of Coaching

Feedback is essential to learning. Without feedback the athlete will not know where to focus their attention to improve their performance. There are two main sources of feedback available to the athlete and these are:

- The naturally available feedback from within the athlete as a result of making a movement. This feedback is sometimes referred to as **intrinsic feedback** and is always present for the athlete but they may not always be aware of it.
- Additional feedback to the athlete that can be provided by some external source such as from a coach, other athletes, spectators, mirrors or from watching a video replay. This feedback is sometimes referred to as **extrinsic feedback**.

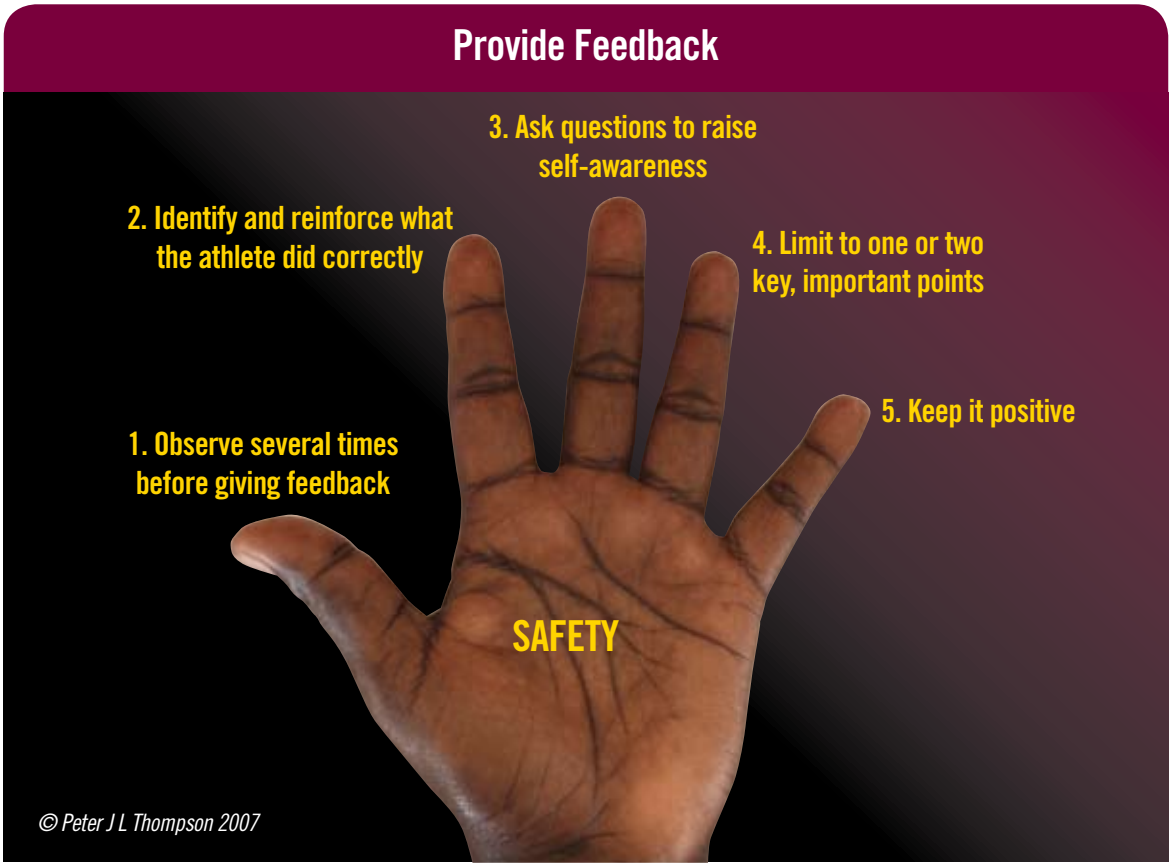
Both types of feedback are important and their relative importance depends partially on the stage of learning of the athlete. For example, at the initial stage of learning the athlete does not have a clear idea of what the movement should look and feel like. Consequently, the intrinsic feedback will be less usable for the athlete. The skill of providing feedback, if done well, will provide the type of extrinsic feedback which also helps to develop the athlete's intrinsic feedback.

It is, firstly, important to reinforce the need for a coach to observe several times before providing feedback. The reasons for this were emphasised when considering the skill of 'observe and analyse' and include identifying what are consistent actions against one-time actions. This means that the coach should provide their extrinsic feedback intermittently, not all the time. Constant feedback from a coach may produce rapid short term gains in athlete performance but slows down long term learning by not developing the athlete's ability to use intrinsic feedback. Constant extrinsic feedback can also make the athlete totally coach-dependent and not able to function in training or competition without the coach. The athlete-

centred approach to coaching encourages the athlete's self-analysis, self-determination and self-correction through their well developed awareness and use of intrinsic feedback. It gives ownership and responsibility for performance to the athlete.

Following the several observations, the coach should focus on what the athlete did correctly. Try to be specific when you do this and provide usable information. For example, "that was good" holds no real information. It might be better to say, "that was a much better effort because you held your posture well throughout the movement."

Raising the athlete's awareness of what is happening through questioning can be very useful, even for a complete novice in the first stage of learning. As the athlete progresses into the second stage of learning, however, they have a clear picture in their mind and also a feel for the movement. Coaches can encourage the use of intrinsic feedback for all athletes through careful questioning. For example, "what were you aware of at take-off?" "tell me what you saw when you were doing that sprint drill?" "what did you feel at release in those last three throws?" The coach may use follow-up questions to raise the athlete's awareness even more and so help them to make better use of their intrinsic feedback. Always remember to delay giving any additional extrinsic feedback until the athlete has had time to process the intrinsic feedback.



The Coaching Hand – Providing Feedback

As you develop your experience and knowledge as a coach it is easy to see more and more correct and incorrect things. The coach now has to use his judgement to decide on providing feedback for just one, or two, key important points. These should reinforce the most important correct action and providing correction for the most important incorrect action to help the athlete make progress. This should be expressed briefly in simple, understandable language followed by further practice.

How you provide your extrinsic feedback will set the learning climate for your athletes. You should always be honest but express this honesty positively to build each athlete's confidence. For example, it might be better to say, "Try to really explode and extend your leg and ankle off the take-off board", rather than, "Don't be so rigid at take-off."

When some coaches hear that they should, "Keep it positive", they feel they have to say to the athlete, "Well done", "Good effort", "Excellent!" regardless of whether the athlete has actually done something well or not. "Keep it positive" refers to the climate of practice that you create, not praising poor performance. Experienced coaches frequently sandwich criticisms between two positive statements, creating a so-called 'praise sandwich'. Doing this means that the athletes are both motivated and also know what they have to do to improve. For example, "You really put a lot of effort into that last attempt", a positive statement. Then, "Your arms were very passive as you sprinted. On these next attempts try to focus on your arm action and driving just the upper arms backwards, forcefully but relaxed", some critical feedback. Finally, another positive statement "Keep this effort up and you will continue to make good progress in your sprinting."

Video can also be a very powerful source of extrinsic feedback for athletes. In training, it can provide an almost immediate source of objective feedback that can be watched repeatedly, as well as slowed down for more detailed analysis. Comparison with previous sessions and video of competition performances can clearly reveal the athlete's progress.

It is often said that, "Effective coaches are effective communicators". The skill of communication is itself a foundation for the basic skills of coaching and all coaches should develop how they communicate.

Communication

The Skill of Communication – the 'Foundation' of the Basic Skills of Coaching

Communication is the two-way process of exchanging information between the athlete and coach, and assists motivation, goal setting and all skills learning. Success in coaching depends to a large extent on your ability to communicate effectively in a variety of situations and with people of all types and ages. Communication skills, like all skills, can be learned. Each individual has the potential to practice and improve their ability to communicate. Communication consists not only of sending messages but receiving them as well. Coaches tend to be very good in the sending area of communication but many times pay little attention to receiving.

As we have seen, coaches need to have effective communication skills to be able to both give and receive information. Coaches need to do this with not just with athletes but with their parents, partners, other coaches, officials, administrators and all the other people who are involved in athletics.

Most importantly, for coaches, the skill of effective communication is essential as a foundation for four of the five basic skills of coaching. These are:

- Build and develop relationships
- Provide instruction and explanation
- Provide demonstrations
- Provide feedback

The skill of 'Observe and Analyse' is done 'inside' the coach and involves receiving sight and hearing information and analysing this information. But, since there is no 'sending' in this coaching skill, the skill of communication is not involved.

Communication is not simply talking and listening. It also includes forms of non-verbal communication such as facial expressions, clothes and appearance and bodily posture. Verbal communication of sending and receiving is important. Non-verbal communication is of equal, if not more, importance as it has been estimated that over 70% of information between two people is carried non-verbally.



Every message a person sends is composed of two parts, content and emotion. Content refers to the information in a message and emotion refers to the feelings you have about the message. The content is usually sent verbally and the emotion, non-verbally. Emotion can also be transmitted not by what you say but how you say it. How you say something includes the qualities of speech such as volume, tone and

tempo. Choosing the correct speech pattern is one of the ways to make communication more effective.

Sometimes the communication between an athlete and a coach is ineffective and there may be many reasons for this. The coach may not communicate what was intended, the message may be wrong for the situation or there may be a lack of the verbal and non-verbal skills to send the message. The athlete may not be paying attention to the coach or he may misunderstand the message that is sent. Ineffective communication is not always the fault of the coach, nor is it always a problem with the athlete. Usually problems in communication lie with both sides, the athlete and the coach. If the coach develops his communication skills many of these problems can be avoided. Perhaps you should ask yourself, "How do I communicate most of the time?"

Assessing How You Communicate

This exercise will help you think about how you are delivering your messages to your athletes. Fill in the circle ❍ you think most accurately reflects how you communicate most of the time. Be honest and answer as you really do communicate, not how you would like to communicate.

	Never		Sometimes		Often
Think about what I am going to say before I speak	❍	❍	❍	❍	❍
Listen the same amount as I speak	❍	❍	❍	❍	❍
Think the athlete has something useful to say	❍	❍	❍	❍	❍
Use simple, appropriate language for the listener	❍	❍	❍	❍	❍
Clearly know how the athletes have interpreted what I have said	❍	❍	❍	❍	❍
I communicate consistently from day to day	❍	❍	❍	❍	❍
I encourage athletes to discuss things	❍	❍	❍	❍	❍
Check for understanding	❍	❍	❍	❍	❍
Listen well without planning what I am going to say next	❍	❍	❍	❍	❍
Am aware of my voice level and tone	❍	❍	❍	❍	❍
There is consistency between my voice and my body language	❍	❍	❍	❍	❍

Evaluating your Communication Skills

Developing Effective Communication Skills

The skill of communication is like any skill and can be improved by the correct practice. Evaluating your responses to the previous exercise can help you see any areas you need to improve. Effective communication involves the following skills:

- Learning to use your voice

- Developing non-verbal skills
- Developing questioning skills
- Developing listening skills
- Developing and maintaining credibility

Learning to Use Your Voice

The attention that athletes give to a coach is not related to how loud he speaks. Altering the volume, tone and tempo of your voice are ways in which speech patterns can make communication more effective. Good coaches vary their voice patterns to maintain interest in what they are saying and to emphasise important points. It is sometimes useful, for example, to pause for a moment before saying something very important as this focuses the athletes' attention on what is to follow the pause.

Developing Non-Verbal Skills

It has been said that non-verbal communication can convey over 70% of the information in a message. If the verbal message we are sending is correct and accurately sent it is essential that our non-verbal communication reinforces and is consistent with this verbal message. Coaches should be aware of how they communicate non-verbally in different situations and make necessary changes.

Developing Questioning Skills

Questioning is a really important part of the skill of communication. In coaching, it can be used for a number of purposes including:

- Getting to know your athletes, which is an essential part of building and developing relationships. This can help you to motivate them to stay involved in athletics, develop their skills and contribute to their personal development. For example, you might ask them, "What do you enjoy most about athletics? How are you getting on in your other sports? Are your parents interested in your athletics?"
- Finding out what they already know or can do. For example, "How would you describe a good warm up before a session?" "What are some important things to remember when hurdling?"
- Checking your understanding of what they have said. For example, "Let me check I have understood you correctly. Did you mean …?"
- Helping athletes to learn skills by involving them in their own learning, focusing their attention and raising their awareness or helping them find solutions. For example, "What were you aware of when you were in the 'set' position?" "How balanced were you at release in those last few throws?" "What could you do next time?"

A 'closed' question is one that has a "yes" or "no" response, a right or wrong answer or a single word. You may use closed questions occasionally when you are finding out what the athlete knows. An 'open' question is one that has no 'correct' response as it allows the athlete to express what they are thinking, what they are aware of. Open questions that start with 'what' are usually very good for asking the athletes to think and this raises their awareness. Avoid questions that begin with 'why' as they may seem to criticise the athlete and often result in a rather defensive response. Try to rephrase 'why' questions into other questions that begin with 'what', 'how', 'where' or 'tell me'. Really listen to the athlete's response.

Also avoid leading questions such as, "You do know what I mean don't you?" If you are only looking for

one particular answer, questioning is limited and you are not really listening but merely waiting for the right answer. One of the main reasons for the coach to reduce telling and increasing questioning is that it helps athletes to take responsibility, to solve problems and to make decisions.

To help you develop your questioning skills, try to:

- use questions rather than telling to provide a balance to your coaching
- think about the purpose of your question and use open and closed questions appropriately
- plan and phrase your questions carefully, keep them simple and avoid 'why' questions.
- really listen to answers, don't assume anything, check you have understood and then think before you speak.

Developing Listening Skills

We have already seen that communication is a two-way process and yet too often individuals may be good at telling and perhaps rather poor at listening.

Listening is, however, a key skill for an effective coach. You cannot build a good relationship without listening and you cannot learn everything about your athlete simply by watching. Asking questions, inviting comment and then really listening to what others say is a vital skill. Really listening? There is a difference between listening, half-listening, and really listening, actually hearing. Some people, are poor listeners; they half-listen Often they are more interested in planning what they will say next, working through their own ideas or moving on to something else.

Listening skills can be developed by using the following techniques:

Active listening

Being attentive - Look at the athlete, make eye contact, ensure posture, gesture and facial expressions show interest and that you are listening. Don't think about your response while they are speaking - trust you will know what to say or do next

Not interrupting

Avoid interrupting - One of the principal causes of poor communication is the coach interrupting the athlete before they have had the opportunity to fully express themselves. Never finish a sentence for them.

Agreeing

Show understanding - By nodding, repeating or re-phrasing what has been said at appropriate intervals, the coach can show he has understood the athlete's message.

Asking

Asking questions - Questions open up communication by inviting the athlete to clarify or expand on what they have said. If the question relates to what the athlete has said it clearly shows the athlete that you have really listened and heard what they have been saying.

Developing and Maintaining Credibility

Athletes accept, respect and are more likely to communicate with a coach who has credibility. This credibility is developed in a number of ways:

- **Knowledge of athletics**
  You should have confidence in what you know about athletics and also the confidence to let athletes know what you don't know. It is better to say "I don't know the answer to that, but I'll find out", than to guess an answer and be incorrect.

- **Talk only when necessary**
  If you talk too much athletes will not know what is important and what is not. Make sure that what you have to say is important and expressed in simple, clear language.

- **Clothes and appearance**
  How you look will affect people's opinion of you, especially in the early stages of relationships. Athletes like to feel pride in their coach and this is developed if the coach appears professional in dress, manner and preparation.

- **Behaviour**
  The behaviour of all coaches should be consistent with, and follow the spirit of, the IAAF Code of Ethics for Coaches.

Effective communication is the basis of good coaching. Without this communication it is difficult for the coach to pass information to the athlete. Both mental skills learning and physical skills learning are based on instruction and explanation, demonstration, practice and feedback. Developing effective communication skills will not only aid the process of teaching mental and physical skills, but help the coach in their skills of coaching and in all their various roles.

3

DEVELOPING THE ATHLETE

"You can't make the grass grow faster by pulling on the blades."

AFRICAN PROVERB

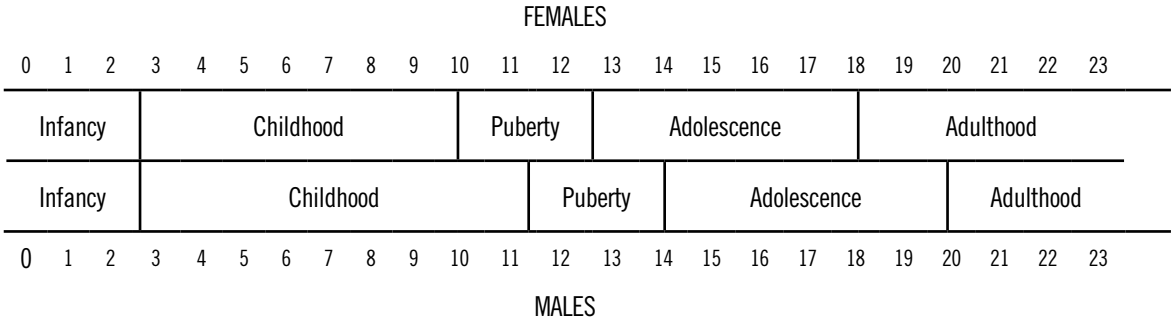
Growth and Development

As a coach you may work with athletes of any age and it is important to realise that growth and development is not just an issue with children and young athletes. Each of us grows and develops in different ways throughout our lives and this is the same for all the athletes we coach. But novice coaches frequently begin their coaching with younger athletes and an understanding of the specific needs and capabilities of children and adolescents is essential if the needs of these athletes are to be recognised and met.

Children are not just smaller versions of adults. They have very particular needs and capabilities. One of the major issues in children's sport can be a lack of knowledge on the part of coaches and parents about how children grow and develop. This ignorance places unrealistic expectations on the child and often causes them to give up the sport. Children have many sports that they can choose to do. That they choose to do sport at all, whether it is for recreation or competition, is a very positive thing. All coaches should work to ensure that the training programmes they plan are suitable for the long term, life-long physical and mental development of the athletes they work with.

Good coaches know and understand the many changes that take place from child to adult and structure their coaching to best suit the needs of the young athlete. In the following descriptions in this chapter it is assumed that children are receiving good levels of nutrition. Restricted nutrition and sickness will both affect the way in which a child grows and develops. This should be taken into account by the coach when deciding the needs of the child.

There are clear growth stages that children pass through from birth to adult. These stages are the same for boys and girls, but girls generally mature earlier than boys. This is clearly shown in the diagram below.



Stages in growth and development up to adulthood

Physical Development

Physical growth is obviously important to performance. We will start by looking at how the body changes physically during development. There are important changes in body size and proportions. These changes affect the way children can perform different skills and activities.

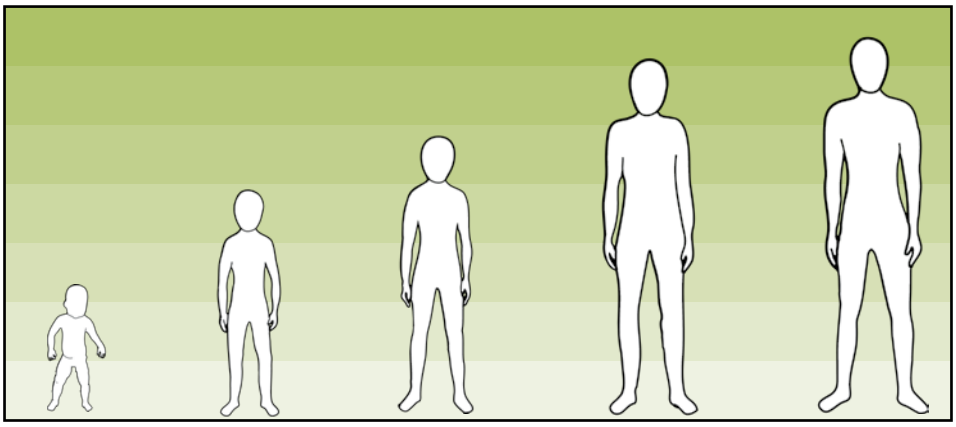
Patterns of Growth - Changes in Size

Children grow in size at a very fast rate. At birth infants are only about a quarter of their adult height. This final adult height is usually reached at about twenty years of age. There are four characteristic stages of

growth from birth to adult:

- Rapid growth in infancy and early childhood
- Slow, steady growth in middle childhood
- Rapid growth during puberty
- Gradual slowing down of growth in adolescence until adult height is reached.

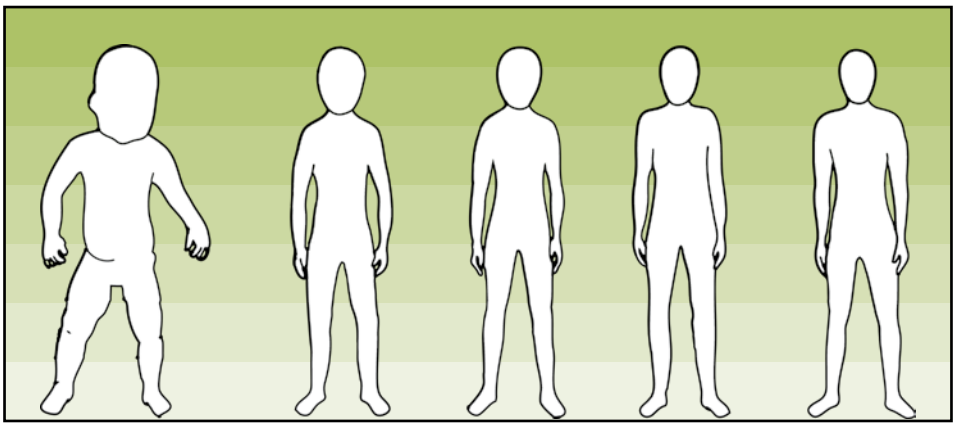
Both genders are of a comparable shape and size during infancy and childhood.



The increase in body size from birth to adult

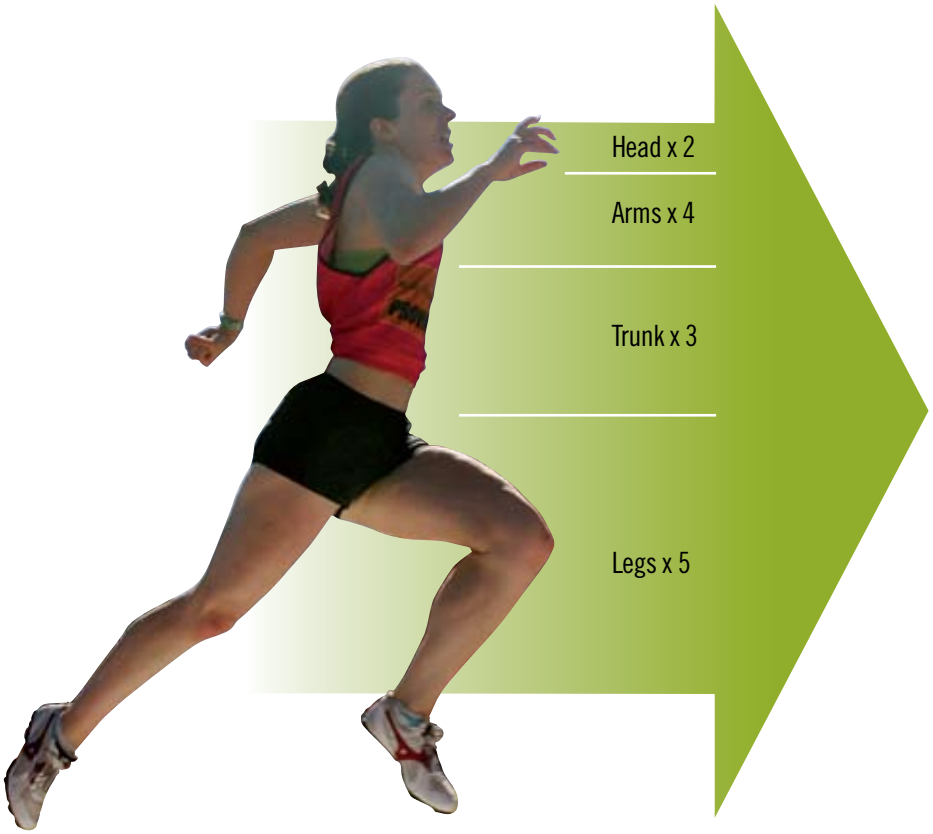
Patterns of Growth - Changes in Proportions

The physical proportions of the body at birth are very different from those of the adult. Some body parts grow more than others during development to reach the final adult proportions. The illustration shows the relative size of body parts at different ages.



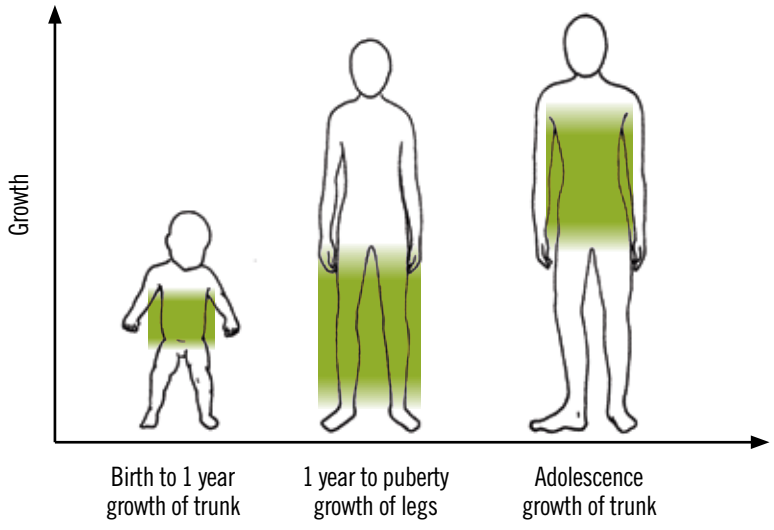
The changes in proportions from birth to adult

The head is proportionally large and the legs proportionally short during childhood. At birth the head is one quarter of the length of the body compared with about one sixth in the adult. The legs are about one third the length of the body at birth and one half in the adult. Because the body proportions change this means that not all of the body segments grow by the same amount.



Amount of growth from birth to adult

Changes in the size and shape of the body are also caused by different segments growing at different times. These changes in body proportions will have a great influence on how skills will be performed. For example, changes in the relative size of the head in childhood affects the balance of the body during movement and the relative shortness of the legs in the very young limits their running ability. At the beginning of puberty children have long arms and legs. They are better suited for running but the rapid growth may make them appear to be clumsy and to have difficulty in coordination.

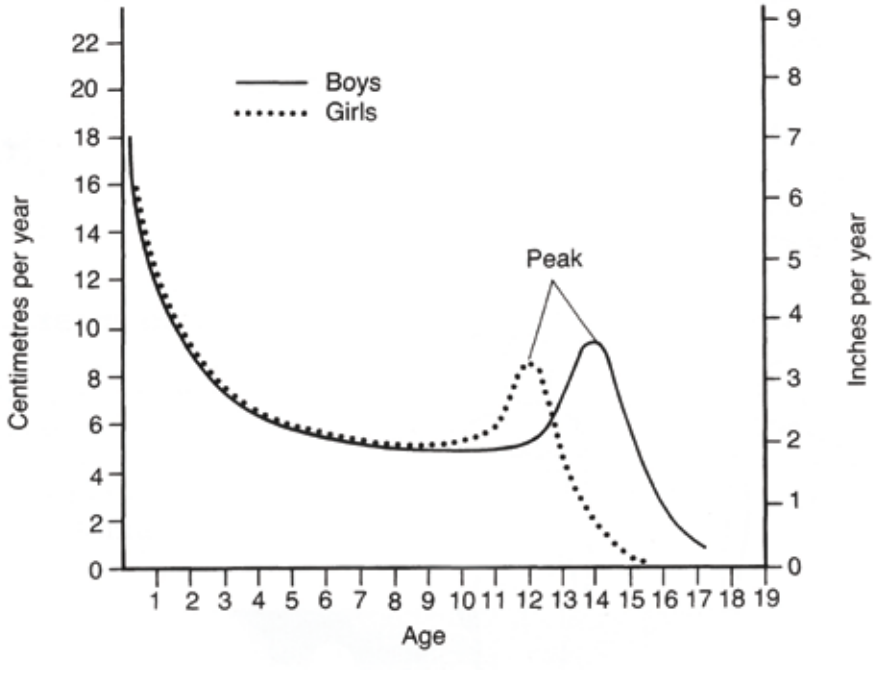


Areas of growth

Growth Spurts

When the rate of growth increases rapidly it is called a growth spurt. The most important growth spurt is the one which occurs at puberty. This spurt produces a rapid increase in both weight and height

The peak of this growth spurt occurs at about age 12 for girls and age 14 for boys. Before this growth spurt there are no important differences between boys and girls in weight and height. During growth spurts most of the child's energy is used for growing. Children will be easily tired and may not be able to keep up their usual volume or intensity of training. Light training will stimulate bodily growth if the child has enough energy.



Rate of height increase

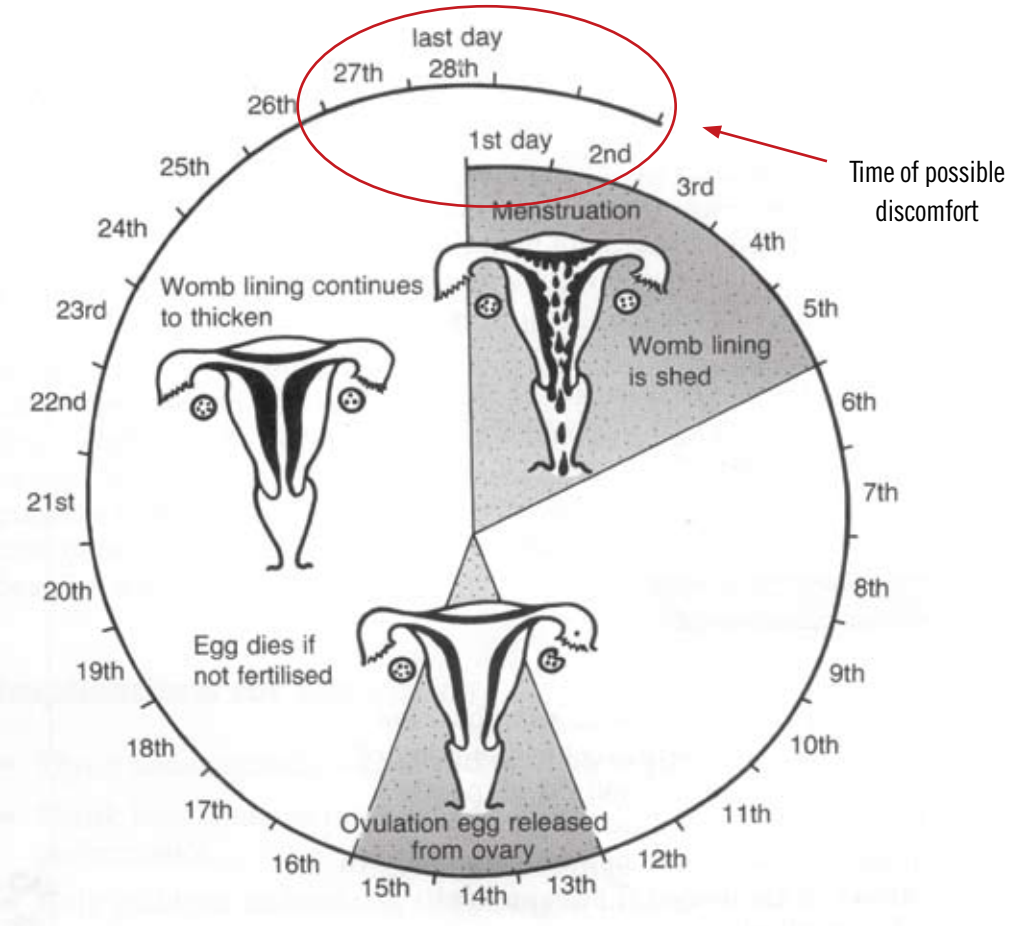
Differences Between Boys and Girls

The growth spurt and puberty occur at different ages for girls and boys. Girls usually start and finish the stages of puberty and adolescence earlier than boys. The characteristic differences between boys and girls occur at puberty in response to changes in hormones produced by the body. Typically, this results in broader shoulders and little change in hip width in boys and broader hips and little change in shoulder width in girls. These changes affect the way boys and girls move.

Wider hips in the girls result in the thighs being angled more inwards which can change their running action. This may be very frustrating and difficult for the athlete to understand. Knowledgeable coaches prepare their female athletes before the changes at puberty. There may be a period for the athlete when there is little or no improvement in athletic performance. Once the athlete has adapted to the new body shape progress can be made. This period of adjustment can take up to two years. Patience and encouragement from the coach during this time will be of most benefit to the young woman.

The sexual development which happens at puberty can bring physical difficulties for adolescent children, as well as causing them mental and emotional preoccupation. Coaches need to be particularly understanding with girls when menstruation begins. This may, but should not, inhibit their participation in physical activity.

Menstruation is a normal biological process that commences with the sexual development at puberty. Male coaches in particular should understand what is happening to the bodies of the female athletes they coach. At puberty girls start to produce mature eggs in their ovaries. They will notice this because each month they will lose a small amount of blood through the vagina. The onset of menstruation is known as 'menarche' and this is an obvious and key developmental stage for girls which provides precise information about their rate of biological development. This menstruation is also known as a 'period' and generally lasts for about five days. The illustration shows the changes that occur in the ovaries and womb during the menstrual cycle.



A typical 28 day menstrual cycle

An athlete should note the absence of menarche or any irregularities in the timing of her menstrual cycle and, as with any physiological irregularity, seek medical advice if necessary. A female's weight fluctuates naturally during her menstrual cycle and this may mean differences in the range of 0.5 kg to 3 kg. Good communication between the coach, athlete and parents can help reduce anxiety over what is a natural, biological process in the body.

Early and Late Developers

Each child develops at their own rate and some children develop earlier and some later than the average. For both boys and girls the age for the peak of their major growth spurt may frequently occur up to two years, or more, before or after the average age.

	Peak Growth		
Maturation:	Early	Average	Late
Boys	12	14	16
Girls	10	12	14

Ages for peak times for growth in height for boys and girls

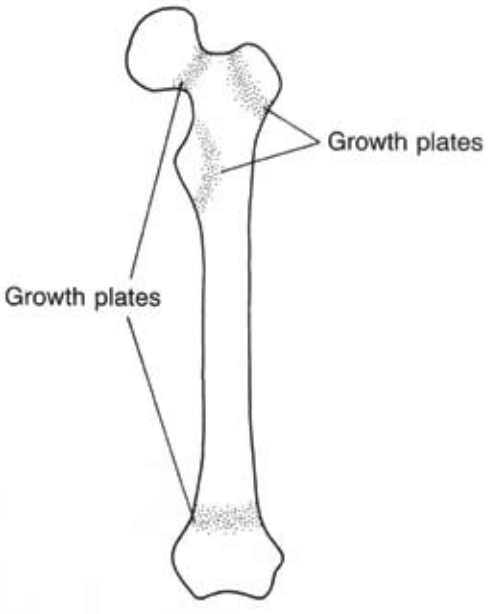
There can easily be differences of four years in physical development between children of the same chronological age. Thinking about growth stages and developmental age rather than age alone is perhaps one of the most important considerations when coaching young athletes. Early success may be due entirely to relative size and strength at the time if the athlete is an early maturer. As other children catch up, the early maturers may be left behind. On the other hand, the late developers are frequently overlooked if they are judged only on their performances.

Structure of the Body

The changes in size and proportion are the easily observed signs of development. They are the result inside the body of changes to the skeleton. The skeleton of a child is mostly cartilage, which is softer than bone and can bend. The process by which cartilage becomes bone begins very early in life in special growth areas in the bones. These special growth areas are called growth plates.

These growth areas in the bone are the weakest part of the bone. They can be easily injured by a sudden force or a repeated force. Mild forces can stimulate bone growth, but excessive forces can cause damage and have serious long term effects.

Excessive bounding or excessively repeated, vigorous throwing and jumping should be avoided during periods of rapid growth. Once the body stops growing the growth plates become solid bone and are no longer weak areas.



Growth plate of the thigh bone – the femur

Children and Exercise

Children do not tolerate exercise as well as adults. They are much less aware of their real limits. Children do not breathe as slowly or as deeply as adults. The average six year old child breathes in 38 litres of air to get one litre of oxygen. The average 18 year old needs only to breathe 28 litres of air to get one litre of

oxygen. This means that the younger the athlete the harder their bodies must work to provide the oxygen their muscles need.

The body has three energy systems. Two of these are capable of working without oxygen and the other is the aerobic system, using oxygen. The physical changes that occur during and after puberty will improve athletes' energy producing abilities. The relative amount of the improvement in each energy system may help decide what event or distance is best for a young athlete.

Implications for the coach

- Think about growth stages rather than ages
- Think how changes in physical proportions will affect performance
- Help children understand the changes taking place in their bodies
- Set standards of performance according to physical developmental age not chronological age
- Sometimes group children according to their physical development, using height and weight as a guide
- Encourage skill learning for all your athletes, late developers could be just as successful as others when they reach adulthood
- Don't use exercises which place excessive force on bone growth regions during periods of maximum growth.

Developing Control of Movement

Coaches who work with young children must spend a great deal of time teaching a foundation of basic skills and helping children to become more skilful. These basic skills include the movements needed for running, jumping and throwing. There should be a development of coordination in these basic athletics-like movements before specific event skills are attempted.

When children start to play, either on their own or under supervision, they learn skills. The degree to which they can learn particular skills depends on their maturation and experience, the teaching they receive and the difficulty of the task.

Maturation refers to changes which occur in the body over a period of time. Learning is the change in a person's performance of a task that comes from practice. While one particular performance may vary from another it is an indication of how well a skill has been learned. Both learning and performance are limited by maturation, not only of the skeleton and muscles but also of the nervous system.

The nervous system does not fully mature until early adulthood. The system includes the brain and all the nerves through which messages are passed around the body. Very young children are not as good at remembering or selecting important cues as older children. They cannot make decisions so well, and cannot control muscular movements so quickly or precisely. The young athlete's skill will be limited by their stage of development.

Children and adults both learn through applying previous experiences. The greater the opportunities a child has to move, the greater his chances to learn. The wider the range of movements and skills the child has a chance to practice the greater the range of experiences to draw on to put into specific event skills.

An essential task for coaches who work with young athletes is, firstly, teaching children foundation movement patterns and athletics-like activities. As they develop the children can move to the skills of athletics and commence systematic training. It is important that these foundation skills are taught at the level at which the children operate. Young athletes are not as fluent in language as adults. They need very clear explanations. They need to understand what they are trying to learn and then about how they should do it. Coaches frequently make the mistake of either not taking into account what children may already know, or assume children have more experience than they actually have.

The difficulty of the task is a significant factor for enjoyable, motivating learning sessions. The same task presents different difficulties to different people. The same task also presents different difficulties to the same person at different stages of their growth. The more complicated a task, the more difficulty young athletes may have in learning the task. This will show in poorer performances in the initial attempts. It is important to present the skill in a way that gives the greatest chance of successful performance. The more difficult the task for the athlete or group, the more practice time will be required.

Children's Basic Movements

Children learn different patterns of movement from birth. They go through stages as they learn the basic movements that later will help with specific athletic skills.

A child's basic movements

There is considerable variation in the age which different children go through the same stages. Some may have very immature patterns of movement at puberty or in adolescence. Others may have very mature patterns in childhood. The opportunities that are created by the coach can be very important in accelerating progress. For late developers the coach must allow the athlete to fully learn basic movements before going on to more advanced movements. What is clearly known is that for all athletes the basic movements can be coached, practised and improved, just as with any skill.

Children's Basic Capabilities

Compared with adults, children are limited in their ability to take in information, make quick decisions and evaluate their own performance. Because they have less experience than adults, children do not know the important things to look for in skills or situations. This means they need help in concentrating on what is important for them at the time. As they develop skills and gain more experience they are better able to take in and use more information.

Good self awareness and self evaluation depend on being able to correctly use available feedback. Better performance depends upon being able to assess one's own previous performance and making corrections when needed. Children sometimes find it difficult to evaluate their own performance since they are relatively inexperienced. Self evaluation can be developed by asking the athlete to concentrate on just one or two important points in practice and then using questions to raise self-awareness in the process of feedback.

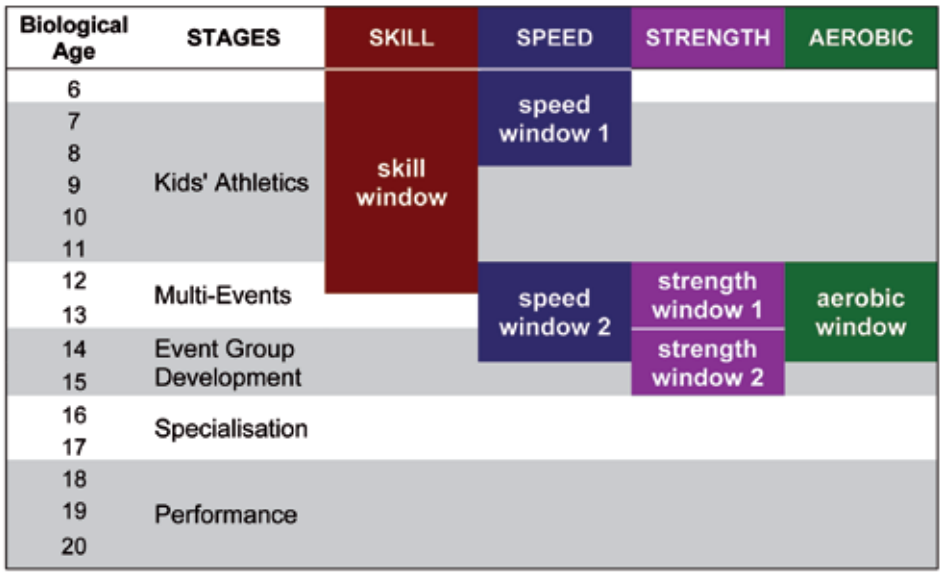
An understanding of what is happening inside the body as it grows and develops is essential in helping the coach know when is the optimum time to be doing certain activities. For the developing athlete the major changes occur in the structure of the body, the development of the nervous system, hormonal system and how they produce energy, their metabolic systems.

Developmental Windows of Opportunity

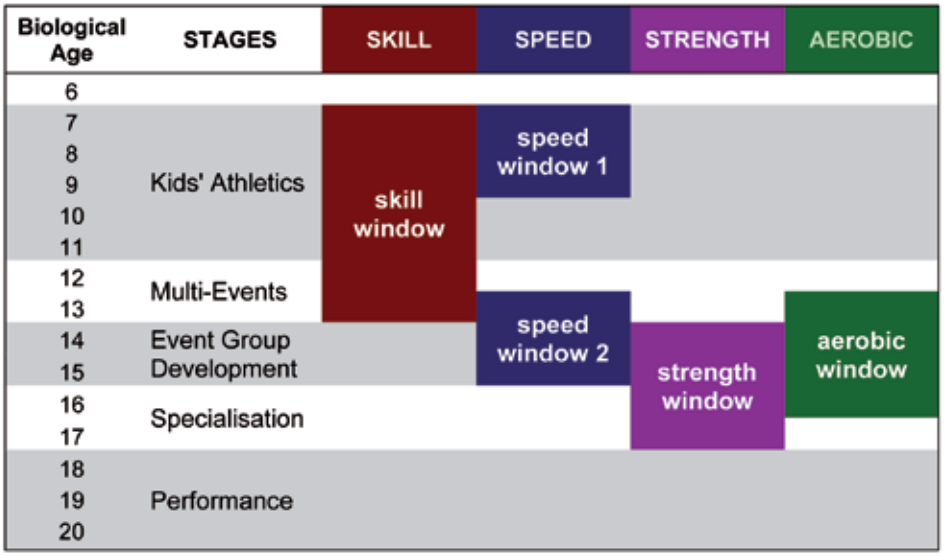
At birth and through infancy a child's nervous system is in place but is not fully developed. As the nervous system develops and matures in childhood it becomes capable not only of sending clearer messages down the nerves but also capable of sending these clearer, more precise, messages down the nerves at a quicker, faster rate. If an infant wants to make a big movement of the muscles this is very easy for them but they find it difficult to make small, precise muscular movements. The time when the nervous system has matured sufficiently so that the child can make and learn accurate muscular movement coincides with the time when the child can now make quicker movements. The time immediately following this nervous maturation can be considered as 'windows of opportunity' for the development of skill and speed.

In fact skill and speed are not the only components of fitness that have windows of opportunity. The diagrams for the developmental windows of opportunity for boys and girls show additional opportunities, for the development of strength, aerobic capacity and a second time for speed.

The years occupied by the 'skill window' have been recognised for many years as the 'skill hungry years' or the 'golden age for skill learning'. During this time there should be an ongoing emphasis on skill development through participation in Kids' Athletics and a range of other sports. Towards the end of the stage there should be progressively more attention on the athletics specific basic skills of all event groups using modified equipment. It does not mean that if a child misses this skill window they will never reach their potential. What it does mean is that experienced and effective coaches make use of this knowledge so that athletes do activities which encourage the development of the components of fitness for that 'window of opportunity' at the correct time. There is never a better opportunity to develop basic physical literacy than during the skill window.



Developmental 'windows of opportunity' in the young athlete – Females



Developmental 'windows of opportunity' in the young athlete – Males

The first 'speed window' is also related to the development of the nervous system and its ability to now carry messages much more quickly. This speed window does not mean that the athlete should now suddenly be doing 100m sprint repetitions. Instead there should be a development of reaction movements and quickly initiated movements. This can be done through a variety of speed-based, multi-directional movements and games based on activities lasting less than 4-5 seconds with adequate recovery in between.

The 'strength window' is related to the hormonal changes that occur at puberty. Testosterone is the hormone associated with the development of secondary male sexual characteristics but it is important to note that this hormone is also present in females. In females it is present in much less significant amounts than males and once puberty occurs for girls the hormone responsible for female characteristics, oestrogen, becomes dominant. For girls there are effectively two strength windows. The first occurs just prior to puberty when any strength gains and nervous adaptations achieved at this time will remain after puberty.

The second window for girls occurs after puberty when further strength training for functional strength development can commence.

For boys, the window of opportunity for strength occurs in the twelve to eighteen months after puberty, as testosterone levels rise and peak. Boys could do strength training before puberty but the effects would not be as effective as waiting for the testosterone levels to rise.

Testosterone has a number of effects in the body. Testosterone promotes muscle development and this is well known by most coaches. But it also has effects on the energy systems. Testosterone promotes an increase in the number of red blood cells which are responsible for transporting oxygen around the body and to the exercising muscles. It also increases the efficiency of the mitochondria, the parts of the muscle cells where oxygen is used to make energy. Both of these effects mean that the production of aerobic energy is improved and training can now work towards developing the athlete's aerobic capacity.

The second speed window occurs due to the continuing development of the nervous system now having the addition of the developing energy systems. During this speed window all types of speed related work may now be carried out to the benefit of the developing athlete.

Missing a window of opportunity does not mean that a child will never reach their potential. But it does mean that if a window is missed in any way, there needs to be assessment of the athlete by the coach to see whether remedial work is necessary. This is frequently the case if young children specialise in an athletics event too early and don't develop full physical literacy. It should also be remembered that remedial work may frequently be necessary with mature adults returning to athletics after an extended break from sport. In these cases the coach should assess the individual's current physical literacy in addition to their fitness.

Social Development

In this section we will look at the way in which children develop relationships with others. Coaches, parents and teachers all know that there are some children who can get along very easily with adults and other children. Others find these relationships difficult. Understanding how young people develop views of themselves can help you become a more sensitive and effective coach.

Self Image - *How Children See Themselves*

As they grow up children are learning about the world around them all the time. They are also building in their minds a picture or image of themselves. This self image develops through the things that they can or cannot do and by how other people see them. It is shaped by:

- What they want to achieve
- Their achievements in practice and competition
- Other children's achievements
- Feedback from the coach and other adults, athletes and friends

Influence of Others

Different groups of people become more or less important as children grow. These groups and individuals are sometimes called 'significant others' because of the powerful influence they can have on children. Significant others include parents, teachers, other children and coaches, all of whom may have different attitudes towards a child. Changing situations and information from these different sources means that children frequently have to adapt their image of themselves. When they become exposed to different adults and other children the need to fit in with them becomes important. As they mature they understand better how to get on with others.

Parents are usually the most important figures in children's lives, particularly in their early years. As children grow they become more independent of their parents and parental influence becomes shared with the influence of others, such as teachers and coaches. Parents, however, remain an important part of how children see sport and most children want their parents to be pleased with them and their efforts.

The influence of other children becomes stronger as children become more independent. The relationships which develop also change in nature at different stages of development.

The Development of Relationships at Different Ages

Infancy and early childhood 0 - 5 years
Children are self centred and expect others to adapt to and meet their needs. Cooperative play is absent. Children play alongside each other rather than together.

Middle childhood 6 - 9 years
Friendship groups become bigger, but are still quite small. Other children become more important and they learn to compare themselves with others 'to see who's best'.

Late childhood 10 - 13 years
Friends become more important. A greater range of social contacts are built and they may do sport because their friends do. They work well together but become more aware of differences in ability.

Adolescence 13 - 20 years
The period of transition from childhood to adulthood. Peer groups can become the dominant influence. This frequently causes conflict between adolescents and adults. Group members may work together very effectively.

Influence of the Coach

Coaches can develop very close relationships with young athletes and become very important to them. Because they teach new and exciting activities, and reveal new abilities, they can assume a significance in children's lives second only to that of the family. This may be particularly true where athletics becomes especially important to the child and the coach-athlete relationship continues for a long time. Coaches should be aware that they are in a position both to build confidence and to destroy it with a few words, or even a look.

Ability and Effort

Young children have difficulty in distinguishing cause and effect of what they do. Between the ages of about 7 and 9 they learn this distinction, but do not understand the difference between ability and effort. They believe their success is determined by how hard they try. Between about 9 and 11 they still regard effort as the most important reason for success. They are beginning to appreciate that ability is important, but only when there has been little apparent effort.

It is not until they are about 12 years old that they can recognise that their success is determined by a combination of ability and effort. Coaches and parents may incorrectly encourage this limited understanding by telling them they will succeed if they "try harder". For some, the realisation that they do not have as much ability as others may be difficult to accept. The coach needs to be understanding and make this awareness less difficult by an emphasis on personal improvement.

When Mistakes Happen

Handling mistakes in a positive way may seem difficult but it can and should be done. Mistakes, in fact, can be a useful part of learning. If you never make mistakes, you may never learn. Remember that athletes do not deliberately make mistakes. Give encouragement right away and help them to learn from their mistakes. Accept that mistakes are a necessary part of learning and use them effectively.

Implications for the Coach:

- Use praise to reward children's efforts
- Try to get maximum involvement for everyone
- Provide opportunities for responsibility as children get older
- Be sensitive to the adolescent who seeks independence and identity
- Give confidence by encouraging children to try new things
- Give everyone some success during a session
- Pay attention to everyone, not just the best athletes
- Evaluate the performance not the child
- Don't make children specialise too early
- Handle mistakes positively.

Play, Sport and Competition

Play and sport are not necessarily the same thing and play has different functions for adults and children. For adults, playing means relaxing away from work and possibly taking some recreation. For children, play provides opportunities for interesting learning experiences. The world of play for children is the world in which they should live for long periods. It provides a path for stepping upward from childhood to adulthood.

Competition is a form of comparison and means different things to the child than to the adult. As a coach you can develop the competitive ability of children when they are mature enough. How athletes see and meet the challenge of competition is greatly influenced by the attitude of the coach.

Children's Play

The nature of children's play changes with age. In early childhood, children practice moving in different ways, and using toys and balls. It might be called a period of "playing with …". Middle childhood is a time when children create fantasies. They spend time in make-believe and might be described as "playing at …" So, for example, a young runner might claim he is a famous athlete when he is running. It is only during the later stages of childhood that children come to simply "playing …" The games with rules which form such a large part of adult play are now more meaningful.

Understanding these stages in the development of play is valuable for coaches. Children enjoy things which are presented as play and they learn much more. Play can be a useful tool for the coach to use to his advantage.

Adult Play

Sport is the adult form of play. The rules of sport determine what technical and tactical skills are needed. The understanding of these rules comes when experienced athletes are able to think about the consequences of their actions. Children do not usually reach this stage of full understanding until adolescence.

Children's Understanding of Competition

The adult understanding of competition is not very meaningful to young children. Between 4 and 6 years of age children try to win prizes, but this is not competition in the sense of being 'better than'. It is a contest for a limited reward that only winners can have. By about the age of 6 or 7 they become able to compare themselves with others and a more mature understanding of competition begins to appear. The point at which children learn to make comparisons is influenced by both their level of understanding and the 'significant others' around them.

Formally organised athletics competitions with strict rules are not appropriate for most children until about 12 years of age. This is because of their relatively immature understanding of competition and the

causes of success and failure. Kids' Athletics for the IAAF is both a programme of activity and also a stage of athlete development. The introductory athletics-like activity of Kids' Athletics provides a fun competitive arena with team and social implications.

Kids' Athletics - *Adapting Athletics for Children*

We have seen that children differ from adults in many ways and that they are not merely smaller versions of their older brothers and sisters or parents. Children at the same age can also be at very different stages of physical development. Children's physical size and proportions are changing all the time. It is possible to change or adapt the techniques and equipment of athletics to make them more suitable for children. It is important to do this because children's early experiences in athletics will often decide how much they enjoy it and whether they choose to continue with it.

We can adapt athletics to the needs of children by:

- modifying techniques
- adapting and improvising equipment and implements of a suitable size and weight
- modifying rules to help learning and performance.

Coaches should modify techniques to meet the needs of children. Changes in the shape of the body and the difference between adult and child proportions affect and limit the way children perform skills. Children are also not only smaller than adults but relatively weaker. This will affect when and how specific techniques are taught. For this reason the techniques of elite athletes are not usually suitable for children. Teaching progressions and lead up drills should always take into account the developmental stage of the learning athlete.

Kids' Athletics provides children with equipment of an appropriate size and weight. We have seen that it is important that children should learn correct movement patterns and basic techniques from the beginning. The use of equipment and implements that are too big or too heavy will prevent correct learning of these basic techniques. This is particularly true in the throwing events where the regulation size shot, discus and hammer are frequently too large and too heavy for the younger athlete.

Kids' Athletics also provides athletics-like activity with modified rules. There is no reason why rules should not be changed to fit children's skill level and their learning situation. Changing rules to fit children has rapidly increased learning and consequently the enjoyment of the activity. For example, hurdling over the competition heights and distances for a particular age group is very difficult for all but a few. It is very easy to set hurdles lower or, even better, use Kids' Athletics equipment or canes and other equipment at distances apart to suit the learners. This keeps the essential feature of rhythmic sprinting over an obstacle and more children can experience it. As they improve so the height and distance can be adjusted closer to the recommended competition hurdles.

Implications for the Coach:

- Keep rules to a minimum with younger athletes
- Competition should be organised but informal until about 12 years of age
- Avoid placing children into adult-like competition until they are ready
- Do not pressure children to win at all costs
- Reward children for their efforts
- See how you can adapt athletics to fit the child
- Use appropriately sized equipment and implements
- Change the rules to get better learning
- Use small groups and teams where possible
- Be creative in solving problems.

Developing the Athlete

We have seen that young children have special needs in sport and should follow programmes which are specific to their needs. As coaches, we are also aware that any individual who has just commenced any physical activity has different needs from and capabilities for training than someone who has been doing this activity for a longer time. This is true no matter what age an athlete starts being involved in athletics.

Athletics is recognised as being a 'late-specialisation' sport. This is because most athletes achieve their best performances generally between 24 to 34 years of age. Taking a long term approach to athlete development and training benefits all athletes, whatever their age or level of competition.

Athlete Development - *the Long Term Approach*

The main concept of 'Athlete Development' involves taking a long term approach to athlete development and training. This long term approach is designed to help individuals of all ages and all abilities to optimise their development and reach their potential. As you begin to understand the background to this long term approach, you will understand why it is recommended by the IAAF for all coaches and athletes. Effective coaches choose a long term approach as it helps them to improve their athletes year after year, possibly until after the age of 40, the time when the body's biological clock causes performance to decrease. Even then, it will help athletes to get the best from what they have.

In its simplest form athlete development relates the structure and nature of training at any time to where an individual athlete is on their developmental pathway. This means that individuals are, "doing the right things at the right time" for their long term, not necessarily immediate, development.

Athlete Development – "doing the right things at the right time"

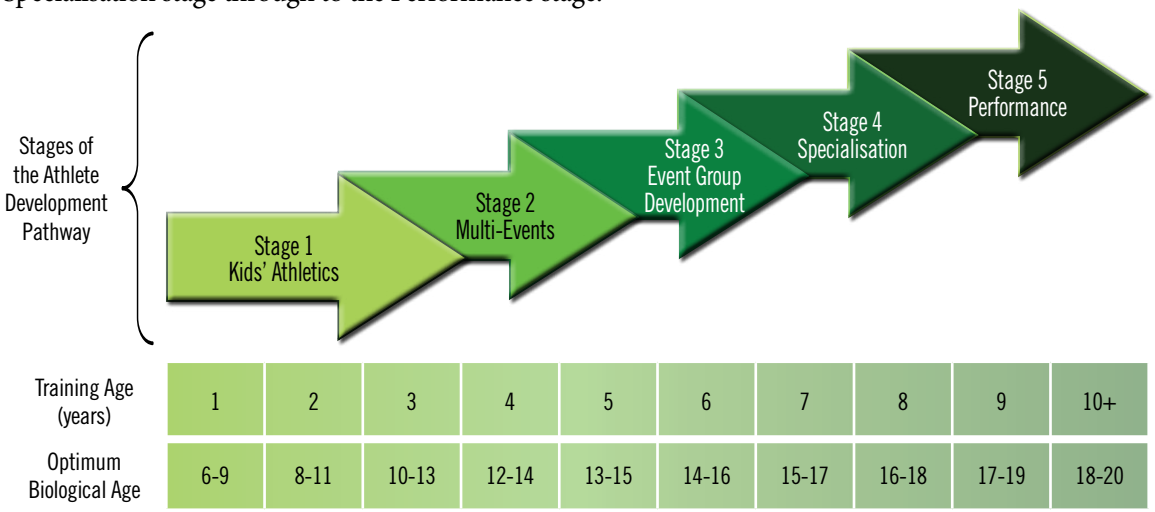
Many people in sport have pointed out that much of what comprises 'athlete development' is not new knowledge. The vast majority of the knowledge on which it is based is widely accepted and has been used as a foundation for physical education teaching and coaching practice for many years. The difference that the 'athlete development' programme brings is an organisation and structuring of this approach for coaches to use. It has the potential to create a better integrated development system for everyone who is involved with athletics and to motivate athletes to stay in the sport.

The long term athlete development approach is an organised approach toward achieving the optimal training, competition and recovery throughout an athlete's career. It recognises that any individual who has just commenced athletics has different needs from and capabilities for training than someone who has been doing it for longer. This is true no matter what age an athlete starts being involved in athletics and emphasises the importance of coaches knowing the 'training age', as well as the 'developmental age', of each athlete they coach.

Stages of Athlete Development

Providing a uniform athlete development pathway within a 'late specialisation sport' like athletics means that we can recognise a five-stage athlete development model. The progressive nature of this five-stage

model guides athletes from the Kids' Athletics stage, Multi-Events stage, Event Group Development stage, Specialisation stage through to the Performance stage.



Training Age (years)	1	2	3	4	5	6	7	8	9	10+
Optimum Biological Age	6-9	8-11	10-13	12-14	13-15	14-16	15-17	16-18	17-19	18-20

The Five Stages of the IAAF Athlete Development Pathway

It is actually possible to recognise seven stages of movement and exercise development but the coach usually has no involvement with the first and last of these stages. While stage 0 and stage 6 will not be considered they remain of integral importance to each individual.

Stage	Name of Stage	Optimal Biological Age	Training Age Range
Stage 0	Movement awakening	0 - 5/7	-
Stage 1	Kids' Athletics	5/7 - 11/12	0 - 2/4
Stage 2	Multi-Events	11/12 - 13/14	2 - 4
Stage 3	Event Group Development	14/15 - 16/17	5 - 7
Stage 4	Specialisation	16/17 - 18/19	7 - 9
Stage 5	Performance	18/19 +	10 +
Stage 6	Exercise for life	-	-

You have seen that athlete development relates the structure and nature of training at any time to where an individual athlete is on their developmental pathway. This again emphasises that individuals are "doing the right things at the right time" for their long term development. Let us now look in more detail at the characteristics of each of the stages that make up the IAAF athlete development pathway.

Stage 1 – The Kids' Athletics Stage

The first stage for athletes in the IAAF development pathway is 'Kids' Athletics', reflecting the well established IAAF Kids' Athletics training and competition programme designed for young children. The 'Kids' Athletics' developmental stage should be a structured and fun introduction to athletics-like activities, with an emphasis on developing basic fitness and foundation movement skills. It emphasises such skills as

the 'ABCs' of movement: Agility, Balance, Coordination and Speed, the 'ABCs' of athletics: walking, running, jumping and throwing and the movement skills related to body awareness and to hand-eye and foot-eye coordination.

All these foundation skills and movements add together to provide a 'vocabulary' of movement which are referred to as 'physical literacy'. To develop this basic physical literacy there should be participation in as many play, or play-like, games and movement patterns as possible. The annual plan should have no periodisation structure but there should be a well-planned programme of basic conditioning with proper fitness and skill progressions that are monitored regularly. Competition can take place at any time but training is not structured for, or specific to, competition.

Ideally, children will commence Kids' Athletics between 6 and 9 years of age and will continue until physically, socially, emotionally and skilfully they are ready for the next stage of development. If individuals commence their activity at an older age, they should still achieve a minimum training age of 2 years before moving on to the second stage. If it is an adult who is commencing athletics, they may not go through the Kids' Athletics stage but their physical literacy must be assessed. Any areas of poor physical literacy should be addressed by the coach providing appropriate remedial activities.

Stage 2 – The Multi-Events Stage

The second stage of development is called the 'Multi-Events' stage where all individuals now learn how to train and develop their athletic skills. For young athletes this means participating in and learning all the events of athletics, along with basic technical, competition and tactical skills. Although the focus is on training, competition can be used to test and refine skills at any time of the year.

During this stage the young athlete is learning how to train and they should be introduced to an understanding of the importance of an active, dynamic warm up, an effective cool down and flexibility work. They should also learn the importance of a healthy diet through nutrition and hydration, rest, relaxation and sleep. The training environment should also be a place for positively developing the basic mental skills that underpin performance and continued participation such as the five Cs, communication, commitment, control, confidence and concentration.

In this stage, training can begin to be planned in a periodised way but because of the need to build a 'solid base' the training year should only have one macrocyle, making it a 'single periodised' year.

Stage 3 – The Event Group Development Stage

The third stage is the 'Event Group Development' stage and is sometimes referred to as the stage for 'building the engine'. During this stage there is an emphasis on greater individualisation of fitness and technical training. For young athletes, this is the time to begin to focus on an event group rather than all events. But they are a 'runner and walker' rather than an '800m athlete'; a 'thrower' rather than a 'javelin thrower'; a 'jumper' rather than a 'triple jumper'. As athletes enter this stage some enjoy doing

all events equally and may choose the Combined Events event group. Athletes who have the highest potential for the performance in the Combined Events will show excellent 'physical literacy' in the previous Multi-Events stage of development.

If the athlete is in this stage between the ages of 13 and 17, they undergo some critical changes in relation to their physical development. These physical developments will also probably have significant influences on the athlete's skill development and also on their mental and social development. It is also during this stage that the importance of having confidence in their abilities and competence to perform basic sporting skills is crucial for the individual athlete. This is not only in terms of their performance development but, crucially, in terms of whether they choose to keep participating in athletics or not.

The emphasis in this stage is still on training which is predominantly high in volume and low in intensity and the time commitment to training will increase for both athlete and coach. There are now specific targets for each competition undertaken with a view to learning basic tactics and mental preparation. The reason that many athletes reach a performance plateau during the later stages of their careers is primarily due to an over-emphasis on competition instead of training during this stage, which makes it a significant period in their athletic development. The training year may be either a single or double periodisation structure but the longer that single periodisation is maintained, the better the athlete's foundation for the future.

Stage 4 – The Specialisation Stage

With the entry to the fourth stage, 'Specialisation', comes a 'fine-tuning of the engine'. There is a continued emphasis on physical conditioning, maintaining high volume training but now with increasing intensity at appropriate times of the year. The athlete now will tend to focus on an event or a small number of events. Individual strengths and weaknesses are now more clearly identified and action can be taken to improve these.

There is a gradual shift towards performing techniques and tactics in a variety of competitive conditions during training which increasingly model competitive environments. The coach will focus on optimising preparation both physically and mentally. The training year may again be either a single or a double periodised plan and for the first time, competition will influence the structure of the annual plan.

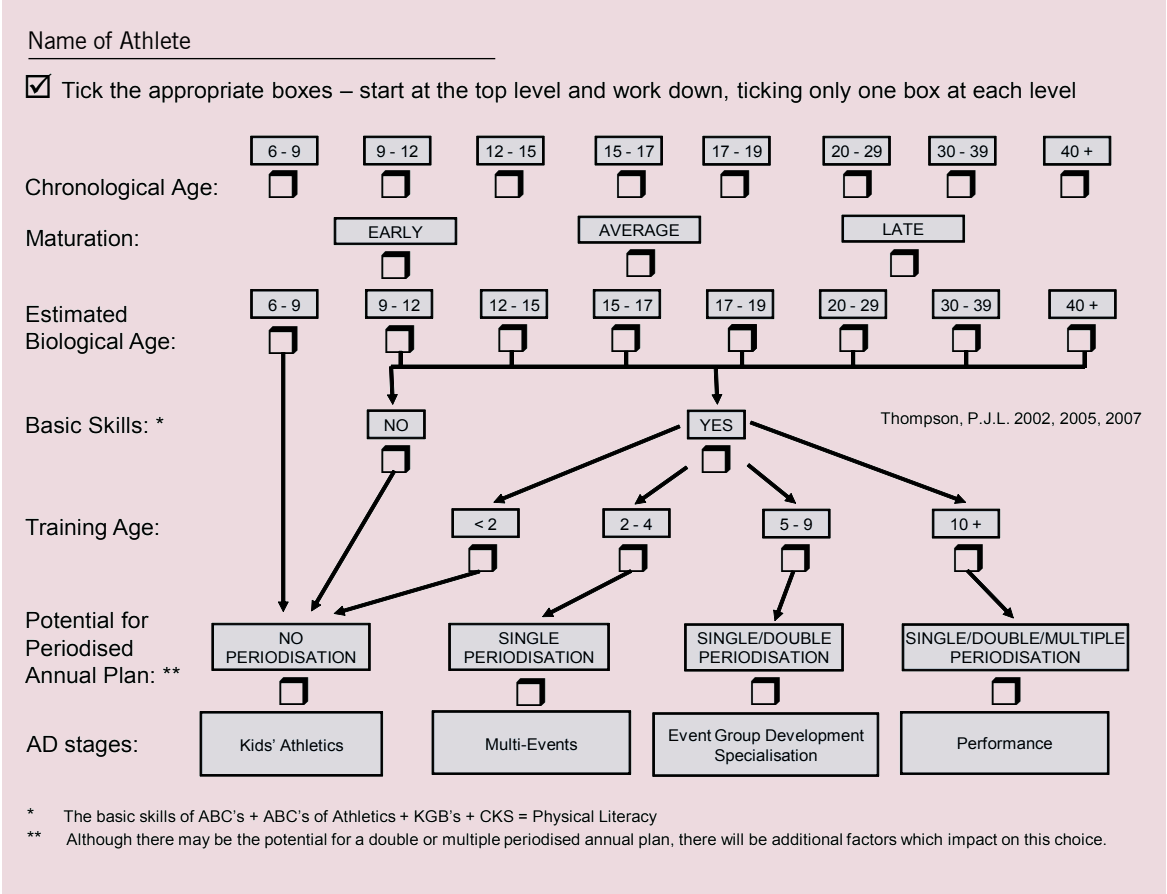
Stage 5 – The Performance Stage

The final stage of preparation and participation in athletics is the 'Performance' stage and will last until the individual retires from actively competing. The emphasis now is on further specialisation and, where possible and appropriate, performance enhancement. All of the athlete's physical, technical, tactical and mental capacities should now be fully established with the focus shifting to the optimisation of performance, at whatever level.

All athletes can now be trained to peak for specific competitions and major events; whether those competitions be the Olympics, a regional competition or a local meeting or event; with each aspect

of training individualised. An individual's annual plan may show either single, double or multiple periodisation, depending on the events being trained for and taking into account the athlete's personal needs and circumstances.

To summarise athlete development, even if an athlete misses the optimum biological ages for each development stage indicated for the five stages of the IAAF Athlete Development pathway the pathway should still apply. No matter what the athlete's age, following the stages of the athlete development pathway permits a progressive introduction to and development in athletics. This is shown in the following flow diagram which assists you in determining your athletes' stage of athlete development and the options for structuring the annual plan for any individual, of any age and of any ability level.



Determining the stage of Athlete Development and training structure of the annual plan

Let us look at how a coach might use the flowchart to determine the stage of development of an athlete and then the appropriate training structure for the annual plan. If you take as an example an athlete who has a chronological age of 14 years you would start at the top of the flowchart and tick the box for '12-15'. The athlete might be an early maturer with an estimated biological age of 16 years and you would tick both these appropriate boxes, 'Early' and '15-17'. Does the athlete have physical literacy, the basic movement skills? Tick the appropriate box, which we will say for this example is 'yes'. Now, how long has the athlete been in athletics or athletics-related training? This will give the training age. Let us say, for this example again, it is 3 years and you tick '2-4'. The final box to tick is the one which indicates that this athlete should still be in the Multi-Events stage and following a single periodised annual plan for their training.

Many coaches make the mistake of looking at the athlete's stage of biological maturation, 16 years in the example given above, and thinking that the athlete is in a more advanced stage of development than they actually are. Always remember that if this athlete is to reach their full potential at around the age of 27 years, he still has 13 years of training to go. If they have a low training age of only three years they need to be laying the foundation for the future, not specialising too soon, nor training too intensely too soon.

If the training age for this same example athlete had been 6 years, then the coach would tick the box corresponding to the Event Group Development and Specialisation stages. The coach and athlete would have begun to think about the event group that the athlete is most interested in or has performance potential for. But with a training age of 6 years, the athlete would still be firmly in the Event Group Development stage. It is only after the training age goes beyond 7 years that the athlete would enter the Specialisation stage.

Athlete Development and Maturation

The benefits of the coach taking a long term athlete development approach are even greater for our young athletes. The 'athlete development' approach closely follows the principal stages of growth and development that characterise the first two decades of life. If a long term approach to training is not adopted for young athletes there is likely to be a plateau in performance when growth and development slows significantly around 18 years of age. This, for some athletes, may result in their performances deteriorating. At this point any earlier short term training approach cannot be reversed - it is now too late. This often leads to drop out from athletics at ages 15-18, before the athlete has achieved anything close to their potential.

It has been said that competitive sport loses as many people as it attracts. The same can be said for the great mass of recreational athletes who are not even in organised training situations. Every person who leaves athletics is a symptom of a recurring cause, an incorrect understanding of the place of competition for novices of any age. It is the altering of developmental training patterns to meet the needs of immediate competition that really causes them to join the many 'lost athletes'. The effective coach takes the approach of "doing the right thing at the right time" and in doing so helps to retain their athletes in the sport.

Athlete development relates the structure and nature of training to any athlete's developmental pathway so that individuals are doing the right things at the right time for their long term, not necessarily immediate, development. It is also clearly about knowing the place and relative importance of competition at different stages in an athlete's development.

Planning, Competition and Athlete Development

Even if the coach follows the long term athlete development approach, it may be difficult to explain to some people, parents in particular, that an 11-year old child will be in the Kids' Athletics or Multi-Events stages. They will ask, or demand, "But I want you to coach them to win, now. Why aren't they in the Specialisation or Performance stage right now?" The reason why they aren't in an advanced stage is partly that athletics is a 'late-specialisation' sport, with best performances generally occurring between 24 to 34 years of age. It is also because the athlete development model uses the concept of integrating periodisation into the process of structuring the annual plan for each individual.

Periodisation simply means dividing a calendar year into several periods, hence 'periodisation'. These periods are 'preparation', 'competition' and 'rest or transition'. The preparation period is itself comprised of a 'general preparation phase' and a 'specific preparation phase'. The less time someone has been training, with a low 'training age', the greater the percentage of training time that needs to be spent in building the 'training and adaptation foundation'. This should mean a long preparation period for beginners. It also follows for an athlete with a low training age that this long preparation period should have much more time devoted to the general preparation phase, rather than the specific preparation phase.

The flowchart illustrating how to determine the optimal structure for the annual plan clearly shows that a novice of any age without physical literacy should be in the Kids' Athletics stage, with no periodisation. This beginner should spend around 48 weeks of the year in active training developing a full physical literacy with competition being possible at any time. This competition can be prepared for by appropriately resting up before the competition but not by introducing specific competition-type training. The next four athlete development stages then progressively introduce periodisation, with each potentially using a single periodised year.

As the athlete's training age increases, a double periodised year can gradually be introduced and this is an option for each of the Event Group Development, Specialisation and Performance stages. A double periodised year simply has two cycles of the periods: preparation - competition - transition and permits two competitive peaks in the year . It is, however, recommended that athletes in the Event Group Development stage follow a single periodised plan for as long as possible to provide a solid foundation. When a high training age is attained, as in the Performance stage, and the adaptation to training is stable, the coach and

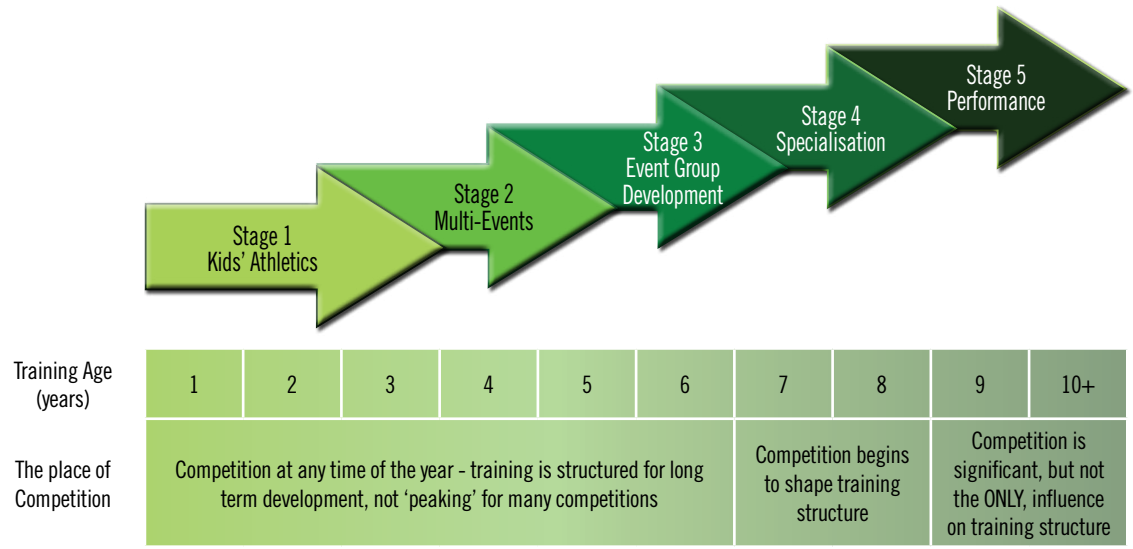
athlete have the potential to choose a triple or multiple periodised structure to the annual plan.
Even in the Performance stage, however, you may choose to use a single periodised year for reasons other than competition. These reasons include:

- when the athlete has experienced injury or major illness in the previous year
- when major technical changes are to be made

- to re-establish or change the nature of the training base
- to have a low-key year between years of major competitions or other stress.

"But, what about competition?" you might hear from your athletes, "That's the reason we're involved in Athletics." By now, a picture should be emerging for you as a coach that strongly emphasises individual development in training. It is true to say that any team can only be as strong as its members are strong. If individuals are not developing to their potential, if individuals are constantly injured or, worse case, if they choose to leave the sport, it is because their long term needs are not being met in training. The positive side of athlete development is that it offers a way of having the best of both worlds, good athlete development and good competitive performances.

In all the stages of 'athlete development' you can compete at any time during the year. The important message for the coach is that training is structured for the long term needs of the individual athlete, not to meet immediate competition needs. This does not mean that competition is unimportant. It has already been stated that training can be reduced to 'rest up' for more important competitions. But the overall structure and type of the training is not continuously being changed to meet the specific demands of competition. The diagram below shows that as training age increases, competition can begin to have a gradually increasing influence on the nature of the training and the structure of the annual plan.



The place of competition in structuring the annual plan

Each coach should be able to answer the question, "How will your athletes' training be different next year from this year's?" All coaches should be serious in wanting to get the best out of what their athletes are able to put into training. All coaches should be serious in wanting to have training where rests and breaks are planned rather than being enforced by injury or illness to their athletes. Yet, many coaches are unable to answer this simple question.

The concept of 'athlete development' supports what we intuitively sense, that training should progress from the general training of the Kids' Athletics stage to the predominantly competition specific training of the Performance stage. Understanding and applying the principles of long term athlete development provides a real benefit for all athletes and is recommended for use by all IAAF qualified coaches.

4

DEVELOPING PHYSICAL FITNESS

The Body in Sport and Athletics

The human body is a highly complex living 'machine' and anatomy is learning about the structure of the body. Athletes come in all shapes and sizes and have different skin colours, but their bodies all work in exactly the same way. As you develop an understanding of how the body is built you are better able to understand how it responds to exercise and training. You do not need the detailed, complex knowledge of a doctor but you do need to know the basic structures of your body and how they work together.

Cells - Building Blocks of Life

A cell is a unit of living material and is the basic building block of life. All living things are made up of one or more cells. Human bodies are made up of millions of tiny, living cells. Cells make up our skin, our bones, muscles, brains and all the other parts of our bodies. Everything we do involves millions of tiny cells of different shapes and sizes working together. Each type of cell or group of cells carries out a different job. As a result not all cells look the same. Some cells, for example, are designed to:

- carry messages - nerve cells carry electrical messages
- carry chemicals - red cells in the blood carry oxygen around the body
- support the body - bone cells make up the skeleton
- move the body - muscle cells can create force

Each cell has its own job to do but all cells live, grow and finally die, to be replaced by new cells.

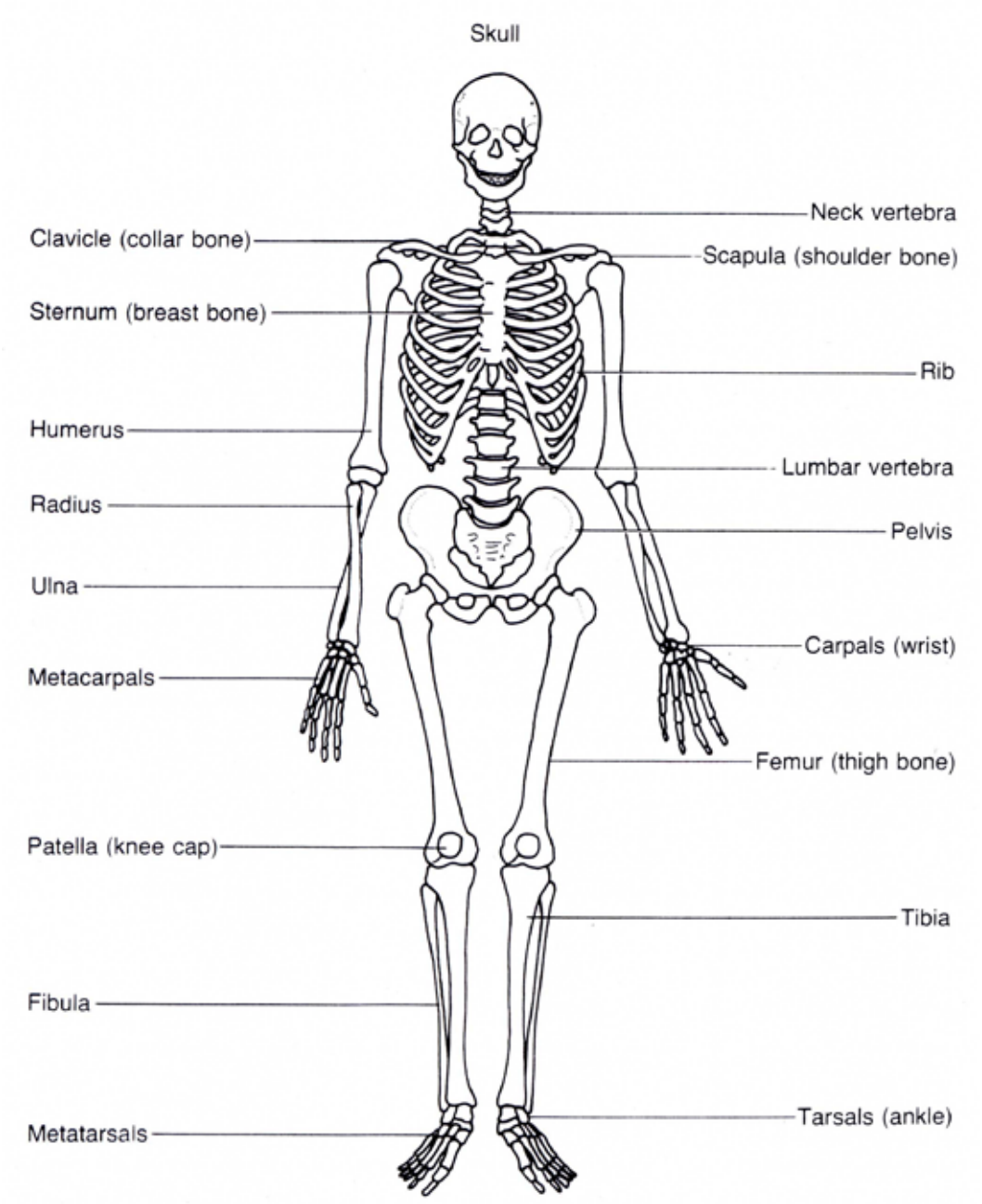
The Skeleton

Human beings, like most large animals, have a skeleton inside their bodies. A skeleton is a system of bones and other supporting material. It has three important functions:

- Support - It gives support to the rest of the body, like the framework of a building. Without this support we would be a shapeless lump
- Protection - It gives protection to important and delicate organs of the body. The skull, for example, protects the brain
- Movement - It provides anchorage for muscles. Muscles fixed to the skeleton can operate joints. This allows us not only to move parts of the body with a high degree of precision and control but also to move the body as a whole.

In the human skeleton there are over two hundred bones. Some are long, some short, some round, some flat but all bones have the same basic structure. When a baby develops inside its mother's womb some cells form a tough, flexible substance called cartilage. During childhood and adolescence much of the cartilage slowly changes to bone. The gristle you can feel in your ears and at the end of your nose is cartilage that doesn't change to bone.

Bone is very hard and strong and has to stand up to large forces. Bones have living and non-living parts. The living part makes the bones slightly flexible and lets them absorb sudden shocks. The non-living part of a bone makes it rigid and gives it strength.

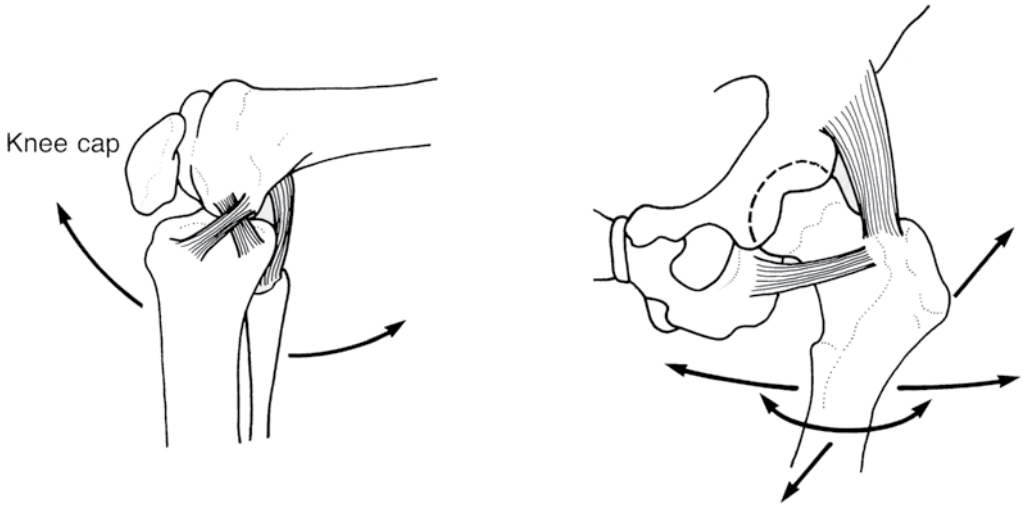


The human skeleton

The bones of the skeleton act as a system of levers. In most parts of your body the bones are not actually joined. Instead, they fit closely together, forming joints. At each joint the bones are linked by tough, flexible ligaments. The different joints between your bones allow you to move in different ways.

This is a hinge joint, the bones can move in one direction only

This is a ball and socket joint, the bones can move in almost any direction.



Knee joint

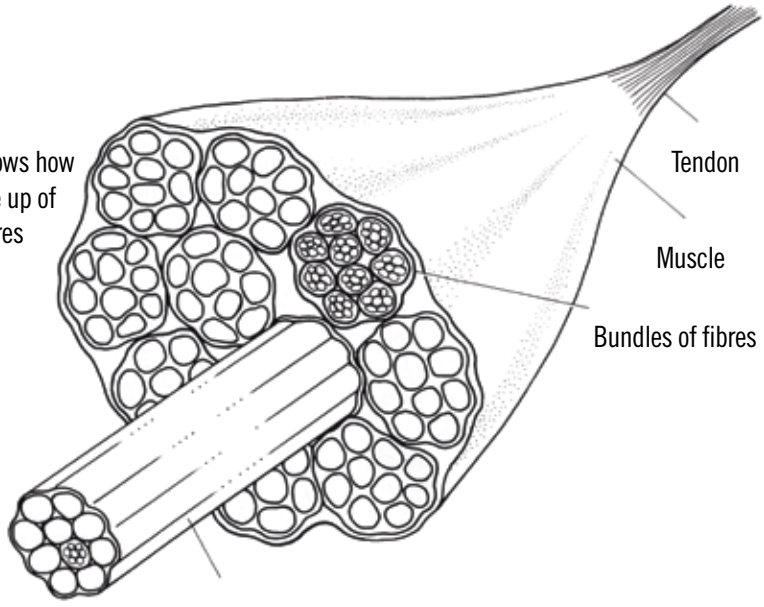
Hip joint

Each kind of joint allows a different sort of movement. Whenever we move, bones move. But what makes bones move?

Muscles

Bones are moved at joints by the contraction and relaxation of muscles attached to them. You have over 600 muscles in your body and these make up approximately 40% of your weight. You use these muscles to move, breathe and even stand still.

This illustration shows how a muscle is made up of bundles of fibres



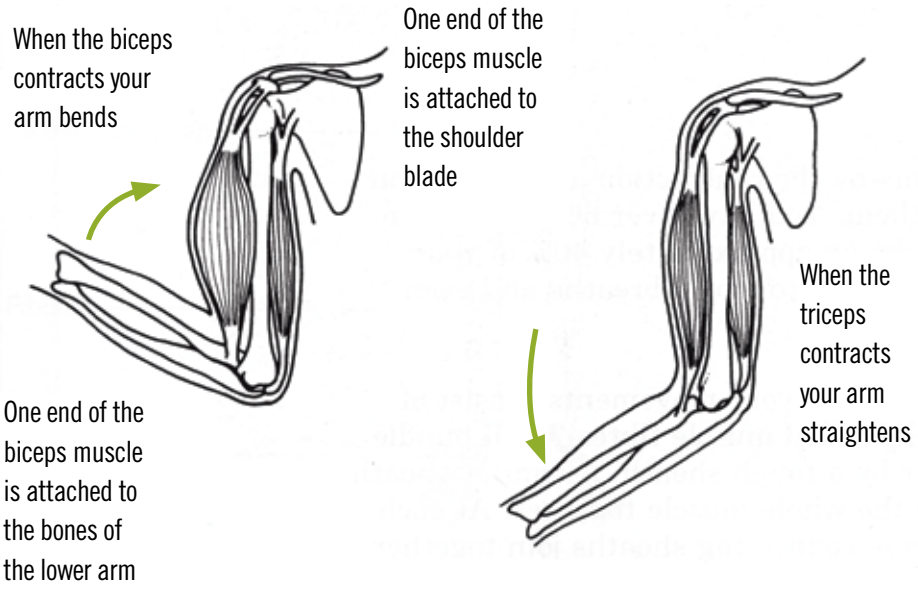
Inside a muscle

This illustration shows how a muscle is made up of bundles of fibres

The muscles you use to control your movements consist of bundles of long, thin cells called muscle fibres. Each bundle of fibres is held together by a tough sheath. A similar sheath round the outside holds the whole muscle together. At each end of the muscle all these connecting sheaths join together forming the tendons which anchor the muscle to bone.

Muscles are attached by the tendons to bones on either side of a joint. Most muscles only work across one joint of the body. Some muscles work across two joints, such as the hamstrings, which work across the hip and knee joints.

Movement is caused by muscles pulling on a bone. Muscles can only pull, they cannot push. This is why most of your muscles are arranged in opposing pairs. When one muscle tenses and contracts, its partner relaxes and stretches to allow movement. If both muscle groups contract at the same time and with equal force the joint is fixed and there is no movement. The elbow joint is a good example of the action of opposing muscle groups. The biceps muscle bends the arm at the elbow and is opposed by the triceps muscle which straightens the arm.



Muscles in the upper arm

Movement is rarely produced as the result of the contraction of just one muscle. In body and limb actions, groups of muscles are usually involved in making a single movement. The contribution that each muscle in the group makes can vary considerably according to the effort and action required.

Training programmes should always provide a balanced development of a muscle and its opposing muscle. There should also be a balanced development of the muscles on the right and left side of the body. Training which results in an unbalanced development of one muscle or group of muscles over its opposition generally leads to injury of the weaker muscle or makes the risk of injury much greater.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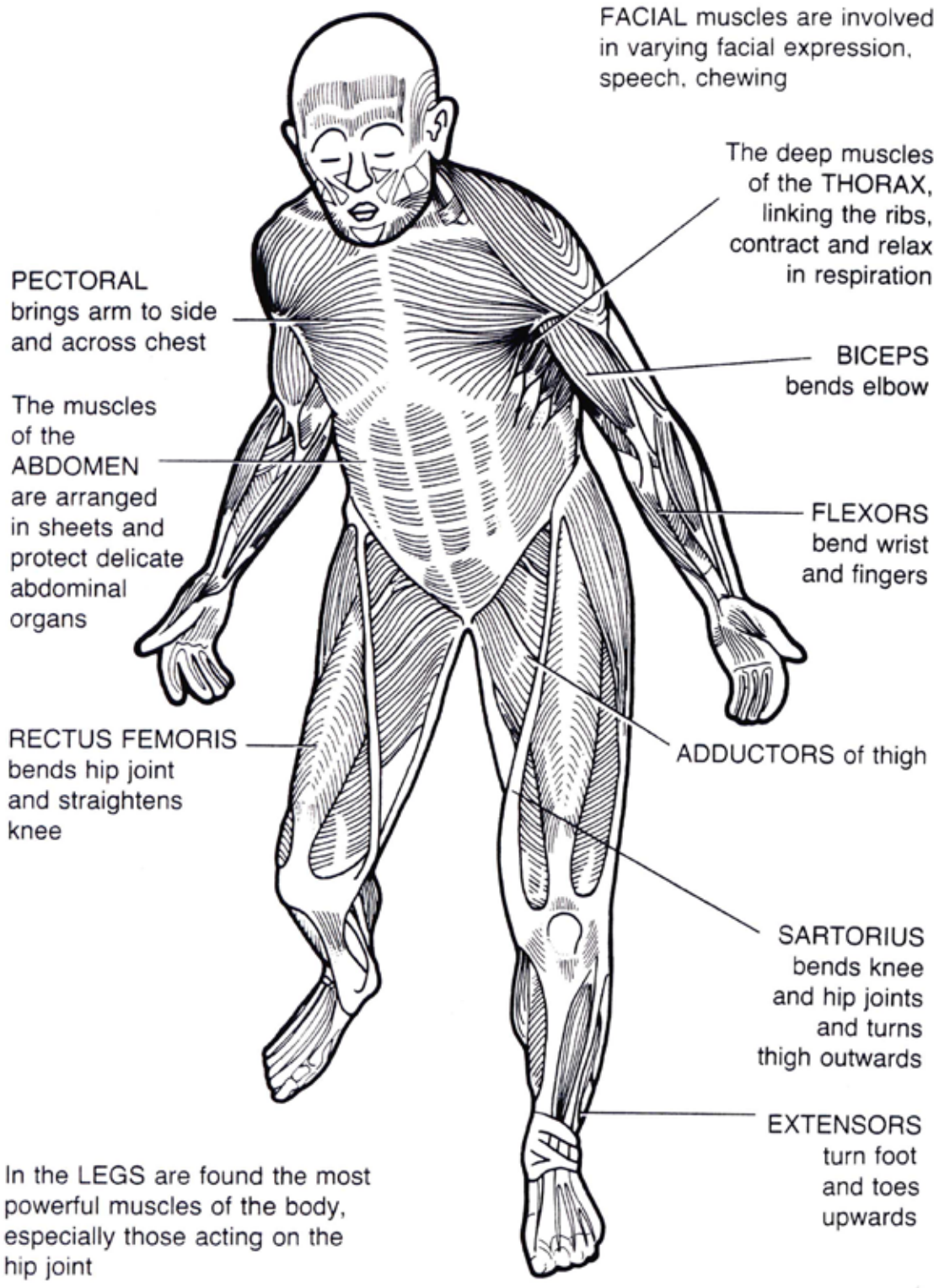
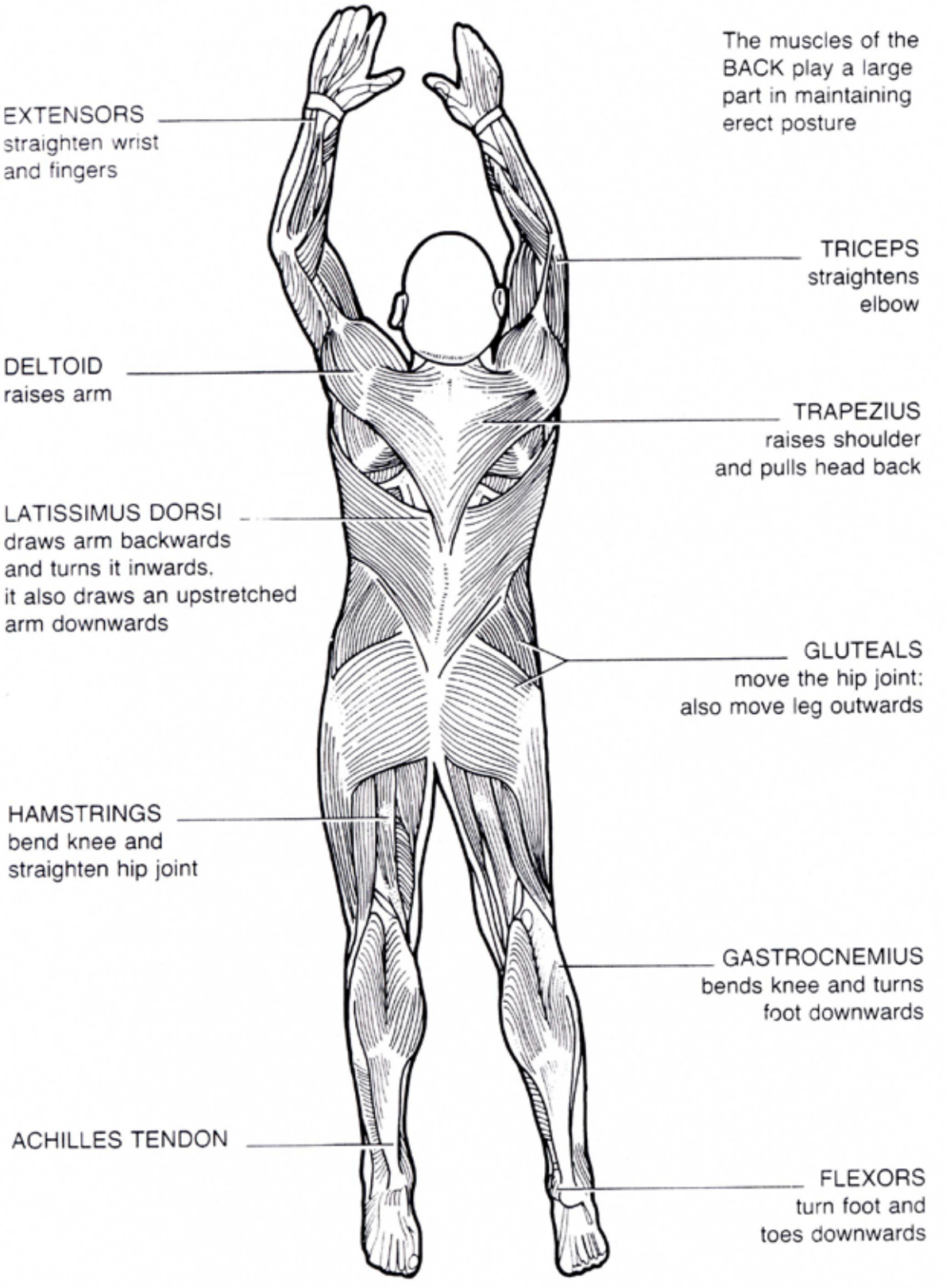


The skeletal muscles – front view



The skeletal muscles – back view

Muscle Fibre Types

We have seen how muscles are made up of bundles of muscle fibres. Not all muscle fibres are the same. Simply, there are two major types of muscle fibre found in each muscle:

- Fast twitch fibres
- Slow twitch fibres

Each individual in each of their muscles has a mixture of fast twitch muscle fibres and slow twitch fibres. Different people have different percentages of fast and slow twitch fibres. These percentages are determined at birth by heredity but some of the fibres may be changed by the type of training the athlete does.

The fast twitch muscle fibre is like the engine of a sprint type racing car. It can produce high speed movement for short periods of time. The chemical reactions involved in this fast movement mean that the athlete cannot use the fast twitch fibres for very long. A slow twitch muscle fibre produces less power and speed but can operate for much longer periods. It produces waste products that are easily disposed of and for this reason slow twitch fibres are very important in endurance events.

For the athlete who has predominantly slow twitch fibres, sprint training will improve their speed. The fastest speed attainable will still be far less than for an athlete who has a greater percentage of fast twitch fibres. Conversely, endurance training will improve the endurance of the athlete who has a high percentage of fast twitch fibres but the final endurance of that athlete will still not be as good as the athlete who has a higher percentage of slow twitch fibres to begin with.

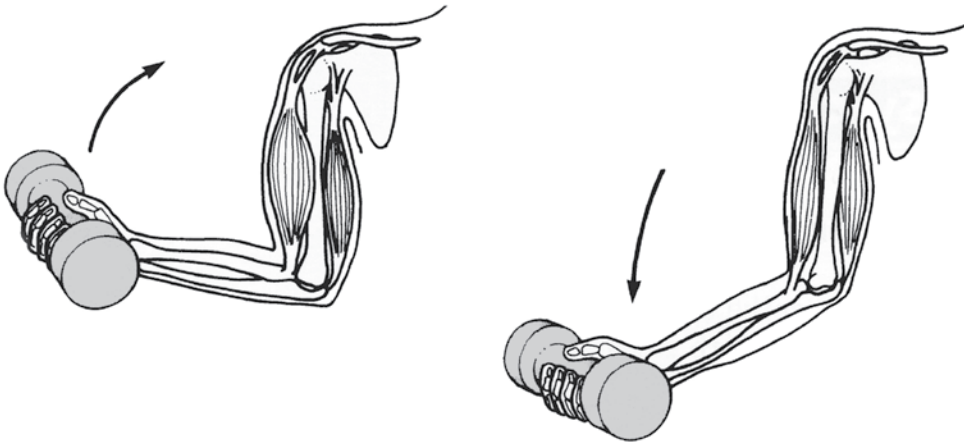
How Muscles Pull

Muscles work like engines by burning fuel to produce movement. They are energy converters changing the chemical energy in the food we eat into the energy of movement. When your muscles are relaxed the fibres are relatively soft. When you want to move the muscles act by contraction. The muscle fibres within the muscle contract in order to exert a force. This does not always mean that the muscle itself contracts or shortens overall. The greater the force you need to produce, the more fibres you use and the more the muscle will tend to bulge out. Muscle contractions are of two major types:

- Dynamic contractions
- Static contractions

Dynamic Contractions

When a contraction results in a change in muscle length and movement at a joint or joints this is called a dynamic contraction. When the contraction force is greater than the load to be lifted, the dynamic contraction results in a shortening of the muscle. This is known as a concentric contraction.

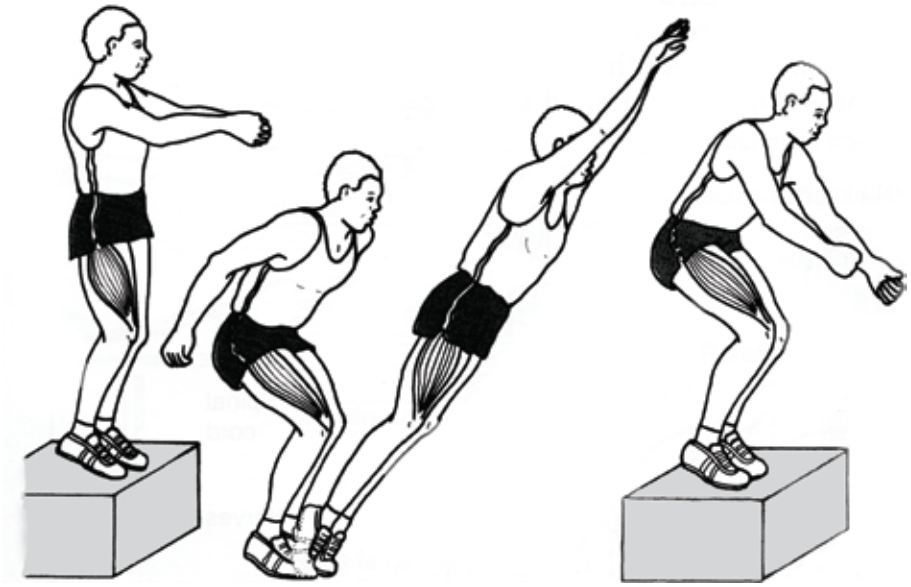


Concentric contraction,
muscle shortens and thickens to raise a load

Eccentric contraction,
muscle lengthens and controls lowering of load

Dynamic contractions of the biceps muscle

If the contraction force is slightly less than the load to be lifted, then the dynamic contraction results in a lengthening of the muscle. This is known as an eccentric contraction. Eccentric contractions tend to be 'controlling' contractions as can be seen from the example when the athlete jumps down from a box to the floor.



Eccentric contraction | Concentric contraction

Dynamic contractions of the thigh muscle

Static Contractions

This type of contraction is more commonly known as an isometric contraction. When a muscle contracts isometrically it develops tension, but there is no lengthening or shortening of the muscle and no movement. Such contraction is very common and can be observed when an attempt is made to move an immoveable object. Isometric contractions occur in athletics when opposing muscles act to stabilise a joint or parts of the body, such as the abdomen or 'core'. Most of the visible contractions a coach will deal with in athletics

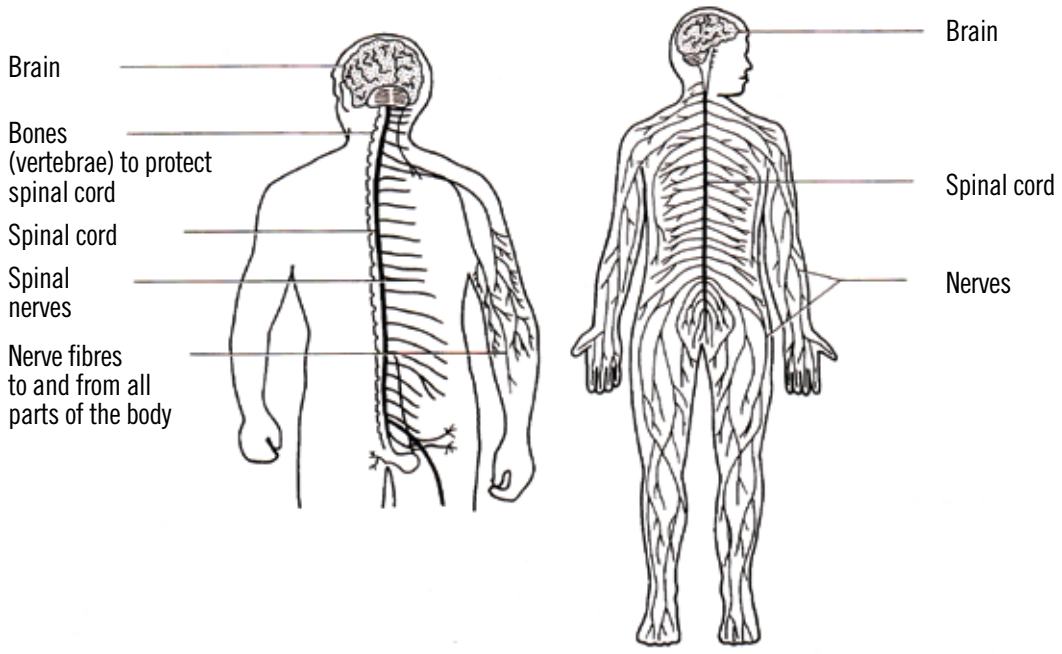
are dynamic but he should not forget the important role of the postural control muscles and plan to develop the isometric strength and endurance of these muscles.

Isometric contractions – example the "On your marks" and "Set" positions

Muscle contractions can be of various types and they all act to exert a pulling force on a bone. But what makes the muscles pull?

The Nervous System - *Getting Information from Place to Place*

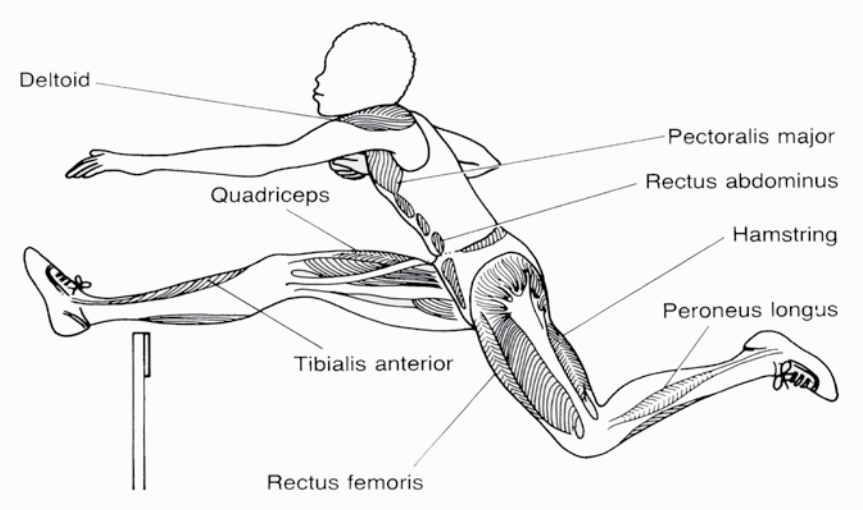
Your muscles pull when they receive signals from your brain telling them to do so. These signals are carried by nerves made up of special nerve cells. The actual contraction process of a muscle fibre is started when it receives a nervous impulse, which is an electrical signal carried by the nerve cells. The nervous system is the network that includes the brain, spinal cord and the many nerves that branch off the spinal cord to all parts of the body.



The Nervous System

The nervous system's signal to the muscle determines the number of individual fibres that contract. When a light load is placed on a muscle only a few fibres of the entire muscle need to contract to perform the task. As the loading increases more and more muscle fibres must be signalled to contract.

The nervous system allows coordinated movements of the body and acts as a two-way system. In addition to the signals coming from the brain to the muscles, there is information going back to the brain. This information includes all the senses, and how fast and with what force a muscle is contracting and the position of the various joints.



Muscles involved in a hurdle clearance

In coaching it is useful to be able to analyse the muscle actions of basic athletic skills. For example, if you are coaching a hurdler you need to know the muscles involved in the hurdle clearance. By understanding how muscles work and identifying the principal muscle groups that are involved in a particular skill you are in a better position to devise training programmes and exercises specific to the athlete and event.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Exercise Physiology

The study of how the body functions and the changes that occur as a result of regular body exercise is known as exercise physiology. When you know how the body produces the energy for muscular contractions you will be able to plan more effective training for your athletes. In addition, a good coach knows and understands the basic physiological differences that can occur between individuals.

Muscles work like engines by burning fuel to produce movement. They are energy converters changing the chemical energy in the food we eat into the energy of movement. This chemical or metabolic energy of movement can be produced in different ways by three separate energy systems.

In order to determine how metabolic energy is produced in our muscles we have to consider some important factors. "Is air we breathe, in the form of oxygen, required for this energy production?" If it is, we say the energy system is aerobic. If the energy system is capable of operating while there is no oxygen available from the air we breathe, then the energy system is anaerobic. Anaerobic simply means "in the absence of oxygen".

So, there are three energy systems operating in the bodies of our athletes. One of these is aerobic, requires oxygen and only operates when oxygen is present. Two are anaerobic, operating when oxygen is present but are capable of producing energy in the absence of oxygen.

The Energy Systems

The three metabolic energy systems operating in our bodies provide the energy we need to contract muscles. These energy systems operate continuously and it is how long and how hard we do whatever physical activity that determines which system contributes most. The three energy systems are:

Aerobic Process

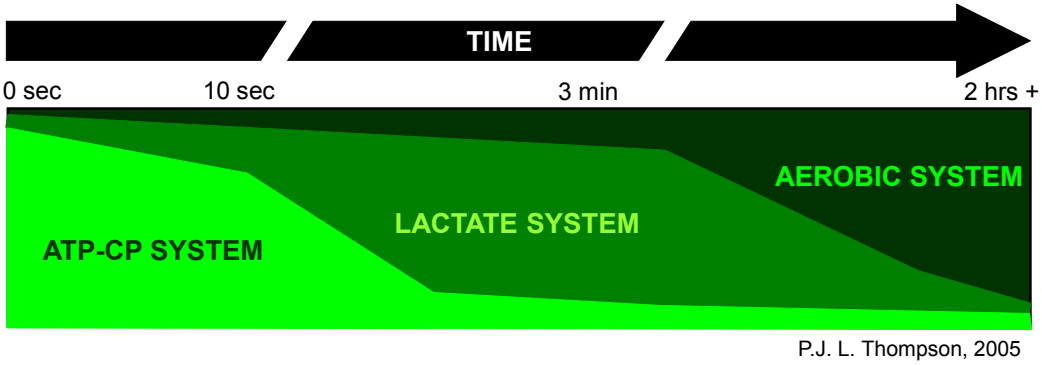
- **The Aerobic System**
  The muscle energy system which requires oxygen

Anaerobic Processes

- **The Lactate System**
  The 'linking' energy system which is capable of operating without oxygen and produces lactate and acid
- **The ATP-CP System**
  The stored, start-up energy system which is capable of operating without oxygen and uses 'CP' as fuel but does not produce lactate or acid.

Although these they energy systems are distinct they actually work together continuously to provide the energy needed for movement. There is no 'switch' inside of our bodies that suddenly says, "O.K., now you're going to switch to the aerobic system." Or, "Now, you're going to switch to the lactate system or the ATP-CP system." It is how long and, equally important, how hard or intense we do whatever physical activity that determines which energy system is emphasised and contributes most.

The following diagram illustrates the contribution of the three energy systems over time, assuming that the athlete is trying to perform at their optimal intensity for the duration of the activity. The word 'optimal', in this use, means the most intense performance that the athlete can maintain for the duration of the activity. You will see that the 'Time arrow' is not continuous but broken at 10 seconds and approximately 3 minutes so that the important changes in emphasis can be more clearly shown.



Contribution of the three energy systems over time

The aerobic-anaerobic split refers to how much the aerobic and anaerobic energy systems are emphasised in a particular activity. Long distance endurance athletes, for example, produce most of their energy aerobically; while sprinters, hurdlers, jumpers and throwers depend more on anaerobic processes for their events. The aerobic-anaerobic split is determined by identifying how long and/or how hard our athletes work and the nature of their recoveries.

System	Characteristics	Energy Provided for	How Developed	Training Effects
Aerobic system	Uses oxygen and fuel stores to provide energy	Prolonged low to moderate intensity work	Aerobic endurance training, e.g. steady state running, cycling, swimming for 20-30 minutes or longer	Improved transportation of oxygen to the working muscle, use of fuels and removal of waste products
Lactate system	No oxygen requirement but produces lactate and acid	The 'linking' energy system that can provide energy over the complete range of durations and intensities	Repetition training, fartlek and circuits where higher intensity work is required with partial recovery during short lower intensity periods	Improved ability to generate energy from this system and to create and use lactate as a fuel source
ATP-CP system	No oxygen requirement and uses CP but no lactate or acid produced	Immediate high intensity activity but can only sustain it for a few seconds	High quality speed and power work (2-8 secs.) with enough rest to allow full recovery and replenishment of the CP	Improved ability to perform maximal efforts and a greater capacity to produce such efforts repeatedly

Summary of the three energy systems

There is one important exercise time, ten seconds, in high intensity exercise that marks a major shift in emphasis from one of the three energy systems to another. After approximately 10 seconds of maximal muscular activity the energy system providing the majority of the energy shifts from the ATP-CP system to the Lactate system. If we want the athlete to do maximal intensity work it has to be of only 2-8 seconds duration with sufficient recovery.

Aerobic Energy – The Endurance Energy System

The aerobic system requires oxygen. This system is emphasised in lower intensity exercise and is the basic system which provides the energy for most human activity from birth to death. As such it is also important in recovery from exercise of all intensities. It is very efficient and does not produce waste products. The heart and lungs are important in aerobic activity as oxygen and fuel are carried to the muscles in the blood.

The aerobic system resists fatigue. It takes longer to overload than either of the other two energy systems. Training the aerobic energy system must be a minimum of a total of 20 minutes duration. The work load for aerobic training can be either continuous or broken up into repetitions of harder and easier running or exercise. Correct aerobic training will improve aerobic energy production in the muscle and also improve the efficiency and function of the heart and lungs, the oxygen transport system.

ATP-CP Energy System – The 'First 10 Seconds' Energy

The ATP-CP system is the one referred to as the 'stored' or 'start-up' energy system. This system provides the majority of energy when our athletes do bursts of high speed or high resistance movements lasting up to 10 seconds. The stores of energy, 'CP', in the muscle which are used up in the intense burst of activity return to normal levels within 2-3 minutes of rest.

The ATP-CP energy system is developed by alternating periods of work and rest. The work time should be very intense, usually of 2-8 seconds and should not exceed 10 seconds, as this is the limit of the energy system. The rest periods should be 2 to 3 minutes, depending on the duration of intense activity, to allow the muscle energy, CP, stores to build up again. If an athlete shows the effects of fatigue, allow more rest time or decrease the work time.

Lactate Energy System – The 'Linking' Energy System

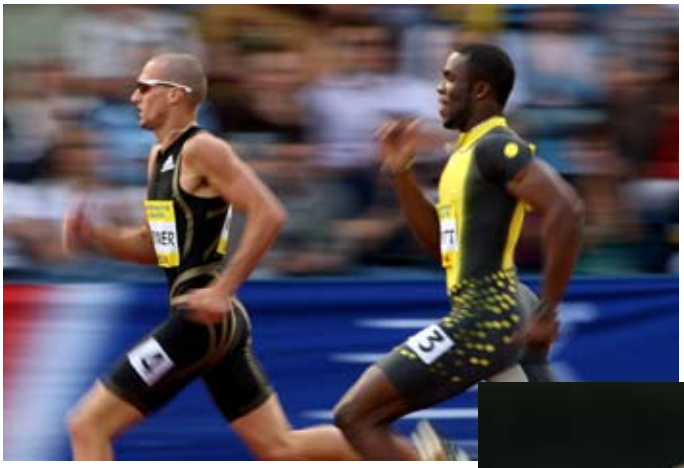
The lactate energy system is called the 'linking' system because it provides the bridge between the capabilities of the aerobic and ATP-CP systems. In the late 1990s our understanding of how the body produces metabolic energy changed dramatically. As a coach you are probably aware that lactic acid can form when you're exercising, particularly when it's an intense activity. You may believe, or have been told, that it only forms when you 'run out of oxygen', that it is a useless waste product, that the burning sensation that comes, for example, from a long, fast sprint is caused by this lactic acid. You may also believe that the soreness that comes the day after a hard training session is again caused by lactic acid and that massage will help to get rid of this waste product. From all this you may still believe the old view that lactic acid in the body is very bad news.

The reality is very different. All the old beliefs of how bad lactic acid was are now known to be unfounded. It is not produced just when the body 'runs out of oxygen', it doesn't produce burning sensations and it doesn't produce muscle soreness. Far from being a troublesome waste product, lactic acid or part of it, can help us produce more energy, more quickly. We now know that lactic acid, as such, just does not exist in the body. As soon as it is formed it splits up, separates, into a 'lactate bit' and an 'acidic bit'. The lactate bit is definitely not a 'bad guy' but is instead is a 'good guy' playing a positive and central role in our metabolism and in how we produce energy. Understanding this role of lactate in the body is important and can be applied to produce major improvements in athletes' performance.

The lactate system is capable of operating without oxygen but is operating all the time, like all of the three energy systems. This energy system is more emphasised in exercise of high levels of intensity but this high intensity may prevent the removal of the lactate and acid bits if not enough oxygen is available. When it does operate without sufficient oxygen, the lactate and acid accumulates within muscle cells and the blood.

The lactate is a useful source of fuel for the athlete and correct training helps the body both use and clear lactate but the acid is a major cause of fatigue, which eventually slows the athlete. The more intense the exercise rate, the faster the rate of acid accumulation to high fatigue-causing levels. For example, the 400 metre sprinter will accumulate high levels of acid after 35-40 seconds. The 800 metre runner runs more slowly and accumulates acid at a slower rate, reaching high levels after about 70-85 seconds.

As you are sitting and reading this book you are producing lactate and acid and, at the same time, you are using it and moving it around the body but you are not building up high levels of the acidic bit and so you are not aware of the process. Lactate production within your muscles occurs in healthy, well oxygenated individuals at all times. Coaches and athletes, however, are not so much concerned with rest as to what happens during exercise and in the recovery from exercise.



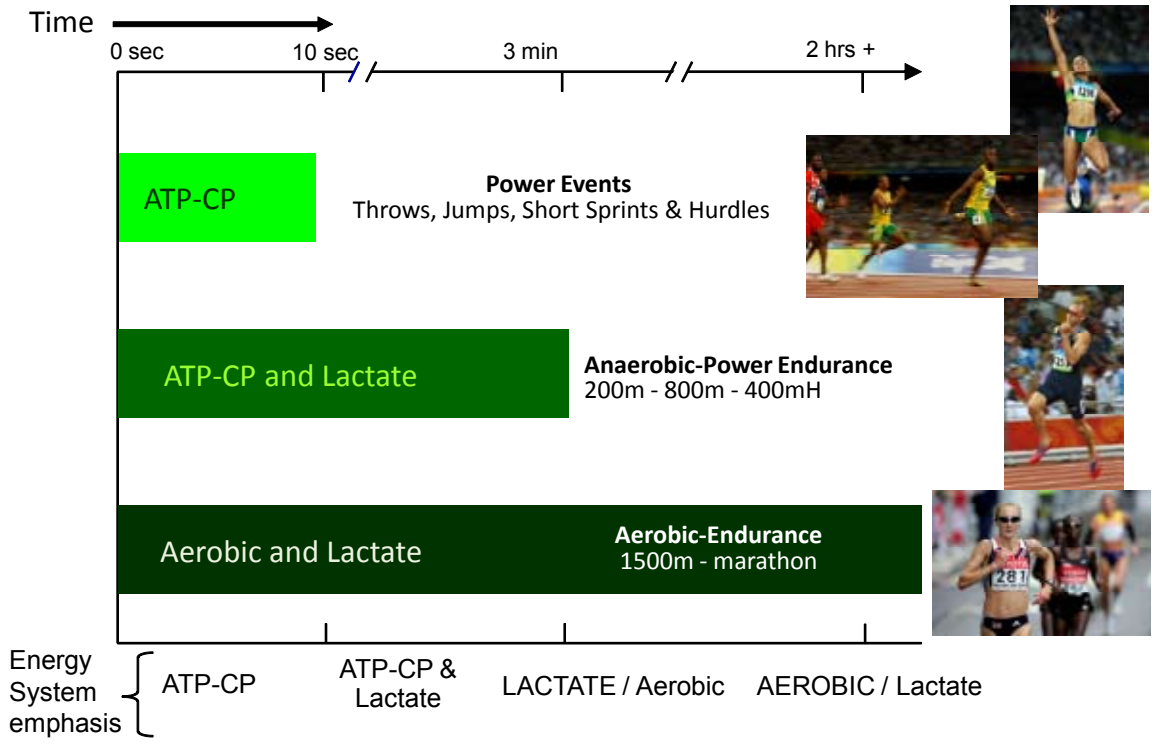
Getting rid of acid after very intense activity is a slower process than the replacement of energy stores in the anaerobic ATP-CP system. It may take more than one hour for lactate and acid levels to return to their pre-exercise level. Recovery activities such as walking, easy running or more active running following intense efforts will speed up the removal of the acid. The first ten minutes of active recovery produces the greatest reduction in lactate and acid levels.

The lactate energy system may be developed by continuous activities or varying the intensity of repetition of work loads of 10 seconds to almost any duration. Rest periods and recovery activity will depend on the duration of the work and should be thirty seconds to ten minutes to allow utilisation of the lactate and removal of most of the acid that is produced.

	ATP-CP	LACTATE	AEROBIC
Duration	0-10 secs	10 secs-1+ min	1-60+ mins
Distance	20m-80m	80m-400m	300m-15+ km or Continuous
Intensity	Maximal	80%-100%	50%-80%
Repetitions	3-4	1-5	3-20+
Recovery/Reps	2-3 mins	30 secs-10 mins	30 secs-3 mins
Sets	1-4	1-4	1-4
Recovery/Sets	5-8 mins	5-20 mins	5-8 mins

Summary of the Development of the Three Energy Systems

The athlete's body is capable of emphasising any combination of the three energy systems. Different events demand different types and amounts of muscle activity. Consequently, different energy systems predominate in the various events. Improving performance is often the result of carefully designed training programmes that aim to increase the capability of emphasising specific energy systems and muscles.



Energy Systems and the Events of Athletics

In summary, all three energy systems work continuously:

- the relative contribution of energy from each energy system to a particular physical activity will depend on the energy requirements, which will be directly related to the intensity and duration of the exercise
- different events have different types and amounts of activity
- different events therefore emphasise different energy systems.

In the early stages of athlete development, in the Kids' Athletics, Multi-Events and Event Group Development stages, there should be a general development of all the energy systems. As the athlete enters the Specialisation and Performance stages the development of the energy systems can shift to those emphasised in an athlete's chosen event.

The Cardio-Respiratory System - Getting Oxygen Around the Body

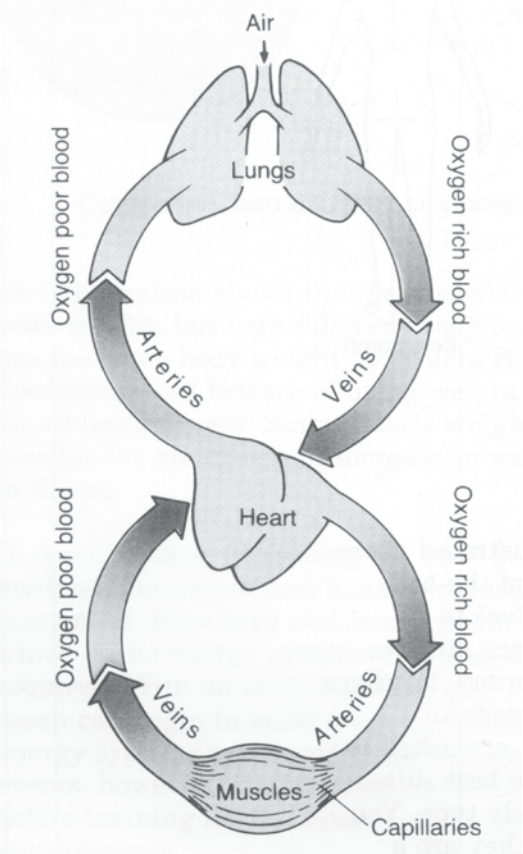
The cardio-respiratory system is responsible for getting oxygen, fuel and nutrients to the working muscles. It is also used for taking waste products away from the muscles. It consists of the lungs, the heart, the blood vessels and blood.

Lungs - Getting Oxygen into the Blood

Air is taken into the lungs through the nose and mouth. In the lungs oxygen from the air is absorbed into the blood. When the body is at rest about 10 litres of air are breathed every minute. During hard exercise this breathing rate can go up to 120-150 litres per minute. The maximum amount of air that can be taken in through the nose is about 50 litres per minute. For most athletic activities breathing should be through an open mouth.

The Heart - Life's Pump

Your heart works night and day pumping blood around your body. It is a large pump made of muscle and never stops working from before you are born until you die. Every muscular contraction of the heart is called a heartbeat. When you exercise your muscles need more oxygen so your heart beats faster to pump more oxygenated blood to them. This increase in heart rate will be from a resting level to a maximum rate which varies from individual to individual and can be over 200 beats per minute. This heart rate can be best felt in the pulse at the wrist or side of the neck. Training has the effect of not only making the heart beat faster but to increase in size so that it may pump more blood with each beat. Training then, increases the size, thickness and strength of the heart muscle and the size of the chambers inside the heart so that the whole heart gets bigger and stronger.



Oxygen is taken from the blood in the capillaries and used in the muscles

The cardio-respiratory system

The Blood Vessels and the Blood

The blood travels around the body through a network of tubes called blood vessels. Arteries are the blood vessels that carry blood away from the heart. Arteries divide into small capillaries which penetrate into all body tissues so that the blood supply is close to every cell in the body. These capillaries are where all the material transported to the cells is transferred and where all the waste products are taken into the blood. Capillaries join up to form veins which return the blood to the heart. Training has the effect of increasing the number of capillaries in the muscles, which means they can work more efficiently.

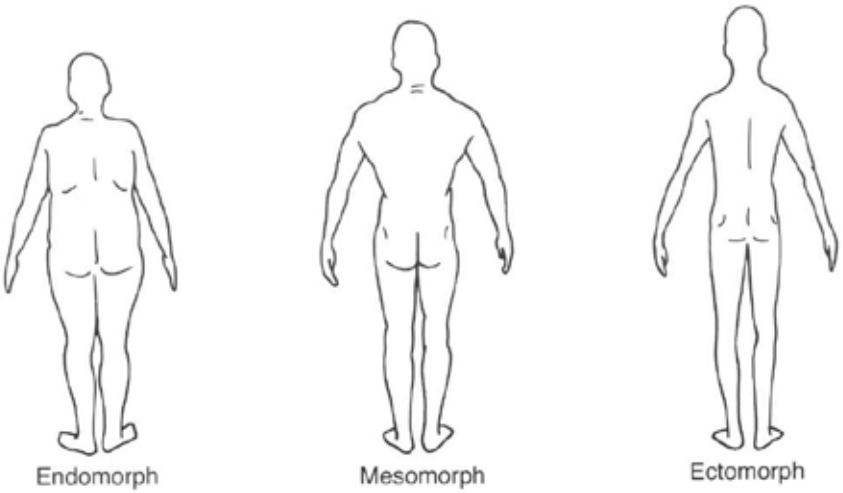
Blood carries chemicals and other substances around the body. This is why the blood and the vessels in which it flows is called a transport system. Blood is important for:

- Carrying oxygen from the lungs and food from the digestive system to the cells of the body. Red cells in the blood transport oxygen.
- Carrying carbon dioxide from the cells to the lungs where it is removed and breathed out of the body.
- Carrying waste materials from body tissues to the kidneys where they are excreted.
- Preventing infection by healing wounds and fighting germs.
- Releasing oxygen in the capillaries so it can be used in the muscles.

Individual Differences

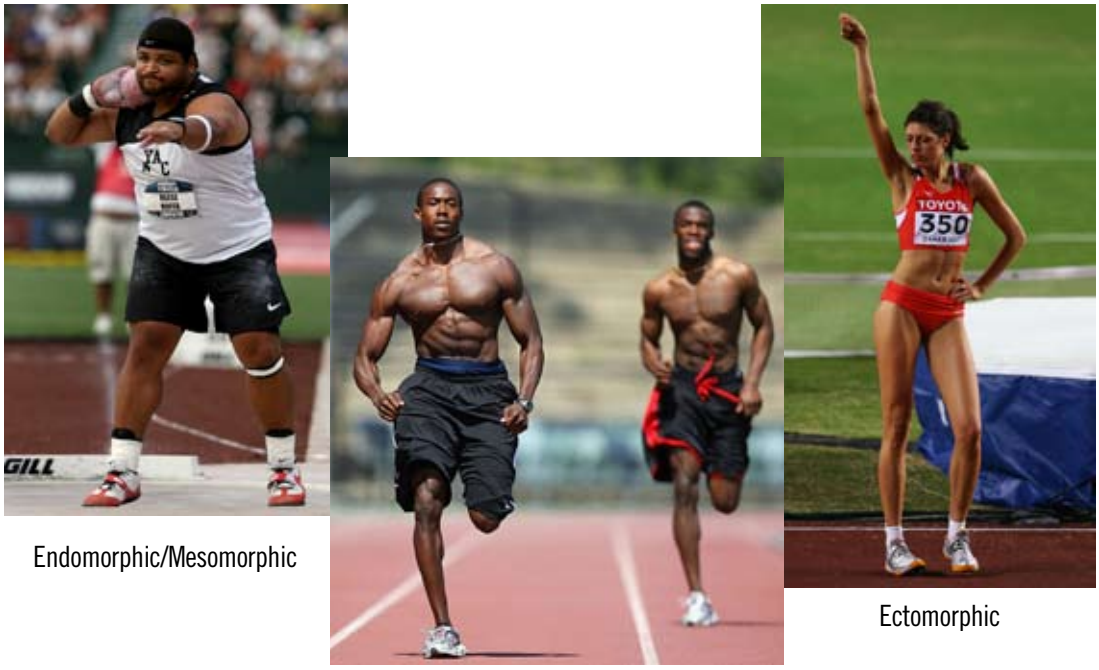
Each athlete is an individual. Individuals come in all shapes and sizes but for both males and females we can recognise that there are three main body types:

- Endomorph type
  These individuals tend to have a less well defined body outline and can become fat very easily
- Mesomorph type
  Individuals who are well proportioned and muscular
- Ectomorph type
  Thin individuals who tend to be tall



The three basic physique types

The three extremes of these body types are illustrated above. Most people are a combination of one or more of the body types. In athletics, certain events lend themselves to particular body types. For example, long distance athletes and high jumpers tend to be ectomorphic. Sprinters, hurdlers and jumpers tend to be mesomorphic and throwers an endomorphic and mesomorphic mix.



Endomorphic/Mesomorphic

Mesomorphic

Ectomorphic

Body Types

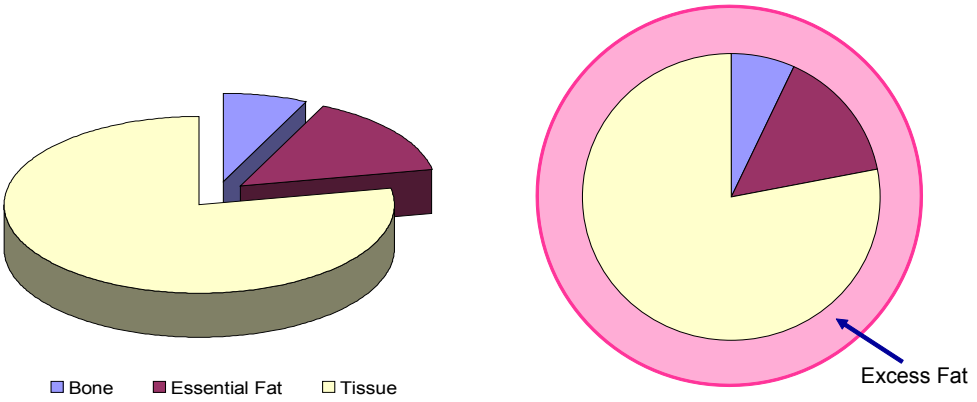
When you are asked to advise a young athlete what event they may be best suited for in the long term it is necessary to take into account their body type. You should also assess their muscle type, whether they are a predominantly fast or slow twitch muscle fibre type. Coaches should, however, always remember the stages of athlete development and encourage multi-event and event group development before any specialisation into a specific event.

Body Composition

If you weigh the body you are weighing two components:

- Lean body weight
  Bone, muscle, other tissue and essential fat. This is sometimes called lean body mass, LBM
- Excess fat
  Stored in various sites around the body

The individual's body composition refers to the relationship between lean body weight and excess fat. Improvement in performance should come from increasing lean body weight and decreasing any excess fat.



A: weight 75kg
(Lean Body Mass = 75kg)

B: weight 75kg
(Lean Body Mass = 68kg + 7kg Excess Fat = 75kg)

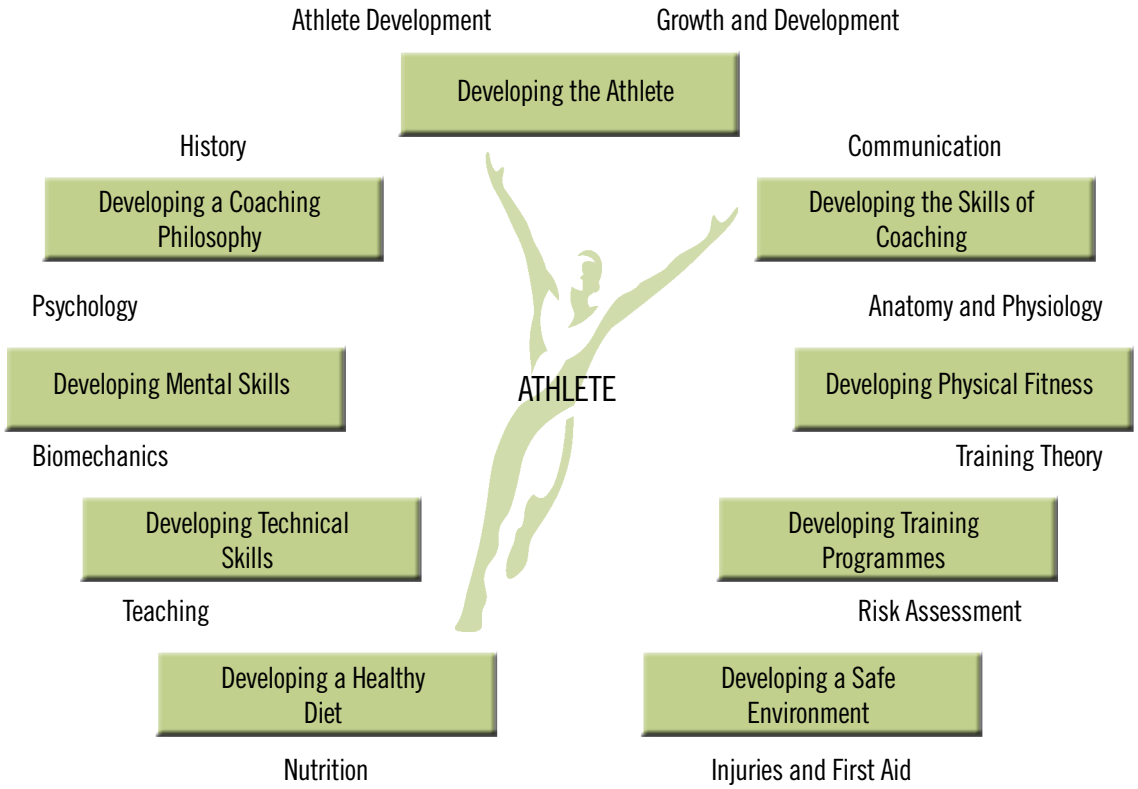
Body Composition – Two individuals, A and B, with the same body weight but very different 'fitness'

The illustration shows that two people can have the same body weight but very different body compositions. Athlete A has the same body weight as athlete B of 75 kg but no excess fat. Athlete B has a weight of 75 kg but a lean body mass, LBM, of 68 kg, meaning that he is carrying an unnecessary 7 kg of excess fat. Coaches should beware of using weight alone as a measure of an athlete's fitness. Since muscle weighs more than fat it is possible for an athlete to show an increase in weight as their LBM increases and he improves in fitness.

In this chapter on the human body in sport and athletics we have looked at the basics of anatomy and exercise physiology and have seen how the body produces movement and how it produces the energy for this movement. How hard and how long an activity is will decide which of the energy systems is emphasised to produce most of the energy required. With an understanding of the energy systems a coach can begin to build training sessions to develop the energy systems. In the early stages of athlete development, in the Kids' Athletics, Multi-Events and Event Group Development stages, there should be a general development of all the energy systems. As the athlete enters the Specialisation and Performance stages the development of the energy systems can shift to those emphasised in an athlete's chosen event. All athletes, however, require a basis of aerobic development to provide a healthy cardio-respiratory system and as a 'foundation for life', before considering the training for any athletics' event specific energy system requirements.

The Components of Fitness

In athletics, records are made to be broken. Men and women around the world continually challenge and improve upon past performances in all events. These improvements in performance are generally a result of higher levels of fitness. This fitness comes from an improved understanding by coaches and athletes of training and its effects. Training theory is the bringing together of all information about athletics from social and scientific sources for the coach to apply in a practical way for the benefit of each athlete.



This information is used by the coach, along with the knowledge he has of the athlete, to produce effective training programmes. But before you begin to look at building training programmes it is important to understand what is meant by 'fitness' and how it can be developed.

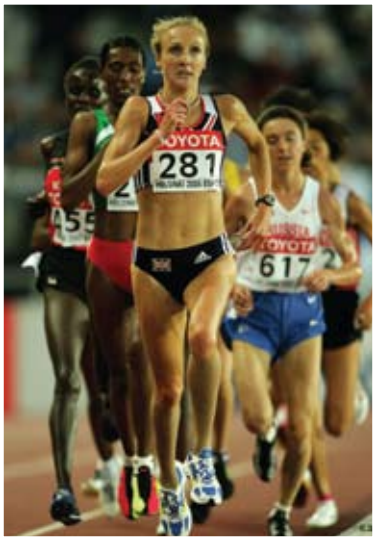
What is Fitness?

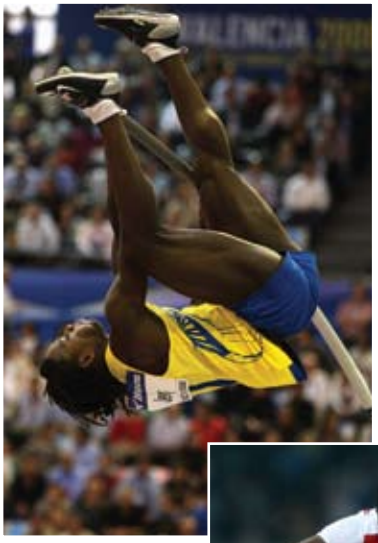
Fitness is how well a person is adapted to and capable of living a certain lifestyle. The fitness of an athlete is generally greater than that of the non-athlete. The athlete needs to be fit for the demands of his chosen athletic event in addition to being fit for the demands of day to day living. But what is fitness made up from? The principle of specificity states that there is a specific response to the specific nature of a training load. This specific response will tend to emphasise one or more of the components that make up fitness. These components of fitness are basic and respond well to training.

The Components of Fitness

There are five basic components of fitness and these are endurance, speed, strength, flexibility and coordination.

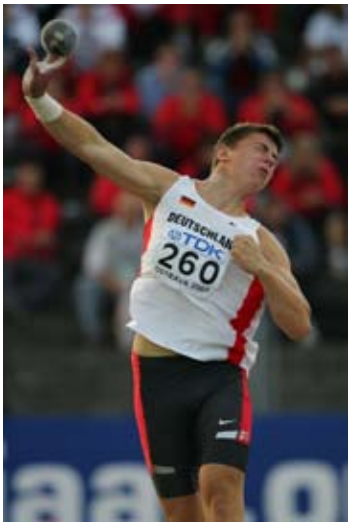
- Endurance
- Speed
- Strength } Power
- Flexibility
- Coordination

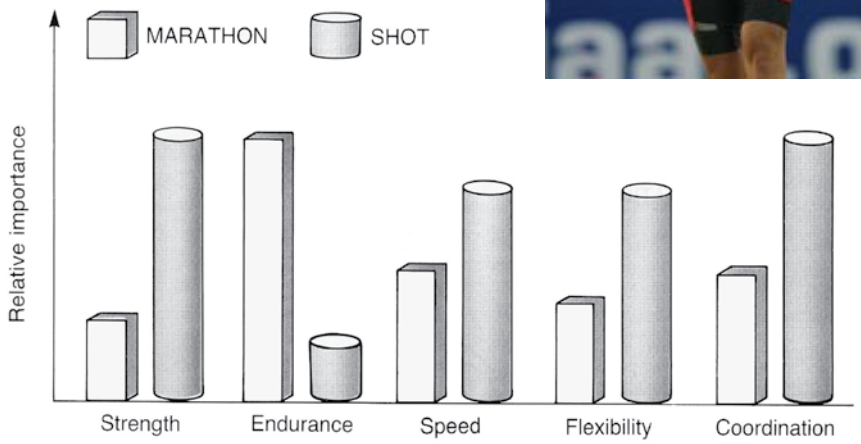




Each exercise in training will tend to develop a particular component of fitness. For example, when distance or duration is extended or maximal the exercise becomes endurance based. Quickness and frequency of movement would give a speed exercise. If the load of an exercise is high or maximal it is a strength exercise. The ability to move through a wide range of joint motion would be a flexibility exercise and activities that have relatively complex movements are called coordination exercises. This is a simplified view and in practice exercises usually develop two or more of the components of fitness.

Different events have different demands on fitness. The fitness of a distance runner is obviously very different to the fitness of a shot putter, as illustrated below. The table illustrates the relative needs for strength, endurance, speed, flexibility and coordination in these events.





Profile for the components of fitness for the marathon and shot

To provide a fitness foundation for all athletes and later to develop the specific fitness required for an event it is necessary for the coach to understand the characteristics of the five components of fitness and how to develop them.

Developing Endurance

Endurance

Endurance refers to the ability to perform work of a given intensity over a time period and is sometimes called 'stamina'. The main factor which limits and at the same time affects performance is fatigue. An athlete is considered to have good endurance when he does not easily fatigue or can continue to perform in a state of fatigue. Endurance, of all the components of fitness, should be developed first. Without endurance it is difficult to repeat other types of training enough to develop the other components of fitness. There are two basic types of endurance:

- **Aerobic endurance**
- **Anaerobic endurance**

Aerobic Endurance

Aerobic means 'with oxygen' and aerobic endurance means muscular work and movement done emphasising the use of oxygen to release energy from the muscle fuels. We have seen how the absorption and transport of the oxygen to the muscles is carried out by the cardio-respiratory system. Aerobic training leads to both a strong cardio-respiratory system and an increased ability to use oxygen in the muscles. Aerobic endurance can be developed by continuous or repetition running. The longer the duration of an event the more important is aerobic endurance.

Anaerobic Endurance

Anaerobic means 'without oxygen' and anaerobic endurance refers to the energy systems which are capable of operating without oxygen present. They allow muscles to operate using energy they already have in store. Anaerobic training of the right type which emphasises the lactate system allows the athlete to clear and tolerate the build up of the 'acid' part of lactic acid. Remember that lactic acid does not exist in the body. As soon as it is formed it separates into a 'lactate' bit and an 'acid' bit. We have seen that the acid is the 'bad guy' but the athlete can use the lactate as a fuel source.

There are two important types of anaerobic endurance. The first is speed endurance which involves principally the aerobic and lactate systems but emphasises the lactate system. Developing speed endurance helps an athlete to run at speed despite the build up of acid. The second type of anaerobic endurance is the endurance needed to maintain maximal velocity speed in sprinting, hurdling, throwing and jumping, where the ATP-CP system is emphasised.

Development of Endurance

The most important types of endurance training using walking and running are:

- **Continuous Training**
- **Repetition Training**

Continuous training simply means walking, running or doing whatever training activity without rest. Continuous training may be used to develop general endurance, specific endurance and for recovery. It usually takes place away from the track and provides a variety of pace, location and running surface in the athlete's training. Runs may be short, medium or long but it should be remembered that 'long' and 'short' are relative to the stage of development of the athlete and their fitness levels. The same distance might be a 'short' run for one athlete and a 'long' run for another athlete. The other type of continuous training which may be used throughout the year is 'Fartlek' training, where the athlete 'plays' with a variety of running speeds or rhythms.

Repetition training is breaking a total distance or any training load into smaller units which are repeated, hence repetitions. In walking and running the pace, distance and rest/recovery intervals and activity are prescribed. Usually done on the track but may be done in a park on grass or anywhere. Repetition training can be divided into two main types by pace or running rhythm: extensive and intensive. When the training emphasis is on general endurance, extensive repetition training is used; when the emphasis is on event-specific endurance, intensive repetition training is used.

Training loads are usually defined by the following parameters:

- Volume can be described by the running distance (m, km, miles) or the running time (sec, min, hours) or by the number of repetitions or number of sets of repetitions.
- Intensity, which would be the pace, rhythm or running speed (min/km, min/mile, seconds per 400m lap, etc.)
- Rest/Recovery is the time, or interval, between different repetitions or sets of repetitions (sec, min or distance).

Developing General Endurance

General endurance is developed mainly through continuous, extensive repetition and fartlek training. The pace used for both these methods should be based on the athlete's running rhythms. These methods should be applied throughout the training year, using the following guidelines and remembering that continuous training runs should also be use throughout the year for recovery and regeneration:

- **Slow Continuous Runs** (Goal: regeneration)
  Pace: Easy rhythm; Volume: up to 30 minutes; Rest: not applicable.
- **Long Slow Distance Runs** (Goal: general endurance)
  Pace: Marathon rhythm and slower; Volume: 60-150 minutes; Rest: not applicable.
- **Medium Continuous Runs** (Goal: general endurance)
  Pace: ½ Marathon to Marathon rhythm; Volume: 30-60 minutes; Rest: not applicable.
- **Fast Continuous Runs** (Goal: general endurance)
  Pace: 10 Km to ½ Marathon rhythm; Volume: up to 10-45 minutes; Rest: not applicable.
- **Extensive Repetition Training** (Goal: emphasise aerobic endurance)
  Pace: 3000m to 10,000m rhythm; Volume: increases with the competition distance; Rest: depends on the individual runs in the sessions (see sample sessions).
- **Fartlek** (Goal: aerobic and lactate endurance)
  Pace: rhythmic 'speed-play'; Volume: 10-45 minutes, increases with the competition distance; Rest: not applicable but the 'easier' sections should still be active running.

Here are some sample extensive repetition sessions:

a) 2 x 10 x 200 m (3000m pace) [between reps = to running time, between sets: 5 min]
b) 15 x 400 m (5000m pace) [between reps = to running time]
c) 1 min, 2 min, 3 min, 2 min, 1 min (10,000m pace) [between runs = to running time]

It is important to remember that when using extensive repetition training the coach must monitor the pace carefully to ensure it stays within the prescribed rhythm and does not compromise the athlete's ability to complete the session. Running too fast during extensive repetition training is a common mistake.

In the section on growth and development we read that testosterone has a number of effects in the body. Testosterone promotes muscle development and this is well known by most coaches. But it also has effects on the energy systems. Testosterone promotes an increase in the number of red blood cells which are responsible for transporting oxygen around the body and to the exercising muscles. It also increases the efficiency of the mitochondria, the parts of the muscle cells where oxygen is used to make energy. Both of these effects mean that the production of aerobic energy is improved and training after puberty can now work towards developing the athlete's aerobic capacity.

Repetition Training and Interval Training

Repetition training may also be divided into two main types according to the recovery activity that takes place during the 'intervals', the time between the faster repetition sections.

- Repetition Training
- 'New Interval Training'

In standard Repetition Training the rest period between repetitions and sets may be passive, walking or

easy running. But in the 'New Interval Training', which has become popular because of its effectiveness in developing both the aerobic and lactate energy systems, the recovery in the intervals is a very active 'roll-on', running recovery. New interval training is a type of repetition training where the training effect occurs in the interval between the faster sections. Only repetition training that has the training effect taking place in the interval should be called 'interval training'. To compare a classic repetition session of 15 x 400 (3000m pace) [90"] with new interval training:

Sample new interval training sessions:

15 x 400 (5000m pace) [100m roll-on] or
3 x 5 x 400 (3000m pace) [100m roll-on & 3 mins] or
3 x 5 x 400 (5000m, 3000m, 5000m, 1500m, 5000m) [100m roll-on & 800m roll-on].

What does 'a very active roll-on, running recovery' really mean? Some coaches find it useful to ask athletes to imagine that they are riding a bicycle. When you are pedalling along it is like being in the faster repetition distance of the session. When you come to the recovery interval it should feel like you stop pedalling – but you do not touch the brakes at all – you just roll, naturally on.

This very active 'roll-on', running recovery could be 25" to 35" or more per 100m for an inexperienced athlete. For experienced juniors and seniors in the Specialisation and Performance stages of athlete development, a 100m roll-on may easily be 25" or less. The roll-on recovery distance can be 100m, 200m, 300m or any distance that is suitable to the stage of development of the athlete, to provide variety and create different effects on the lactate energy system.

In summary, it is true to say that the term 'interval training' should only be used for the specific repetition training where the training effect takes place in the interval between the faster sections. So we can say,

"Interval training is always repetition training
but not all repetition training is interval training."

The effective coach knows this important distinction and uses the correct term to describe the training to be undertaken.

All repetition training can be varied by:

- **Repetitions** The total number of repetitions in a session – may be divided into sets.
- **Duration** Length of time or distance of one repetition
- **Intensity** Rhythm, pace, speed or velocity of the repetitions
- **Recovery** Time of the intervals between repetitions and sets
- **Recovery activity** From a walk to easy running or more active as in new interval training.

Pace for Endurance Training

Coaches use 'pace' in planning endurance training and it should mean,

"The running rhythm the athlete would use if they were racing that distance today – not their personal best"

Pace can be used as a guide for an athlete's running rhythms for their continuous on repetition training. For example, '800m pace' means the running rhythm for this repetition will be the same rhythm as the athlete would have used if they had been racing in a 800m race that day. But this should be their 800m mid-race rhythm and not their 800m finishing pace. Coaches planning training for running sessions should avoid using 'target times' for their athlete's repetition training. For example, a 36 seconds time for 200m might be an 'easy' effort for an athlete on a day when they are 'fresh'. The same time of 36 seconds may feel much harder and produce a different physiological response, or be unachievable for that same athlete, if the athlete is very fatigued.

To repeat, '3000m pace' means the running rhythm for the repetition will be the same mid-race rhythm as the athlete would have used if they had been racing a 3000m race that day, the day of the actual training, not their personal best for the distance. For example, an 82 seconds time for 400m might be an 'easy' effort for an athlete on a day when they are 'fresh'. The same time of 82 seconds may feel much harder and produce a different physiological response if the athlete is very fatigued from training, from other things in their life or if the weather is not good through wind, rain and/or temperature.

Using running rhythm and 'pace' means that the speed of the repetitions is adjusted each day to the athlete's fitness and energy levels. With training groups, using target times may fit one or two athletes in the group but not most of the athletes in the group. Using 'pace' means that every athlete trains at their individual rhythm and level of performance, developing the fitness that they need.

Developing Event Specific Endurance

Event specific endurance is developed mainly through intensive repetition training and only becomes a focus once the athlete has entered the Specialisation or Performance stages of athlete development. The pace used for this method should usually be the athlete's running rhythm for that event but may, close to the competition season during the competition period, be based on the target time for the competition distance.

Intensive repetition training, called 'acidosis training', leads to high concentrations of acid in the body and should be used carefully, if at all, with younger athletes.

- **Intensive Repetition Training** (Goal: event specific endurance)
  Pace: Based on event specific pace; Volume: increases with the competition distance; Rest: depends on the individual efforts in the session

The following table shows the types of repetition training you can do to develop endurance with an emphasis on the lactate system compared to the training with an emphasis on the aerobic system.

LACTATE/Aerobic		AEROBIC/Lactate
Relatively low	← Total Repetitions →	Relatively high
10 secs-2+ min	← Duration →	2-60+ mins
80m-600m+	← Distance →	300m-1200m+ or Continuous
80%-100%	← Intensity →	50%-75%
30 secs-10 mins	← Recovery →	30 secs-3 mins
Walk/easy run	← Recovery activity →	Easy/active run

Comparison of repetition training to shift the emphasis of endurance development from the Lactate to the Aerobic system

Endurance is used in two ways in athletics. It is used for an event group, which includes middle and long distance running and race walking, and as a component of fitness. This can be confusing and lead to some coaches to think that endurance is only relevant to the events of the endurance event group. But the 100m runner or the sprint hurdler needs endurance to maintain their maximum speed to the end of the race. The throws and the jumps events require athletes to have enough endurance to maintain performance through all the rounds of those events. This type of endurance emphasises predominantly the ATP-CP energy system. To develop this we have to use repeated maximal efforts of short duration with sufficient recovery:

	ATP-CP
Duration →	0-10 secs
Distance →	20m-80m
Intensity →	Maximal
Repetitions →	3-4
Recovery/Reps →	2-3 mins
Sets →	1-4
Recovery/Sets →	5-8 mins

Developing anaerobic endurance emphasising the ATP-CP energy system

With a clear understanding of all that comprises the 'Endurance' component of fitness the effective coach can ensure that their athletes' endurance needs are met, appropriate for each athlete's age, maturation and stage of athlete development.


USA
Beijing 2008
3167

Developing Speed

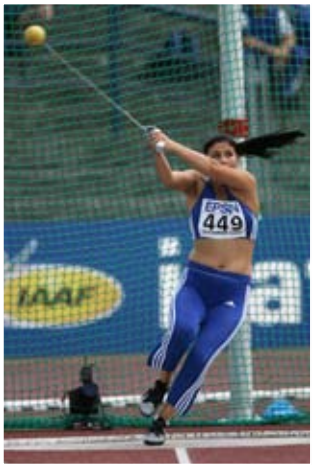
Speed

Speed is the capacity to travel or move very quickly. Like all the components of fitness, speed can be broken down into different types. It may mean the whole body moving at maximal running speed, as in the sprinter. It may involve optimal speed, such as the controlled speed in the approach run of the jumping events. Or, it may include the speed of a limb, such as the throwing arm in the shot or discus, or the take off leg in the jumps. Speed includes the following types:

- **Maximal speed**
  - As fast as you can - may involve whole body or limb movement
- **Optimal speed**
  - Controlled speed in the approach to a jump, making a throw or the best average speed for whatever distance you are walking or running
- **Acceleration speed**
  - The rate of change in speed
- **Reaction time**
  - The time between a stimulus and the first movement of the athlete. Includes the reaction to the gun in the crouch start but also to how quickly an athlete responds to something in an event
- **Speed endurance**
  - The ability to continue to express either maximal or optimal speed as fatigue levels increase.

Maximal speed

Optimal speed



Acceleration speed

Reaction time

Speed endurance

At birth and through infancy a child's nervous system is in place but is not fully developed. As the nervous system develops and matures in childhood it becomes capable not only of sending clearer messages down the nerves but also capable of sending these clearer, more precise, messages down the nerves at a quicker, faster rate. The time when the nervous system has matured sufficiently so that the child can make and learn accurate muscular movement coincides with the time when the child can now make quicker movements. The time immediately following this nervous maturation can be considered as 'windows of opportunity' for the development of skill and speed.

In fact, we have seen that skill and speed are not the only components of fitness that have windows of opportunity. The diagrams for the developmental windows of opportunity for boys and girls show additional opportunities, for the development of strength, aerobic capacity and a second time for speed.

The first 'speed window' is related to the development of the nervous system and its ability to now carry messages much more quickly. This speed window does not mean that the athlete should now suddenly start doing 100m sprint repetitions. Instead there should be a development of reaction movements and quickly initiated movements. This can be done through a variety of speed-based multi-directional movements and games based on activities lasting less than 4-5 seconds with adequate recovery in between.

The second speed window occurs in adolescence due to the continuing development of the nervous system now having the addition of the developing energy systems. During this speed window all types of speed related work may now be carried out to the benefit of the developing athlete.

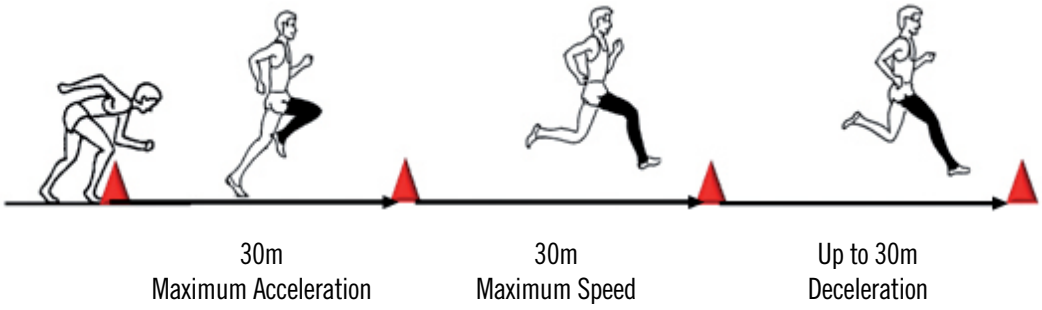
Development of Speed

Speed training involves development of a skill so that the technique is performed at a faster rate. To develop speed the skill must be practised on a regular basis at a maximum or close to maximum rate of movement. Maximal running speed, for example, is developed by runs over short distances at maximum

effort. Perhaps the foundation exercise for developing maximal speed is the 'Flying 30s' which are maximal sprints over 10m, 20m, 30m or even 40 metres. The most common distance for senior athletes is 30 metres which is why the exercise is known as 'Flying 30s'.

The coach marks out an acceleration zone of 30m, and a 'maximal speed zone' of 30m with a run-out for controlled deceleration of up to 30m, as shown in the diagram. The skill of moving at speed should, like all skills, be practised before the athlete becomes fatigued. For this reason recovery times between repetitions and sets should be long enough to recover from any fatigue. In the case of this exercise which emphasises the ATP-CP energy system there should be recoveries of 2 mins - 3 mins between repetitions and at least 5 mins - 8 mins between sets.

Because this exercise requires intense effort and concentration to achieve maximal speed, there should not be more than 3 repetitions in a set. The coach can make the Flying 30s the whole session such as 3 x 3 x Flying 30s (max) [2' and 5'-8'] or part of the session, provided it is at the beginning when the athlete is not fatigued, such as 2 x 2 Flying 30s (max) [2' and 5'] before moving on to another activity.



Flying 30s for the development of maximal velocity sprinting

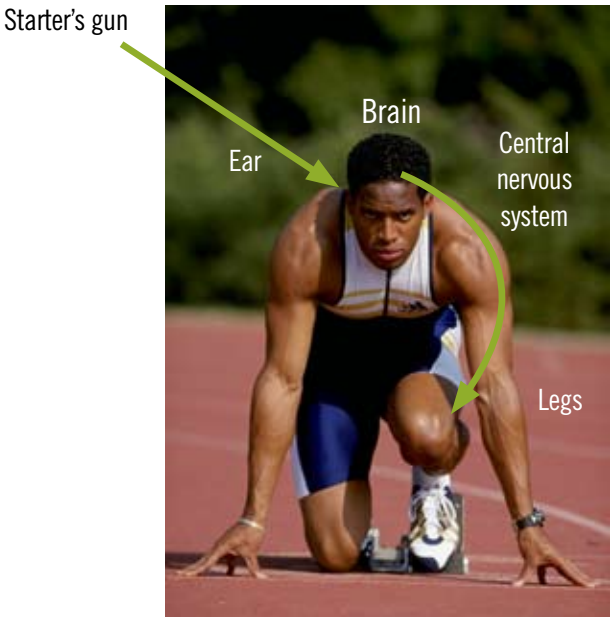
The athlete accelerates maximally from a standing start position so that they attempt to achieve maximal velocity before the 'maximal speed zone'. Through the maximal speed zone the athlete tries to maintain frequency, how quickly their legs are moving. The athlete should not show any acceleration in the maximal speed zone as this should have already occurred. If the coach observes an athlete slowing on the maximal speed runs during a session he should stop the practice and move on to something more appropriate since the athlete is no longer practising maximal speed.

If the athlete is young or has a low training age, they may be capable of 'Flying 10s' where the 'maximal speed zone' is just 10 metres long. But the acceleration zone should still be 30m and the deceleration zone should still be up to 30m. They can then develop to 'Flying 20s' and for senior athletes with a high training age and a stable, uninterrupted training background, to 'Flying 30s' and even to 'Flying 40s'.

Reaction Time

When considering speed it is important to include reaction time. Reaction time is the time between a stimulus and the first movement by the athlete, such as the firing of the starter's pistol and the athlete's movement from the blocks. There are many factors both physiological and psychological which influence reaction time and the initiation of movement. It also includes the athlete's response to what happens during a competition. How long does it take the athlete to react. Simple reaction time games can be great fun for young athletes and in the Kids' Athletics stage of athlete development these games ensure that the

first window of opportunity for speed is optimised. Reaction time for athletes of all chronological ages and training ages can be improved with practice, provided the practice situation is realistic.



Reaction time of the athlete in the sprint start

Power

Power is the interaction of strength and speed, the relationship between speed of contraction and speed of movement. It relates how quickly an athlete can produce force and not merely how much force they can produce. Power lets athletes accelerate quickly and successful athletes are powerful athletes. This quality of speed of movement and strength to increase power output should be developed, once a basis of speed and a foundation of maximum strength has been developed. Power is of obvious importance in the 'power' events of sprinting, hurdling, jumping and throwing but is still of importance in those events which emphasise endurance such as walking and distance running.

	ATP-CP
Duration	0-10 secs
Distance	20m-80m
Intensity	Maximal
Repetitions	3-4
Recovery/Reps	2-3 mins
Sets	1-4
Recovery/Sets	5-8 mins

Summary of the development of speed emphasising the ATP-CP energy system

With a clear understanding of the different types of speed the coach can devise exercises to develop and improve the athlete's speed capacities, at the right time in an individual athlete's developmental pathway and in the correct way.

Developing Strength

Muscular strength is the ability of the body to exert force. Strength is important to every event in athletics for both males and females, provided this is functional strength. Muscle fibres within the muscles respond when subjected to weight or resistance training. This response makes the muscle more efficient and able to respond better to the central nervous system.

Strength is a very important component of fitness for all athletes but the important question is frequently asked, "Is training for strength appropriate for children and young athletes?" With a sound knowledge of growth and development and the stages of athlete development, the coach now knows that young athletes can begin learning the 'techniques of free weight lifting' from about the ages of 8 - 11 years when they are in the 'skill' window of opportunity. Then, once they are mature enough and have entered the 'strength' windows of opportunity, they can start 'free weight training' for strength gains.

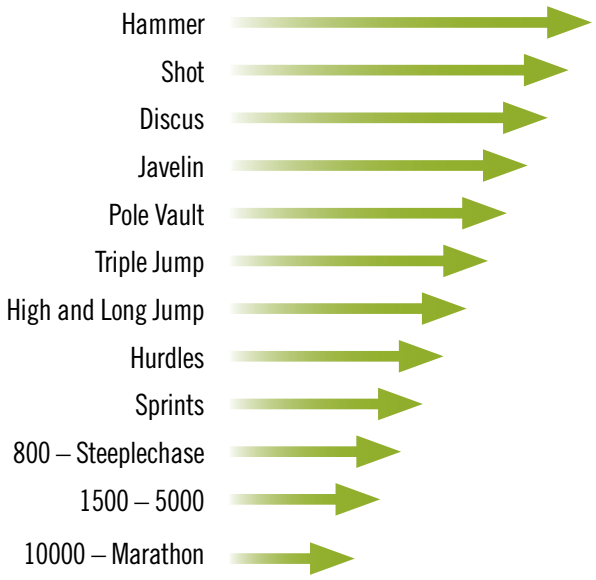
Types of Strength

Muscular strength is the ability of the body to exert force and may be broken down into four types:

- **Maximum strength**
- **Power**
- **Strength endurance**
- **Reactive Strength**

Maximum Strength

This is the greatest force that a contracting muscle can produce. Maximum strength does not determine how fast a movement is made or how long the movement can be continued. It is relatively more important in events where a large resistance needs to be overcome or great forces controlled.



Representation of maximum strength contribution to various athletics events

The relevance of maximum strength for all athletics events is often ignored. Maximum strength is a necessary basic quality as a foundation for power development but has little value in itself. Athletes should be strong but not be 'weightlifters' and their maximum strength must be evaluated in its contribution to their abilities as a powerful athlete.

Power

Power is the interaction of strength and speed, the relationship between speed of contraction and speed of movement. It relates how quickly an athlete can produce force and not merely how much force they can produce. Successful athletes are powerful athletes and this quality of strength should be developed, once a foundation of maximum strength has been developed. Power is of obvious importance in the 'power' events of sprinting, hurdling, jumping and throwing but is still of importance in those events which emphasise endurance such as walking and distance running.

Reactive Strength

Reactive strength is the potential of the athlete to use the elastic properties of their muscles and tendons. When a muscle works eccentrically, that is when the muscle is creating force but the dynamic contraction results in a lengthening of the muscle, it 'stores' energy. We have seen this in the section on the 'Body in Sport and Athletics' where you can see a picture of an athlete jumping down from a box to the floor and then springing up again. The athlete moves from an eccentric action to a concentric action.

This storage of energy by the muscles and tendons is similar to when you stretch a rubber or an elastic band. As you stretch the band it becomes longer and stores energy. If you release the band it very quickly, almost explosively, releases the stored energy and returns to its normal length. In athletics this process is called the 'stretch-shortening cycle', also known simply as the SSC. The stretch-shortening cycle describes the capacity of the muscles and tendons to produce high concentric forces within a very short time after an eccentric stretch. These high concentric forces are called reactive strength.

Unlike maximum strength and power there are two specific mechanisms in reactive strength:

- Storage of Energy - while the muscle is stretching energy will be stored (eccentric phase)
- Reflex actions - this permits energy to be regained quickly at shortening (concentric phase).

Reactive strength is an independent dimension of strength and will not automatically be improved by higher maximum strength or power capacity. It is often over-looked in the running and walking events but provides a vital element to performance in these, as well as in the traditional 'power' events.

Strength Endurance

This is the ability of the muscles to continue to exert force in the face of increasing fatigue. Strength endurance is simply the combination of strength and duration of movement. Performing an exercise, such as sit-ups, to exhaustion would be a test of strength endurance. This strength characteristic determines an athlete's performance where a movement is repeated over a fairly long period of time. Runs between 60 seconds and 8 minutes, for example, require a lot of strength endurance. The ability to sprint, hurdle, throw or jump repeatedly in training or competition and maintain performance levels also requires strength endurance.

Development of Strength

Weight training and resistance training will both develop strength. If there is an increase in muscle mass as a result of training this is called hypertrophy. Muscle hypertrophy is associated more as a result of training for maximal and reactive strength rather than strength endurance. When strength training stops the principle of reversibility indicates that some strength will be lost and the muscle mass may reduce. Reduction in the muscle mass is known as atrophy. Muscle atrophy is a direct result of low, or no, activity and may be a factor in injury rehabilitation.

Maximum strength is best developed by exercises which involve a low number of repetitions and a large resistance or loading. Power is developed through fast repetitions using an appropriate loading and strength endurance is developed using a high number of repetitions with a low resistance. Reactive strength is developed by using exercises which utilise the SSC such as bounding. These methods can be combined by the coach into an overall strength programme and these combinations will vary for different events.

For young athletes, we have seen in the chapter on growth and development that the strength 'window of opportunity' is related to the hormonal changes that occur at puberty. When the athlete reaches this level of maturity they can safely shift from 'weight training for technique development' to 'weight training for strength gains'. Testosterone is the hormone associated with the development of secondary male sexual characteristics but it is important to note that this hormone is also present in females. In females it is present in much less significant amounts than males and once puberty occurs for girls the hormone responsible for female characteristics, oestrogen, becomes dominant. For girls there are effectively two strength windows. The first occurs just prior to puberty when any strength gains and nervous, or neural, adaptations achieved at this time will remain after puberty. The second window for girls occurs after puberty when further strength training for functional strength development can commence.

For boys, the window of opportunity for strength occurs in the twelve to eighteen months after puberty, as testosterone levels rise and peak. Boys could do strength training before puberty but the effects would not be as effective as waiting for the testosterone levels to rise.

Free Weights

The term 'free weights' is given to weights that, when they are moved, the path of the weights is free to move anywhere. Free weights include barbells and dumb-bells. Barbells are long bars that are held by the athlete with two hands. Dumb-bells are short bars that permit weight to be lifted either singly or in both hands. The advantages of sometimes using dumb-bells include identifying muscular imbalances. With free weights, whether using a barbell or dumb-bells, where and how the weights move is controlled 100% by the athlete. With 'machine weights', while the athlete may be able to lift very heavy weights, the path of movement of the weights is controlled by the machine.

The advantages of using free weights, rather than machine weights, include:

- Offering a greater variety of movement
- Muscular imbalances are highlighted
- Permit whole body exercises which help develop stability of the joint areas
- Producing greater power output than machine weights
- Contributing to the development of core stabilisation strength.

It is recommended that all athletes use free weights where ever possible. Machine weights may have some role to play in the initial rehabilitation after injury but, for the healthy athlete, machines do not develop functional strength. Machine weights are also expensive and require more maintenance. With free weights it is possible to improvise inexpensive, safe and appropriate equipment and environments.

Hicham El Gourrouj, double Olympic champion in 2004, using a basic free weights training room

In strength training the following terms are used to describe an exercise:

- Resistance
  - the load a muscle or group of muscles is required to move
- Repetitions
  - the number of times the exercise is performed without stopping, referred to by coaches and athletes as 'Reps'
- Sets
  - a specified number of repetitions comprises one set.

Three sets of ten repetitions, for example for a back squat exercise would be written:

- Back Squat 3 x 10 x (resistance) [recovery between sets]

For structuring weight training sessions to develop strength for athletes in the Specialisation and Performance stages the coach should think of using the '3-5 Rule' to guide the structure of the weights session.

The '3-5 Rule' for Strength Training	
3-5	Sessions per week
3-5	Exercises per session
3-5	Sets per exercise
And, for maximal strength or power:	
3-5	Repetitions or Reps per Set
3-5	Minutes recovery between sets

This 'rule' is intended as a useful guide to structure successful weight training sessions but in practice it may not be possible to have the time to schedule 3-5 weight training sessions per week. Or, it may not be appropriate to the stage of development of the athlete to have 3-5 weight training sessions per week. If this is the case, a minimum of two strength sessions per week are necessary to develop strength.

Free weights permit whole body movements which develop many muscles and muscle groups at the same time. They also help the athlete to control their joints and develop postural strength. In this book we will look at two of the most important basic free weight lifts used for strength training.

- The Stiff-leg Deadlift
- The Squat

The first of these, the Stiff-leg Deadlift, helps to develop the correct feel for raising and lowering a weight while maintaining a correct body position. It also lays the foundation for more advanced lifts such as the Clean and Snatch.

In the Stiff-leg Deadlift and the Squat the technical characteristics of the trunk position are essentially the same. The athlete should start with a vertical trunk. The chest should be pushed forwards and at the same time the shoulder blades should be pulled backwards and downwards towards the hip joints.


The athlete should feel as they were trying to hold a money note between the shoulder blades. They should try to maintain this chest and shoulder position, and feeling of 'holding the note', through the whole movement of the lifts.

The Stiff-leg Deadlift

The stiff-leg deadlift is considered an essential foundation exercise for:

- Understanding the importance of shoulder position in maintaining posture
- Development of eccentric control in the hamstring, gluteal (buttocks) and lumbar spine regions
- Raising awareness of what a 'normally straight back' feels like under loading
- Stimulation of overall strength increases
- Increased ligament and tendon strength.

Front view at 45°

Side view

Technical Characteristics

Start and Finish Position

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

Keep holding a note between the shoulder blades

- The soles of the feet remain flat on the ground with the centre of pressure at the mid-foot.
- The bar starts in contact with the mid-thigh.
- The feet should be shoulder-width apart and facing forward
- The knees should be slightly bent. Note that this is not as some coaches think a straight-leg deadlift. This knee position is crucial and once the bent knee position has been established it should not be adjusted at all during the movement of the lift.
- The trunk is vertical. The shoulders are directly over the bar. The chest should be pushed forward and the shoulder blades pulled backwards and downwards, as if trying to hold a money note between them.
- The hands are placed one thumb length from the edge of the rough marking on the bar. This is just wider than shoulder width.
- The arms are straight with elbows pointing along the bar and with wrists flexed. The athlete maintains locked arms through this lift.

The Descent

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- Maintaining the straight back and with the shoulders pulled back and bent knee position, the bar is lowered under control directly down the front of the thighs.
- This movement is aided by flexing at the hips and moving the hips backwards but not the knees, as the bar gets lower. There should be no movement, no straightening or further bending, of the knees.
- It is important to maintain a straight back with the normal slight inward curve in the lower spine throughout the movement.
- The coach should emphasise the importance of the athlete pulling the shoulder blades back together. "Imagine you are holding a money note between them" and pushing the chest forwards throughout the movement. Losing this shoulder position will mean the hamstring stretch will not be felt.
- The descent continues until the Hamstrings, the back of the thigh, become fully stretched and tight.
- Most athletes feel this before the bar reaches the knees. If the athlete has flexible hamstrings and a greater range of movement is needed to feel the stretch, then this is OK as long as the athlete's back does not become horizontal. If the athlete does not feel the stretch before this point and the knees are in the correct position and the shoulders appropriately pulled back, progressively add more weight to the bar until the athlete does feel the stretch.

The Ascent

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- From the bottom position with a full stretch on the Hamstring muscles the trunk is returned to the start position through hip extension and raising the trunk.
- There should be no movement, no straightening of the knees, as the athlete returns to the start position.
- The bar should return along the same path as it descended until the athlete has regained the start position.

The Squat

The Squat is the foundation lift for any athlete who wishes to gain functional strength. Squats are considered essential exercises for:

- Stimulation of overall strength increases
- Increased ligament and tendon strength
- Increased bone density
- Development of the muscles around the 'core', the lower back, hips and knees
- Improved neuromuscular coordination and efficiency that will improve performance in movements which are biomechanically similar.

There are many variations of the Squat but we shall focus on the three types that most athletes will use:

- The Back Squat
- The Front Squat
- The Overhead Squat

As a coach you will see other variations of squats as you do your coaching. As you observe and analyse these variations you should evaluate in what ways these might be useful in your athletes' functional strength development.

The Back Squat

Rear view at 45°

Side View

Technical Characteristics

Preparing to lift the Bar

- Place bar in squat rack - slightly below shoulder height.
- Always walk forwards into squat frame.
- Stand mid-bar so the bar is positioned across the top of the back - across the trapezius muscles.
- Hands are evenly spaced - elbows are bent to less than 90°.
- Position feet directly under bar.
- Pull shoulder blades back fully - imagine that you are holding a money note between the shoulder blades - then push chest upwards and outwards.
- At the same time - pull the shoulders down towards the hip joints.
- Fully prepare body and mind before lifting bar.
- Stand straight and take 2–3 steps backwards to the 'start position'.

Start and Finish Position

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- Start with - and keep - feet flat on floor - shoulder-width apart with toes pointed slightly outward in a natural position - this will be '5 to 1' on a clock for most athletes.
- The athlete should feel the 'centre of pressure' - where they are aware of feeling the 'weight' - on the forefoot with the whole foot flat on the floor.
- Keep head 'up' throughout lift.
- Maintain normal curve in lower spine throughout lift.
- Maintain shoulder blade and chest position throughout lift.
- Athletes with long legs or poor flexibility may benefit from a wider stance.

The Descent

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- Before moving - take a deep breath in - hold until final stages of lift.
- Before moving - tighten lower back, abdominal and gluteal (buttock) muscles - pulling everything tight in this way is known as 'bracing' the trunk.
- A good coaching cue is for the athlete to imagine that the feet are 'ripping up the floor' by 'pushing' outwards throughout the lift – the feet should not move but this cue really activates the gluteal muscles.
- Begin by flexing at the hips and knees simultaneously - that is at the same time.
- Keep trunk upright throughout lift - maintaining a normal lower back curve.
- Knees should move in line over the toes - a common fault that should be avoided is for athletes to bring their knees inwards during the descent.
- As the athlete descends they should be aware of the 'centre of pressure' moving from the forefoot towards the heels.

The Bottom Position

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- During the movement, the athlete must maintain a normal lumbar back curve, with the chest pointing upwards.
- The downward movement finishes when hip joint passes below top of knee.
- This means the knees will bend past 90°:
- This is important for athletes since the hamstring and gluteal muscles do not become fully involved until the hips pass below the knee.
- The pressure on the knees is reduced as the knees pass through 90°
- Always stopping the descent at 90° means the athlete will never develop strength through a full range of movement.
- Feet stay flat on the floor throughout lift.
- In the bottom position the athlete should be aware of the 'centre of pressure' now on the heels.

The Ascent

- From the bottom position - drive upwards to the start position - leading the movement with the chest.
- In the ascent the athlete should be aware of the 'centre of pressure' of the weight moving from the heels - to finish in the start position - under the forefoot.

Young athletes and weight training

Young athletes should learn the techniques of weight lifting at a young age and then use weights for strength development when they are mature enough. For strength endurance they can use resistance exercises with bodyweight, circuit training and medicine ball exercises.

The Front Squat

Technical Characteristics

Start and Finish Position

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- Front squats move the weight of the bar more onto the thighs during the movement.
- With the bar in front of the body the athlete will get immediate feedback if the upper body leans too far forward. This lift may, therefore, be a progressive stage in teaching posture in back squats.
- Bar rests on upper front deltoids held in place by a clean grip with hands spaced slightly wider than shoulder width apart.
- Elbows are high and level with bar. Wrists should be extended and the grip relaxed.
- The action of the head, shoulders, trunk, hips, knees and ankles are exactly the same in this exercise as the back squat.

Descent and Ascent

- The action of the head, shoulders, trunk, hips, knees and ankles are exactly the same in this exercise as the back squat.

Bottom Position

- The bottom position is very similar to the Back Squat with the thighs below parallel to the ground and the knees pointing along the same line as the toes.

The Overhead Squat

This exercise is often over-looked but it is an excellent conditioning movement for all events and is one of the best exercises for developing trunk strength throughout the full range of movement. It is also a vital component of the squat snatch lift.

Technical Characteristics

Start and Finish Position

Athlete's awareness of the 'Centre of Pressure' on the sole of the foot

- In the overhead squat the bar is held in a wide grip above head.
- Once in place the hands should pull apart from each other - without moving on the bar. This helps to create shoulder stability.
- The arms should remain fully extended throughout the exercise with the elbows pointing along the length of the bar.
- The bar is positioned above and slightly behind the head.

Descent and Ascent

- The action of the head, shoulders, trunk, hips, knees and ankles are exactly the same in this exercise as the back squat.

Bottom Position

- The bottom position is very similar to the Back Squat with the thighs below parallel to the ground and the knees pointing along the same line as the toes.

The recommendations and statements made on strength and conditioning training in this book reflect the advice of Clive Brewer, an IAAF Consultant for Strength and Conditioning, with contributions, consensus and input from athletics coaches representing all IAAF Areas. The materials for the Stiff-leg Deadlift and the Squats were written specifically for the IAAF by Clive Brewer.

Strength Endurance Training and Conditioning

The development of muscular conditioning depends on a number of factors. These factors include the stage of development and experience of the athlete, the type of strength that is to be developed and the facilities available. Exercises that use body weight alone as a resistance are a good way to start strength endurance training, especially for younger and inexperienced athletes.

There are other resistance exercises which require a minimum of equipment. An example of these are exercises using medicine balls. A medicine ball, or an improvised, similarly weighted object, can be used to develop the general strength endurance and coordination required for walking, running, jumping and throwing.

Exercises Using Body Weight

Exercises that use an individual's body weight are very effective. They require no equipment or facilities and you can do them anywhere. Body weight exercises offer the opportunity for variety and progression. This can be seen with some of the variations available on a simple exercise such as press-ups, also known as push-ups.

Press Ups

The basic press-up is carried out from a front support position with a straight back and the head in natural alignment with the spine. The arms should be shoulder width apart. If strength levels are low, the athlete may rest the lower body on the knees rather than the feet.



Variations on the Press-up

Finger tip Press-up	Front support on finger tips
Press-up touching chest	Touch your chest in between press-ups
Press-up clapping hands	Clap your hands in between press-ups
Press-up with feet raised	Front support with your feet on a bench or box
Press-up raising one leg	Raise alternate straight legs each time you lower the body
One arm Press-up	Front support with one hand behind your back
Press-up from handstand	From a handstand against a wall, touch your forehead to the ground

Here are some more examples of resistance exercises using body weight alone:

Triceps Dip

Back support using a chair or box, starting in the 'up' position.


Sit Ups

Make the exercise with bent knees and hands on the chest, shoulders or sides of the head - not clasped behind the head. Draw the navel towards the spine before moving upwards.

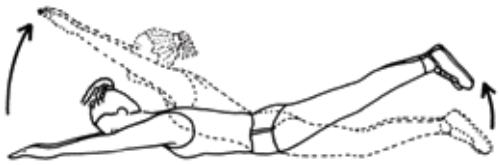


Leg Raise

Lying down but with the upper body raised up onto the elbows. Ankles are dorsiflexed and legs are raised one foot's length above the ground.


Back Extension

Lying face down alternately raise arms and then legs



Chinnies

Sit-ups bringing alternate elbows to opposite knee.

Squats

Standing with feet shoulder width apart, squat as low as the athlete is able.

Squat Jumps

From a standing position repeatedly make a quarter squat and then jump as high as possible. On landing, sink the hips into another quarter squat position to absorb the landing and immediately jump again as high as possible.

Circuit Training

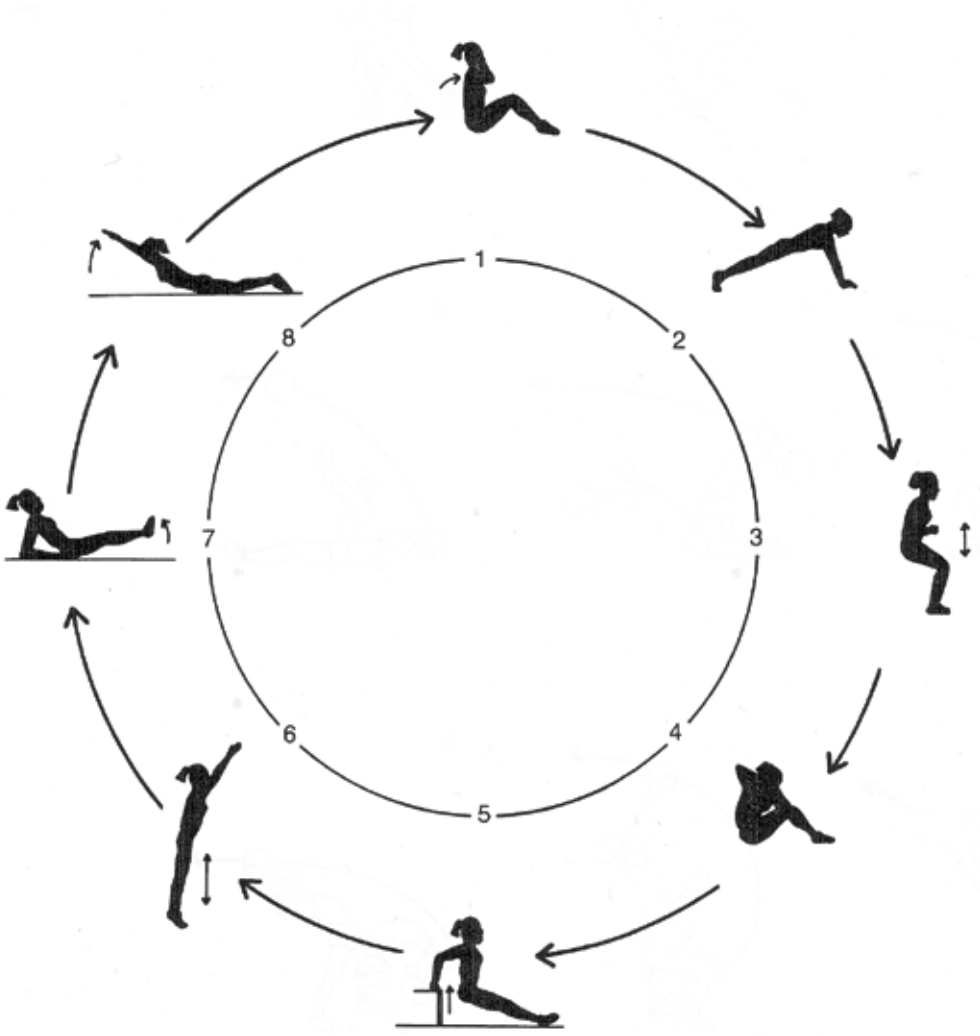
Circuit training is the term given to resistance exercises grouped together to achieve general or specific conditioning. Exercises are performed in a circular arrangement which allows athletes to progress from one exercise 'station' to the next until all stations have been visited. The completion of all exercises is one circuit. This type of training is ideal for small or large groups of athletes working together.

The coach should think of the body in four basic areas when planning a circuit training session

Exercises for each area should be worked in sequence, so that one leg exercise, for example, is not followed by another leg exercise.

The volume and intensity of exercises can be varied in many ways to make circuit training progressively demanding. Time is a good guide for setting work loads for the beginner. It allows each individual to perform the number of repetitions they are capable of and can easily be monitored by the coach.

The following is an example of a general conditioning circuit, using body weight as a resistance.



Number of circuits	1 - 5
Time at each station	30" - l' 30"
Recovery between exercises	1 5" - 45"
Recovery between circuits	2' - 5'

A general conditioning circuit

Exercises with Medicine Balls

The following are examples of exercises using a medicine ball:

1.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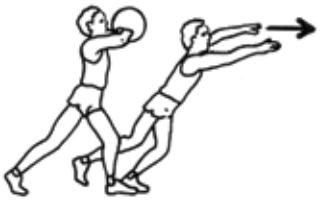

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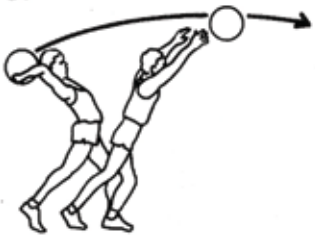

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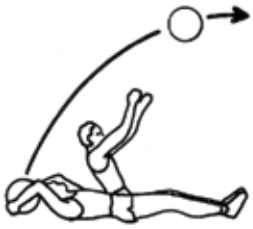

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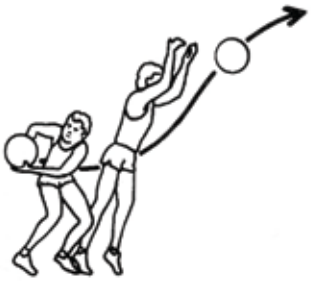

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9.


10.


11.


12.


Developing Flexibility

What is Flexibility?

Flexibility is the ability to perform joint actions through a wide range of motion. The natural range of motion of each joint in the body depends on the arrangement of tendons, ligaments, connective tissue and muscles. The limit to a joint's range of motion is called the 'end position'. Injuries can occur when a limb or muscle is forced beyond its normal limits. Flexibility training may not reduce the risk of injury by gradually increasing a joint's range of motion but may help to express power through the optimal range of motion.

Restricted flexibility is one of the common causes of poor technique and performance. Poor flexibility can also hinder running speed and endurance since the muscles have to work harder to overcome the resistance to an efficient stride length. Flexibility tends to decrease as we get older, while females are usually more flexible at all ages. Young athletes should do regular individualised stretching programmes to develop flexibility where it is needed and maintain existing flexibility. This can prevent the loss of flexibility that comes with age.

A traditional broader definition of flexibility has been,

"the ability to perform a range of movement in a joint or a series of joints."

Coaches and athletes have over many years created many ways and means to enhance flexibility. Unfortunately, many of these methods have improved flexibility but may have been carried out at the wrong time to benefit the training session or competition or have given improvement at the cost of joint stability. Traditional passive stretching has been incorrectly used for several decades based on the ritual of a typical athletics warm up routine. For the past several years there has been an increasing use by informed and innovative coaches of a much more active, dynamic approach to flexibility exercises in the warm up. These more active, dynamic exercises are called 'mobilisation exercises' and are designed to prepare the body for the session which follows.

There are two main types of flexibility activities:

- **Flexibility exercises in the warm up**. Mobilisation exercises should be chosen for the warm up which access the athletes' existing range of motion (ROM) and prepare the body for the activity about to be undertaken

- **Flexibility exercises to increase ROM**. These exercises are aimed primarily at a long term programme to increase the range of motion, ROM, in a joint or series of joints. These exercises may be part of a cool down to a session or form a separate flexibility session itself.

Flexibility in the warm up

There is no evidence that traditional passive type stretching lowers the chance of becoming injured, which is one of the main reasons athletes have performed such exercises in the warm up. As a coach you want the athlete to work opposing muscle groups together actively in the warm up to optimise performance in the training or competition to follow. This is referred to as 'functional flexibility'. This is important because when an athlete performs a movement, especially a speed movement, the muscles required to move the

body or an implement in the desired direction must contract quickly. However, the opposing muscle must relax equally as quickly for optimum performance. The functional flexibility needed is activated through an active, dynamic warm-up, using appropriate mobilisation exercises. Traditional static stretches do not provide this functional flexibility and may actually 'put the muscle to sleep' – something you definitely do not want in the warm up. Some examples of active, dynamic mobilisation exercises are shown in the following pages.

Examples of active, dynamic mobilisation exercises

Flexibility to increase the ROM

There are times when an athlete has a limited ROM at a joint or a series of joints and needs to work on improving this. This should be in a separate flexibility session, not in the warm up. Whenever an athlete does a flexibility session to increase the range of motion you want the selected muscle or muscle group that are stretched to relax and so enhance the range of motion. This protects not only the muscle but also the joint or joints involved with a specific muscle group. If athletes execute a passive stretch until they feel discomfort it means that pain receptors in the area being stretched are being triggered and the body is telling the brain something is not right. An athlete should not feel discomfort or pain during flexibility training.

Improving flexibility, like the development of other fitness abilities, is a slow process. To increase the range of motion of a joint the muscles have to be stretched beyond their normal point of resistance and the stretch held for a period of 15-30 seconds. The duration of holding the stretch within the 15-30 seconds range will vary according to the stretch being used and the fitness of the athlete. This work should be done several times a week using appropriate flexibility exercises. There are two main types of stretching exercise:

- Active stretching
- Passive stretching

In active stretching the athlete controls the movement. These exercises are usually done in the 'end position', as a static exercise and these can be used in the cool down, for between 6-10 seconds to regain any ROM 'lost' during the session. If the active, static stretch is to increase the ROM in a separate flexibility session, the stretches are held for between 15-30 seconds.

Examples of active, static stretching exercises

Example of passive stretching

In passive stretching the exercises are only performed in the end position, the static type of exercise. A partner controls the movement and great care is required. The athlete actively goes to the end position and the partner progressively applies pressure. At this point the athlete should concentrate on relaxing the muscles being stretched. Passive static stretching exercises can produce good improvements in range of motion provided the individual controlling the stretching is skilled in this type of stretching.

Sample Mobilisation Exercises for the Warm Up

Slow to Fast ***Active to Dynamic*** ***General to Specific***

ARM CIRCLES

Either standing upright or while walking, circle one arm clockwise and the other arm counter-clockwise. Alternate direction.

LEG SWINGS

Standing side-on to a hurdle or something similar, place hand on the hurdle for support and swing the outside leg forwards and backwards – flexing and extending the leg/hip and keeping the pelvis 'neutral'. Repeat for other legs. Another exercise can be done with body facing the bar, swinging leg to the side away from and across the body – adducting and abducting the leg/hip.

HEEL FLICKS

Small running steps, athlete quickly picks "toe up – heel up" behind them close to the body – ankle is 'cocked'.

WALKING LUNGES

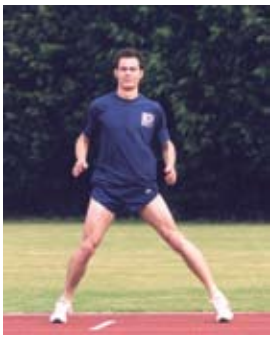
Long strides, high knee raises into low lunge position, feet always facing forwards, rear knee down towards the ground, front knee at approximately 90 degrees or less. Alternate arm and leg action.

Sample Mobilisation Exercises for the Warm Up

Slow to Fast ***Active to Dynamic*** ***General to Specific***

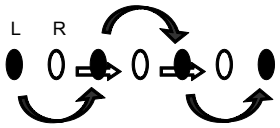
SKIPPING

SIDE STEPS



CARIOCA

Facing sideways, travelling to the right, left foot goes in front of right, right foot goes to the right, left foot goes behind right and then right foot goes to the right.



BACK SLAPS

Walking or skipping - stretch arms out to the side at shoulder height and then swing arms across body to slap the back. Alternate right on top, right underneath

Sample Stretching Exercises for Increase of ROM

For the cool down or as a separate session for improving flexibility

CALF STRETCHES

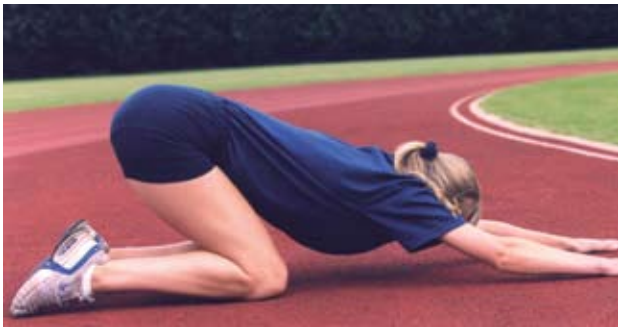
ADDUCTOR STRETCH

QUADRICEPS STRETCH

IT BAND STRETCH

HAMSTRING STRETCH

SHOULDER STRETCH



Stretching exercises in the cool down:
hold for 6 -10 seconds

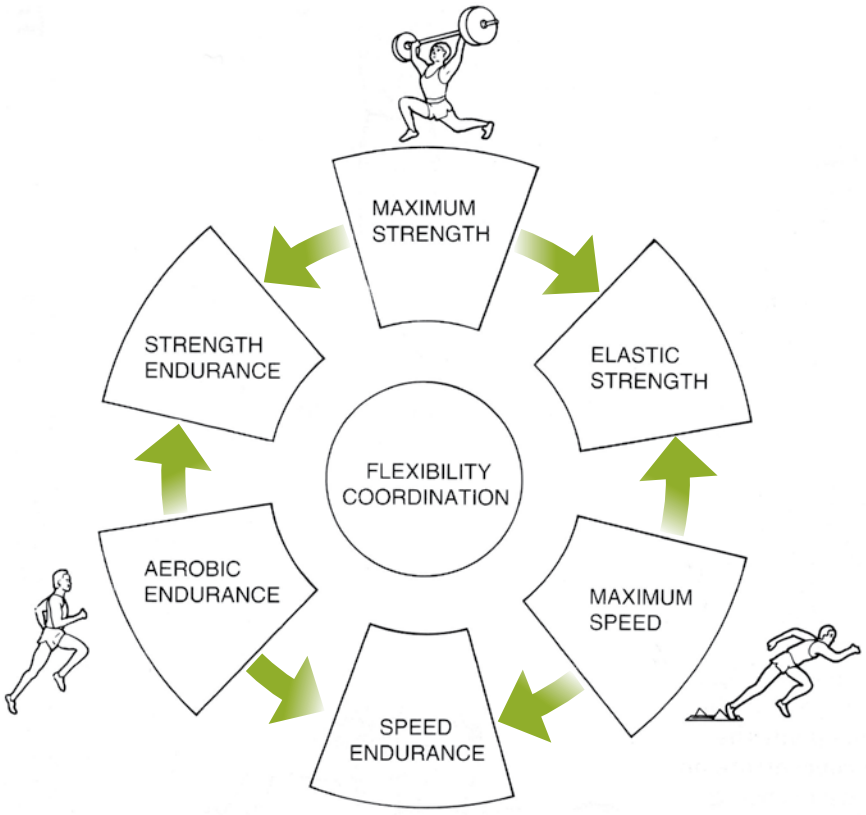
Stretching exercises in a flexibility session:
hold for 15 -30 seconds

Developing Coordination

Development of Coordination

Coordination is the ability to carry out complicated movements such as those involving more than one sequence or body part at the same time. It is the ability to carry these movements out at the optimal speed, efficiently and accurately. It is considered that an athlete with good coordination is capable not only of performing a skill well but also of rapidly solving a training task or learning a new skill. Coordination is one of the elements of 'physical literacy' and, in many ways, is required before a child can develop the other elements, which together make up physical literacy.

The coordination required for walking, running, jumping and throwing can be developed from a young age once the nervous system is mature enough. Girls between the ages of 8 and 11 and boys between the ages of 8 and 13 have exceptional rates of learning in the skill 'window of opportunity'. Basic coordination exercises and skills that are learned at this age become the foundation for later event specific skill development. In the mature athlete coordination exercises and drills remain important as they maintain a balance against the imbalances caused by very specific training.



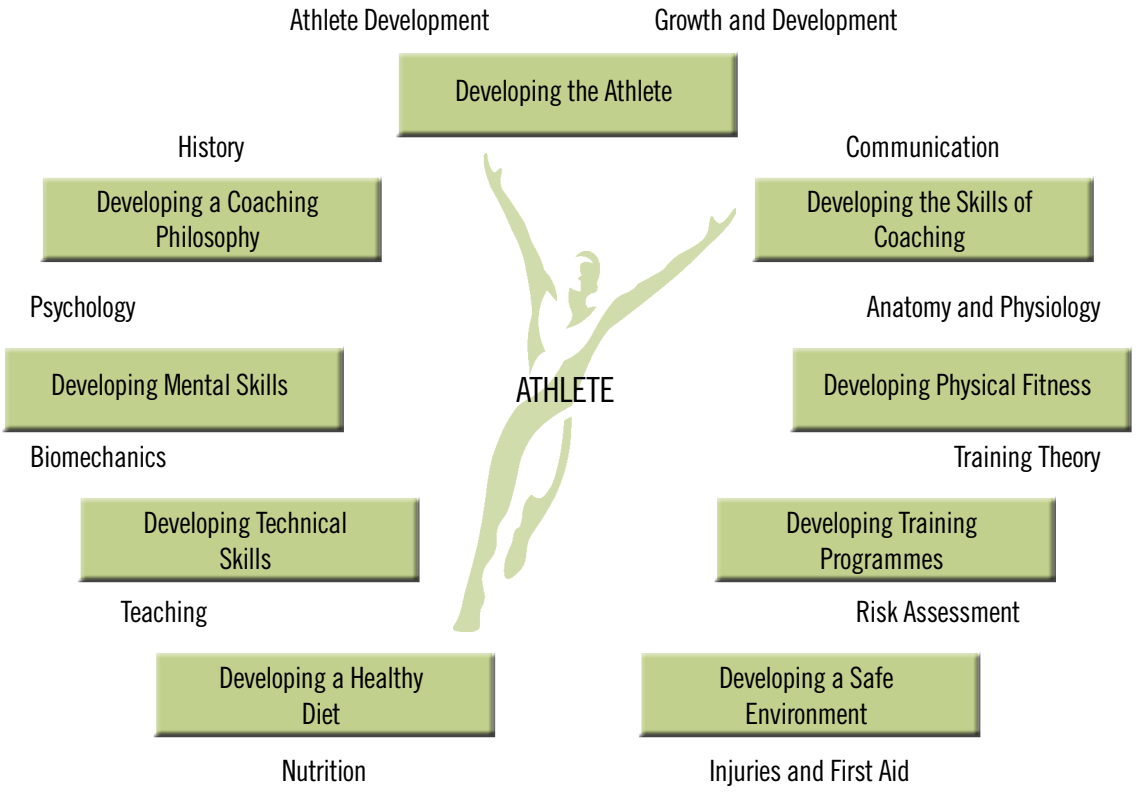
Inter-relationship of the components of fitness

The components of fitness have been presented separately to identify the characteristics of each. In practice there is no such thing as a 'pure' strength exercise or a 'pure' speed exercise. The components of fitness contribute to overall physical fitness and an understanding of their inter-relationship allows the coach to plan training more effectively.

5

DEVELOPING A PLANNED APPROACH TO TRAINING

The Principles of Training



What is Training?

Training is a systematic process with the objective of improving an athlete's fitness in a selected activity. It is a long term process that is progressive and recognises the individual athlete's needs and capabilities. Training programmes use exercise or practice to develop the qualities required for an athlete's long term development.

The process of training can be planned because training follows certain principles. These principles of training need to be fully understood before the coach can produce effective long term programmes. The three most important of these principles are:

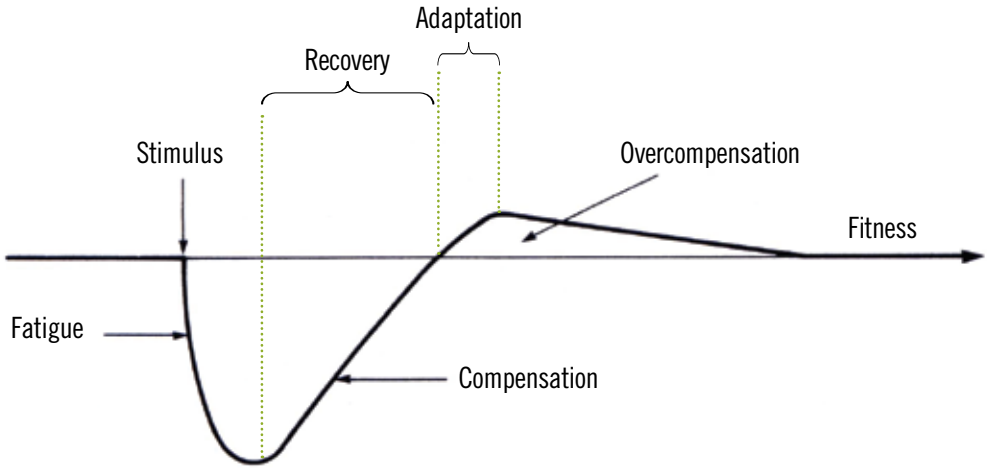
- Principle of Overload
- Principle of Reversibility
- Principle of Specificity

Principle of Overload

The human body is built up of millions of tiny, living cells. Each type of cell or group of cells carries out a different job. All cells have the ability to adapt to what is happening to the body. This general adaptation takes place inside the body all the time. There is also an adaptation to the training for athletics.

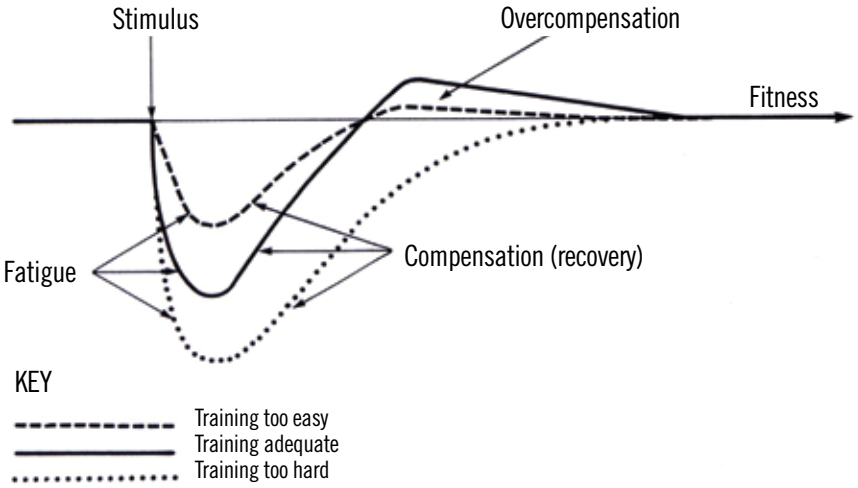
A training load is the work or exercise that an athlete performs in a training session. Loading is the process of applying training loads. When an athlete's fitness is challenged by a new training load there is a response from the body. This response by the body is an adaptation to the stimulus of the training load. The initial response is of fatigue. When the loading stops there is a process of recovery from the fatigue and adaptation to the training load.

This recovery and adaptation returns the athlete not just to his original fitness level, but to an improved level. This higher level of fitness is achieved through the body's overcompensation to the initial training load. So, overload causes fatigue, and recovery and adaptation allow the body to overcompensate and reach higher levels of fitness.



The Principle of Overload

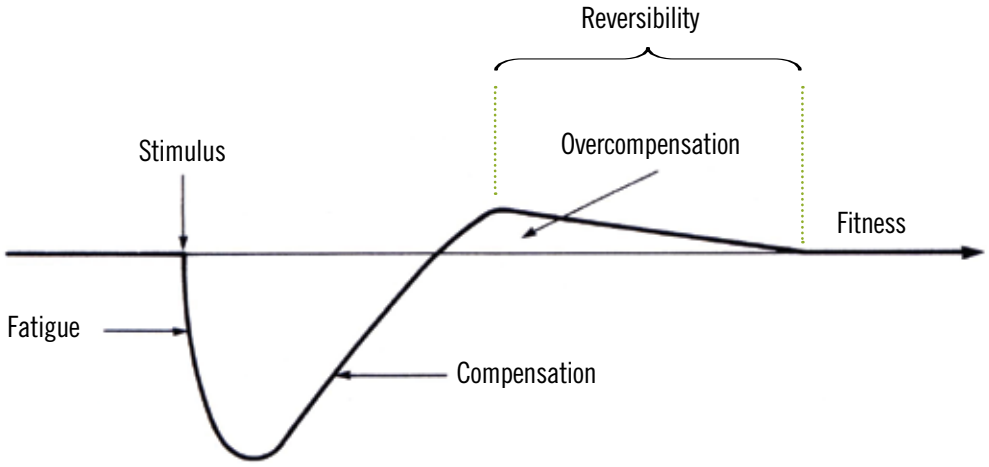
The body's ability to adapt to training loads and overcompensate in recovery explains how training works. If the training load is not great enough there is little or no overcompensation. A loading that is too great will cause the athlete to have problems with recovery and he may not return to original levels of fitness. This condition is caused by overtraining.



Different training loads have different effects of the athlete's recovery and adaptation

Principle of Reversibility – "If You Don't Use It, You Lose It"

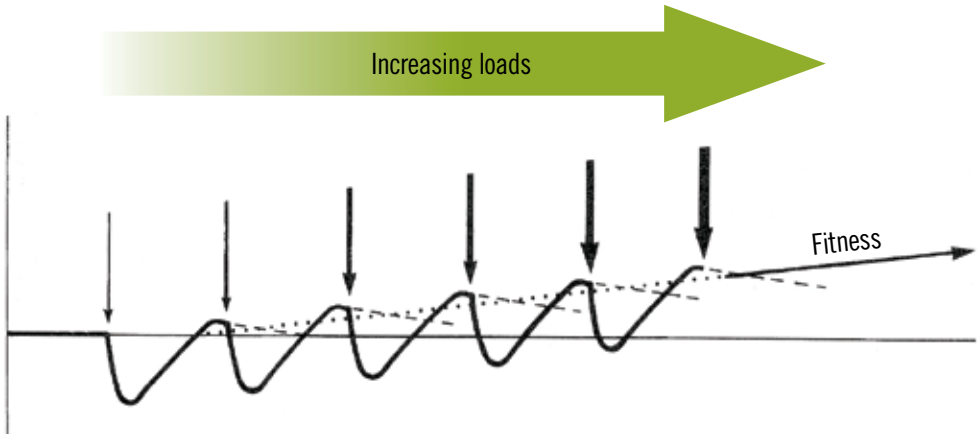
If the athlete is not exposed to regular training there is no loading and the body has no need to adapt. This is shown in the illustration of the principle of overload, where the fitness level of the individual returns slowly to the original level. For training to be effective the coach must understand the relationship between adaptation, the principle of overload and the principle of reversibility. Fitness improves as a direct result of the correct relationship between loading and recovery.



Principle of Reversibility

The term progressive overload is used to explain that increasing levels of loading will lead to progressive adaptation and overcompensation to higher levels of fitness. These increasing levels of loading would include such things as a higher number of repetitions, faster repetitions, shorter recovery times and heavier weights.

When the coach continually applies the same training load to an athlete there is an initial increase in fitness to a certain level and then the athlete remains at that level. Once the body has adapted to a particular training load, adaptation ceases. Similarly, if the training loads are too far apart the athlete's fitness level will keep returning to original levels. Widely spaced loading will produce little or no fitness improvement.



Progressive Overload

We have seen that different training loads have different effects on an athlete's recovery. An excessive training load causes incomplete adaptation and the athlete will have problems with recovery from the training stimulus. These problems with recovery can also be cumulative. This occurs when the loading is repeatedly too great or too closely spaced. The decline in performance caused by incomplete adaptation is one of the most obvious symptoms of overtraining. In this situation the coach must allow time for proper recovery and should evaluate and reduce the training loads used.

Overtraining produces decreased performance

The ratio of load to recovery is called the frequency of training or the Training Ratio. Determining the correct training ratio for an individual athlete is one of the ways in which the coach produces optimal levels of improvement in both fitness and performance. With a young athlete the ratio may be 1:4, meaning 1 unit of load to 4 units of recovery. A mature, experienced athlete may need to be 1:2 or 1:1 to give continuing fitness improvements. In practical terms the recovery is not necessarily a complete rest but could be a lighter or easier training load. This can be seen in the very successful training philosophy, for the athlete with a training age of more than ten years, of alternating hard and easy days, and hard and easy weeks. The younger athlete may respond well to a hard/easy/easy format or need an even lighter loading.

Planning time in your athletes' training specifically for recovery is essential but time alone is not the only thing you can do to help this recovery. There are many additional things you can do to actively and positively aid the recovery process. These things will ensure that the athlete is able to optimise the fitness benefits of any training. In simple terms, it means that by planning recovery time and activities your athletes will experience a four-fold benefit. Firstly, they will get better performance from the same training; secondly, they will be able to progress their training at a faster rate because both their performance and training capacity have improved; thirdly they will actually begin to train the adaptation process as the cells respond more quickly and more profoundly to the volume, intensity and frequency of their training and, finally, they will be less susceptible to injury and illness.

The coach should always remember that the moment the athlete finishes a session the body starts recovering and the training effect only then commences. Since the majority of your athletes' fitness adaptations occur through recovery, the goal of your training programme should be to optimise recovery. In other words, instead of 'recovering to train', as many coaches and athletes do, you should 'train to recover'. This is an important distinction in emphasis and is more than merely playing with words. Those athletes who 'recover to train' have a focus entirely on the sessions that they do and rest is seen, at best, as a necessary evil. These athletes are still stuck in the mind-set that merely completing a session is sufficient to improve performance, which we have seen is not true. When you 'train to recover', however, each session is seen in the context of the recovery opportunities that follow them. Training for recovery should never be confused with training less. Instead, these athletes create a better way of balancing their training, resting and recovery, making their training more efficient.

Principle of Specificity

The principle of specificity states that the specific nature of a training load produces its own specific response and adaptations. The training load must be specific to both the individual athlete and to the demands of their chosen event or events. This may be obvious when comparing the demands of events such as marathon and shot. It is less obvious but just as important when planning the training of a 200 metre specialist compared with a 400 metre specialist. Or, a 100 metre hurdler compared with a 400 metre hurdler.

General training must always come before specific training in the long term plan. The general training prepares the athlete to tolerate the loadings of specific training. The volume of general training determines how much specific training the athlete is able to complete. The greater the volume of general training in an athlete's foundation the greater is the capacity for specific training.

Why Training 'Works'

An individual bought a new house which had a large garden. Although he had never dug a garden before he was inspired by the many productive gardens around him to plant some vegetables. The first Saturday after moving in he spent almost six hours digging with a spade. That night as he lay exhausted in front of the TV he noticed that his hands had become painfully blistered and some of the blisters had split open. The next day the muscles were sore all over his body. He knew, and most people he talked to, recognised that he had overdone his first efforts at digging. A week later his body had recovered but his hands were still healing.

Whenever we do an activity which is more, or different, from what we usually do it produces an **Overload**. If the overload is too great, as was the case with our over-enthusiastic gardener, the cells of the body do not have time to adapt. So, it is the rest or **Recovery** after an overload that permits the cells of the body time to adapt to what we are asking of them and it is the **Adaptation** to that overload that increases our ability to do an activity. In simple terms, the adaptation of cells allows us to increase our fitness.

Thinking about our gardener again, he noticed that he had a general response to what he did, with muscle fatigue in the evening and soreness the next and following days. He also noticed that there was a very specific response with the painful blistering of his hands. So any overload has both a general and a **Specific** response.

During the next week he spoke to many people at work and socially. An athletics coach he knew suggested he try a different approach to his gardening. She suggested that the next time he decided to do some digging it should be for only 30 minutes. This he did. That evening his hands were slightly red and he felt a little tired but the next day he woke feeling little stiffness and his hands no longer exhibited any signs of redness. Three days later he had a day off work and following the coach's advice dug once more for just 30 minutes. Again, the next day he was fully recovered. His cells had successfully adapted to the digging.

His new 'gardening coach' advised digging on a regular basis, every three to four days. With her advice he found that he could gradually increase the time of his digging and introduced varying times from as little as 20 minutes to much longer. After several weeks he was able to dig more frequently and up to one and a half hours without suffering too much muscle fatigue or having problems with his hands. In fact, his hands had become roughened and calloused where he held the spade and his overall strength while digging had improved.

From this the gardener had learned that how long he dug, the volume or duration; how much effort he put into his digging, the intensity and how often he dug, the frequency, determined how he felt afterwards. With the appropriate combination of volume, intensity, frequency and recovery, the cells of his body were able to continue adaptation to his digging and he became a progressively fitter gardener. This story illustrates clearly why training improves fitness - why training 'works'.

Summary of Training Principles

- The body is capable of adaptation to training loads
- Training loads of the correct intensity and timing cause overcompensation
- Training loads that increase progressively cause repeated overcompensation and higher levels of fitness
- There is no increase in fitness if loading is always the same or too far apart
- Overtraining, or incomplete adaptation, occurs when training loads are too great or too close
- Adaptation is specific to the specific nature of the training.

In addition to the basic principles of adaptation, overload, reversibility and specificity there are three other principles that we should consider as coaches in setting out the training plan for an athlete.

Principle of Individualisation –The Individual's Response to Training

Each individual is unique. Each individual brings to athletics his own capabilities, capacities and responses to training. Different athletes will respond to the same training in different ways. There is no such thing as an ideal training programme that will produce optimal results for everyone. You, as the coach, need to understand the principles of training and apply them with your knowledge of the individual athlete. This knowledge should be of the many factors that affect the planning of the individual athlete's training programme. These factors include heredity, developmental age and training age.

Athletes inherit physical, mental and emotional characteristics from their parents. This is heredity. These inherited characteristics should be recognised by the coach. Many of these characteristics can be modified by systematic training but the extent to which they can be changed and modified will be limited by the inherited potential. Not every athlete has the inherited potential to be an Olympic champion. All athletes have the ability to make the most of what inherited potential they do have.

Our knowledge of growth and development tells us that young athletes of the same chronological age can be at very different levels of physical maturity. Individuals of the same chronological age can often be up to four years apart in their developmental or biological ages.

Each individual athlete has a different level of fitness and experience. The length of time an athlete has been training will affect their fitness level and capacity for work. Training age must be considered and is simply the number of years an athlete has trained for athletics or an athletics-related activity. The importance of knowing an athlete's training age was emphasised in the chapter on 'Developing the Athlete'. It is not possible to know the appropriate stage of development without knowing an athlete's chronological age, biological age and training age. Without knowing the athlete's stage of athlete development it is not possible to plan appropriate training. The following table helps to explain the importance of considering biological and training ages as well as chronological age.

Chronological Age	Biological Age	Training Age
11	9	1
11	13	4

Athletes of the same chronological age, but different stages of athlete development and very different capacities for training.

In the second situation shown in the next table, the athletes' capacities for work may be similar, but the individual responses to training will still need to be considered.

Chronological Age	Biological Age	Training Age
12	13	2
15	13	2

Athletes of different chronological ages, but same stage of athlete development and similar capacities for training.

Principle of Variety

Training is a long term process and loading and recovery can quickly become boring for the athlete and the coach. The successful coach will plan variety into the training programme to maintain the athlete's interest and motivation. In training for athletics a change is sometimes better than a rest.

This change and variety can come from such things as changing the nature of the exercise, the environment, time of day of the session and the training group. Variety is an area in which the coach can be at his most creative.

Principle of Active Involvement

The performance of an athlete is a result of the combination of an athlete's efforts and the coach's skill. The last principle we shall consider is perhaps the most important. Without it a successful training programme cannot be started. The principle of active involvement in training means simply that for a training programme to be fully effective the athlete must want to actively and willingly participate. This participation and involvement should go beyond how an athlete behaves in the presence of the coach. It requires that the athlete's actions in all aspects of his lifestyle contribute to successful performance. This principle is sometimes called the 'principle of individualisation' and the athlete will need to be educated in this responsibility and then encouraged to fully accept the responsibility for himself.

Developing a Plan

Good planning, organisation and review are essential in whatever we do in our lives. Whether it is small things like arranging to meet friends, to bigger things like learning something new or to very big things such as building a house we need to plan, then build and review. If your goal, for example, is to travel to see a distant relative you may start by finding out how far away they live, what are the possible means of transport, when is it convenient to visit, how long will you stay there and will you come back the same way? Deciding these things is all part of the planning process. As you set out on your journey you will monitor your progress to ensure that everything is going to plan. Once you have returned home and the journey is now complete, you review how the trip went; what went well in addition to what did not go as well and what you might have learned to apply to any future travels.

The exact same steps are required in being an effective coach and the planning, organisation, doing, monitoring and reviewing skills are all part of the coaching process. If you do not plan and review when you coach do not be surprised if, on your 'coaching journey', you and your athletes do not 'arrive' at where you want to be.

We have already seen that the process of coaching can be simply stated as planning what you are going to do, doing what you have planned to do and then reviewing what you have done. This 'Plan-Do-Review' process of coaching is cyclical, repeated over and over.

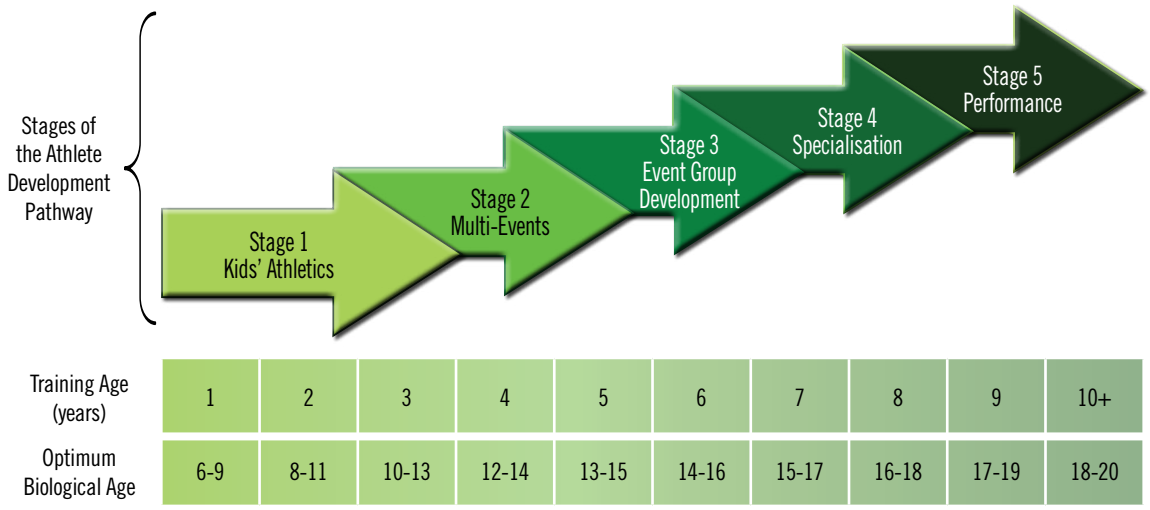
Planning begins the Cyclical Process of Coaching

We have looked at the 'doing' of your coaching in the chapter on developing the skills of coaching and noted that coaches, particularly novice coaches, tend to enjoy this doing aspect of the coaching process most. We have learned that long term athlete development means that coaches should have the athletes they coach 'doing the right things at the right time'. This is not possible without planning and review and the coach needs to take the time to develop the skills of effective planning and review. In the long term plan, all training should be planned so that it is suitable for the long term development of each athlete's potential.

Planning the Training Programme

One of the most important responsibilities of the coach is planning the athlete's training programme. Planning is a long term process since elite athletes may not reach their full performance capabilities until 24 years of age or older. In this long term planning the coach has traditionally looked at what the athlete wants to achieve in competition for a particular year and has divided this year into a number of periods, structuring the year according to these competition needs. Now we know that this traditional approach to planning ignores the long term developmental needs of the younger and beginner athletes. There should be structure to the training and periods of differing activities but these should reflect the athlete's stage of athlete development, not the demands of competition.

The first thing that a coach needs to do in planning the training programme is to identify what stage of athlete development each athlete is in by looking at their chronological age, biological age and training age. In those situations where the coach uses competitions to determine the training structure for athletes in the Kids' Athletics, Multi-Events and Event Group Development stages, this is a clear sign that the coach has not understood long term development and is specialising too early.



Training at any time must be seen as part of the long term plan

The term 'periodisation' is used simply to describe the division of the training programme into a number of periods of time. Each of these periods will have specific training objectives.

The major objective of any plan is to meet the long term needs of the athlete. For athletes in the Specialisation and Performance stages it is focussed also on bringing the athlete to the most important competitions of the season, fully prepared and in a physical and mental state to perform at a level never previously achieved. Achieving optimum performance at the right place and time is called 'peaking'.

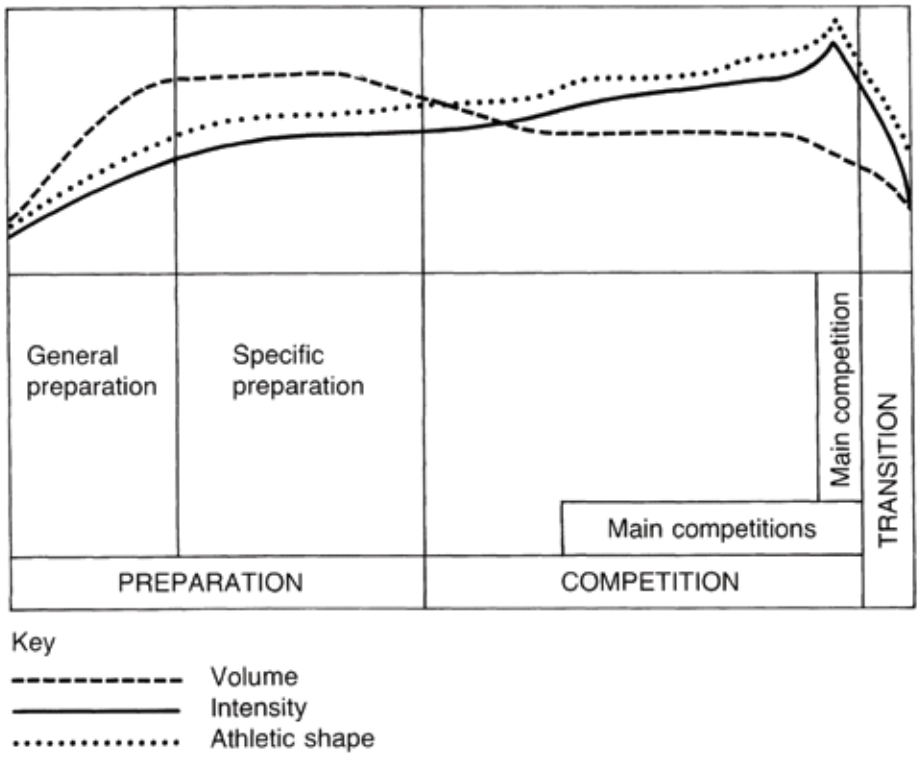
Planning for the year or season ahead is done backwards. The coach and athlete decide how much time is available for training and then plan where they want to be at the end of this time. This might be where and when the major competitions will be for the season ahead but for athletes in the Multi-Events and Event Group Development stages the coach should always remember that there will only be one 'peak' in the year. The next task is to work back in time through the training periods until arriving at the beginning of

the training year. All training plans should be simple and flexible as the plan will be modified according to the athlete's progress and improvements in the coach's knowledge and experience.

Periodisation – What to do and When to do it

The time that the coach and athlete have available for training can be divided into specific periods. These periods of training should be followed whether the time available is a full year, six months, twelve weeks or any other amount. There are three main periods to any training which make up a larger cycle of training known as a macrocycle:

- A preparation period
- A competition period
- A transition period



The general structure of a macrocycle of periodised training

In the illustration, lines indicate the relative levels of both volume and intensity during the three periods of the training programme. But what are volume and intensity, and how can we measure them?

Volume and Intensity

Volume refers to the quantity or amount of any training. It is the total of all repetitions, such as metres for running or total kilograms lifted for weight training. For continuous endurance training it is the kilometres or miles covered in training runs. In the jumps and throws it may be the total number of jumps or throws performed in a session.

Intensity is the quality of training and relates to how hard you try to do something. In speed training it may be the time taken to cover a set distance. In endurance running it may be related to the pace or rhythm that the athlete reaches during the run. If percentage is used to describe the intensity then the best an athlete can achieve at any distance, height or weight is 100% and the intensity of training will be a percentage of this best performance.

Intensity	% of athlete's best performance
Maximum	95-100
Sub Maximum	85-94
High	75-84
Medium	65-74
Light	50-64
Low	30-49

Scale of intensity relative to best performance

The training load is a combination of both volume and intensity. Throughout the training programme there is a progressive increase in loading. This increase is always an increase in volume before there is an increase in intensity.

The Preparation Period

The first and longest period of any training programme is the preparation period. In this period the athlete will move gradually from very general to specific training. The main objective of the period is, as its name suggests, to prepare the athlete for the competition period. The general training can be thought of as a foundation of 'training to train' and may, for athletes with a low training age, last as much as one half, or more, of the whole plan of preparation, competition and transition. All round general fitness is developed by gradually increasing the volume of training. This general fitness will allow the athlete to do the more demanding specific training which follows without injury. Volume should not increase in a straight line, but in steps to allow time for recovery, adaptation and overcompensation.

Increase in the volume of training

The beginning of the preparation period when general training is taking place is the best time to introduce new techniques or modify existing skills. Technique work should always be carried out when the athlete is not fatigued and so should come before any general fitness training in a session.

Following the general preparation comes a specific preparation. This is when training is increased in both volume and intensity. For the walker and the runner, kilometres or miles reach their highest levels. In the Specialisation and Performance stages of athlete development the training becomes more specific to the athlete's event with conditioning training now emphasising the energy systems used in the event.

The Competition Period

In the competition period the volume of training is gradually reduced and the intensity is increased. Heavier weights can be lifted, but much less often. The speed of specific walks, runs, jumps and throws should be faster with longer recovery times. The training during this period is most related to the characteristics of competition. Endurance, however, should not be forgotten during this period since enough endurance training should be done that the athlete can maintain endurance during competition. Training loads should be heavy enough to keep the athlete's fitness improving and light enough to keep the athlete enthusiastic and with high energy levels for competition. 'Athletic shape' refers to how fit an athlete is for his chosen event. This athletic shape should be at its highest in the last part of the competition period.

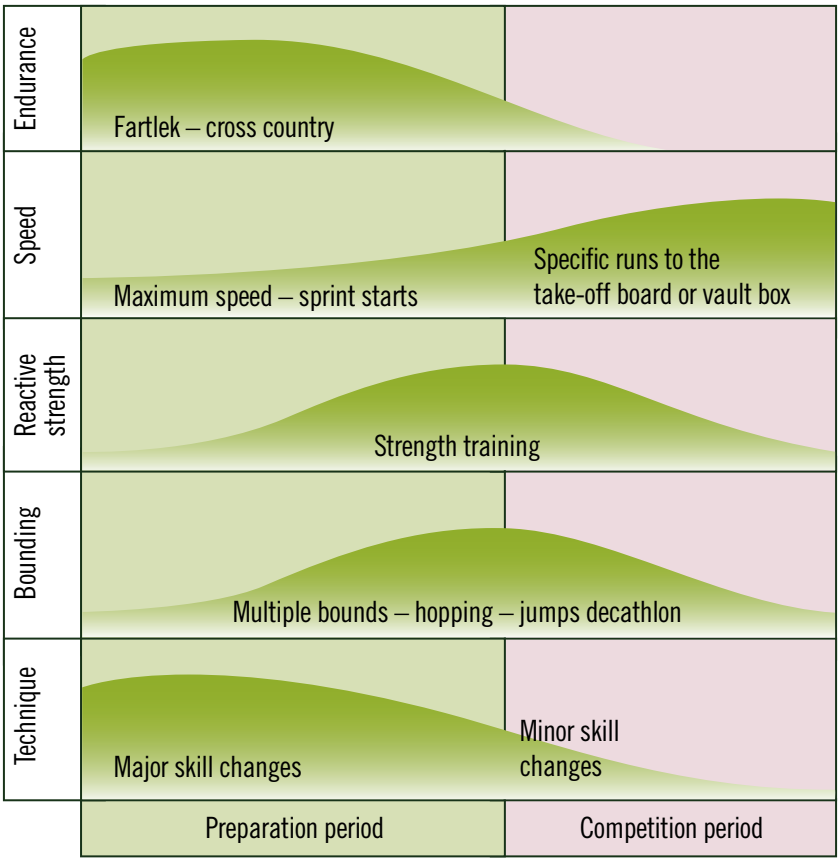
The Transition Period

The transition period comes at the end of a period of planned training and can be thought of as an 'active rest'. The main objectives of the transition period are to allow the athlete an opportunity to recover mentally and physically from the training loads of the preparation and competition periods. Athletes should be encouraged to try different types of low volume, low intensity activities away from the usual training environment. The activity should provide change and allow the athlete to return to athletics refreshed and eager to resume training for the following season. The transition period is also a useful time for the coach and athlete to evaluate what was achieved and to make plans for the future.

If there is only a short duration of time given to training in the year, as happens in many countries, then the coach and athlete are encouraged to be as active as possible in the transition period so that fitness and skills gained are not lost. In those situations where there are only three to four months of training in the year it is very difficult for athletes to make progress if they are always in the position, each year, of having to recover lost fitness and to re-develop skills.

The Plan in Action

Dividing the training plan into periods gives the coach guidelines for developing fitness and technique relative to volume and intensity. The coach who has athletes in the Specialisation and Performance stages of athlete development also needs to know what types of training are best to do for a particular event. Since each event has its own relative needs for endurance, speed, strength, flexibility and coordination the specific preparation and competition training should reflect this. The following diagram illustrates when the components of fitness could be developed for particular events, in this example, a general plan for the jumps.



A general training plan for the jumps

Modifications

At the beginning it was stated that part of the coaching process is review and that training plans need to be flexible. There will always be factors in practice that change the athlete's situation. These may include injury, sickness or longer than anticipated recovery from training loads. The track or field may be unavailable or the weather conditions unsuitable for the planned sessions. The athlete may also progress faster than anticipated. Whatever these factors, the coach must continually monitor and review what they are doing to make allowances and change the training plans to suit the athlete's situation. The most effective coaches are those who not only plan, but continually review and know when and how to change or modify their plans.

Planning the Session and the Training Week

We have seen that it is possible to plan training because athletes adapt to training loads according to the principles of overload, reversibility and specificity. The time available for preparing an athlete will vary greatly from a year to a few months. By creating an annual plan and dividing the time into periods the coach can plan progressive training. But how does this affect what we do from day to day, and how and when do we design the training session itself?

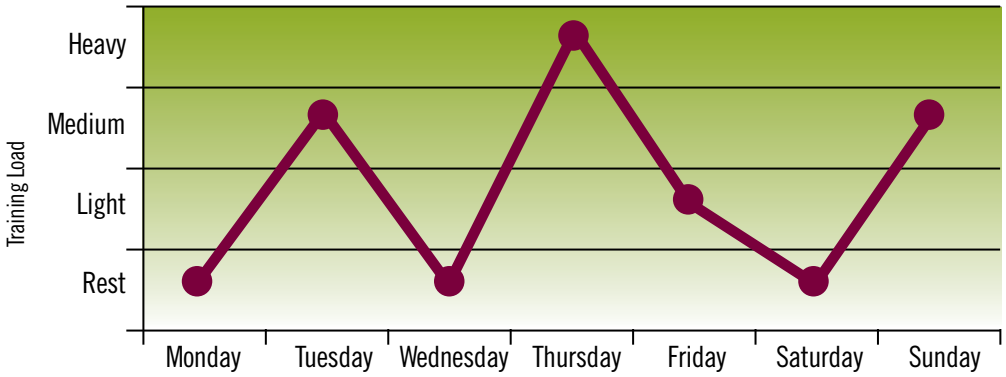
The effectiveness of a coaching session is largely dependent on your planning. Some coaches believe that they can plan the session as they are travelling to the track facility or even as they go along through the session. While a very few coaches may have a wealth of experience on which to draw for these 'improvised' sessions, and they may be enjoyable, they do not fit into the 'big picture'. Coaches simply cannot devise a series of progressive sessions tailored to the specific needs of the athlete, the period of the annual plan and the conditions unless they commit time to some previous planning. This does not have to be time-consuming and like all skills, the more the coach plans, the more skilled and the more quickly achieved his planning becomes.

We have seen that training progresses in periods and cycles of activity and the smallest of these cycles is given the name microcycle. The microcycle is usually considered to be 7 days duration. The number of training sessions in a microcycle will depend on the athlete's chronological age, biological age, training age, fitness, capacity for work and where the microcycle comes in the two active periods of the training programme, the preparation and competition periods.

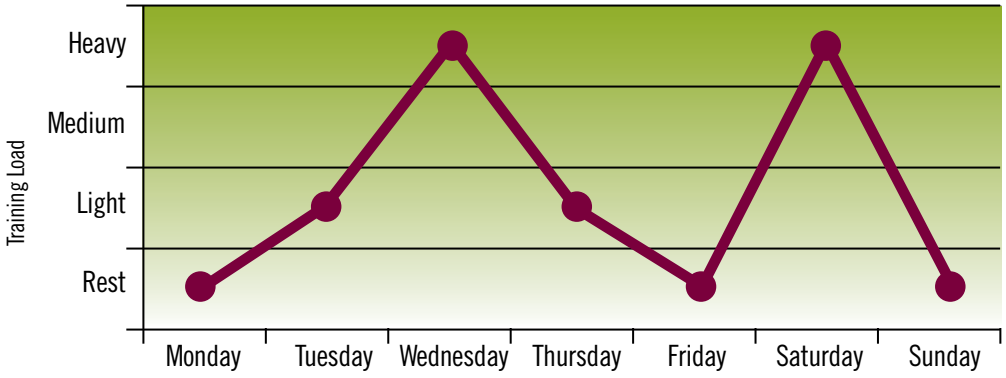
Planning the Microcycle – The Training Week

The 'training ratio' or 'density' of training is the ratio of training load to recovery. This recovery may be a complete rest but more often it is a lighter, easier or, in advanced programmes, different training load. The training load is varied by increasing or decreasing the number, volume, intensity or combination of volume and intensity of the training sessions.

Young athletes can begin a more structured training in the Multi-Events stage when 2 to 5 training sessions a week may be possible. The following are examples of microcycles for a young, inexperienced athlete in the preparation and competition periods. The 'heavy' loading on Saturday in the competition period represents a race.

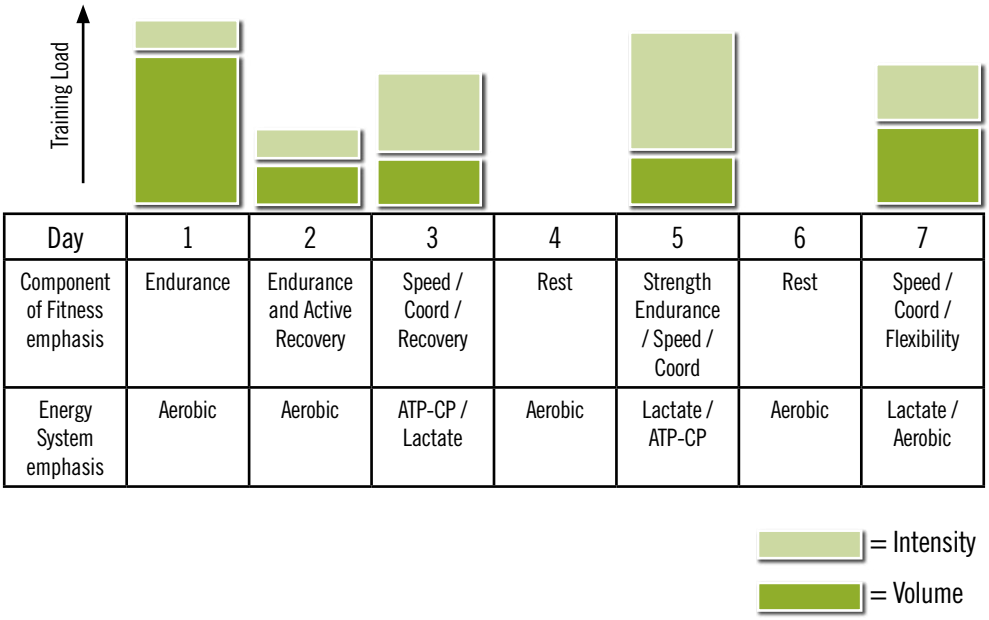


Sample microcycle showing the Training Load for a young, inexperienced athlete – Preparation Period



Sample microcycle showing the Training Load for a young, inexperienced athlete – Competition Period

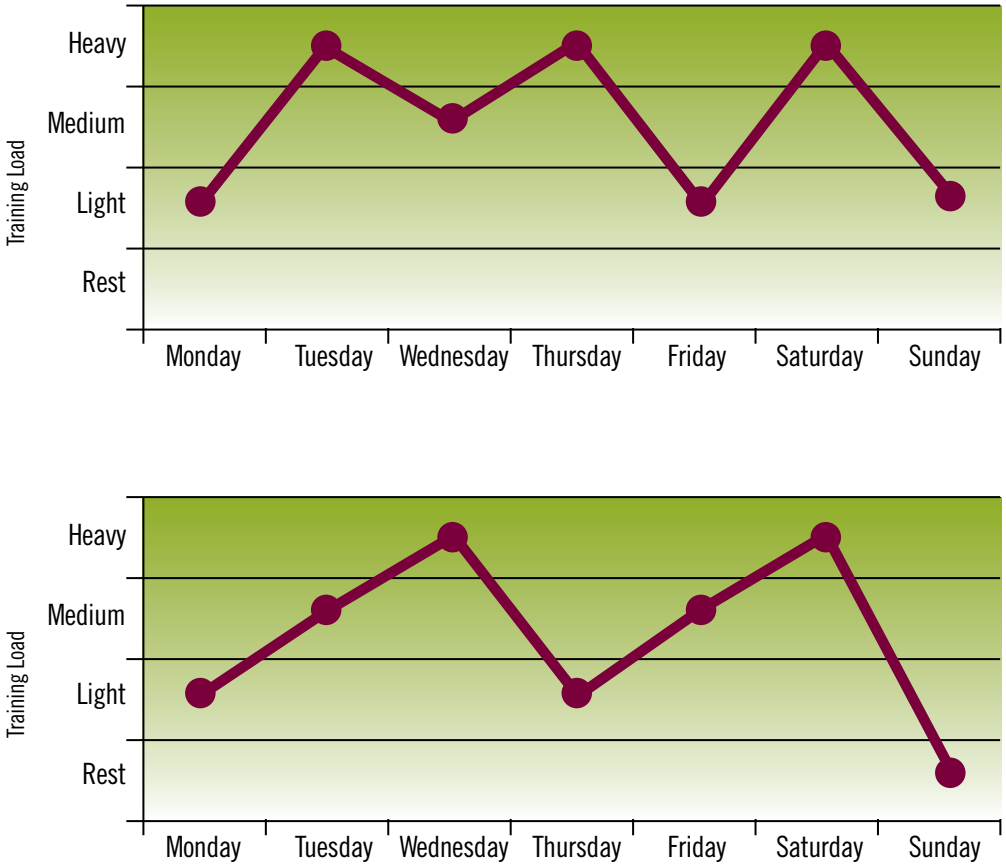
Once the training load for a week has been established in relation to the annual plan and period, then the actual focus of each session can be written for that microcycle.



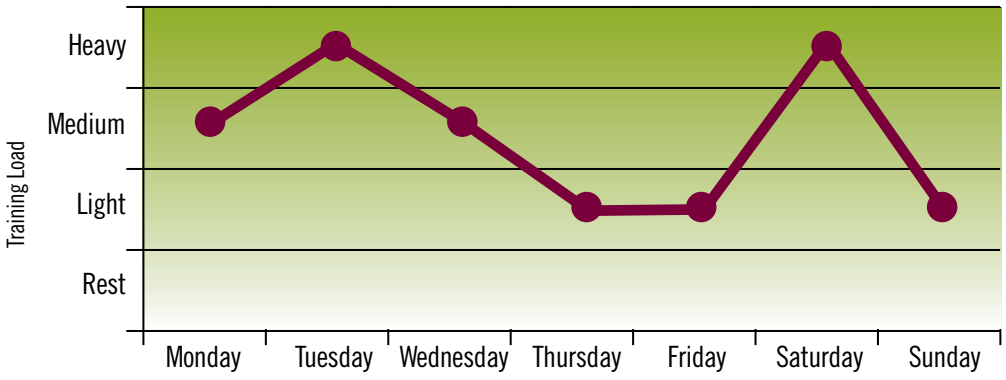
Day	1	2	3	4	5	6	7
Component of Fitness emphasis	Endurance	Endurance and Active Recovery	Speed / Coord / Recovery	Rest	Strength Endurance / Speed / Coord	Rest	Speed / Coord / Flexibility
Energy System emphasis	Aerobic	Aerobic	ATP-CP / Lactate	Aerobic	Lactate / ATP-CP	Aerobic	Lactate / Aerobic

Planning the focus for each session of the microcycle - e.g. for a young or novice athlete with a Training Age of less than 4 years

As athletes mature and gain experience they are able to tolerate higher training loads. They may develop gradually over a number of years to where they can carry out sessions on 6-7 days a week, with the possibility of more than one session per day. Some athletes in the Performance stage, with a training age of 12 plus years may at certain times of the annual plan do as many as twelve or more sessions in a microcycle. The basic principles, however, still apply.

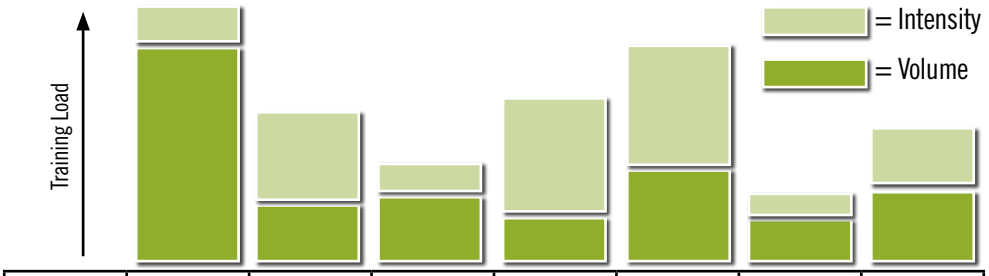


Sample microcycles showing the Training Load for a senior and experienced athlete – Preparation Period



Sample microcycle showing the Training Load for a senior and experienced athlete – Competition Period

Again, for athletes in the Specialisation and Performance stages the actual focus of each session can be written for that microcycle, once the training load for a week has been established in relation to the annual plan and period.



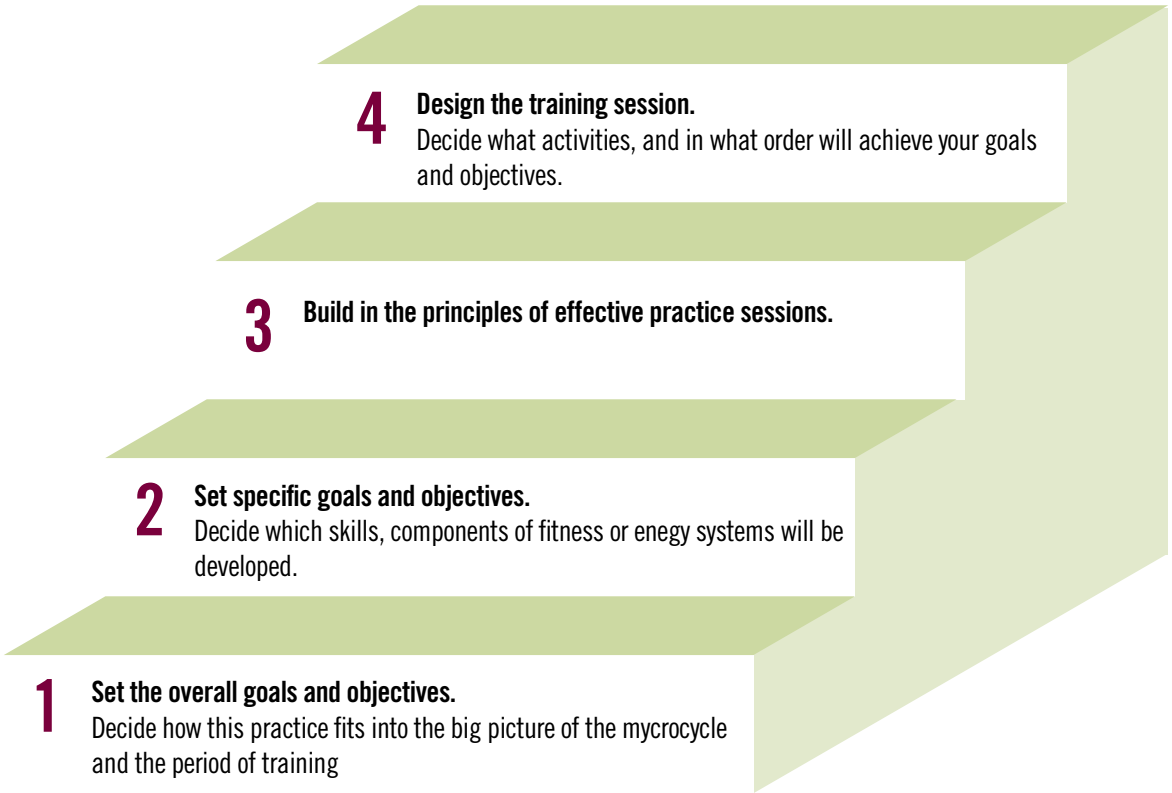
Day	1	2	3	4	5	6	7
Component of Fitness emphasis	Endurance	Maximum Strength / Endurance	Endurance and Active Recovery	Speed / Coord / Recovery	Strength Endurance / Speed Endurance / Coord	Endurance and Active Recovery	Speed / Coord / Flexibility
Energy System emphasis	Aerobic	ATP-CP / Aerobic	Aerobic	ATP-CP / Lactate	Lactate / ATP-CP	Aerobic	Lactate

Note: Power event athletes frequently have one day of full rest in the microcycle

Planning the microcycle - e.g. for a senior and experienced athlete with a Training Age of 8 years or more.

Planning the Training Session

The training session is the basic building block of coaching. In the training session skills are learned, conditioning and fitness are achieved and confidence is developed. In athletics the training session usually contains various units of activity set between a warm up unit at the beginning and a cool down unit at the conclusion. To decide on what units of work are suitable for a particular session the coach should follow the following four stages of planning:



The third step of the planning process is the creative mixing of various units into your session. When designing your training session try to consider some of the following principles of effective practice.

Principles of effective training sessions

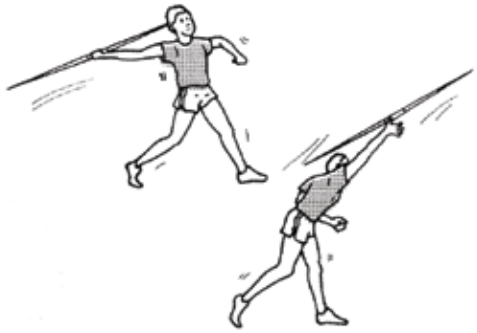
Keep all active	The athlete should be active, rather than a passive viewer or listener
Use all 5 skills of coaching	Before the session decide what you will work on – as a coach on your skills of coaching
Give clear, concise instructions and goals	Learning improves when the athlete knows what is expected of him - demonstrations help improve accuracy of instruction
Recognise progress	Beginners perform better when they are informed of their progress - drills and exercises should allow measurement or recognition by which the coach and athlete can assess progress
Give positive feedback	Emphasise and reward things the athlete is doing well
Provide variety	Maintain interest by varying activities - prevent boredom by using short time periods for instruction
Encourage enjoyment	Training sessions should be focussed fun and enjoyable
Create progressions	Learning is enhanced if it progresses from material that is - known to unknown - simple to complex - general to specific
Plan optimal use of resources	Make sure that whatever resources you have available they are all used - if you do not have the correct equipment consider improvising with what is available
Allow for individual differences	Allow for different learning rates and in the different ways people learn. Take into account different capacities for work.

The final step in planning the training session is designing or actually setting out what the athlete will do in the session.

Each session should contain the following progression:

The Warm Up

The warm up starts slowly and gradually involves all muscles and body parts in exercise which prepares the athlete mentally and physically for the units which follow. All exercises should be ones that the athlete can do well. The warm up is not the time to be teaching skills although feedback may be provided to remind athletes of the correct movement.

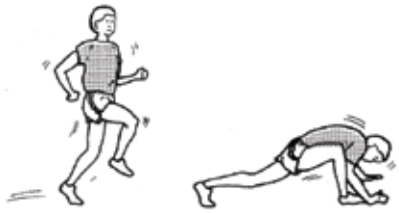


A Skills Unit

Instruction starts with the known skills and progresses to the new or unknown skill. Athletes should practice and may have the opportunity to try their new skills in a competition-like setting. If no new skill is being introduced, and conditioning is the main objective of the session, athletes may move straight from the warm up to the fitness unit.

A Fitness Unit

This unit involves physical conditioning activities which are specific to the needs of the athlete's development. These activities may involve running, jumping, throwing, weight training or other resistance work.



The Cool Down

The cool down gradually reduces the body's temperature and heart rate. If done well, this is the first step in the recovery and adaptation to what was done during the session. It also provides an opportunity for the coach and athlete to evaluate the completed session.

This progression through the session allows for a gradual build up of physical activity and moves from:

- slow to fast
- easy to difficult
- known to unknown
- general to specific
- start to finish.

The Warm Up

The first unit of every training session or preparation for competition should be the warm up. The warm up gradually and systematically prepares the athlete for the training or competition activity which follows. This preparation is both physical and mental as the warm up:

- mobilises the muscles and tendons
- heats the body, particularly in the muscles and joints
- concentrates thought and rehearses the skills of what is to follow

Individuals have different needs in a warm up, but if well planned and executed it will result in improved performance. An active, dynamic warm up usually consists of three parts and there should be no static stretching in the warm up.

Activity	Purpose	Time (minimum)
Easy aerobic run	Increase muscle temperature and heart rate	5 mins
Mobilisation	Access and prepare for range of movement	10 mins
Event Specific	Coordination and preparation on the focus of the session or competition	5 mins

The effective warm up should progress from

- slow to fast
- active to dynamic
- general to the specific and
- simple to more complex

The Cool Down

An effective cool down is as important as the warm up, but is frequently neglected by the inexperienced coach and athlete. The cool down gradually reduces the body's temperature and heart rate and speeds up the recovery and adaptation process before the next training session or competition. During the cool down the coach can also go over with the athlete the session just completed and evaluate the performance. A typical cool down consists of:

Activity	Purpose	Time (minimum)
Easy aerobic walk or run	Lowers body temperature. Gradually reduces heart rate.	5 mins
Light stretching exercises	Recovers any loss of flexibility from the session, stretches held for 6-10 seconds	5 mins

On the following pages are sample session plans which show the planning needed before coaching the session can commence. You will see that the coach has planned for their own development as a coach, as well as planning for the development of the athletes.

Date:	**Time:**	**Venue/conditions:**	
20th September 2009	*4.00 p.m.*	*Outdoor track*	
Athletes:	**Equipment:**	**Organisation/safety**	**Coaching points**
Mixed, Under 13 years *Av. Training Age: 3 years*	*Cones, Reaction balls,* *Whistle (for starts).*	*Have enough equipment for group*	*Controlled fast reactions*

Session goals for athletes: *Introduce athletes to the sprint start using a variety of fun methods to maintain athletes' interest and motivation.*

Personal coaching goals: *To use questioning to establish athletes progression throughout the session.*

Unit	Content	Organisation	Coaching Points
Warm up (10 mins)	*2 Laps easy run* *Throwing balls on infield* *Mobilisation exercises* ● *Skipping* ● *Side steps* ● *Carioca*	● *Carry out safety check on the area* ● *Check with athletes for any injuries/activities at school*	● *Good posture for exercises* ● *Knees/hips high* ● *Toe up* ● *Use questioning* ● *Athletes to suggest other mobilisation exercises*
Technical (15 mins)	*Intro/Progression* ● *Falling starts (find front foot)* ● *Lie on back/front* ● *Sitting* ● *Triangular* ● *Standing*	● *Discuss use of space with other coaches on track* ● *Use different signals to start – audio, visual, tactile*	● *Lean forward slightly* ● *Fast arms* ● *Drive off front foot* ● *Check reaction to signal* ● *Involve athletes in suggesting different types of starts*
Technical (15 mins)	*Crouch Start - Breakdown phases* ● *"On your marks"* ● *"Set"* ● *'Bang' – whistle or "Go"*	● *Demonstrate each phase* ● *3 at a time* ● *Set cones at 15m*	● *Position of fingers, knees, feet, shoulders* ● *Push on the blocks initially with both feet* ● *Observe from different positions and angles* ● *Use questioning / feedback* ● *Athletes observe each other*
Competition (10 mins)	*Sprints to 30m using crouch starts* ● *Vary gap slightly between "set" and "go"* ● *Athletes takie part in making the starting signal* ● *Vary nature of signal*	● *Set cones at 30m* ● *Group to ability* ● *Observe from different positions and angles* ● *Use questioning*	● *Maintain sprint technique throughout* ● *Smooth transition from start into acceleration phase* ● *Acceleration to stride phase* ● *Observe start and finish*
Cool down (10 mins)	● *2 Laps easy run* ● *Static stretching*	● *Check athletes OK* ● *Review the session*	● *Athletes relaxed and loose* ● *Provide feedback by questioning and 'telling'* ● *Hold stretches for 6-10 secs*

Evaluation: **Session goals:** *To be completed after the session*

Personal goals: *To be completed after the session*

Sample Session Plan 1

Date:	Time:	Venue/conditions:	
14th May 2009	*4.00 p.m.*	*Outdoor track*	
Athletes:	**Equipment:**	**Organisation/safety**	**Coaching points**
Mixed, Av. Age: 17 years	*Cones*	*The track is a busy 'road'*	*Rhythmic running*
Av. Training Age: 6 years			

Session goals for athletes: *Develop the athletes' specific endurance using repetition training.*

Personal coaching goals: *To use instruction and explanation effectively through the session to clearly convey the information and organisation of the session to the athletes.*

Unit	Content	Organisation	Coaching Points
Warm up (20 mins)	*Warm up for 10' away from track* *Throughing balls on infield* *Mobilisation exercises* ● *Skipping* ● *Side steps* ● *Carioca* ● *Easy strides*	● *Carry out safety check on the area* ● *Check with athletes for any injuries/ activities at school*	● *Run tall* ● *Knees/hips high* ● *Toe up* ● *Use questioning* ● *Athletes to suggest other exercises*
Technical (15 mins)	*Running drills over 20m* ● *High Knees* ● *Butt kicks* ● *Stepping over the ankle* *All with walk back recoveries*	● *Discuss use of space with other coaches on track* ● *Have athletes work in pairs and watch each other*	● *Posture* ● *Coordinate arms* ● *For Butt kicks – "Toe up, Heel up"* ● *For all drills check the position of the ankle and maintain sole of foot parallel to the ground*
Fitness (40 mins)	● *3 x 200 (approx 1500/3000 pace)[200 easy run] then 5' walk and recap of training to come:* ● *3 x 4 x 300 (3000, 1500, 3000, 800) [60" and 5'-7']*	● *Introduce session and instruct and explain* ● *Recap and ask them what they are going to do after 3 x 200* ● *Move athletes positions in the group for each repetition*	● *Set the rhythm from the first three 200m runs* ● *Check for understanding after explaining the session* ● *Observe athletes for concentration and fatigue during the session* ● *See how athletes react to running in front, in the middle at the back of the group*
Cool down (15 mins)	● *4 Laps easy run* ● *Static stretching*	● *Check athletes response to training* ● *Hydrate* ● *Review the session*	● *Athletes relaxed and loose* ● *Provide feedback by questioning and 'telling'* ● *Hold stretch for 6-10 secs*

Evaluation: **Session goals:** *To be completed after the session*

Personal coaching goals: *To be completed after the session*

Sample Session Plan 2

Review and Evaluation

The coach should become used to assessing during the session what is going well, what is not going well and what is needed for the next sessions. The work that was actually performed during the session should be reviewed after the session and recorded, noting any changes from what was planned. In this way the coach gradually comes to know each individual athlete's capacity for work and response to training. The coach should also think about their own performance as a coach in sessions and review this after the session by self-reflection or by reflecting with the help of another coach or coaches. With this knowledge future plans can be written more effectively to develop both the athlete and coach and the cyclical process continues:

Review is an essential part of the Cyclical Process of Coaching

Summary

The details of each training session fall easily into place with the basic tools provided by:

- The principles of training
- A knowledge of the components of fitness and energy systems
- An understanding of training periodisation
- Knowledge of the athlete's stage of athlete development, abilities and objectives

Using these basic tools to design sessions and programmes, the coach will have a much more effective understanding of the way his training will work. He will no longer have need to search for set training programmes provided by books, magazines and used by other athletes and coaches. These fail, as they miss out the vital ingredient of any programme, the athlete himself.

6

DEVELOPING TECHNICAL SKILLS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OSAKA 2007

Developing and Controlling Forces

When a coach is working with an athlete on any activity, that specific activity requires the athlete to control their movement. This movement is caused by muscles pulling on bones in a controlled way to create force. The coach should have a basic understanding of forces so that they can develop the technical abilities of each athlete.

Expert coaches are able to analyse the techniques involved in athletics and modify them to make desired improvements with a particular athlete. The novice coach often has difficulty deciding which technique to use and what modifications to make. The simplest and most often used approach to overcome this difficulty is to copy the event techniques used by current champions. The problem that arises is top athletes frequently have different techniques and additionally, coaches and athletes copy bad, as well as good, aspects of each technique.

Every athlete has individual strengths and weaknesses. The technique of the champion is frequently built on training and practice over many years and is developed to suit his particular strengths and weaknesses. This highly developed technique is usually not suitable for a developing coach or athlete. How can coaches improve their ability to select the best techniques and identify the causes of faults they observe? To answer this question an understanding of how athletes develop and control forces to produce movement and an ability to analyse movement is essential for the modern coach.

What is Force?

Forces produce movement and a force is simply a pull or a push. We cannot see force, but are aware of it because of the effects it produces. For example, a high jumper applies force to the ground. We do not see the force but we observe the results, the athlete leaving the ground. Biomechanics is the science concerned with understanding the internal and external forces acting on a human body and the effects produced by these forces. Internal forces are those forces created inside the athlete's body by the action of muscles pulling on bones. External forces are those acting outside the body such as gravity and friction.

In this chapter we will look at the basic language and principles of biomechanics to help your analysis of movement. These principles applied in practice, combined with the development of a good 'coaching eye', will make you a more effective coach.

The Way Athletes Move

Linear motion is movement along a straight line and rotational motion is movement about an axis of rotation. In athletics, movement is usually a combination of linear and rotational motion and is called general motion. A sprinter's body, for example, has linear motion but the movement is caused by the rotational motion of the legs. Both forms of motion take place to produce the general motion of running. A discus thrower uses rotational motion to build up speed before releasing the discus. He also moves with linear motion from the back to the front of the throwing circle. This is another example of general motion.

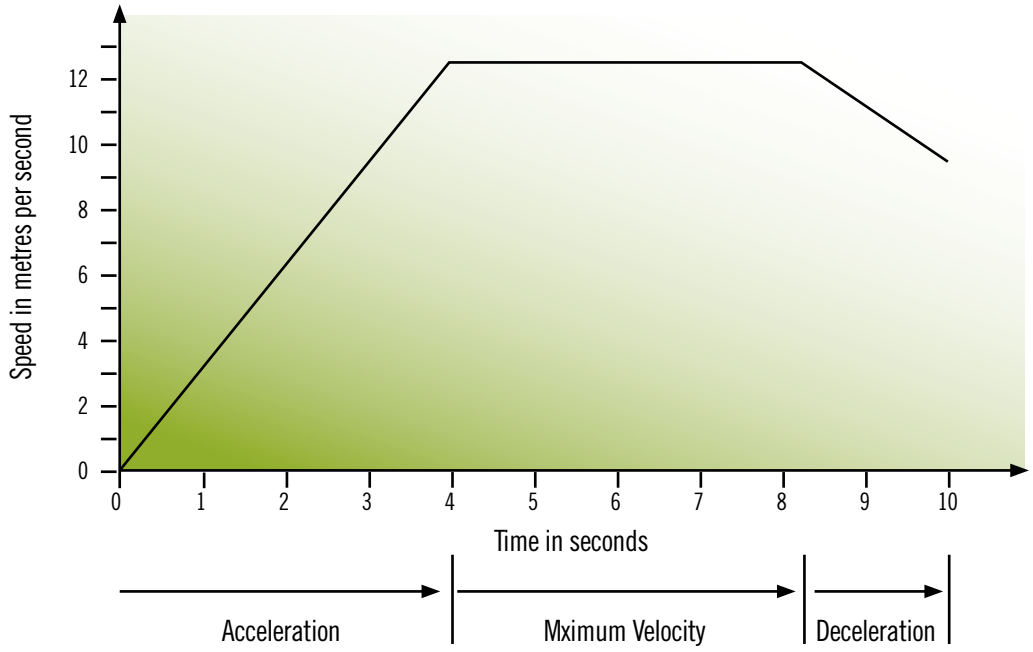
Velocity and Acceleration

Speed tells us how fast a thing is moving. This thing may be the human body or a throwing implement. Velocity tells how fast a thing is moving and in which direction. A sprinter may cover 100 metres in 10 seconds. His horizontal velocity is determined by dividing the distance covered by the time taken. In this example 100 metres divided by 10 seconds gives a velocity of 10 metres per second.

Athletics has standard distances, so we can compare times to see which athlete has greater velocity. From experience, we know that an athlete who runs 100 metres in 10 seconds is faster, or has a higher velocity, than an athlete who takes 12 seconds. An athlete who runs 1500 metres in 3:40 has a higher velocity than an athlete who runs 4:00.

When you race any distance your velocity changes. At the starting line you are not moving and have zero velocity. After the gun has fired you gain velocity or accelerate. Acceleration tells us how fast the velocity of something is changing. Running acceleration may be to a maximum velocity, as in the 100 metres or to a velocity which is optimal for the event.

An athlete who slows down loses velocity and is said to be decelerating. If we look at the speed-time graph for a sprinter we see an initial phase of acceleration. This is followed by maximal velocity sprinting and finally a phase of deceleration as the athlete fatigues.



Speed-time graph for a sprinter

As you study the speed-time graph see if you can answer the following questions:

- How many seconds is the sprinter accelerating?
- What is the sprinter's speed after 2 seconds?
- What is the sprinter's speed after 6 seconds?
- After how many seconds does the sprinter start decelerating? (See page 163 for answers)

Momentum

Momentum is the quantity of motion a body has and is a product of weight and velocity. In the human body there can be a transfer of momentum from one body part to another. In the long jump, for example, the 'blocking' of the free leg when the thigh is parallel to the ground at take off transfers momentum as additional force to the take off leg.

Angular momentum is the quantity of angular or rotational motion a body has and is the product of the moment of inertia and rotational velocity. When a body is rotating the moment of inertia is proportional to its size. If the arms are bent in sprinting, for example, their moment of inertia is less than if they are straight. A rotating body has a given quantity of motion or momentum and any reduction in the moment of inertia will cause acceleration to an increased rotational velocity. In sprinting this principle affects arm action and leg recovery, where making the arms and legs as 'short' as possibly through bending them at the elbow and knee speeds up their movement. Any increase in the moment of inertia has the opposite effect of reducing rotational velocity. This increase of moment of inertia is used, for example, in the different flight techniques of the long jump to slow down forward rotation.

There can also be a transfer of angular momentum from one body part to another. This is applied in the throws when, for a right handed thrower, 'blocking' the left side of the body immediately before delivery transfers angular momentum to accelerate the right, throwing side.

Implications for the Coach

There are two practical principles that apply specifically to walking, running, jumping and throwing where the athlete is concerned with creating optimal force and speed:

- Use all the joints that can be used
- Use every joint in order

Use All the Joints That Can be Used

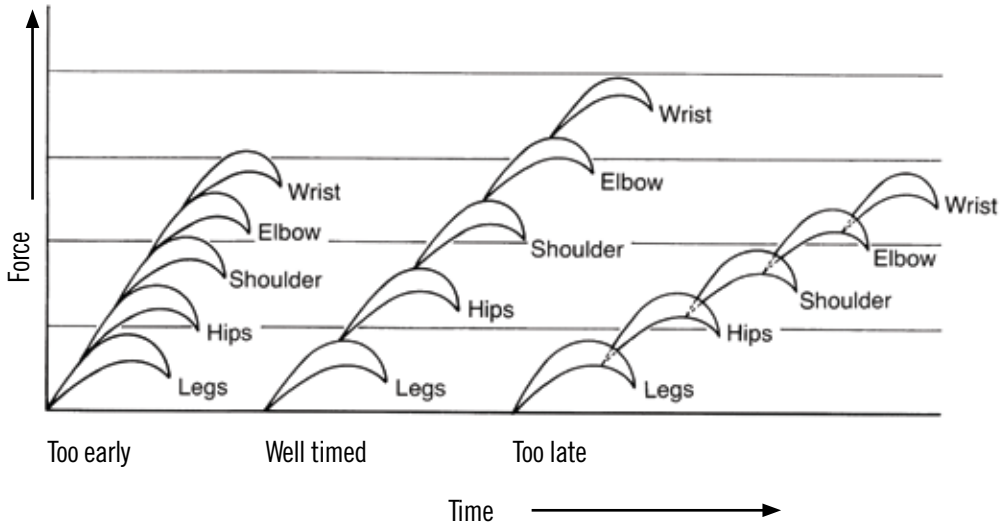
The forces from each joint must be combined to produce the maximum effect. This is best done when all joints that can be used are used. This will help to get the most speed or acceleration out of a movement.

In the shot put, for example, the knee, hip, shoulder, elbow, wrist and finger joints should all be used to exert the greatest force on the shot. Beginners frequently miss out early joint movements such as the knee or hip action, or fail to complete a movement fully by not using the wrist or fingers.

Use Every Joint in Order

When several joints are used in a skill, their sequence and timing are important. This principle tells us when the joints should be used. Movement should begin with the big muscle groups and move out through the progressively smaller muscles, from big to small. This pattern produces optimal forces and flowing, continuous movement.

The continuous, flowing movement produces what is known as a summation of forces, the forces adding together. The force generated by one part of the body is built on by the force of subsequent joints. In the well timed shot put, the hip action commences just as the leg extension decelerates. The shoulder action commences as the hip rotation decelerates and so on.



Summation of forces in the shot put

The release velocity of an implement depends on the speed of the last part of the body at release. The correct sequence and timing allow the athlete to attain maximal release velocity.

Laws of Motion

Understanding the relationship between force and motion owes much to the work of an English scientist, Sir Isaac Newton. He is best remembered for his three laws of motion.

Newton's First Law of Motion

It is important to know the definition for each of the three laws of motion and more important, know how to apply the laws in practical situations. Newton's first law of motion states:

"All bodies continue in a state of rest or uniform motion in a straight line unless acted upon by some external force."

What are the implications and applications of this law? A sprinter, for example, will not move from the blocks until his legs exert force against them. The high jumper will not take off from his approach run unless a force is applied to change direction.

Newton's Second Law of Motion – Law of Acceleration

"The acceleration of a body is proportional to the force causing it and takes place in the direction the force acts."

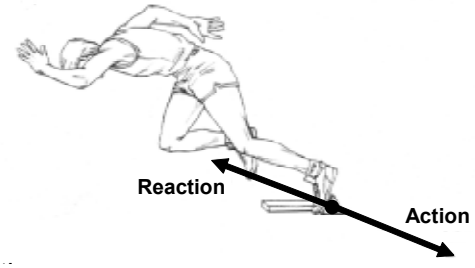
More force means more acceleration. A sprinter's acceleration from the blocks is proportional to the force exerted against the blocks. The greater the force exerted, the greater will be the acceleration away from the blocks. In the throwing events, the larger the force exerted on an implement the greater will be the acceleration, release speed and consequently, distance thrown.

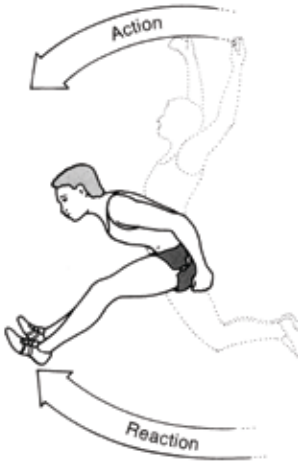
Once an implement has been released there are no forces which can act to accelerate it. The same is true for the athlete's body in the jumping events. The greater the force the athlete exerts at take off the greater the acceleration and height or distance achieved. Once the athlete has left the ground nothing he does will accelerate the body. When maximal forces are needed the muscles contract to generate this force and this is why injuries are more likely to occur in the acceleration or deceleration phases of a movement.

Newton's Third Law of Motion – Law of Reaction

"To every action there is an equal and opposite reaction."

A runner exerts a force against the ground. This creates an equal and opposite reaction force which moves the body over the ground. The law of reaction also applies to movements that occur in the air. In these situations the equal and opposite reaction is shown in movements of other parts of the body. A long jumper, for example, will bring the arms and trunk forward in preparation for landing. The equal and opposite reaction is movement of the legs into a good position for landing.





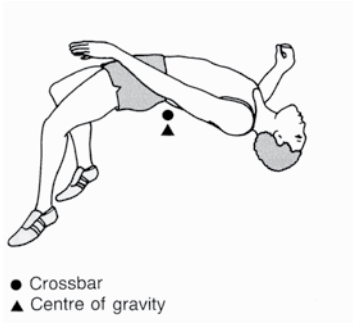
Action and reaction in long jump landing

Runners creating equal and opposite reactions

Centre of Gravity

Gravity is a force which is always present and is a pulling force in the direction of the centre of the earth. This force acts on every object through an imaginary point called the centre of gravity (CG). A solid, uniform composition object like a shot or discus has its CG in the centre and this is a fixed point.

The human body is an object with a complex and constantly changing shape. The centre of gravity now moves according to the positioning of the body and limbs. The CG may be inside the body, for example, when standing or it may be outside the body as in the pole vault and flop high jump bar clearances.



The Fosbury Flop technique in the high jump

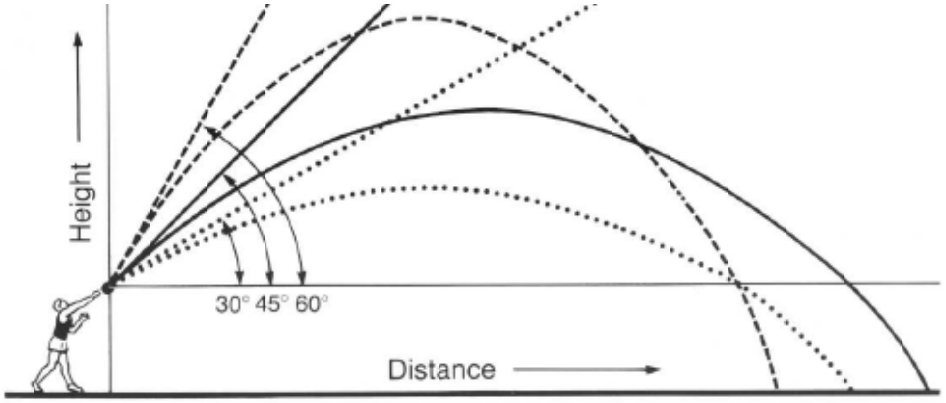
The piked bar clearance in the pole vault

The athlete passes over the bar while the centre of gravity passes through or beneath it

When an athlete launches himself or an object into flight gravity will act as a force pulling the athlete or object towards the ground. The flight path of the centre of gravity of a body is a curve called a parabola. The parabolic flight path depends on three factors:

- Speed of take off or release
- Angle of take off or release
- Height of the athlete's CG at take off, or CG of implement at release

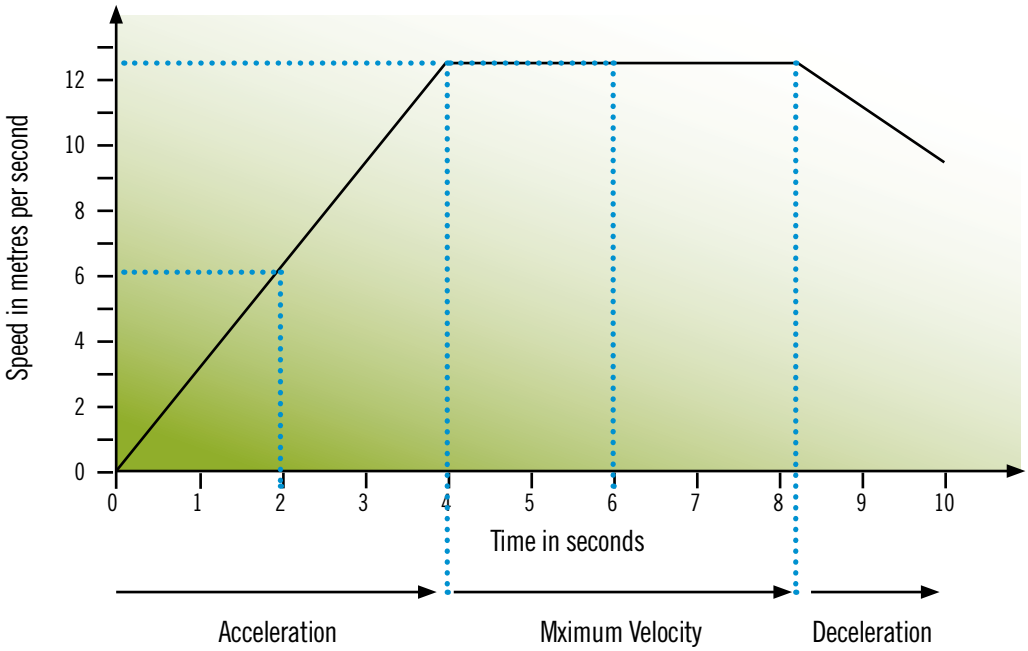
Of these, the speed of an athlete at take off, or of an implement at release, is the most important factor. Greater speed means greater distance achieved. Air resistance can also affect the distance travelled by an athlete or implement.



The parabolic flight path for various release angles

All the principles of movement are based on how forces are developed and controlled by the athlete or how they act on the athlete's body. They may appear complex at first but, as you learn the basics for each event, biomechanics and an analysis of movement will become an understandable and usable part of your coaching knowledge helping to make you a better coach. If your biomechanics knowledge improves as your 'observation and analysis' skills improve you will be able to more effectively help the athlete in developing their technical skills.

Answers to Acceleration Graph



- This sprinter accelerates for 4 seconds
- The athlete's velocity is a little more than 6 metres per second after 2 seconds
- The athlete's velocity is approximately 12.5 metres per second after 6 seconds
- The athlete starts decelerating after a little more than 8 seconds of sprinting

Developing Technique

One of the roles of the coach is as a teacher. Coaches want to know how to help their athletes improve their performance and not just through improving their fitness. The teaching role of a coach includes helping athletes to acquire knowledge, attitudes and physical skills or techniques. When a skilled athlete competes the following characteristics are easily observed in the skilled performance:

- correct moves done at the correct time
- little visible effort, physiologically efficient
- unhurried, highly coordinated actions
- capable of speed and accuracy
- consistency and smoothness of movement
- the desired results are achieved

How does the beginner move from the initial, uncertain and inaccurate actions to the highly skilled, efficient movement of the elite athlete? Like all training, the process of learning technical skills is a long term process. The coach who understands the factors that affect learning is in a position to teach technical skills at all levels and ages. There is no substitute for practical coaching experience and the application of learning theory in helping athletes to acquire the skills of athletics.

Techniques and Skills

Techniques are the basic building blocks of skilled performance. Techniques are simply the most efficient way of solving a physical task or problem within the rules of the sport.

The ability to perform a perfect technique is not the same as being a skilled performer. The skilled athlete has good, consistent technique and also knows when and how to use this technique to produce the best results. Skills teaching for athletics includes not only the techniques of the various events but also the important skills of when and how to use these techniques. Competition can present the athlete with many different situations and he needs to be taught how to respond to these challenges.

There are many different types of skill and these may be classified according to whether the competition situation is an 'open' or 'closed' environment. Another way to classify skills is again into two types, 'simple' or 'complex', and we shall see that this classification is of more use when teaching skills to the beginner.

Open and Closed Environments

Closed skill situations are those in which the environment for performing the skill is stable and predictable. The athlete can almost ignore his surroundings and concentrate on the effort of the performance. The throwing events are examples of what is meant by a relatively closed competition environment.

When the athlete needs to respond to outside factors during competition the skill operates in an open situation. The running environment, for example, is open for a 1500m runner because he cannot ignore the actions of the athletes around him. For a 100m sprinter or sprint hurdler, it is more closed. In an open environment, strategy and tactics are more obvious and important parts of the skill than in the closed situation. The technique of most skills are taught in a 'closed' situation until the technique is well developed. At this stage any factors that make the competition environment an open situation can be

gradually introduced.

Looking at competition environments as open or closed has importance in guiding what we teach an athlete. The classification of skills into how difficult they are, that is simple or complex, is of greater practical importance as this guides how we should teach the athlete any technical skill.

Simple and Complex Skills

A simple sports skill is one that an individual can perform with very little practice. Complex skills are ones that an individual finds more difficult and take more time to learn. The same task presents different difficulties to different people.

"What is a simple skill for one person may be a complex skill for another."

The same task also presents different difficulties to the same person at different stages of their growth and experience. Simple and complex then are relative terms when used to describe athletic skills. Coaching technical skills means we must evaluate how the learner views the skill. It does not matter whether the coach views a skill as simple or complex, it is the athlete's thoughts and views that decide the difficulty of the task.

Technique and Skill Learning

Technique and skill learning are invisible processes. We can see the results of technique and skill learning in improved performance but the process of learning is inside the body and mind. Learning involves the nervous system, the brain and memory. Whenever we practice a technical skill the memory of the previous attempts are used to physically perform the action again. With continued practice a clear and precise memory of the action is formed and this can be recalled for use as needed. The brain's memory of a particular technique or action is called a 'motor programme' and can be thought of as a set of instructions or the software programme for that technique. The motor programme begins being formed in the earliest stages of skill learning. As learning progresses the motor programme develops, so that for the advanced athlete the motor programme is a complete set of instructions that give consistent performance.

Does practice make perfect? In the past there was a common phrase used by coaches, athletes and others: "Practice makes perfect." But this is not always true. Understanding that practice creates a motor programme for a technique we realise that actually, "practice makes permanent." So, as far as any practice is concerned, it should be always be remembered by the coach and athlete that "Only perfect practice makes perfect and permanent."

"Only perfect practice makes perfect and permanent."

Stages of Learning

The learning of techniques progresses inside the athlete as a gradual development of the motor programme for that technique. We cannot see the motor programme but, as we observe the athlete, it is possible to

recognise three stages of learning that help the coach to understand where the athlete is in development of their learning.

Basic characteristics of the three stages of learning

The Thinking and Understanding Stage - Working out What to do

Before they can learn anything children or beginners of any age must know and understand clearly what it is they are trying to achieve. Too many inexperienced coaches begin by telling or showing how to do something without first explaining what the learner is trying to achieve. They make the incorrect assumption that the learner knows. During this phase it is important to give suggestions about how to do the skill which draws on the athlete's previous experience.

The Practising and Learning Stage – Developing the Technique

The athlete is now able to perform the basic technique with an increasing degree of consistency. Practice allows the athlete to develop the technique, provided that the practice is focussed on building on what is correct while identifying what may need to be corrected. This 'perfect' practice means that the motor programme develops most during this stage.

The Skilled or Advanced Stage – Performing the Skill

The control of movement becomes more automatic as the motor programme is very well developed and can be used in a variety of different external situations. Athletes can learn to attend to choosing what to do and when to do it, rather than how to do it. This is the stage of skilled performance. Now the athlete can learn more about applying effort and strategy to the new skill, under a greater variety of conditions.

Technical skill learning is a continuous process from beginner to advanced performer. The three stages of learning obviously do not represent distinct steps with clear boundaries but each stage has clear

characteristics. Knowing which stage of learning an athlete is in helps the coach to decide on the best ways to help their athletes to continue to learn and become technically skilled. Let us now look more closely at what the coach should be focussing on in each of the three stages.

The Thinking and Understanding Stage – Working out What to do

"A picture is worth a thousand words" and this is particularly the case in this stage where the athlete is trying to create a picture in their mind of what they are going to do. During this stage the coach should be particularly patient as progress may be slow, depending on the learner and the nature of the skill itself.

The coach can help the beginner in learning a new technical skill by:

- Briefly introducing the technique to be learned, relating it if possible to other similar skills that the athletes may already know and be able to do
- Providing a simple, effective demonstration of the skill using the key points for providing a demonstration outlined in the chapter on the skills of coaching
- Using a teaching method that allows the beginner to perform the skill well enough to begin practising it
- Praise and reinforce the correct action, not the result
- Provide intermittent, simple feedback using the key points for providing feedback.

The duration of the beginning stage depends on the experience and coordination of the athlete and how complex the skill is for the individual. It may happen in one short technique unit for an experienced athlete learning what is for him a simple technique. It may be a much longer period for a younger athlete, or inexperienced athlete at any age, learning a new and, for him, complex technique. Whatever the situation, learning can take less time if similarities between the new technique and a previously learned skill are explained by the coach. The beginning stage is completed when the athlete can perform a 'rough' or basic form of the technique, although many errors remain.

The Practising and Learning Stage – Developing the Technique

The intermediate practising and learning stage is when the athlete develops by regular practice the motor programme that was initiated in the beginning, understanding stage. The athlete has now acquired the basic technique, reduced the errors and performance begins to become more consistent. Practice alone, however, is not enough to learn the technique correctly. Athletes need to be motivated to learn and to know that what they are doing is correct. They also need to know what they are doing incorrectly and, more importantly, how they can correct these errors. The coach should use feedback to develop the athlete's awareness of what they are doing and their ability for self-correction.

Athletes now begin to know what the technique more accurately looks and feels like and so are capable of beginning to analyse and correct their own errors. The coach can help them to do this by focusing the athletes' attention on the available feedback. Athletes can attend to visual information such as the flight path of the javelin and to sounds, such as the rhythm of their feet striking the ground as they run, hurdle or approach a jump or throw. They can also attend to the all-important 'feel' which comes from the feeling of the type of tension in muscles, the angle of and movement around joints and the sense of balance. Coaches can help athletes to use this information by raising their awareness of what is happening through questioning and encouraging them to analyse and correct.

As with all three stages of learning there is no set timetable for the intermediate stage. Learning a simple technique may happen in a day, but a complex technique may take years to reach the advanced stage. In the intermediate stage the athlete begins to perform the technique accurately and consistently but in a constant environment. When the technique becomes automatic the athlete has entered the advanced stage.

The Skilled or Advanced Stage – Performing the Skill

In the advanced stage athletes are able to maintain a high level of performance under a variety of competition-like environments. Athletes are confident and have a good understanding of their skill. This understanding and well developed 'feel' for the skill means that they are able to evaluate themselves more effectively. In this stage the athlete needs to be motivated to practice the skill as improvements are small and not so easily achieved. The ability to perform a skill will be affected by changes in other components of fitness such as strength and speed. As a result constant attention to skill is necessary through all three stages of learning to continuously update the motor programme to the athlete's continuously changing body.

Summary of Technical Skills Learning

- Since the process of learning cannot be seen directly, technical learning is assessed by observing changes in performance of the technique
- Learning a technique is a continuous process consisting of three stages: understanding, practising and skilled
- Learning a new technique involves combining previously learned movement patterns with new movement patterns
- Learning a technique creates a motor programme, a set of instructions for performing the new skill
- The main concern of teaching during the beginning stage is to communicate in general terms how to perform the new technique so that the motor programme may begin to develop
- The main concern of teaching during the intermediate stage of learning is to structure practice conditions and provide feedback that assists development of the motor programme
- As athletes proceed through the intermediate stage of learning they develop a 'feel' for the correctly performed skill
- The main concern of teaching during the advanced stage is designing effective practice conditions and motivating athletes to continue to learn
- Reaching the skilled stage of learning does not mean that skill learning is finished. It means that the potential limits are being approached and that learning must continue if the limits are to be reached and if the motor programme is to remain updated to the athlete's changing physical fitness.

Methods of Teaching Simple Technical Skills

A simple sports skill is one that an individual can perform with very little practice. The ease of learning is usually a result of the simplicity of the technical skill. Sometimes it is because beginners have seen the skill performed many times by other people, either in person or on television. It is generally considered that 80% of learning takes place through what is seen. The coach should take care to label a skill as simple only when beginners acquire it quickly and easily. When what appears easy to you is hard for learners to

master you should label that skill as complex in the eyes of those learners. Sometimes what appears to be a simple skill may be complicated by fear and nervousness and this is frequently seen with beginners in the hurdles, steeplechase and pole vault events. If there is any doubt whether a skill is simple or complex for the learners it should be taught as a complex skill.

There are two methods commonly used in teaching simple skills:

- the imitation method
- the demonstration-practice-feedback method

The Imitation Method

Simple imitation is often the best way for athletes to learn. It requires the athlete to focus on what is to be imitated or copied, "Watch this. . . . Would you like to try that, or would you like to see it again?" If the imitation that the athlete makes of the movement is accurate this should be confirmed, "Yes, that's it. Now remember and practice it". When minor corrections are required point them out in a clear way.

The Demonstration-Practice-Feedback Method

This method is really a development of the imitation method and involves the following four steps:

- Provide a demonstration
- Allow time for practice, observe carefully
- Provide feedback which may be in the form of re-doing the demonstration
- Allow further practice and maintain feedback.

Methods of Teaching Complex Technical Skills

Complex technical skills are actions or movements that an individual cannot easily learn by the methods used for simpler skills. There are a variety of methods of teaching complex skills and all in one way or another simplify the skill to make learning easier. To be an effective coach you need to be able to evaluate the beginner athlete and simplify the skill to their level and always remember:

"What is a simple skill for one person may be a complex skill for another."

There are two commonly used methods to teaching complex skills:

- Shaping
- Chaining

Let us take a look at how these two methods make learning a complex skill easier.

Shaping a Complex Skill – Making the Whole Action Simpler

Shaping is a word used to describe the way people learn to do a wide variety of things. It is similar to the way a sculptor begins with a shapeless lump of clay and gradually shapes it into a figure. The form of a skill takes shape gradually in the same way.

Shaping can be described as follows:

- briefly explain and provide a demonstration of the complete skill to be learned
- use a simplified or incomplete version of the whole skill that includes the most important actions and is something the learners can be successful at
- allow practice of the simplified skill
- gradually change the tasks so that the whole skill is shaped into a reasonable example of the finished product through practice
- encourage athletes who are having problems to try it in other, simpler ways.

Sample shaping of a complex skill - the hurdles

Hurdling is usually seen as a complex skill by learners because of the technical rules of the event and the fear and apprehension beginners have about hitting the hurdles. The essential thing in hurdling is rhythmic sprinting. Shaping the hurdling technical skill should encourage this rhythmic sprinting, remove any fear factor and gradually introduce the technical elements.

Here is a possible sequence to shape this skill:

Stage 1 Athletes sprint from a line over 3-6 sticks placed flat on the track and across a lane. The sticks should be adjusted in several lanes so that each athlete runs in a lane where they naturally have 3 strides between the sticks

Stage 2 The sticks are replaced by very low obstacles that offer no resistance if hit

Stage 3 Hurdles set at the lowest height and with no, or low, toppling weights replace the low obstacles

Stage 4 Hurdle height is gradually increased to competition height and the hurdles are gradually moved towards the correct distance for the learner's age group.

Chaining a Complex Skill – Breaking a Skill into Simpler Parts

Another way to approach the teaching of a complex technical skill is to have athletes chain it together. A complex skill is made up of a number of simple, distinct parts. Each part may be thought of as a link in a chain. The simple parts or links of the whole skill are learnt using the methods of teaching simple skills. For chaining to be effective the parts should be put together as soon as possible to form the whole skill. In

the intermediate stage of learning the athlete may practice parts of the skill but should always finish with the whole skill, putting the links back into the chain.

Here is a sample chaining of a technical skill - the shot. If the athlete views the technique of putting the shot as complex it can be broken down into the following parts:

Link 1	Holding the shot correctly in the hand and against the neck
Link 2	The putting action from the shoulder, elbow, wrist and fingers
Link 3	Starting position at the rear of the circle
Link 4	The glide across the circle
Link 5	The power position
Link 6	Delivery and release
Link 7	Recovery.

In chaining you can teach the parts in sequence, as in forward chaining links 1 to 7, or backward chaining links 7 to 1. Chaining may also be used to teach the parts out of sequence to emphasise certain actions or to give the learners the satisfaction of early success. For these reasons the shot is frequently taught, links 1, 2, 5, 6, 3, 4, 5, 6, 7.

Shaping vs. Chaining

Chaining is quite different from shaping. In chaining each part is practised just as it is performed in the finished, whole technique. In shaping the first attempts of the athlete may be so rough that they hardly resemble the finished technical skill at all.

There are no rules to tell which method of teaching technical skills is best for a particular situation. Coaches find out through experience which method suits them and become more able to decide whether the skill is simple or complex for a particular individual. Generally, it is best to teach a technical skill as a simple, whole skill whenever the individual is capable of learning this way. Whichever method of teaching is used the coach has a very powerful role to play in creating an effective, enjoyable and motivating learning environment. If the coach effectively applies the five basic skills of coaching to this area of teaching and coaching techniques each athlete will become able to act and decide with independence, be able to determine their own success and be more likely to achieve their potential.

7

DEVELOPING MENTAL SKILLS

Developing Mental Skills

It is as important for a coach to help individuals develop how they think, their mental skills, as it is to develop their physical skills. In this chapter you will be introduced to some of the factors that influence performance and how these factors may be controlled by the use of mental skills. This is a clearly psychological aspect of coaching, but it is also true that no part of coaching is without psychological aspects.

Mental Skills

Once you gain an understanding of how you can apply and develop mental skills you will find that the benefits will extend far beyond the world of athletics. These skills are of great benefit to coaches and athletes in everyday life. Mental skills are not just a means of avoiding or recovering from disasters. They also play a very important part in organising practice and training effectively so that things go correctly in the first place. Remember that no matter what labels you apply to this aspect of coaching, the most important part of the coach's responsibility is getting to know your athletes. You can't help them to think without knowing how and what they think.

Most athletes and coaches recognise that physical development alone is no guarantee of success in athletics. An athlete must have the correct frame of mind. Psychological preparation is as important as physical conditioning. Getting both right together is what creates an excellent or peak performance rather than an average performance. It is important to emphasise that everything in this chapter relates to anybody who wants to be better at what they do. These skills can help your athletes become better athletes, and can also help you to become a better coach.

When we talk of basic mental skills for athletes these can be summed up by the five 'Cs':

- Communication
- Commitment
- Control
- Confidence
- Concentration

Basic Mental Skills - The Five Cs

Communication

Good communication skills are needed by both the athlete and the coach. We have looked at communication in the chapter on developing the skills of coaching and you will have read that communication is a two-way process. The coach should be a role model in communication skills and this will assist the athlete in the development of their communication as well.

All mental skills require practice in exactly the same way as physical skills. Just as with physical skills, some individuals will pick up mental skills much more easily than others. But, with practice, anyone can improve their mental skills. Before looking at the techniques for developing other mental skills it is necessary to understand what is meant by the terms personality and commitment.

Personality

Professional psychologists have tried to measure personality in many different ways. The most important conclusion from all their research is the apparently obvious statement that no two people are the same. This is an important statement for the coach because it means:

- People will interpret the same piece of information differently
- People will respond differently to the same situation and the same person will also respond differently in different situations

Commitment

Commitment basically means how much an individual wants to achieve a goal. To understand this commitment we need to know what motivates an individual and what goals they have. Individuals have many different goals in being involved in athletics. Typical reasons are:

- to have fun
- to master new skills
- to compete and win
- to make friends
- to become fit
- to experience excitement

Understanding the reasons why your athletes are taking part is very important. Unless they obtain what they are looking for from sport, they are unlikely to want to stay involved with it and will choose to drop out. It is also unlikely they will develop the necessary commitment to their development. External pressure from coaches and parents is unlikely to increase the commitment of an athlete in the long term and may actually decrease it. Self commitment, self motivation and fulfilment are what makes a truly successful athlete, not the imposed ambition of someone else. As a coach you can help develop commitment in your athletes by helping them understand what they want to achieve, their goals, and how they will achieve them.

Goal Setting – Helping your Athletes to Know what they Want to Achieve

Perhaps one of the most fundamental skills for a coach is goal setting. Athletes need clearly defined goals so that they have targets to aim for. They need to know exactly what they have to do to achieve these targets and know when they have achieved them. Goals need to be set out for the next training session, the next week, the next month and the whole season. The goals should build towards well defined, important events in the athlete's experience. Good goal setting increases commitment and also helps to build self confidence in the athlete.

The key to success in goal setting is focusing the athlete's attention on an appropriate goal. The precise choice of goal can be influenced by almost everything that influences performance, but the athlete must believe them to be appropriate. If they don't, then the goal will not motivate and guide their behaviour. Athletes will only be committed to achieve goals which they accept. Consequently, goal setting must be a shared experience.

How difficult should goals be? We do know that success breeds success and athletes will get the best results if you try to help them experience success, and help them to set their goals accordingly. If goals are set which cannot be achieved at least 50% of the time your athlete will fail more than succeed. To be effective the athlete must see the goal as a realistic challenge. The goal must be seen as difficult enough to be worthwhile but easy enough to be achievable.

Achieving a goal is success. In setting the goal you need to know how you will judge success. Simply deciding to "do your best" is open to misinterpretation and is not a sufficiently specific goal. To be effective, goals should be specific not general.

Goal setting should be a joint effort between the coach and the athlete. The main features of good goal setting are:

- Goals should be specific and should determine what an athlete has to do. They should not specify outcomes that depend on others
- They must be measurable so that progress and success can be recognised
- They must be agreed with and accepted by the athlete
- They must be of varied difficulty with some challenging but realistic and should be seen as stepping stones to success
- Time phased so that they are structured into long term, short term and intermediate
- As the athlete is involved with the process they should be exciting every time he thinks of them
- They must be recorded so that they form almost 'a contract of commitment'.

Goals should be written down or recorded in some way. Always discuss the possibilities of a target or a situation before you write the goal down. The goals do not always have to be physical achievements but can be used to change and modify both physical and mental performance. They can also be used by the coach and athlete to modify behaviour.

Control – Learning to Control Emotions and Anxiety

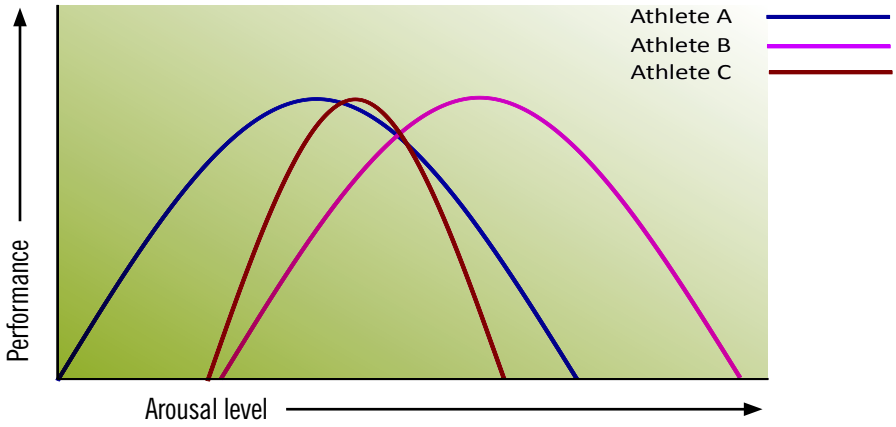
Anxiety means simply how much an individual is aroused or ready for a given situation. Anxiety is always present in any situation, although when levels are low we may not even notice it. Many times anxiety is

used incorrectly to mean only those characteristics of individuals who are showing very high levels of anxiety. When you know an athlete well it is often easy to see whether they are over-anxious or not. The symptoms of anxiety can be seen as falling into two types:

- Worry
- Physiological arousal

Worry refers to thoughts or images about what might happen in an impending event, while physiological arousal is part of the body's natural preparation for "fight or flight". Examples of physiological arousal include increased heart rate, sweating and the need to go to the toilet.

We all know people who appear never to worry about things. They are relaxed and possibly under aroused, that is their anxiety levels are too low. Then there are some individuals whose anxiety levels are very high all the time. Personality certainly affects how individuals see things but the response of anxiety can be controlled with practice. If we look at how performance relates to anxiety we see an inverted-U shape curve. Performance at low and high levels of anxiety or arousal are not as good as an optimal mid-point. This optimal level of arousal is different for different individuals. Also the same person has different optimal levels of arousal for different situations. An athlete, for example, may need to be psyched up if he is competing on his home track where he always trains. But he may need to stop his anxiety levels going too high when travelling to do the same event in a major championship in an unfamiliar setting.



Relationship of arousal to performance
Athlete A achieves best performance at a lower arousal level than Athlete B and Athlete C has a narrower area of optimal arousal

Helping athletes to control their anxiety levels is one of the most important responsibilities of the coach. It does not matter how well physical preparation has been if the athlete arrives at the competition and is unable to perform at their best due to being under or over aroused. There are two ways in which the coach can help prepare the mental skills of emotional control:

- Effective goal setting to increase self confidence
- Using appropriate relaxation techniques

We have already looked at effective goal setting. The athlete who has clear targets can focus on these rather than some vague worry about all the possibilities of competition. Relaxation is as much a physical skill as

throwing a shot or jumping over a bar. Because it is a physical skill it can be taught and improved through practice. An athlete who is skilled at relaxation can use these techniques when anxiety threatens to go too high by controlling the physical responses to anxiety. When goal setting and relaxation work together the athlete should be in a position to control levels of anxiety and concentrate thoughts on the efforts required for competition.

Confidence

Confidence means how well a person views themselves in a particular situation and it is situation specific. An athlete may be confident in certain situations but if the situation changes they may feel less, or more, confident. So it is really about how the individual 'sees' how well they can meet the demands of any situation. For example, an athlete may e very confident when competing in a local competition against known opponents. The same athlete may be less confident when competing in a national championships against athletes they do not know. The greater the athlete's confidence, the more stable their performances will be in a wider variety of situations.

We have seen that increased self confidence comes from good goal-setting and will help increase the control of emotions. Increasing confidence will also permit the athlete to approach technical skills in a more relaxed way. There are many ways that the coach can build confidence during training and competition. And many of the things a coach does and says not only builds one C but may have impact on two or more. For example, if a coach recognises effort and achievement at the correct time, this will help to develop both commitment and confidence.

Concentration

The mental skill of concentration is needed in both training and competition. If it is poorly developed it is difficult for the athlete to be consistent and to build their confidence. Concentration relates to where an athlete's focus of attention is and how well they can maintain and control that focus. The athlete's concentration is affected by where they are looking, what they are listening to, what they are saying and thinking inside themselves and what they are feeling and sensing.

Good concentration reflects an athlete's ability to sustain focus and attention on 'something' for a defined period of time. This 'something' could be from varied sources of information and in athletics the focus of concentration is different for different events. The 'power' events of the sprints and hurdles, for example, require a brief but intense focus during their competitive effort. The jumps and throws require a similar brief but intense focus but also have to maintain their focus of concentration though several rounds of efforts. For all events, concentration is necessary for consistent technical performance and to respond tactically to the changing environment.

The coach should build situations requiring concentration into practice and competition. This can develop the quality of concentration by focussing on two areas:

- What the athlete is focusing on
- How long can this focus be maintained which is usually called the athlete's 'attention span'.

Before doing something the coach can re-emphasise what the focus of concentration is for that activity.

Then, during the activity the coach may occasionally stop, or 'freeze', the activity and ask questions of the athlete to find out what they were seeing and thinking at that time. This can raise the awareness of the athlete to where their focus of attention is at any time and whether the focus was where it should be. The review and evaluation that takes place after performance is also an ideal time for the coach to ask questions of the athlete so they become more aware of what they were concentrating on and how effective that was. Like any skill, some individuals will naturally have better concentration than others but everybody can improve their skill of concentration if it is practised.

The Five Cs – Summary

All contacts between the coach and the athlete have the potential to develop the athlete's mental skills. Sometimes just one 'C' is deliberately focussed on by the coach but, as the athlete matures and develops, the skills of communication, commitment, control, confidence and concentration become more inter-related. The challenge then for the coach is to maintain the development of these skills in the adult athlete. But, at all stages of athlete development, the effective coach should plan mental skills training into sessions just in the same way that physical skills training is planned.

Workshop – Mental Skills Training in Practice

Get together with another coach and ask each other the following questions. Try to answer briefly in one or two sentences.

"Do you use goal setting when you coach?"

If "Yes", do you? If "No", would you?

- Involve your athletes in setting their goals?
- Use only long term goals?
- Use only short term goals?
- Use a variety of goals
- Use specific, measurable goals?
- Encourage your athletes to work out their own tactics and adjust their goals?

Work together with another group of coaches to discuss the following questions and situations. There are no correct or incorrect answers and you should be open to the views of others.

- An athlete you coach is considering giving up athletics. What steps would you take to encourage the athlete to stay in the sport? Discuss how important commitment and goal setting are in the situation.
- In what ways is coaching a gifted athlete different from coaching athletes of average ability?
- In coaching athletes, what are the areas of responsibility that:
  – the coach should take total control over?
  – coach and athlete can share responsibility?
  – the athlete should have control?
- Discuss situations that you can create in training that will help to develop your athletes' concentration.

8

DEVELOPING A SAFE ENVIRONMENT

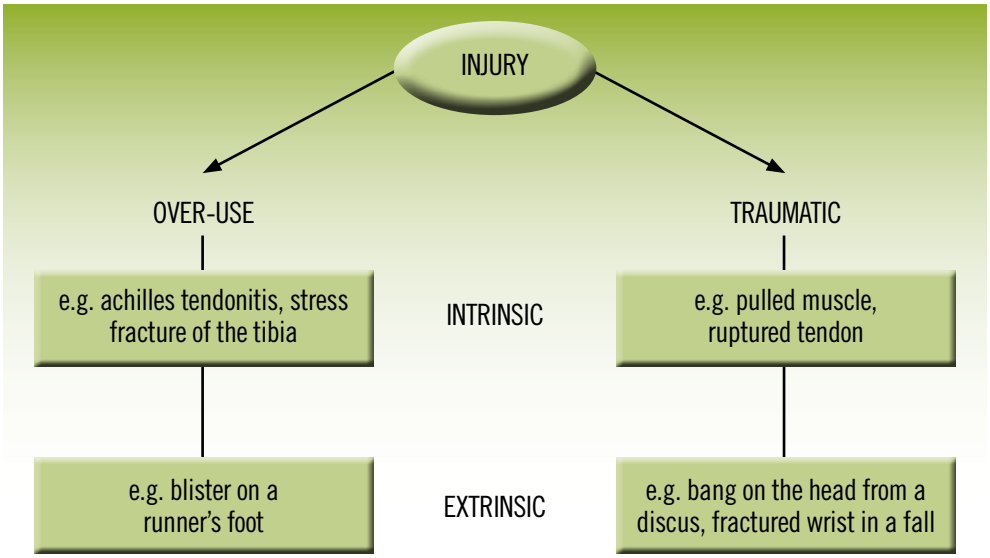
Developing a Safe Environment

As a coach you must be aware that each athletics event and training or competition situation contains an element of danger. It is important that you should have a good understanding of these inherent safety risks and wherever possible to remove or reduce these risks. Obviously, certain events place athletes at greater risk than others. Coaches have a duty to develop a safe environment for each athlete and to prevent injuries. But injuries and illness are an almost inevitable consequence of training and competition at some time, no matter how safe the environment, and the coach must be able to manage them promptly and correctly.

Prevention of Injury

The saying, "Prevention is better than Cure" is especially relevant to the athlete. Many preventive measures are very much common sense but specific precautions are still important.

There are two ways in which injuries can occur. An injury may be caused by a particular traumatic incident, for example a fractured collar bone from falling in a race. On the other hand the injury may be caused by over-use, for example, achilles tendon injuries in runners. Either may be caused by intrinsic factors, which are factors restricted to the participant, or extrinsic factors, when outside agents are involved. In sports requiring long periods of training the problem of over-use injuries may well be of equal, and often more, importance to prevent.



Traumatic and over-use types of injury

Remember that athletes are also at risk from non-sport activities. They can fall down a step or trip up as easily as non-athletes. No matter how safety conscious you are accidents will happen. If you are constantly aware of possible dangers you should be able to minimise the risks. This chapter is intended to help you realise what practical preventive measures you can apply in your coaching and what actions to take if injury does occur.

Prevention through Skill

Skill is of great importance in safety. You must see skills training as not simply a means of improving performance, but also as a means of preventing injury. Skill involves not only the athlete's physical control to make the body do what the mind instructs, but also the mental ability to 'read' a situation, to know the risks involved, and so reduce them.

It is important for the athlete to develop the ability to relax in competition and training so that the body can be allowed to carry out the required activity at an automatic level. Tension and anxiety can break down the reflex nature of skilled performance and increase the risk of injury, such as when a sprinter tries too hard to maintain speed and 'pulls' a muscle.

Fatigue also causes a breakdown of skill. This fatigue may occur in a single training session or result from training loads being too high or too close together. Whether overtraining is short term or long term a coach must be able to recognise the signs and symptoms of fatigue and reduce training levels before injury or illness occurs.

General symptoms of fatigue and stress:

- Listlessness. Lack of responsiveness and enthusiasm
- Loss of appetite
- Disturbance of sleep and waking up tired
- Raising of resting heart rate
- Possible loss of weight
- Incomplete recovery between sessions
- The skin and muscles may appear and feel 'puffy'
- They express relief when a chance to 'escape' from training or competition presents itself.

Prevention through Fitness

Skill alone will not totally protect an athlete because he is at risk if he undertakes activity beyond the limit imposed by his general fitness. Increased fitness reduces the risk of injury in two ways. Firstly, by its effect on the muscles, tendons and joints and, secondly, by increasing general endurance so that the participant can compete for the whole duration of training and competition without fatigue.

We have already discussed the five main components of physical fitness, Strength, Speed, Endurance, Coordination and Flexibility and each of these must be developed to a sufficient level to do the required activity.

If we look at strength, as an example, we know that muscles become stronger if they are made to work. The work load that you choose must be appropriate to the athlete's requirement for his particular event. For example, it is obviously unnecessary to strengthen the shoulder girdle muscles of a marathon runner in the same way you would strengthen those of a discus thrower. Strength training must meet individual needs and the most appropriate training for muscles is frequent repetitions of the type of work required for individual skills. A correctly strengthened muscle is more resistant to injury.

Coordination means that the muscles are receiving the messages to 'pull' at the correct times and in the

correct sequence. An athlete who has well developed coordination is at less risk of injury because there muscles are acting at the correct times with the correct forces and are not 'working against each other'.

Endurance involves both muscular endurance and cardio-respiratory endurance. The development of endurance fitness prevents fatigue. Injury statistics for all sports indicate that injuries are more liable to occur when an athlete is becoming tired.

Many coaches believe that improved flexibility will injury-proof their athletes but this may not always be true. Your athletes should understand that flexibility is an important part of muscle fitness and may have a role to play in injury prevention, if done at the correct time. Tight muscles are clearly at risk from tearing, for example, hamstring strains, but should be warmed up using active, dynamic mobilisation exercises.

We have learned that static stretching in the warm up is unlikely to prevent injuries and will reduce the athlete's performance in the activity to follow. There is, however, plenty of evidence from athletes, coaches and physiotherapists that if you were to do any static stretching for the purpose of injury prevention, the best place to do this might be in the cool down or as a separate 'flexibility session'. As the athlete cools down immediately after a training session the body's temperature is raised and you get increased extensibility in the tissues, ligaments, tendons, muscles and neural structures. This simply means that any stretching you do will be more effective provided the muscles are not overly fatigued.

Although static stretching may not be the best activity for a warm up, it remains a very valuable method for increasing the range of motion and flexibility to achieve optimum performance and possibly help prevent injuries. But the coach should always remember that any use of static stretching should be individualised and not a 'one size fits all' approach. Flexibility is achieved by stretching in various ways. It is easy, uses little energy, requires no apparatus and improves with practice.

Prevention through Nutrition

Good nutrition can make its impact on preventing injury by helping an athlete to recover between training sessions. It is important that athletes pay constant attention to eating habits and develop a healthy diet. The diet must meet the demands placed on the body by training. In particular, an athlete must consume sufficient energy in the form of carbohydrates to maintain the stores of energy within the muscles and help prevent fatigue. Athletes should eat something easily digestible and high in energy about 2 to 3½ hours before training or competition.

Prevention through Warm Up

There are three main reasons to warm up:

- To activate the muscles and tendons, particularly those that are going to be used, and go through the range of muscle and joint motion for the activity which follows
- To increase blood flow to the muscles and prepare the joints
- To prepare athletes for what is to follow by stimulating them mentally and physically.

Each of these reasons contributes to preventing injury, provided the warm up is carried out correctly. You should be systematic, using active, dynamic mobilisation exercises. You should also vary your exercises for the varying parts of the body from session to session. Allow for some individual differences in warm up routines.

Prevention through Environment

Many injuries to athletes occur by accident when they are not actively participating. It is not uncommon to see sprained ankles or bruised shins because an athlete has fallen over a kit bag or piece of equipment left lying around beside the track. You must look carefully and critically at all your training facilities in terms of safety.

Safe, well designed equipment is important in injury prevention and although it is clearly event specific, certain general remarks can be made. Take time to ensure that any equipment is safe and fit for use every time you come to use it, before, during and after the activity. Damaged or faulty equipment is frequently a cause of injury. If you do not have direct responsibility for equipment maintenance you must make sure the person responsible is aware of the need for correct, regular maintenance.

Many different surfaces are encountered in athletics. Some are natural and some are synthetic but both can cause problems. Natural surfaces change from day to day according to the weather. Synthetic surfaces may be relatively hard and can easily cause over-use injuries if used too often. Whatever the surface, be sure your athletes choose the correct footwear to suit the conditions. Reduce the risk of injury by varying the surface for training when possible.

The clothing an athlete uses is very much a matter of personal choice, or imposed by finances, but should always be chosen carefully. Nylon is often cheaper than natural fibre but is particularly bad in hot climates and heat generating activities. Shoe design has advanced greatly and better, safer shoes are now available. Particular care is necessary, however, to select footwear appropriate to individual events and, in particular, appropriate to the surface. As a coach you must be prepared to advise the athletes on the preferred choices.

Prevention through Treatment

There is no doubt that previous injury predisposes to recurrence or further injury. A possible explanation of recurrent strains and sprains is persistent instability and muscle weakness. You must have adequate arrangements, when possible, for acutely injured athletes to be assessed and treated correctly. The use of

protective strapping of injured joints can be very helpful, but it is second best to the proper rehabilitation and recovery of an injured joint.

Implications for the Coach

Sports injury prevention can seem to be a complex problem, but it can be reduced to the word responsibility. A responsible attitude on the part of the coach, athletes, officials and the medical profession can go a long way in preventing injury. You have the responsibility to make sure your athlete is fit for athletics, that he is not over-trained, that he uses the correct equipment and obeys the rules. As a coach you also have the responsibility not to be so ambitious that you push your athletes beyond their capabilities or with children and novices, beyond the limits imposed by their age and experience.

Injuries and illness are an almost inevitable consequence of training and competition at some time, no matter how safe the environment, and the coach must be able to manage them promptly and correctly. The following section looks at the role the coach can play and also the roles they are not qualified to play. It is as important for a coach to know their limitations as well as their areas of competence and it is recommended that all coaches hold a current, recognised First Aid qualification.

Soft Tissue Injuries

The disruption or tearing of soft tissue is found with most sports injuries. The small blood vessels, or at times major blood vessels, which supply these tissues are also ruptured. This leads to a blood flow into and around the site of the injury. You can usually recognize this by the presence of pain, swelling and discoloration. The three stages of injury care are named according to the extent of this internal bleeding.

The Three Stages of Injury

- **The Acute Stage (0 - 24 hours)**

  This stage is defined as the time immediately following the injury and lasts until all bleeding has stopped, usually 0 - 24 hours. Proper management can reduce this time period considerably.

- **Middle Stage (24 - 48 hours)**

  This is the stage when bleeding has ceased and the acute stage has ended. The injury is still susceptible to bleeding starting again, usually 24 - 48 hours after the injury. If proper procedures are not followed, there is a danger of the injury returning to the first stage. Note that the injury should never be massaged in the acute or middle stages of injury.

- **Final Stage (48 hours +)**

  This occurs when all bleeding has ceased and there is little chance of it starting again, usually from 48 hours on. At this time therapeutic care can greatly enhance recovery. Healing, in the form of soft scar tissue, occurs gradually during this stage.

All injuries pass through these three stages, and the coach should recognise them so that he can manage the injury effectively.

Immediate Treatment and First Aid

A successful return to competition can often be dependent on the judgement of the first person in contact with the injury and the application of the appropriate first aid. If the coach is without medical assistance he must exercise his own judgements as to whether an athlete should continue in competition, or training. With a major injury the decision makes itself but with an injury that still allows mobility the decision is not always so easy. If in doubt, you should rest the athlete.

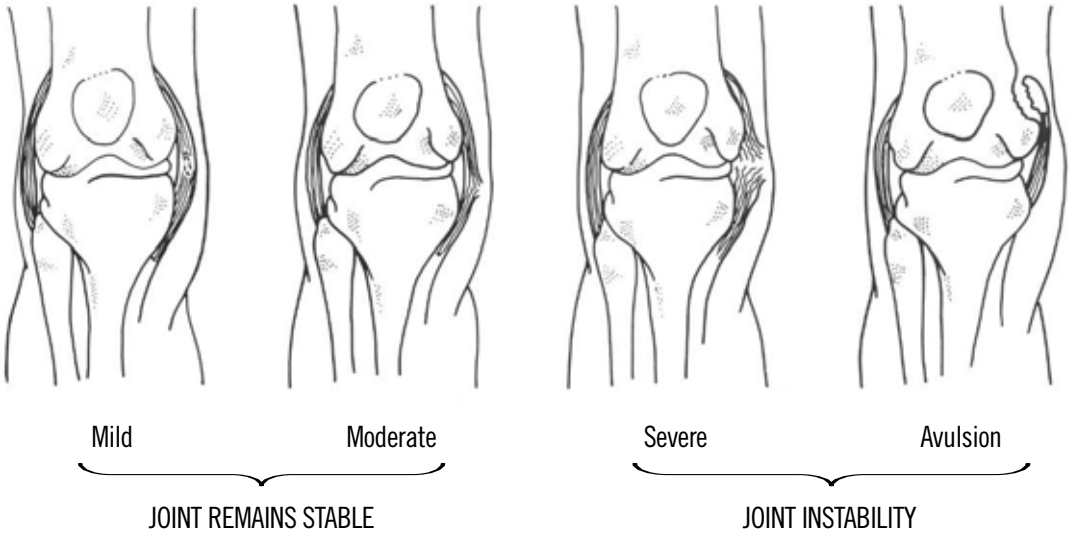
Soft Tissue Injuries

Soft tissue injuries are the most common injuries involved with sports. These include injury to muscle, tendon and ligaments with occasional nerve and blood vessel involvement. The more common types of soft tissue injuries are bruises, cuts, scrapes or abrasions, and strains and sprains.

In each case the degree of injury to muscles, tendons and ligaments can be classified as follows:

- Mild
- Moderate
- Severe
- Avulsion, tearing away from the bone

These four degrees of injury are illustrated in the knee joint. Mild and moderate tears are not difficult to diagnose. Often the athlete does not feel them till he cools down. Then, within 24 hours, there is local tenderness and a restricting pain when he bends or straightens the knee.



Ligament sprains to the knee joint

With moderate and severe tears the athlete usually notices a 'pull'. With a moderate sprain it is sometimes possible to complete the activity, but with a severe sprain there is sufficient pain and loss of power that the athlete is forced to stop. Avulsions in athletics are rare since in the mature athlete they are usually the result of a violent contraction against resistance. They are, however, more common with adolescents whose muscular strength has outgrown the strength of the attachment to the bone. When the avulsion is of a tendon, such as the achilles tendon in the heel, the belly of the muscle to which the tendon is connected will probably 'cramp' and go into spasm.

Care of Soft Tissue injuries

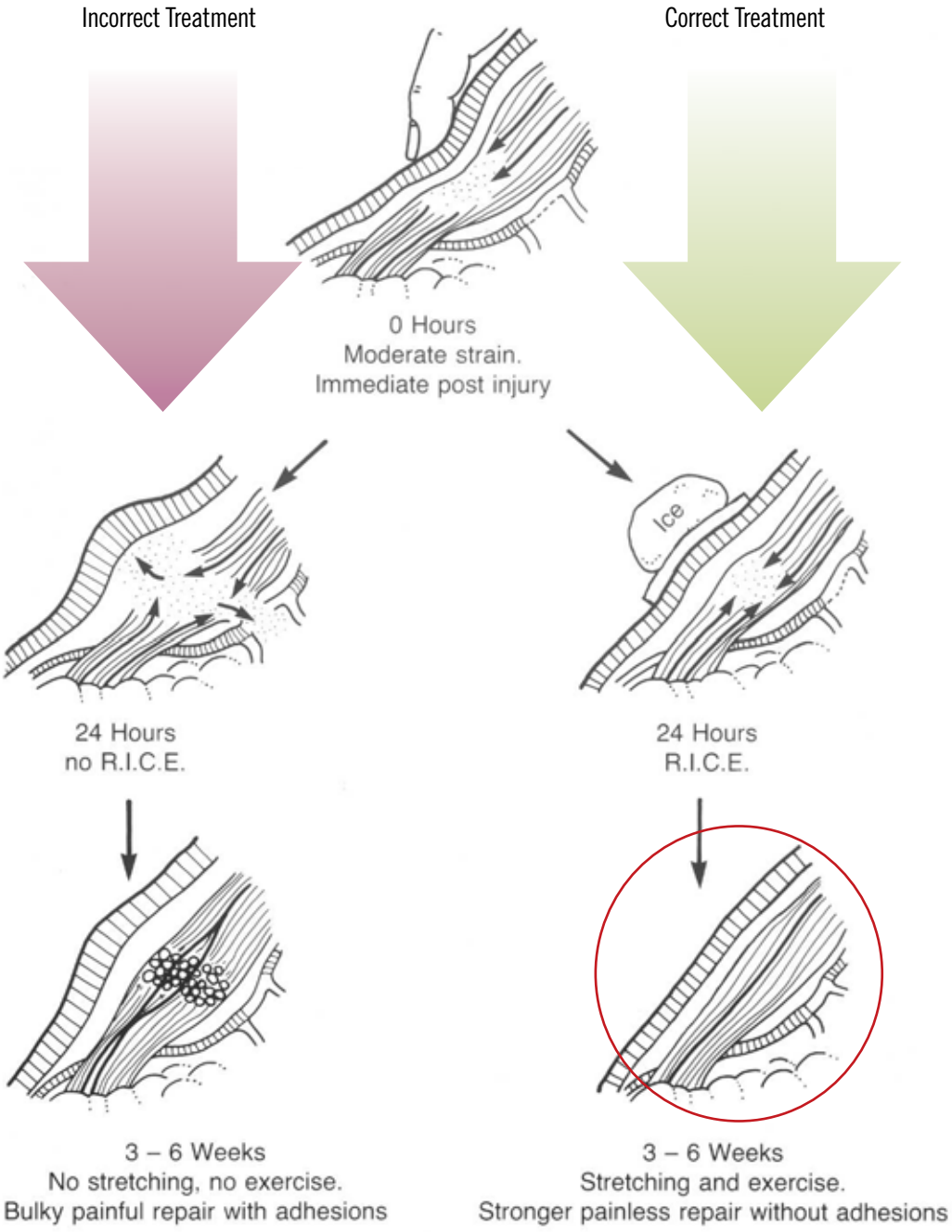
The steps you should take in the care of minor soft tissue injuries are outlined by the initials P.R.I.C.E.D

P.R.I.C.E.D - The care of soft tissue injuries

P	Prevention	"Prevention is the best cure."
R	Rest	The injured area should be immobilised.
I	Ice *	Ice or cold can be applied either directly or indirectly to the skin usually on a wet towel. If applied directly, the source of the cold application should be kept in motion, as in a light circular motion.
C	Compression	Compression is usually done by wrapping with sterile bandages or tape or by direct, manual pressure.
E	Elevation	Elevation means placing the injured part above the level of the heart as in the injured leg propped up on a support while the athlete is lying down.
D	Diagnosis	If possible, the athlete should see a qualified sports medicine doctor or physiotherapist to provide an accurate diagnosis of the injury.

* Warning - prolonged contact of cold directly on the skin can damage the skin and cause frostbite. Repeated short, 5 - 10 minutes, applications of cold are better than a single prolonged one

The two steps of 'Compression' and 'Elevation' are the most important and time can be wasted applying ice when it is more important to bandage firmly the already elevated part. If the athlete is going home he should be instructed to rest and to continue elevating the part. It is also important to point out the dangers of bandaging too tightly as this can reduce the normal blood flow to an area.



A muscle tear and repair with and without correct treatment

Factors Affecting Recovery

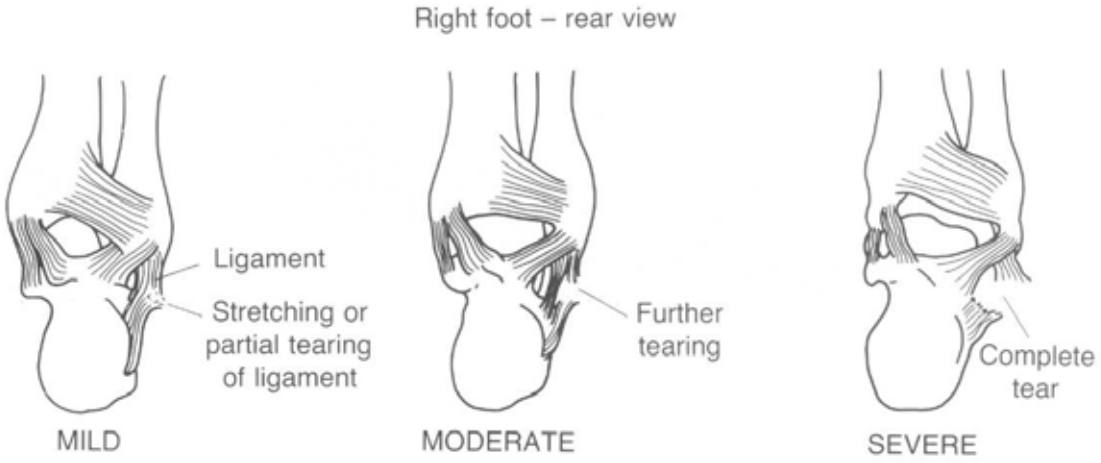
The following factors will determine how fast an athlete will recover from a sports injury:

- The type and severity of the injury
  Major injuries will take longer to heal than minor ones
- Early management
  Quick and proper first aid will shorten recovery time
- The type and frequency of therapy
  Selecting the correct therapy and applying it conscientiously will promote healing

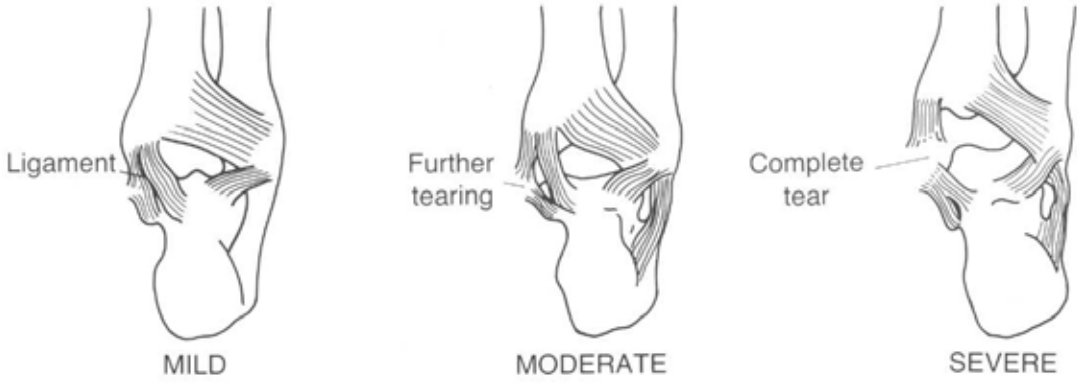
- Nutrition
  A healthy diet will provide the nutrients to speed the healing process
- Individual differences.
  Young athletes heal faster. Athletes differ in their physical and psychological make-up and this affects individual healing time.

Injuries to the Ankle

In some ankle injuries the ligaments prove stronger than the bones to which they are attached. This causes an avulsion, the tearing off of a piece of bone. This bone fracture will probably have to be pinned back to its original position to allow the necessary bone repair. To anyone not familiar with sports injuries this might seem to be the most serious of the injuries to the ankle. This is not so. Bone injuries when properly set will give a very strong repair. Ligament injuries will often leave a source of weakness. For this reason, it is often said that it is worse to sprain an ankle than to 'break' it.



An inversion sprain. This is the most common type of ankle sprain and happens in athletics when the athlete steps on the kerb or on the foot of an opponent.



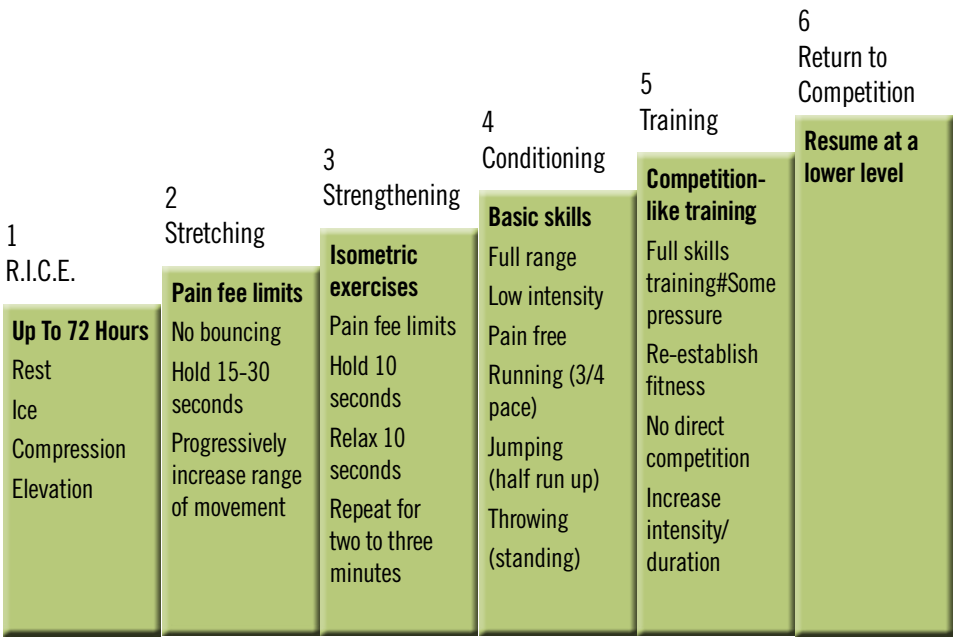
An eversion sprain. Quite common among athletes as a result of stepping on an uneven surface.

Rehabilitation of Sports Injuries

Before returning to action, an athlete must be totally rehabilitated if they are not to be re-injured. The requirements for proper rehabilitation include:

- Regaining full flexibility, 100% of previous range of motion
- Full strength return in the injured part
- Absence of pain
- Psychological readiness, absence of fear

Coaches who are doubtful about when an athlete is able to return to training and competition should consult with the athlete's doctor to ensure that there has been proper rehabilitation.



Stages in the rehabilitation of an injury

Developing an Injury Management Programme

If developing a successful training programme is a coach's greatest challenge, then managing injury has to rate a close second. Despite advances in diagnosis and treatment, injuries remain traumatic experiences. Though a stress fracture or pulled muscle is physical, the athlete is also affected psychologically. A physician may prescribe treatment for the physical injury, but it is the coach who must help the athlete address other needs.

If you develop a thorough injury management programme, the injured athlete can still contribute to the group, even though he or she cannot run, jump, or throw. Likewise, the training group can help the injured athlete recover and rehabilitate. The key is to realise that injury affects an athlete in many ways and all must be addressed for a fast, successful recovery.

First, recognise that training for athletics, particularly running, is an addictive activity. Every athlete trains for different reasons, yet all athletes share the need for the repeated training 'fix'. This need creates problems

for the injured athlete who cannot train.

When faced with a break from training or competition, most athletes deny they are injured. But fully accepting injury is the first step on the road to recovery. This has to be a complete, realistic acceptance, with recognition of what is necessary to allow the body to regenerate and heal.

The addictive nature of exercise adds another complication during injury. The athlete will experience complex feelings similar to withdrawal symptoms from any addictive routine or substance. The symptoms include irritability, restlessness, frustration, guilt, general fatigue, depression and isolation. Less frequently, athletes experience insomnia, muscle tension, soreness, and gastric disturbance. If the athlete can realise that these feelings are common, they become easier to accept and control.

One way of alleviating these symptoms is to replace regular training with other activities, both physical and mental. This helps the athlete focus on what can be done, rather than what can't be done. Once the activities are identified, coach and athlete should set goals. Goal setting allows the coach to help the athlete take control of the situation and not play the role of victim, controlled by the injury.

"Focus on what can be done, rather than on what can not be done."

Set goals for other actions, such as following the doctor's advice on physical therapy. And make goals that will keep the athlete involved, if possible, with the training group. Because an injured athlete often feels unworthy, he may withdraw and avoid contact with training partners. If the injured athlete maintains contact, he will have an active and powerful support group that can aid in recovery.

While injured, athletes may become anxious about their weight. Let athletes know that good nutrition provides the necessary building blocks for repairing the injury. Many athletes actually prolong their injury by a compulsive anxiety to maintain their appearance as an athlete. The athlete should ask, "Is it better to have a slight weight increase and be healthy, or to hold weight down and remain injured?" Work with the athlete to set nutritional goals that reflect body composition, not weight. Encourage the athlete to maintain a healthy diet but make sure that the energy intake is appropriate for their level of activity.

Activity Guide for Injured Athletes

Keeping an injured athlete active is perhaps the most important part of your injury management program. Activity puts the focus on what can be done, allows the athlete to work toward a goal and eases frustration.

Of course, any activity must be safe. You must work with the athlete and the doctor or physiotherapist to establish which joints, muscles, tendons, and ligaments need protecting, and how much protection they need. Then choose the safest exercise, keeping in mind that the more closely the activity resembles the athlete's event, the more transfer there will be when the athlete returns to training and competition.

Running in water is the most effective activity for maintaining a general endurance fitness, but athletes need variety to keep motivated. If possible, incorporate at least two of the following activities into an athlete's programme. To maintain continuity, schedule workouts for approximately the same time of day as your usual training sessions.

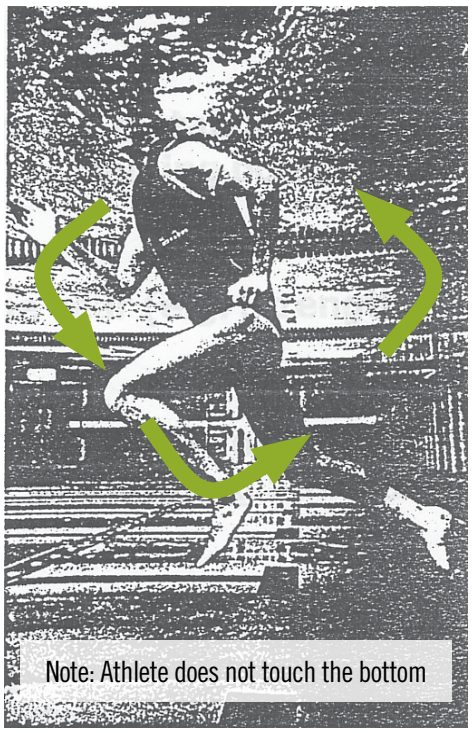
Whatever activity your injured athletes do, an easy and relaxed transition back to training and competition

is essential. The longer an injury has taken to heal, the more gradual the return to a full training schedule should be. Gradually reduce the alternative exercises as the training load for athletics increases.

Water Training

Running in water and swimming are good conditioning exercises. In water, the whole body moves against resistance. Because the water supports the athlete's body weight, a water session is a low-stress activity that is perfect for most injured athletes.

Athletes should run in water at least six feet six inches or 2m deep, so there is no danger of accidentally hitting the bottom. Deep swimming pools are ideal. The athlete's form should be as close as possible to his running form on land. If the athlete is moving correctly, the gluteal, buttocks, and soleus muscles will be worked at least as hard as when running over ground and the athlete will move slowly forward, covering the width of a pool in one or two minutes, depending on how fast they 'run'.



Water Running

A water running session can be structured to almost mirror a training session on land. As with any session, you should create specific workouts of varying duration and intensity, including recovery intervals. An easy session might consist of five minutes of easy swimming, followed by five to seven minutes of water running, ending with a five minute cool down swim. Increase the water running until the athlete can handle 20 to 30 minutes comfortably.

Then move on to both longer and more specific water runs. Athletes must learn to gauge intensity using effort instead of a stopwatch. Also, use slightly shorter recovery periods during pool workouts than on the track. For example, an athlete's track session might consist of two sets of 5 x 400 meters at 3000m pace with 90 seconds of rest between repetitions and five minutes between sets. In the pool, the same athlete should do two sets of five at an intensity similar to the effort for a 3000 metres pace on land. The recovery between repetitions should now be 60 seconds. During the recovery athletes may run easy in the water, swim an easy backstroke to keep their shoulders relaxed, or simply relax at the side of the pool.

Cycling

Cycling is another activity injured athletes can do safely. The bicycle supports the athlete's weight, thus reducing stress on the lower extremities. Cycling workouts of 20 minutes or more are good for maintaining and improving general cardio-respiratory fitness. Whether athletes use a road bike or a stationary bike resistance, the emphasis should be on low resistance, low gears, at a high leg speed. Before training, adjust the bicycle seat height and handlebars if necessary, so the athlete's upper body is relaxed and the pelvis does not rock from side to side with each pedal stroke.

A typical session on a stationary cycle consists of a five minute warm-up at 60 to 80 revolutions per minute

(rpm), followed by 20 minutes at 100 to 120 rpm, and a five minute cool down at 60 to 80 rpm. Extend the duration of the rides as the athlete gets used to the activity. One of the problems with cycling is that the leg never extends fully either at the hip or the knee, as it must in running. For this reason, cycling should be combined with exercises that permit complete and active knee and hip extension.

Weight Training

Weight training on weight machines may be helpful for injured athletes because the injured area can be isolated and protected while the rest of the body is conditioned. Structure the weight session so the athlete exercises both arms and legs, the right and left sides of his body, and the opposing muscles on each limb. Weight machines offer some degree of support and protection, but free weights develop much better functional joint and muscle control. Incorporate free weights as soon as the injury permits, preferably from the beginning of rehabilitation.

Recreational Walking

"Walk before you run" is an old saying but few athletes with leg injuries think of walking as a way to progress to running. An easy walk of 60 minutes or more on undulating terrain will gently stress the lower extremities. This should be done, without any adverse reaction afterwards, before the transition back to running, jumping or throwing can commence.

Stretching and Relaxation

No list of alternative exercises would be complete without a reminder of the benefits of stretching and relaxation. Relaxation is a passive activity, but it is definitely a physical skill, one that is all too often neglected. Injured athletes especially benefit from relaxing because they have an even greater need to keep relaxed and focus on the positive. Because many alternative exercises are done indoors, they can be easily preceded or followed by a flexibility routine.

Injury is not an intentional component of any training programme and yet the potential is always there. Whether it is caused by overtraining or a traumatic event, part of the healing process should be identifying the cause of the injury. If the coach and athlete together can learn what caused the injury, the first step has been taken toward future prevention.

Summary

The IAAF Code of Ethics for Coaches includes the statement: "Coaches must ensure that practical environments are safe and appropriate. This appropriateness must take into consideration the age, maturity and skill level of the athlete. This is particularly important in the case of younger or less developed athletes." The effective coach will take into consideration and do everything that can contribute to developing a safe environment. In this environment, athletes should be able to test and push their limits without unnecessary risk and reach their potential.

9

DEVELOPING A HEALTHY DIET

Developing a Healthy Diet

Diet, like the word 'nutrition', means all the food a person eats and drinks. Diet directly affects the performance and health of each athlete. Coaches should be aware that athletes' eating and drinking patterns will influence how well they can train and whether they are able to compete at their best. Coaches should work with athletes to develop healthy diets where they are individually aware of their personal nutritional goals and of how they can select the nutrition to meet these goals.

A well chosen diet offers many benefits to all athletes, regardless of event, gender, age or level of competition. These benefits include:

- Optimal gains from the training programme
- Enhanced recovery within and between training sessions and competitions
- Achievement and maintenance of an optimum body weight and physique
- A reduced risk of injury and illness
- Confidence in being well prepared for competition
- Enjoyment of food and social eating situations

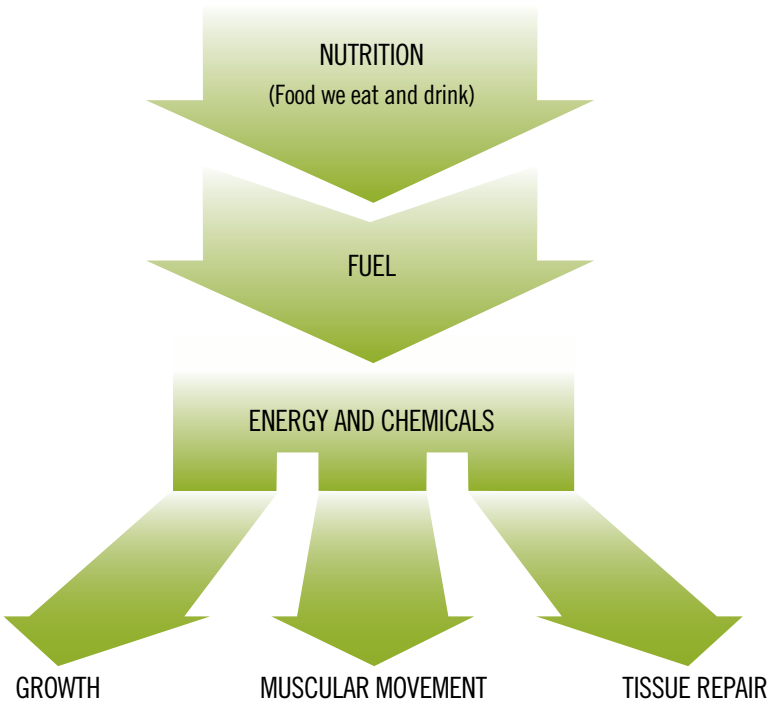
Despite these advantages many athletes do not meet their nutritional goals. The reasons for this can include:

- Poor knowledge of foods and drinks
- Coaches having poor or outdated knowledge of sports nutrition
- Poor choices when buying food
- Inadequate cooking skills
- Inadequate finances
- A busy lifestyle leading to inadequate time to obtain, prepare or consume appropriate foods
- Poor availability of good food and drink choices
- Frequent travel
- Indiscriminate and incorrect use of supplements and sports foods

In this chapter we will look at the way food can play a very important part in successful training and competition. We will look at why the body needs food, which sorts of food are good for us, which are unnecessary and which are not so good and why. But first we should understand what we mean by 'nutrition'.

Nutrition

Nutrition means all the food a person eats and drinks. The whole human body is made from this food, and all energy comes from food. The food acts in the body as a fuel, providing energy and chemicals for movement, growth and to keep the body healthy. What we need nutritionally is affected by our age, gender, physique, level of physical activity and state of health.



Calories – the energy value of food

The energy the body gets from food is measured in calories. Different foods provide different amounts of energy and so have different values in calories.

Types of Food	Energy contained - measured in Calories
Bar of chocolate	300
Glass of milk	100
Piece of bread	75
Apple	50
Cup of tea	5

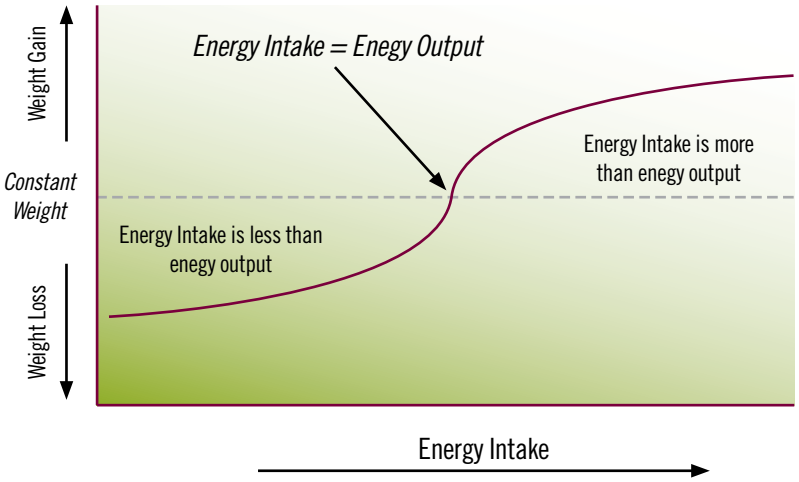
Examples of different foods and their calorie content

The amount of calories a person needs depends on how big and active they are and how efficiently their body uses food. Some people eat a lot and never get fat. They use up food for energy more quickly than those who put on weight easily. The rate at which a person converts food to energy is known as the metabolic rate. People have different metabolic rates, but everyone's metabolic rate can increase during exercise.

The amount of calories a person needs also depends on his age. You probably need more basic energy between the ages of 12 and 17 than at any other time in your life. Growing uses up a lot of energy and young athletes will find it hard to train and compete if their diet lacks energy.

The Energy Balance

A person should eat and drink the number of calories to supply the energy their body requires. The average person has basic energy requirements to maintain the body through normal daily activities like sleeping and breathing. The athlete has these basic energy requirements plus the energy needed to train and compete. A typical growing adolescent might need about 2500 calories of energy per day for basic energy requirements. He may need an additional 500 calories for a training session. So, a young athlete's daily energy needs can be 3000 (2500 + 500) calories, or more.



The Energy Balance

The performance of an athlete who does not take in sufficient calories will be reduced. When the calorie supply is constantly low the athlete will lose weight as he uses up the energy stored in the body. A person who takes in too many calories will store any amount more than the body requires as fatty tissue. This non-essential fat in the body, which was discussed in the chapter on Developing Physical Fitness, will also reduce performance.

This energy balance is important for successful training and competition. Any steady rise or fall in weight or, more importantly non-essential fat, should be checked by the coach. A doctor should be seen if eating or exercise habits are not the obvious cause.

Weight Control

The energy balance showed us how weight can be changed by what we eat and drink but we know that weight alone is not a good indicator of fitness or health. Non-essential body fat should be controlled for best performance. Sensible weight loss through reduction in non-essential fat can be achieved by cutting down on those foods which are high in calories such as fat and sugar, but low in nutrients. You should not dehydrate, fast or follow an unbalanced diet to lose weight. The first result of this will be decreased performance. A good diet to reduce weight will be lower in calories but still maintain a daily supply of the energy and nutrients required for the body to be healthy. Safe weight loss, even in training, is 0.5 to 1.0 kg per week, until the desired weight is reached.

Other athletes need to increase weight, or more correctly, increase their lean body mass, without increasing non-essential fat. Again, a good diet to increase lean body mass will be slightly higher in calories than the energy balance requires but still maintain a balanced daily supply of the energy and nutrients required for the body to be healthy.

Nutrients

Food is made up of many different things. Those things which are essential for the body to function well are called nutrients. Nutrients have different jobs, though they may work together or need the presence of others to work properly. The different types of nutrients are:

- Carbohydrate
- Protein
- Fat
- Vitamins
- Minerals
- Water
- Fibre

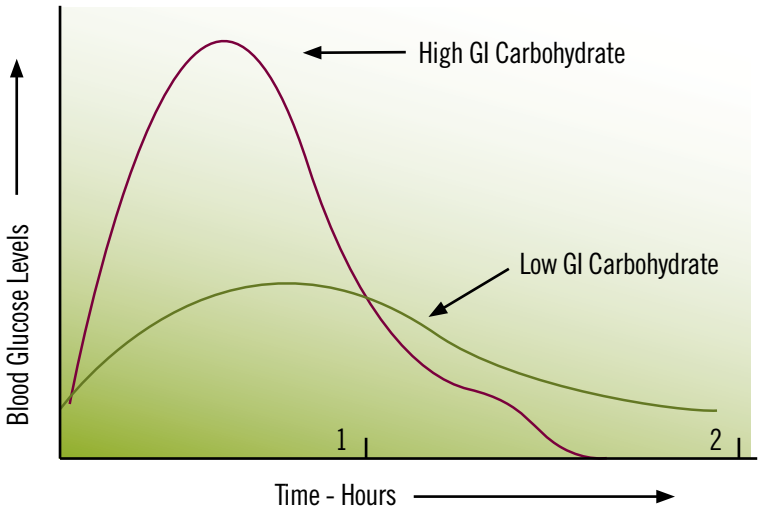
Carbohydrates – Energy Food

The body gets the major part of its energy requirements from carbohydrates. They break down quickly and easily in the digestive system to form the basic fuel of glucose which is stored in the body as glycogen. This energy must be refilled every day from carbohydrate foods in the diet. Everyday eating and drinking plans for athletes need to provide enough carbohydrate to fuel their training programmes and also to optimise the recovery of muscle glycogen stores between training sessions and competitions.

Carbohydrates from natural sources such as rice, corn, potatoes, beans and fruit have a balance of other nutrients and are good to eat. Concentrated or refined carbohydrate such as white sugar, honey, soft drinks and chocolate bars are a relatively poor source of carbohydrate. They are high in calories and low in other nutrients. They also cause the body to produce large quantities of the hormone insulin, which takes the glucose quickly out of the blood. This makes the athlete feel very low in energy.

Not all carbohydrate foods behave in the same way in our bodies. All carbohydrates convert to blood sugar but some convert quickly, others more slowly. The glycemic index or GI describes this difference by ranking carbohydrates according to the rate the conversion takes place and the effect on our blood glucose levels. Terms which were used in the past such as 'complex carbohydrates' and 'sugars' are now recognised as having little nutritional or physiological significance.

The glycemic index (GI) is a ranking of carbohydrates on a scale from 0 to 100 according to the extent to which they raise blood sugar levels after eating. Foods with a high GI are those which are rapidly digested and absorbed and result in marked fluctuations in blood sugar levels. Low GI foods produce gradual rises in blood sugar and insulin levels because of their slow digestion and absorption. This more gradual fluctuation of blood sugar level has proven benefits for health and an individual's energy levels.



The effects of High GI and Low GI carbohydrates on blood glucose levels

Choosing low GI carbohydrates, the ones that produce only small fluctuations in our blood glucose and insulin levels, is the secret to having good energy levels. Eating high glycemic carbohydrates, ones that turn to sugar quickly, will decrease energy levels. When you eat high glycemic carbohydrates your blood sugar levels soar. When this happens your body produces insulin. One of the roles of insulin is to keep your blood sugar levels regulated. When your blood sugar goes up very quickly your body produces the insulin quickly to clear the excess sugars. In fact the body tends to over-produce the insulin and so ends up by taking too much sugar out of the blood and lowering the blood sugar levels.

Here is how it relates to energy levels. When you over-produce insulin you clear the sugars out of your blood too well and your blood sugars are lower than they should be and the athlete feels lethargic. By choosing low glycemic carbohydrates the energy release is gradual and long lasting with stable blood sugar levels, which is ideal for athletes.

In the Glycemic Index for food each entry is compared to glucose. If the rate that glucose converts to blood sugar equals 100, numbers lower than 100 mean that food converts to blood sugar slower than glucose. In terms of increasing energy levels for athletes, the lower the GI the better.

High glycemic foods are considered to have a GI of more than 70. Foods with a GI of between 55 and 70 are considered intermediate and low glycemic foods have a GI of less than 55.

Breads, Grains and Pasta		Fruits		Snacks		Cereals	
baguette	95	dates, dried	103	rice cakes	82	cornflakes	77
pasta	92	watermelon	72	jelly beans	80	weetabix	77
instant rice	91	pineapple	66	doughnut	76	shredded wheat	69
white bread	70	raisins	64	corn chips	72	oatmeal	61
wholemeal bread	69	mangoes	56	mars bars	68	museli	56
hamburger bun	61	banana	53	wheat crackers	67	oatbran	55
pita bread	57	orange	43	power bar	57	porridge	49
white rice	56	blueberries	40	popcorn	55	all bran	42
brown rice	55	apple	36	oatmeal cookies	55		
multigrain bread	48	raspberries	32	banana cake	47		
spaghetti, white	41	dried apricots	30	peanuts	14		
		grapefruit	25				

Dairy		Potatoes and Root Crops		Vegetables		Legumes	
ice cream	61	parsnips	97	sweet corn	55	baked beans	48
ice cream (low fat)	50	baked potatoes	83	green peas	48	chickpeas, tinned	42
milk, semi-skimmed	34	instant potatoes	83	carrots, cooked	39	chick peas	33
chocolate milk	34	chips	75	green beans	15	butter beans	31
fruit yogurt, low fat	33	mashed potatoes	73	peppers	15	lentils	29
milk-skim	32	beetroot	64	spinach	15	kidney beans	27
milk -fat-free	32	new potatoes	57	tomatoes	15	soy nuts	18
soy milk	31	boiled potatoes	56	asparagus	15		
milk, full fat	27	sweet potatoes	54	broccoli	15		
yogurt *	14	yam	51	cucumber	15		
* plain, unsweetened, low fat				lettuce	15		

Sugars		Beverages	
maltose	105	gatorade	78
glucose	100	fizzy drinks	68
honey	73	colas	65
sucrose	65	orange juice	57
table sugar	65	grapefruit juice	48
lactose	46	pineapple j uice	46
fructose	23		

Cucumber: GI 15

Baguette: GI 95

Some foods and their Glycemic Index

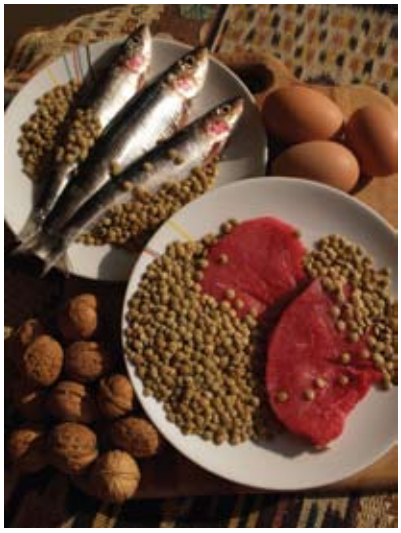
Proteins – *Growth and Repair Food*

Until the age of about 18 the body makes new cells in order to grow. Also, throughout life, cells wear out and are replaced. Some types of cell only last a few weeks before being replaced. Others last much longer. All the material for new cells comes from food. Proteins are the main body building and repair nutrient. As they are needed to build new body tissue during growth, and are also used to repair any damaged tissue, there is a constant need for a regular protein intake.

Proteins are made up of building blocks called amino acids. There are 21 types of amino acid which combine in different ways to make different proteins. Inside the digestive system proteins are broken down into their amino acids. Of the 21 amino acids all but eight can be made inside the human body. The eight that must come from food are called essential amino acids. 'Protein quality' relates to how many of the eight essential amino acids a food supplies. High quality proteins are generally animal proteins such as egg protein, milk protein, fish and meat protein. Lower quality protein is found in plants such as nuts, lentils and beans. For a person who does not eat meat or animal products a wide variety of plant proteins must be eaten to obtain all the necessary amino acids for health.

10 g of protein is provided by any of the following:

2 small eggs	2 cups cooked pasta
300 ml cow's milk	3 cups rice
20 g skim milk powder	400 ml soy milk
30 g cheese	60 g nuts or seeds
200 g yoghurt	150 g legumes or lentils
35-50 g meat, fish or chicken	200 g baked beans
4 slices of bread	150 ml fruit smoothie
90 g breakfast cereal	120 g tofu or soy 'meat'



Examples of protein rich foods

Protein has been traditionally considered a key nutrient for sporting success and the athlete in training needs protein to create and repair muscle tissue. Most athletes consume diets with more protein than they can easily use, without the use of protein supplements. The athletes most at risk of failing to meet their protein requirements are those with severely restricted energy intake or little dietary variety.

The timing of protein intake can help to ensure that the body uses as much as possible in recovering and adapting to training and is discussed later in this chapter. The additional cost of protein supplements and the fact that they only contain a limited range of nutrients must be taken into account. There is little justification for using very expensive protein-only powders or amino acid supplements. Everyday foods are likely to be just as, or more, effective than supplements and have the benefit of providing a range of other nutrients.

Fat – Slow Energy Food

Fat is contained in many animal and vegetable foods. Butter, margarine, plant oils, fish oils and the fat on meat are all foods where the fat is visible. There are many other foods where the fat content is not so visible, such as milk, cheese, nuts and certain vegetables. Generally, vegetable fats are better for us than animal fats.

Fats are a very concentrated source of energy. Weight for weight, they provide twice as much energy as carbohydrates. But fat is not as good an energy source as carbohydrate because it is digested very slowly and uses more oxygen to produce this energy. Fat can be a factor, however, in supplying the energy requirements for events that last longer than 2 hours.

Fat is stored under the skin and inside the muscles. It is a reserve energy source and is essential to carry the fat-soluble vitamins around the body. Diets that contain large amounts of fat can lead to obesity, heart disease and cancer. A person needs only a small amount of fat in the food they eat and drink to be healthy.

Vitamins

Vitamins are needed daily, but only in tiny amounts. They play an important part in many chemical processes that take place in the body. Even slightly low vitamin levels can reduce athletic performance. If a vitamin is always low, or missing, from your diet you could become very ill. Such an illness is called a deficiency disease. A balanced diet with enough of the right kinds of food will supply the vitamins needed for health.

There are two types of vitamin, fat-soluble and water-soluble. Fat-soluble vitamins are stored in the body ready for use. Water-soluble vitamins cannot be stored and so must be in the daily food intake. Any water soluble vitamins not used are passed out of the body.

Both the fat-soluble and water-soluble vitamin content of food is affected by how the food is stored and cooked. The longer food is stored the more vitamins are lost. Canning removes more vitamins than freezing. Cooking can also remove many vitamins. Raw, uncooked vegetables are best, followed in order by steaming, baking, boiling and frying. Vitamins are found in different proportions in all natural foods and are highest in fresh foods.

Vitamin	Why Needed	Good Food Sources
Vitamin A (fat-soluble)	Helps keep skin smooth and soft. Maintains linings of tubes in the body. Helps to see in dim light	Liver, Fish Oils, Eggs, Leafy Green Vegetables, Yellow Fruits and Vegetables such as Apricots and Carrots
Vitamin D (fat-soluble)	Helps regulate absorption and distribution of calcium for strong bones and teeth	Butter, Margarine, Fish Oils, Eggs. Also produced by sunlight on skin
Vitamin C (water soluble)	Helps heal wounds and bind cells. Helps prevent fatigue and resist infection. General body maintenance.	Citrus Fruits such as Oranges and Grapefruit, Green Vegetables, Tomatoes, Potatoes

Some common but important vitamins - why they are needed - and how to add them to your diet

Minerals

Minerals, like vitamins, are also needed in small daily amounts. They include calcium, sodium, potassium, iron and iodine. These minerals are essential for the proper function of nerves and muscles and help build body structures such as bone, teeth, muscle and skin. A well balanced diet will normally supply all the minerals needed for health.

Iron is a mineral which is essential for the transport of oxygen in the body. Women in particular, because of menstrual blood loss, may have difficulty in getting enough iron from their diet. Red meats are rich in iron. When this source is not available or eaten, iron can be obtained from foods such as dates, prunes, apricots, raisins and most beans. Iron is more readily absorbed by the body when combined with vitamin C, so the diet should supply both in the same meal.

Iodine helps control the rate energy is released from food. A shortage of iodine causes the thyroid gland in the neck to swell up. This is called a goitre. Fish and seafood are a major source of iodine. Iodine deficiencies can be found in some inland areas where salt water fish are not available or where the diet is very restricted.

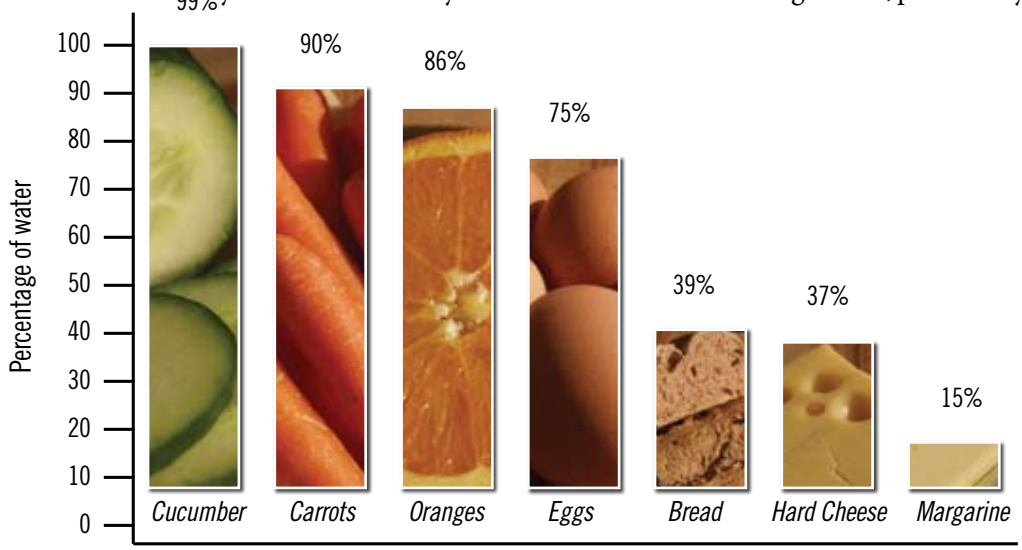
Mineral	Why Needed	Good Food Sources
Sodium	Found in all body cells. Controls body's water balance	Table salts and most foods
Calcium	Makes bone and teeth. Helps blood clotting. Helps muscles react normally and recover from exercise	Milk, cheese, green vegetables, bread, nuts
Iron	Needed to help make haemoglobin, the red substance in the blood that carries oxygen around the body.	Liver, red meat, eggs, beans, lentils, spinach, yeast, figs, prunes, nuts, treacle, raisins, dates, apricots
Iodine	Helps regulate all bodily functions and controls the rate that energy is released from food	Salt water fish, fruit, vegetables

Some common but important minerals - why they are needed - and how to add them to your diet

Water

You can live for several weeks without food, but you will die within a few days without water. Athletic performance is affected almost immediately if the body's water requirements are not met. Water is one of the most important nutrients required by the body. About two thirds of your body is water. Each cell of your body contains water. Your blood is water with minerals, vitamins, proteins and blood cells floating in it. The average person should take in about 1 litre of water in drink every day and another litre contained in food. Food contains more water than you might think.

You need to drink more if you exercise hard as you can lose a lot of water through sweat, particularly in hot



Percentage of water found in different foods

climates. Dehydration is when not enough water has been taken in to replace what has been lost from the body. Thirst is a feeling we get which tells us the body needs water and to drink. Thirst, however, may be a bad indicator of how much water we need and when. If we are exercising hard, by the time we feel thirsty we may be already dehydrated and performance may be already reduced.

Drinks should be taken often and in small amounts before, after and under some conditions during competition or training. They should not be ice cold as this causes problems in the stomach. Water, diluted fruit juices and sports drinks are better for replacing sweat loss than sweet and fizzy drinks. Bottled water from a sealed bottle is recommended in some countries or regions where the water is not pure enough to drink.

Sweat is made up mostly of water, but its salty taste comes from tiny amounts of potassium, calcium and magnesium. Salt tablets should not be taken as normal diets contain plenty of salt to replace that lost in sweat. Salt tablets in the stomach also take out fluid from the body and can have the bad effect of making a person more dehydrated.

Fibre

Fibre is an important part of the diet, but is not absorbed by the body and is often ignored as a nutrient. Fibre is a substance found in every plant cell. In plants it provides the support to stiffen their stems and hold the leaves out flat. The tough layers around grains of wheat, oats and rice are also a type of fibre called bran.

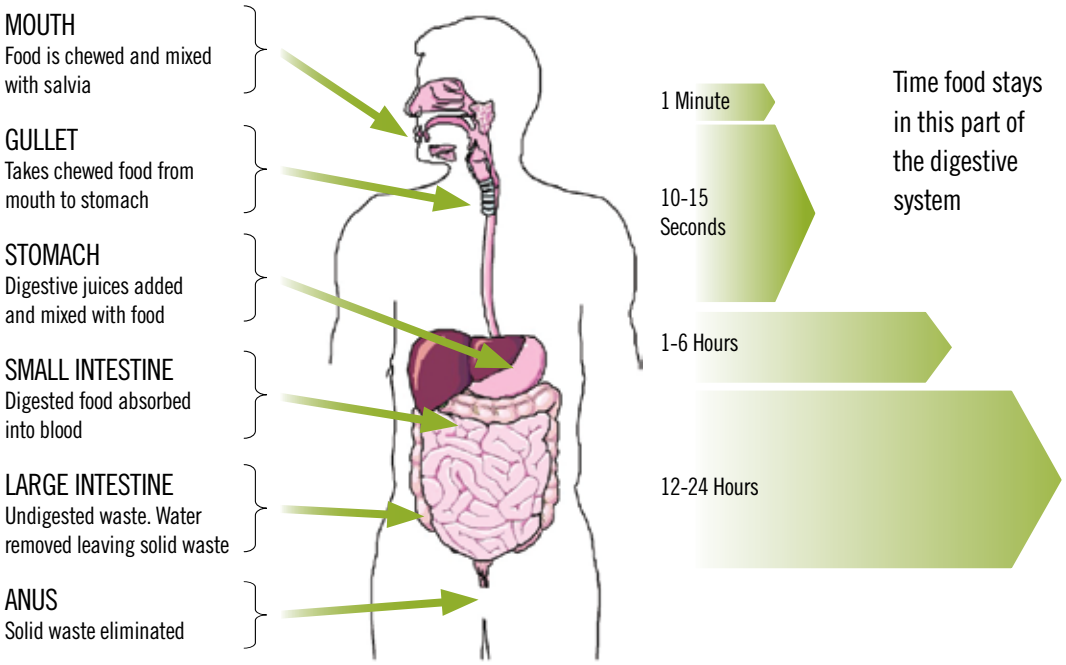
Fibre foods are natural laxatives. They are essential in adding bulk to food as it passes through the digestive system. Foods high in fibre are satisfying as they make you feel full without making you fat. Natural plant foods are generally high in fibre. Processed foods such as white flour, white rice and white pastas are not so good to eat, as they have had much of their fibre content removed in manufacture.

Summary of Nutrients

Nutrient	Why Needed	Good Food Sources
Protein	Growth Repair Slow energy	Meat, eggs, fish, chicken, nuts, lentils, beans, dairy products, soy products
Carbohydrate	Essential Energy	Rice, wheat, corn, potatoes, bread, pastas, fruits, sugar, honey
Fat	Slow energy and the absorption of some vitamins	Butter, red meats, cream, plant and fish oils
Vitamins Minerals Water Fibre	Aid in the efficient use of other nutrients and regulate bodily processes	Obtained by a varied daily diet with plenty of fresh fruit and vegetables and by drinking plenty of appropriate fluids

The Digestive System – Changing Food to Fuel

Food, even after a lot of chewing, consists of large chemical units which cannot be used by the body. Digestion is the breaking down of food into smaller chemical units so that they can be absorbed by the body. Absorption of these chemical units into the blood takes place in the stomach and small intestine. Food that is not absorbed is eliminated.

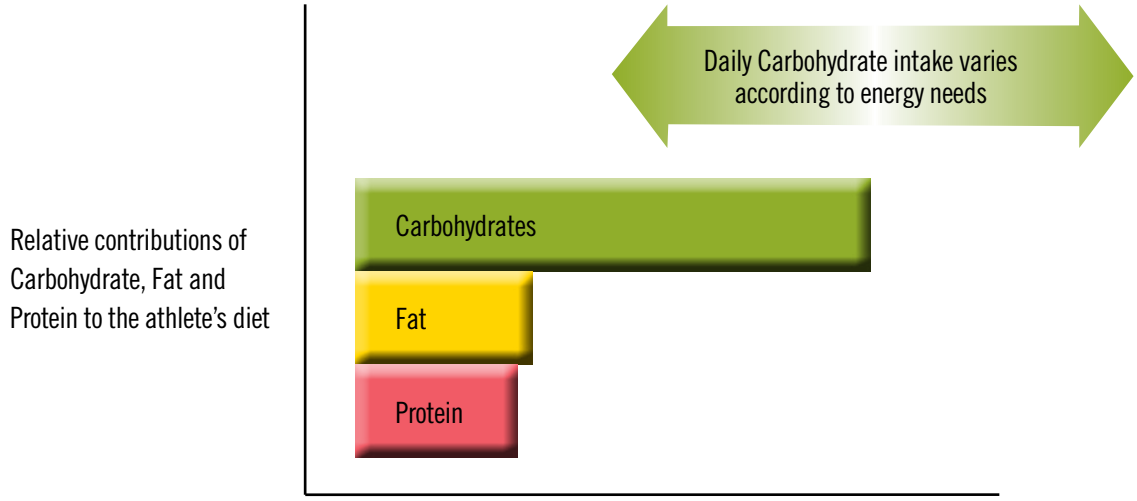


The Digestive System

The Nutrient Balance

The nutrient balance is like the energy balance. A person must take in all the nutrients that they require to be healthy. If the diet supplies this then they have a balanced supply of nutrients. We have seen that the athlete has special nutrient needs for successful training and competition. A typical high performance diet for an athlete will provide most energy from carbohydrate sources, with low and almost equal amounts of fat and protein. The amount of carbohydrate taken in each day will vary according to the activity that is to come and the activity that the athlete is recovering from.

Traditionally, guidelines have been given for the percentage protein, fat and carbohydrate composition for athletes' diets. These guidelines should no longer be provided in the form of percentages of total dietary energy intake, such as 60%-65% carbohydrate, since the actual amount of protein and fat in a diet will be fairly consistent from day-to-day. But the carbohydrate requirements will vary according to the fuel costs of the athlete's training and competition requirements, added to the other requirements from their other daily activities.



The actual needs for carbohydrate will be specific to the individual athlete and it is important to get feedback from the athlete about their energy levels in training and competition to assess whether there is a problem with fuel availability.

Nutrition and the Young Athlete

Athletes should be encouraged to develop good eating habits from an early age and to maintain and develop these through adolescence into adulthood. The coach should be aware of growth spurts during childhood and adolescence and ensure that the athlete has an adequate intake of energy, protein and minerals to meet their increased nutritional needs. Young athletes who are eating a wide range of foods should not need to use dietary supplements and coaches and athletes should be aware that these do not provide a short cut to success.

Nutrition and the Female Athlete

Female athletes have similar nutritional needs to male athletes but the minerals calcium and iron are particularly important in the diet of female athletes. We have seen that calcium is important for healthy bones and disruptions to the menstrual cycle may mean that the athlete is not absorbing sufficient calcium. Healthy bones need a good supply of calcium and Vitamin D. Calcium can be provided by a well-chosen diet containing at least three servings a day of calcium-rich foods and it is recommended that women eat more calcium than men, even though they generally eat less food. Vitamin D is formed during well-managed exposure to sunlight such as spending a small amount of time in the sun during the morning hours before putting on sunscreen. Any female athlete who has a disruption of the normal menstrual cycle could suffer irreversible damage to their bones and should be referred immediately to a medical expert for investigation.

Iron deficiency is a cause of fatigue and reduced performance for all athletes. Females are particularly at risk because of the increased iron requirements due to menstrual blood losses. Eating foods rich in iron will help to reduce this risk. Ideally, females should consume moderate servings of red meats in 3-5 meals each week. They may choose to eat iron-enriched foods such as enriched breakfast cereals. They may also combine plant and non-meat sources of iron with foods that help with the absorption of the iron such as vitamin C.
Routine use of iron supplements is not recommended for any athlete since too much is just as harmful as

too little. Self-medication with iron supplements may not address the real problem that is causing fatigue or solve the cause of low iron levels.

Supplements

A number of 'sports foods' have been developed to supply a specific formulation of energy and nutrients in a form that is easy to carry and consume. These may be convenient just prior to, during or after a training session. These sports foods include sports drinks, sports gels, liquid meals and sports bars.

If an athlete has a medically diagnosed deficiency of an essential vitamin or mineral, and an increased intake of food is not possible, a supplement may be useful for the athlete as a short term solution. The use of supplements, however, does not compensate for poor food choices and an inadequate diet.

The use of other dietary supplements is widespread in sports but coaches and athletes should not expect benefits from most of these other supplements. Few of the products that are used by athletes have any proven benefit and some may even be harmful, particularly if the product is produced under questionable conditions. The coach should be aware that any athlete who is liable for drug testing under national or international programmes should be especially careful about supplement use. Frequently supplements do not contain what they claim to contain and may contain what they should not contain. These 'hidden' ingredients can include prohibited substances. If an athlete produces a positive doping reading, ignorance of the contents of a supplement is not an excuse. If an athlete does choose to use a supplement the coach should first check the actual supplement with a qualified medical officer. If this is not possible, or if there is any doubt at all, the supplement should not be taken.

All coaches and athletes are cautioned against the indiscriminate use of dietary supplements and young athletes are actively discouraged from supplement use.

Pre- and Post-Performance Nutrition

Energy levels in the body should be high before performing in either training or competition. The recommended athlete's diet shown earlier will normally supply this energy. But when should we eat and drink before exercise, and how much and what kinds of food are best? The meal itself will not produce higher performance but it can reduce performance. Eating a small amount of solid food immediately before competition is much better than eating too much. Each individual will be different in what works well for them, but in general:

- Eat a small, easily digested meal high in carbohydrate
- Eat about 2 to 3½ hours before competing
- Restrict fats and proteins since they are slowly digested
- Avoid foods which form gas in the digestive system
- Drink small amounts of water often, before and after competition, and during if it is a prolonged endurance competition or has several efforts in a single day such as in the Combined Events

Recovery after a training session or competition is the beginning of the process of adaptation and becomes part of the preparation for the next training session or competition. Replacement of sweat losses is an essential part of this process. Both the water and salts lost in sweat must be quickly replaced. The athlete should aim to drink about 1.2 - 1.5 litres of fluid for every kg of weight lost in training or competition. If

sweat loss is high then sports drinks containing sodium can be used, if no food is taken at this time.

It has been found that a small amount of high quality protein combined with carbohydrate helps the adaptation to training, if taken soon after the training session. Special sports foods such as sports bars and liquid meal supplements can provide a compact and convenient way to consume carbohydrate and protein when everyday foods are unavailable or are too bulky and impractical to consume. However, the additional cost of these products and the fact that they contain only a limited range of nutrients must be taken into account.

A Healthy and Balanced Diet

A healthy and balanced diet is one that maintains an individual's energy balance and nutrient balance. It need not be expensive and should simply follow these guidelines, where the coach should encourage the athlete to:

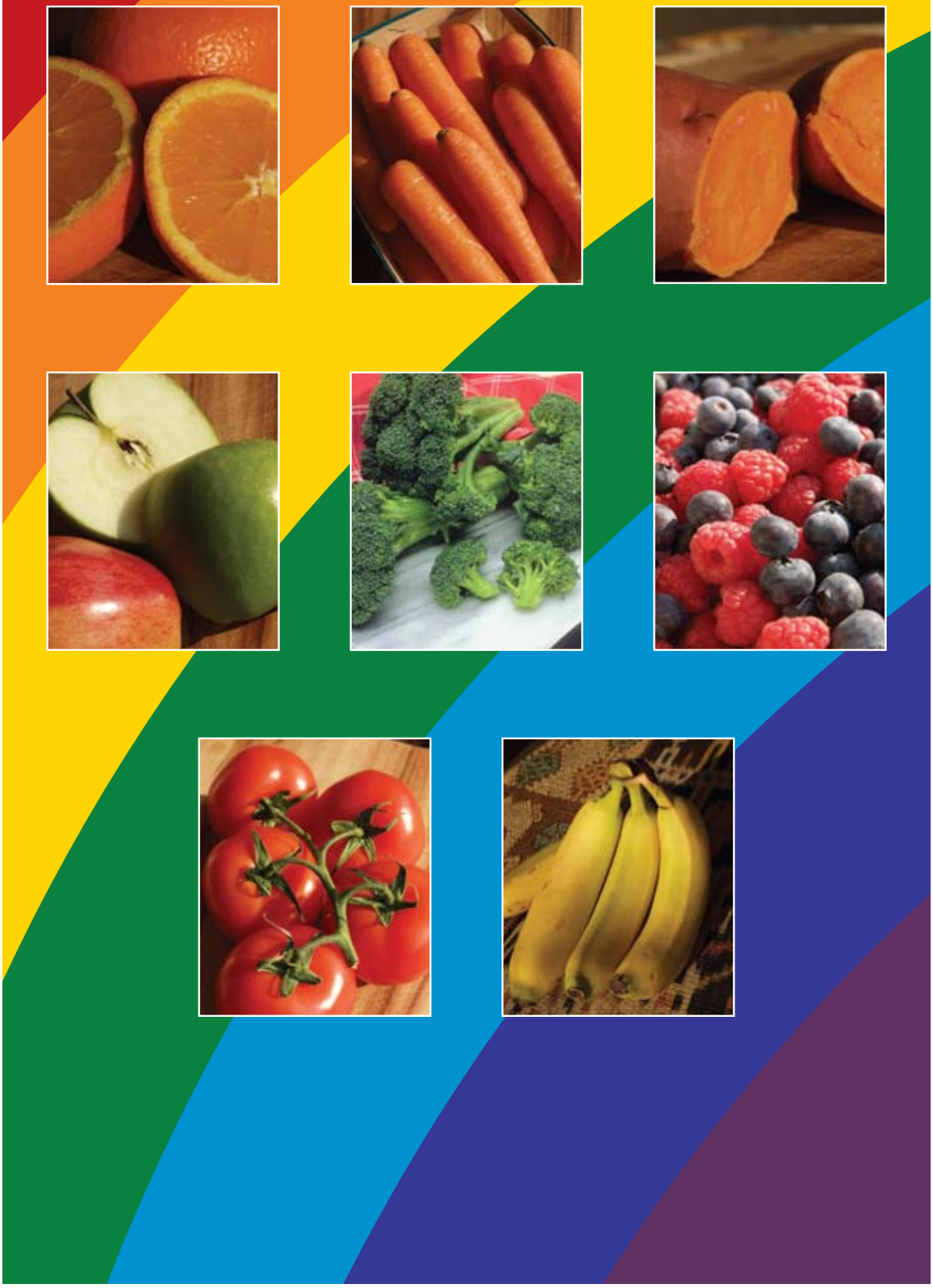
- Eat lots of different kinds of food such as vegetables, fruits, fish, meats, dairy produce and grains
- Be open about trying new foods
- Try to 'eat a rainbow' of fruits and vegetables every day - the strong colours of many fruits and vegetables are an indication of a high content of various vitamins. Choose from:

Red	such as tomatoes, watermelon, cherries, berries, red apples and red peppers
Orange/yellow	such as carrots, sweet potato, apricots, peaches, oranges, cantaloupe, mangoes and papaya
Green	such as broccoli, lettuce, green apples and grapes
Blue/purple	such as blueberries, plums, purple grapes, raisins and beetroot
White	such as cauliflower, bananas, onions and potatoes

- Eat fresh food rather than ready prepared, frozen or canned foods
- Eat a high proportion of low glycemic, carbohydrate-rich foods
- Grill, steam or bake foods. Avoid boiling and frying
- Avoid fatty meals and sweet or salty snacks
- Check fibre intake by eating wholemeal breads, cereals and pastas. Eat brown instead of white rice
- Flavour foods with herbs and spices rather than salt unless sweat losses are very high
- Drink small amounts of water and fruit juices often.

We have seen that proper nutrition can not only create a healthy body which performs better but this nutrition can also help the athlete to recover and adapt from training and competition. Encouraging and helping athletes to develop a healthy diet is one of the key responsibilities of the effective coach. Whenever possible, the coach should think carefully about applying these principles to their own diet for their own well-being and to provide a suitable role model.

The recommendations and statements made in this book reflect the conclusions of the IAAF Consensus Conference on Nutrition for Athletes held in Monaco in April 2007 and published in *Nutrition for Athletes – a practical guide to eating and drinking for health and performance in track and field.* The International Association of Athletics Federations. 2007.



Code of Ethics for Coaches

Summary

The basic principle of the IAAF Code of Ethics for Coaches is that ethical considerations leading to fair play are integral, and not optional, elements of all sports activity. These ethical considerations apply to all levels of ability and commitment. They include recreational as well as competitive Athletics.

The development of fair play or sportsmanlike behaviours and attitudes is not an automatic consequence of participating in Athletics. These fair play behaviours can be learned from the coach who provides a positive role model and applies consistent, clear reinforcement for what are desirable and undesirable actions. The role of the coach is, therefore, crucial as an ambassador, educator and guardian of the ethical values of fair play within Athletics.

The coach's primary role is to facilitate the process of individual development through achievement of Athletic potential. This role accepts the athletes' long term interests as of greater importance than short term athletic considerations. To fulfil this role the coach must behave in an ethical manner, respecting the following points:

- Coaches must respect the basic human rights, that is the equal rights, of each athlete with no discrimination on the grounds of gender, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, birth or other status.
- Coaches must respect the dignity and recognise the contribution of each individual. This includes respecting the right for freedom from physical or sexual harassment and advances.
- Coaches must ensure that practical environments are safe and appropriate. This appropriateness must take into consideration the age, maturity and skill level of the athlete. This is particularly important in the case of younger or less developed athletes.
- Coaches must acknowledge and respect the Rules of Competition. This respect should extend to the spirit as well as to the letter of the rules, in both training and competition, to ensure fairness of competitive opportunity between all athletes.
- Coaches must exhibit an active respect for officials, by accepting the role of the officials in providing judgement to ensure that competitions are conducted fairly and according to the established rules.

- Coaches have a responsibility to influence the performance and conduct of the athletes they coach, while at the same time encouraging the independence and self determination of each athlete by their acceptance of responsibility for their own decisions, conduct and performance.
- Coaches must assert a positive and active leadership role to prevent any use of prohibited drugs or other disallowed performance enhancing substances or practices. This leadership by coaches includes education of the athletes of the harmful effects of prohibited substances and practices.
- The coach must acknowledge that all coaches have an equal right to desire the success of the athletes they coach - competing within the rules. Observations, recommendations and criticism should be directed to the appropriate person outside the view or hearing of the public domain.
- Coaches must never solicit, either overtly or covertly, athletes who are receiving coaching to join their squad or change their coaching situation without first involving, and then continuing to involve, the current personal coach or coaches.
- The coach must acknowledge and recognise that all athletes have a right to pursue their athletic potential, including when an athlete's development would benefit from a change of coaching situation. The coach should ensure that, in these cases, any formation of a coaching partnership or transfer to another coach is actively explored with the athlete, whose decision is supported.
- Coaches should hold recognised coaching qualifications. Coaches should respect that the gaining of coaching qualifications is an ongoing commitment, achieved through the upgrading of their knowledge by attendance of accredited courses and through practical coaching experience. Coaches also have a responsibility to share the knowledge and practical experience they gain.
- Coaches must respect the image of the coach and continuously maintain the highest standards of personal conduct, reflected in both the manner of appearance and behaviour. Coaches must never smoke while coaching or in the presence of athletes, nor consume alcoholic beverages so soon before coaching that it affects their competence or that the smell of alcohol is on their breath.
- Coaches must enter into full cooperation with all individuals and agencies that could play a role in the development of the athletes they coach. This includes working openly with other coaches, using the expertise of sports scientists and sports physicians and displaying an active support of their National Federation and the IAAF.

About the Author

Peter J L Thompson has been involved in the world of athletics for over 50 years, as an athlete but, mostly, as a coach for almost 40 years to international level middle and long distance athletes. He received a Bachelor of Science Honours degree in Geology from the University of London, a Post Graduate Certificate of Education in Physical Education, Geography and Geology from Carnegie College, University of Leeds, a Master of Science in Biomechanics from the University of Oregon and undertook further Master studies in Sport Psychology and Doctoral studies in the Social Psychology of Sport at the University of Oregon.

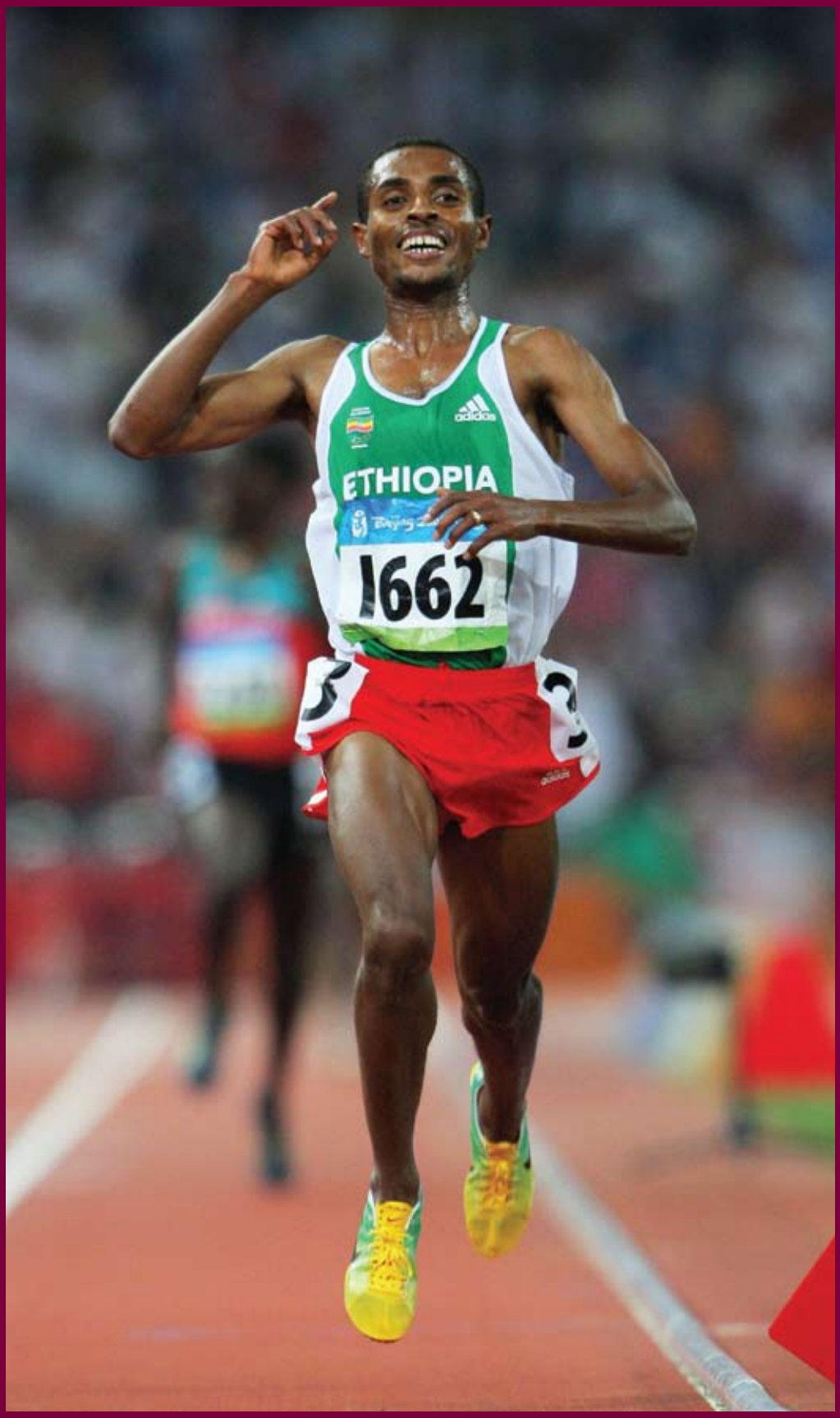
Of British birth, Peter Thompson has coaching experience from within Europe, Oceania, NACAC, Africa, Asia and South America. He has resourced and applied cutting edge knowledge and technologies to his own and to others' coaching practice. Peter has worked with individuals from school level through to national record holders and world record holders, achieving world class performances using natural, morally and ethically accepted practices. The athletes he has coached have competed in the Commonwealth Games, Olympic Games and IAAF Track & Field, Road and Cross Country World Championships.

The co-educational squad that Peter first coached in the very early 1970s covered principally the Sprints, Hurdles and Combined Events and included the young Daley Thompson, double Olympic Champion. He was Daley's first athletics coach and worked with him from 14-17 years of age, before departing for the U.S.A. Peter's coaching experience includes 13 years in the U.S.A. where he initially coached at the world-renowned University of Oregon, Eugene and then at Florida State University, Talahassee.

After his collegiate coaching, Peter developed and coached an elite group of American male and female distance athletes, 800m to marathon, many of whom were recruited by Nike's Athletics West club 1980-1986, and then with Reebok, 1986-1990. His long term training group included such athletes as Cathie Twomey, World Best 20 Km and world-ranked for 5000m and Marty Cooksey, World Number 1 ranked road racer in 1986, PanAm 10,000m Champion and World Bests for 20 Km, Half Marathon, 30 Km and twice at 15 Km.

On returning to the UK in 1990 Peter worked for almost eight years with the IAAF, as the International Project Leader for the IAAF Coaches Education and Certification System. In 1991 he authored the IAAF CECS Level I text, *Introduction to Coaching Theory* and in 1996, the *IAAF Code of Ethics for Coaches*. After leaving the IAAF he held the positions of National Endurance Coach with Scottish Athletics, Executive Director of the Australian Track & Field Coaches Association and served as a consultant to UK Athletics from 2000-2007 in the creation, writing and implementation of a new five-level coach education system. Between 2001 and 2007 he was the honorary coach to the historic Oxford University Cross Country Club and also served as the endurance coach to Oxford University Athletics Club.

Peter Thompson has directed many world class events such as the Prefontaine Classic IAAF Grand Prix Meeting in Eugene, Oregon and was National Secretary and now a Vice President of the British Milers' Club. In February 2007 he returned to work for the International Association of Athletic Federations in Monaco as Senior Manager within the Member Services Department. His responsibilities have included the implementation of the new five-level IAAF CECS, managing programmes and contributing to the writing of new and updated materials for Levels II, III, IV and V of the new CECS.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"I am very pleased to welcome the publication of 'Introduction to Coaching' - the official IAAF guide to coaching athletics. I am convinced that this book, which contains the very latest understanding of the sport sciences and coaching practice, will have a very positive impact on the development of coaches. The innovative, competence-based approach taken through these pages truly moves coaching theory into coaching practice."

Lamine Diack, IAAF President

Much has changed since 1991 when the IAAF CECS Level I text titled *Introduction to Coaching Theory* was written. Coaching practice is dynamic and has moved on, coach education is finally becoming competence-based and the IAAF has a new, five-level, global Coaches Education and Certification System, CECS. When first reviewing the changes to be made to the original book, with feedback from around the world, it appeared that only ten percent of the text might need changing. In reality, the work has proven considerably more extensive and the book you are now holding has been restructured and essentially re-written. The competence-based approach taken is designed to move coaching theory into coaching practice and provide the coach with an appreciation of both 'how to coach' as well as 'what to coach'.

The IAAF's aim is to provide what coaches need. The contents of *Introduction to Coaching* provide coaches with the following four things:

- An understanding of the cyclical nature of the process of coaching, the repeated passage from planning, to doing, to reviewing and on again to planning
- A recognition of the five basic skills of coaching and then application and practice of these skills within their coaching
- A basic knowledge and practical understanding and application of the sport sciences
- A focus to 'see' the athlete and make their coaching athlete-centred and appropriately coach-led.

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