"Why would someone plant the seeds of a tree

the shade of which they will never see?"

Greek proverb

- 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.

Philosophy is simply the way you see situations and experiences in your life. 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. 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. You will need to develop a caring and continuing relationship with the athletes you coach.

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

The key to developing a coaching philosophy is knowledge. Knowledge of yourself and knowledge of what you want to achieve, your objectives. Why do you coach or want to coach? What do you value most in coaching?

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

- Winning
- Fun
- Athlete Development

“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

In simple terms we can identify three distinct leadership styles, authoritarian, cooperative and casual.

		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	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

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”. 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. ‘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. 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.

'right fit'.

In the IAAF 'athlete-centred' model, World Anti-Doping Agency, WADA. Drugs are a symptom of the 'win at all costs' philosophy and of ignorance on the part of the coach and athlete. There would be no use of drugs if all coaches followed in words and actions the "Athletes first, winning second" philosophy

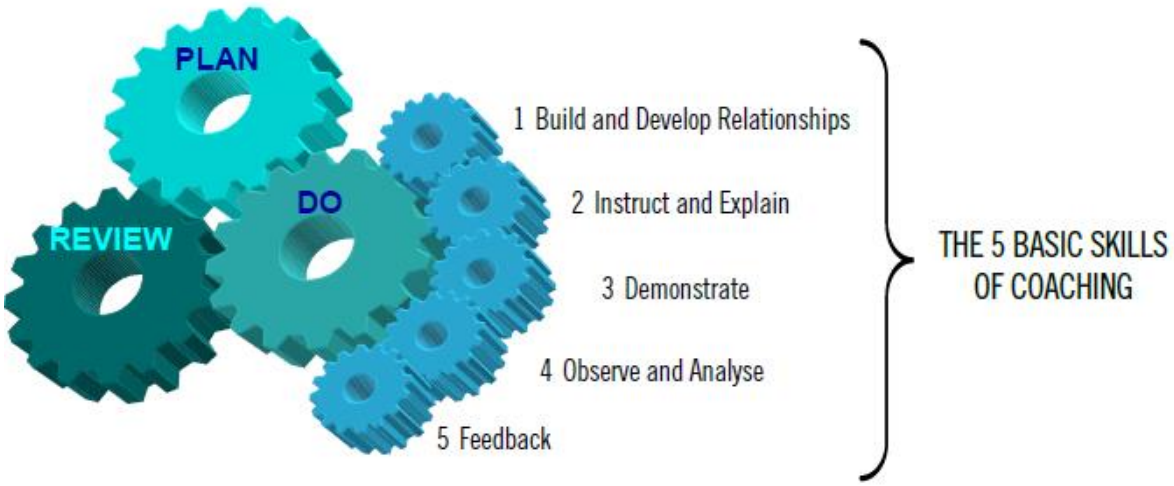
Discussion Topics

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."



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'. The statements at each finger and thumb of these coaching hands will act as 'aide memoires' 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. If you are not familiar with the athletes you are coaching, it is important to smile and make eye contact. The coach should also understand that each athlete expects a different amount of attention.

Build and Develop Relationships

1. Be confident as a coach in front of your athletes
2. smile and make eye contact
3. show interest in and respect for each athlete
4. use athlete's names
5. Coach the athlete rather than 'coach athletics'

SAFETY

They really do, "coach the athlete rather than 'coach athletics'".

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

For the coach, the 'giving' or 'telling' part of communication and is necessary for conveying information and for organising people and groups. 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. 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. Keep what you are saying to a minimum and express the content in simple, jargon-free, language. 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

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

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.

- 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.

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.

Use is not for 'providing a demonstration' and using video in this way should not be considered in this section.

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

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.

Observe and Analyse – the 'Seeing' Skill of Coaching

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

'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. Inexperienced coaches tend to stand too close to the athletes.

Observe & Analyse

1. Break the action down into phases
2. Observe several times from several directions
3. Compare with your technical model
4. Identify what's correct as well as what's incorrect
5. Decide what action to take, if any

SAFETY

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."

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.

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. 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. The coach should focus on what the athlete did correctly "that was a much better effort because you held your posture well throughout the movement." intrinsic feedback. Always remember to delay giving any additional extrinsic feedback until the athlete has had time to process the intrinsic feedback.

Provide Feedback

1. Observe several times before giving feedback
2. Identify and reinforce what the athlete did correctly
3. Ask questions to raise self-awareness
4. Limit to one or two key, important points
5. Keep it positive

SAFETY

"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" creating a so-called 'praise sandwich'. "You really put a lot of effort into that last attempt", a positive statement. Video can also be a very powerful source of extrinsic feedback for athletes. 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.

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. 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

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.

- Learning to use your voice
- Developing non-verbal skills
- Developing questioning skills
- Developing listening skills
- Developing and maintaining credibility

Learning to Use Your Voice

Developing Non-Verbal Skills

It has been said that non-verbal communication can convey over 70% of the information in a message.

Developing Questioning Skills

Avoid questions that begin with 'why' as they may seem to criticise the athlete and often result in a rather defensive response.

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

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:

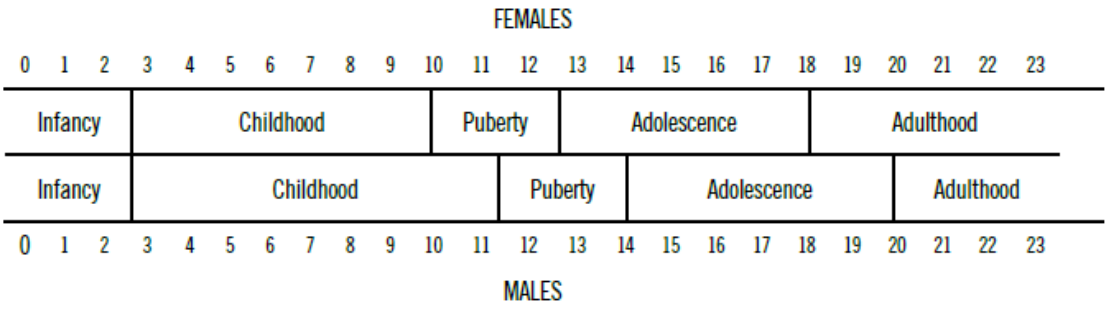
- Knowledge of athletics- You should have confidence in what you know about athletics and also the confidence to let athletes know what you don't know. It is better to say "I don't know the answer to that, but I'll find out", than to guess an answer and be incorrect.
- Talk only when necessary- If you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

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.

Growth and Development

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. Recreation or competition, life-long physical and mental development of the athletes they work with. 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

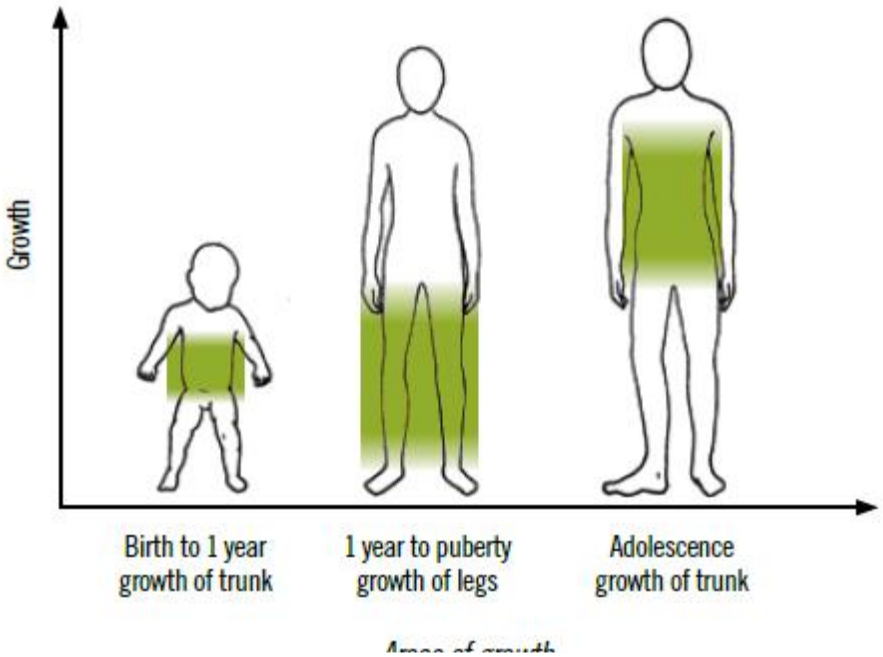
Children grow in size at a very fast rate. At birth infants are only about a quarter of their adult height. This final adult height is usually reached at about twenty years of age. There are four characteristic stages of growth from birth to adult:

- 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

Patterns of Growth - Changes in Proportions

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. 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.

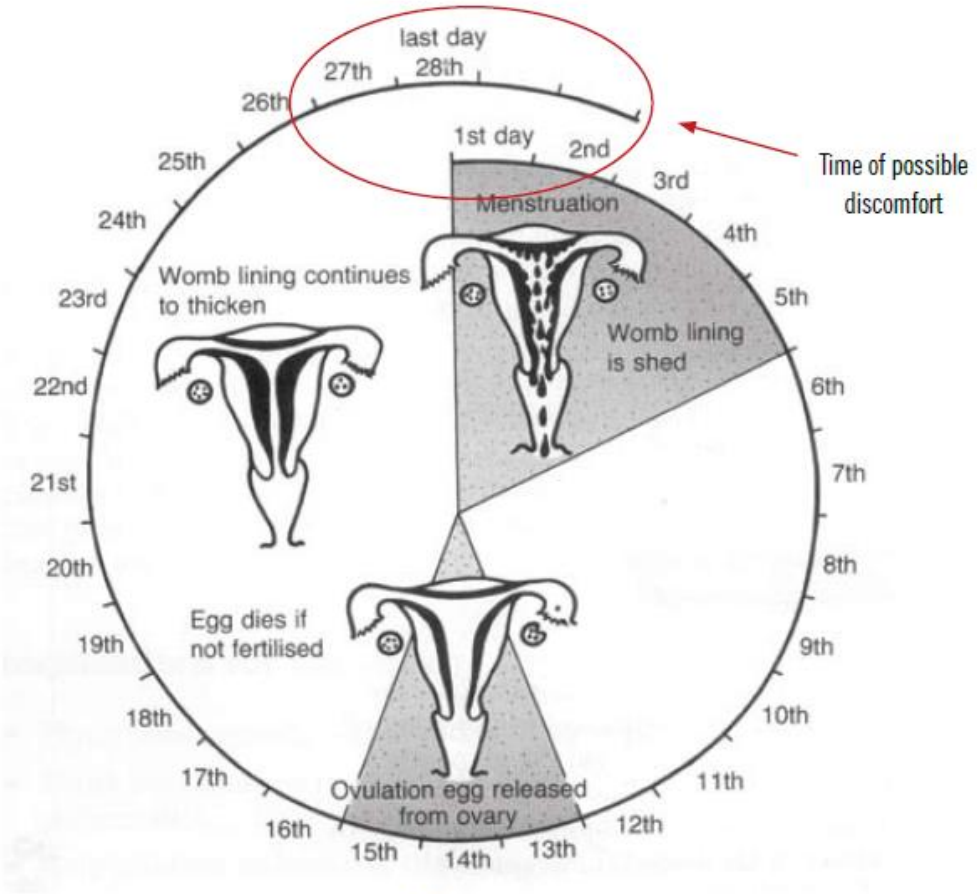


When the rate of growth increases rapidly it is called a growth spurt. The most important growth spurt is the one which occurs at puberty. This spurt produces a rapid increase in both weight and height. The peak of this growth spurt occurs at about age 12 for girls and age 14 for boys. Before this growth 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.

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. Knowledgeable coaches prepare their female athletes before the changes at puberty. This period of adjustment can take up to two years. The sexual development which happens at puberty can bring physical difficulties for adolescent children, as well as causing them mental and emotional preoccupation. 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.



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.

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

The skeleton of a child is mostly cartilage. These special growth areas are called growth plates. These growth areas in the bone are the weakest part of the bone. 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. The body has three energy systems. Two of these are capable of working without oxygen and the other is the aerobic system, using oxygen.

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.

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.

A child's basic movements

Developmental Windows of Opportunity

'windows of opportunity', '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. physical literacy than during the skill window.

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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 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.

Self Image - How Children See Themselves

- 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

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.

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.
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.
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

Ability and Effort

Between the ages of about 7 and 9 they learn this distinction. Between about 9 and 11 they still regard effort as the most important reason for success.

When Mistakes Happen

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.

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.

Children's Play

Adult Play

Children's Understanding of Competition

Between 4 and 6 years of age children try to win prizes, 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. 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.

Kids' Athletics - Adapting Athletics for Children

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.

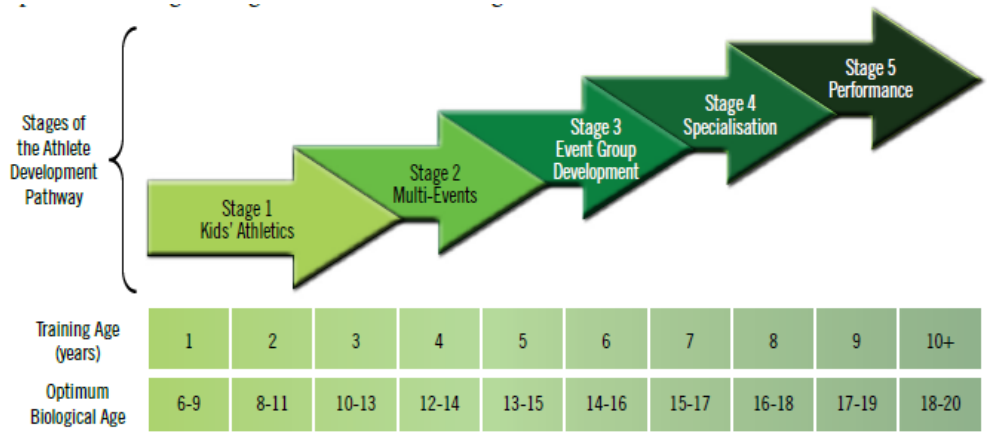
Implications for the Coach:

- 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 z 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.

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.

Athlete Development - the Long Term Approach

The main concept of 'Athlete Development' involves taking a long term approach to athlete development and training until after the age of 40.



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	-	-

The 'Kids' Athletics' developmental stage should be a structured and fun introduction to athleticslike 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'. 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.

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 'finetuning 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

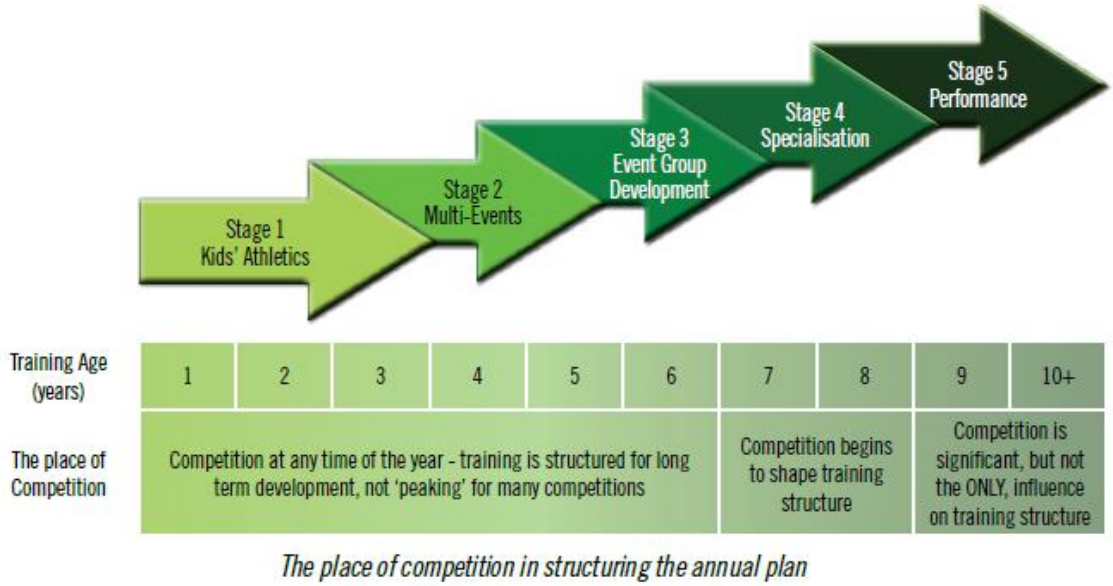
The final stage of preparation and participation in athletics is the 'Performance' stage and will last until the individual retires from actively competing. The emphasis now is on further specialisation and, where possible and appropriate, performance enhancement. All of the athlete's physical, technical, 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. 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.

Athlete Development and Maturation . 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. best performances generally occurring between 24 to 34 years of age. 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. 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

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.



The place of competition in structuring the annual plan

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.

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.

Cells - Building Blocks of Life

A cell is a unit of living material and is the basic building block of life. As a result not all cells look the same. Some cells, for example, are designed to:

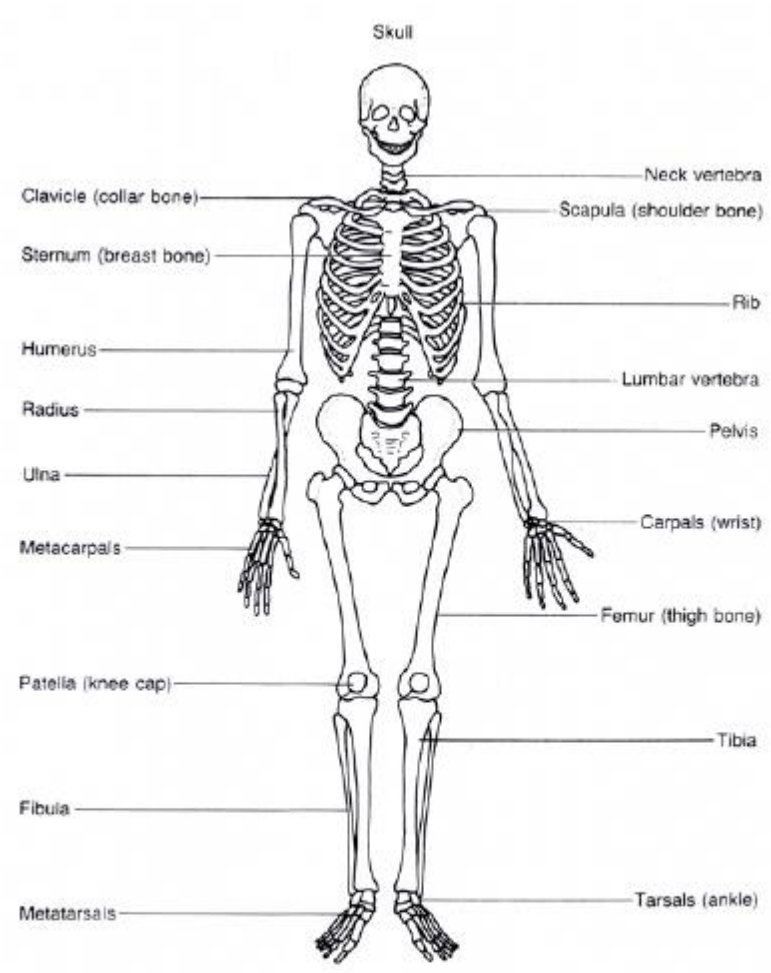
- carry messages - nerve cells carry electrical messages
- carry chemicals - red cells in the blood carry oxygen around the body
- support the body - bone cells make up the skeleton
- move the body - muscle cells can create force

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. 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.



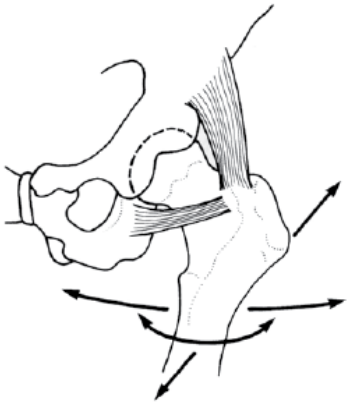
The human skeleton

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

Knee joint

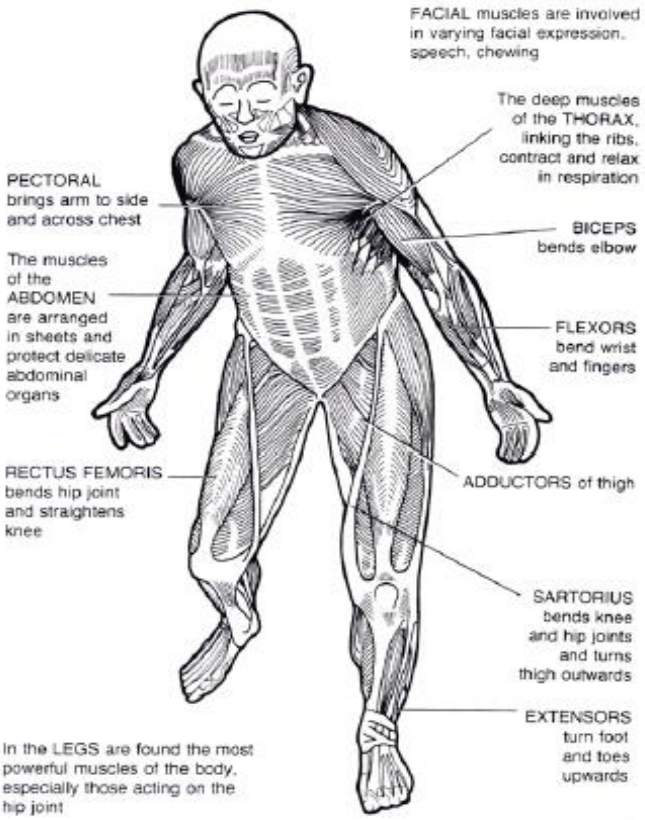
This is a ball and socket joint, the bones can move in almost any direction.



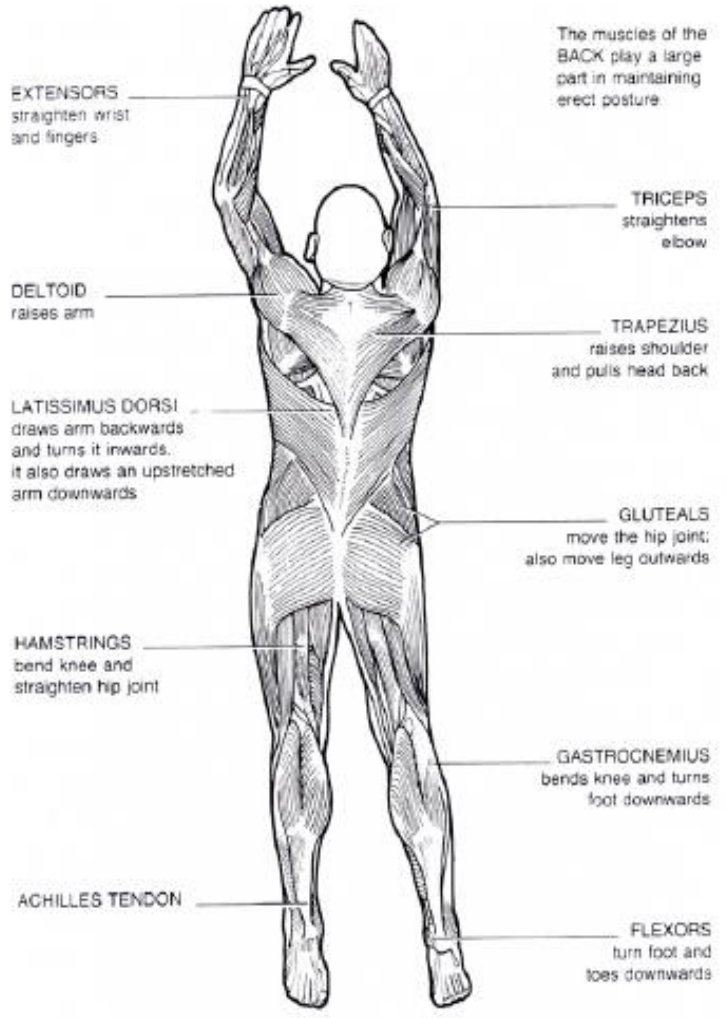
Hip joint

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. 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. 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 skeletal muscles – front view



The skeletal muscles – back view

There are two major types of muscle fibre found in each muscle:

- Fast twitch fibres
- Slow twitch fibres z

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. 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. 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.

Diagram-pg-75

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.

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 as the abdomen or 'core'. Most of the visible contractions a coach will deal with in athletics. 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

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. They are energy converters changing the chemical energy in the food we eat into the energy of movement.

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:

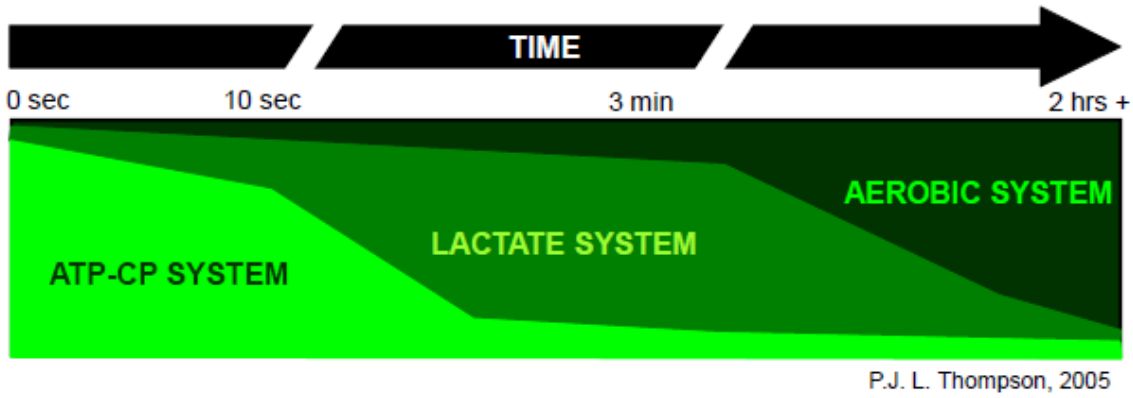
Aerobic Process

- **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.

Diagram-pg-80



Contribution of the three energy systems over time

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

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. Training the aerobic energy system must be a minimum of a total of 20 minutes duration. 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. 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.

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. from a long, fast sprint is caused by this lactic acid. 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.

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.

Tables-pg-84

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 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.

The Heart - Life's Pump Every muscular contraction of the heart is called a heartbeat. level to a maximum rate which varies from individual to individual and can be over 200 beats per minute. 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.

T**he 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

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. Muscle type. Are a predominantly fast or slow twitch muscle fibre type.

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. 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.

Fitness is how well a person is adapted to and capable of living a certain lifestyle.

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

- Endurance
- Speed Strength
- 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.

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.

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.

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
- '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?

"Interval training is always repetition training

but not all repetition training is interval training."

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"

Using running rhythm and 'pace' means that the speed of the repetitions is adjusted each day to the athlete's fitness and energy levels.

Developing Event Specific Endurance 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

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

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

Speed Speed is the capacity to travel or move very quickly.

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.

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 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. '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'. 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 athlete accelerates maximally from a standing start position so that they attempt to achieve maximal velocity before the 'maximal speed zone'. Reaction time is the time between a stimulus and the first movement by the 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.

	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

Developing strength

Muscular strength is the ability of the body to exert force. 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.

Hammer Shot Discus Javelin Pole Vault Triple Jump High and Long Jump Hurdles Sprints 800 – Steeplechase 1500 – 5000 10000 – Marathon

Representation of maximum strength contribution to various athletics events

Power Power is the interaction of strength and speed. 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. 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.

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.

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.

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 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.

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 z 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 z the normal slight inward curve in the lower spine throughout the movement.
- The coach should emphasise the importance of the z 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 z back of the thigh, become fully stretched and tight.
- Most athletes feel this before the bar reaches the z 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 Back Squat

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 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 90o:
- 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 z pass through 90o
- Always stopping the descent at 90o 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.

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 Bottom Position

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

The Overhead 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.

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

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.

Triceps Dip Sit Ups Leg Raise Back Extension Chinnies Squats Squat Jumps

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 following is an example of a general conditioning circuit, using body weight as a resistance. Diagram-pg-120

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

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.” 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.

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. In passive stretching the exercises are only performed in the end position, the static type of exercise.

Sample Mobilisation Exercises for the Warm Up

Slow to Fast Active to Dynamic General to Specific

ARM CIRCLES LEG SWINGS HEEL FLICKS WALKING LUNGES

Sample Mobilisation Exercises for the Warm Up

Slow to Fast Active to Dynamic General to Specific

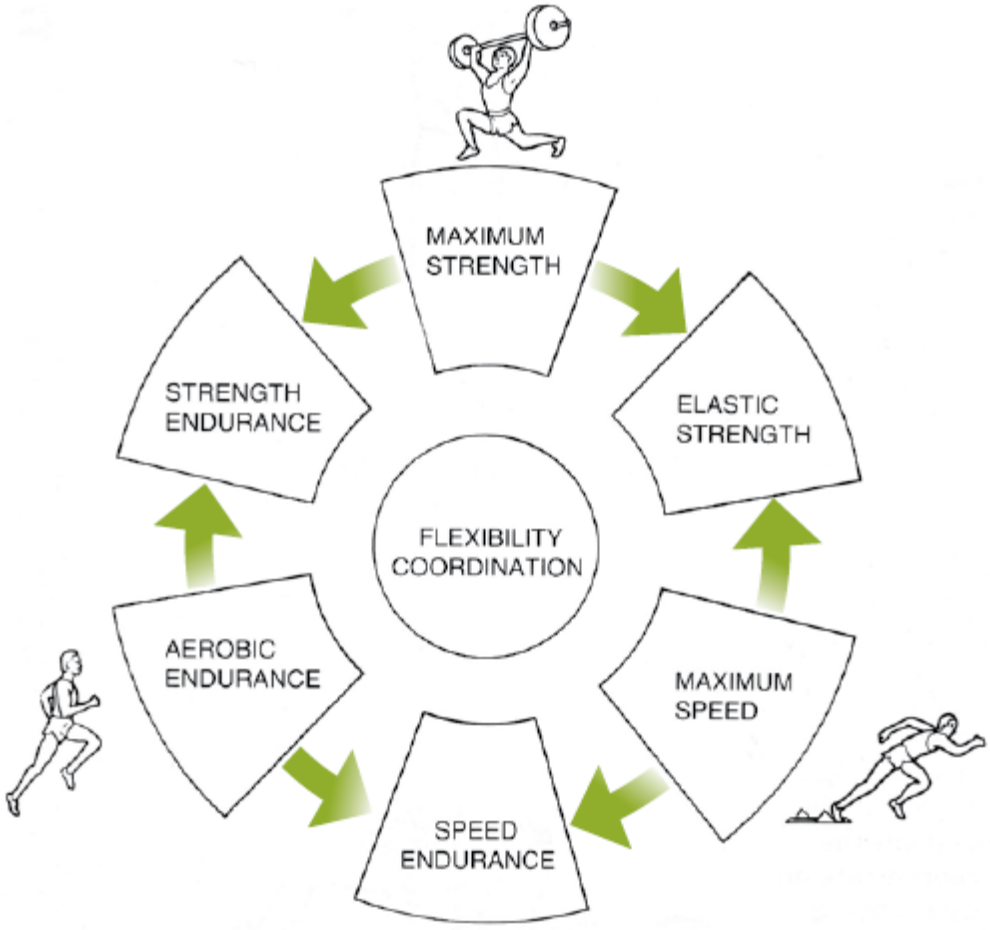
SKIPPING SIDE STEPS CARIOCA BACK SLAPS

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

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'



Inter-relationship of the components of fitness

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.

What is Training? Training is a systematic process with the objective of improving an athlete's fitness in a selected activity. The three most important of these principles are:

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

A training load is the work or exercise that an athlete performs in a training session. 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 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.

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

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.

The principle of specificity states that the specific nature of a training load produces its own specific response and adaptations. 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.

Whenever we do an activity which is more, or different, from what we usually do it produces an Overload. 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.

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

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. Same chronological age, biological ages. 'Developing the Athlete' athlete's chronological age, biological age and training age.

Principle of Variety, Principle of Active Involvement

Developing A plan

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. This 'Plan-Do-Review' process of coaching is cyclical, repeated over and over. 'doing the right things at the right time'. reach their full performance capabilities until 24 years of age or older. r chronological age, biological age and training age. the Kids' Athletics, Multi-Events and Event Group Development stages.

Stages of the Athlete Development Pathway: Stage 1 Kids' Athletics, Stage 2 Multi-Events, Stage 3 Event Group Development, Stage 4 Specialisation, Stage 5 Performance

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

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.

Achieving optimum performance at the right place and time is called 'peaking'. 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.

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

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.

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

Scale of intensity relative to best performance

The training load is a combination of both volume and intensity. This increase is always an increase in volume before there is an increase in intensity. The first and longest period of any training programme is the preparation period. 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. 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. '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 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.

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. 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. Young athletes can begin a more structured training in the Multi-Events stage when 2 to 5 training sessions a week may be possible.

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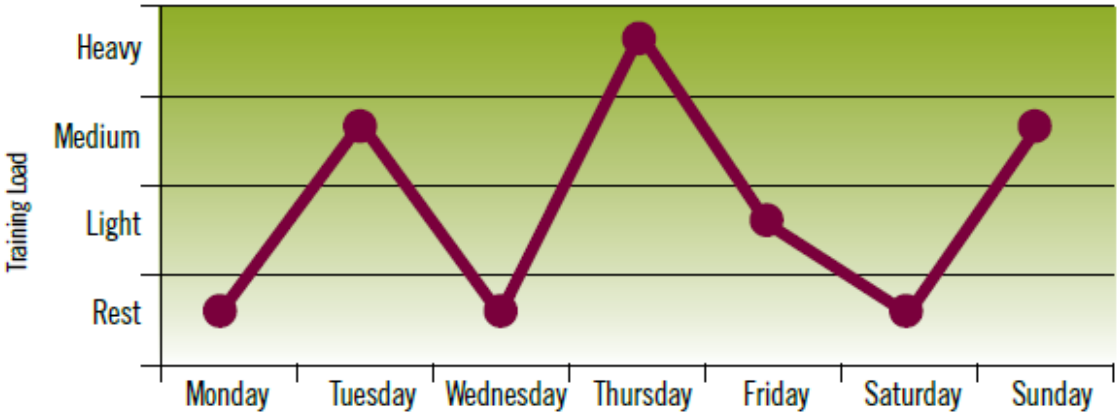
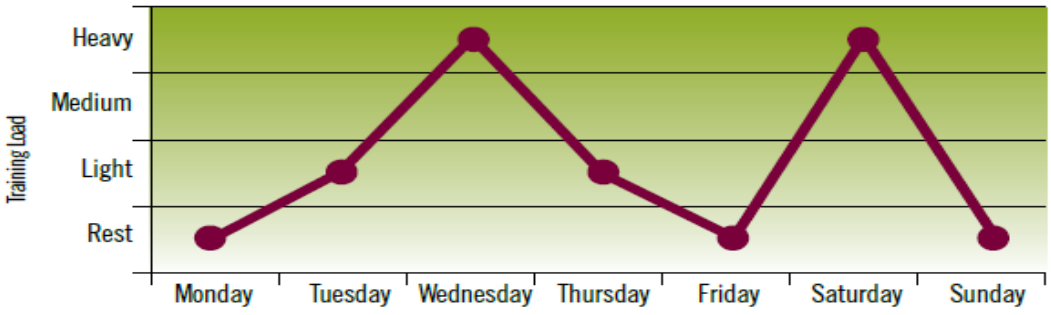


Sample microcycle showing the Training Load for a young, inexperienced athlete – Preparation Period



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

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

= Intensity

= Volume

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

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 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. **A Skills Unit** Instruction starts with the known skills and progresses to the new or unknown skill. **A Fitness Unit** 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. 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 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

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

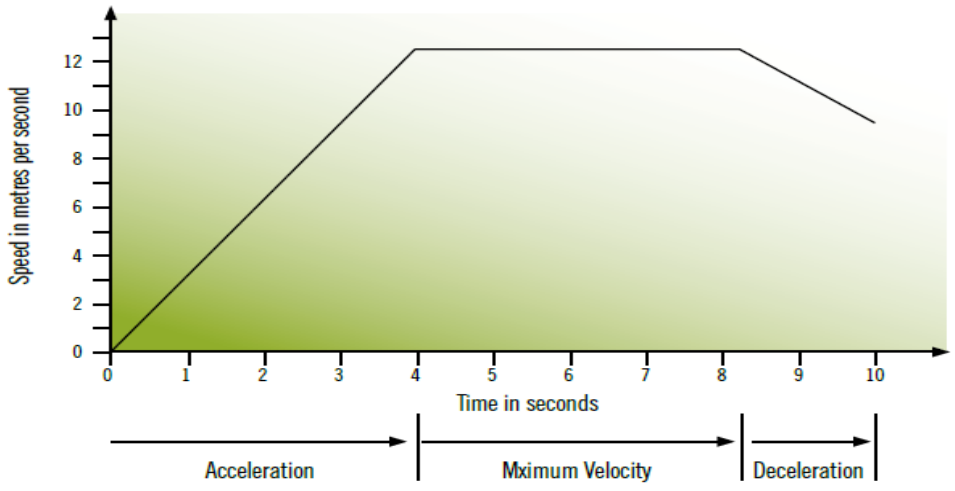
Summary The details of each training session fall easily into place with the basic tools provided by:

- 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

What is Force? Forces produce movement and a force is simply a pull or a push.

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. 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.



Speed-time graph for a sprinter

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.

Use All the Joints That Can be Used 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.

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. 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 "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.

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. Diagram-pg-162

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. …are developed and controlled by the athlete or how they act on the athlete's body.

- 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

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

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. 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'.

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. Complex skills are ones that an individual finds more difficult and take more time to learn.

Technique and skill learning are invisible processes. Learning involves the nervous system, the brain and memory. 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. "Only perfect practice makes perfect and permanent." …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, The Practising and Learning stage – Developing the Technique, The skilled or Advanced stage – Performing the skill.

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 z 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.

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.

"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

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.

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.

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

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

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. Generally, it is best to teach a technical skill as a simple, whichever method of teaching is used the coach has a very powerful role to play in creating an effective, enjoyable and motivating learning environment.

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

- Communication
- Commitment
- Control
- Confidence
- Concentration

Communication is a two way process

Personality

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.

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

- 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'

Control – Learning to Control Emotions and Anxiety

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. 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 midpoint. 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

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. 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.

Concentration The mental skill of concentration is needed in both training and competition.

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

Workshop – Mental Skills Training in Practice

Prevention of Injury The saying, "Prevention is better than Cure" 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.

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.

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 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. 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. 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'. 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.

Prevention through Nutrition 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

Prevention through Environment 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.

Prevention through Treatment 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.

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 z
- Avulsion, tearing away from the bone

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

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 This causes an avulsion, the tearing off of a piece of bone.

- Regaining full flexibility, 100% of previous range of motion
- Full strength return in the injured part
- Absence of pain
- Psychological readiness, absence of fear

Developing an Injury Management Programme

"Focus on what can be done, rather than on what cannot be done."

Water Training Athletes should run in water at least six feet six inches or 2m deep, so there is no danger of accidentally hitting the bottom.

Cycling Cycling is another activity injured athletes can do safely. Cycling workouts of 20 minutes or more are good for maintaining and improving general cardio-respiratory fitness.

Weight Training, Recreational Walking, Stretching and Relaxation

"Coaches must ensure that practical environments are safe and appropriate.

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 z 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

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.

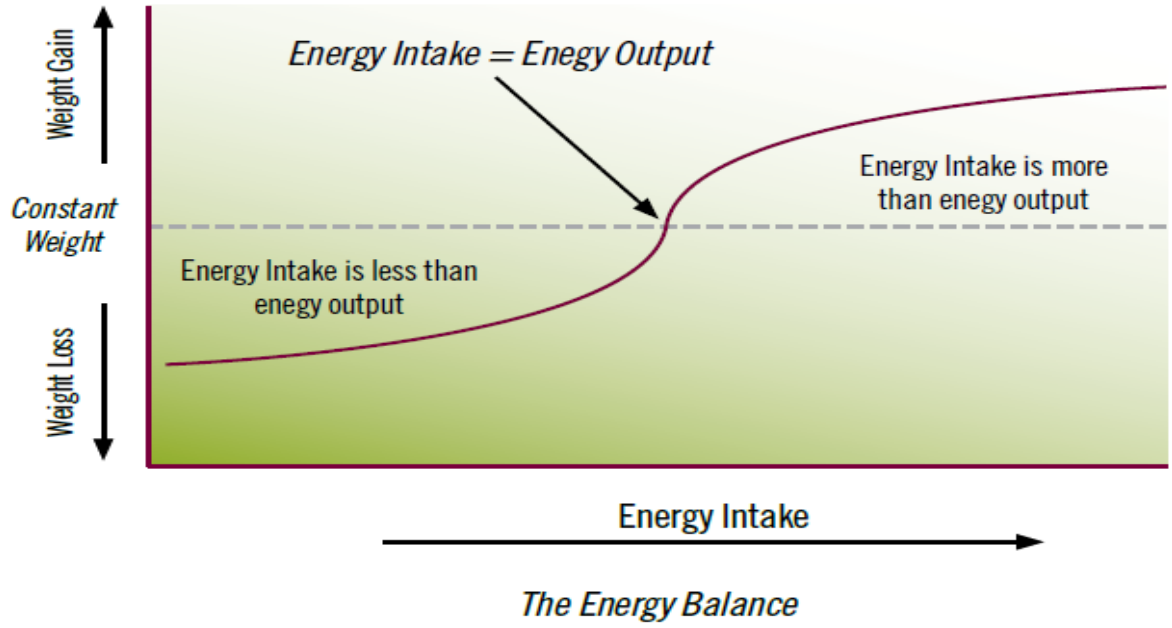
NUTRITION (Food we eat and drink)

FUEL

ENERGY AND CHEMICALS

MUSCULAR MOVEMENT GROWTH TISSUE REPAIR

Calories – the energy value of food The energy the body gets from food is measured in calories. 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. ..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

…Even in training, is 0.5 to 1.0 kg per week, until the desired weight is reached.

…increase their lean body mass,

The different types of nutrients are:

- Carbohydrate
- Protein
- Fat
- Vitamins
- Minerals
- Water
- Fibre

Carbohydrates – Energy Food ..fuel of glucose which is stored in the body as glycogen. This energy must be refilled every day from carbohydrate foods in the diet. 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. 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. 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.

Proteins – Growth and Repair Food Until the age of about 18 the body makes new cells in order to grow. 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.

Fat – Slow Energy Food 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.

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. Such an illness is called a deficiency disease. 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
VitaminC (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

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. Red meats are rich in iron. 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 goitre.

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

About two thirds of your body is water. The average person should take in about 1 litre of water in drink every day and another litre contained in food. Diagram-pg-207

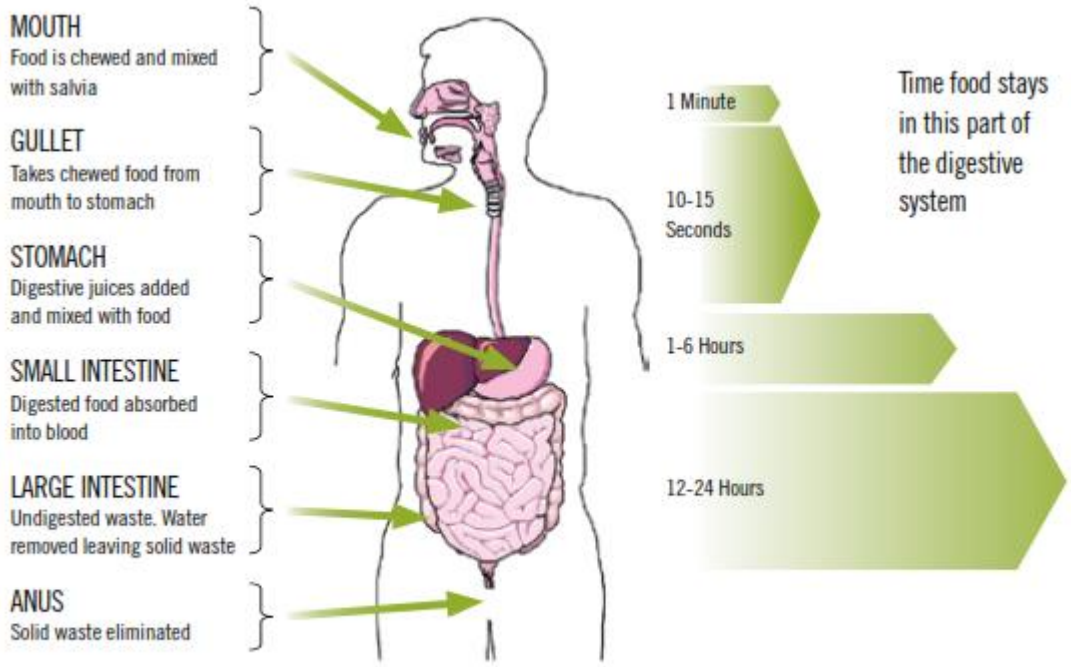
If we are exercising hard, by the time we feel thirsty we may be already dehydrated and performance may be already reduced. Sweat is made up mostly of water, but its salty taste comes from tiny amounts of potassium, calcium and magnesium.

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. Natural plant foods are generally high in fibre.

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 Absorption of these chemical units into the blood takes place in the stomach and small intestine.



The Digestive System

The Nutrient Balance The nutrient balance is like the energy balance. such as 60%-65% carbohydrate. 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. 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.

Pre- and Post-Performance Nutrition 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 z 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.

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.
- 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

Summary of the Code of ethics for Coaches

Fair play is integral, and not optional, elements of all sports activity. They include recreational as well as competitive Athletics.

- basic human rights, that are the equal rights, gender, race, colour, language, religion, political
- respect the dignity and recognise the contribution of each individual.
- safe and appropriate. the age, maturity and skill level of the athlete.
- the Rules of Competition.
- for officials
- encouraging the independence and self determination of each athlete by their acceptance of responsibility for their own decisions, conduct and performance.
- prohibited drugs or other disallowed performance enhancing substances or practices.
- The coach must acknowledge that all coaches have an equal right to desire the success of the athletes
- personal conduct, reflected in both the manner of appearance and behaviour.