ATHLETICS OMNIBUS – INFLUENCE OF GROWTH ON PERFORMANCE

From the Athletics Omnibus of Richard Stander, South Africa

1. INTRODUCTION

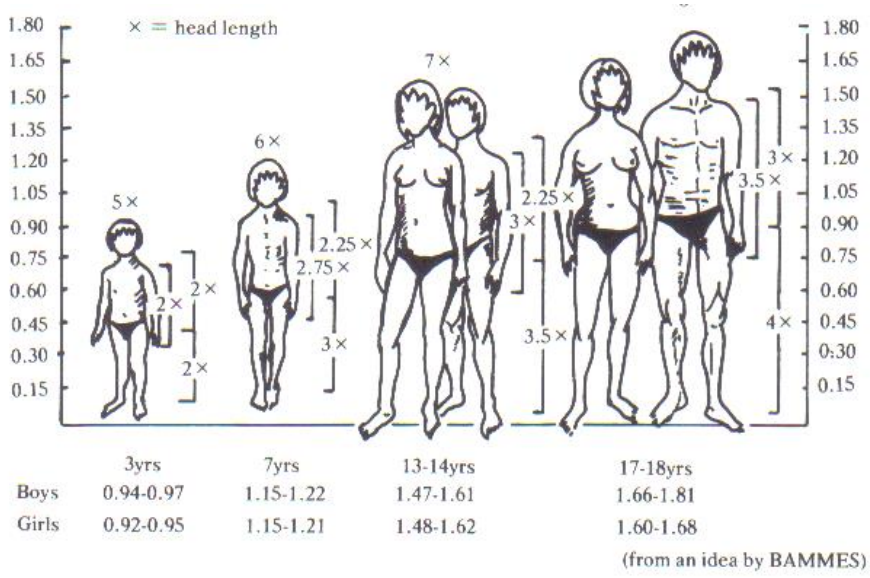
A new born baby is not just a smaller version of a fully grown adult. The need of the new born baby is very different to that of a fully grown adult. For the new born baby to become a fully grown adult, the baby will go through various phases of development.

There are 4 clearly defined phases of growth from infancy to adulthood. Each of these phases has specific needs that must be addressed for the baby to develop into an adult.

The most obvious difference between a baby and an adult is the physical appearance. The sketch below gives a schematic lay-out of how the physical appearance of the body changes during the various phases of development from birth to adulthood.

From the schematic lay-out it can be seen how the baby develop into a man or a woman. This chapter will only deal with the development that is generic to both men and women.

In the sketch, the head is used as an averaged norm to calculate the physical differences during the various phases of development. By using the height of the head of an infant at 3 years old, the averaged lengths of an adult's arms, upper body and the lower body can be determined. During the growing phases from birth to adulthood, the skeletal and muscle growth will be the most noticeable.



Other change that is less noticeable is the development of the blood circulation system (Cardio vascular system) and the oxygen circulation system (cardio respiratory system). As the chambers of the heart develop, the chambers will have an increased capacity to handle greater volumes of blood. Likewise, the lungs will grow in size, resulting in more oxygen that can be taken into the lungs.

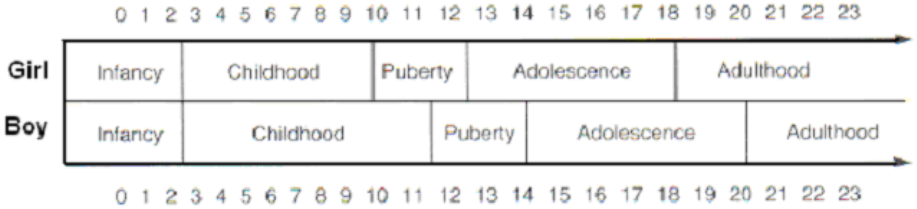
Changes that are not noticeable but that can be measured are the development of the pulse pressure, blood volume, red cell count (and the amount of haemogloben that it carries) and the speed of the air intake of the lungs.

Not all aspects of growth takes place at the same time and this have a direct influence on the performance level of the athlete during the various phases of development.

2. MATURATION – PHASES OF GROWTH FROM A BABY TO ADULTHOOD

There are 4 clearly defined areas of growth from birth to adulthood.

They are infancy, childhood, puberty and adolescence.



Stages of growth from birth to adulthood according to gender

With the exception of infancy, the development phases of boys and girls differ slightly. The diagram illustrates the difference of development between boys and girls.

2.1. INFANCY

Infancy is defined as the 1st 3 years after birth of both the baby boy and girl. At birth the body has more than 200 bones that, with the exception of the skull and collarbone, are soft cartilages.

At the same time the body at birth have more than 300 muscles that must support and/or move the body. The capacity of the muscles to move the body of the infant is very limited mainly because of the undeveloped muscles and the bones that are still soft bendable cartilages.

At birth the infant is about a quarter of their adult height, but rapid growth will take place during the infancy phases. This rapid growth will be mainly in the torso area and is not as noticeable as in the later phases of growth. The head in proportion to the body is too big and is mainly responsible for the child experiencing difficulty to maintain balance.

Physical activity during infancy should be limited to the development of motorial functions of the limbs with the emphasis of fine motorial functions of the eyes, mouth, fingers and toes. The emphasis must be on playing games that is not strenuous and exhausting on the bones and muscles.

Any physical activity placing emphasis on the development of the larger muscle groups will result in the muscles bending the soft and spongy long bones in the body such as the femur (thigh bone), the tibia, etc, as well as the deformation of joints such as knee and ankle joints, resulting in distorted growth and alignment of the bones and joints in the later phases of development.

2.2. CHILDHOOD

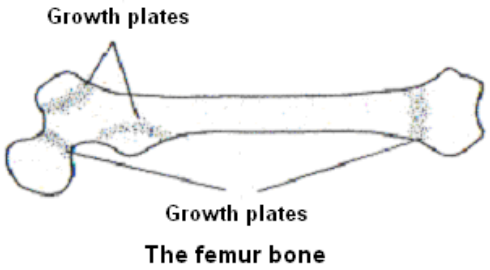
Childhood years for boys and girls are defined as:

- Boys – 3 to 11 years after birth
- Girls - 3 to 10 years after birth

During childhood the shape and size of both boys and girls are very comparable.

The clothing that they wear and the way their hair is cut are often the method used to distinguish the boys from the girls.

During childhood growth will take place mainly in the arms and legs. The bone growth takes place at the growth plates. The growth plates are the weakest part of the bone and can easily be injured during strenuous training. The arms and legs become longer because of bone growth and cause the child to appear clumsy. The child will experience difficulty to co-ordinate the movement of the arms and legs.



The femur bone

The heart growths significantly in size during childhood but the muscle strength will only develop noticeably during puberty and adolescence. The growth of the heart give the appearance of the child having almost unlimited endurance.

Due to growth of the heart as apposed to the delayed development of the heart muscles, endurance related activities must be monitored to avoid overuse injuries, particularly in the bone structures which are still soft and spongy.

The lungs grow fast during childhood but the capacity to take in air is limited and as a result the muscle response to training and the recovery rate after training is limited. A recovery period of at least 48 hours of recovery time must be provided between strenuous training sessions during childhood.

Due to the growth of the heart and the lungs during childhood, the nature of intensive training during childhood should be aerobic (less than 80% of maximum intensity) to ensure that the heart develop a stronger pulse rate and the lungs develop a faster air intake speed.

During childhood, boys and girls must be encouraged to play together. All sots of jumping activities should be encouraged. Throwing events with balls must be limited to implements with reduced weight.

The emphasis should be on activities with varying speeds using natural objects. Speed exercises should consist of short starts from different positions to sharpen the reflexes. At all times the focus should be on playing rather than competing.

Note that jumping, throwing and sprinting exercises require anaerobic energy. The volume of this type of training must be limited to a few repetitions per session. The average of all exercises which includes the jumps, sprints, throws and distance related exercises must remain below 80% of the maximum capacity to avoid overusing the muscles and bone structure.

2.3. PUBERTY

Puberty years for boys and girls are defined as:

- Boys – 11 to 14 years after birth
- Girls - 10 to 13 years after birth

During puberty the child will experience a significant growth spurt.

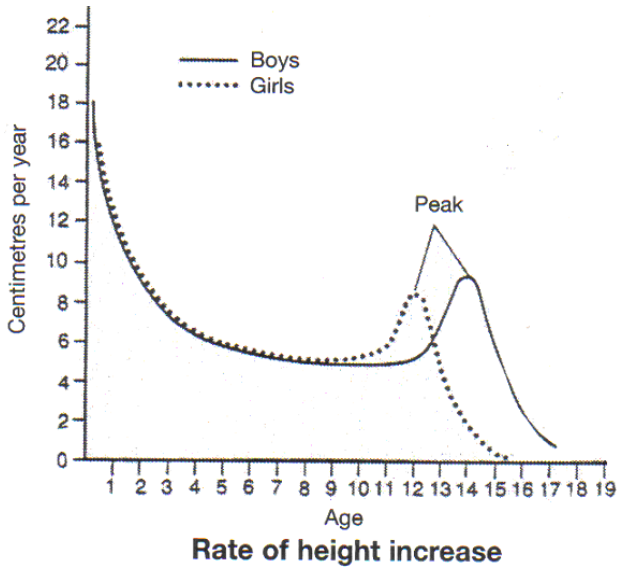
The sketch illustrates the significance of the growth spurt.

The growth spurt will require most of the child's available energy intake. As a result the child will lack enthusiasm and will appear sleepy and unresponsive.

During puberty the boy will develop broader shoulders but little change will take place in the hips.

During puberty the girls will develop broader hips and very little grow in the shoulders will take place.

Apart from the hips and the shoulder, most of the growth will take place in the arms and legs.



Rate of height increase

The 14 years old the girl has already grown to approximately 97% of their final height. The 14 years old the boy has grown to approximately 85% of their final height. On average the fully grown women's spine is 14% shorter than that of the average man.

During puberty, the bones of the child will develop much faster than the muscles. Because of the longer bones, the muscles which are attached to the bones are under strain.

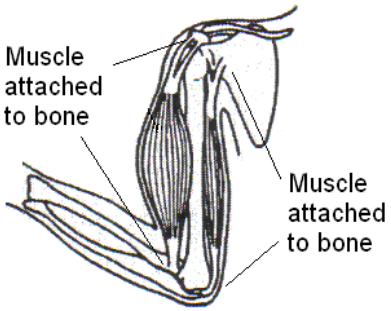
When muscles are subjected to strenuous exercises during puberty, the possibility of fractures increases significantly in the areas where the muscles are joint to the bones.

The long bones in the body grow faster than other parts of the body during puberty.

The arms and legs increase in length and the child often loses co-ordination simply because the arms and legs now takes longer to reach their destinations.

The athlete may even lose the skills developed previously because the longer limbs require a different type of technique or movement.

Moderate training will enhance growth but the training must be closely monitored.



Muscles in the upper arm

Due to the rapid growth of the limbs during puberty, emphasis must be placed on skills development and athletics movement.

Skills development must be monitored and measured on a regular basis without creating pressure associated to competitive athletics. Any physical activity during this phase must be closely monitored to avoid retarding the growth spurt which is of vital importance for performance during the later growth phases.

Puberty is regarded as the golden age of skill learning. During this period the child wants to learn skills. The child is now more capable of learning then any other time in the live of the child.

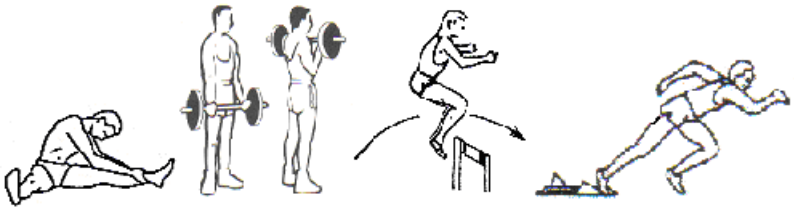
Specialization must be avoided during puberty to avoid the suppression of the development of basic athletics skills of a wide variety. There is sufficient scientific evidence that athletes specializing too young, are injury pruned during the adolescence period.

Athletes that developed a wide variety of skills during puberty have 500% better chance to achieve success in later development phases than athletes specializing during puberty.

2.4. ADOLESCENCE

Adolescence years for boys and girls are defined as:

- Boys – 14 to 20 years after birth
- Girls - 13 to 18 years after birth



Adolescence is regarded as the phase where the child is prepared to be an adult. The aerobic conditioning of a child during the childhood phase and the development of skills of a wide variety during the puberty phase will provide the adolescent with a sound base to develop specific skills in preparation for adulthood.

Conditioning during adolescence consists of a mixture of general and specific training. The adolescent must now be introduced to disciplined and planned training. The phasing of training and preparing for peak performances at planned time slots must now form part of conditioning.

The adolescent must be exposed to refined specific technique training and the development of speed. It is also now the time to develop the tactics and strategies for specific events.

2.5. ADULTHOOD

Adulthood for men and women are defined as from:

- Men - 20 years after birth
- Women - 18 years after birth

The bone and muscle growth in the body have stopped. The adult athlete can now be subjected to specialized strength, endurance and speed endurance training sessions in a specialized event in preparation for ultimate performance levels.

3. IMPLICATIONS FOR THE COACH OF ATHLETES IN THE GROWING PHASES

Coaches must keep in mind that the body of the child is continuously changing. It is important to note that the growth phases used as a reference are based on averages. It is possible that some children will develop faster than others. The difference in physical appearances of children of the same age may be as much as 4 years.

The coach should therefore monitor the physical changes of the athlete and coach the athlete according to the athlete's physical capacity at the time of training rather than using the age of the athletes as reference.

The children will not understand why they experience difficulty to master certain techniques, particularly during puberty. It is important that the coach explain to the growing athlete e.g. that the reason why they struggle with coordination is because their legs are growing faster than normal.

Children find it difficult to evaluate their own progress. When the coach prepare training programmes for children, objectives must be set to monitor progress. These objectives must be set based on the athlete's physical age rather than the chronological age of the athlete.

When the coach divides the athletes in groups, it must be done on their physical ability rather than on their chronological age or gender.

3.1. CHILDHOOD

During the childhood phase the emphasis of training must be on playing games that consist of activities with varying speeds using natural objects. The speed practices should consist of short starts from different positions to sharpen the reflexes. Exercises that place force on the bone growth regions such as speed endurance training must be avoided. Weight training during childhood should not take place.

The intensity of the training during childhood should be aerobic (less than 80% intensity) to ensure that the heart develop a stronger pulse rate and the lungs develop a faster air intake speed.

3.2. PUBERTY

The training of athletes in the puberty and early adolescent phases must be trained in groups rather than individually. The emphasis should be on the social development of the training with a strong fun and games approach.

The emphasis of training should be on aerobic training and the development of skills of a wide variety. The intensity of the training during puberty should be aerobic (less than 80% intensity) to ensure that the heart develop a stronger pulse rate and the lungs develop a faster air intake speed.

Weight training should be limited to exercises using body weight.

3.3. ADOLESCENCE

During the adolescence phase the emphasis of training consisting of a mixture of general and specific training.

The adolescent must be introduced to disciplined training, the phasing of training and preparing for peak performances at planned time slots.

The athlete must now be introduced to weight training to compensate for the rapid weight gain that takes place during the adolescence phase.

4. PRINCIPLES FOR STRUCTURING A TRAINING SESSION

Structuring a training session for growing athletes will depend on the following factors:

4.1. MATURITY

The maturity of the athlete is determined by:

4.1.1. The physical development of the child such as bone and muscle development. The physical strength of the athlete will determine the speed of progression.
4.1.2. The psychological and neurological development of the athlete. The athlete's capacity to deal with tension will determine if the athlete will respond positive during competition.
4.1.3. The level of training exposure during previous years will determine the level of skills training and the volume and intensity of the training.

4.2. EXPERIENCE

The level of exposure to a wide range of skills and aerobic training during the childhood and puberty will determine to what extend specific skills will be developed during adolescence and adulthood.

If the athlete is capable to execute a wide range of movements and skills, the athlete will be able to master advanced skills required for high level competition much faster.

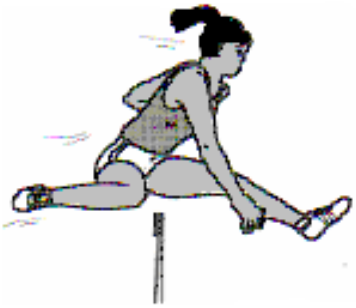
4.3. TEACHING

The capacity of the coach to teach will enable the athlete to master advanced skills much faster. The coach must take in consideration that some athletes are more developed than other and must guard against treating all athletes the same way. The coach should follow the following strategy when coaching athlete's skills:

VISUALIZE
The coach must explain new skills in such a way that the athlete and create a picture of the task at hand in the mind. Demonstrating the skill before hand or audiovisual material of the skill that must be mastered will help to visualize the execution of the skill

LEARNING
The coach must simplify the skill that must be mastered and allow the athlete to execute the skill by doing it slowly and as the confidence grow, faster and faster.

SKILLS DEVELOPMENT
Once the skills is mastered and the athletes is able to execute the skill full speed the athletes must be subjected to a number of competition and time trails to enable the athlete to refine the skills obtained and measure progress on a regular basis.



4.4. DIFFICULTY OF TASK

Athletes will experience the same task differently. Their maturity level and their exposure to other sporting codes will have a direct impact on how quickly growing athletes will master advanced skills.

5. THE COACH MUST REMEMBER

5.1. Expose the child to a wide range of movement during childhood and puberty phases.
5.2. Develop the basic movements before special skills are developed. Do not subject children to specialized training before the adolescence phase.
5.3. Start with simple tasks and progress to complex tasks. Focus on the training of parts of the body before engaging the whole body.
5.4. Avoid continuous training sessions. Rather split the training sessions into shorter periods of physical activity.
5.5. Expose the athlete to competition to allow them to test their skills level as soon as possible.
5.6. Develop the confidence of the child by encouraging children to try new things.
5.7. Apply the "KIS" (keep it simple) principle – Use simple understandable language
5.8. Focus on one fault only during correction sessions
5.9. Do not give the child too many instructions at a time to implement.
5.10. Be positive when giving feedback to children
5.11. Give everyone in the training group some success during a session

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