**PEOPLE'S DEMOCTRATIC REPUBLIC OF ALGERIA**
**MINISTERY OF HIGHER EDUCATION AND SCIENTIFIC RECHEARCH**
**MOHAMED KHIDER UNIVERSITY OF BISKRA**

**Institute of Sciences and Technologies of Physical and Sport Activities**

**Departement of Sport Training**


# COURSE HANDOUT

## SUBJECT : THOERY AND METHODOLOGY OF SPORT TRAINING

**Academic Level** : Second Year (3rd Semester)
**Speciality** : Sport Training

**Prepared by :** Dr. DAKHIA Adel
**Email :**adel.dakhia@univ-biskra.dz

**1. General Informations about the Course:**

**Course Title:** Thoery and Methodology of Sport Training

**Target Audience:** Second year students

**Speciality** : Sport Training

**Educational Unity** :Fundamental.

**Duration:** 14 weeks (42 hours)

**Coefficient:** 02

**Credits: 03**

**Learning Objectives:**

- Understand the fundamental principles and both theoretical and practical knowledge related to the specialization.
- Enhance the student's pedagogical, technical, and tactical proficiency within the specialization.

**Prerequisite Knowledge:**

- Basic understanding of the specialization through relevant guidelines and concepts.
- Familiarity with major theories in sports training and the functions of body systems.

**Assessment Method:**

Continuous assessment + Final exam

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# FIRST COURSE: Sports Training—Definitions, Aims, Functions and Characteristics

## 1.DEFINITIONS OF SPORTS TRAINING AND COACHING

### 1.1. DEFINITIONS OF SPORTS TRAINING

1. Sports training is the basic forms of preparation of sportsmen. — Matveyev

2. Sports training, based on scientific knowledge, is a pedagogical process of sports perfection through which systematic effect on psycho-physical performance ability and performance readiness aims at leading the sportsman to high and the highest performance. —Harre

3. Sports training is a scientifically based and pedagogically organised process through planned and systematic, effect on the performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competition. — Schnabel.

**1.2.DEFINITIONS OF COACHING**: - Coaching may be define as the technical skill which involve coordination of factors like time,sequence, action, movement and speed

4. Sports training is the process of preparation of sportsman based on scientific and pedagogical principles aims at improving and maintenance of higher performance capacity.

## 2.AIMS OF SPORTS TRAINING

The main aim of sports training is to prepare a sportsman for a highest possible performance in a main competition in a particular sport / event. Besides this following should be considered as the aims of sports training:-

i. Improvement of physical fitness.

ii. Acquisition of motor skills.

iii. Improvement of tactical efficiency.

iv. Education and improvement of mental capabilities.

I- Improvement of physical fitness:- The performance in sports generally depends upon the physical fitness of a sportsman, hence the improvement of

various components of physical fitness or motor abilities is the prime aim of sports Tanning. Every sports activity needs specific types of physical fitness but in this view the development of physical fitness should not be ignore because specific fitness is depends on the general fitness.

II- Acquisition of motor skills: - Every sports activity needs certain movement procedure to tackle a particular task which refers to the technique when this technique is learn and perfect it is called as skill. When, ever sportsmen indulge in technical training aim of which is to acquire skills of particular sports. Technique training is differ from sports to sports if we take the example of Gymnastic & Diving which requires greater amount of technical training where as track events needs very less amount of technique to be learnt.

III-Improvement of tactical efficiency: - Tactical training in sports competition helps the sportsmen in such a way where he/she makes the best use of his abilities, skills and all external factors which are beneficial to attain high level of performance and hinder the opponent to do so. Tactical training includes knowledge of rules, tactical abilities and technical training, therefore improvement of tactical efficiency is considered to be the important aim of sports training.

IV- Education and improvement of mental capabilities: - Performance in any sport/event up to some extent depend on the personality of a sportsmen, therefore education and improvement of mental capabilities is also considered as one of the aim of sports training. Education in sports includes:

-Development of positive attitude towards competition.

-Dedication and devotion towards particular sports/event.

-Sincerity and honesty.

-Self confidence and optimum level of aspiration and Formation of good habits. Keeping all these things in mind it is the moral duty of every physical education teacher, instructor and coach to educate the sportsmen through sports training.

## 3.FUNCTIONS OF SPORTS TRAINING

The performance of an individual depends upon the performance capacity of a sportsperson; this capacity is complex in nature and depends upon certain factors like speed, strength, flexibility, endurance and coordinative abilities. If we take the physique into an account which is moreover genetic and it cannot be trained by means of training but other factors are trainable to some extent. To achieve these following tasks of the sports training should be considered:

I-Development of Sports Personality:-Personality of sportsman is observed in the form of habit, behavior and attitude towards the requirement of training of competitive sports/events. It is quite clear that the personality is influenced in the process of tackling the task involved. Hence the personality of the sportsman can be develops through systematic & logical guidance during regular participation in sports activity. To ensure the improvement and achieve high level of performance it is worthwhile to develop the physical, mental, and social aspect of a sportsman. The sportsmen are required to develop the specific personality characteristics. The specific personality characteristics which are more suitable to attain high level of sports performance in particular sports.

II- Performance Efficiency:- The rate at which performance efficiency is develops during the sports training is largely depend upon the amount of training and competition. It has the decisive bearing on the improvement of performance efficiency and performance ability. The performance efficiency is also depend on the amount of training load is given during sports training. But the quality of the way of training is organised will also be crucial for changing high load into higher performance capacity.

III-Physical Training:- Physical training of sportsman is refers to the speed, strength, endurance, flexibility and coordinative ability. These qualities are performance prerequisites of any sports. Requirement of these qualities vary from sports to sports because some sports require single ability whereas other requires combination of two. To improve these abilities sportsman should

regular participate in general, specific and competitive sports activity demanded for a particular sports.

IV- Technical Training:-Technical training enables the sportsman to make the optimum and best use of the physical abilities during the sports competition. The technical training helps to achieve the skill of particular sport which is directly related to the sports performance because higher the level of technical skill higher will be the performance. In order to acquire mastery over the skill one should regular participate in technical training because it ensures the perfection of skill which helps to attain high performance in sports competition. Technical mastery over the skill also ensures the proper application of motor abilities which reduce the efforts energy consumption during the competition.

V- Tactical Training:- The use of correct tactics enables the sportsman to make the best possible use of physical and psychological capacity of sportsman. The tactical training helps in understanding the strength and weakness of the opponent's and also develop the ability to overcome these types of situations during competition. Gradually increasing of tactical efficiency helps the athlete to win the top level events in national and international competition. Keeping all these facts in mind all sort of skills and abilities should acquire during training which are normally put into practice to win any sports/events. Hence tactical training must be considered as the important part of sports training.

VI- Mental Training/Intellectual Training:- Intellectual training refers to the higher demand put on the mental faculty of a sportsman. When sportsmen engage in training of competitive sports he should encouraged understanding the latest technical and tactical aspects of a game and how to develop these by modern means and methods of training. It is also desirous to develop good habits, positive attitude and tactical ideas with good imagination which helps to develop the new technique and help in planning and analyzing the daily schedule. By doing so sportsman systematically develops the mental faculty which continuously, helps to improve the theoretical knowledge of sports

training. Thus mental training is considered to be the important part of sports training.

## 4.CHARACTERISTICS OF SPORTS TRAINING

Sports' training is not merely concerned with physical activities which involve the physical movements. The various activities like dance, play and various fields i.e. industries and factories also involve physical movements. Those activities or areas can not be considered the sports training because sports' training has some essential features which are observed in all kinds of physical culture and which are particularly more prominent in competitive Sports training.

Some of the important features / characteristics which are more common are as follows:-

1) Sports training aim is to achieve high performance in a competition.

2) Sports training concerned with individual matter

3) Sports training is a planned and systematic.

4) Sports' training is a scientific process.

5) In sports training coach has the dominating role

6) Optimum development of physical and psychological level of sportsman.

7) Sports training control's daily schedule of a sportsman.

8) Sports training is a educational process

9) Sports' training is a process of perfection.

10) Sports' training is a process of development of hidden talent

1. Sports training aim is to achieve high performance in a competition: - The important feature of sports training is to achieve the highest possible performance in any of the sports competition and to maintain it for a longer period of time. The great talent of a sportsman can not longer afford to train to achieve high level of performance in various sports competition. Sports' training is not a simple play or recreational activity but it is a serious activity which helps to attain high performance in a competition.

2. Sports training concerned with individual matter: - Performance in any sports is the sum of various factor which are differ from individual to individual. If we take up the example of sprint event where as at high level of International competition, there is slight difference in cm / fraction of seconds which decides performance record, victory or defeat. For that vary reason it is necessary to identify the individual potentialities during the training because one might having the good reaction time whereas other may have good acceleration ability and loco motor speed and so on. Therefore it is an urge / need to emphasize on the individual matter during the training.

3. Sports Training is Planned and Systematic: - It has been observed that sports training is planned in the form of training plan / training cycle according to the time and duration of the competition and as per the requirement of particular sports / event. The sports training is organized on the basis of logical facts which are practically designed to improve in performance systematically.

4. Sports Training as a Scientific Process: - Nowa- days this is the era of science and technology because performance of human being are advancing due to the science and modern technology. The performance in sports is highly influenced by the scientific method of equipments, facilities and modern theories of sports training. So as to attain high level of performance in sports competition it is necessary to incorporate the science in the process of sports training.

(5) In Sports Training Coach has Dominating Role: - Sports training is planned, organised and evaluated by the coach/trainer / PET who controls each and every things of a sportsman. The coach is not only responsible for the coaching of the sports person but his dominant role should be understood in a broad sense. In addition to his direct role with the young sports person in sports training he should also have the close association with scientist and other person who helps in uplifting the performance of sportsman. The coach should stimulate and encouraged not only to train well the sportsperson but also to learn them all kinds of education. The dominant role of the coach should not be considered as treatment of the sportsman as children because the highest

performance in a competition is depend upon the good imagination and successful participation in an event.

(6) Optimum development of Physical and Psychological level of Sportsman: - To achieve the optimum Physical and psychological development of a sportsman maximum training load should be given but increase in the load should be in a way so that the sportsman adapt as per the requirements of a game/ sports. Adaptations of load by a sportsman always improve the performance most effectively. Hence the sports Training become an important part of the life of a sportsman.

(7) Sports training controls daily schedule of a sportsman:- Sports training is not a fun and enjoyment which can be treated as recreational activity .To continue with a regular training with its best effect the sports training become a tough task because the sports man has to adjust his other activities as per the daily schedule of a training so that training can run smoothly once/ twice a day. When we look into its vital feature of sports training we always realize that sportsman must possess high degree of discipline, sincerity and honesty as these are the qualities of a champion sportsman's.

(8) Sports training is a educational process:- As it is quite clear that Sports Training is a educational and pedagogical process which helps to develop the over all personality of a sportsman without developing the personality the higher performance is impossible or in other words development of the sports personality is directly proportional to the performance improvement of the sportsman through Sports training.

(9) Sports Training is a process of Perfection:- It is well known fact that sports training is planned, systematic and scientific process of preparation of sportsman for higher performance. To achieve the aims of Sports training various means and methods are applied. These means and methods are flexible in nature which can be modified improved and new methods are developed with the help of various sports sciences. The process of observation, conducting experiment, analyzing data and discovering new thought is an important characteristic of sports training in modern time. Hence the sports'

training is a continuous process of perfection and improvement of sports performance.

(10) Sports Training is a Process of Development of Hidden Talent:- Sports training is a goal oriented process by preparing a sportsman for the higher performance as the need and requirement of the competition. The regulation of training helps the coaches to assess the performance of the player at any moment. For effective regulation of training few points should be kept in mind:

i- Training plan should include aim, sub aim, load, means and methods.

ii- Training documents should be maintained.

iii- Information regarding level of competition and rate of improvement.

## SECOND COURSE: PRINCIPLES AND MEANS OF SPORTS TRAINING

# 1.PRINCIPLES OF SPORTS TRAINING

## 1.1.Principle of Continuity of Training

The principle of continuity of training state that training of the sportsman should be continuous and regular process. It is the establish fact that regular Training of a sportsman always leads to the better result. Hence too long break / interval in the training should be avoided. To ensure this principle of training following points should be taken into an account.

I. Sportsman should be educated regarding the importance of continuity by highlighting the positive and negative effect of training.

II. The knowledge of the sportsman should be extended by convincing them that all the performance factors are developed through the long process of training.

III. Condition of optimum load should be created because too long and too short volume of regular training does not effect positively on the performance.

IV. In case of sick injured person the physician should always be consulted because in case of injury some part of the body can be given exercise or low intensity training load may be given.

## 1.2. Principle of Increasing of Training Load

This principle of training load derived from the well established fact which exhibit the clear cut relationship between the load and adaptation process. In this principle coach or physical Education teacher must continuously plan for new and higher demand among the sportsperson so that training load can be increase to get the maximum possible benefit of the sports training. Generally two methods: linear and step methods are used to increase the load but in special situation combination of both linear and step method may also be used to progress the load during training.

**1.3.Principle of Individual Matter**

It is established facts that two like are not alike. In sports training all the sportsman taking part in the training are differ in the training age, health condition, individual capacity to bear load, recovery pace, body constitutions and so many other factors. Keeping all these factors in mind training must be formulated as per the need of an individual consideration.

**1.4.Principle of Active Participation**

It is the fact principle of psychology that you can bring the horse into the water but you can not compel the horse to drink water. On the basis of similar principle a player who is passively engage in training does not analyze and evaluate thoroughly always remain looser because such prayer totally depend upon the coach who never develop confidence and does not improve the capacity to improve the performance. Therefore the coach must educate their player to activity and consciously participate in sports activity during training.

**1.5.Principle of Planned & Systematic Training**

It is the establish fact that sports training is a scientific and pedagogical process. Therefore to achieve the high level of sports performance in a competition, the training must be plan in a proper system. These two principles are interrelated with each other because a correct planning is only made if we know the proper system of Sports training. In other word training is the goal oriented process hence training should be arrange in such a way so that the main aim of sports Training is achieved and performance can be improve and maintain for the long period of time. The important aspect of systematic training refers to the correct and sequential arrangements of all training components. This will not only improve the

performance but also stabilize the previous performance and create the base for future performance. For the proper planning and systematic training following points should be kept in mind for the sequential arrangements

I. General preparation

II. Specific preparation

III. Effective competitive exercises

IV. Tactical training

V. Technical training

**1.6.Principle of General and Specific Training:**

General and specific training of a sportsman is equally important because general training create the base and specific training help to improve the performance. As we all know that better is the base, the better will be the performance. General and specific training can not be separated but it is always advisable that both general and specific training should be given to a sportsman

**1.7.Principle of Competitive & Specialised Training**

The specialised training refers to the use of specific means and methods for the improvement of particular sports performance in a competition. It is scientific fact that specialize training with the help of specific means and methods lead to better performance but in true sense when the training starts in the childhood and continue up to the age of 25 years or even more then the specialised training does not effect much towards positive side but some time it also effect the negatively because of the following.

I. Specialised training is not suitable for children.

II. High performance is achieved early and it is difficult to maintain for long time.

III. High performance is achieved before the start of high performance age.

IV. High performance depend upon the total personality of sportsman specialised training always leads to the improvement of selected systems & organs of the body which some time result the inadequate of other systems.

**1.8. Principle of Clarity**

To provide the maximum possible benefit of sports training to a sportsman for the effective training the clear picture of technique and tactics and other aspects of performance enhancement should be given. For the implementation of this fact following points should be kept in mind:

(i) Language must be clear & correct.

(ii) Teaching aids like black board, photo, illustration, video film graph, etc should be used.

(iii) Various sense organs should be stressed e.g. (drum beating)

(iv) Constantly informed the quality of movement.

(v) Information should be given as per age, sex and experience.

**1.9.Principle of Cyclicity**

The training plan is formulated as per the availability of time for training. The training can be plan in three different forms of cycles:

I. Macro Cycle: duration 3 - 12 months.

II. Meso cycle : duration 3 - 6 week or it is called as monthly cycle.

III. Micro cycle: duration 5 - 10 days also called as weekly plan.

**1.10.Principle of Ensuring Results**

The main aim of sports training is to achieve the highest possible performance in a competition. In this regard training should be formulated in such a way so that ultimate aim of sport s training is ensured by attaining the result in a competition.

**1.11. Principle of Critical Training Load**

To meet the higher demand of competition in unforeseen situation the training load should be administered more then the general load. This administered of critical load should b e given 4-5 times in a year.

**1.12.Principle of Adaptability**

For the effective use of training the adaptation process should take place. To ensure the adaptability the training load should be followed by a measured period of the recovery. The optimum adaptation is possible when there is proper proportion between the load and recovery.

**1.13. Principle of Uniformity & Differentiation**

To achieve the best possible result the training should be formulated uniformly but allowing the individual difference. The uniformly also mean the similar principle of training like time and duration of the activity. Similarly the load may vary as per the capacity of an individual.

### 1.14.Principle of Awareness

The sportsman should educate in such a way so that they can aware about the importance of training and competition demand from time to time. The sportsman should also aware by creativity so that they can actively participate in the training.

### 1.15.Principle of Visual Presentation

Visual presentation in the training mean that one should present the total task in brief so that every player become familiar / aware about the demand made on them. In this principle of sports training. Sportsmen are taught to observe/watch carefully so that they can make maximum use of their sense organs. The main aim of visual presentation/ demonstration to improve the observation power of the sportsman which helps in skill learning.

Following points are to be considered in visual presentation:

i. Correct mental picture of movement sequence is to be given.

ii. Information should be provided through visual aids.

iii. Different kinds of aids should be used.

iv. Selection of aids should be done on the basis of functions, aims and features of training task.

v. Visual aids may also be used for teaching purpose.

### 1.16.Principle of Feasibility

This principle is based on the fact that man develops from being active and that development is released by performance. According to this principle training of the sportsman should be done in optimum form so that maximum benefit of training can be taken. Too little and too much training should be avoided. For the effective use of this principle following points should be kept in mind:

i- Observe the needs of sportsman.

ii- Create the demand among sportsman individually

and develop the bearing capacity.

iii-Consider the age and sex of sports man.

## 1.17.Principle of Regulation of Training

Sports training is a goal oriented process by preparing sportsman for the higher performance as per the need and requirement of the competition. The regulatory process of training helps the coaches to assess the performance of the player at any moment. For effective regulation of training few points should be kept in mind:

i. Training plan should include aim, sub aim, load, means and methods etc.

ii. Training document should maintain.

iii. Information regarding level of competition and rate of improvement.

## 2.TRAINING MEANS

The main aim of training is to achieve the high sports performance, this high sports performance can only be achieve if the training is done in the scientific and systematic manner. During sports training any object, method or procedure which helps to improve and maintain the performance is called as training means. Similarly any material or immaterial object which helps to achieve the objectives of the sports training is also called as training means. There are various means and methods of training but for better understanding of students/sportsman, teacher/coaches and scientists the training means are classified into two main parts;

## 2.1.PRINCIPAL MEANS

Training means are the important means among all the means for the improvement, maintenance and faster recovery. During sports training the training session should begin carefully so that all the factors of training can be arrange in a systematic and scientific manner. This act of training will helps to ensure the best possible performance.

• Warming Up: - For the effective training warming up is the important aspect which not only raises the temperature of the muscle but also minimizes the possibility of the injury.

• Arrangement of Exercises: - The proper sequential arrangement of the physical exercises is the first and foremost principle which helps to attain the highest performance and quick recovery from fatigue after training.

Exercises are generally classified into three main parts:-

I.Gen exercises: - These types of exercises are taken from other sports in general which do not have any relationship with the movement of any kind of competitive sports. Generally these exercise helps in all kind of sports movement which are not performed with the help of any kind of element or apparatus.

II- Specific exercises:- Specific exercises are of two types I type of exercises are related to the sequence of movement of competitive exercise but this type of exercises deviate from the characteristics of training load. To improve the performance load should be repeated more than the demand. II types of exercises are partial related to the sequence of movements, but they are specifically concerned with the particular event or an individual. These exercises also activated the various muscle in the same manner as desired for particular competitive event.

III-Competitive exercises:- Competitive exercises may be define as the form of movement which are in the sequence of movements and its typical features, corresponds broadly with the demand of specific competitive event.

• Limbering down exercises: - Each training session should be followed by limbering down / cool down exercises should be done for 10 - 15 minutes.

- Low pace exercises: - First of all low pace/ low intensity exercises should be done continuously so as to bring the organism/body to the normal functioning.

- Flexibility & Stretching exercises: - Low pace exercise should be followed by the flexibility & stretching exercise which not only reduce the possibility of fatigue but also helps to remove the metabolic products from the blood cells.

## 2.2.ADDITIONAL MEANS

i. Educational means: During training session the task is to be demonstrate, explain, observe, verbal discussion and some sort of lecture may be delivered. These means will helps the player to gain knowledge about the task, make the movement concept clear this act will not only develop the mental abilities but also motivate the sportsman by creating interest for active participation.

ii. Health & Nutritional means : During and after the training for the improvement and maintenance of health and fitness proper balance diet is to be taken, during training liquid diet rich in minerals and after training session carbohydrate rich diet should be provided to the sportsman.

iii. Physiotherapeutic means: Physio-therapeutic means in the form of massage, ultrasound, sauna bath, cryotherapy and electrotherapy may be used so as to relaxation of body, prevention and rehabilitation of injuries and quick recovery from fatigue.

iv. Psychological means: In training of a sportsman psychology plays an important role in the enhancement of sports performance. Physiological research indicates that the nervous system is responsible for the recovery process and this nervous system is control and regulated by so many psychological factors. Keeping in view the fact psychological means like mental training, autogenic training, auto suggestion, ideo motor training and psycho tonic training means may be used so as to remove the fear, relaxation, develop the confidence and psychological preparation of the athlete/ sportsman.

v. Biomechanical means: There are various biomechanical means in the literature but cinematography is an important mean which not only helps in the assessment of technical training but also provide the feedback regarding the other biomechanical aspect of training.

vi. Natural means: In the training of a sportsman the natural means like weather condition, light, air, water and altitude indirectly affect the performance of the sportsman. Keeping in view the venue of the competition, day and time of the competitive event training of the athlete may be done under

the ideal natural condition so that the sportsman get familiar with all possible circumstances.

vii. Material object means: In sports training material object means like training equipment, apparatus and audiovisual aids may be used as important means so that movement concept become clear, provide feedback to the sportsman and helps to motivate the sportsman to improve their technical and tactical efficiency.

## THIRD COURSE: TRANSFER THE TRAINING

In the field of learning, transfer of training is a topic or area having a wide range. This concept is very important or significant in the field of physical education. A player can learn new skill with greater ease and less difficulty if learning from any previously learned skill is being transferred to the new learning process. With this, learning experience of one gets consolidated.

### 1. CONCEPT OF TRANSFER OF TRAINING

In the field of education, concept of transfer of training is not a new one. It is being used in all kinds of learning and it plays important role in different learning processes as it always takes place within the context of what is learned previously. What is being learned at one stage facilitate progress at the next stage. It is through the result of transfer that familiar learning curve takes place. Learning received in one situation influences the learning acquired in another situation because learning acquired in one situation gets being transferred to the other situation. When the training conditions of two tasks are highly similar, the degree of transfer is greater. Some skills are familiar to each other, because of which they should be taught if not simultaneously, but just after each-other. When learning got during one stage is being transferred to the learning being taking place on next stage, it is known as the transfer of training. The basic principle on which the process of transfer of training is based is that skill learned in one situation can be used or utilised in another situation. There is hardly any skill in which no experience from past learning is being used. The process of transfer is being affected by the amount of practice on the original activity. Under this process, what is learnt with respect of one task is being transferred to the learning of another task, which is being learnt in the future. If during the early part of a series of related tasks, greater effort is being extended, then the transfer will take place in large amount. Acquisition of the subsequent skill will be affected to a lot of extent by the knowledge and understanding of the fundamental principles of previous skill. There are some principles which are common to both the skills, i.e., that is learnt earlier and

which is being learnt in the future, and one should understand the common principles, which will help in transferring the training or knowledge of one skill to another properly. Coach or teacher should teach the skills having some common features in such a sequence that players can retain some points of skill from which training is to be transferred. If the direct practice is readily available, one should not rely on the transfer of training. Process of transfer of training should be used at the next level properly if direct practice is not possible. Where learning a large number of practical situations require a lot of material or time, the transfer of training is of great help and benefit. Thus, transfer of training is a very systematic process which should be done with utmost cautious and care. Teacher should have knowledge of how to manage this process.

Defining the Concept of Transfer of Training Various experts have defined the concept of transfer of training in various ways, some of which are as follows:— In the words of McGeogh and Irion this process takes place whenever the existence of a previously established habit influence the performance of another habit. According to Cratty, the effect which is being produced with the practice of one task upon the performance of another task is known as transfer of training. Crow and Crow has defined the concept of transfer of training as carry-over of habits of thinking, feeling or working from one learning area to another.

**2. KINDS OF TRANSFER OF TRAINING**

There are no certainty of the fact that transfer of training will take place in all the training programmes. When and how this process will take place, it is also even not certain. There are three categories into which transfer of training can be classified, which are discussed asfollows :—

a. Positive Transfer of Training : In this kind of transfer of training, the learning of a previous skill helps in acquiring the other skill. Thus, benefits of earlier learning can be utilised on the acquisition of other skills. This kind of transfer take place on in those situations in which there are some common features of characteristics in two skills. How much similarity is being found is

the factor which determines the quantity in which transfer will take place. For this, it is necessary that the player should keep in his mind the main points of the previously learned skill.

b. Negative Transfer of Training : If the acquisition of particular skill interferes with the learning of subsequent skill, it is known as negative transfer of training. This kind of situation takes place when learner is to make a new response to an old stimulus. Thus, if the previously acquired skill hamper the process of acquisition of new skill, it is known as the negative transfer of training.

c. Zero or No Transfer of Training : As the name suggests, in this kind of process, no part of previously learned skill is being get transferred to the process of learning the new skill. Thus, there will be neither positive transfer nor the negative one. This kind of situation takes place when the skills are totally un-related to each other.

Thus, we can say that generally in the learning process, transfer of training takes place in some extent. Sometimes, it can be positive, sometimes, negative and sometimes zero transfer.

**3.VARIOUS FACTORS AFFECTING TRANSFER OF TRAINING**

There are various factors which affect the process of transfer of training, some of which are as follows :—

i. If there are any kind of similarities between the skills taught and which are going to be taught, transfer of training can take place. Thus, it is the nature or the kind of skill which plays an important role in determining the fact that whether the process of transfer of training will take place or not.

ii. Students can differentiate between the fundamental elements if they are being labelled by the teacher as they can remain stick to the mind of the players or the students for a longer period of time. With this mental activity, analytical capacity of the students and their power to concentrate will increase considerably.

iii. Process of transfer of training will be determined by the fact whether the students to whom skills are being taught are capable of keeping the things

stored in their mind or not. In other words, it is the intelligence level of the students which play an important role in determining the extent to which transfer of training can take place. Only those students can perform this function who have

the ability to keep in their mind all the skills taught earlier. Intelligent students, who possess this quality can easily formulate generate principles which help them in performing this process.

iv. Process of transfer is being affected to a lot of extent by the mental set-up, ideals and the purposes of the students or players. More transfer will take place only in that situation if a player learns or practice a skill with a great interest and enthusiasm. If player does not have any interest in practising the skill, this process will not take place successfully.

**4.DIFFERENT THEORIES OF TRANSFER OF TRAINING**

Various studies have been conducted to find out the mechanism or the means through which process of transfer of training takes place. To explain its mechanism, various theories have been put forward by the experts,some of which are as follows :

a. According to Thorndike and some other experts, transfer of training takes place when some kind of similarities are being found in the skills. If the fundamental objective of various activity is same, one can think of transfer of training. When the conditions or the requirements are almost identical, this process can take place. Transfer of training has an important place in the field of physical education. Experts have suggested to establish the specific habits and training in particular skills which are useful in carrying out desirable behaviour. Thus, this theory suggests that transfer of training takes place when the some tendencies or the behaviour units are identical or common to earlier taught skill and the skill to be taught.

b. Some experts have propounded the theory of formal mental discipline. This doctrine is based on the idea that there are certain mental activities which exercises the mind and as a result of these exercises, general mental agility produces. For producing maximum amount of exercise, difficult exercises

should be undertaken. However, this theory or the view is not supported by the experts of modern times.

c. W.C. Baglay provided the theory of ideals, in which he stated that transfer of training takes place in form of ideals. If the conclusions are being drawn from previous experience are imbibed as ideals of some importance, they can be transferred to the other situations as well. In the field of sports and games, when a player learns to obey different rules, he imbibes the importance of fair play and sportsmanship, and he apply these qualities on the playing ground and also in his general life.

d. Charles H. Judd has propounded the theory of generalisation according to which, when an individual learn something, he tend to make certain conclusions or generalisations. In the subsequent situations, these generalisations affect the process to some extent. It is the on the child's individual discovery of the solution that the transfer of training depends. Teacher should encourage the players to make generalisation from the teaching on their own. It is by the generalisation that students can solve various kinds of problems.

e. According to theory of faculty, human mind is comprised of various faculties which are independent in nature. Each faculty consists of various activities within it. It is only within a particular faculty that the transfer of training can take place. However, later it was said by the

experts that transfer of training cannot take place in the absence of common faculty.

f. Spearman put forth the theory of two factor, in which he stated that all the human beings consist of certain qualities, some of which are general while some are specific in nature. General abilities were termed by him as g-factor, while specific abilities as s-factor. In the activities of general nature transfer of training can take place to more extent, while rate of this process in the case of s factor is less, the reason being that g-factor are common among various activities while s-factors are specific to certain activities only. Thus, experts have tried a lot to find out the mechanism which facilitate the transfer of

training. All the theories are complementary to each other and not contrary. No teacher should try to make this process applicable forcefully in the training programme. Only that part of the skill should be transferred which can actually be transferred, otherwise, objectives of the training cannot be obtained successfully.

## FOURTH COURSE: TRAINING PLANNING

### 1. MEANING

In sports attainment of the high performance is largely depend upon the systematic and scientific approach of training therefore planning finds its important place in sports training. Before organising any activity one has to plan well in advance. The process of sports training helps to develop personality and performance of a sportsman. Planning ensure development in the sports performance therefore it continues for so many years, months, days and even training session too. Planning of any event largely depend upon the nature of the competition in which sportsman has to participate.

### 2.Definition

Planning is an important method to ensure continuous development of personality and sports performance which enable the sportsman to achieve best performance in the training age of high performance.

Principles of Planning:-

Planning is the complex scientific process. The effect of the planning depends upon the so many factors. The principles of planning are discussed in detail for the better understanding of coach, trainer and physical education teacher.

1. Planning should be based on the progressed sports performance:- Basically training is planned in such a way so that best performance can be achieved in future. In other words all kinds of training plan directly or indirectly based on the structure of future performance.

2. Planning should be aimed at personality & performance development: - Training is an educational process as it aims at personality and performance development of the sportsman. So it is essential to plan because without the required attitude, interest, mental capabilities, personality traits, proper habits etc. sportsman cannot be trained effectively for a long period.

3. Planning should be based on the scientific knowledge & experience: - Training is highly scientific procedure as it is a competition oriented process. The scientific method helps the sportsman in much quicker and effective improvement. For the qualitative and quantitative improvement coach should

know the means and methods which are used by the successful sportsman and latest knowledge about the following:

i- Training methodology

ii- Growth and development

iii- Principles and laws of systematic development

4. Planning must ensure harmony among various training plans :- In specific training various types of plans are needed for e.g. Short term & long term plan, individual & group plan. The aim of this plan is in harmony with each other. The short term & long term plan must fit into the long term plan. Individual & groups plans must supplement each other to ensure proper development of an individual & a group.

5. Planning is a continuous process: - Planning is not static it is dynamic process. It can be modified according to the effects & changes in the personality & performance caused by training & other factor. Time to time the planning process may be evaluated.

6. Planning should be based on factors determining performance: - The aim & content of planning must be determined after a careful observation. Plan must include all the factor i.e. time, status, diet, family routine etc. During plan all important factors which have a direct or indirect effect should be carefully considered.

7. Planning must be pragmatic & concrete: - It should be based on verifying fact, scientific knowledge & should not take the form of wild imagination. Whatever is planned must be based on the load tolerance ability otherwise it leads to accumulation of fatigue and overloads.

**3.TYPES OF TRAINING PLANS**

Training plan can be classified according to the duration and according to the number of person involved in the training. According to the duration the training plan of following types:

(i) Training conception

2. Yearly plan

3. Meso-cycle plan

4. Micro - cycle plan

5. Training session plan

(i) Training Conception: As it is clear by the name it self in real sense it is not a plan but a concept for planning and carrying out of training process for a long period. It involves principles and fundamental rules for the formulation of training.

Ø Training plan normally prepared by concerned federation

Ø It is prepared for different level and class of sportsmen.

Ø It is prepared on the basis of analysis

Ø It is also prepared on the basis of international trend.

Ø It form the basis of all kinds of training plans which can be further classified into three:

• Training conception for complete duration.

• Training conception for different stages.

• Training conception for a training cycle longer than

a year i.e. Olympic plan.

(ii) Yearly Plan: These plans are made for the effective formulation and proper implementation of training for the period of one year. The yearly plan is a kind of document in which training details are laid down clearly and precisely. The yearly training document generally contains the

following:

Ø Time available for training.

Ø Level of sportsmen.

Ø Analysis of present state of sportsmen.

Ø Goal and Sub goal.

Ø Performance factor to be achieved.

Ø Information about the training contents.

Ø Sequence of training.

Ø Arrangement of Meso cycles.

Ø Date of competition.

Ø Other relevant information.

(iii) Meso-cycle plan: These plans are perhaps the important plan because in these plans are formulated for the sufficient duration i.e. 3-6 week duration, hence it helps to check the adaptation process caused by training. Meso plan is the important tool for the control and regulation of sports training. Each Meso cycle has its set aims and objectives which are to be achieved by proper formulation and arrangement of micro cycles. These plans are more specific and detailed in comparison to yearly plan. Meso plan is also called as operative plan. After each Meso cycle some sort of test or competition are to be conducted so as to check whether the desire

objectives have been achieved or not. If the aims and objectives are not achieved then the training plan for subsequent Meso cycle has to be changed or readjusted.

(iv) Micro - cycle plan: Micro cycle is the short term plan which form the basis for Meso cycle. Due to short duration of micro cycle desired objectives can be achieved by systematic arranging the load of a sportsman in number of micro cycles and as a result of which adaptation can be achieved in Meso cycle.

In micro cycle plan number of training session are planed with contents in detail. On the basis of this training is carried out in each training session. The planning of micro cycle depends upon several factors such as training state, Meso cycle, nature of sports etc. In planning for micro cycle normally following rules are followed:

1. The degree of load should vary within the micro cycle.
2. The aim and contents of load should vary within the micro cycle but it should ensure optimum load for the development of one or two factors.
3. The aim contents and load in a micro cycle must correspond to the aims and contents of Meso cycle in which it falls.
4. In micro cycle having very high load should provide one or two training sessions for active recovery.
5. In competition period the micro cycle are generally formulated in such a manner that there is no carry over of fatigue from one micro cycle to the next micro cycle.

6. The micro cycle immediately before start of important competition should be formulated in such a manner that the sportsman is able to participate in the competition in a state of super compensation.

(v) Training session plan: Training session plan is the basic unit of training process. The actual process of training is realized in a training session. Keeping in mind the importance of training session it will be discussed separately.

Training plan is also divided into individual and group plan:

* Individual Plan:- Individual plan are more common in individual sports. These plans are necessary to ensure optimum development of sportsman as in individual plan the individual factors form the basis of planning.

* Group Plan:- The group plan are most often used in team games. In the initial stage of training group training plans are generally used to ensure uniform type of training facilitating training of large number of sportsman.

## FIFTH COURSE: TRAINING LOAD AND ADAPTATION PROCESS

## TRAINING LOAD

In sports training load is a central concern / phase through which performance of a sportsman is improved. Every sports training consist of physical exercises / movements which causes fatigue. Fatigue is directly a product of training load which helps in the process of adaptation. Therefore training load and fatigue are important for any kind of sports performance. If load remain constant then there will be stagnation in the performance. Training load helps to stimulate the various organs of a body which helps to adapt these by giving proper shape to the body parts so that the

maximum possible work can be done in a minimum effort. If we seriously look into the matter the word load has not been properly define in the sports sciences. The concept of the term load has been borrowed / derived on the basis of stress in the medical science. It is again question of discussion whether the load is equal to the stress or not, It is quite clear that load is always good for the health whereas stress has its negative effect on the body.

### 1.DEFINITIONS OF LOAD

1. Amount of work done by an individual body is called as load.

2. Load is the psychological and physiological demand put on the organism through motor stimuli resulting in improvement and maintenance of higher performance capacity.

* What is Demand: In sports training and competition demand may be represent as the act of doing physical exercise / movement. The amount of work required for these demands is the product of load factor or components such as quality of movements, types of exercise, load volume and load intensity.

### 2.TYPES OF LOAD

As per the demand of training and competition and as a result of it the rate at which disturbance take place in physiological functions of the body, the load is mainly divided into two parts:

1. External load

2. Internal load.

## 3.FACTORS OF TRAINING LOAD

Load factors also called as features of load or in other words the component of load which all together are included in training load are called as factors of load. The important factors of load are:

### 3.1.Movement Quality

The quality of movement is the subjective factor which cannot be measure properly and precisely. When the correct movements are performed by a sportsman it directly affects the training load. For any kind of technical and tactical process of perfection movement quality become important aspect of training load. By increasing the degree of difficulty of movement training load may be increase gradually.

### 3.2. Types of Exercise

Each and every training load consists of physical exercises/ movements. These exercises have different effect on the performance of an individual as per the nature and demand required by a particular game/ sport. According to the effect, the exercises are classified into three parts :

(i) General exercises

(ii) Specific exercises

(iii)Competitive exercises

These exercises are important means of the training. Every exercise depends upon the body part which involve in a particular movement. Similarly the type of coordination required and the way in which load is given so that it may have different effect on the performance ability of a sportsman.

### 3.3. Load Intensity

The intensity is represented in degree or rate at which work is done in relation to the time. Load intensity is further divided into two parts:

A. Intensity of Stimulus- intensity of stimulus refers to the pace of doing work or pace of doing one single movement. For example: Speed of 100 meter sprint in mt./ sec.

B. Density of Stimulus- Density of the stimulus may be define as the ratio between the load and recovery or it may be understood as the pause / rest between the two motor movement or set of movement. For example: Rest period between the two sprint of 100 meter.

### 3.4. Load Volume

The load volume may be defined as total work done in one training session. The load volume is also divided into two parts :

A. Duration of Stimulus- It may be expressed in time/ distance in a single stimulus and set of stimuli. For example: total time take in 100 mt. sprint/ distance of one repetition.

B. Frequency of Stimulus- frequency of stimulus may be define as the number of repetitions in one set of exercises. For example: In practice of 100 meter sprint 10 times in which 10 will be the frequency of stimulus / movement.

## 4.PRINCIPLES OF TRAINING LOAD

### 4.1. Principle of continuity and long term

The load should be continuously means there should not be any break in the training. The load given to a sportsman should be followed for a long period of time which keeps the body to maximum adaptation.

### 4.2. Principle of progression of load

Same kind of load for a long period does not effect much hence the progression of load is necessary load may be progress in linear / step form method. Frequency

Ist improve volume

-Duration

-Density

IIndIntensity

-Intensity proper

-Density.

### 4.3. Principle of Variation increase load

Linear increase of load may be assess/ measure in every training session which is applicable to beginners. -Step method is maintain for long period after

proper adaptation process it increased further which is applicable to advance athlete/ sportsman.

**4.4. Principle of load and adaptation**

Load should be increase after attainment of phase of super compensation.

**4.5. Load should be optimum as per the individual capacity**

optimum load should be given as per nthe individual capacity of a sportsman.

**4.6. Proper and sufficient rest between two training session:**

Proper proportion between load and recovery should be maintain so as to get the maximum benefit of adaptation process.

**4.7. Principle of general and specific load**

Among beginners one kind of load improves so many factors where as in case of advance athlete same kind of load develops only one factor. Hence specific load should be given to improve the performance of desired event. For e. g. 100 mt. sprint.

**4.8. Principle of proper ratio between intensity and volume**

If intensity is high volume should be low and vice versa.

**4.9.Load should be administered by training cycles**

The administration of load should be done according to the training cycles so as to get the maximum benefit of adaptation in main competition.

**5.JUDGEMENT OF TRAINING LOAD (Objective and Subjective Means)**

Training is the indispensable means of performance improvement. The quantum of load has to be optimum to get the best possible results therefore the training should be plan regulated and evaluated from time to time. This is possible only when we can measure the load. Unfortunately there is no such precise/accurate/ reliable method to measure the load. The administration of training load is also vary from according to the training age of a sportsman. In this regard for beginners training load may be given once in a day where as in case of advance players load should be given twice a day. However with the help of psychological and medical science some objective and subjective

means have been derived which are commonly used by the coaches and training expert for judging the training load.

**5.1. Objective Means**

In this method generally we assess the physiological and biochemical changes during the training and just after the training session. To judge the training load of a sportsman following objective means may be used:

i. Heart rate

ii. Body weight

iii. Intensity of load

iv. Volume of load

v. Oxygen consumption

vi. Lactic acid concentration

vii. Blood urea concentration

viii. Other biochemical changes in the body

**5.2. Subjective Means**

The subjective means to judge the training load need to have specific equipment and expert in the field. This is not easy but cost by too. Hence the coach and expert largely depend upon the subjective method to assess the training load. In this method the judgment of training load is done by assessing/judging the external symptoms of a sportsman. In this method to assess the training load one should be well aware of the following factors:-

i. Behaviour of a player

ii. Face reading of sportsman

iii. Movement of a player

iv. Colour of the skin

v. Increase quantity of sweat

vi. Error committed by a player in performing technique

vii. Increase respiratory rate

viii. Feeling pain in the muscle

ix. Features of face

x. By seeing the performance action

xi. Body movement

xii. General experience of coach

## 6.MEANING OF OVER LOAD

During training of a sportsman load is given to the players as per their capacity when ever this load goes beyond the capacity of an individual the physiological and psychological function of the sportsman get disturb. This load does not effect immediate if the administration of the overload continue for a longer period it leads/causes decrease in the performance capacity of an individual. In general all the physical activity are performed by the muscular system as per the metabolic efficiency of the body. This muscular system and metabolic system largely depend or control by the nervous system of the body. When the nervous system disturb the whole system of the body get disturb which also causes the decrease in capacity to perform any physical task. It happen in the past that over load adversely effect the achievement of the training but in modern trend sports scientist are in the opinion that over load occur due to the so many reason. If symptoms of the over load are diagnose and causes are identified then the over load may be avoided or it may be completely eliminated from the training of a sportsman.

## 7.CAUSES OF OVER LOAD

Over load occurs due to the so many reasons but some of the important causes of overload are as follows:

### 7.1. Improper use of training method

During training of a sportsman if the training method is not used properly or there is error or fault in the training method it may lead to an over load. It may be understood in the following ways:

i. Immediate increase of training load does nod lead to any adaptation which causes over load.

ii. If the recovery is ignored in relation to training load it may cause over load.

iii. If proper proportion between intensity & volume is not maintained then it may lead to over load.

iv. High intensity in endurance event training may cause over load.

v. High volume in sprinting event will also lead to over load.

vi. Participation in too many competitions may also cause over load.

vii. Ignorance of other training means may also cause over load.

**7.2. Life Style of a Player**

For any kind of high class performance high degree of discipline is expected by the sportsman failing which condition of over load may occurs. Following points in relation to life style of a sportsman may be understood as the causes of over load:

i. Improper rest or sleep may cause overload.

ii. Not taking meal in the time may also cause overload.

iii. Use of alcohol, nicotine tobacco may also lead to overload.

iv. Dirty dress, unhygienic living condition may also cause overload.

v. Aggressive and derogative attitude may also cause overload.

vi. Engagement in unwanted / dirty activities in free time also causes over load.

**7.3. Socio-Environmental Causes**

Every individual or sportsman lives in the society and he/she has to adjust in the society according to the socio environmental condition. When an individual engage in sports traininghe may lead to over load because of the so many reasons.

i.Family tension

ii. Too much engagement in family work

iii. Lack of family support

iv. Lack of coordination with subordinates

v. Mental load due to the study

vi. Poor result of the examination

vii. Too much engagement in entertainment

viii. Negative attitude of society towards sports

**7.4. Health Related Causes**

Health of an individual is the main factor which contributes lot to the sports performance. If any of the health factor lack during the training it may cause over load:-

i. Cough and cold

ii. Any kind of fever

iii. Disturbance in digestive system

iv. Any kind of injury

v. Infection

**8.SYMPTOMS OF OVER LOAD**

The various symptoms to identify the over load may nbe understood in the following ways:-

1. Changes in psychic behaviour of a sportsman

i. Over excited

ii. Doubt in mind

iii. Attitude towards criticism

iv. Loss faith in coach

v. Loss of motivation

vi. Loss of confidence

vii. Feeling of depression

viii. Depression

ix. Indifferent behaviour

x. Uneasiness

2. Performance Symptoms:

i. Decrease in coordinative efficiency

ii. Tension in movement pattern

iii. Poor movement flow

iv. Chances of injury

v. Concentration ability decreases

vi. Recovery period is delayed

vii. Competitive fear

viii. Loose temper immediately

ix. Forget team tactics and strategy

x. Chances of error increase

xi. Surrender in tough competition especially at the end of event

xii. Decrease efficiency of readiness

3. Somatic functional symptoms

i. Loss of sleep.

ii. Loss of appetite.

iii. Decrease in body weight.

iv. Digestive system disturb.

v. Vital capacity decreases.

vi. Recovery rate decrease.

vii. Chances of injury and infection.

**9.TACKLING OF OVER LOAD**

Tackling of over load is a serious problem especially when the over load reaches to the advance stage it become very difficult task to manage. During training coach is the central concern hence he / she needs to work with a team of sportsman, doctors, psychologist even than if at all it required he should take family members in confidence. While organising the process of tackling the over load following measures can be taken into an account:-

**9.1. Training Measures**

i. Recognize the causes as earliest as possible

ii. Remove the causes of over load.

iii. Modify the training.

iv. If necessary re plan the training.

v. Avoid trials /competition.

vi. Complete rest is not advisable.

vii. Again start training when symptoms of over load seems to decrease.

viii. Intensity of load should be increase first.

ix. Load volume should be increase carefully.

**9.2. Nutritional Measures**

i. To increase appetite food like milk vegetable and fruits may be given.

ii. Decrease the quantity of protein in food.

iii. No tea, coffee and cigarettes should be provided to the sportsman.

iv. Small quantity of light alcohol is advise after meal.

v. Heavy doses of vitamin A,B & C should be provided.

**9.3. Physical Therapy**

i. Sportsman should expose to open air swimming.

ii. Warm bath 15 - 20 minutes at 330c to 370c temperature may be given.

iii. Cold and fresh water shower in the morning should be followed by proper rubbing massage by towels.

iv. Rhythmic exercises with the help of music may be given.

v. Sona bath and steam bath should be avoided completely. (Body loose lots of electrolytes)

**9.4. Climate Therapy**

i. Change in the environment for e.g. Hill area to plan region.

ii. Light sun rays treatment is advise.

**10.ADAPTATION PROCESS**

Indeed the nature and process of adaptation which include both physiological and psychological aspect of training not yet derived completely. Whenever any sportsman participates in sports training or competition in which muscles of the body are made to contract through exercise or movement as per the demand of the body in relation to particular sports. This continuous act of movement needs more energy which is produce by carbohydrarate, protein and fat etc in the human body. For the quick and immediate requirement of the energy carbohydrarate is the main source of energy. When movement / exercise continue for quite long period there is decrease in the energy substance take place. For the fulfillment of this energy requirement metabolic process take place in the body as a result of which some compound chemical produce out of which one of the chemical compound is known as lactic acid. As the physical exercises are performed comparatively for more time the amount of lactic acid increase in the muscle which causes fatigue in the body. If we are able to provide a correct ratio of recovery during training which helps to control the quantity of lactic acid in the muscle and gradually one passes through the limit of fatigue. In this context it may be understood that recovery is directly related with the result of fatigue.

## 11.LOAD AND ADAPTATION

During the sports training and competition the load is given in the form of exercises or movements as per the demand of the body in relation to the particular sports or event. Therefore the process of demand create disturbance in the Psycho-Physiological state of the human body. To overcome this problem all the structural and functional parts acts together to regain the normal condition of the organism. When the process of loading continue for a longer time specially in days then the structural and metabolic changes take place in the human body. The continuous acts of exercises/ movements lead to tolerate the more loads as a result of which adjusting to the external conditions the performance capacity increases. This way tackling of load is termed as adaptation. Adaptation:- Adaptation may be define as the adjustment of physical and psychological functional systems accomplished under the influence of external load, to a higher performance standard and the adjustment to the specific external conditions. The physical and psychological adaptation is the similar process which brings about changes in the functional, biomechanical and structural changes in the human body.

## 12.LAWS / RULES / CONDITION OF ADAPTATION

There is direct relationship between the load and adaptation. This relationship is governed by certain laws which are called as laws of adaptation which are explained

as under:- Optimum load leads to better adaptation- The load should be given as per the capacity of in individual because if the load is less adaptation will not start similarly if the load is high recovery process is delayed.

- Correct proportion between load and recovery- Better adaptation always needs the maintenance of correct proportion between load and recovery. There should be proper rest between training sessions. Due to hetrochronocity the various organs of the body recover at different pace hence complete rest may be provide at the end of a week.

- Adaptation is faster in beginners in comparison to trained sportsman - for the better adaptation in case of beginners the load should be given in linear form where as for trained sportsman it should be given as per the individual capacity.

- Exposure to new and inhabitable exercises leads to faster adaptation - If a sportsman expose to new and inhabitable specific exercises the adaptation process will be faster among trained sportsman.

- Specific load leads to specific development - In case of trained sportsman load given in the specific exercises suitable for the particular game leads to better adaptation process.

For e.g. If we want to improve the speed of basketball players, than the load should be given in the form of specific exercises with the ball.

-Correct proportion between load tolerance and training load:- It is true that if the correct proportion between load tolerance and training load is maintained then the performance will improve gradually which will lead to better adaptation process.

-Adaptation is not permanent through training load: There are various stages of the competition the preparation for the competition through training load not lead to stable adaptation if the training is stopped the load will adapt at lower level if the training is continue then the adaptation process will also improve.

- For optimum adaptation maximum load is essential: Stable load does not lead to any improvement in adaptation process therefore for the optimum level of adaptation 2 -3 times in a year the maximum load should be given.

- Adaptation is faster if perfect ratio between intensity and volume is maintained: For the faster adaptation if the volume is high intensity should be low similarly if the intensity is high volume should be low.

- Continuity in training and load factor: Once / twice load given to a player does not lead to any kind of adaptation process. Hence training should continue for so many days and load should be given regularly as per the capacity of the sportsman.

- Adaptation leads in duration which is required for the structure of training load: The adaptation process varies from time to time as per the requirement and structure of training load.
- Variation in training means quick phase of super compensation: It is very difficult to create the phase of super compensation at the faster rate but variation in training means create quick phase of super compensation.

**13. LOAD AND RECOVERY RELATIONSHIP BETWEEN LOAD AND RECOVERY FACTORS AFFECTING RECOVERY**

(i) Intensity of Load: Sportsman recovers from intensive load because high intensity causes faster fatigue but after activity the recovery is also faster.

(ii) Volume of Load: Sportsman recovers slow from volume load. Because high volume causes slow fatigue but after activity it also makes the recovery process delayed.

(iii) Nature of Load: After training load one need to recover from fatigue. This recovery process is fulfilled by production of energy through ATP-CP system and depletion of glycogen. ATP system caused faster recovery where as glycogen cause or take long time to recover.

(iv) Health: Recovery process is control by central nervous system which is influence by the hormonal interaction. Hence the sound health is the prime characteristics of faster recovery.

(v) Physical Fitness: A physically fit person recovers faster in comparison to sedentary person. Basic endurance is important factor and specific endurance may help in faster recovery.

(vi) Nutrition: Balance diet containing all required nutrients are important for faster recovery, after training meal like carbohydrate sodium potassium and vitamins taken into liquid form are good for quick recovery. Similarly meal taken five times a day in fixed time and good eating habits are considered to be ideal for faster recovery.

(vii) Sleep: 7-8 hours of sound sleep is established fact for recovery it not only recover physiologically but psychological too.

(viii) Daily Routine: Proper daily routine helps to improve the recovery process. A set routine of a sportsman in the form of circular bio rhythm, if the process is disturbed than the recovery process is affected adversely.

(ix) Total Load: The sum offload given in a day directly influence the recovery process. If the lod is beyond the capacity of a sportsman than the recovery process is delayed.

(x) Age: Youngman recover faster in comparison to older one.

(xi) Sex: Recovery process is slower in female in comparison to male.

(xii) Experience: Experience people recover faster and quicker due to the movement quality of a sportsman.

(xiii) Climatic Factors: In colder places sportsman recover faster in comparison to hot places.

## 14. MEANS OF FASTER RECOVERY

Training Methodological Means

(a)Macro Cycle: Generally this is the period which is decided into preparatory, competition and transitional period. During the transitional period after the hard preparatory and competition period, the exercises done at low pace with medium volume are very much effective for recovery process. In other way the correct formulation of load dynamics in a macro cycle helps to prevent accumulation of fatigue.

(b) Meso Cycle: The Meso cycle have a normal duration of 3-6 week after each Meso cycle a week time is devoted for the recovery process. Again low training load is helpful to achieve the faster recovery. In Meso cycle the use of general exercises with proper adjustment of load dynamics is also important for prevention and accumulation of fatigue.

(c) Micro Cycle: Since the duration of micro cycle is very short i.e., about one week hence in this period the recovery can be ensured by doing the following :

i. Training load should not remain constant

ii. There should be variation in Training i.e. strength training.

iii. During this period one or two Training session of about 60-90 min should be devoted for active recovery.

iv. At the end of micro cycle complete rest should be given.

(d) Training Session

i. Warming - Up

ii. Sequence of exercises and task

iii. Rest Pauses

iv. Cool Down

Nutritional Means

(a) Sportsman is advised to take balance diet

(b) After Training session light digestive drinks containing carbohydrates, minerals and vitamins are suggested for faster recovery.

(c) Inculcate the good eating habits in fixed time. Physiotherapeutic Means

(a) Physiotherapeutic means should be selected

carefully with the consultation of experts.

(b) Sona bath should not be used more than twice a week

(c) Physiotherapeutic means should be used in addition to the training means but these means should not substitute the training means. Psychological means Psychological means are also helpful for accelerating the recovery process. These means should not be used during training or just after the competition but use of psychological means between the training sessions or just before the sleep are very much useful for sound sleep.

## SIXTH COURSE: TRAINING METHODS

### 1.DEFINITIONS OF TRAINING

According to Martin, “Sports training is a planed and controlled process of achieving goals in which the changes of motor performance and behaviour are made through measures of content, methods and organizations.” According to Mathew, “Sports training is the basic form of preparation of sportsmen.” According to Thiess and Schnabel, “Sports training is scientifically based and pedagogically organised process which through planned and systematic, effect on performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competitions." According to Harre, “Sports training, based on scientific knowledge, is a pedagogical process of sports perfection which through systematic effect on psycho-physical performance ability and performance readiness aims at leading the sportsman to high and the highest performance. Through active and conscious interaction with the given demands in sports training, the sportsman's personality develops according to the norms and standards of socialist society.”

### 2.MEANING OF TRAINING METHODS

Training methods is highly a specialized field, which aims for high performance level. Training to improve fitness components and other required aspects. This methodology cover wide area of physiological, Psychological and social aspects, apart from these the individual also, works on technique tactics, skill and strategy of related activity. This is again applicable differently to every individual, though can be designed for groups also. In the field of sports and games keeping individual differences in consideration is valuable, Every method is known for its special component, therefore it is required to know by a trainer that which athlete require which component or quality more. Training is well in advance organized programme with an aim of optimum performance. Training is a basic process of preparation for the highest level of performance, this preparation can be for any kind of activity. It is physiological, psychological, intellectual preparation of an individual in a systematic instructional process to assist the athlete for achieving highest possible

performance. Training is a systematic and scientifically designed work out of physical exercises and mental preparedness for the attainment of optimum level of performance. Training is a process designed for the development of various motor and psychological qualities need specifically by individual who is under straining to perform at best possible level in competition. Training is a programme organized to achieve all needed aspects of physical fitness, technical and tactical demands and psychological preparedness, which increases the capabilities of performer.

## 3.METHODS IN SPORTS TRAINING

Methods of training show the correct and different ways to develop the fitness components. Each method aims to develop one or the other component. The selection of method depends upon period of training level of athlete, age and sex of athlete etc and the selection of correct method for needed type of training is very important. Below some training methods are presented which aims for the development of three basic components of physical fitness and wellness i.e. STRENGTH, ENDURANCE AND SPEED.

### 3.1.METHODS OF STRENGTH DEVELOPMENT

Three common effective methods of muscular strength development are:

(i) Isotonic Exercises

(ii) Isometric Exercises

(iii) Isokinetic Exercises

#### 3.1.1. ISOTONIC EXERCISES

'Iso' means 'same' 'Tonic' means 'tension'/'resistance'. Isotonic exercises are those contracting exercises where the load taken by related muscles remains constant throughout the complete range of joint. As movement of muscles involved this contraction is rhythmic in nature. It is characterized by constant resistance on muscles involved in complete motion. In Isotonic contraction length of related muscles keeps on changing with no variation in load. Example Bicep curls with constant weight. It involves

(i)concentric and (ii) Eccentric contractions.

(i) Concentric contraction: Any movement characterized by shortening (Principle action of muscles) of flexor muscle and lengthening of extensor muscle. Concentric contraction is commonly known as Shortening Contraction ( the prime muscle actually shortens).

(ii) Eccentric contraction: Any movement characterized by shortening of extensor muscle and lengthening of flexor muscle. Eccentric contraction is commonly known as Lengthening Contraction.

### 3.1.1.1.ADVANTAGES OF ISOTONIC CONTRACTION

a) It involves basic movements (flexion and extension etc) of joints,. Basic fundamental movements are easy to perform.

b) Muscle endurance is the assistant component developed.

c) Fast gain of muscle hypertrophy (increased thickness).

d) Somebody weight can be used to perform exercises (situps etc)

e) Helpful in development of some specific skills. Skills which need undamental movements of javelin throwing, basketball shooting etc.

f) It is an effective method to develop dynamic strength.

### 3.1.1.2.DISADVANTAGES OF ISOTONIC CONTRACTION

a) Chances to have soft tissue injuries as it is dynamic in nature.

b) For effective results, sometimes good equipments are required.

c) These exercises can not be performed anywhere (eg squat etc).

### 3.1.2. ISOMETRIC EXERCISES

'Iso' means 'same' 'Metric' means 'length'. Isometric exercises are those contracting exercises where the length of related muscles remains constant throughout the workout. It is characterized by not any kind of change in the length of muscle involved. As no movement can be performed no change in length of related muscle this contraction is static in nature. These exercises involve the tension (tension is developed) but there cannot be any change in length of related muscle holding weight in static position. Pushing against any object without overcoming resistance are the common examples of isometric exercises.

### 3.1.2.1.ADVANTAGES OF ISOMETRIC CONTRACTION

a) Essential activity of Rehabilitative programme. In the recovery phase injured athlete goes for this type of contraction. (Intensity of workout depends upon stage of recovery)

b) Iso metric contraction can be performed without any equipment. (Using body weight).

c) Isometric exercises can be performed anywhere.

d) As there is no rest phase in isometric contraction, involved muscles working efficiency improves.

e) It is helpful in development of specific slalls, which need static movements of - shooting, archery etc.

f) It is an effective method to develop static strength, (Maximum strength).

g) Muscle endurance, is an assistant component developed.

### 3.1.2.2.DISADVANTAGES OF ISOMETRIC

(i) Isometric exercises can not be the part of daily training programme. It can cause lose of interest

(ii) Quick release of tension may cause injuries.

(iii) During Isometric contraction blood pressure raises, this may lead to serious consequences.

(iv) Athletes of major games do not prefer to put much concentration on isometric exercises.

### 3.1.3. ISOKINETIC EXERCISES

'Iso' means 'same' "Kinetic' means 'motion'. Isokinetic exercises are those contractual exercises the tension in flexor throughout the movement. Isokinetic exercises are characterized with constant speed. In these exercises maximal contraction occurs throughout the full range of motion. As Isokinetic involves movement of joints, these are dynamic in natur but require advanced and special machines/equipments (eg multigym etc) to perform.

### 3.1.3.1.ADVANTAGES OF ISOKINETIC

Isokinetic is method for

(a) Fast development of involved muscles.

(b) Isokinetic exercises develop flexor muscle and extensor muscle simultaneously.

(c) It requires less effort in compaired with Isometric or Isotonic.

(d) t is helpful in development of specific skills likeswimming, cycling etc.

(e) Muscle endurance and speed are assistant components developed.

### 3.1.3.2.DISADVANTAGES OF ISOKINETICS

a) Controlled is kinetic contraction can be performed with equipments only.

b) Is kinetic equipments are advanced therefore need good maintenance.

c) It is a advanced method therefore require special supervision on performer.

d) It cannot be performed anywhere.

## 3.2.METHODS OF ENDURANCE DEVELOPMENT

Three effective methods of endurance development are:

1. Continuous Training Method
2. Interval Training Method
3. Fartlek Training Method

### 3.2.1. CONTINUOUS TRAINING METHOD

Dr. V. Aaken is the main head behind inventing this effective method for endurance development. The rest intervals in the training programme are missing. It is a continuous workout without any break. This method is generally used once in a week in advanced training programme. This method is also used for beginners with low intensity. There are three type of continuous training method:

(a) Slow Continuous Method

(b) Fast continuous Method

(c) Slow fast (alternate) continuous method.

a) Slow continuous method- In this method athlete runs slower from his racing pace but on the other paint he runs more distance than the actual race. This is mainly used by 'Marathon' runners or even very effective for long distance track events. General athlete also adopts this method with approximately covering 25-30 kms. It took 30 to 40 minute extra than the completion timing. Heartbeat goes about 160 per minute.

b) Fast continuous method- In this method athlete runs faster from his racing pace but the distance covered is decreased if compaired to actual race distance. This method is mainly used by medium distance runners.

General athletes also adopt this method with approximately covering 5 to 10 Kms. It took about 5 to 8 minutes less time, depends upon distance reduced and intensity increased. Heartbeat goes about 190 per minute.

c) Slow fast continuous method- In this method the athlete running pace varies or the running pace is not fixed in this method. It is a combination of slow and fast running. This method is very general in nature and can be used by beginners. This method is adopted by almost in every game and sport-conditioning programme. The time variation of slow running and fast running decides the intensity here. This method covers approximate 10 -15 Km of distance and the heartbeat goes about 200 per minute. (This method ends up in fast running pace.)

**3.2.1.1.Advantages of continuous method**

(I) This method does not require any special guidance lean be performed easily by beginners.

(II) This method gives out good experience about actual competition. For example - Marathon

(III) It is effective method during off season for maintaining endurance.

(IV) As variation in pace can be made, this method is well adjustable from athlete's points of view.

(V) This method does not require any specific ground. (Roads are the best & easiest way, but safety must be there)

(VI) Develop both Aerobic and Anaerobic endurance. Disadvantages of continuous method

(I) This method sometimes requires good knowledge of time and pace managements.

(II) It is difficult to apply this method on a group at a time. This is mainly a individuals training programme.

### 3.2.2. INTERVAL TRAINING METHOD

Woldermar Gershler is the person who introduced this method. The rest period during workout is the main part in this method. The load of work in this method is mainly decided by taking the period pf rest in consideration. In this method the heart rate in intervals between the runs is controlling factor. After workout the heart rate in the rest period when comes around 120 beats per minute, the athlete is allowed to restart the work out in same manner as was in previous. The duration of rest period when comes around 120 beats per minute, the athlete is allowed to restart the workout in some manner as was in previous. The duration of rest period must be of 80-90 seconds ( if target is to get 120 beats per minute in resting heart rate).The duration here also decided the work load. Interval training method is mainly used by advanced coaches and athletes. Interval training in general is short breaks alternating with intensive short workout. Three type of Interval training area.

#### 3.2.2.1. Target Running

In this type of interval method runner fixed "Distance or Time as a target and start with a slow pace running to racing pace upto the target. After getting the target (Distance or time) athlete again shows down his/her running pace. This work outs is followed by Intervals. The duration of intervals depend upon the difficulty level of target and athletes potential. In short it is a continuous running with increasing speed. This is mainly adopted by short and medium distance runners. This method consists of 5-6 intervals and to duration is 60-120 minutes.

**3.2.2.2. Repeat Running**-In this method runner keeps on repeating the work out of running at or above the race pace after each rest period. Here also runner runs for a given distance or time this is also applied mainly by short and medium distance runners. It is also practiced by players of major games like foot ball players, basket ball players etc. the integral duration differ individual to individual. This method consists of 3-A intervals and its duration is 60-90 minutes.

### 3.2.2.3. Formal Running

In this runner covers the racing distance (competition distance)..Within a well-decided time as good Athlete go for formal running distance and try to achieve that given distance within specified distance. This method is mainly used by short distance runners. This method consists of 4-5 intervals and its duration is 60-120 minutes.

### 3.2.3.Advantages of Interval Training Method

i. It improves both energy producing system that is AEROBIC and ANAERIOBIC.

ii. Speed is the assistant component developed by this method.

i. This method requires less time period if compared to continuous method.

ii. This method having less strain if compared to other method of endurance development.

iii. It gives good competitive experience, mainly by Formal running method.

iv. Preferred to every athlete of any games or sport for endurance development.

v. Components of load (intensity, volume etc) can be managed easily in this method.

### 3.2.4.Disadvantages of Interval Training Methods.

i. This method requires well-trained coaches or good knowledge of training methodology.

ii. It requires well-marked track, indicators for distance covered and timers etc.

### 3.2.5.FARTLEK TRAINING METHOD

Astrand is the person who introduced this method; Fartlek is a modified cross-country running. This method is characterized by variable running paces, no active rest is provided. Rather the slow running (jogging) is the rest period in this method and athlete runs on the road, terrain path, park land, small mills etc. The fast running period with the recovery (slow running) periods works alternately and depends upon the athlete's adoption of load. Fertlek is an advanced training method and mainly used by distance runners. It is performed by well experiences and advanced athletes because it has no predetermined

schedule to follow. The length of both periods (fast running pace and recovery interval) can be changed during workout. Self-awareness and highly pace judgment skills are required to experience different running paces and long short recovery intervals as demanded. Fartlek is also very effective for athlete of every games and sports. Number of intervals depends upon athlete's workout level and immediate fitness level. There is no preplanned duration or distance or number of intervals in this ,method. An average athlete may cover 20-40 kms. (or more ). Advantages of Fartlek training Method

i. It develops self-awareness and pace judgement skills in an athlete.

ii. It gives opportunity to athlete to experiment his fitness level by increasing racing pace and checking fitness of recovery period.

iii. It is an adventurous and creative effort (This create interest in athlete).

iv. It is effectively applicable to all athletes (athlete any game or sport)

vi. Fartlek method athlete is independent to perform in the way he/she likes.

vii. It can also be practiced off season. Disadvantages of Fartlek Method.

i. Fartlek method requires well-trained coaches and good knowledge of training Methodology.

ii. As nothing is very specifically perished led, this method is mainly for advanced athletes.

iii. Path followed/Track selection may cause harms. If unknowlgly it involves slippery runway, thorns etc. Athlete sometime last actual path also.

iv. It is hard to measure actual distanced covered by athlete.

**3.3.METHODS OF SPEED DEVELOPMENT**

Two effective methods of speed developmentsi. Acceleration Runs.

ii. Pace runs.

In every speed workout three phases arrives that is.

a) Acceleration phase-This includes starting to achieve the race pace by an athlete. This is a process of speeding up of athlete.

b) Racing phase-This includes the racing pace. This is a process where athlete runs allot and at the maximum speed possible.

c) Deceleration Phase- This includes the showing down from racing phase. Athlete cannot stop him self abruptly. Therefore the deceleration phase is adopted properly.

### 3.3.1. ACCELERATION RUN METHOD

In this method the more emphasis is given on first phase of speed workout (Acceleration Phase). In this method athlete concentrates on starting and then gaining the maximum speed as fast as possible, but he/she does not maintain the maximum speed. Athlete tries to slow down easily just after gaining maximum speed. Therefore acceleration on run method has always I phase longer compared to II and II Phase of speed workout, with II phase as of shortest duration. In this method athlete may not prefer formal start initially (starting slowly and the trying to touch the II phase as fast as possible). Number of repetitions and intervals depend upon athletes ability. An average athlete may go for 8 to 12 repetitions with 60-120 sec of rest intervals.

#### 3.3.1.1.ADVANTAGES OF ACCELERATION RUN METHOD

(i) It is highly effective for sprinters.

(ii) It assists in skill developments like better start,etc.

(iii) Acceleration run method helps athlete in understanding his/her own running approach of understanding the changes in length of strides needed at different phases body balance etc.

#### 3.3.1.2.DISADVANTAGES OF ACCELERATION RUN METHOD

(i) Changes of injuries are more because quick changes of phases is required e.g. muscle pull, over streatching of ligaments, ankle strain, back pain etc.

(ii) Well prepared and maintained track is required.

(iii) It is harmful if performed on hard surface and with out proper general and very specific warming up.

### 3.3.2 PACE RUN METHOD

Pace run method is of two types:

(a) RACING PACE RUN METHOD

In this method the more emphasis is given on record phase of speed workout (Racing Phase). In this method athlete concentrates on Racing Pace (Pace

require in competition) and try to maintain that pace. The duration or distance of II Phase (racing phase) in this method is always longer than the actual. This method is highly beneficial for sprinters or short distance runners. Number of repetitions and intervals depend upon athletes load taking ability (anaerobic capacity). An average athlete may go for 6-8 repetitions with 90-120 secs of rest intervals.

### 3.3.3. VARIED PACE RUN METHOD:

In this method athlete runs with variation in running pace. This method is very effective for speed controlling. Athletes runs in various paces and try to maintain every changed pace for short duration. This method is therefore very taxy and mainly adopted by advanced athletes. The athlete makes changes in the running pace by their own or by the indication given through coach. Speeding up or slowing down from running pace can also be settled by ground distance or time elapsed.

#### 3.3.3.1.ADVANTAGES OF PACE RUN METHOD

(i) By practicing this method athlete gets good hold on pace controlling.

(ii) Athlete of any game and sports can adopt it.

(iii) It helps athlete in understanding his/her own running approach.

(iv) This method helps athlete to manage pace as demanded in competition.

#### 3.3.3.2.DISADVANTAGES OF PACE RUN METHOD

(i) Well-prepared and maintained track is required.

(ii) This method needs good coaching and planning;

otherwise athlete may go under overload.

CIRCUIT TRAINING

R.E. Morgan and G.T. Adamson introduced circuit training in 1953. This training programme involves almost every component of fitness and is very scientific and effective. In circuit training different specific exercises are performed in a sequence. In this programme selected exercises are to be performed at different stations. There can be 5 to 10 stations in a single training programme with 2 to 4 sets. Athlete performs specific exercise of each station and as soon as he/she finishes the exercise will rush other station for next

specified exercise. Duration of performing exercise in each station is also specified; degree of difficulty can be increased or decreased, depending upon the objective of training. Distance between each station also plays its role in adjusting the load. Circuit training can be formed to develop one or two fitness components, depends upon the type of nature of game and requirement of fitness components. It can also be designed by putting main concentration on same muscle group. Circuit training is very interesting and creative activity proper instructions and clear objective and good deconstruction is very essential before undergoing circuit training. Circuit training is preferably for advanced athletes.

## SEVENTH COURSE: FLEXIBILITY

### 1. MEANING

Flexibility is a kind of motor ability in real sense neither it is a conditional ability nor it is a coordinative ability. Some part of the flexibility depends upon the energy liberation process where as other part of it is controlled and regulated by the central nervous system. There are various terms are used synonym to the flexibility which are stretchability, elasticity, suppleness and mobility. In scientific sense the flexibility is much more then that these terms actually means.

### 2. DEFINITION

Flexibility may be defined as the ability to perform movement with greater amplitude (wide range) or in other words it may be defined as the range of movement possible around a specific joint. Stretchability & Elasticity are the qualities of the muscle and ligament by which they stretch and regain to its normal position without any adverse effect. Suppleness is the ability of the muscle to remain in low tension which helps to perform the movement easily. Mobility is related to the degree of movement possible in different planes at a joint. Improving flexibility through stretching is another important aspect for preparatory activity. It has been advocated that through better flexibility a sportsman or a player can achieve the following advantage (importance)-

(i) It helps to improve physical performance.

(ii) It helps to execute/perform the skills more efficiently and gracefully.

(iii)It helps in prevention of sports related injuries.

(iv)It helps to increase elasticity of the muscle and ligaments; hence wider range of motion is possible.

(v) Better elasticity leads to forceful contraction.

### 3.FORMS/TYPES OF FLEXIBILITY

### 3.1.PASSIVE FLEXIBILITY

It is the ability to perform movements with wider range with some external helps.

Example:- Partner exercise (stretching exercise)

### 3.2.ACTIVE FLEXIBILITY

It is the ability to perform movements with larger amplitude without any external help.

Example:- Swinging of legs

### 3.3. DYNAMIC FLEXIBILITY

It is the ability to perform movements with greater amplitude when the body is in motion. Dynamic flexibility is more specific to sports movements.

Examples:- Running and taking sammer Sault in gymnastics.

### 4.FACTORS DETERMINING FLEXIBILITY

Though there are many factors which determine the flexibility of a particular joint however some of the factors are being discussed as follows:-

### 4.1. Anatomical structure of a joint

When two or more bone join together with the help of ligament. In that case the structure of the bone ends decide the possible movement in a joint.

Example: Shoulder joint is much more flexible in comparison to elbow and knee joint.

### 4.2. Attachment of the muscle and ligament at a joint

The arrangement of muscle and ligament at a joint determine the possible movement which can take place. Example: Long length attachment of ligament helps to execute the movement with wide range and also avoid the chances of injury.

### 4.3. Muscle strength

An individual with less strength can perform the movement with wide range but in case of active flexibility the strength of the muscle contribute a lot to the range of movement.

### 4.4. Coordination

It is well known fact that some part of the flexibility is control and regulated by the central Nervous System hence the ability of the Nervous System which meaningfully integrate the contraction and relaxation of the muscle of a joint plays a vital role.

**4.5. Skill**

When the body is in motion or moving form it is the only factor which determine the flexibility of an individual For i. e. Running in the Football and kicking the ball with sammer Sault.

**4.6. Muscle temperature**

The more the temperature of the muscle greater the range of movement and vice versa.

**4.7. Time of day**

In the morning flexibility is poor afternoon good and in the evening it is the best.

**4.8. Exercises**

Frequent and regular doing of physical exercises increases the flexibility up to some extent.

**4.9. Fatigue**

It has been observed that an individual under the state of fatigue realize slightly decrease in the range of movement.

**4.10. Age**

Children are more flexible than adult and flexibility decreases as the age increases.

**4.11 Sex**

Normally women are more flexible in comparison to men due to difference in the joint and lower muscle mass.

**4.12. Emotions**

Whenever an individual is under the state of psychological factors like emotion and depression or muscle cool down it lower the flexibility.

**5.METHODS OF IMPROVING FLEXIBILITY**

Stretching technique for improving flexibility has under gone some changes over past few years. As a result of it some new technique have developed, which are as follows:-

**5.1. Ballistic Method**

In this method movements are performed in swing in a rhythmic manner. This method can be used with counts to stretch at a particular joint to its maximum. The major problem in this method is that it needs good warming up failing which it may cause injury. Though this method is not very good but the some sportsmen like gymnast are commonly using this method just because of the nature of sports event.

**5.2. Slow Stretch Technique**

This method is better than the ballistic method because the movements are done slowly and muscles are made to stretch gradually to its maximum limit and then brought back to its normal position.

**5.3. Slow Stretch and Hold Technique**

This method is better than the slow stretch technique because in this method muscles are made to stretch to its full limit and then this position is hold for 5-10 sec.After that it brought back to the normal position. This technique is more effective which minimize the chances of injury too.

**5.4. Proprioceptive Neuro Muscular Facilitation Technique (P.N.F.)**

This is one of the techniques being used from last few years. There are number of different P.N.F. techniques currently being used. These technique involve combination of alternating contraction and relaxation of both against and antagonist muscles. These techniques evolve 10 sec. pushing phase (contraction) followed by a 10 sec. relaxation phase.

(A) Slow Reversal Hold The individual lying on his/her oblique or back with the knee extended and ankle flexed at 90 degree, a partner passively flexes the leg at hip joint to the point where slight discomfort is felt in the muscle. At this point the individual pushes against the partner resistance by contracting hamstring muscle. After pushing for ten second. The hamstring muscle are relax and quadriceps group of muscles are contracted as the partner applies passive pressure to further stretch the hamstring and also to have more flexibility at hip joint. This should be repeated three times. When there is a flexion at hip joint that is when the leg moves up to 90 degree the following muscles are contracted (1) Iliopsoas (2) Sartorius (3) Rectus femoris and hamstring group is stretched. As the leg moves beyond 90 degree quadriceps group of muscle is contracted and further stretch on hamstring group of muscle.

B:- Contract Relax: It is variation of above technique in this the hamstring are contracted isotonically so that the leg moves towards the floor during the contraction phase.

C. Hold Relax: Again it is variation of slow reversal technique it involve isometric contraction against immovable resistance during push phase (Contraction). During relaxation phase both techniques involve passive stretching.

EXERCISE 1: Standing in a quadral squat position, it relax hamstring group so that there will be easy stretch for hamstring in the next exercise.

EXERCISE 2: Feet apart up to shoulder width slowly bend forward from the waist to stretch the hamstring to come up first bend the knees their gradually come up.

EXERCISE 3 : Pull one leg to the chest, it will stretch the upper hamstring and the hip muscle.

EXERCISE 4: Assume a hurdle stretch position to stretch your quadriceps.

## EIGHTH COURSE: IMPORTANCE OF TECHNIQUES IN SPORTS TRAINING

Sports activity consists of sports movements. A sports movement is a motor action complete in itself. The efficiency or effectiveness of these sports movements determines the sports performance. All factors of performance capacity are ultimately needed to increase the efficiency of the sports movement/movements during training or competition. As a result the sports performance in sports depends to a great extent on the efficiency or effectiveness of sports performance in sports depends to a great extent on the efficiency or effectiveness of sports movements or motor actions. In other words the factor technique/co-ordination is of high importance as it is through technical actions that the given tasks in sports training or competition are effectively tackled. Technique and technical training, therefore, is an important part of the total process of training. The technique and technical training in sports is based on four basic considerations:-

(1) In each sport tasks have to be fulfilled or tackled during competition. Each task can be tackled in one or more ways. The best motor procedure of tackling the task has to be determined and consequently taught to the sportsmen. This becomes the aim of technical training.

(2) After determining the technique or motor procedure to be taught it is essential to know in which way this motor procedure is realised into actual motor action by the sportsman. For this we have to study the control and regulation of the motor action by the central nervous system. In other words, motor co-ordination as determinant of motor action has to be studied.

(3) The third step/consideration is to find out ways and means by which motor co-ordination is perfected and refined. This is essential for improving the effectiveness of the motor action. The process of improving and perfecting the motor co-ordination is called the motor learning process.

(4) After studying the motor learning process we have to study and explore the ways and means of organising and implementing technique training in such a way that motor learning takes place faster and effectively.

These four considerations or steps give rational and scientific basis to technical training in sports. The science of sports training is mainly concerned with the organisation and implementation aspect of technique training. But, for this it has to depend heavily on the knowledge about motor co-ordination and motor learning though these aspects are not its direct concern. The present chapter on technique, therefore, does not aim directly at motor co-ordination or motor learning.

Basically, its aim is to provide fundamentals and guide lines for proper formulation of technique training in sports. As discussed earlier motor co-ordination also forms the basis of co-ordinative abilities. The training for coordinative abilities is, therefore, basically aimed at affecting the motor co-ordination through motor learning process. Co-ordinative abilities are, therefore, considered to be a part of the performance factor technique/coordination.

## 1.TECHNIQUE, SKILL AND STYLE IN SPORTS TRAINING

### 1.1.Technique

it is defined as the motor procedure for tackling a motor task. Motor procedure should be understood as a system of movements of body parts in a definite sequence. Many of these movements, however, may take place simultaneously. The motor procedure or technique is always task or goal oriented. In different sports sportsmen have to tackle different types of motor tasks. Therefore, different motor procedures or techniques are required in different sports. In shotput, for example, the motor task is to put the shot as far as possible; whereas in weightlifting, in clean and jerk, the motor task is to lift as much weight as possible. In team games, the sportsmen are required to tackle a variety of tasks under different conditions. Therefore, in these sports the sportsman has to learn a number of techniques with possible variations.

### 1.2.SKILL

A motor skill is acquired through a long process of motor learning. Skill denotes the level of effectiveness with which a movement or motor action can be done. Skill is defined as automatisation of motor procedures. A sportsman

tries to learn a technique or motor procedure and through continuous and systematic process he is able to acquire the skill i.e., automatisation of the motor procedure. In other words, one can say that skill is the capacity of the sportsman to realise technique in actual motor action.

Technique training aims at the development of technical skills and not at the development of technique. As the process of skill acquisition is the process of motor learning, therefore, technique training is essentially purposeful manipulation or exploitation of motor learning for best results through organisation of training means and methods. In sports, we come across sportsmen with varying degree or level of skill who are attempting to follow the same motor procedure or technique. Their skill or lack of skill does not convey much about the effectiveness or correctness of the technique. Skill can be assessed and evaluated by the use of different procedures e.g., biomechanical procedures of skill assessment. Skilful movement are made possible by highly advanced control and regulation processes of motor coordination. To understand skill and to derive guidelines for its improvement, therefore, motor co-ordination has to be first understood in all its relevant details.

**1.3.STYLE**

Style is individual expression of technique in motor action. No two sportsmen are alike in different factors

which determine motor action. Therefore, each sportsman, because of his peculiar psychic, physical and biological capacities realises the technique in a different manner. This is his style. Several sportsmen may follow the same technique in order to tackle a definite task, but the motor action of each will be different from that of the others. Technique model, therefore, should be flexible enough to allow for individual difference. It is wrong and unproductive to try to copy each and every minute detail of technique model or the technique of outstanding sportsmen. In actual practice, we come across individual styles of technique. The analysis of individual styles of top level sportsmen is the basis for preparing a model of technique. This model may not tally cent percent with

the style of any sportsman. Sportsman tries to do the movements according to the technique model; but at the same time the individual style, of top sportsmen, of doing the movements forms the basis of technique model. In the end, it is important to understand that the model of technique is a generalised model of successful motor procedures of tackling motor tasks. These models are to be followed by sportsmen of all levels. But the children and sportsmen of lower qualification are normally not in a position to effectively adopt this technique model in all the required details. Therefore, it is essential to prepare separate models of technique or technical demand profile for lower stages of training. Needless to say these profile must be based on the technical model high performance training stage with due modification in consideration of possible changes in the model in the near future.

**2.MOTOR CO-ORDINATION**

Previously, it has been stressed that skill is the product of motor co-ordination automatised to a great extent. An understanding of the basic mechanism of how motor actions are controlled and regulated is essential for effective formulation of motor learning process. For this purpose motor co-ordination is described briefly in the following paragraphs. The control and regulation processes involved in motor co-ordination takes place at different levels of CNS. Some of these processes are conscious bound and some are not conscious bound. Hacker states that there are basically three levels with definite tasks of co-ordination:

(i) intellectual level which is responsible for the general plan of action (ii) perceptive-cognitive level responsible for the motor action programme (iii) senso-motor level responsible for fine programming of the musculo-skeletal system. In motor co-ordination almost all parts of the nervous system are involved in an integrated manner. As soon as the sportsman decides to tackle a certain task, a movement programme for accomplishing this is formed at all the CNS level which are to be involved. The forming of movement programme is considerably affected by motor memory and the perception of the prevailing situation. On the basis of this programming the required nerve impulses from the different levels go to the concerned muscles which respond by contracting

as directed by the nervous system. With the action of the muscles the motor action starts. During the movement execution the various motor sense organs send the informations back to the nervous system. This information do not come from the working muscles and joint only.

Information about the changed situation is also taken up by the nervous system through eyes etc.

Vast amount of information regarding movement, environment etc. is continuously reaching the nervous system. All this information is analysed and synthesized to arrive at conclusions regarding which way the movement is taking place. During information uptake and synthesis motor memory plays an important role as it helps in quick identification of signals, thereby helping in movement perception. The actual picture of the movement being done is then compared with the movement programme according to which the movement should take place. This vital process is called comparison and takes place at all levels at which the movement programme was formed. The comparison allows to detect differences and discrepancies between the between the movement programme and the actual movement. On the basis of this correction impulses are sent to the muscles to correct the movement. In this manner, in a cyclic form, the movement execution is controlled and regulated till the end. The above given description of motor co-ordination is a highly simplified description of a process which in reality is very complex. It is important to realise that the quality of motor co-ordination primarily depends on the effectiveness of three key mechanisms: programming, information uptake and synthesis and comparison. In technique training, therefore, we have to primarily aim at improving these three mechanisms. Programming and comparison, however, cannot be affected directly. This can be only done through information uptake and synthesis. Therefore, giving of timely and correct movement feedback forms the basis of technique training. With the improvement in these mechanisms qualitative/ quantitative changes take place in the movement execution. Alongwith this there is progressive shifting of functions and responsibilities to lower levels of control i.e., automatisation.

## 3.AIMS OF TECHNIQUE IN SPORTS

In different sports different types of tasks have to be tackled. Therefore, technique aims at different things in different sports. The aim for which a technique is to be used is important for proper formulation of technique training as well as for correct assessment and evaluation of technique. There are numerous techniques which are used in sports. It is, therefore, impossible to discuss the aim of each and every technique. But in the following paragraphs general aim of technique in different groups of sports is discussed in brief.

### 3.1. Endurance Sports

In these sports technique aims at ensuring high movement economy or reduction in energy expenditure. In endurance sports, normally one or two techniques have to be learnt. The movements to be learnt are usually simple and can be learnt in a short period. Examples: long distance running, cycling, rowing etc.

### 3.2. Sprints

The aim of the technique in sprint events is to ensure high movement frequency with high generation of force for short duration. In these sports also one or two movements are to be learnt. These movements are usually simple but as these have to be done at high speed therefore the role of technique is more as compared to endurance sports. Examples: track and field sprints.

### 3.3. Power Sports

In these sports the technique aims at generating maximum force for imparting maximum speed to the body or to an implement. The movement must be performed with high co-ordination so that the force generated by different muscle groups/body parts can be effectively simulated to achieve the principal aim of technique. In these sports normally one or two technique have to be learnt. The movements are usually complex requiring much longer period of training for perfection. Examples: shotput, high-jump, weightlifting.

### 3.4. Technical Sports

These sports are characterised by a large number of techniques with a very high degree of difficulty. The technique aims at executing a movement or

combination of elements with high quality combined with grace and beauty. Because of several techniques, their high degree of difficulty and constant introduction of new and more difficult exercises the role of technique in these sports is very high. Examples: gymnastics, diving, figure skating.

**3.5. Regulatory Sports**

In these sports technique aims at regulating a system consisting of sportsman and some equipment/ automobile/animal. The force for movement is external and the sportsman has to control and regulate it to get best results. Examples: sailing, motor sport, equestrian.

**3.6 Combat Sports**

In combat sports the aim of technique is to execute learned movements for tackling a task in consideration of the situation and tactics. In these sports technique is mostly used as a tool for effective tactical action. A large number of techniques are required to be learnt and mastered alongwith their variations. Examples: boxing, judo, wrestling.

**3.7. Team Games**

The technique aims at tackling a task in consideration of situation, opponent, team mate and tactical aim. Like combat sports, in team games also technique is normally subordinated to tactical action. Large number of techniques and their variations have to be mastered with the aim of applying these under different conditions from tactical aspect. It is difficult to determine the relative importance of factor technique/co-ordination in different sports. But the extent of importance of this factor in sports depends on the following three things:-

- Number of techniques.
- Degree of difficulty technique.
- Variable applicability of technique and its variations.

**4.RATIONAL TECHNIQUE**

A motor task can be solved or tackled by different techniques. But out of these one technique will be the most effective for a sportsman. This technique can be called the rational technique for him It will enable him to tackle the task with

best results. A technique which is best or rational for one sportsman may not be the same for the other. The rationality of a technique cannot be determined by bio-mechanical analysis of the technique alone. More factors must be taken into consideration to decide whether a technique will suit a sportsman or not. All the external and internal factors which can have a significant effect on the motor procedure during action

have to be carefully judged. Some of the important factors are:-

• Bio-mechanical factors.

• Energy expenditure.

• The role of ground, equipment, opponent etc. during the course of movement execution.

• Height, weight and body dimensions.

• Tactics.

• Psychological considerations.

• Motor habits.

Motor Learning Learning is a fundamental activity in human life and is instrumental in the development of personality. Learning can take place through play or work. But in addition to these two, there is also learning activity which directly aims at acquiring knowledge and capabilities. and motor learning. Both are interrelated and interdependent. In sports, both the types of learning are common though motors learning takes precedence over mental learning. The process of skill acquisition is essentially a process of refinement and stabilisation of motor co-ordination. This process, however, is influenced by a number of factors which if properly managed can make motor learning more effective and faster. Important among these are discussed below in brief:

**4.1. Information Essential for Learning**

The motor learning starts with the giving of information about the movement which has to be learnt. Moreover, information as feedback is also essential for effective control and regulation of motor action. A constant, timely and systematic flow of relevant information before, during and after the movement execution is obligatory for motor learning i.e., unity of mental and motor

learning. The role of information in motor learning points to the fact that motor learning is a conscious activity in which for best effects the sportsman must be mentally and physically active. It also brings into focus the role of language and motor sense organs in motor learning.

**4.2. Training State**

Motor learning is further dependent to a great extent on the training state. The level of conditional and coordinative abilities for effective motor learning is self explanatory. In addition, the already acquired skills have an important role to play in the learning of new skills. The already learnt skills can hinder or help motor learning through transfer or interference effect. Moreover, certain psychic factors like mental capabilities, personality traits etc. enable the sportsman to do motor learning in a much better way.

Without the required motivation and interest, the learning activity cannot be done effectively. It is, therefore, essential to cultivate positive interest and attitude for motor learning. On this basis the sportsman can be easily motivated to put in his best in the activity of motor learning. This enables him to do technique training with the required concentration and attention. The above mentioned three factors which influence motor learning in reality represent three groups of factors. In addition to these factors, the social factors also have an effect on motor learning. Last, but not the least, the proper formulation and implementation of motor learning activity in the form of technique training can have a highly positive effect on motor learning. The process of motor learning in sports training is normally a long process. As the nature of motor learning is not uniform throughout, therefore, different types of means and measures are adopted to affect it positively at different times.

**5. The motor learning**

The motor learning process is normally divided into three phases described below:-

(i) Phase I It begins with the introduction of a sportsperson to the movement/technique which he/she has to learn. It ends with the achievement of rough co-ordination i.e., the sportsperson is able to do the complete movement

but with several errors and mistakes. Depending on the complexity of the movement this phase can be short or long. In the case of complex movements or technique e.g.,pole-vault this phase can last several weeks. But in the case of simple techniques like dribbling in basketball it is much shorter.

(ii) Phase II This phase starts with the acquisition of rough coordination and ends with the acquisition of fine coordination i.e., the sportsperson is able to do the movement nearly perfectly under normal conditions; but he/she is unable to do so under changed or difficult conditions. In this phase motor co-ordination undergoes vast changes. This phase is normally much longer than the earlier one and is also more hard on the sportsperson.

(iii) Phase III This phase starts with the achievement of fine coordination and ends with the mastery of the technique. As a sportsperson cannot master a technique cent percent, therefore, this phase never ends. Moreover several factors like growth, periodisation, change in technique model etc. keep affecting the skill level negatively and as a result the technique training in the third phase never ends. Mastery of technique denotes the ability of the sportsman to do the movement nearly perfectly under all types of conditions: normal, changed or difficult.

## 5.1. TECHNIQUE TRAINING IN THE FIRST PHASE

The aim of technique training in the first phases of skill acquisition is to achieve rough co-ordination i.e., to enable the sportsman to do the complete movement, under easier conditions. The movement has several errors and mistakes but effort should not be to achieve perfect movement but a complete, though largely imperfect movement. The control and regulation processes in the first phase are too inadequate to allow perfect movement execution. The movement programming is not complete. It mainly consists of a visual image of the movement formed by seeing the demonstrations and through verbal explanations. It lacks kinesthetic elements of programming. Moreover, the movement programming does not include all the details of the movement.

Therefore, to start with the programming is inadequate and incomplete. Because of imperfect programming, the motor commands to the muscles are

imperfect. Moreover, there is irradiation of excitation among the motor centres which leads to innervation of muscles not needed for the movement. This results in undue tension in the body in general. As in programming the kinesthetic elements which pertain to control and regulation of muscle actions with the required tension and sequence are largely absent, therefore, this function has to be performed by the higher centres which are ill equipped for this task. The result is imperfect movement with conscious control by higher centres. Information uptake and synthesis is also inadequate for the task. Foremost short coming is the lack of awareness and utilisation of information coming from the kinesthetic, tactile and vestibular sense organs. Sportsman, due to this reason depends heavily on his optical sense and verbal information from outside for feedback about the movement. He lacks the 'feel of the movement'. Short-comings in the motor memory because of lack of required experience seriously hamper the process of information synthesis and movement perception. All these things lead to poor feedback about the movement. The process of comparison which forms the basis of movement correction cannot take place effectively because of poor programming, unsatisfactory feedback and inadequate motor memory. The result is that the sportsman normally does not become aware of movement errors himself and hence cannot correct these. The poor state of motor co-ordination in the first phase finds expression in poor movement execution. When one looks at the movement execution, one can notice several draw backs in it. Some of the important drawbacks which characterise rough coordination are given below:-

***** The movements are usually tense and cramped. The undue muscle tension, however, enables the sportsman to do the movement by ruling out movement of other body parts. But muscles tension ,also ensures more energy expenditure and faster onset of fatigue.

***** The movement execution lacks proper rhythm. The application of force is incorrect and is either too much or too less. This makes the movement unrhythmic, jerky and edgy.

***** Because of wrong force application the movement flow is not smooth. There are sudden changes in the speed of movement significantly lowering the movement flow and continuity.

***** The sportsman is unable to meaningfully the movements of different body parts i.e., coupling of

movements. This results in undue wastages of force generated by various body parts as it cannot be added to the force generated by other body parts.

*****The movement amplitude is either too less or too much. Generally, because of undue muscle tension and body rigidity, the movement amplitude is lesser than required. This results in ineffective force generation.

***** The movement execution is highly inconsistent. Each repetition of the movement differs significantly from the previous one.

***** There is low movement accuracy and precision.

### 5.1.1. IMPLICATIONS FOR TECHNIQUE TRAINING

On the basis of the nature of motor co-ordination in the first phase of skill acquisition, the following suggestions are presented for effective formulation and implementation of technique training in the first phase.

- Analysis of the Present State Technique training is a long term process, therefore, before its start a general strategy or plan of technique training for all the three phases must be worked out. For this purpose first the present state of the sportsman must be analysed. Among other things, it is important to find out the label of co-ordinative and conditional abilities, the technical skills learnt in the past, motor experience, motivation, interest and other mental and psychological qualities and traits which are important for learning the intended movement. If it is needed then effort should be made to improve certain things e.g., conditional or coordinative abilities, motivation etc., without which technique training cannot be effectively started. Special stress should be laid on improving the motivation and interest of the sportsman since without these technique training is not possible. This can be done by different means: demonstrations, explanations, discussions etc. The sportsman must be convinced about the importance of the technique to be learnt. On the basis of the analysis of the present state, the teaching procedure, including teaching

steps/stages, sequence of exercise to be use, means and methods to be followed etc., should be planned.

- Practice Under Easier and Favourable Conditions In the first phase, as a rule, technique training should be done under easier and favourable conditions of learning. The movement execution can be made easier by adopting several means: breaking the movement into parts; by practising with lighter/smaller equipment; by doing the movement at a slower speed, by giving external help and so on. By favourable conditions were also mean technique training should be done in an atmosphere in which a sportsman can practise without any external disturbance or discomfort. Practise under conditions of fatigue should be avoided. Stress should be laid on enabling the sportsman to do the movement optimum number of times, because only by doing the movement he will learn it. Therefore, it is important that sportsman is enabled to get a feeling of the complete movement as quickly as possible.
- Development of Movement Concept Movement concept or movement image is a vital part of movement programming which forms the basis of movement execution. Therefore, a lot of effort should be made to enable a sportsman to have a clear movement concept of the technique which he is to learn. In the first phase all the details of movement concept should not be given. Only that much is needed which can be grasped by the sportsman. Moreover, the stress should be on the visual aspect of the movement and not on the dynamic and temporal. Development of movement concept should be mainly achieved through demonstrations, explanations, by showing pictures, diagrams, etc. The basic rhythm of the movement, however, should be stressed right from the beginning of technique training.
- Less Stress on Kinesthetic Perception In the beginning of motor learning a sportsman cannot consciously discriminate between the informations coming from his kinesthetic, vestibular and tactile sense organs. This is because of the lack of requisite movement experience as well as due to the absence of link between these sensations and his consciousness. Therefore, during practice less stress should be laid on this information i.e., kinesthetic perception. On the

contrary, more stress should be laid on the visual and verbal information. Lack of discrimination of kinesthetic perception, however, does not mean that the sportsman cannot feel the movement. He can feel the movement but he is unable to determine the quantitative and qualitative aspect of the movement through kinesthetic perception. He should be asked to consciously feel the movement but should not be asked to correct or refine the movement on its basis.

- Less Correction In the first phase of skill acquisition, too much stress on movement correction is not advisable. This is because of two main reasons. Firstly, he is not in a position to have a good movement perception and hence is unable to effectively correct his movement. Secondly, because the aim of technique training is rough co-ordination and not fine co-ordination. Movement correction should be limited to major and basic errors in the main phase of the movement. Alongwith correction is a good amount of encouragement should also be given to the sportsman. This should take place in the form of pointing out the progress he has made in learning the technique. Encouragement in this sense is a positive means for further refinement and stabilisation of movement concept.

- Competitions Formal competitions during the first phase of skill acquisition should be avoided because of poor level of motor co-ordination and also because of higher chances of stabilisation of incorrect control and regulation process under high psychic stress. But in team and combat sports

informal competitions, with changed rules etc., can be used with positive effect on motor learning as these afford opportunity to sportsmen for variable applicability of the technique being learnt.

## 5.2. TECHNIQUE TRAINING IN THE SECOND PHASE

The second phase of technique training begins with the achievement of rough co-ordination and ends with the acquisition of fine co-ordination. The second phase is characterised by high training volume, increased amount of movement correction and erratic progress in motor learning. All these factors tend to make technique training very stressful and uninteresting for the sportsman resulting

in loss of interest motivation and decrease in the quality of learning activity. In the second phase the motor learning is not smooth. It is characterised by phases of stagnation. These are the phases in which, inspite of continuing technique training, no significant improvement takes place. There can even be deterioration. But after these phases of stagnation there is normally a sudden increase in performance. It may also happen if during stagnation the technique training is stopped for some training session. It seems

that during stagnation phase the further refinement of motor co-ordination continues though it does not find any expression in the movement execution till it reaches a certain level.

**5.2.1.IMPLICATIONS FOR TECHNIQUE TRAINING**

* Help and Encouragement As pointed out earlier, the motor learning in second phase is not smooth. It is characterised by phases of stagnation. Besides, it involves high amount of movement correction, high training, volume and high level of concentration and attention. All these things tend to make motor learning stressful and frustrating for the sportsman. Unless the coach adopts certain means for

constant encouragement, help and motivation the sportsman can gradually loose interest and motivation for technique training.

* High Volume of Technique Training The volume of technique training in second phase is much more than in the first phase. This means higher number of repetitions in a training session. The technique training, therefore, should be carefully planned and organised so as to enable the sportsman to do the needed number of repetitions with proper attention and concentration.

* High Concentration and Attention The technique training in second phase aims at fine coordination and as a result there is increased amount of movement correction and increased stress on movement perception and conscious execution of movement. Therefore, each repetition of movement must be done with a high degree of concentration and attention. In a systematic manner the sportsman must direct his attention and concentration to different parts, details

and aspect of movement execution. He should also strive to consciously perceive and understand the movement sensations.

* Practise Under Normal Conditions As a rule the movement should be practised under normal and standard conditions. But this rule may have to be modified in sports like team games and combat sports. In these sports, because of the nature of sports and also because of subordination of technique to tactics, the technique training in second phase has to be, to some extent, done under different changing conditions.

* Refinement of Movement Concept In the first phase only a gross movement concept is conveyed to the sportsmen. In the second phase the movement concept has to be further refined and enriched with more details. Now the movement concept should not be limited only to the visual aspect of the movement. It should be gradually extended and refined to include dynamic and spatial aspects of the movement. For this purpose, in addition to verbal explanations and

instructions, the teacher should increasingly make use of other means by which the internal structure of the movement can be made clear to the sportsman e.g., use of graphs, diagrams, bio-mechanical procedures etc. Accurate and timely feedback is of high value in this

regard. Tasks of movement observation and description are valuable means for further refinement of movement concept. These tasks, however, should be carefully planned and the activity of the sportsman must be properly supported and guided to get the best results. The use of language has a double to play in the development of movement concept. Firstly, it is used as a means for conveying the information. Secondly, it is used to build association between movement perception and awareness. The second function of language is the basis of making the sportsman conscious about movement perception, and thereby helping in fine programming. The effect of verbalisation of a technique, which takes place consciously or unconsciously to some extent in advanced sportsmen, depends on the link between language and movement sensations. The development of movement concept runs parallel to the

advancement in motor learning. The development of required conditional and coordinative abilities also runs parallel to motor learning process.

6. Stress on Kinesthetic Perception The kinesthetic perception should be given high priority in the second phase. The sportsman must be enabled to correctly perceive it. The role of language in this regard has already been pointed out in the preceding point i.e., point No. 5. In addition to facilitate kinesthetic perception movement feedback should be used. The feedback during the movement or immediately after the movement execution is very helpful in this regard. To make the sportsman aware of kinesthetic sensations the movement can also be done with minor variations in speed, force etc. It helps the sportsman to differentiate between sensations he receives while doing the movement differently. The aim of improving kinesthetic perception should not be limited to mere awareness but it should extend to differentiation and precision in movement perception.

* High Movement Correction In the second phase the movement execution has to be continuously corrected till it is possible to execute the movement without error under normal conditions. All possible means and methods of movement correction should be used to achieve this target. But all this must,be done in a systematic and organised manner. Major errors must be removed first. Moreover, at one time the stress should be laid only on one or two errors and not more.

* Competitions Sports in which technique is to be realised under standard and unchanging conditions competitions should be avoided during the second phase. In other sports in which technique is realised under constantly changing conditions the competitions are advisable. In these sports competitions, by the end of second phase, should be increasingly used as effective means of technique training as these allow for meaningful technical actions coupled with tactical aims.

**5.3. TECHNIQUE TRAINING IN THE THIRD PHASE**

The third phase of motor learning starts with the achievement of fine coordination and leads the sportsman to achieve mastery over the technique.

Mastery of skills is considered to have been achieved when the sportsman is able to do the movement successfully under different and difficult conditions. It denotes the variable applicability of movement. The important criterion to judge skill mastery is the ability to do the movement correctly and effectively in competition. The third phase of motor learning never ends. Complete mastery over the technique is never achieved, and as a result a sportsman has to continue training for this purpose. The continuity of technique training is also necessary to effectively maintain the level of skill acquired and to avoid deterioration due to discontinuity. In addition to this, there are other factors which can lead to deterioration in skill. Most common among these are the effects of periodisation, growth in height and weight and change in body proportions in childhood and adolescence, changes in rules and regulations of competition, introduction of new equipment, surface etc., necessitating relearning, introduction of new technique and so on. All this makes it imperative to continue technique training without any end in sight. In the third phase motor co-ordination achieves a very high level of perfection. The movement execution is characterised by a high degree of automatisation. Movement programming is highly perfect. It takes place in a highly differentiated manner at all levels of CNS involved in motor co-ordination. There is a highly advanced fine programming containing the detailed programme of dynamic, temporal and spatial aspects of the movement. The programming is now combined with anticipation of goal, movement and situation. Programming is not limited to a single movement programme but it essentially includes several alternative programmes of the movement and its variations. At any moment during the movement execution the CNS can switch over to an alternate movement programme with ease and speed.

The muscle innervation is highly differentiated and accurate due to high level of movement programming. Different muscles are made to contract at the right time, with right force and speed and in correct sequence most appropriate for achieving the goal. The irradiation in motor centres is practically not there. Information uptake and synthesis also achieve a very high level. Sportsman is

acutely aware of the various sensations coming from different sense organs especially from the kinesthetic, vestibular and tactile sense organs. There is high level of differentiation, filtering and selection of information signals which takes place at high speed and with high accuracy. Sportsman, if he so wants, can attend to the minutest details during the course of the movement and even immediately after the movement. A high level of association between movement perception and language is a unique characteristic of the mastery of technique. Verbal description or mental imagination of the movement calls forth corresponding movement sensation. The control and regulation of the movement is now achieved through the internal circuit which is best
equipped for this task. There is a vast store of motor experience in the memory which helps strongly in the information uptake and synthesis. Because of the high level of programming and Information uptake and synthesis the comparison of intended and actual movement takes place very fast and accurately. This enables anticipation of movement errors and corresponding movement correction which is difficult to be observed by another person. This results in smooth and graceful movements. Sportsman is in a position to perceive minute deviations from the intended movement programme. He also perceives the speed of deviation. This enables him to correct the movement with high speed and effectiveness. A high level of motor co-ordination in the third phase of motor learning is characterized by several movement qualities mentioned below:-

***** The movement can be done with high degree of precision and accuracy.

***** There is a high degree of movement constancy. Thenimportant parameters of movement change very little from repetition to repetition e.g., speed and force values or indices.

***** There is also a high degree of movement consistency or result consistency. Irrespective of the changed conditions the sportsman is able to achieve fairly constant results.

* The movement is also characterised by a high level of other qualities e.g., movement coupling, movement flow, movement rhythm etc.

*The movement execution is accompanied by feelings of joy, pleasure and satisfaction. Sportsman enjoys doing the movement which he can do with high results and with great ease and comfort.

### 5.3.1. IMPLICATION FOR TECHNIQUE TRAINING

The technique training in the third phase is continuation of the technique training in the second phase. There is only qualitative difference. In many respects it resembles the second phase e.g., help and encouragement, training volume, high concentration and attention, stress on kinesthetic perception and high amount of movement correction. In addition the following guidelines are given:-

#### 5.3.1.1. Practise Under Difficult and Different Conditions Mastery of skill

can only be achieved by practicing the movement under different and difficult conditions. The application of this principle takes place in two ways depending on the nature of sports.

(i) Standardised Sports In these sports the technique is realised under more or less standard conditions e.g., in swimming, gymnastics, weightlifting, track and field. In these sports technique training should aim at stabilisation of movement execution under different difficult conditions. This is achieved mostly by practising the movement under higher psycho-physical load e.g.,

• Practising the movement with different rhythm, higher resistance, higher speed etc.

• Practising the movement under different external conditions e.g., ground, surface, weather conditions, changed ground dimensions etc.

• Practising the movement with minor changes in the movement execution.

• Practising the movement under higher psychic stress caused by competition, spectators etc.

• Practising the movement under conditions of fatigue.

(B) Non Standardised Sports In these sports the technique is realised under constantly changing conditions e.g., team games, combat sports. In these sports technique training should aim at variable applicability of skill. The movement

should be practised under considerably different conditions. The important possibilities are mentioned below:-

• Practising the different variations of technique.

• Practising the movement in combination with other movements.

• Practising the movement from tactical aspect.

• Practising the movement different partners and opponents.

• By changing the external conditions for movement practise e.g., size of ball or other equipment, difficult weather conditions, change in rules, change in ground dimensions.

**5.3.1.2. Development of Movement Concept**

The movement concept must be further developed in the third phase of technique training. All the aspects and details of movement execution need to be conveyed to the sportsman gradually and systematically. For this purpose one should not limit the movement concept only to diagrams or pictures of the movement. But it should extend to the kinetic and kinematic aspects of the movement. The effort should be directed to enable the sportsman to understand the internal structure of the movement. Along with the refinement of the movement concept effort should be made to develop the required conditional and co-ordinative abilities still further.

**5.3.1.3. Accurate and Precise Feedback High**

amount of movement correction is an important characterstic of the third phase of technique training. For this purpose the sportsman must be given very accurate and precise feedback about the movement execution. For this the coach or teacher should not depend on his subjective judgement only. He should increasingly use various equipments and apparatus which can give accurate information about the movement execution e.g., video films, timing devices, cinematography, force platform etc. Quick and timely feedback is essential for achieving mastery of a skill.

**5.3.1.4. Increased Use of Competitions**

In the third phase competitions should be used as means of technique training. Competitions involve higher degree of psycho-physical demands and,

therefore, help in skill acquisition under different and difficult conditions. Role of competitions for achieving stabilisation of movement execution as well as for variable applicability of learnt movement can hardly be exaggerated.

**5.3.1.5. Ideo-motor Training**

In the third phase because of highly strong link between language and movement perception ideo motor training can be used with positive results. Ideo-motor training, also called mental practise, is helpful for the precision and stabilisation of temporal and spatial aspects of movement execution. Best results by ideo-motor training are achieved when it is combined with actual movement practise. Ideomotor training has also proved to be effective for maintenance of skill during periods when technique cannot be done e.g., training break due to injury or illness. Ideo-motor training is a complex psychological procedure and should be learnt under expert guidance before it can be effectively used by a sportsman independently.

**5.3.1.6.RELEARNING**

In sports, sometimes it becomes necessary to change the already learnt movement. This is called relearning. Relearning is basically restructuring of a skill to a lesser of greater extent. Relearning is normally more difficult than new learning because of high degree of interference of already learnt movement. It also does not always lead to good results. In sports, relearning becomes necessary due to any of the following two factors:-

• Introduction of a new and more effective variation of technique.

• Presence of a few or a large number of errors in the movement execution which have been automatised. The necessity for learning a new variation of technique mostly arises due to introduction of new implement or equipment, introduction of new playing surface, or change in rules and regulations of competition.

In technical sports like gymnastics, diving etc. there is a continuous change in the movements to increase their degree of difficulty, thereby necessitating new learning or relearning. In case of children and adolescents, rapid growth in

height, weight or change in body proportions can lead to adoption of a new variation of technique.

In India relearning is a common problem faced by sportsmen due to automatisation of incorrect movement execution in the initial stages of training or due to nonavailability of standard equipment/implements or playing surface. The process of relearning according to Harre can be

divided into the following four phases:-

I. Phase The old variation of skill is highly dominant and strongly hinders the new variation. It is not possible to successfully execute the new variation.

II. Phase The old variation is destroyed but the new variation has not yet been adequately learnt. There is still a strong interference.

III. Phase The new variation is gradually acquired, but it is not yet stable and can be easily disturbed if the movement is done under different and stressful conditions. During competition or under stress the old variation asserts itself over the new one. The performance with the new variation is still less as compared with the performance with the old variation.

IV. Phase The new variation achieves stability and reliability. The performance starts improving. But if care is not taken the old variation can again assert itself. In this phase mastery of new variation is achieved only after some tome. Relearning is a long strenuous process and often does not yields desirable results. Regarding relearning following suggestions are made:-

1. It is best to avoid relearning, and it can be possible if the correct variation of technique is taught from the very beginning. It is helpful to teach a basic variation of technique in initial stages of training and on the basis of this in later stages the other variations can be learnt. It is also important not to go in for a high degree of automatisation of a technique in the initial stages as it will make relearning, if required, more difficult later on.

2. If relearning cannot be avoided it should be planned on a long term basis. During the process of relearning, competitions should be avoided. The old variation should not be used at all in training or in competition.

3. The process of relearning is very hard on the sportsman. For best results his full co-operation and willingness is required. To achieve this coach must convince the sportsman about the importance of relearning for his performance improvement. He should also constantly encourage and motivate the sportsman to ensure high level and volume of learning activity.

4. The process of relearning must be continuously controlled and regulated.

5. Ideo-motor training should be used as an additional means of technique training. It helps in checking interference and in facilitating positive transfer.

**6.TRANSFER OF MOTOR LEARNING**

Motor learning does not begin from a scratch. There is always some amount of co ordination patterns existing which affect motor learning. In childhood, and also later on, we acquire certain basic and fundamental movements which serve as a base for learning other movements. According to Roleb the motor learning in later phases of life is essentially a reorganisation and restructuring of the basic movements learnt in childhood. The already learnt movements or movement patterns can help or hinder the learning of new movements. This effect is called transfer of motor learning. When the transfer helps in learning a new movement it is called positive transfer of motor learning. But when it interferes or hinders new learning it is referred to as negative transfer or interference.

**6.1.INTERFERENCE**

In sports interference can take place in two forms or ways: (i) old skill or coordination pattern hindering the learning of new skill. Relearning falls into this category.

(ii) a skill being learnt hindering the learning of another skill or vice versa. Interference does not only take place when the movement to be learnt is similar to an already learnt movement. But it can also take place when the two movements are directly opposite to each other regarding the coordination mechanisms. For an effective tackling of the problem of interference following things should be performed:-

1. Several movements should not be learnt simultaneously, especially those movements which

are similar to each other.

2. Correct variation of technique should be learnt to avoid relearning at a later stage.

3. Interference is considerably reduced or totally stopped when the sportsman is able to adequately differentiate the movement programmes of the skills concerned. Therefore, the coach must adopt means and measures to clarify the movement concepts of the movements. Ideo-motor training or mental practice can also be used effectively for this purpose.

**6.2.POSITIVE TRANSFER**

The positive transfer can take place in two ways (i) from an already learnt skill (ii) from a skill being learnt at the same time. The basis of positive transfer is the similarities between co ordination mechanisms of the two skills. Bernstein found that for positive transfer the similarities between the senso-motor co-ordination of two skills is decisive and not the similarities in the external aspect of movement execution. Motor learning process should be consciously planned and implemented to ensure maximum possible positive transfer. To achieve this the following steps should be taken:-

1. The movement should be learnt in a definite sequence. For this purpose the various exercises and technical skills should be hierarchically organised and systematised on the basis of the coordination mechanisms. On the basis of this system learning of a class of exercise/technical skills is faster because of the positive transfer from the exercises previously learnt. Such a systematization of exercises laying down the sequence of learning of various exercises is highly desirable in all sports.

2. The development of required co-ordinative abilities is a necessary prerequisite for effective positive transfer as the development of co-ordinative abilities ensure generalisation and stabilisation of co ordination mechanisms for a group of exercises or technical skills. E.g., balance ability for learning

exercises depending primarily on balance. But care should be taken to develop special co-ordinative abilities with specific exercises for best results.

3. The positive transfer is desirably affected by practising the movement with opposite side, hand or foot. Both sided practise has been found to have a positive effect on positive transfer.

## 7.METHODS OF TECHNIQUE TRAINING

Method of technique training essentially concern the regulation of the activity of the teacher and the taught for the purpose of enhancement of motor learning. There are three method of technique training. These are used in different forms in technique training.

### 7.1. PRESENTATION METHOD

In this method the teacher is active and the student is physically passive but mentally receptive. The main task accomplished in this method is the presentation of information and knowledge about the movement to be learnt by the student. In sports the presentation method is used in three forms which are described below:-

#### 7.1.1. Demonstration

Demonstration of the technique to be learnt is normally one of the first steps is technique training. The complete movement may be demonstrated by the teacher or some student. Technique is also demonstrated through films, video, diagrams etc. For the proper utilisation of demonstration in technique following suggestions are given:-

1. Correct variation of technique must be selected for demonstration. The demonstration of this technique should be correct otherwise the students will form a wrong movement concept. The movement should be demonstrated several times during the practice if needed. The demonstration by actually doing the movement before the students must be further supplemented by showing the movement in picture, figures etc. to clarify important aspects of the technique. Showing films or video recording of the movement execution of famous sportsmen serves the additional purpose of creating positive motives and interests for learning the concerned technique.

2. The technique to be demonstrated should be suitably modified to correspond with the level of the students. Highly advanced version of technique is normally beyond the ability of children and
beginners to realise it in their movements.

3. During demonstration observation tasks should be set for the students so that they can properly and systematically observe the important and finer points of technique.

4. Demonstration can be done in slow movement to effectively illustrate the fast and complex phases of movement. For the sake of clarification important phases, therefore, should be 'stretched' or even done exaggeratedly.

5. To facilitate observation, the class formation should be correct. All students should be able to clearly see the complete movement. Demonstration should also be done at an optimum distance from the students. If needed, the demonstration should be done in such a way that the students can observe the movement from different angles e.g., front, back, side or from above.

6. Demonstration and explanation normally should not be given simultaneously especially to the beginners. For best results the demonstration and explanation should be in a definite sequence. But while demonstrating the movement in slow motion or when using films, figures etc. explanation and demonstration can be given simultaneously.

### 7.1.2. Lecture

In sports lectures are not commonly used on the field during movement practise. These are mainly used in theory sessions. The contents and method of lecture must correspond to the level of the students. It must ensure optimum attention and receptiveness on the part of the students. Long lectures containing difficult words and ideas should be avoided. For the purpose of technique training the lectures must depend considerably on the use of audio-visual aids.

### 7.1.3. Explanation

Explanation consists of a few lines, sentences or hints. An explanation should never become a lecture. Explanation in technique training should be used for making the movement concept clear, for correction and for motivation and

encouragement. It is also used to compare the two movements as well as to generalise the important aspects of the movement. For effective explanation in technique training following suggestions are offered:-

1. It should be short and simple containing only the information needed for the time being. It should last for a few seconds only.
2. In an explanation simple language should be used which can be understood by the students. The extent to which difficult scientific words and concepts should be used depends on the knowledge and mental maturity of the students. They should be prepared for this gradually through separate theoretical sessions.
3. Explanation should be used to enable the students to learn and internalise standard terms and expressions and to associate these with the actual sensations they receive during the movement execution. The use of correct and effective examples is of immense value in this regard. It also helps to avoid interference and to facilitate positive transfer.
4. In an explanation the vital and crucial aspects of movement execution should be repeatedly stressed.
5. Explanation should be given in a loud and clear voice with a tone which is optimistic and motivating. Explanation should never be depressing and demoralising.

### 7.2. CO-OPERATIVE METHOD

In co-operative method the student and teacher are both active. The most common variation of co-operative method is movement practise. In movement practice the student does the movement for optimum number of times while the teacher is constantly supervising, helping and correcting him. There is a high degree of interaction between them, mental as well as physical. There is a constant flow of information between the two.

#### 7.2.1. Movement Practise

The manner in which the movement should be practised in the three phases of motor learning has already been discussed. Here some more helpful suggestions are given:-

• The movement to be learnt should be done, with the required concentration and attention, for optimum number of times. As the absence of fatigue is a necessary prerequisite for motor learning

therefore, repetitions should be done in such manner that fatigue does not accumulate to a significant extent. It is preferable to arrange the repetitions in series with pauses of optimum

recovery in between. During the pauses exercises should be done to accelerate recovery as well as for removing mental tension.

• The pauses should be utilised to give additional information and hints about the movement, for giving demonstrations and also for motivating and encouraging the students.

• Each repetition of the movement should be done with the aim of doing the movement in a better way i.e., repetition without repetition.

• Stress should be laid on conscious movement perception. Use of language during movement execution is very helpful in this regard. To start with it should be done loudly but progressively with lower voice till it becomes just a mental activity.

• In case of complex movements, the movement should be broken into parts for the purpose of learning. Later on with the advancement in learning the parts should be gradually combined till practice with the complete movement is possible. During movement practise certain more measures are adopted. Due to the importance of these measures for the effectiveness of movement practise these are discussed below in more detail.

**7.2.2.HELP AND SAFETY**

Measures for providing necessary help or assistance or ensuring safety of the sportsman are not needed for learning of all type of movements. But in some sports, due to the nature of movement or technique these measure have to be adopted. Help in the form of physical support or assistance should be given in cases where the students cannot do the movement on their own e.g., swimming, pole-vault, gymnastics etc. External help or assistance enables the students to get a feeling of the complete movement, thereby enabling better movement

concepts. It is also motivating to the student when they are helped to do the complete movement. The external help however should be provided only to that extent to which it is required. It should not lead to habit formation, thereby hindering the learning process. Gradually and progressively, the
external help should be reduced till it is no more required by the students.

Safety measures have to be adopted during movement practise when there is a risk of injury or mishap. The safety measures should be adopted, if the situation so warrants, even if the student does not feel the necessity of it. On the other hand these have to be adopted if the student thinks he can get injured though the situation does not warrants this. Use of protective equipment like pads, mattresses etc., are commonly used. Much more important is, however, the physical presence of the coach or helpers to give a feeling of safety to the student and to induce confidence in him.

### 7.2.3. HINTS AND IMPULSES

It is quite common during movement practice to remind the student about various aspects of movement execution which have been already explained to him. This is done through hints and impulses. Hints are short phrases or incomplete short sentences which are loudly said by the coach to the student while he is doing the movement e.g. head up; look forward, trunk straight, high knee action etc. The hints help the student to correct the movement during the movement execution.

Impulses are special sounds or words to draw the attention of the student about the application of force during definite phases of movement execution. There are, for example, such words or signalled; Now! Hup! Ya! Go!Jump! etc. These help to do the movement with correct rhythm. Impulses can also be given in forms of counts. The impulses, to be effective, must be given at the right time otherwise these tend to disturb the motor coordination. As a rule impulses should be given fraction of a second before the required application of force. It is always better if the impulses are preceded by some sort of a sound so that the student prepares himself for the coming impulse and can effectively make use of it.

## NINTH COURSE: Physical Qualities

### Introduction

Any educator concerned with the development of young athletes must first understand their specific characteristics and needs. It is essential to recognize that an athlete aged 6 to 18 is not a miniature adult but a growing individual. Training must take into account the physical, biological, and psychological changes that occur throughout growth, particularly during puberty.

Puberty does not occur at a fixed chronological age. In girls, menarche (the onset of menstruation) generally occurs between ages 11 and 13, although it can appear as early as age 10 or as late as 16. In boys, puberty typically begins between ages 13 and 15, with a possible range from 11 to 17.

Furthermore, chronological age is a weak indicator of biological maturity. Research shows that chronological age can differ from biological age by as much as five years among individuals of the same age group — and in sport contexts, this gap can reach up to seven years.

Therefore, skilled coaches understand and consider the numerous developmental changes from childhood to adulthood. They design training programs according to the athlete's developmental stage, capabilities, and physical needs. Children go through well-defined developmental stages, which are similar for boys and girls, although girls tend to mature earlier.

### 1. Physical Development

Physical growth is fundamental to performance. The human body undergoes structural and proportional changes during development that directly affect how children perform motor skills and physical tasks.

#### 1.1. Changes in Height

Children experience rapid growth. At birth, a child's height is approximately one-quarter of their adult stature. Four distinct stages of growth can be identified from infancy to adulthood:

Rapid growth during infancy and early childhood Slow and steady growth throughout childhood.

Accelerated growth during puberty

Gradual deceleration in growth during adolescence until adult height is reached

In early childhood, boys and girls are similar in size and shape.

**1.2. Changes in Body Proportions**

During growth, some parts of the body develop more rapidly than others to achieve adult proportions. In early childhood, the head is disproportionately large, while the legs are relatively short. At birth, the head comprises about one-quarter of total body length, while the legs make up about one-third.

These differences influence how motor skills are performed. For instance, a relatively large head in childhood affects balance during movement. Similarly, shorter legs in very young children limit their ability to run efficiently. At the onset of puberty, children typically have longer limbs, making them better suited for running; however, this rapid growth can temporarily disrupt coordination and lead to awkward movements.

**1.3. Growth Spurts**

A sudden increase in growth rate, known as a "growth spurt," involves both height and weight gain. This typically occurs around age 12 for girls and age 14 for boys. During growth spurts, much of the body's energy is devoted to development, leaving children more easily fatigued and potentially unable to sustain the same training volume or intensity. However, light training can still stimulate physical development, provided the child has sufficient energy reserves.

**1.4. Differences Between Early and Late Developers**

Children mature at different rates. Some develop earlier or later than average. For both boys and girls, the peak growth spurt may occur up to two years before or after the mean. Consequently, there may be a four-year developmental gap between children of the same chronological age.

When coaching young athletes, it is essential to focus on developmental stage rather than age alone. Early success may be primarily due to temporary advantages in height or strength. As peers catch up, early developers may lose

their advantage. Conversely, late bloomers are often undervalued because their performance is assessed without accounting for delayed development.

**2. Physical Qualities**

For young athletes, the focus of training should not solely be on performance outcomes but on the development of motor skills. Emphasis should be placed on activities that enhance coordination — including body control, spatial awareness, and foot placement — which are closely linked to proprioception.

Regular physical activity, whether through organized sports or informal play, prompts the nervous system to adapt to varying demands. These adaptations occur progressively each year. Physical activity promotes the development of balance, agility, and coordination.

Therefore, children should be exposed to a variety of sports and physical disciplines to acquire new skills, learn new movement patterns, and improve their overall fitness — changes that will benefit them for years to come.

Motor skills develop rapidly until adolescence, underscoring the importance of engaging in multiple disciplines. Children and adolescents require a minimum level of physical activity for harmonious psychophysical development. This need is often fulfilled naturally through spontaneous movement.

Compared to adults, children exhibit greater motor activity, partly due to brain impulse dominance and a lower subjective perception of physical exertion.

Physiologically, children and adolescents differ from adults in their capacity to perform and tolerate effort. They experience “sensitive phases” — optimal periods for developing specific motor capacities, which occur at different times and intensities. While their adaptation mechanisms to physical and mental stress follow the same principles as adults, the pace of adaptation is different.

Due to the rapid maturation of the central nervous system in early childhood, developing coordination skills is especially important. Most motor abilities essential to physical fitness reach their peak development at the beginning of puberty, making this a critical window to emphasize their enhancement.

During the 13–15 age range, training begins to target specific skill sets, particularly those related to sprinting and jumping.

Training for children and adolescents should follow a systematic long-term approach. However, the objectives, content, and training methods differ significantly from those appropriate for adults.

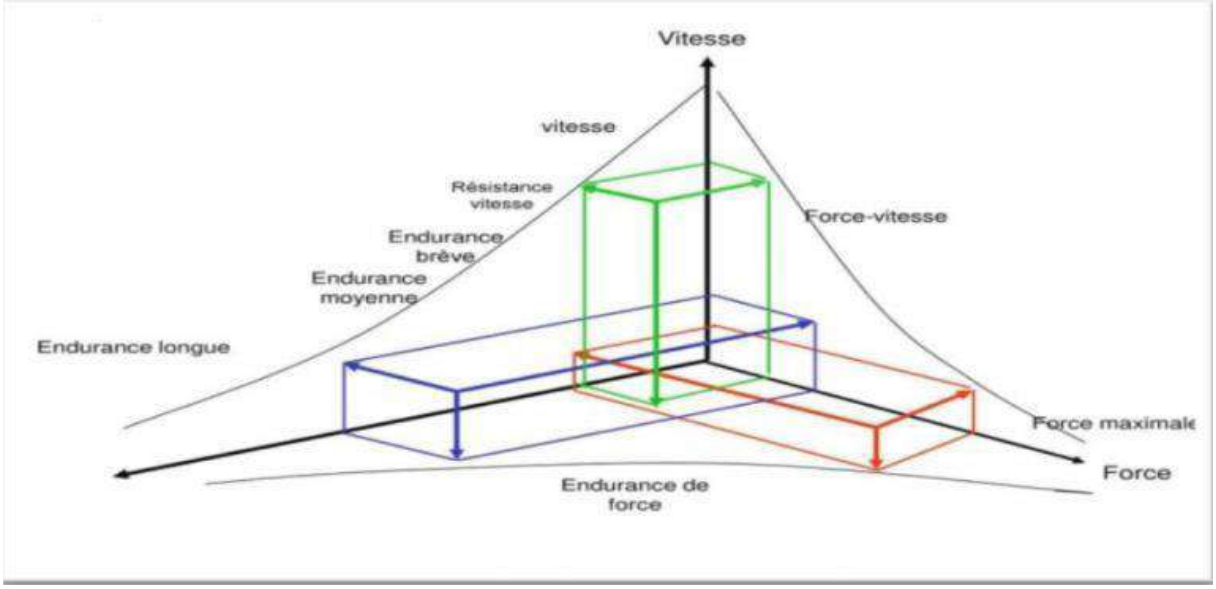


**Figure8. the relationship between the differentes qualities physics LECA ,R. (2020)**

## Adaptation to Age and Developmental Level

Issues related to adaptation to age and developmental stage, along with long-term planning, must remain a constant concern. One of the key arguments supporting the principle that "training children and adolescents is not merely a scaled-down version of adult training" lies in the fact that children and adolescents, unlike adults, are still undergoing growth and development. Their bodies are subject to numerous physical, psychological, and psychosocial transformations, all of which impose limitations on their training capacity.

Growth velocity continuously decreases until adulthood, with the exception of a temporary acceleration during puberty—typically occurring between ages 11 and 13 in girls, and between 13 and 15 in boys. However, different body segments experience growth spurts at varying times: hands and feet reach their adult size earlier than the legs and forearms, which in turn mature earlier than the thighs and upper arms. This pattern is known as the "centripetal growth regularity."

**Primary School Cycle (Ages 7–10)**

a) Psychophysical Characteristics

At this stage, the child is energetic, optimistic, small, light, and lean. By age 8, the brain has nearly reached its adult size; however, the full development of its neural pathways is still ongoing. Children at this age can acquire new motor skills rapidly, but unfortunately, their ability to retain and consolidate these learned movements is limited.

b) Physical Training Orientation

The focus should be on general motor skills and coordination: running, jumping, crawling, climbing, balancing, and lateralization. Training should include:

Educational running drills

Reaction and decision-making speed

Core stability exercises

Nervous system stimulation

Stretching

Postural learning

**Second School Cycle (Ages 10–13)**

This phase marks the first "golden age" of motor learning.

a) Psychophysical Characteristics Peak period for motor learning Improved strength-to-weight ratio Increased width-based growth Enhanced strength due to improved muscular leverage Rapid maturation of the vestibular system (balance) and other sensory organs Skills not acquired during this window will be difficult and costly to develop later.

b) Physical Training Orientation

General and sport-specific motor skill development Precision in running drills

Avoiding incorrect or unsuitable motor patterns

Core strengthening

Speed of movement

Rhythm-change drills and reaction speed (which, by the end of this stage, can reach adult levels)

**First Pubertal Phase (Ages 13–15)**

a) Psychophysical Characteristics

Peak growth spurt

Sudden changes in body structure, including increases in height and weight, which may disrupt the strength-to-weight ratio

Decline in specialized coordination

Maximum development of physical conditioning factors

b) Physical Training Orientation

Enhancement of physical conditioning components

Coordination drills

Core stability

Speed training

Flexibility work

**Second Pubertal Phase (Ages 15–18)**

a) Psychophysical Characteristics

Slowing of growth and development parameters

Increased shoulder width and skeletal mass

Second "golden age" of learning

Development of intellectual capacity and observational skills

b) Physical Training Orientation

Increased training intensity

Muscular strengthening

Core stability

Stretching

Coordination exercises

According to Platonov (1988), the key physical qualities to be developed are: Speed, Flexibility, Endurance, Coordination capacity, Strength.

**Table 6: Development of Physical Qualities by School Cycle (Adapted from Duchateau, J., 1997)**

| | | Premier cycle scolaire | | | Second cycle scolaire | | | Premier phase pubertaire | | | Deuxième phase pubertaire | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination | | +++ | +++ | +++ | +++ | +++ | +++ | +++ | | | | | |
| Educatif de course | | ++ | ++ | ++ | +++ | +++ | +++ | ++ | ++ | ++ | +++ | ++ | + |
| Vitesse | Réaction | ++ | ++ | ++ | +++ | +++ | +++ | | | | ++ | ++ | ++ |
| | Course | | | | | + | + | + | + | ++ | ++ | ++ | ++ |
| | Mise en action | ++ | ++ | ++ | +++ | +++ | +++ | +++ | | | | | |
| | Gestuelle | + | + | + | ++ | ++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ |
| | Chang rythme | + | + | + | ++ | ++ | ++ | + | + | + | +++ | +++ | +++ |
| Capacité | | | | | | ++ | ++ | +++ | +++ | +++ | ++ | ++ | |
| Puissance | | | | | | | | | | | +++ | +++ | +++ |
| Renforcement musculaire | | | | | | | | | | | +++ | +++ | +++ |
| Gainage | | + | + | + | ++ | ++ | ++ | +++ | +++ | ++ | ++ | ++ | ++ |
| Etirement | | + | + | + | + | ++ | ++ | ++ | +++ | +++ | +++ | +++ | +++ |

## 2.1. Speed

According to Zatsiorsky (1966), speed is "the ability to perform motor actions in a minimal amount of time." Frey (1977) further defines speed as the capacity that allows, based on the mobility of neuromuscular system processes and the muscles' ability to generate force, the execution of motor actions within the shortest possible time under specific conditions. Cazorla (2014) describes gestural speed as the maximum number of cyclic or acyclic movements that can be performed within a given time frame.

Leca (2020) distinguishes several types of speed:

Reaction speed: the ability to respond to an external stimulus in the shortest possible time. This includes:

Simple reaction speed (response to a stereotyped visual or auditory signal),

Complex reaction speed (involving information decoding, as seen in team sports).

Acyclic speed or gestural speed: the velocity of a single movement, such as a throw or a strike. This type of speed is significantly influenced by the proportion of fast-twitch muscle fibers. Gestural speed against resistance is heavily dependent on muscular strength. Skeletal muscles consist of different fiber types:

Type I (slow-twitch or red fibers): smaller in diameter, highly vascularized, rich in mitochondria, low in glycogen, fatigue-resistant, used in low-intensity, prolonged efforts (e.g., posture maintenance).

Type II (fast-twitch or white fibers): larger, less vascularized, low in mitochondria, high in glycogen, fatigue quickly but produce powerful contractions, recruited for short, high-intensity efforts.

Training and the type of physical activity practiced influence the proportion of these fiber types. Endurance training promotes type I fibers, while short-duration, high-intensity exercises (30 seconds to 2 minutes) favor type II fibers.

Cyclic speed or movement frequency (sometimes called velocity): the rhythmic repetition of a sequence of actions, such as locomotion. It involves alternating muscle contractions and relaxations. Movement frequency depends on the muscle's capacity to contract and relax rapidly.

Explosive speed: the ability to initiate a maximal muscle contraction in the shortest possible time. It is defined as "an athlete's ability to rapidly alter their momentum or that of an object" and relies on the anaerobic lactic energy system. Explosive speed reflects the neuromuscular system's capacity to rapidly increase force output.

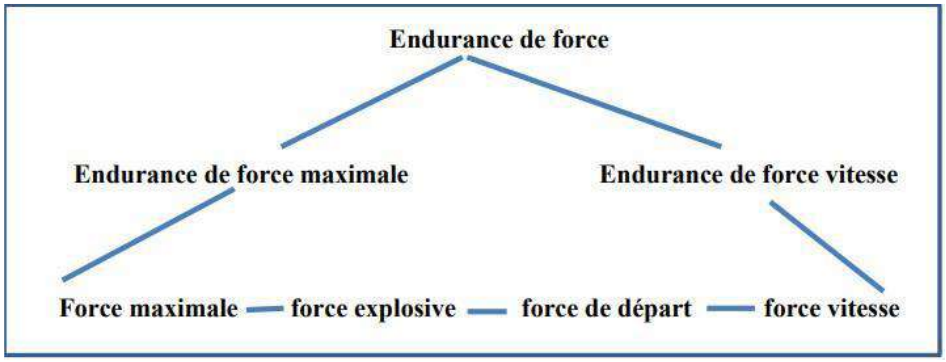


**Figure.9 :Correlations between the 3 formes principales of Strenghs.**

## 2.2 Strength

Specific strength involves one or more muscle groups that are directly engaged in performing a specific sports movement. Dynamic muscle work, which can be either concentric or eccentric, involves changing a muscle's length either through contraction or elongation. Static (isometric) muscle work refers to tension generated by a muscle contraction that does not alter the muscle's length. From a training methodology perspective, dynamic strength is subdivided into maximal strength, strength-speed, and strength-endurance. In various sports activities, strength never manifests in a purely abstract form but rather as a combination influenced by multiple performance-conditioning factors.

In general:

Static strength is closely related to dynamic strength and influences its expression.

Static strength is greater than dynamic strength.

Since static strength is easily measurable and shares limiting performance factors with dynamic strength, it serves as a relevant indicator.

### 2.3.1 Maximal Strength

Maximal strength is the greatest amount of force a muscle or muscle group can generate during a movement. If the resistance is insurmountable, we refer to maximal isometric strength (no movement), representing the highest force in a voluntary contraction (e.g., lifting a weight once = 1 repetition maximum or

1RM). If the resistance is less than maximum, we refer to maximal dynamic strength (with movement).

### 2.3.2 Strength-Speed

This refers to the neuromuscular system's ability to overcome resistance with the highest possible contraction velocity. It's a subtype of dynamic strength with two components:

### 2.3.3 Explosive Strength

Explosive strength is the ability to accelerate a movement that has already been initiated. It represents the neuromuscular system’s capacity to overcome resistance with the greatest contraction speed possible.

Strength endurance is the capacity to resist fatigue during prolonged strength-oriented efforts. It depends on:

Stimulation intensity (% of maximal strength),

Stimulation volume (number of repetitions),

Exercise duration.

Depending on the discipline, one may observe dynamic strength endurance, static strength endurance, or strength-speed endurance. It is the ability of the muscular system to resist fatigue during sustained or repetitive efforts (both static and dynamic).

### 2.3.4 The Strength-Velocity Relationship

Strength is always expressed at a certain speed: the heavier the load, the lower the maximum velocity, reaching a point of isometric tension (evident when trying to lift a heavy object—greater load equals slower speed). The relationship between contraction force and shortening velocity is hyperbolic.

Power, defined as the product of force and velocity, is also the ability to perform an explosive movement as quickly as possible. It reflects energy output from the combination of strength and velocity—one of the most crucial factors in athletic performance. Therefore, an athlete must develop both strength and maintain velocity. Repeated efforts call upon both qualities, particularly during repeated sprints (very high intensity).

From a physiological standpoint, developing this strength and increasing contraction speed depends on:

Muscle mass involved,

Number of actin-myosin cross-bridges during contraction,

Neuromuscular improvements,

Presence of isoforms (protein variants of myosin heavy chains).

Strength-Endurance Relationship:

Strength is defined as the force a muscle can exert against resistance in a single maximal effort. Muscular endurance is the ability to perform many repetitions against a given resistance over time. The goal is to improve the capacity to remain strong for longer, acknowledging that strength involves both energy and neural factors.

For long sets, maintaining neuromuscular activity is key. This could be termed "long-lasting strength" or "enduring strength." Strength training enhances muscles' ability to sustain repeated effort. This is developed with shorter recovery times and higher repetition volumes.

The repeated sprint test (e.g., 10x50m with 30s rest) can assess muscular fatigue resistance. Strength endurance training should be individualized. For example, assessing after how many sprints an athlete exceeds a 10% fatigue threshold helps tailor the training load.

Muscular strength development relies on two key factors:

Neural factors – involve motor unit recruitment (smallest contractile element controlled by the nervous system). Effective neural command recruits more motor units (spatial summation = ~80% of potential), increases discharge frequency (temporal summation = ~20%), and enhances coordination between agonist and antagonist muscles for better movement efficiency.

Structural factors – include muscle composition (fast vs. slow fiber ratio) and muscle elasticity. Theoretically, the more fast-twitch fibers a muscle contains, the greater its strength potential.

Long-term training adaptations lead to hypertrophy (muscle mass increase), typically after ~8 weeks. While hypertrophy is beneficial, excessive mass can hinder performance, so a balance between neural and structural factors is essential. Maximal strength training targets neural development.

### 2.3.5 Strength in Children

In contrast to Anglo-Saxon practices, strength training in children remains hindered by misconceptions that it may harm growth plates, weaken tendons and ligaments, or provide minimal strength gains. However, balance training is a crucial preliminary step to enhance later strength training effects and injury prevention. This quality should be developed throughout growth.

According to recent studies, light free-weight training during late childhood is essential for developing coordination, balance, and agility. With proper posture and technique, weight can be gradually increased. In short: yes, children can build strength with well-designed resistance training.

Studies show that properly supervised strength training leads to 10–40% strength gains in less than 20 weeks, with some children reaching gains up to 70%. Variability depends on training volume (e.g., 3 sets of 10–15 reps per exercise, moderate load, 2–3 sessions/week over 8–14 weeks). Factors like training specificity, assessment method, and baseline strength levels also influence outcomes.

Strength development correlates with growth and physical changes, especially as puberty increases muscle mass naturally. During adolescence, muscle strength rises rapidly, then stabilizes unless stimulated by targeted exercises.

Before puberty, strength gains result mainly from nervous system improvements—better coordination and motor unit recruitment without significant muscle size increase.

### 2.3.6 Strength Development During Growth

Pre-puberty: Strength gains stem from neural factors. Training may include motor circuits involving speed, coordination, and balance, with an emphasis on playfulness. Anaerobic alactic and aerobic training are suitable; however, lactic efforts should be avoided due to poor tolerance. Bone fragility requires caution.

Early puberty: Emphasis should be placed on neural development. Circuit training using bodyweight, resistance bands, and light weights is recommended. This period is ideal for developing speed (reaction time, acceleration, coordination) and flexibility (especially during the growth spurt).

Pubertal children gain strength without hypertrophy. Combined aerobic and strength training does not reduce endurance but may limit strength gains, especially explosive strength. Some guidelines, including those from the World Health Organization (WHO), advise against structured strength training in prepubescent children. However, such recommendations often reflect data from specific sports (e.g., rhythmic gymnastics, figure skating) and may not be universally applicable.

Even in young girls, endurance strength can be significantly improved through appropriate training. While women may have a lower trainability (about 40% less than men), proper programming yields substantial benefits.

Consensus suggests children can start training between ages 6 and 8, but physical, cognitive, and social maturity should guide program design. Children must understand instructions and demonstrate sufficient balance and proprioception.

Chronological age is not always indicative of readiness. Instead, biological age—considering maturity, motor skills, and physical and psychological capabilities—should guide physical preparation. Using chronological age alone may result in unsuitable or even harmful training programs.

At the end of puberty, the growth spurt marks an ideal window for strength development across neural and structural factors. Some authors suggest early neuromuscular and motor skill training during childhood enhances adult performance more than starting during adolescence. In contrast, a lack of early neuromuscular training can lead to diminished motor abilities in adulthood.

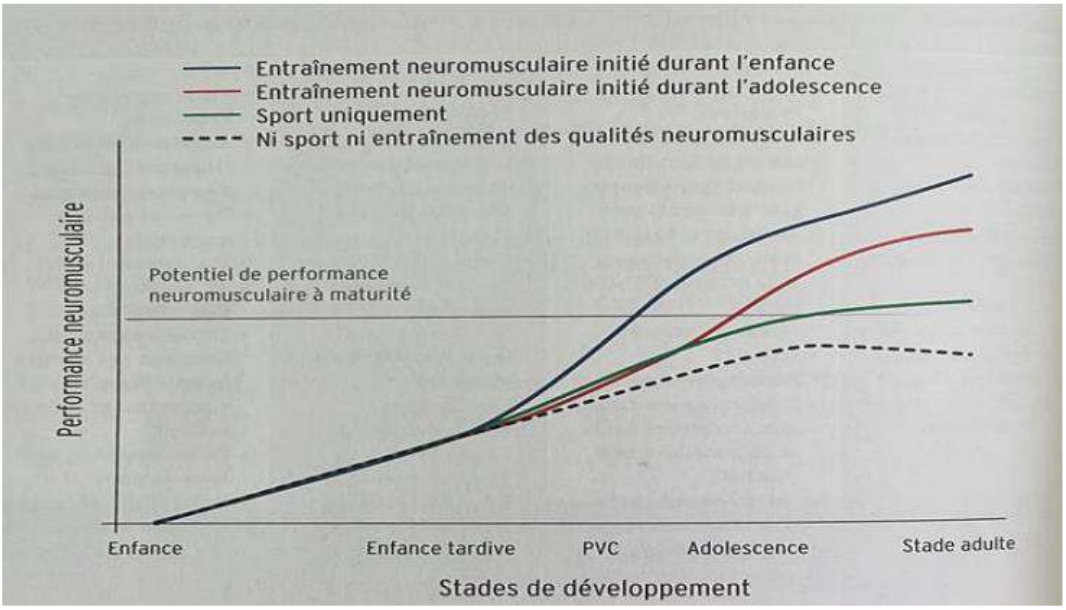


**Figure 10. Performance Potential According to Developmental Stages**

The growth spurt is a favorable phase for the development of muscular qualities. However, caution is needed: although muscles display a high degree of "trainability" during this period, the passive locomotor system is less capable of tolerating intense stress (thus, no maximal strength work or loaded squats should be performed).

Training must begin progressively. Initial programs should include exercises utilizing body weight, resistance bands, medicine balls, Swiss balls, and light weights. These should form the foundation of introductory training sessions. Strength training programs should consist of fundamental (multi-joint) exercises as well as basic movements aimed at reinforcing the shoulder and pelvic girdles and support muscles such as those involved in core stabilization.

Strength development programs for youth athletes must be carefully designed and structured. Every exercise must be clearly explained and properly demonstrated to ensure understanding and safety.

**Table 07: Conceptual model for implementing different forms of strength training across the various stages of athletic development in young athletes.**

| Développement a long terme de la force, de la puissance et de l'endurance | | | |
|---|---|---|---|
| *Faible* niveau de compétence dans le domaine de l'entrainement de la force *élevé* | | | |
| ▪ entrainement de la coordination.<br>▪ travail du gainage corporel<br>.<br>▪ entrainement de l'agilité.<br>▪ entrainement de l'équilibre<br>▪ entrainement de l'endurance musculaire avec son propre poids et matériel (médecine ball) en insistant sur la technique. | ▪ entrainement de l'équilibre.<br>▪ entrainement pliometrique sous forme ludique (saut à la corde) avec un focus sur la bonne réalisation des sauts et la technique d'atterrissage<br>▪ travail du gainage corporel.<br>▪ entrainement de l'endurance musculaire avec son propre poids et du matériel<br>▪ entrainement avec des charges libres légères et un focus sur la technique et la posture. | ▪ entrainement de l'équilibre.<br>▪ entrainement pliometrique avec des sauts de faible hauteur<br>▪ travail du gainage corporel.<br>▪ entrainement avec des charges libres légères/modères.<br>▪ entrainement de la force avec des charges modères.<br>▪ entrainement excentrique (fin de l'adolescence)<br>▪ entrainement de la force par rapport à la spécificité de la discipline sportive. | ▪ entrainement de l'équilibre.<br>▪ entrainement pliometrique avec des sauts de hauteur modère.<br>▪ travail du gainage corporel.<br>▪ entrainement avec des charges libre modérée/ lourde.<br>▪ entrainement de la force avec des charges lourdes.<br>▪ entrainement de la force par rapport à la spécificité de la discipline sportive. |
| **Adaptation principale induite par l'entrainement** | | | |
| Adaptations nerveuses | | Adaptations hormonales, nerveuses, musculaires et tendineuses | |

### 2.3.7. Importance of Core Stability Exercises During Growth

Core stability training is a form of strength conditioning aimed at strengthening the abdominal and back muscles. Performed in static positions either standing or lying down, this type of training deeply engages the muscles of the abdomen and back, contributing to the support and protection of the spine. It promotes body alignment, posture maintenance, and optimal force transmission by minimizing energy leaks. Core stability plays a vital role in maintaining body balance in both static and dynamic contexts. In dynamic situations, it enhances speed of movement, directional changes, acceleration, and deceleration. It thereby enables performance restoration and quick reestablishment of balance, which is constantly challenged during athletic actions.

Core work is especially important during growth because children undergo changes in height and weight that disrupt both static and dynamic equilibrium. During puberty and adolescence, as these bodily changes accelerate, there is a need to increase training loads that include core work, balance, proprioception, and coordination. Core stability exercises should be systematically integrated into training to enable children to meet the functional demands of physical activity and protect their developing osteoarticular structures.

**2.3. Flexibility in General**

Flexibility, synonymous with joint mobility, is defined as "the ability to perform movements with the greatest possible range, whether actively or passively." According to Platonov, it represents “the set of morpho-functional qualities that ensure movement amplitude.” Flexibility is attributed to a functional anatomical ensemble composed of muscles, ligaments, and joint capsules, which together allow a full range of segmental motion. It is limited by both mechanical factors (muscle-tendon, capsular, and ligament elasticity, bony restrictions, muscular or adipose mass) and neural factors (such as agonist-antagonist coordination).

Flexibility refers to the ability to move joints through a wide range of motion. Each joint’s natural mobility is determined by the configuration of tendons, ligaments, connective tissues, and muscles. Injuries can occur when a muscle or limb is forced beyond its natural limit. Flexibility training can help reduce this risk by gradually expanding the joint’s range of motion.

There are two subcategories:

Joint flexibility, which concerns the structure of the joints (often called laxity).

Stretching capacity, involving muscles, tendons, ligaments, and joint capsules.

Flexibility is a motor skill partially conditioned by coordination, as range of motion depends on muscular relaxation. Passive flexibility always exceeds active flexibility, constituting a reserve of mobility. When a muscle is stretched, the stretch reflex provokes a rebound contraction, which is useful in plyometric actions such as throws and jumps.

Anatomical and Physiological Factors Limiting Flexibility:

Muscle stretch capacity

Joint structure (laxity)

Muscle mass and strength

Muscle tone (including breathing's role)

Stretching ability of tendons, ligaments, joint capsules, and skin

Age and sex (girls are generally more flexible than boys)

Warm-up level of the locomotor system

Time of day (less flexibility in the morning, more in the evening)

A link exists between flexibility and performance. As long as the total stretching time is "reasonable" (less than 2 minutes), its impact on performance is minimal or nonexistent, especially if the stretched muscle is part of a kinetic chain. If there is uncertainty, a short rest period of 5–10 minutes after stretching can help maintain flexibility without reducing performance. When included in warm-ups, the muscle contractions involved in dynamic exercises help cancel out any negative effects of stretching.

### 2.3.1 Flexibility Development

Flexibility can be developed at any age, with a sensitive period between ages 6 and 10–12. In adulthood, flexibility tends to decline due to the progressive loss of extensibility in tendons, ligaments, fasciae, and muscle sheaths (associated with reduced collagen fiber elasticity). Flexibility development is not uniform. It remains stable in children aged 5–8, decreases around age 12–13, then increases again up to age 18. In girls, it remains stable until age 11, then improves until age 14, at which point it plateaus. Boys are generally less flexible than girls, with the gap widening during puberty. Changes in bone length and joint morphology may explain these trends. Joint mobility peaks around ages 9–10 and then declines due to morphological changes, such as reduced hip flexibility.

Passive hip flexion in girls: 92° at age 9 → 83° at age 14

Passive hip flexion in boys: 84° at age 9 → 80° at age 14

Flexibility must be maintained throughout adolescence, as aging results in reduced collagen elasticity. The gender difference (girls being more flexible) is explained by:

Lower muscle mass to stretch

Hormonal influences

Flexibility gains can be maintained after a 14-session stretching program over 30 days, with only one maintenance session per week. Stretching methods involving isometric contraction–relaxation–stretch cycles yield better results than static or dynamic stretching alone. Incorrectly performed stretching (e.g., poor posture) may cause injury, especially during childhood and adolescence. Thus, all stretches should be done gently, without sudden movements.

Prolonged stretching of a muscle group reduces activation and contractile strength and decreases maximal isometric force for up to one hour afterward (-28% immediately; -9% after one hour). Therefore, stretching during warm-ups may not deliver the expected performance benefits. It is generally recommended to remove it from warm-ups. However, if total elimination is difficult, stretches may be retained for hip flexors (e.g., hamstrings).

**3. Assessment**

Assessment is the process of measuring, quantifying (often through statistical methods), and characterizing a complex situation, entity, result, or performance. Depending on its objective, assessment may use diverse tools and methodologies grounded in theoretical, policy, or practical considerations. Consequently, its meaning varies across fields such as politics, education, psychology, and science.

In sports, assessment evaluates an athlete’s performance or activities. Using defined criteria, it allows comparisons with large samples and aims to monitor training status, guiding observation, measurement, and feedback to optimize performance. It also informs athletes about their progress toward goals, the quality of their performance, and physical development over time. The key goal is to propose or develop training plans suited to an athlete’s age and skill level for better self-awareness and motor development. Thus, assessment

serves both coaches and athletes, becoming essential for adjusting training processes and tracking whether goals are being achieved.

### 3.1. Objectives of Assessment

In sport, assessment is crucial for:

- Assigning athletes to the most suitable activity based on aptitudes and interests.
- Enhancing athlete abilities by:
- Encouraging progress through monitoring and motivation.
- Setting realistic, achievable goals aligned with current abilities.
- Adjusting training loads based on fitness levels.
- Improving training programs and methods:
- Predicting current and future performance.
- Motivating athletes.
- Helping sedentary adults determine their exercise tolerance for health-focused training.
- Promoting physical activity;
- Training professionals in assessment techniques;
- Conducting normative studies.

Assessment often involves comparing results, using either normative or criterion-based approaches.

### 3.2. Physical Testing

A test is “a systematic procedure used to measure a sample of individual behavior.” Tests are tools for evaluating physical fitness components and can be used for inter-individual comparisons. Comprehensive assessment requires a test battery meeting the following criteria:

- Clearly defined objectives
- Available resources (human and material)
- Specific sport demands

Test Requirements:

Objectivity: The measurement must be independent of the evaluator's biases or judgments.

Reliability: The test must consistently distinguish between individuals in the tested group.

Sensitivity: If all individuals obtain the same score, sensitivity is zero.

Validity: The test must accurately measure what it intends to.

Standardization: Testing and performance measurement conditions must be the same for all participants.

Calibration: The creation of a benchmark scale that positions individuals within a defined population.

Test Typology**:** Field Tests (for aerobic capacity assessment and training use): These tests evaluate athletes based on performance metrics. By relying on test data and athlete capabilities, field tests objectively identify physical resources necessary for structured conditioning. Conducted outside of competition, coaches observe that improvements in physical qualities seen in field tests usually translate to competitive performance. Field testing is indispensable—competition results alone cannot validate training effectiveness. Improvements in records, grades, or match results help pinpoint performance factors needing development.

Field tests are valuable tools for adapting training to the demands of competition. Through self-assessment, athletes provide essential feedback for coaches.

Laboratory Tests: While offering highly accurate results, lab tests may lack real-world relevance. These advanced tests measure physiological limits, such as $VO_2$ max, blood lactate levels, and power output (in watts). Laboratory assessments require sophisticated equipment and experimental conditions. Due to the high cost and technical requirements, access to such testing is often limited to well-funded programs.

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