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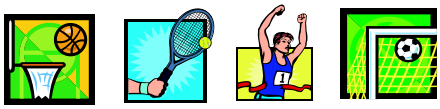


P.E. Theory Book

4th E.S.O.

1st Term

General concepts in physical activity

First of all, it is essential to give the definition of several concepts, so that they are all clear and we use the same vocabulary when we use them.

Physical activity is any body movement in which we use more energy than the one we use when we don't move.

Physical exercise is any physical activity that has been planned, has a structure and is repeated in time, and its goal is to be fit, to improve someone's physical condition or to keep one or more components of that physical condition.

Physical condition is the ability and vitality that allows people to fulfill their daily general tasks, to enjoy an active leisure, preventing at the same time diseases and injuries which can be produced out of the lack of activity. The physical condition consists on a group of characteristics owned by any individual or which can be achieved related to their own ability of doing physical activities.

Cycling is a sport that needs a very good physical condition.

We can say that the physical condition of a sportsman is given by his/her:

A- Anatomical condition: it states the difference between the different body shapes in human beings. The base of the anatomical condition is the mechanical structure. Taking this into account, we can differentiate among three different body shapes:

a- Ectomorph: elongated and straight muscles.

b- Mesomorph: strong, very marked muscles.

c- Endomorph: fat predominates over muscles.

B- Physiological condition: it can be defined as the functional ability of doing physical exercise without danger for the organism.

C- Motor condition: it is conditioned by the physical qualities of the human being. These qualities are endurance, speed, strength, coordination and flexibility (elasticity).

D- Nervous and psychomotricity condition: This quality is determined by the reaction against stimulus and the sportsman's coordination.

E- Ability and skills condition: this quality allows us to obtain the biggest performance with the smallest work when doing sport.

Basic physical qualities

Basic physical qualities are the necessary movement skills on which men and sportsmen develop the technical skills. Physical qualities are developed through training and they determine the physical condition of a person. The development of these basic physical qualities greatly influences the learning of the technical skills and the tactical techniques of sports, and also on the learning of the movement skills. The basic physical qualities are:

1- Endurance.
2- Speed.
3- Strength.
4- Flexibility.
5- Coordination.

1- Endurance

Definition: There are many definitions for endurance, but they can all be gathered in one; endurance is the ability of a sportsman to make an effort, more or less intense, for the longest possible period of time.

Football requires a high endurance level.

We can distinguish two different types of endurance:

A- Aerobic: it is the ability of doing and keeping an effort, done at a low or medium intensity, for a long period of time, in which our muscles receive enough oxygen.

B- Anaerobic: it is the ability of doing and keeping an intense effort, bearing in mind that the oxygen received by our muscles won't be enough to make the whole exercise, considering too that the muscles get easily tired. This situation is known as oxygen debt, and the workability of the sportsman will depend on his own ability of working under fatigue conditions. There are two types:

a- Alactic: the energy used by the muscles to contract is the A.T.P. It is a very short energetic source, lasting only 5 to 10 – 30 seconds, that is as long as the energy deposits last. Lactic acid is not produced and the effort can be recovered easily. The energy of the organic molecules is transformed by the cells in chemical energy held in the ATP, which is the means of transport for the energy created and needed in the cellular processes, all of which need energy.

b- Lactic: it is produced when the energy used by the muscles to contract is obtained from the glucose in blood or from the glycogen in the liver. The capacity of this energetic source is wider than the previous one, thus it can last from 20- 30 seconds until 90 – 180 seconds. Its recovery, though, is very slow, due to the fact that lactic acid has been produced and it has deposited in the muscles.

Training endurance

There are two types of systems when training endurance:

1- Continuos

Its main characteristics are:

a- There is no break.

b- They last for a long time.

c- They should be performed in the natural media.

d- Depending on their intensity they will work aerobic or anaerobic endurance.

Continuous systems can be made in two different ways:

A- At a regular rhythm: obtained through continuous running. Its main characteristics are:

a- Regular and moderate intensity.

b- Long working time, between 15 to 60 minutes.

c- The heart rate must be between 140 and 160 beats per minute.

d- Used to increase the aerobic endurance.

B- Changing rhythms: through the Swedish fartlek. Its main characteristics are:

a- Run on a changing terrain.

b- Varied intensity, both in rhythm and distance.

c- The body must adapt to the rhythm changes.

d- The heart beat must be between 140 to 200 beats per minute.

e- Speeding, continuous rhythm, ups and downs, etc… are worked in this exercise.

The marathon is probably the highest example of endurance.

2- Fractional systems

They are of two types:

A- Interval – training: the main characteristics of this system are:

a- The necessary time to perform this activity will be 70 % of the time used to perform it at its highest intensity.

b- The recovery time between series will be more or less a minute.

c- The running distance will vary between 80 to 100 meters.

d- Depending on its intensity, aerobic or anaerobic endurance will be trained.

B- Repetitions: the main characteristics of this system are:

a- The performing time in the round will be 90 – 95% of the time usually used at this distance.

b- The heart rate per minute will be between 160 to 200 beats.

c- Recovery between series will be practically total.

d- Anaerobic endurance will be worked.

Benefits produced by working endurance.

Working endurance produces the following benefits:

a- The heart rate is increased, so the heart can receive more blood and as a consequence, it can expel more blood with every heart beat (Systole)

b- The heart walls get more resistant.

c- The heart rate decreases, so the heart gets more efficient and more energy is produced during the physical effort.

d- Capillarization increases thanks to the oxygen increase in the skeletal muscle.

e- Positive impact on respiratory system, so the lungs increase their capacity.

f- The organs used to clean our body (liver, kidneys…) are activated, so they eliminate more harmful substances.

g- The muscle system gets stronger.

h- Metabolism is activated, as the capacity to oxidate carbon hydrates and fats is increased (less obesity); also, the "good cholesterol" (High Density Lipoproteins or HDP) increases, and the "bad cholesterol" (Low Density Lipoproteins or LDP) decreases; lactate in blood is eliminated more easily, so the body will recover faster and better.

2- Strength

Definition: It is the ability of a sportsman to fight against and win an external force by means of muscle contraction.

There are two different contractions:

a- Isotonic contraction: When contracting, the muscle varies its length. If the length becomes shorter it will be called **positive or concentric isotonic contraction**; if the muscle length becomes longer it will be called **negative or excentric isotonic contraction.**

b- Isometric contraction: the muscle strength applied can't defeat the resistance, so the muscle doesn't vary its length.

c- Auxotonic or mixed contraction: In the same movement, both isotonic and isometric contractions are produced, at the same time or alternatively.

Swimming is a sport that demands strength and coordination.

There are three types of strength:

a- Slow, pure or maximum strength: This strength is produced when we succeed against a resistance without taking into account the time used.

b- Quick or fast strength: it is produced when we succeed against some strength, taking into account the time used.

c- Explosive strength: it is produced when we succeed against a resistance of 75 % in the sportsman's maximum test, at the highest possible speed.

Training Strength

To train strength there are different systems:

A- Weight lifting: it has the following characteristics:

a- It can be made with weight or with specific machines.

b- You can work with your partners or with medicine balls.

c- Very specific muscles groups are trained.

d- You must observe all the security rules.

B- Multi-jumping training: this system has the following characteristics:

a- All kind of jumps can be made (forward, backward, on one foot,…)

b- It Works on the strength of the lower limbs.

Doing a basketball dunk requires, among other things, some great impulse strength.

C- Isometric training: this system has the following characteristics:

a- The sportsman's strength receives a higher resistance.

b- This training can cause muscle exhaustion.

c- When this training is finished, relaxing and elasticity exercises must be performed.

D- Circuits: this system has the following characteristics:

a- An exercise is assigned, and it must be performed through different stations, always with the same time and recovery patterns.

b- Work can be also made with a fixed number of repetitions.

c- The number of the stations will be between 8 and 12.

d- The drills will vary so as to avoid working on the same muscle group on two consecutive stations.

e- Both, strength and anaerobic work are being trained.

Training strength according to your age.

A- 10 – 14 years old:

a- Only general strength is trained.

b- The drills performed must never be higher than the sportsman's weight.

c- It is important to watch the back position in every exercise at every moment.

B- 15 – 17 years old:

a- We can begin to work on specific strength areas development.

b- We begin to lift very light weights, always paying attention to the back position. It is only recommended for regular sportsmen.

C- 18 years old and older:

a- Strength can be trained at any level.

b- The lifting weights will be always made in percentages.

c- The back position will be watched at any moment.

3- Speed

Definition: It is the ability of a sportsman to move and go forward at the highest intensity in the shortest time possible.

There are three types of speed:

a- Pure or gestural speed: every movement made without paying attention to the distance.

b- Moving speed: the ability of making the distance in the shortest possible time.

c- Reaction speed: determined by the time elapsed between the stimuli and the sportsman's reaction against it.

Tennis requires both gestural and reaction speed.

Training speed

There are several systems to train speed:

A- Starts:

a- We react against a stimuli.

b- The distance covered will be of about 10 meters.

c- It can be made with different variations (sitting down, standing up, back on floor, lying down, etc.).

d- We work mainly on speed reaction.

B- Muscles empowerment:

a- We should make specific exercises to work on the muscles that are necessary for speed.

b- We can use devices such as rubber bands, tensors, ballast jackets, ballast wristlets.

c- Both, reaction speed and moving speed are being trained with this system.

Throwing the ball against the goal in handball is a fast and explosive gesture.

C- Progressions:

a- We run in different series, at an intensity of 95 to 100 %.

b- Recovery between series must be complete.

c- The running distance must be in between 30 to 150 meters.

D- Displacements:

a- Series of 30 meters which will be made at a medium intensity.

b- The series will vary (facing front, facing back, skipping, heels behind etc.) .

c- We will pay close attention to the running technique.

Benefits made after working on speed.

Working on speed provides the following benefits:

a- It improves the muscle coordination.

b- It improves the speed with which orders are transmitted to the nervous system.

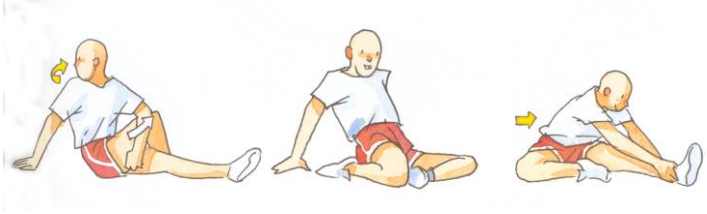
c- The heart walls get stronger.

d- The muscle strength increases, mainly on the lower limbs.

4- Flexibility

Definition: It is the joint mobility together with the muscle elasticity.

Exercises made on the floor to develop flexibility.



Agents that determine flexibility

a – Joint mobility: The way each joint is built depends on the bone segments it is made out from, on its tendons, on its ligaments and on other joining elements.

b- Muscle elasticity: The articular tissues (tendons, ligaments, muscles, etc.) that make the joints can stretch or shorten, but the most important elasticity to be taken into account is the muscle elasticity.

As shown in the image, high jump needs great flexibility.

Factors that affect flexibility

a- Age: flexibility decreases as the sportsman ages. The more the sportsman trains, the better the flexibility will be.

b- Gender: Women have better flexibility than men.

c- Climate: High temperatures help to improve flexibility.

d- Genetic: due to heritage and constitution, some people are more flexible than others.

Systems to train flexibility

To train this quality there are some methodologies based on the repetition of exercises (drills), which will cause the highest tension on joints and muscles.

a- Active methods: exercises are made in an active way, not using inertia to reach the positions.

b- Passive methods: exercises are made in a passive way. To reach the positions we use the help of another person or an apparatus, otherwise, the position wouldn't be reached.

Benefits made after working on flexibility.

Working on flexibility provides the following benefits:

a- It improves the ability of elongating our muscles, so that they can stretch without injuries.

b– It improves the articular movement, so our exercises will be wider without having to use our joints in extreme movements.

c- The person will be more agile, so the technical work will be easier and better.

d- Muscles will relax more easily.

5- Coordination

Definition: It is the ability of a sportsman's whole body or just one of his/her body parts, to develop an orderly and efficient sequence, a gesture or a specific action, all of them under his/her brain control.

There are two different types of coordination:

A- General: movements with all our body parts are made at the same time.

B- Segments: movements are made just with some of our body parts. This is subdivided in:

a- Eye - hand: eye-hand coordination.

b- Eye - foot: eye-foot coordination.

Systems to train coordination

There are several systems to train coordination, but the most important ones are:

a- Shifts: general running exercises are done (skipping, run progressively etc.)and also specific running exercises (jumps changing the leg, jump the skipping rope, walking on certain areas of the court, etc.).

b- Exercises with balls: such as bouncing or throwing two or more balls at the same time, technical gestures with an analysis of the coordination and the performance.

Tennis requires an excellent coordination

Work developed on the different basic physical qualities.

Work is determined by three main factors:

A- Work intensity. It is the work quality; we distinguish:

a- Maximum intensity: working at a 100 % of the possibilities. As an example, in athletics it would be the speed disciplines (100 meters).

b- Sub-maximum intensity: working at a 75 % to 80 % of the possibilities. For example in athletics, the medium distance disciplines (800 meters).

c- Medium intensity: working at a 50 % to 60 % of the possibilities. Once again in athletics, the long distance disciplines (10,000 meters).

B- Work volume: It is the amount of work done by the sportsman.

C- Working time: It is the time used to make a specific effort. It can be:

a- Short: speed races in athletics (100 meters).

b- Medium: medium distance in athletics (1,500 meters).

c- Long: long distances in athletics (10,000 meters).

Warm-up.

All activity that uses physical qualities must be preceded by a warm-up. Warm-up is the group of exercises made before doing any physical activity, soft or intense, which helps the body to get ready in order to do an effort preventing injuries.

The main aim of warm-up, as mentioned in its name, is to rise the body temperature, in order to achieve some **effects or goals:**

a- To improve the muscle function, so that it improves the muscle ability to contract and relax, and also its elastic abilities. This way, the possibility of getting muscle contractions and injuries is diminished.

b- To activate the joints, so they lubricate with the movement. This way, the ligaments get ready for the effort, preventing this way injuries and sprains.

c- To activate organic functions by means of the cardiovascular and the nervous systems.

The **phases** in a warm-up are:

a- Varied and continuous running. It consists on running softly for 8 or 10 minutes; half of the time is used for plain running and the other half is used for varied exercises, as lateral running, rising your knees, bending down, lowering, etc.

Continuous running is the first part of a warm-up.

b- Articular mobility. It consists on doing soft, circular movements with all the body joints.

Warming up the joints is essential to prevent injuries.

c- Muscle stretching. It consists on stretching all the major muscle groups by doing static exercises (quadriceps, calf muscles, adductors).

Stretching allows our muscles to increase performance.

d- Running exercises. They must be made with a higher intensity than in the continuous running, as for example rising your knees, your heels, lateral running, very soft multi-jumping, etc.

General guidelines to follow when warming-up.

a- Time: how long the warming-up should be depends on several factors, among which we highlight the day time (at early hours, the warming-up must be longer than in the afternoon), the outdoors temperature (if it is cold, the warm-up should be longer), and the training level (the people with a higher training level will need shorter warming-up times, because their bodies adapt easier to the effort). As a general rule, the warming-up will last between 10 to 20 minutes.

b- Intensity: it must be moderate and progressive. Only aerobic (90 - 120 ppm). Not overloading.

c- Sequence: always following the order (continuous, varied running, joint mobility, stretching and running exercises).

d- Exercises to be done: the exercises must be comprehensive, not difficult and using several muscles groups.

Types of warm-ups

a- General: It is the one performed before any sport activity. It must work on all the body parts. It is the necessary warm-up to be done before any physical activity, regardless its purpose being sport or leisure.

b- Specific: In this warming-up we work on the specific areas that are going to be used during the training.

Effects of the warming–up on our bodies.

The effects can be gathered in four groups:

A- Activation of the muscle function, due to the increase of the muscle temperature, which causes:

a- An improvement in the blood circulation.

b- A decrease in possible injuries.

c- An increase in the speed of the contraction and relaxation of the muscle.

d- A better energy production of the muscle.

e- An increase of elasticity.

B- Stimulus of the nervous qualities, due to the activation of the central and peripheral nervous system, producing:

a- An improvement in coordination.

b- An increase of the agility.

c- A stimulus for ability.

C- Psychological preparation, producing:

a- A better concentration for the competition or training.

b- A beginning for communication and interaction.

D- Improvement on the body abilities, due to the activation of the respiratory and circulatory apparatus, producing:

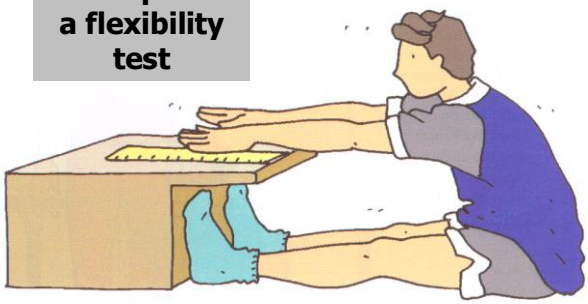
a- A stimulus in the production of energy, thanks to the optimum level of oxygen in our muscles.

The warming-up is beneficial for our body

Evaluation of a sportsman's performance

To state the level of a sportsman, there are several tests that will value specific aspects of each basic physical quality. There are tests for all the different basic physical qualities.

Example of a flexibility test



Example of a balance test

Tests must be done at the beginning and at the end of a training period, so that they will provide the real improvement of the quality in analysis. They must be done under the same conditions (exercise, distance, etc) and under similar circumstances (terrain, time, etc)

Athletics

A bit of history

The principles on which athletics is set have remained unchanged through centuries. In Ancient Greece (8th century B.C.) athletics competitions were already held, as the ones which took place in Olympia (Olympic Games). In these games, athletes competed to be the fastest and the strongest. There were different disciplines in these games as speed and resistance races, long and triple jump, or javelin and discus throws.

The development of athletics to the sport we know at present days began in the middle part of the 19th century in England, where athletics was used at schools and universities as part of the education.

When the Olympic Games were restored in Athens in 1896, athletics became the outstanding sport in this competition. From then, athletics has spread all over the world.

Image of an athletics stadium

In athletics, we can find races and contests. In the contests group, we have the jumps and the throws.

Regulations

Competitions are held on a track made out of tartan. This material allows the perfect grip of the special shoes the athletes wear, which have got nails. The track has got oval shape and it measures 400 meters in the inside edge of lane one. Normally a track has got eight lanes. There are also specific areas to make the jumps and the throws. We will explain the specific rules of the disciplines in each of the following sections.

Races

Races are one of the basis motoric skills. All the races have three different phases:

A- The start: The different parts of a start coincide with the callings of the starts judge. According to the race, there can be two starts:

a- Low start: it is made from the starting blocks, which are used to give a bigger impulse to the athlete. The callings given by the start judge are: "On your marks, set, and then there is a gunshot". The athlete must have four

supports on the track. This start is used in the following races: 100, 200 and 400 meters; 110 meters male hurdles, 100 meters female hurdles and relays 4 x 100 and 4 x 400 meters.

Start from the starting blocks in a 200 meters race

b- High start: it is made with a slight unbalance on one of the feet, to help the athlete begin the race. It is used for distances longer than 400 meters.

B- Race development: each race has a different long stride technique, passing obstacles or passing the baton, etc. The only common elements to all races are frequency and amplitude. **Frequency** is the number of long strides done by the athlete in a particular distance. **Amplitude** is the distance achieved in each long stride.

C- The arrival: it is the last phase of the race. The race is finished when the athlete crosses the finish line with his/her chest.

Taking into account the Olympic program, these are the races:

A- Speed races: 100 meters, 200 meters and 400 meters, both male and female categories.

Last meters in a 100 m. race

Finish line in a 100 meters race

B- Middle distance races: 800 meters and 1500 meters, both male and female categories.

A 1500 meters race

C- Long distance races: 5000 meters, 10,000 meters and marathon, with a distance of 42,195 meters.

Last meters in a 5000 m. race

Marathon race, held out of the stadium

D- Races with obstacles, divided into:

a- Hurdles: 100 meters female, where the hurdles are 0`84 meters high, 110 meters male, where the hurdles are 1`06 meters high and 400 meters, where the hurdles are 0`76 meters high for females and 0`91 meters high for men.

Athletes passing the hurdles in a competition

b- Steeplechase: it has a distance of 3,000 meters both for males and females.

The water obstacle in the steeplechase race

E- Relays: they are team races. Four athletes have to pass a baton among them during the race. The baton is a 30 centimeters long cylinder tube. The athletes have to pass the baton to each other in a specific area. This area differs according to the race. Passing the baton can be made in two different ways:

Passing the baton in a 4 X 100 meters relay race

a- Upper pass.

b- Lower pass.

The two distances in relays are 4 X 100 meters and 4 X 400 meters, both male and female categories.

F- Race walk: race walk consists on a sequence of steps in which there is not aerial phase, which means that there must always be one foot on the floor. The distances in race walk are 20 km. and 50 km., both in male and female categories.

50 kilometers race walk

Jumps

Jumps are included in the athletics **contests.** There are some common characteristics:

a- Two athletes never compete at the same time

b- They compete in turns that have been previously arranged.

All the jumps are in male and female categories and they have several phases:

a- Running, its length will vary depending on each jump.

b- Whipped, the back foot leaves the floor

c- Flight, aerial phase of the jump.

d- Landing, the athlete lands on the sand or the mattress.

There are 4 types of jumps:

A- Long jump: it is a horizontal jump, and it consists on making a jump with one leg as long as possible, until the athlete lands on a sand pit. The running before the jump has a progressive acceleration, in order to reach the top speed at the moment of the strike on the table. This table has a soft material which helps to say if the jump was valid or not, as if the athlete steps on this soft area, the shoe nails leave a trace on it. To measure the jump length, the judge will use the last trace left by the athlete on the sand pit. Each athlete will make three jumps each in the competition. Then, the athletes with the eight longer jumps will make three other jumps each.

Arerial phase in long jump

Landing in long jump

B- Triple jump: it is similar to the long jump, with the difference that the athlete must make three strikes before beginning the aerial phase over the sand pit. The first and second strikes are made with the same leg and the third strike uses the other leg. The rules are similar to the long jump ones.

Image of a triple jump competition

C-High jump: it is a vertical jump. The aim is to go over a bar placed horizontally on two uprights. This discipline has had a big evolution along the years, and there have been different styles:

a- Two feet together jump: facing the bar, the athlete jumped with the two feet together and landing on his/her feet.

b- Scissors jump: the athlete jumps first with one leg and then the opther, falling on the feet.

c- Ventral jump: the athlete jumps over the bar facing it, with the ventral part of the body towards the bar, and landing on a mattress on his/her back.

d- Fosbury jump: this name comes from the US athlete Dick Fosbury, who in the Olympic Games in Mexico 1968 made a great revolution in this discipline The athlete strikes with the foot that is further away from the bar, then goes over the bar on his back and the landing is made on the mattress also on his back. Each athlete can try three times in each of the heigths to jump over them.

Fosbury style in high jump

D- Pole vault: in this discipline, the athlete must jump over a bar helped by a pole made out of a resistant but flexible material. The length of the pole depends on the strength and speed of the athlete. The jump is preceded by a 40 meters running, in which the athlete must hold the pole at the waist height. Then, to do the strike, the athlete must put the pole inside a small box and then he/she must transfer all the energy of the running into the pole, pushing and bending it to start the flight. As the pole is flexible, it will throw the athlete upwards and he/she will go up with the feet first, facing the bar, rising legs and arms not to throw the bar down, and pushing the pole away, finally falling on the mattress on his/her back. The rules are similar to the high jump ones.

Sequence of a pole vault

Throws

Throws are included in the athletics **contests** and they consist on throwing an artifact as far as possible. Throwers are strong, plosive athletes who can make actions at a very high speed.

Throws have two phases:

a- Impulse phase: they get the artifact ready by increasing its speed.

b- Throwing phase: they transfer all the energy achieved in the previous phase to the artifact.

During a competition, all the athletes will make three throws, and then, the eight ones with the longest throws will go into a final phase with three more throws to improve their results. The winner will be the one with the longest throw distance. If there is a tie, judges will check the second best throw and so on.

A throw is not valid if the artifact lands outside the limits of the landing area or if the athlete steps outside the throwing area when he/she throws.

There are four disciplines: shotput, javelin throw, hammer throw and discus throw.

a- Shot put: the artifact is a metal ball that weights 7 '260 kilos for men and 4 kilos for women. The throwing area is a circle of 2'135 meters of diameter. There are both male and female categories.

Shotput discipline

b- Javelin throw: it is a spear pointing in both ends, with a handle made out of rope in the middle to throw it. The weight of the javelin is 800 grams for men and 600 grams for women. The javelin must be thrown over the athlete's shoulder. There are both male and female categories.

Javelin throw discipline

c- Hammer throw: it is a metal ball similar to the shotput one, but with a wire ending in a handle. It weighs 7'250 kilos for men and 4 kilos for women.

Technically speaking, it is a very difficult throw. The circled area for throwing is surrounded by a jail for safety reasons. It has just a small gap through which the hammer is thrown. There are both male and female categories.

Hammer throw discipline

d- Discus throw: it is an artifact similar to a dish. It has 22 centimeters of diameter and it weighs 2 kilos for men and it has 18 centimeters of diameter and weighs 1 kilo for women. The circled throwing area is similar to the hammer throw one. There are both male and female categories.

Discus throw discipline

Combined disciplines

This discipline combines several others. Athletes competing in the combined disciplines are the most complete ones, as they must show proficiency in very different disciplines. There are two:

1- Decathlon: It is only for men and it has 10 disciplines that are played in two days:

A- First day:
a- 100 meters.
b- Long jump.
c- Shot put
d- High jump.
e- 400 meters.
B- Second day:
a- 110 meters hurdles.
b- Discus throw.
c- Pole vault.
d- Javelin throw.

110 hurdles discipline

e- 1500 meters.

1500 meters discipline

Pole vault discipline

The athletes obtain points in the different disciplines according to some punctuation tables. These tables give different scores according to the results got by the athletes in each of the disciplines. At the end of the competition, the winner will be the one with the highest score, after having added up all the results.

2- Heptathlon: It is only for women and it has 7 disciplines that are played in two days:

A- First day:

a- 100 meters hurdles.

b- 200 meters.

c- Shot put.

d- High jump.

Fosbury style in high jump discipline

B- Second day:
a- Long jump.
b- Javelin throw.
c- 800 meters.

Long jump discipline

Shot put discipline

Rugby

A bit of history

The origin of rugby can be found in Ancient Rome, in a game called "harpastum". This game evolved along the years to turn into another one called "soule" in France and "football" in Great Britain. The rules changed until the state school of Rugby, a city in England decided to put them together. In 1851 the academy of Edinburgh adopted and published the first regulations for rugby, establishing a division for the first time between football and rugby. At that moment, the English Rugby Federation was created, only to be followed by the French, Welsh, Irish, South African and New Zealand ones.

These nations are the leading ones in international rugby, and they play the two big rugby tournaments, which are the Six Nations Tournament (it used to be the Five Nations Tournaments, before Italy joined it) and the World Cup.

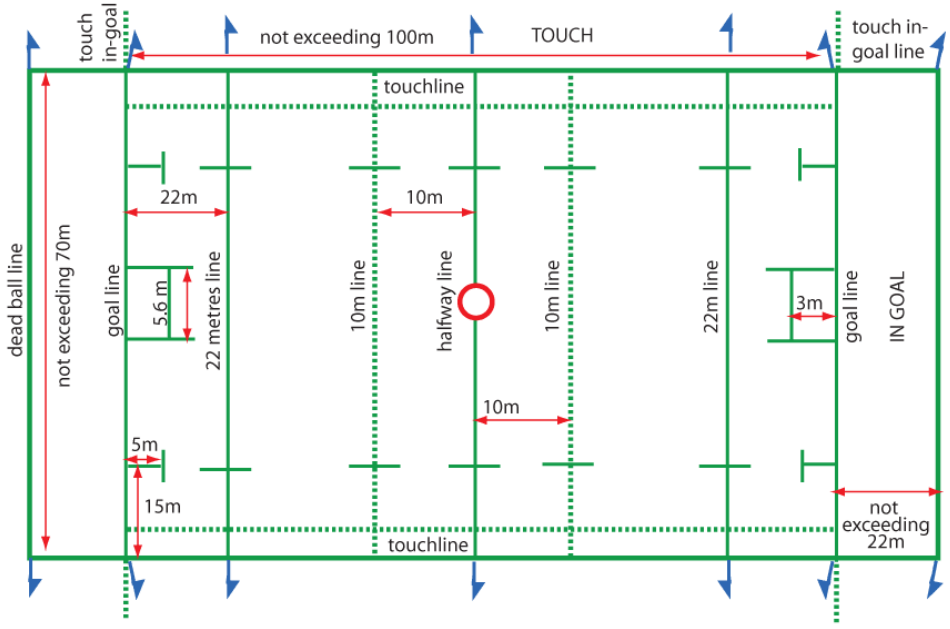
The Spanish Rugby Federation was born in 1923, after Baldiri Aleu, a student of medicine in Montpellier, imported this sport from France and founded the Santboiana Sporty Union in 1920.

Image of a rugby match

Rules

The **aim** of the game is to deposit the ball in the goal line. A **rugby pitch** is 100 meters long and 68 meters wide. The **match** has two times of 40 minutes each with a 10 minutes break. Each **team** has 15 players, 7 of them sitting in the bench for possible changes. The rugby **ball** has an oval shape and weighs less than 500 grams. A rugby match is directed by a **main referee and two touche referees.**

Graphic of a rugby pitch.



A- Punctuation rules; in a match we have:

a- Try: leaving the ball on the floor of the opponent's goal line. It scores 5 points.

A player making a try

b- Conversion: it is to kick the ball over the opponent's goal after a try. It scores 2 points.

c- Penalty: It is to kick the ball over the goal after an infraction. It scores 3 points.

d- Drop: it is to pass the ball over the goal with a rebound shot in a dynamical phase. It scores 3 points.

A- Main rules of the game; we distinguish the following:

a- Avant: done when the ball is passed to a forwarded partner. It is penalized with a scrum.

b- Tackle: done when a player is tackled and he/she doesn't release the ball.

c- Scrum: It is the way of re-starting the game after a penalty.

d- Touche: done when the ball goes out of the pitch through a side line.

e- Penalty: it is signaled by the referee after a violent action, an incorrect tackle, etc.

Technical basis

There are two types:

1- Individual; here we have:

A- The pass: It is the action through which we pass the ball to a partner, It must be always made backwards and using both hands, trying to protect the ball from a possible tackle.

B- Reception: It is the action of receiving the ball from a partner. It must be done with the two hands. The ball oval shape makes this technical gesture very complicated.

C- Kick: It is the action through which we kick the ball. It can be done in different ways according to the moment of the play we are in:

a- Volley: the ball can't bounce. This way we put danger away or we send the ball to a touche.

b- Drop : we kick the ball towards the poles after having bounced it.

c- Penalty: the ball is placed on the floor after the opponent's team has been sanctioned. We kick it towards the poles.

Placing the ball before a penalty kick

d- Tackle: it is an action in which the defender pushes the opponent holding the ball onto the floor, avoiding an advance of this player. It must be done below the shoulders and it can be:

d_1- Frontal tackle.

d_2- Lateral tackle.

d_3- Backwards tackle.

Image of a placaje

2- Groupal; here we have:

A- Touche: it is the action in which the player places outside the playing field, exactly where the line judge says it. The two teams make two parallel lines made out of, at least, two players. The players place themselves in their

own fields, between the 5 and 15 meters line, with a gap of one meter between the two teams. The player making the touche must throw the ball impartially between the two teams who will try to catch it.

Image of a touche

B- Scrum: the referee penalizes an action if an avant has been made. A scrum is made out of eight players of each team, set in three lines, who make the forward. They lean one against the others to be stronger than the other team. One player called the medium, who must belong to the non-penalized team, places the ball in the tunnel created the two facing forwards. Once the ball touches the floor, the two teams push forward to get it and make it stay in their side of the field. Then a new attack can start.

Image of a scrum

2nd Term

Voleyball

A bit of history

Volleyball was born as a sport in the USA in 1895 by the P.E. school teacher William G. Morgan, in Massachussets. At first, this sport was called Mintonette, and its basic rules and concepts were established. Later, another teacher called Halstead suggested the name volleyball, which was accepted.

In 1946, as an international match between Czechoslovakia and France was being played, it was decided to create a Advisory Congress in Paris to be held in 1947. Thirteen federations attended this Congress, in which the rules and statutes for the sport were set, and the Volleyball International Federation was established. At present, volleyball is an Olympic sport, both for men and women.

Image of a volleyball match.

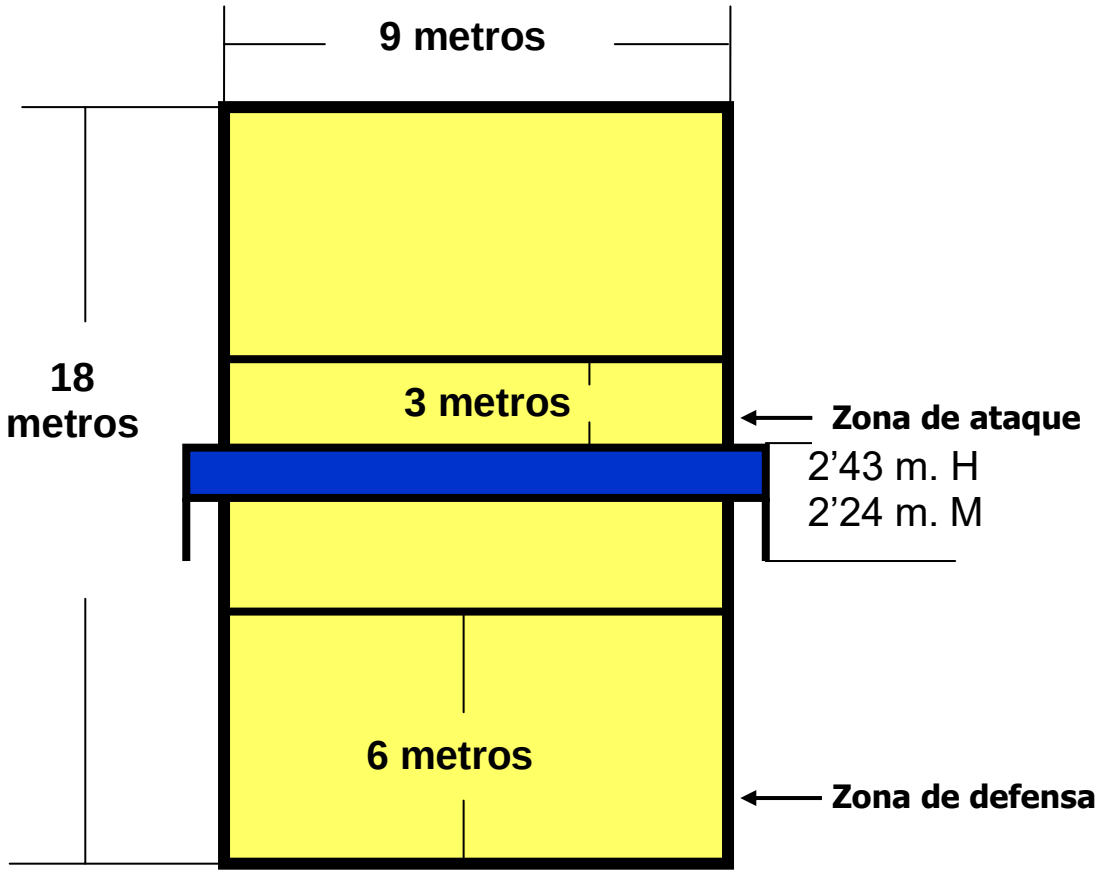
In 1920 this sport landed in Spain, being played first as a beach game. Even if it wasn't a widely played game, the Toledo P.E. School published the first book of rules for the sport in 1925.

General facts of the game.

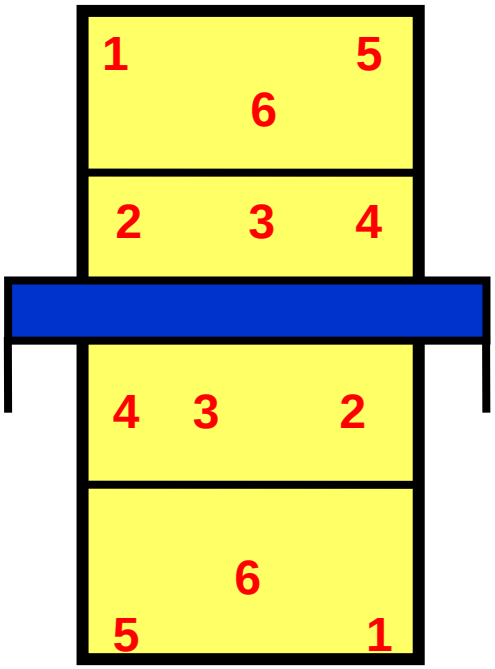
The sport **main goal** is to send the ball into the opponent's field over a net, touching the ball no more than three times, so that the other team can't pass the ball back before it touches the floor.

A volleyball match.

The **court** and its main characteristics are analyzed in the following graphic:



Each position on the court has got an assigned number. Any time a team recovers the serve, the players must go forward one position moving to the right. This movement is called rotation. Once the ball is being played, the players can move to any position. The following graphic shows the numbers given to the specific positions on the court.



A **volleyball team** is made out of 12 **players,** but only six of them can be on the court at the same time. In each set or play, six changes can be made. The player that substitutes a team mate can only enter the court once a set and if he/she needs to be substituted, the former player is the only one allowed to do it.

The ball has a diameter of 21 centimeters and it weighs 270 grams.

Each team can ask for two **times out** of 30 seconds in each set.

It is not necessary to be serving in order to **win a point.** That means that if the point is won by the team that is serving, they score and keep on serving. If the point is won by the team that is receiving the serve, they score and they will serve in the next game.

To **win a set** the team must score 25 points with a difference of two points. If they tie to 25 points, they must keep on playing until one of the two teams reaches a difference of two points. To **win the match** the team must win three sets. If they tie to two sets, the last set or **fifth set** will be the definitive one, and it will be won by the team who gets 15 points with a difference of two. If they tie to 15 points, they will keep on playing until one of the teams gets a difference of two points.

An official match is **ruled** by a main referee, an auxiliary referee and four linesmen. The referees can produce the following penalties: By losing a point; by expelling a player, which means leaving the court and losing a point. In this last case, the player can stay in the technical area, but if the player is disqualified, he/she won't be able to stay in the technical area and the team will also lose the point.

The **ball** can **be hit** with any body part, but it mustn't be retained, be touched twice (double touch) and it can't be hit when it is in the opponent's field. A player mustn't touch the **net** if he/she is attacking or if he/she interferes in an opponent's attack. The serve can't be blocked.

The **líbero** is a player with the following characteristics:

a- He/she wears a different T-shirt.

b- He/she can substitute any player for an endless number of times, which will not count on the global team number substitutions.

The líbero player is wearing a red T-shirt.

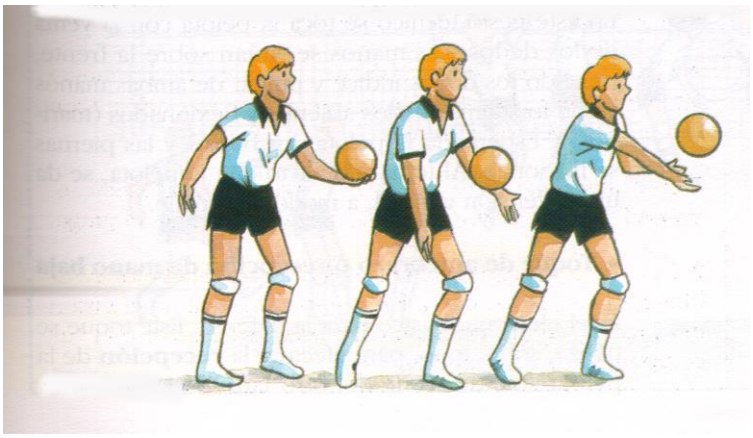
c- He/she can't serve or block, neither can he/she finish an attack by passing the ball to the opponent's field if the ball is above the net.

d- If he/she passes the ball from the attacking area and the ball is above the net, the next step can't be a smash; but if the pass has been made from the defense area, the next step can be a smash.

Technical Basis

A- The serve: with this technical tool the game starts. There are different types:

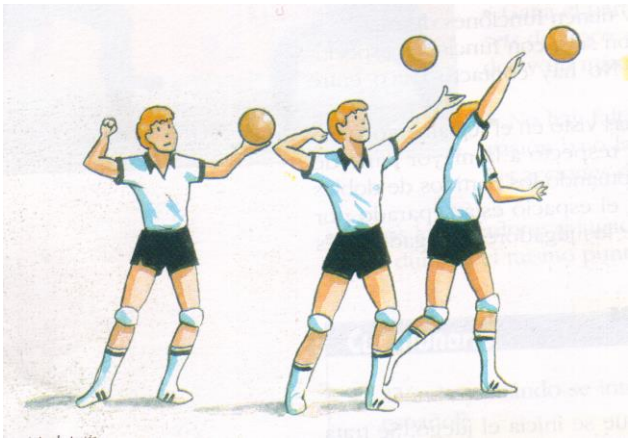
a- Low hand serve: it is the easiest and safest serve. The hand is placed on the ball, in front of the body at the waist height. The hitting hand is cupped and the whole body goes together with the movement in the direction of the ball.



Low hand serve sequence

b- Tennis serve: It is the most efficient one. Facing the net, the ball is thrown upwards above the head. As the ball is going up, the arm gets ready, and at the highest point of the descending trajectory, the ball is hit with an open hand and grouped fingers.

This serve can also be made with a small race before the hit and with a small jump, in order to hit the ball at its highest point. These are called floating serves.



(Left) Sequence of a tennis serve; (Right) Image of a floating tennis serve.

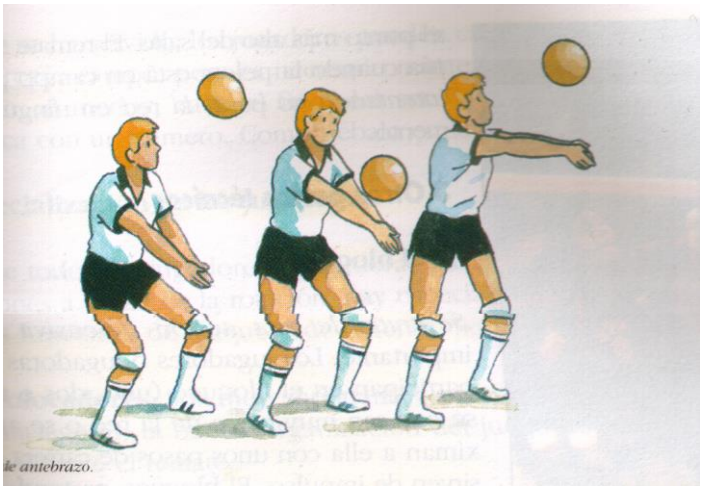
c- Two other serves are the **lateral serve** and the **hook serve,** but they are not commonly used.

B- Touches: It is the technical tool to move the ball once it is at play. There are several types:

a- Fingers touch: it is the most basic technical tool in volleyball. After this touch, the ball can move forward, to the sides or backwards. When the fingers touch the ball, the whole body extends. When this touch is addressed to a mate, its function is to **place** the ball.

Sequence and image of a fingers touch

b- Forearm touch: it is the basic touch in defense and mostly used to receive the ball when it comes from the other side of the net. When touching the ball, the whole body must extend.



Sequence and image of a forearm touch.

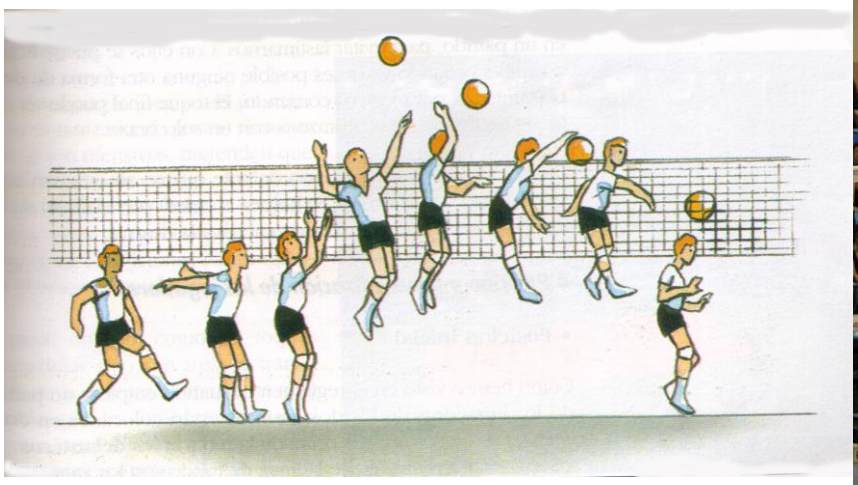
C-Smash: it is the most difficult technical element. Its aim is to attack. A smash must be done when the ball is on your side of the court. This touch has the following parts:

a- Running, done before the smash, is necessary to impulse.

b- Flight, done with both feet together and getting the arm ready.

c- Hit, done when the ball is at its highest point.

d- Fall, done after the hit.



Sequence and image of a smash

D- Blocking: it is a very important defensive action that consists on stopping the ball that comes from your opponent's field. It is normally used as a defensive technique against the smash. The blocking can be:

a- Individual: made only by one player.

Image of an individual blocking

b-Collective: made by two or three players. This blocking needs a powerful and coordinated jump to be at the highest possible position when the ball goes over the net.

Image of a collective blocking

B- Falls: this tool is used to reach low balls. The player goes under the ball, rolling his/her back on the floor after having contacted the ball.

Image of a forearm touch followed by a fall

C – Diggings: Technical tool used to reach far balls. The player makes some running steps, and then dives with his/her chest towards the floor for finally softening the fall with the hands or with the chest itself. The contact with the ball is made with the hand back or with one arm before falling onto the floor.

Images of players digging

Players' positions and specific functions

At the beginning of the game, the players are placed in two lines. The ones closer to the net are called forwards and the ones closer to the end line are called defenders. Once the ball is set in play, the players can move freely, but keeping always the order in the rotations.

As related to the specific functions, we must bear in mind that, even if all the players must play in all the positions, each of them has specialized in one of the following functions:

a- Setters: key players, as their passes are the key in the attacking game.

b- Hitters: they are the ones in charge to finish the attacks. They can jump very high, in order to be able to hit the ball at its highest point.

Image showing a group of blockers and hitters in a match action.

c- Blockers: essential defensive players. They must have great game prevision to anticipate the opponents' attacking actions.

Image of an action with two blockers and a hitter

Tactical basis.

A- General concepts: Three is the maximum number of allowed ball touches in volleyball, so the transition from an attack to a defense is very quick. As a consequence, the reception touch is considered a defensive touch and at the same time, it is also considered the first offensive touch of the next action.

In the technical basis of volleyball we can find the following items:

A- Gestures done by the defense. They are:

a- Forearm touch

b- Blocking

c- Falls

d- Diggings

B- Gestures done by the attackers. They are:

a- Fingers' touch

b- Serve

c- Smash

The correct and mostly used hitting sequence in a game action is:

a- Serve, of the opponent's team (attack).

b- Reception with a forearm touch (defense).

c- Setting, with finger's touch (attack).

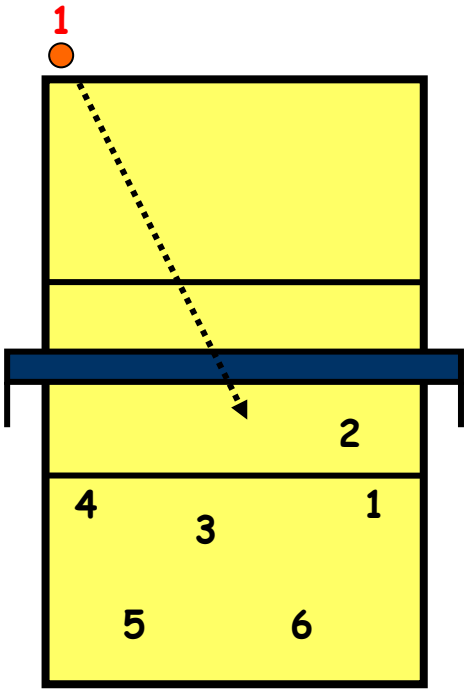
d- Smash to your opponent's field (attack).

e- Blocking (defense) or **reception** of the team that began the game with the serve. A new reception would begin this circle again.

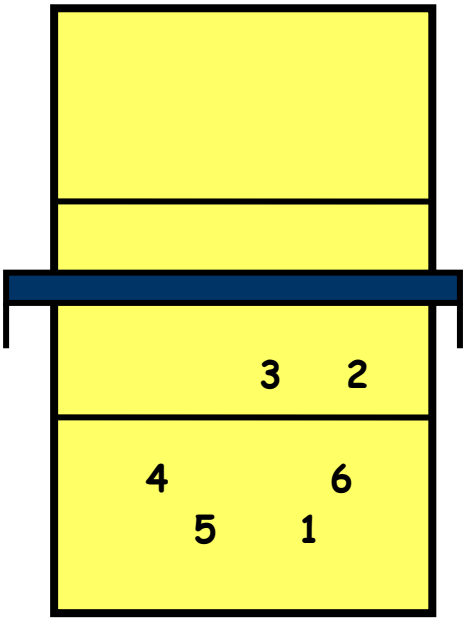
B- Defensive systems:

There are several types:

a- System 1 – 3 – 2. Used to receive the serve when the opponent's team is serving. Five players are on the field waiting for the blocking and one player waits near the net to get ready for his/her team's next setting.



b- System 2 – 2 – 2. Two players blocking. The players can be any of the two positions, 4 and 3 or 3 and 2. The other players cover the areas which have been freed by the blockers.



c- System 3 – 1 – 2. Three players blocking. In this system three forwards go to block the ball.

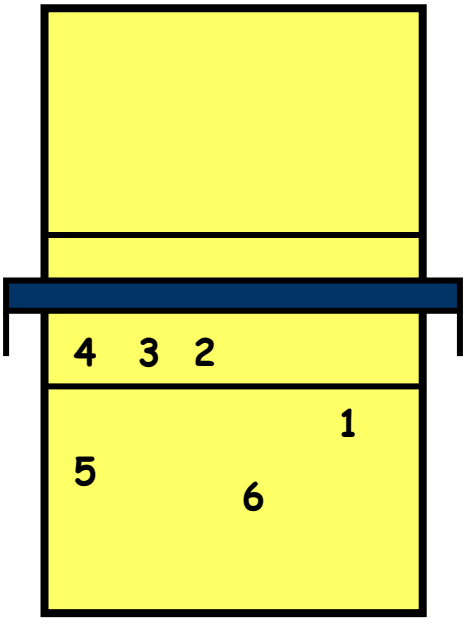
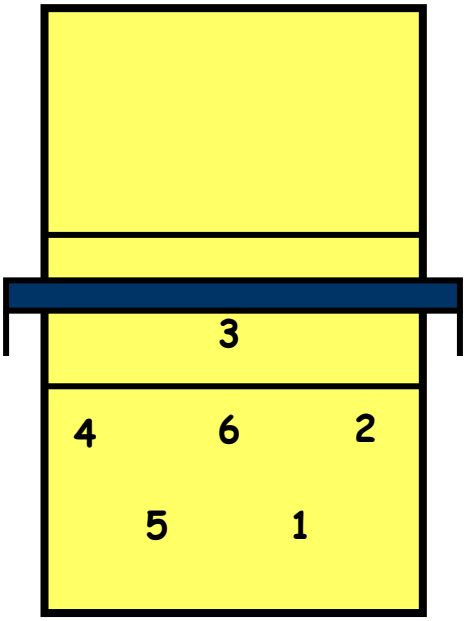


Image where the tactical basis of the two teams are shown.

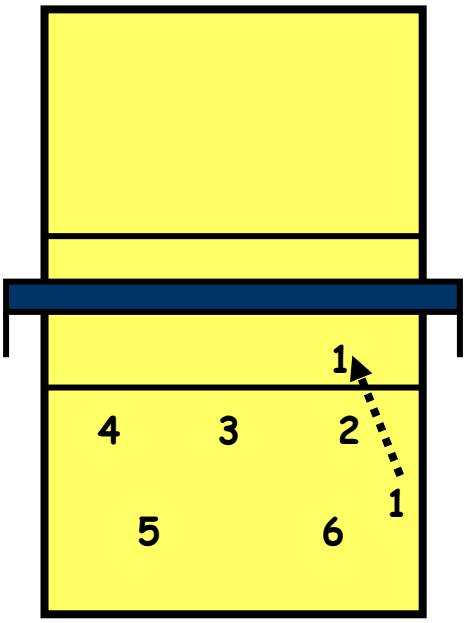
C- Offensive systems:

They depend on the position of the setter. There are two systems:

a- System in turns: each player develops his/her function according to the place he/she has in each rotation. Once the reception of the ball is made, the ball is sent to the attacking line, where the setter- placed in position number 3-, can pass the ball to positions 2 or 4, so that these players can smash.



b- System for specialists: in this system, the players in the defensive line can't get into the attacking area to smash, even if they are specialists. However, the setter can be any player that is in the court at the time. When serving, the setter must be at the assigned position according to the rotation, but once the serve has been done, he/she can go to the best position to set the ball for a partner.



Aerobics

The concept of aerobics

A bit of history

The origin of aerobics can be set when the book titled "Aerobics" was published in 1968 by Dr. Kenneth Cooper. In this book, Dr. Cooper shows a whole training program to increase performance and endurance, and to decrease the risk of suffering heart diseases. As time passed by, music and new steps coming from dancing, jazz, gymnastics… were also used. As a consequence aerobic dance was created. It consists on dancing to the music by means of aerobic steps.

In the last years, aerobics has become an institutional sport, with its rules and regulations. It is not only a competitive sport, but also a free time and leisure activity, in which the participants look for a funny, healthy and entertaining way of doing physical activities.

Image of a choreography in aerobics

Aerobics can be defined as a physical activity (sport or leisure), performed by means of rhythm and gymnastics, whose main aim is to develop the cardiovascular resistance, and which consists on the combined performance of choreographic steps for a long or short period of time, and that can be made at low, moderate or high intensity, but always with music.

Aims in aerobics

Even if the main aim in aerobics is to develop **resistance** (essential ability in the prevention of heart diseases and as a consequence, in the health care), with aerobics we are also developing our **coordination** and **rhythm**, as well as our **creativity** when we make our own routines.

Aerobic resistance is the basic physical ability that allows us to make moderate intensity work for a long period of time. The development of this

ability is very important for both, the sport output and on daily basis, due to the fact that it gives us a good health condition and helps us to prevent diseases.

Coordination is the ability of performing the exact movements and gestures we wish, according to our power intelligence. Coordination is shown in the harmony, flow, efficacy, security, economy and gracefulness in our movements. This ability allows us to learn more and more complicated movements easily. Rhythm is the coordination ability that allows us to match chronologically the body movements to a space-time structure, as for example music. This is an essential ability, not only for the activities performed to music, but for most sport activities.

Basic movements in aerobics

Below find the necessary basic steps to create new choreographies. These steps can show different variations, which will change them into more complicated ones, according to the rhythm, style, direction, intensity or speed in which they will be made.

There are two groups:

A- Low impact: for a step to be considered of low impact, at least one foot must be on the floor at all times. Low impact steps are:

a- March.
b- Heels on the floor.
c- Step touch.
d- Step touch back
e- Open, cross, open, close.
f- V- step
g- Side touch
h- Lounges
i- Side Lounges
j- Front, back, side kicks
k- Skipping.
l- Heels up.
m- Pivot.

Low impact steps in an aerobics routine

B- High impact: for a step to be considered high impact must have an aerial part during its performance, which means that both feet must be above the floor at the same time. By using high impact movements, the resultant choreography will be of a bigger impact than the ones which only use low impact movements.

Most of the basic movements can be made at a low or at a high impact. Besides, they most of them can be made forward, backwards, to the side and diagonally.

High impact movements are:

a- Jogging
b- High kicks
c- Jumping kicks.
d- Jumping jacks.
e- Jumping skipping.
f- Heels on the floor jumping.

High impact steps in an aerobics routine

Musical knowledge for aerobics.

Music in aerobics is essential, as it shows us the speed and the rhythm we must have during a routine, and that is the main reason why the following concepts must be taken into account.

a- The musical tempo: it gives the song rhythm, and as a consequence, the movement rhythm. We can count the music tempo in half notes and quarter notes. One half note is strong and two quarter notes are strong and weak.

b- Musical phrase: they are musical sequences that are repeated along the song. They are made out of 8 musical tempos (half or strong notes) or 16 tempos if we consider quarter notes. We must adapt our steps to the musical phrase, and begin the action at the first beat of the phrase.

c-Musical block: they are made out of two musical phrase (16 half notes or 32 quarter notes). We distinguish them because each block changes something in the song (a new instrument introduced or deleted, new voices…)

d- Musical bridges: they can be 2, 4 or sometimes one musical tempo placed in between two musical phrase.

It is important to remember that in each basic movement in aerobics, any of the steps we make counts its tempo in quarter notes, so a V-step has 4 tempos counted in quarters (two tempos counted in halves).

Music and rhythm are essential in an aerobics routine

Dance routines in aerobics

A dance routine in aerobics is the logical gathering of steps, which will provide a structured and harmonic show following a musical pattern.

To fulfill a creative and funny routine it must have:

a- A variety of movements.

b- Use your own steps, developing them from the basic ones, by means of originality.

c- Balance between the movements to the right and to the left.

d- A variety of directions, creating figures at the same time.

e- Adjusted to the music.

f- If the routine is made by a group, more variations can be made. For example, part of the group can address one direction and the other part the opposite one. The important thing is that the group is coordinated at any time.

Image of a routine in aerobics

First aid.

This topic is included in the P.E. curriculum due to its close relationship with the human body and its health. On the other side, we must be aware that most of the accidents that happen at the High School occur in the P.E. class, as it is a very demanding subject, physically speaking. Normally, the injuries that happen during the class are minor ones (scraps, bangs, sprains…), so we will be probably able to practice the measures we are about to learn in real situations. Sportsmen are accident prone, mainly because their psychology pushes them forward, so they practice sport at very high levels or even with previous injuries that have not been properly healed.

Concept: First aid is the urgent therapeutically actions applied on the victims of an accident or a sudden illness, until the specialized professionals can intervene. The aim of first aid is to relieve the pain and the anxiety of the victim so as to avoid his/her physical conditions to worsen. In some very serious cases, first aid must be applied to prevent death until the arrival of the paramedics.

They are not a medical treatment. They are a group of decisions that must be applied, always with common sense, to improve someone's physical conditions until he/she can be treated by doctors.

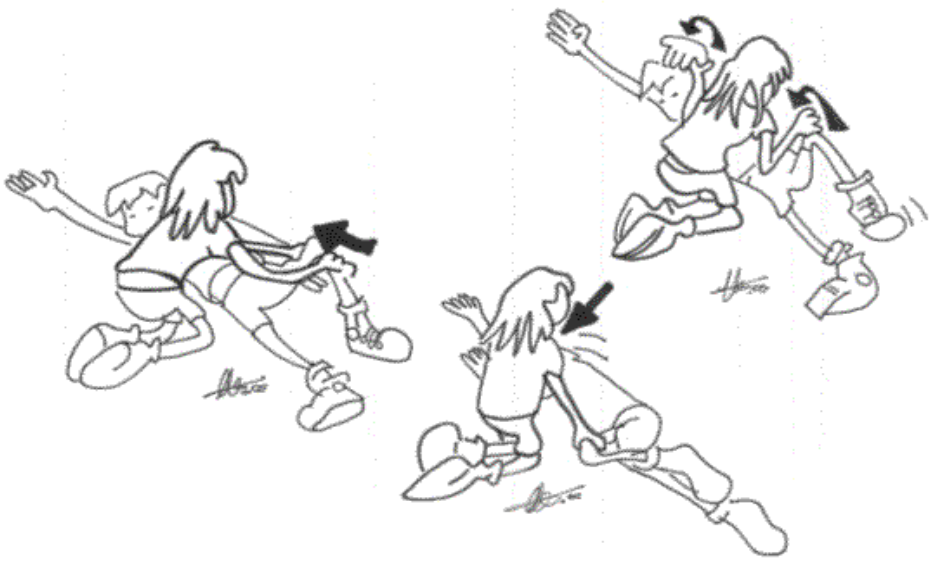
The main aims of first aid are:

a- To preserve lives.

b- Avoid physical and psychological complications.

c- To help recovery.

d- To secure the transfer of the victim to a hospital or health care center.



Squeme of the secure lateral position

General rules to give first aid

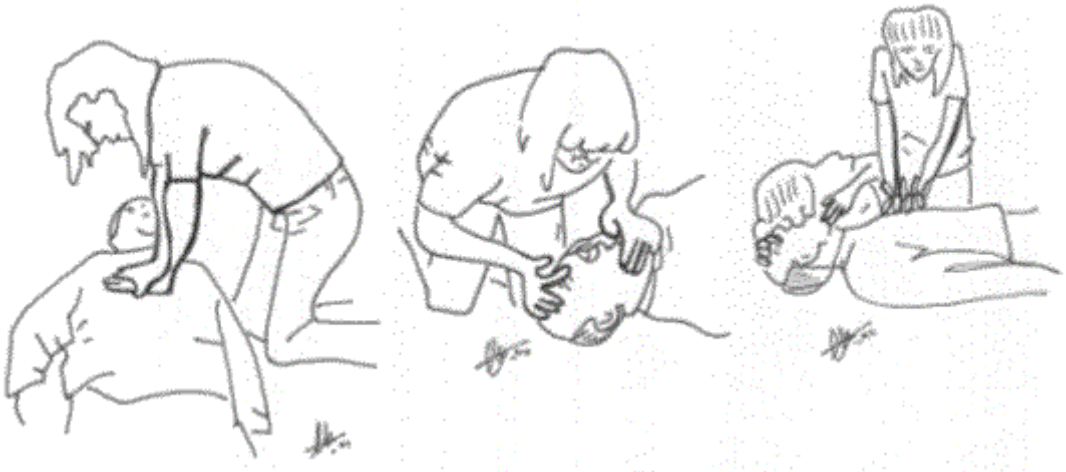
If we face an accident where first aid is needed, we must remember the following rules:

a- Act only if you are secure of what needs to be done. If there are doubts, it is better not to do anything, as we can worsen the victim's condition.

b- Keep calm to act in a quick and efficient way. If you are calm, both the victim and his/her partners will trust you, and you will be able to apply the first aid techniques in an efficient way. Avoid panic, because the victim's life can depend on the helper's attitude and actions.

c- Don't leave the victim alone. Even if you are the only one, we must try to provide the necessary help without leaving the victim.

d- Make a close revision of the victim. There might be other injuries that has undergone unnoticed, both for the victim or the witnesses. For example, in case of burns, we might not pay attention to possible broken bones, as burnings are more evident.



Cadio-pulmonar reanimation

Way to give first aid

We must organize a human chain with the unhurt people. This action will not only help movements, but will also give fresh, open air to the victims. We will also ask people who know how to give first aid for further help. Following the order, we will help the victims who:

a- Are bleeding abundantly.

b- Are seriously burnt.

c- Seem to have broken bones.

d- Have minor injuries.

Once first aid has been given, if necessary, the victims will be transferred to a hospital or a health care center.

General precautions

a- We must consider the possible dangers in the place, and locate the victim in the safest place.

b- Loose the victim's clothes and check if the respiratory system has been blocked by any object.

c- When we make a general checking of the victim in order to value his/her state, we will avoid unnecessary movements. Don't try to get the victim dressed.

d- If the victim is conscious, we will ask him/her to move the four limbs, to state his/her movements and senses.

e- We will place the victim in a lateral position. This way, we will prevent fluids such as vomit or mucus from blocking the respiratory system.

f- Cover the victim to keep his/her body temperature.

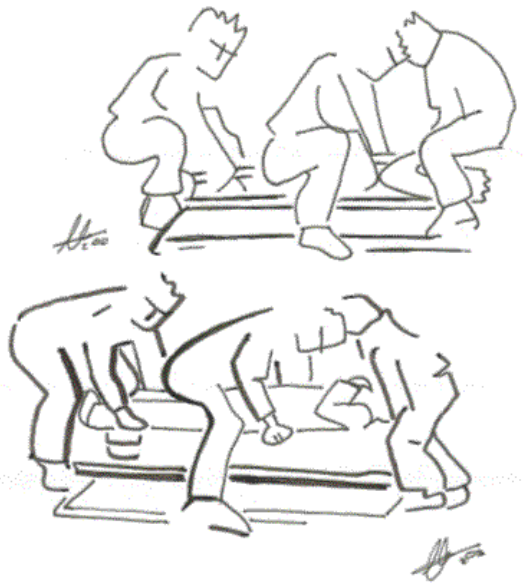
g- Give the victim physical and psychological security.

h- Don't obligate the victim to stand up or to move, especially if we suspect there is a fracture. Immobilize the victim.

i- Don't provide any medicine. Only in some cases, painkillers can be provided.

j- Don't give liquids to a victim that has lost conscious.

k- Don't make any comment about the victim's situation, especially if he/she is conscious.



Victim's transfer. Bridge method.

3rd Term

Indoor football

A bit of history

Indoor football started in Uruguay 1930, when the P.E. teacher Carlos Ceriani asked his students to play football in a handball court. In 1949, this new version of football created its own rules and a bit later it became completely independent from football. A new sport had been born. In 1971 the Indoor football International federation was created in Sao Paulo (Brazil).

Rules

The **aim of the game** is to score goals using any body part but the hands by means of two teams playing on a court.

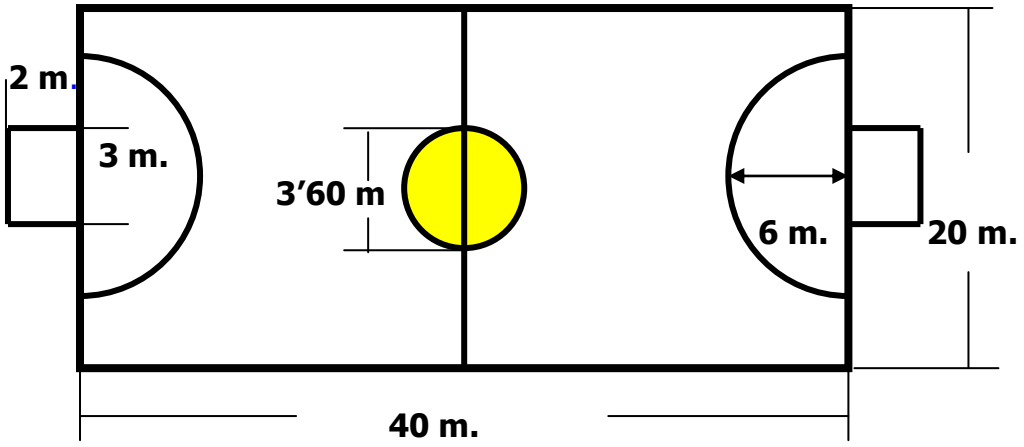
In an indoor football **match** two teams of five players each must play. Seven other players are sitting on the bench.

The **match** consists on two times of 20 minutes each, stopping the time when necessary, and a break of 10 minutes.

The match is directed by two **referees,** a person in charge of the clock and a table judge. The teams can ask for a 1 minute time out in each period.

The indoors football ball has a circumference of 55 centimeters and a weight of 450 grammes.

The measures and characteristics of the **court** are analyzed in the following graphic:



A- Types of faults:

a- Technical Faults: kick, push or grab the opponent. The penalty is a free shot from the place where the fault was made. If the fault is made several times in a role it can be penalized with a warning (yellow card).

b- Personal Faults: if the player takes longer than five seconds to start playing the ball or he/she gives the ball to the goalkeeper, the action is penalized with a throw in.

c- Disciplinary Faults: lack of respect, inappropriate behavior, etc., are penalized with a warning (yellow card). A second warning means that the player is immediately expelled (red card). This player must be substituted by a different one after two minutes.

d- Summative Faults: each team can make five faults in each period without losing the right of a defensive barrier. From the sixth fault, the team will be penalized with a shot of the 11 meters line. It is a shot from a point placed 11 meters away from the goal and without a defensive barrier. If the fault is made closer than 11 meters, the shot will be done from this point.

Technical basis.

a- Driving : It is the mostly used tool in indoors football. It allows us to drive the game on the court with the ball under control. It is usually made with the inner part of the foot.

Players driving the ball

b- The pass: this action helps the players to pass the ball between them. It is usually made with the instep or the inner part of the foot.

A pass between players

c – Shooting to the goal: the aim of this shot is to score a goal. It is usually made with the instep, the inner part of the foot or the cap of the foot.

A player shooting the ball to the goal

d- Dribbling: This actions gathers all the movements made with the ball to overcome an opponent.

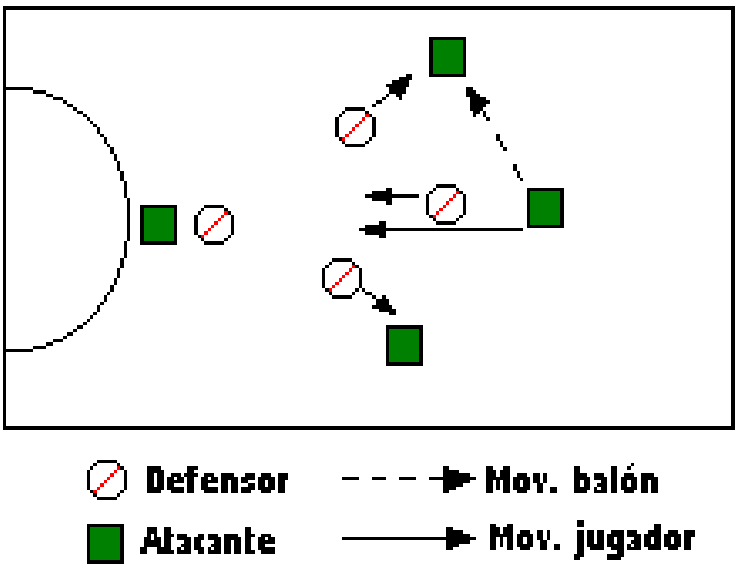
Different dribblings made by players

Tactical basis

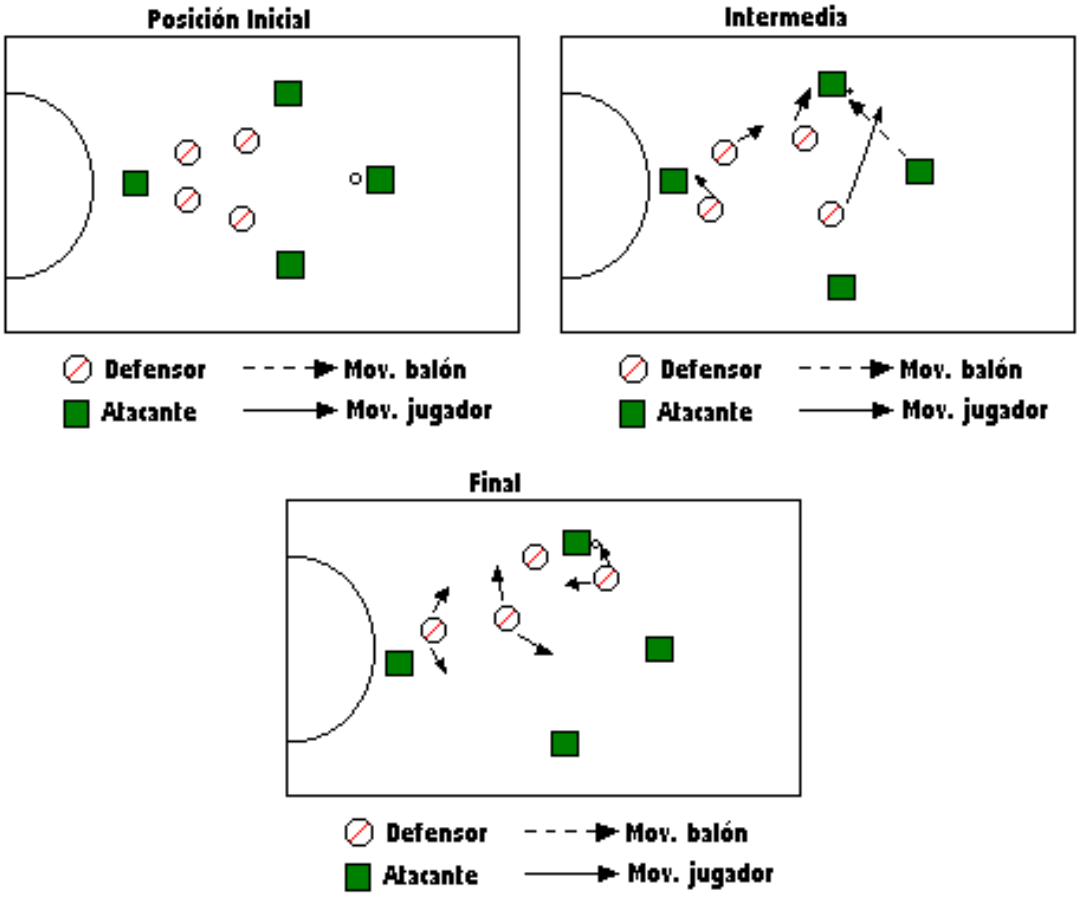
To achieve successfully the attack and defense, the players can placed themselves on the court according to the following systems:

A- Defensive systems:

a- Diamond (1 – 2 - 1): At the beginning it was a 3-1. The most advanced player defends the beginning of the play. The others match with another player as opponents get into the play.



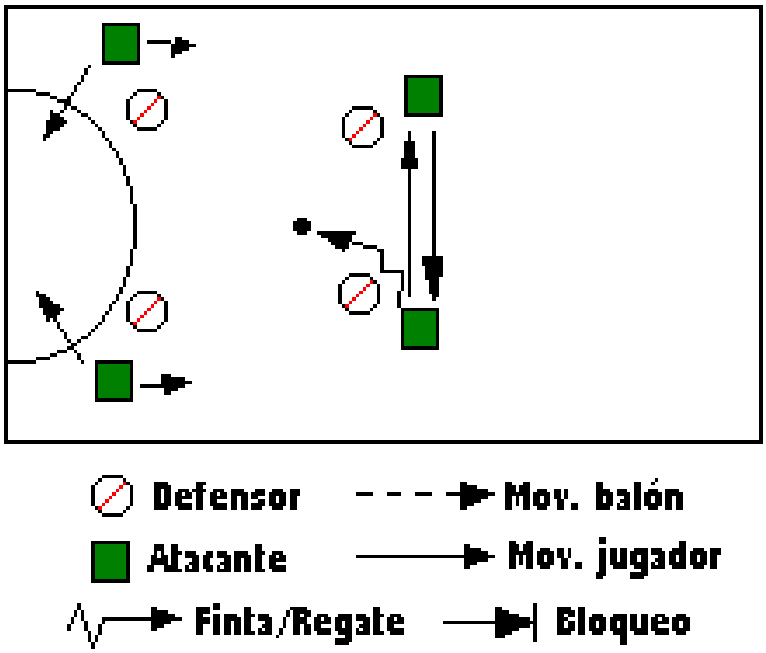
b- Square (2 - 2): First system used in indoors football. It is usually done in the middle of the court. It consists on a passive defense until the ball goes to one of the sides. Then a 2x1 system is made covering the passing line. One of the players at the back goes forward to cover this line.



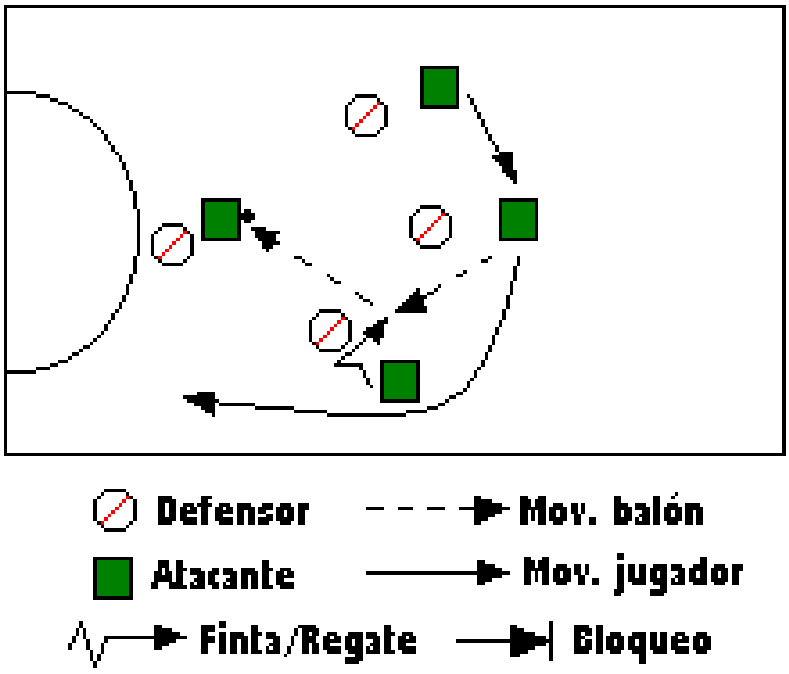
B- Attacking systems:

a- Square (2 - 2): This system gives a good advantage if we have skillful players able to succeed in a one to one action. But, as a disadvantage,

the player who starts the game won't be able to be helped if the opponent's team presses on or they make a good coverage of the passing line. Besides, with this system rotations get complicated due to the distance between lines, and it doesn't provide enough space in the goal area.



b- Diamond (3 - 1): It looks like a diamond, as the three players at the back are not aligned and it can change into a 1 – 2 – 1 system. The advantages of this system are that there are two players to help the ball out, big spaces in the final area, big rotation possibilities and it can be used at many moments of the game. The pivot must move to the sides if the defender team blocks the central aisle.



Activities in the natural media

Organization of activities in the natural media

One activity in nature can be made individually, but it is better to do it in groups. The planning of the activity is a responsibility of all the people taking part in it.

The first things that have to be decided are the duration of the activity, the place where it is going to take place and the influence that the weather might have in the activity.

Once the previous decisions have been taken, it is the moment to apply all the knowledge we have on the chosen activity, and to analyze all the possible variation that can affect the development of the activity.

The most important aspect is the one related to safety. All the cautions, even the most exaggerated ones, will have to be applied for the success of the activity.

Sailing in a catamaran is a leisure or competitive activity done in the natural media

Another important aspect to be programmed is the necessary material. It is essential that all the material is in a perfect condition. The good condition of the material is the first rule for safety.

At present, there are multiple choices to make activities in the natural media. Each of them has different characteristics, so they change their organization requirements. The most common activities are:

a- Horse riding hikes.
b- Rafting.
c- Hiking.
d- Mountain biking.
e- Deep-sea diving.
f- Climbing.
g- Speleology.
h- Nautical activities, such as rowing, sailing, etc.
i- Hand-gliding.
j- Skiing.

In any activity we make in the natural media we must be respectful, not polluting or doing any activity which could damage the environment. To set some examples, a half- eaten apple will take 6 to 12 months to decompose, and a glass bottle will take more than 4,000 years, meanwhile a can will never decompose. These are just simple examples, which show how harmful our actions could be to the environment.

Image of the descending of a river in pirague

Tennis

A bit of history

The origin of the ball games, among which we can find tennis and also the vasca ball, must be found in the Greek, Roman and Arabic cultures. The word racquet can come from the Arabic word "rahat", which means hand palm. Its origins are in ancient religious ceremonies held to honor the fertility at spring time and also in military celebrations.

As far away as the 11th century the monks used to play a game similar to tennis in the cloisters of the monasteries. The game soon changed from the monasteries to the palaces.

Image of the Jeu de Paume

Henry the VIII ordered to build some courts, as for example The Hampton Court, still in use at present, and built after the king's death in 1625. This kind of Indoor tennis with walls was known in England as Royal Tennis and in France as Jeu de Paume (Palm Game). In the 16th century the Jeu de Paume was very successful in France. Some professions as tennis masters, apprentices, associated jobs, racquet and ball manufacturers or even all the necessary net to make bets, fashionable activity in France at that time started to be developed. Between the 16th and 17th centuries the Italian author Antonio Scainio wrote the first book on tennis and the French Forbet published the first official rules of the Jeu de Paume. However, in the 18th century the kings preferred some other activities to tennis and at the end of the century the French Revolution took place in 1789. The bets were forbidden and the Jeu de Paume or Royal Tennis lost its strength.

In those years in Europe the predominant system was the sexagesimal one. Number 60 was the equivalent to the present day number 100, so when they divided the number 60 among the four needed points to win the game, we get the present way to count in a tennis match: 15, 30, 45 and game.

In 1839 rubber could be vulcanized and it was an important advance in the tennis balls. A bit later, the mowing machine was also improved. These two major improvements achieved that tennis started being played on grass in open air. Even if the sport was already being played by other people before, in 1874 Major Wingfield patented a tennis game called "Sphairistiké". He established the net heigth, the court measures, the racquets, etc., all inside a box. Even if it is proved that Major Wingfield was the one who patented the tennis game, it seems that the real inventors of the modern tennis in Birmingham in 1859 were Major Harry Gem and Juan Batista Augusto Parera, who at the age of 17 left

Spain to try luck in England. Later, they founded the first tennis club called The Royal Leamington Spa Lawn Tennis Club in 1872.

In 1877, the first Wimbledon tournament was played, but there was a slight confusion in the rules. In the following years, the organizers gathered to set the rules, and they started what can be called Modern Tennis. In a short time, this game called 'Lawn Tennis' spreads around Europe, the USA, Australia, etc. The first games were always amateur. In Spain, tennis was first played in Barcelona, Madrid and San Sebastian at the beginning of the 20th century. The Tennis Spanish Federation was founded in 1909.

Rules

Tennis is played on a court whose measures can be found in the graphic below. The courts can be made out of different materials:

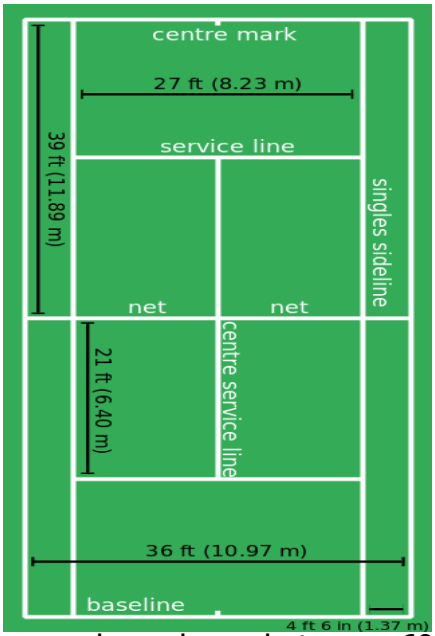
a- Clay: This surface allows a slower game because, when the ball bounces on it, the clay absorbs most of its speed. This surface is convenient for the players who play at the base line.

b- Grass: it is the quickest surface, because a ball can't bounce high on it. This surface is convenient for players who have a good serve and a good volley.

c- Hard: this surface is between the two previous ones, quicker than clay but slower than grass. It is convenient for the multi-skilled players.

d- Indoor courts (synthetic surface): they are very quick courts. Apparently, these surfaces should be convenient for players with a good serve and a good volley.

Diagram of a tennis court



For centuries, tennis racquets' measures have been between 60 to 70 centimeters long and never heavier than 400 grammes. However, at present days, the International Federation has established the following compulsory measures: 81.3 centimeters long (maximum allowed length from the grip to the head), and a stringed surface of 39.4 centimeters long and 29.2 centimeters wide. Until the 60's, most of the racquets were made out of wood, with a leather grip. In 1967, the tennis player Arthur Ashe designed the first racquet made out of steel. It was stronger and lighter than the wooden one. In the 70's

the aluminum racquets were even lighter, more powerful and easier to be controlled. At present, the more widely used materials in the racquet building business are kevlar and graphite. These two materials are rigid and light at the same time, so the ball can be hit more strongly with a better control over it.

An essential part in racquets are the strings. On the strings' quality depends the quality and sensitiveness when hitting the ball. The normal tension of the strings is between 20 to 28 kilos. The tenser the strings are, the less strong the ball will be thrown and the other way round. When the racquet hits the ball, it produces vibrations in the player's arm. To soften these vibrations, we must place a foam element at the low level of the head, which will lessen this effect. Besides, some players use an extra anti-vibrator in the strings, which will absorb this effect at a higher rate. If you play tennis regularly, a bad quality anti-vibrator can injure your elbow.

Images of anti-vibrators for a tennis racquet.

A tennis racquet has the following parts:

a) Head: with oval shape, it holds the strings and two faces, which can be used to hit the ball indistinctively. The size of the head will alter the strength in your hits. The smaller the head is the bigger control over the ball you will get, but the less strength. If the head is bigger, you will get higher strength but less control.

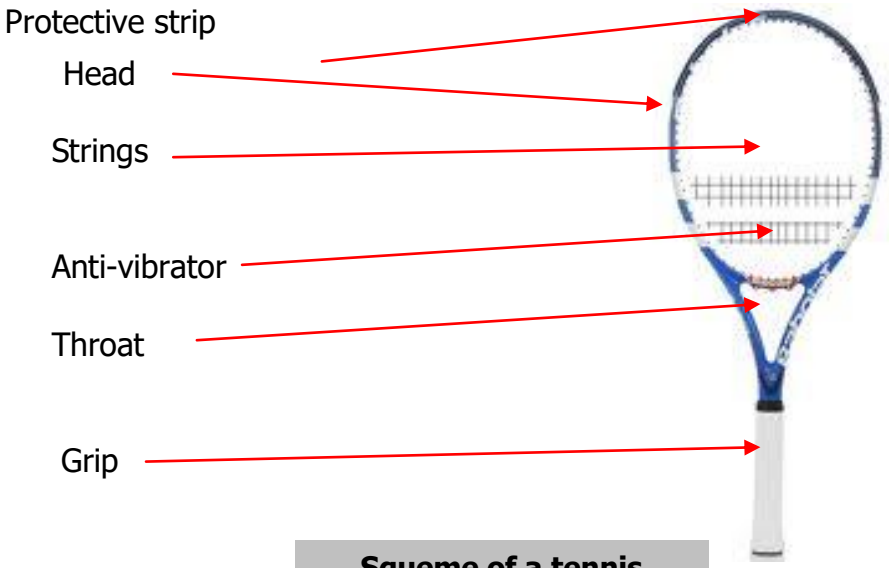
b) Strings: one or two long strings, joined to the racquet in an entwined pattern.

c) Throat: It is the joint between the head and the grip. If you are a right-handed player, you will grab the racquet in this part when you change the grip, so you can find balance as you wait for your opponent's hit.

d) Grip: It is the place to grab the racquet. According to the size of the player's hand, the grip will be thicker or thinner, following a scale from 0 to 5 (in Europe). The most common grips are numbers 2 and 3.

e) Protective strip: It is a band used to protect the outer upper part of the head, as it gets a lot of bangs.

f) Anti-vibrator: It absorbs vibrations without altering the player's sensations.



Squeme of a tennis racquet

A tennis match is played to the best one of three sets. To win the match, you must win two sets. To win the set you must win 6 games with a difference of two. If there is a tie to 6 games, you must play a tie-break. The first player to reach seven points with a difference of two will win the tie-break. If there is a tie to 6 points again, the players will keep on playing until one of them reaches a difference of two points.

The serve goes to one of the players each time. Each game is served by a different player. In the odd games the players must change sides.

The most important tournaments are called Grand Slam and they are played to the best one of 5 sets, so the player must win three sets to win the match. They are played both by men and women. They are:

a- Australian Open: played Melbourne in January. Hard court.
b- Roland Garros: played in Paris in May. Clay.
c- Wimbledon: played in London in June. Grass.
d- U.S. Open: played in New York in September. Hard court.

U.S. Open

Australian Open

Wimbledon

Roland Garros

Other important competition is the Davis Cup. It is a tournament among countries. Each country plays four individual matches and one double match. The country winning three matches is the winner of the tournament. For female teams this competition is called the Federations Cup.

Technical Basis

The most important area is the grip. **The grip** is the way the racquet is grabbed. There are several grips according to the hit we want to fulfill. See below the different grips:

Eastern forehand grip: it is used for forehands that don't require much top spin.

Eastern backhand grip: It is used in a one-handed backhand stroke.

Western forehand grip: It is used in forehands with a great deal of top spin.

Two handed backhand grip: It is only used when hitting a two-handed backhand.

Continental grip: A multipurpose grip used in volleys, serve and sliced shots.

Once the grips have been analyzed, we can say that the technical basis in tennis are focused on the different strokes we can make with the racquet:

A- Drive: it is the easiest stroke to teach and learn. It is the first hit you will learn, if you start playing tennis for the first time. It has four phases:

a- Waiting position: In this phase, we are ready to hit. Both feet are separated, looking for balance and facing the net. The racquet is hold with the left hand in the middle and the right hand in the grip. Both legs are slightly bent and the body weight is to the front.

b-Preparation: Our shoulders rotate to the side where we are going to hit as we place the racquet backwards. The body weight is placed on both feet.

c-Impact: it is made in front of the body, with the arm in extension towards the ball. The body weight must be on the forwarded leg (the left leg here). The movement of the racquet is from the back to the front in a straight line.

d-Ending: going forward, with the arm and the racquet in extension, the body weight totally on the forwarded foot and the heel of the other leg up to get a better balance.

A drive can be made in three different ways, according to the time in the play and to the player's personal characteristics. They are:

a-Flat drive: the ball does not have any effect, so its trajectory is straight. The ball is hit at its back part.

b-Topspin drive: the ball has a forwards rotation effect (top spin). The advantage of this hit is that its trajectory is curved, so it goes over the net with a wide distance. When the ball bounces, it accelerates forwards, so the opponent has more difficulties when hitting the ball back. He ball is it at its lower part and the racquet must move in a trajectory from the low part, upwards and forwards.

Roger Federer making a lifted drive

c-Sliced drive: the ball has a backwards rotation effect (slice). The advantage is that when the ball bounces, it brakes sharply, so the opponent has to go really down to hit the ball back. This way, his attack will be more difficult. The ball is hit at its upper part and the racquet will make a trajectory from the high part forwards.

B- Backhand: this hit has the following phases:

a- Waiting position: facing the net, both feet are set away to keep balance, the knees must be semi-bent, and the body weight will be forwarded for a quicker exit. The racquet will be grabbed at the grip with the dominant hand, using a backhand grip and the other hand will hold the racquet at its neck.

b- Preparation: our shoulders rotate to the side of the hit with the same foot, this means our left foot. The racquet is still held with both hands and the arm begins the movement backwards. The body weight will be on the back foot.

c- Impact: in front of the body, with the racquet in a strong position, which means that, when we hit the ball, it won't suffer any displacement. The body weight changes into the front foot, and the non-dominant hand which was placed on the neck, begins going backwards to keep balance.

d- Ending: the arm must be straight in front of the body, the balance has totally gone into the front foot and the heel of the back foot goes up. The left arm is behind, to help keeping balance.

The backhand can be made in three different ways, according to the time in the play and to the player's personal characteristics. They are:

a- Flat backhand: the ball does not have any effect, so its trajectory is straight. The ball is hit at its back part.

b- Topspin backhand: the ball has a forwards rotation effect (top spin). The advantage of this hit is that its trajectory is curved, so it goes over the net with a wide distance. When the ball bounces, it accelerates forwards, so the opponent has more difficulties when hitting the ball back. He ball is it at its lower part and the racquet must move in a trajectory from the low part, upwards and forwards.

Dimitrov making a lifted backhand

c-Sliced backhand: the ball has a backwards rotation effect (slice). The advantage is that when the ball bounces, it brakes sharply, so the opponent has to go really down to hit the ball back. This way, his attack will be more difficult. The ball is hit at its upper part and the racquet will make a trajectory from the high part forwards.

Juan Martín del Potro making a sliced backhand

C-Two hands backhand: it is an evolution of the traditional backhand. It started being used at the end of the 70's and the first one to use it was the Swedish tennis player Bjron Borg, who is considered one of the best tennis players in history after having won 11 titles of the Grand Slam. The phases of this hit are the following:

a- Waiting position: see the other hits above.

b- Preparation: our shoulders turn into the side of the hit. The racquet is held with both hands on the grip and it begins a movement backwards. The body weight is on the back leg and we begin some short adjusting steps towards the final hit.

Bjron Borg making a two hands backhand

c- Impact: with both hands in front of the body, the body weight on the front leg and with your knees bent to help impact. The racquet hits the ball straightly to have a strong position and the heaps stay behind the racquet.

d- Ending: in front of the body, on the front foot and rising the heel of the back foot to provide balance. The heaps and body go after the ball to facilitate the body action.

Rafael Nadal making a two hands backhand

D-The serve: with this hit we begin all the points. At present it is an essential hit, as the players reach such an amazing ball speed when serving that most of the times it determines the final result. Nowadays there are players who serve up to 210 kilometers an hour. In hard surfaces, a good service is essential to have options in the match. The phases of the serve are:

a- Waiting position: behind the baseline, with the left foot at the front and the right one behind, parallel to that line. The arms are together, racquet and ball, and the body weight on the back foot. Our sight stares to the place where we want the ball to fall on.

Sharapova in serving position

b- Rising movement: we begin this movement by rising the ball with the left arm upwards and the right arm coming out from behind until the elbow is placed at our shoulders' height. There we will make a small pause before the hit that goes before the impact. The body weight has to move onto the front foot.

Pete Sampras and Roger Federer during the rising movement

c- Impact: the impact will be made above our head, with the arm straight towards the ball. The body weight is completely on the front, left leg, and we recover the left arm towards our stomach.

Roger Federer at the moment of the impact

d- Ending: finishing the hit on the left side of our body, the left arm towards our stomach, and the right foot going forward to start with the recovery movement.

The serve can be made in three different ways, according to the time in the play and to the player's personal characteristics. They are:

a-Flat serve: It is the quickest serve. It is used for the first serve. It doesn't have any effect. The impact is made on the back of the ball. The ball trajectory is from the high part, downwards.

b-Sliced serve: it has a lateral rotation effect It is used for the second serve. The impact goes on the lateral, right side of the ball. The ball trajectory is from the high part, downwards, and bending as a consequence of the effect.

c- Topspin serve: it has a forward-upwards rotation effect, so the ball goes over the net with a wide margin. When it bounces, it ejects forward and upwards, so the opponent has to stay at the back of the court. This serve is the most widely used for the second service.

E-Right volley: a volley is the hit made on the ball before it touches the floor, that is, before the bounce. It is normally made near the net, but it can be

made anywhere on the court if the circumstances are so. This hit is used for an attack, and it is done to end the game. It is widely used by players who like attacks and mostly in double matches, because in these matches the four players are near the net most of the time. It is a flat with a slight sliced effect hit.

The phases of the hit are the following:

a-Waiting position: the player has both feet facing the net, knees in semi-bent position, the dominant hand holding the racquet on the grip and the non-dominant hand on the neck. The head of the racquet is slightly high and the hands in front of the body.

b-Preparation and rotation of shoulders: during the preparation, the shoulders and the foot rotate to the side of the hit, the racquet must be held with the left hand to keep balance, and it grip pointing to the opposite foot (the right one). The body weight will be on the left foot, even if we haven't moved the right foot yet.

c- Impact: it must be done in front of the body, with the arm straight towards the ball. The body weight goes into the front leg, which is the opposite one to the hit, so it would be the left leg for right handed people and the right leg for left handed people.

Nicolai Davydenko making a right volley

d-Ending: the body weight is on the opposite leg and the arm which is also at the front in the same direction of the ball.

F- Backhand volley: it has the same general characteristics as the right volley.

These are the phases of the hit:

a-Waiting position: the player has both feet facing the net, knees in semi-bent position, the dominant hand holding the racquet on the grip and the non-dominant hand on the neck. The head of the racquet is slightly high and the hands in front of the body facing always forward.

b- Preparation and rotation of shoulders: during the preparation, the shoulders and the foot rotate to the side of the hit, the racquet must be held with the left hand to keep balance, and it grip pointing to the opposite foot (the right one). The body weight will be on the left foot, even if we haven't moved the right foot yet.

Carlos Moya making a backhand volley

c- Impact: it must be done in front of the body, with the arm straight towards the ball. The body weight goes into the front leg, which is the opposite one to the hit.

d- Ending: the ending is to the front, with the body weight totally to the front to get extra strength. When we transfer the weight, the foot behind goes up to emphasize the ending. The arm is straight towards the front, following the ball's direction and effect, and the left arm is behind to help keep balance.

G- Smash: this hit is used to attack, and it is usually used to end the point or as an answer to an opponent's defensive hit, which is a lob.

As concerning the movement, it is very similar to the serve. The only difference is that the ball was previously sent by the opponent and not by ourselves, as when we serve. This hit can be done from anywhere on the court. It is a flat hit and slightly sliced.

These are the phases in a smash:

a-Waiting position: the player has both feet facing the net, knees in semi-bent position, the dominant hand holding the racquet on the grip and the non-dominant hand on the neck. The head of the racquet is slightly high and the hands in front of the body.

b-Preparation and shoulders rotation: the left foot goes forward, the player rotates the shoulders and he/she rises the left hand towards the ball in order to get a reference and keep balance. Before hitting the ball some small steps might need to be done in order to place ourselves right under the ball.

Jeremy Chardy making a smash

c- Impact: the ball is hit above the player's head, the arm straight towards the ball, the body weight on the left leg and leaning forward. The racquet is held firmly and it is blocked at the impact moment. The left arm begins a descending trajectory towards the stomach area.

d-Ending: at the ending, the body weight is on the front leg, rising the heel of the leg behind to help the movement. The racquet must first go forward and then must be recovered on the left side of the body. The right side is grouped near the stomach area.

Tactical basis

At present, tennis is a sport based on power, as the points are shorter due to the decrease of hits among players.

First of all, the physical aspect is essential to face a tennis match. The players must have excellent conditions in endurance, strength, power, speed, flexibility and coordination. On the second place, the psychological aspect is also relevant: the player must be competitive and ready to cope with pressure.

Self confidence is essential for success

Thirdly, we will see that the technical aspects (how hits are made and the movements on the court) are closely joined to the fourth important aspect: the tactic (decision making related to the player's conditions, the court, the ball and the opponent). A good player must develop strategies to be made on the court. These strategies, which are simply a repeated series of the same hits, will define the player's style and will provide security and trust, and they will be practice in the training sessions. The models used are based on specific tactical principles that are explained below:

a- Tennis is a sport based on mistakes: in each level of the game, 85% of the points is lost due to mistakes. Only the 15% of the points is won thanks to winner points. As a consequence, the secret in a tennis match will be to complicate your opponent's play, so as to oblige him/her to make risky hits. Even very good players make mistakes concerning position, strength or inability to guess the opponent's hit after having been disguised. Non forced mistakes are a significant part in each match, and they are mostly related to the wrong choice of hits or to a faulty technique. To win the match the aim is to reduce your own non forced mistakes and to try to increase your opponent's ones.

b- Hits to the open space: if the player develops his/her own tennis skills to a level in which he /she can direct the ball over the net and into the court, we can say that he/she is ready to send the ball far from his/her opponent. As the other player can't cover all the court angles at the same time, there will be always an empty space, known as open space. If you can throw the ball to this space, you will win the point. The opponent will try to reach it by means of running, so he/she will find it more difficult to run back to his/her place, to give the ball back again. The possibilities of getting a winner point increase the closer the player is to the net or the medium part of the court, as he/she will have less time to react and give the ball back.

c- Off-balance balls: during a match, our opponent will expect us to throw the balls to the open space, mainly if he/she has already done some winning points. As the opponent starts anticipating our plays, and he /she starts

moving slightly to the direction of the ball, it is the moment to send a off-balance ball. It will be extremely difficult for him/her to change direction, recover balance and get adapted to the new ball. This strategy is very effective if the opponent is fast, and he/she moves quickly from side to side of the court, especially if they can anticipate throws to the open space. It is also useful if we have moved our opponent to one side of the court and he/she goes back quickly to the center to cover the open spaces.

d- Use the angles to open gaps on the court: most of the players are taught to make deep second hits, so they go to the baseline, and as a consequence the opponent can't answer back with a short ball hit. Even if it is a basic strategy, we must try to use the court angles, moving the opponent from side to side, so we can make winning points, especially if we take advantage of our opponent's weaker side. If our ball bounces close to the baseline, the opponent will have to go beyond the side line to give it back, so he/she will open gaps. If you are playing on a hard surface, avoid throwing all your hits straight and deep: use the angles instead, crossing the ball from side to side. At least this is what the best players on clay do.

e-Move your opponent around the court: the aim is to look for your opponent's mistake: to do so and show that you are a good tennis player, change hits, vary the speed, depth , effect and collocation of your hits. The best technique is the combination of high hits together with hits from side to side (the most common ones). It is very efficient to begin the game with a deep hit on the baseline, and then a hit that will open a short angle or a dropshot, so your opponent will have to run forwards quickly. Then, your next hit can be a drive to the other side or a lob over his/her head. By doing so, he/she will expect a difficult match.

f- Adapt to your opponent: look for his/her weaknesses and take advantage of them. This is one of the most attractive things in tennis.

g- Adapt to the conditions: the sun, the wind, the temperature and the humidity are all conditions that affect the tennis player. It is essential to train in different places with different climates to get accustomed to these changing conditions.

To finish this chapter on tactic, we can rephrase the words of a former US tennis player, Brad Gilbert: "In tennis, it is essential to know where you win and lose the points in a match; to know your strong and weak points and to know your opponent's strong and weak points, so you will know when and how to attack".

Relaxing. Schultz's autogenous training.

From 1912 Schultz established the principles for the autogenous training, beginning with hypnosis, a discipline in which he was a master. In 1926 he communicated the Berliner Medical Association his first results, obtained thanks to his autohypnosis method. The word autogenous training comes from the Greek "autos" (itself), "gen" (to become), and could be translated as: "the necessary training developed by oneself through which one can build himself".

According to Schultz: "The principle on which this method is based, consists on achieving a general change in the person, thanks to some rational and physiological exercises. This method works the same way as the old hypnosis and it gets the same results as the real suggestive states".

Following the explanation above, the autogenous training has sometimes been called autohypnosis.

Image of the correct position for the autogenous training

Starting with Schultz's studies, some other versions of this training have appeared, but they all have the same core: using images that appeal directly to the vegetative system.

According to Huber (1980): "These images are gathered in formulas, according to basic elements of suggestive efficacy, and they apply to organic regions which are easy to be reached in both ways, subjective and cognitively: the stomach, the breathing, the heart and the head".

They are summarize in six autogenous exercises:

a- Exercise on heaviness.
b- Exercise on heat.
c- Exercise on pulse.
d- Breathing exercise.
e- Abdominal regulation.
f- Head exercise.

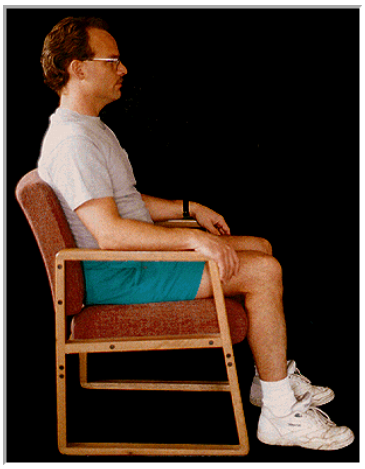


Image of an autogenous training

Places for making autogenous training

To develop the exercises of a correct autogenous training, certain requirements are necessary:

a-Quiet atmosphere, without too many noises and far from stressing stimuli.

b- Mild temperature, not too high or too cold, so as to facilitate relaxation.

c- Dim light. It is important to keep the room with a dull light.

Positions for making autogenous training

There are three basic positions in autogenous training:

a-Lying on a bed or sofa with your arms and legs in a small angle and away from your body.

c- In an armchair. If we choose this place, it is convenient to look for a place to lean our head and feet. .

c- Sitting on a stool. This position is called by Schultz "the carriage driver position". When we use it, our body weight is on the upper part of our bodies, mainly on the back and the lumbers. It was so called because this position is usually found in many professions, where we have to sit down for hours without leaning our back or arms anywhere.

General considerations to perform the autogenous training.

During the practice of the autogenous training we must make an effort to repeat the different actions, not as something external to us, but of inner actions that have a sense based on rhythm and repetition. Our mind must be focused on the activity. On the other side, we must not feel pressure in case our performance is not a very good one. We are learning, and in a learning phase, proficiency is not a goal.

Ways for finishing a training session

To finish a practical session in a proper way is very important, regardless if we are at home or at the therapeutic center. The proposals must be followed by the sportsman: to stretch and flex the arms, to breathe deeply and to open your eyes. This way of ending is compulsory and must be always followed.

After finishing the training and fulfilling a correct ending, it is important not to rise quickly, but to stay on the chair for a while. If some questions had to be asked after the session, the person could ask them still sitting on the sofa, even if he/she is at home. This way, we will prevent dizziness and falls which could spoil the benefits of the autogenous training.