

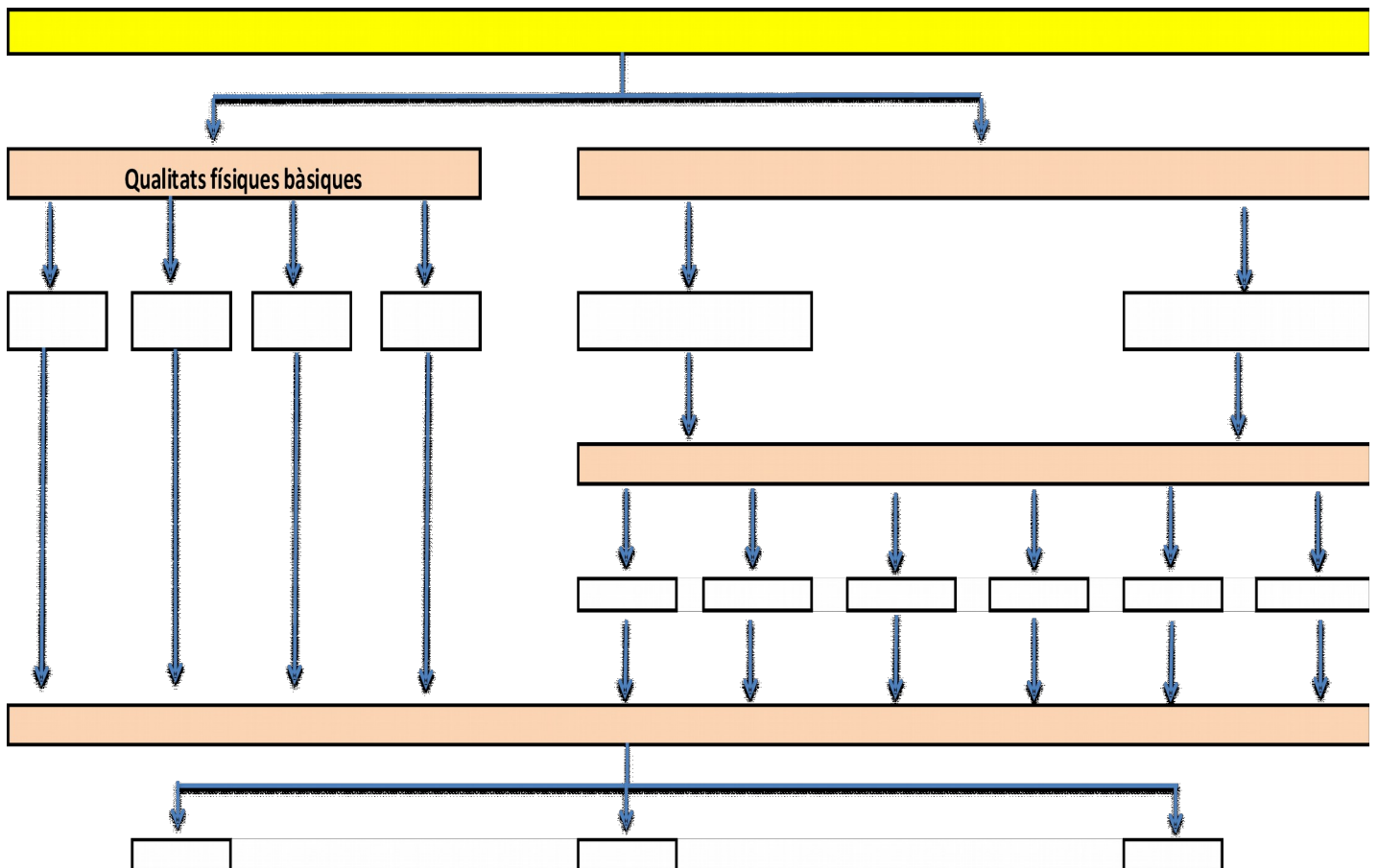
PHYSICAL FITNESS

The concept of 'physical fitness' first arose in 1916, in a scientific study that tried to accurately measure the different physical characteristics of individuals. The idea of 'fitness' suggests it is possible to improve one's physical capabilities through sport or other physical activities.

Have you ever wondered if you're in good shape? (We often think about this when we're experiencing difficulties in performing a particular sporting technique.) This booklet will give you some ideas on how to measure – and improve! - your physical fitness.

To determine how the body improves by doing different activities, there are a number of 'motor skills' (or physical qualities) that we can look at to measure the development of each individual. These motor skills form the basis of someone's physical condition.

1 – MOTOR SKILLS



2 – BASIC PHYSICAL QUALITIES

Our basic physical qualities are determined by metabolic processes and the energy performance of our voluntary muscles.

2.1 – STRENGTH

Strength is the ability of muscles to overcome external opposition.

2.2 – ENDURANCE

Endurance is the ability to maintain physical effort for a long time. However, there are different types of endurance: a marathon runner covering 26 miles requires prolonged, sustained effort, which is different from the intense, concentrated effort of an 800m sprinter.

We could say that: the marathon runner has excellent aerobic endurance; while the sprinter has excellent anaerobic endurance.

What do these underlined terms mean? They refer to different ways of producing energy:

-Aerobic:

- When we work aerobically, we make **consistent, moderate effort** over a **prolonged period of time**. So, this is the kind of endurance we need for long-duration physical activities (lasting **3 minutes or more**).
- There's a balance between our oxygen intake and oxygen demand for activity.
- When we work aerobically, our heart works between approximately **130 and 170 beats per minute**.
- EXAMPLES: Long distance races (3,000m, 10,000m, ...), jogging, walking at a rapid pace, jumping rope, cycling, skating, swimming (long distances), aerobics, dancing... **any activity that requires a moderate pace**.

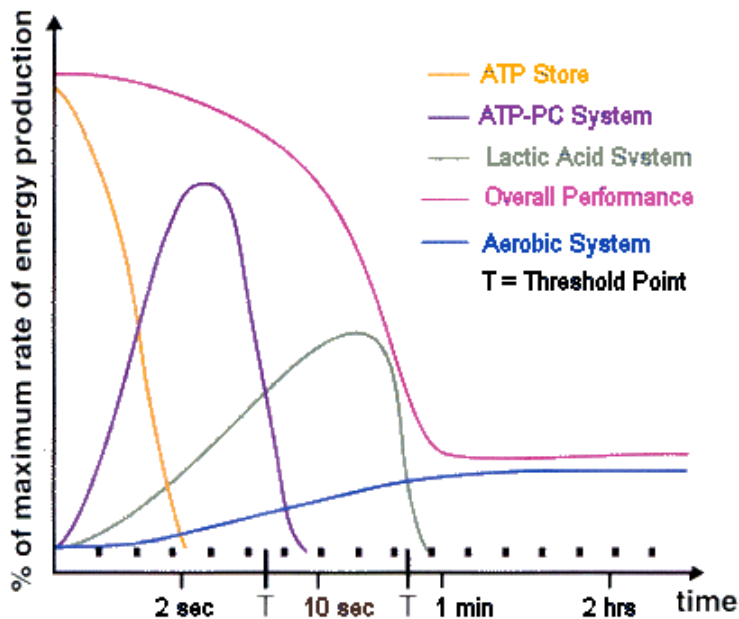
-Anaerobic:

- When we work anaerobically, we make an **intense effort** over a **brief period of time**. So, this is the kind of endurance we need for high-intensity short-duration physical activities (lasting **less than 3 minutes**).
- There is an imbalance between our demand for oxygen (high) and our supply of oxygen (low); in other words, we perform in **oxygen debt**.
- When we work anaerobically, our heart works between approximately **170 beats per minute** and about our **MCI (Maximum Cardiac Index, 220 minus age)**
- EXAMPLES: Sprinting (1,500m or less), swimming (short distances), jumps, throws, cycle sprints... **any activity that requires an intense effort**.

To better understand what endurance is, we need to know the following:

- **Anaerobic threshold:** the limit at which someone can produce energy without oxygen, during intense exercise
- **ATP:** the molecule that enables energy substrates to produce energy

- **Aerobic mode:** a way of producing energy by burning ATP with oxygen, through steady exercise during a prolonged period of time
- **Anaerobic mode:** a way of producing energy by burning ATP without oxygen, through intense exercise during a short period of time. This mode produces a lot of energy, but also produces lactic acid.
- **Lactic Acid:** This is a byproduct of the anaerobic mode of producing energy. Lactic acid changes the properties of blood and temporarily prevents the proper contraction of muscles.



A person's endurance level increases as they grow (except temporarily during the early stage of puberty, when someone is 12-14 years of age), until it reaches a peak at age 28-30. After this point, it gradually descends.

-Heart rate

A good way to test your endurance level is to measure your 'heart rate' (the number of beats per minute that your heart does). There are three methods to measure heart rate:

- 1) Place your fingertips on the carotid artery (located in your neck).
- 2) Place your fingertips on the radial artery (located in your wrist).
- 3) Place your hand over your heart.



With methods 1 and 2, you shouldn't use your thumb, because it has a pulse of its own, and can distort your counting.

Short on time? The number of beats per minute can be quickly calculated by counting heart beats for six seconds, and then multiplying this number by ten.

Heart rate varies according to the person's **age, sex, and individual** characteristics:

- At birth, for example, we have a pulse of 140 beats per minute (bpm). This decreases gradually as we age, until we reach 20 years old, when our heart-rate is 60-70 bpm. It remains at this level until we reach 50 years old, when it increases to about 70 bpm – 80 bpm.
- Generally, women have a higher heart rate than men.
- People who exercise regularly have a low heart rate.

Heart rate also varies according to the activity being performed at any particular moment:

- In the morning, immediately after waking up, we have a very low, 'resting' heart rate.
- During the day, the heart rate increases.
- During physical exercise, the heart rate increase, relative to the intensity of the exercise.

During exercise, we should always remember our own maximum heart rate, (i.e. **Maximum Cardiac Index**). We can estimate this by subtracting our age from the number 220. For example:

Mia Farrow (age 19): $220 - 19 = 201\text{bpm}$ **MAXIMUM**

Victor Argo (age 69): $220 - 69 = 151\text{bpm}$ **MAXIMUM**

James McAvoy (age 37): $220 - 37 = 183\text{bpm}$ **MAXIMUM**

2.3 – SPEED

Speed is performing an action quickly: for example, running a long distance in a short time.

2.4 – FLEXIBILITY

Flexibility is the ability of our joints to bend, twist, and straighten as widely and easily as possible. For example, rhythmic gymnastics requires a very high degree of flexibility.

The flexibility of the human body depends on two factors:

- **The joints' range of movement;** the extent to which our joints can bend, twist, and straighten.
- **The muscles' suppleness;** the ease with which our joints can bend, twist, and straighten.

-Why is it important to maintain, grow, and recover our flexibility during our lifetime?

The evolution of the human race has so far given our bodies a great deal of flexibility. However, in recent centuries, especially since both the Industrial Revolution and, more recently, the beginning of the ongoing IT (Information Technology) Revolution, human societies have been increasingly mechanised and automated. (Think of factories, cars, and computers.)

Physical labour is less and less a part of our lives, particularly in rich, developed countries like Catalonia or Scotland. Many of us have **sedentary lifestyles**: we spend many hours

per day sitting, at work and at home. This type of lifestyle can contribute to heart disease and other health problems, such as back pain and vulnerability to injury.

If we exercise our bodily flexibility, we can avoid many of the health risks of a sedentary lifestyle. Flexibility exercises have the following specific benefits:

2.4a – The tendon muscular system

- Flexibility exercises fight muscle fatigue, because it promotes blood circulation.
- They also prevent muscle and joint injuries, by allowing a greater range of possible movements.
- Exercise increases the strength of antagonistic muscles.

2.4b – Joints

- Regular exercise of your joints prevents tissue calcification, which keeps the joints flexible and 'young'.
- Regular exercise leads to regular renewal of synovial fluid, ensuring that the joints are prevented from degenerative disease.

2.4c – Respiratory and cardiovascular system

- Flexibility exercises improves blood circulation around the body.
- The contrast between tension and relaxation in the process of stretching muscles creates a 'pumping' effect. This enables the proper disposal of waste produced by our metabolism, such as lactic acid.

2.4d – Nervous system

- When stretching properly, we have to breathe slowly, which makes us feel more relaxed. Notice how your limbs feel lighter after a good stretching session.
- Flexibility exercises improve coordination, and our ability to learn motor skills.
- Finally, exercise enables us to 'know ourselves': we begin to understand what our physical limits and abilities are.

The combined effect of all of these benefits is a good **posture**. Posture is the relationship between the position of our body joints.

When we forget to exercise a specific part of our body, the posture of our whole body is affected. For example, if you forget to exercise your hamstring and calf muscles, don't be surprised if your legs get injured easily! (To test how flexible these particular muscles are, try touching your toes without bending your knees. If this is difficult or impossible, you have some work to do!)

-Did you know?

Women are usually more flexible than men, because men usually have larger and tighter muscles.

-Stretching

The following exercises help to improve flexibility:

Methods of Stretching

There are basically two methods for increasing joint mobility: **static** and **dynamic** methods.

Dynamic methods are characterised by gradual extensions that push the limits of our flexibility.

Static methods are maintained for a certain time, in a certain posture.

Both methods can be performed either actively or passively. When you perform actively, you contract your antagonistic muscles by yourself; when you perform passively, someone helps you.

[Active image] + [Passive image]

From theory to practice

-Basic rules:

1. Stretches should begin and end very slowly.
2. Don't rush! Make sure that every stretch is performed properly.
3. Stretching positions should be maintained for a minimum of 10 seconds.
4. Remember to stretch both sides of the body. Do not neglect any muscle area.
5. Each exercise should be repeated 2-3 times each session.
6. Ideally, you should perform stretching sessions three to five times per week.

-Suggestions:

- Don't hurt yourself! Be careful not to push yourself too far, especially during dynamic stretches.
- Remember that everyone's an individual. What is easy for someone else may be difficult for you, so adapt your stretching routine accordingly.
- When stretching a particular muscle, remember to keep the rest of your body relaxed.
- As you become more experienced, it's a good idea to experiment – cautiously – with new stretching positions.
- If we play asymmetric sports that prioritises certain parts of our body over others (e.g. tennis), remember to compensate for this in our stretching routine. So, if your preferred sports tend to emphasise your arm muscles, try to spend a bit more time on your leg muscles during stretches.
- Breathe regularly and slowly during stretches. Never hold your breath!
- If your stretching position is affecting your ability to breathe slowly and regularly, you need to correct your stretching position.