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Improve Posture In Sports And In Life

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Abstract

The posture

"Posture is represented by the set of positions of all the joints of the body at a given moment" (Kendall).

"By posture we mean any attitude, defined by the relationships established between the various body segments, that we can assume in space" (Boccardi).

"Posture can be considered the set of relationships existing between the entire organism, the various parts of the body and the environment that surrounds it" (Tribastone).

"Posture is the somatic expression of emotions, impulses and regressions.unconscious reflection in the external attitude of one's internal condition, of one's personality" (Cailliet).

"Posture is a global response of adaptation to a certain environment, a correlation between the physical and mental aspects of behavior" (Tribastone)

"Posture is defined as the position that the body, or one of its components, assumes thanks to the passive properties of the ligaments and joint constraints and the active properties of the tonic muscles, in harmony with the force of gravity" (Caradonna).

Posture is therefore the result of three fundamental aspects:

1 anatomo-mechanical

2 neuromuscular-neurophysiological

3 psychomotor

Keyword: posture, paramorphisms and dysmorphisms, spine, kinesitherapy

Introdution

Therefore the three structural components of posture, generally integrated and overlapping, are: 1 the mechanical posture

2 the neurophysiological posture 3 the psychomotor posture.

It is important to clarify that there is no one posture but an infinite number of postures: any "balance position" corresponds to them. When we talk about posture we are referring to an "idea" which represents that structural and functional condition of the human body which allows the acquisition of every "normal position" for the performance of motor functions, static or dynamic, with maximum balance (stability) , maximum economy (minimum energy consumption), maximum comfort (minimum stress on anatomical structures).

In practice, posture is the way in which the human body remains in balance, both stationary and in movement, and this balance is the result of the adaptation of the various structures of the body: central nervous system, spine, limbs and their interconnections with the outside world.

"Everyone must take the body they have and use it to the best of their ability. For each individual the best posture is the one in which the body segments are balanced in the position of minimum effort and maximum stability" (Metheny)

POSTURE: ALIGNMENT AND MUSCLE BALANCE.

The upright position, characteristic of the human species, is one of these infinite postures, characterized by vertical alignment and the support of both feet on the ground. It is a completely artificial posture, used very rarely in daily life but which is nevertheless useful to us as a reference position, from which more natural postures can be obtained thanks to its symmetry and some easily definable biomechanical properties (Boccardi).

In fact, the skeletal parts rest on the feet and are supported in balance by the "passive" tension of the ligaments, by the aponeuroses and by the elastic properties of the muscles, as well as by a minimal "active" contraction of the musculoskeletal system. unit especially stabilizing muscles. (Daniels) ".among mammals, man is the one who has the most economical anti-gravity mechanisms, once he has reached the upright position. The expenditure of muscular energy for what appears to be a rather uncomfortable position is in fact very economical" (Basmajan). In the relaxed, symmetrical standing position, the hip and knee joints assume a fully extended position as they must support the weight overhead.

In the ankle joint there is no bony or ligament limit to movement, as there is in the knee; however, passive bijoint tension of the gastrocnemius muscle is an important factor in stability as long as the knee is extended and the body is tilted slightly forward relative to the ankles.

1- Standard posture

In the standard posture, the spine has normal curves and the bones of the lower extremities have an ideal alignment for weight support, resulting in a minimal amount of tension and contracture and leading to maximum efficiency of the body.

The thorax and dorsal region are in a position that favors the optimal functioning of the respiratory organs.

The head is erect in a well-balanced position, so that minimal tension is allowed on the neck muscles.

a- Normal curves of the column.

Column normal curves consist of ones

A - cervical lordosis: convex curve anteriorly at cervical level of approximately 35°

B - dorsal kyphosis: convex curve posteriorly in the upper back region (thoracic region) of approximately 36°

C - lumbar lordosis: convex curve anteriorly in the in part and lumbar) of approximately 50°. (Boccardi)

The upright position can be considered as the alignment of the subject from four sides: front, back, right side and left side. It is difficult for a subject to meet every aspect of the standard.

b- Development of the physiological curvatures of the spine.

The curvature of the vertebral column has undergone a notable modification in the process of phylogenetic and ontogenetic adaptation in humans and primates.

In phylogeny, the transition from a walk with four to two supports was inevitably accompanied by a change in the initial lumbar kyphosis, first in a straightening and, as evolution proceeded, in the achievement of a real inversion of the initial curvature (lumbar lordosis).

The complete balancing of the erection of the trunk occurred over time also thanks to the backward inclination of the pelvis which in turn influences the severity of the lumbar lordosis. As regards ontogenesis, it is known that the intrauterine position of the fetal body is characterized by a flexion of the entire spinal column (marked kyphosis).

This posture is maintained for a certain period of time even after birth, but starting from the 6th-8th week of extra-uterine life, the baby begins to extend the neck while lying in a prone position and, in doing so, activates the posterior neck musculature which, in this way, counteracts the action of gravity.

In a subsequent period, the child, assuming a sitting position, always presents a notable lumbar kyphosis associated with a cervical lordosis. In this situation he learns to control the weight of the head with the muscles located above the shoulder girdle.

Only later does lumbar lordosis form, that is, when he begins to make the first attempts to remain in an upright position and therefore to walk. The definitive orthostatic position is reached when the curvature of the sole of the foot is achieved.

The concept of "orthopaedic" position implies, in fact, a straight posture of the body which is the result of a correct progression of the three physiological curves of the spine and in addition of the correct curvature of the soles of the feet. (Rocabado)

2- Skeletal alignment (Boccardi).

In the upright position the segments are aligned almost as if in an anatomical position, with the head raised and the feet resting on the ground.

The segments are positioned with the major axis vertical, the two feet horizontal. The palms of the hands look inwards.

The joints are almost all in the 0 or starting position and are thus defined in the upright position with the upper limbs aligned with the hips and the palms of the hands facing forward (anatomical position). The ankles are in very slight dorsal flexion (2°-4°), the hips in slight extension. The 90° medial rotation of the upper limb which brings the palm of the hand to look inwards, is divided between internal rotation of the arm (about 30°) and the return of supination of the forearm (about 60°).

a- Ideal plumb alignment: lateral view.

When examining posture while standing, a plumb line is used as a reference line (plumb line). This instrument is used because it represents a standard based on the natural law of gravity and allows us to easily appreciate the effects of this force. The point at which the wire is placed must be a standard fixed point and seen from the side, this reference is slightly anterior to the external malleolus and represents the point at the base of the coronal plane of the body in ideal alignment.

Kendall in 90' describes the ideal upright posture as one in which the plumb line passes through the following points (superficial reference points and anatomical structures in brackets that coincide with the reference line):

1. slightly anterior to the lateral malleolus (through the calcaneal cuboid joint)

2. slightly anterior to the midline of the knee (slightly anterior to the axis of the knee joint)

3. approximately through the greater trochanter of the femur (slightly posterior to the center of the hip joint)

4. approximately halfway across the trunk (lumbar vertebrae bodies)

5. through the shoulder joint

6. bodies of most cervical vertebrae (through the odontoid process of the axis)

7. through the earlobe (external auditory meatus)

8. (slightly posterior to the apex of the coronal suture) In the adult the lumbar arrow must be 4 to 6 cm; the cervical arrow from 6 to 8 cm. (Bricot)

b- Ideal segmental alignment: lateral view.

Let's look at the alignment by segments in a side view. The head is in a neutral position, not tilted in forward or backward. The cervical spine has a normal curve that is slightly convex anteriorly (about 35°).

The shoulder blades are flat against the back and well aligned.

The thoracic curve is normal, slightly convex posteriorly.

The pelvis is in a neutral position, i.e. the antero-superior spines are on the same vertical plane as the pubic symphysis.

The hip joints are in a neutral position, i.e. the longitudinal axis of the pelvis (conventionally indicated as the perpendicular traced from the greater trochanter, apex, to the line that joins the antero-superior iliac spine, SIAS, and the postero-superior iliac spine, SIPS) It must form an angle of 170° forward with the longitudinal axis of the thigh. Neither flexed nor extended.

The knee joints are in a neutral position, neither flexed nor hyperextended. The leg is found to directly extend the thigh. In this position there is no possibility of varying the relationships of the two body segments both in the frontal and horizontal planes.

The ankle joints are in a neutral position, i.e. the longitudinal axis of the leg forms a 90° angle with the support surface.

c- Ideal plumb alignment: rear view.

Examining the upright position, seen from the rear, the fixed reference point is located halfway between the heels and represents the point of the mid-sagittal plane of the body in ideal alignment which occurs, according to Kendall, when the plumb line extends starting to halfway between the two heels, upwards halfway between the lower limbs and across the midline of the pelvis, spine, sternum and skull.

The right and left halves of the skeletal structure are essentially symmetrical and the two halves of the body are assumed to balance precisely.

More precisely, an ideal alignment in rear vision occurs when a plumb line passes exactly:

1. between the heels

2. crosses the intergluteal rim

3. the sacred

4. the VII cervical (C7)

5. the occipital protuberance

d- Ideal segmental alignment: posterior vision

We observe the alignment by segments in a rear view. The head is in a neutral position, neither tilted nor rotated

The cervical spine is straight.

The shoulder blades are in a neutral position, the medial edges are essentially parallel and spaced approximately 7-10 cm apart.

The lumbar and thoracic spine are straight.

The hip joints are in a neutral position, neither adducted nor abducted. The lower limbs are straight, not arched or valgus.

The feet are parallel or slightly apart. The heels are spaced approximately 7cm apart. The external malleolus and the external edge of the sole of the foot are on the same vertical plane so that the foot is neither in pronation nor in supination. The Achilles tendon should be vertical. The pelvis is horizontal, both posterosuperior iliac spines are on the same transverse plane.

e- Ideal alignment: frontal vision

In this vision several lines must be horizontal:

1. bi-pupillary line

2. bi-tragalic line

3. bi-mammillary line

4. bistyloid line

5. bi-scapular line

6. pelvic girdle: bi-SIAS line

Furthermore, the kneecaps point directly forward and the feet are neither prone nor supine

3- Muscle balance.

We have said that good posture is that state of muscular and skeletal balance that protects the body's load-bearing structures from an injury or progressive deformity despite the position (upright, stretched out, crouched, bent over) in which these structures work or resist.

In these conditions the muscles will work more effectively.

Therefore, good muscular balance must ensure good alignment, avoiding excessive tension and contractures of joints, ligaments and muscles.

methods and materials

To this end it is necessary that:

1. the muscular length of the individual muscles allows a normal range of movement for each joint;

2. the muscular strength, expressed by individual muscles or muscle groups, is adequate (in intensity) for the motor task in question, guaranteeing stability and support. (Kendall) These two elements together are the basis of the preservation of good body mechanics in posture and movement.

The upright position of humans is more economical than other mammals, which must support themselves on four limbs but have more or less flexed joints which therefore require continuous muscular effort. (Basmajian)

It is precisely the arrangement of the segments in humans, however, that makes the upright position an attitude of great mechanical effectiveness and extreme economy.

a- Muscle balance in relation to the ideal alignment seen from the side.

Viewed from the side, the anterior and posterior muscles attached to the pelvis keep it in ideal alignment. At the front, the abdominal muscles (external oblique m., rectus abdominis m.) pull upwards and the hip flexors (i.e. soas, m. tensor fascia lata, m. rectus femoris) downwards; posteriorly, the dorsal muscles pull upwards and the hip extensors (gluteus maximus, biceps femoris, semimembranosus, semitendinosus) downwards.

As a result, the anterior abdominals and hip extensors work together to tilt the pelvis posteriorly; the muscles of the lumbar region and the hip flexors act together to tilt the pelvis anteriorly.

The back muscles of the legs are affected since the line of gravity passes in front of the axis of the ankle: therefore the weight of the body applied to the center of gravity is balanced by the strength of the plantar flexors, although the relative role of the soleus and gastrocnemius i opinions are not yet in agreement. (Boccardi)

" it can be said that the position of the pelvis is the key to correct postural alignment or

incorrect. The muscles that maintain correct alignment of the pelvis, both in an antero-posterior and lateral direction are of extreme importance in maintaining good overall alignment. An imbalance between the muscles that exert an antagonistic action in an upright position changes the alignment of the pelvis and has a negative impact on the posture of the parts of the body above or below." (Kendall)

b- Muscle balance in relation to ideal alignment seen from behind.

Due to the symmetry of the attitude, in the upright posture the preservation of balance on the frontal plane is less expensive than on the sagittal plane.

Gravity tends to push the limbs apart to bring the center of gravity down.

The friction offered by the ground and its usual coverings is sufficient to prevent this abduction of the thighs.

Therefore, with fixed feet, the lateral movements of the pelvis, which would imply a modest lowering of the center of gravity, involve four simultaneous angular movements:

1. the external rotation of the foot and the adduction of the hip on the side towards which the pelvis moves

2. the internal rotation of the foot and the abduction of the hip of the opposite side.

The alternating and crossed play of the four antagonistic muscle groups (tibialis and lateral glutes on the first side, peroneal muscles and adductors on the second side) is therefore sufficient to correct the oscillations in this sense. (Boccardi)

Let's see what the stabilizing muscles are on the right and left respectively. (kendall)

Stabilizer muscles to the right

1. right trunk lateral flexors -m. square of the loins - m. internal oblique -m. external oblique

2. right hip adductors

3. left hip abductors -m. gluteus medius - tensor fasciae latae - iliotibialis section of the fascia latae

4. internal rotators - right posterior tibialis m. - right flexor hallucis longus m. - right flexor digitorum longus m.

5. external rotators - left peroneus longus and brevis

Stabilizer muscles to the left.

1. left trunk lateral flexors -m. square of the loins - m. external oblique -m. internal oblique

2. left hip adductors

3. right hip abductors -m. gluteus medius -m. tensor fascia lata - iliotibial tract of the fascia lata

4. internal rotators -m. left posterior tibialis -m. left flexor hallucis longus - left flexor digitorum longus

5. external rotators - right peroneus longus and brevis

4- Posture and center of gravity

Each mass or body is composed of a multitude of small particles attracted towards the earth as described by the force of gravity.

This attraction to which the particles of the body are subjected produces a system of practically parallel forces and the result of these forces acting vertically downwards and the weight of the body. It is possible to locate a point where a single force can be applied which is equivalent, in intensity, to the weight of the body and which acts vertically upwards, so as to give the body balance in every position.

This point is called the center of gravity or center of gravity and can be described as the point where all the weight of the body is thought to be concentrated. (Kendall)

The center of gravity is the exact center of the mass of a subject, i.e. its "geometric center" when this object has a symmetrically distributed mass and is uniform. If the mass, as in the human body, is distributed asymmetrically with respect to the horizontal plane, the center of gravity will be placed proportionally closer to the largest and heaviest area.

With a posture in which the alignment is ideal and in a medium-sized adult, the center of gravity is to be considered located at a point slightly anterior to the spine at the level of L3 (Wirhed) and at approximately

56% of the total height of the 'individual from the ground. (Pirola) However, the center of gravity can vary from person to person based on weight distribution, height, age and sex: in women it is lower, in small children it is higher. The position d The center of gravity varies with the body position.

If in the anatomical position the center of gravity is approximately 100 cm from the ground, lifting one arm raises it by approximately 4 cm, raising both arms by 8 cm, standing on tiptoe by 8 cm, and so on we will thus have "different" centers of gravity.

Wirhed describes the position of the center of gravity in the different body segments and its distance from the two ends of each segment expressed as a percentage of the total length.

For example, the center of gravity of the upper limb measured with low shoulders is located at a point that is about 40% of the total length of the limb itself from the proximal end.

We also remember that the center of gravity of two segments is always found on the line that joins the centers of gravity of these segments, i.e. in a point that is in an intermediate position with respect to the centers of gravity of the two segments but proportionally closer to the center of gravity of the heaviest segment.

a- Equilibrium conditions

In an upright posture, if the vertical line, the line of gravity, is extended from the center of gravity to the base of support, it is placed in the middle of the base of support (data from an almost trapezoidal polygon made up of the lateral profile of the feet and from the two lines that respectively constitute the front and back part of the feet), 3 cm in front of the ankle joint.

Therefore the line of gravity passes on the sagittal plane approximately halfway between the tibio-tarsal and the metatarsophalangeal and on the frontal plane, in well-distributed support, between the two feet.

Around the line of gravity the body is hypothetically in a position of equilibrium which implies a uniform distribution of the body's weight and a stable position of each joint.

From some principles of statics we learn that there are two types of equilibrium:

• a static equilibrium

• a dynamic balance

Static balance is the ability of an object or body segment or the body as a whole to maintain a static position.

Dynamic balance is the ability to maintain, during the various actions of life, the body segments in a condition of stability.

The stability of a body is determined by some factors which we will divide into primary and secondary (Pirola).

The main factors are:

• height of the center of gravity

• width and shape of the support base

• relative position between the line of gravity and the support base

• momentum of the body (mass x velocity).

The secondary factors are:

• orientation of the support base with respect to the line of force

• conditions of the constraint

• gaze orientation

• physical and emotional state of the subject.

Therefore the body will be more stable the lower the height of the center of gravity compared to the height of the subject.

Furthermore, the more the line of gravity is placed inside the support polygon, the more stable the subject will be: in fact there are postural automatisms that allow the line of gravity to always fall inside the support base in the event that create movements of body segments subsequently e.g. e., to support loads.

5- Posture adjustment mechanism

The posture is recorded in the motor centers in the form of a model attitude and from this scheme, once it has become conscious and internalised, the adjustments of the correct posture arise.

The CNS regulates movement through motor schemes or patterns in which bones, joints and muscles play the role of mechanical executors within a whole regulated by the laws of neurophysiology.

The models, he considers genetically determined motor patterns and therefore the innate heritage of the subject, because they are characteristic of the species and inscribed in its cells or groups of snow cells, are intrinsic properties of the brain machine, therefore in themselves devoid of function.

However, when the individual moves, he interacts with the external environment, proposes his motor schemes and carries out a continuous modulation of exteroceptive and proprioceptive afferents which he organizes in the structuring of new motor schemes with functional characteristics.

The development of normal motor skills consists in learning increasingly selective and functional motor patterns and this is possible thanks to the large amount of tactile, kinesthetic information

, sensorial that reach the CNS. during the execution of motor acts.

The CNS controls posture and movement through a mechanism capable of choosing a specific combination of muscles from among the many possible combinations. (Tribastone)

Posture can be considered as the result of a large number of integrated sensorimotor reflexes, at different levels of the neuraxis, with an extremely composite automatic regulation.

At this point we describe, in full, the mechanism that regulates posture and then analyze its sins in more detail Goli constituent elements.

The complex apparatus that controls the postural structure, both in static and dynamic conditions, can be schematized according to an automatic block control system. (Cristofanilli)

BLOCK 1

- the higher centers are grouped together, including the cerebrum, the cerebellum and the brainstem. They receive information mainly from the neuromuscular spindles, from the Golgi tendon organs, as well as from the retina, the skin and the labyrinth.

BLOCK2

- is represented by interneurons, alpha and gamma motor neurons, contained in the spinal cord.

Direct signals to motor neurons, modifying the length of the muscle, can initiate movement.

BLOCK3

- includes the muscle, but it may also contain the factors that influence its contractile response, i.e. force and load.

BLOCK4

- includes proprioceptors (neuromuscular spindles, Golgi tendon organs, the labyrinth) and exteroreceptors (retina, skin receptors) as they are all receptors that can influence posture.

The integration of impulses, from these different systems, occurs at the level of the brainstem.

The altered functioning of a block or a connection between two blocks of the system causes an alteration of the posture.

a- What does the literature say?

In support of what is described above, we learn from the literature that:

." static positions are those in which the forces controllable by the central nervous system, the muscular forces, are able to oppose the modifications of the relationships between the segments that the external forces attempt to generate, i.e. those in which it is the necessary condition to maintain equilibrium is satisfied: the sum of the moments of the acting forces is equal to 0." (Scott)

"The upright posture is characteristic of man. It depends on the integrated activity of a whole series of coordinated reflex mechanisms that determine, maintain and re-establish it." (Houssay)

"The standing position is a broad and complex postural reflex (response) in whose activation the contraction of the antigravity muscles is of fundamental importance, which oppose the action of gravity which would otherwise cause the flexion of the joints and the fall of the body." (Sherrington ,1940)

And again: posture can be interpreted as the result of the sum of the vestibule and cervico-spinal reflexes which, through the perception of the force of gravity and the position of the head in the space activate the antigravity extensor muscles of the spine and lower limbs to allow the desired attitude. (Gagey)

From a cybernetic point of view, where by system we mean a set of different structures that interact to obtain a result, posture is therefore not a sum of reflexes but a multi-sensorial interaction whose aim is the creation of a position: in this case the upright posture.(Gagey)

The neuromuscular system participates in maintaining the upright position by intervening only with corrective mechanisms since in a relaxed position the skeletal segments are kept in symmetrical balance by the passive tension of the ligaments, the aponeuroses and the elasticity of the muscles.

The function of the central nervous system in maintaining posture is essentially to transfer afferent impulses of different origins to the spinal and brain motor nuclei from which the efferents that control the activities of the muscles responsible for maintaining posture originate. Motor neurons are capable of carrying out this integration already at the segmental level.

The basic activity of motor nuclei at the segmental level necessary to maintain posture depends on nerve impulses from different types of sensory receptors:

• cutaneous

• proprioceptive

• visual.

conclusion

Correctly maintained posture facilitates achieving optimal results from exercises, and at the same time prevents injuries and achieves a healthy physical state. Good posture relieves muscle fatigue and prevents joint stiffness, improving the quality of our life. Maintaining correct posture over time ensures the parts of our body are aligned with each other in space in a three-dimensional way. And all parts of the body will be balanced with each other to perform better when exercising, keeping the muscles relaxed and at the same time promoting the flow of oxygen and blood to the muscles during exercise.

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