

The physical exercise in the space fitness Lagree – Massage-Rehabilitation - Manual Techniques

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Abstract

The human body has a great capacity for adaptation, even in the case of significant changes in environmental conditions; like prolonged microgravity.

The force of gravity on the earth produces an acceleration of 1 g (g is the symbol that indicates the acceleration due to gravity). The term microgravity indicates a reduced force of gravity and is therefore used to describe conditions in which the force of gravity is less than that on the earth's surface (less than one g). For example, the gravity force of the moon is only 17% of that of the earth, or 0.17g. The term microgravity is often used to describe conditions in space, because the body may not always be in conditions of weightlessness, i.e. at 0 g.

It is interesting to note that most of the physiological changes due to exposure to microgravity are very similar to those observed in athletes, after a period of inactivity or immobilization, or to changes associated with aging that probably derive from a reduction in physical activity. This similarity is corroborated by the data indicating physical exercise performed during exposure to microgravity as an effective means of counteracting the physiological deterioration that occurs in space. For this reason, but also because exploration in space continues, the influence of microgravity on physical activity is an area of growing interest for sports physiology and exercise specialists. The Space Shuttle spacecraft and on the Orbiting Space Station there is an inversion of the normal posture, that is of the position of the body with respect to the center of gravity, which no longer exists and therefore the mass of blood liquid is redistributed in a different way that on earth. While on Earth gravity retains most of the liquid in the lower limbs, in space, since there is no longer gravity, the liquid collects in the small circle, i.e. at the level of the pulmonary circulation and at the level of the head. Consequences are water retention in the lung and in the face and brain.

The adaptation mechanisms ensure that everything works the same, but in the photos this phenomenon is clearly seen in the so-called lunar faces or puffy, roundish and tendentially ruddy face. In short, astronauts live in space as a person who lived upside down on Earth.

At the organ level, the sensory system is made out of mind areas, for example, the hippocampus in warm blooded animals or the mushroom groups of the natural product fly. These districts are frequently measured and serve a specific job inside the overall fundamental pathways of the sensory system. For instance, the hippocampus is basic for shaping recollections regarding numerous other cerebral locales.

The fringe sensory system likewise contains afferent or efferent nerves, which are heaps of strands that begin from the cerebrum and spinal string, or from tactile or engine kinds of fringe ganglia, and branch over and again to innervate all aspects of the body. Nerves are made essentially of the axons or dendrites of neurons (axons if there should be an occurrence of efferent engine filaments, and dendrites in the event of afferent tactile strands of the nerves), alongside an assortment of films that fold over and isolate them into nerve fascicles. The vertebrate sensory system is partitioned into the focal and fringe sensory systems.

The focal sensory system (CNS) comprises of the mind, retina, and spinal line, while the fringe sensory system (PNS) is comprised of the multitude of nerves and ganglia (bundles of fringe neurons) outside of the CNS that interface it to the remainder of the body. The PNS is additionally partitioned into the physical and autonomic sensory systems. The physical sensory system is comprised of "afferent" neurons, which bring tangible data from the substantial (body) receptors to the CNS, and "efferent" neurons, which do engine guidelines to the intentional muscles of the body.

The autonomic sensory system can work with or without the control of the CNS (that is the reason it's called 'independent'), and furthermore has two regions, called parasympathetic, which are significant for sending orders to the body's essential inward organs, along these lines controlling capacities like heartbeat, breathing, assimilation, and salivation. Autonomic nerves, in contrast to physical nerves, contain just efferent strands. Tangible signs coming from the viscera course into the CNS through the physical tactile nerves (e.g., instinctive agony), or through some specific cranial nerves (e.g., chemo sensitive or repairman signals).

This loss is caused by the lack of bodily statutes, which is an automatic reflex that keeps man on Earth. The main sensors of this reflex are in the soles of the feet and in the legs, therefore, as gravity is lacking, in space it is as if a person was with his feet in the air and therefore the muscles no longer having the stimulus to contraction to maintain the balance, being inactive, they atrophy.

A mechanism of action similar to that which acts on the muscles, is also present in the bones and in microgravity, a hormonal reflex controlled by calcitonin is carried out, so that the bone becomes rarefied, which in technical terms is called osteoporosis.

To counteract muscle reabsorption, astronauts are advised to do a lot of gymnastics, i.e. cycling, but many do not or do not do much, so when they return to Earth, they feel weak and need to do physical rehabilitation. Bone is a complex structure formed by cells that produce bone, osteoblasts and cells that destroy it, the osteoclasts. These cells are placed on a calcium-based trabecular structure, which is the bone matrix. When the bone matrix is destroyed, it is like rust on a piece of iron, it does not reintegrate anymore.

This condition is common in older people and is called osteoporosis. Spatial osteoporosis affects all astronauts, dissipating 30 to 70% of the bone, depending on the length of time spent in space. It is an impressive and worrying phenomenon that has affected all Russian astronauts who have remained in space for periods longer than three months.

This is the main current limitation to a space journey to Mars, which otherwise would have already been done; von Braun presented a complete and detailed project, since 1951.

The administration of hormonal drugs, such as calcitonin, is currently being studied (2005) to reduce the extent of this disease but for example in the elderly it gives poor results.

Because of the fact that in space, the functions of the basic human body are not normal, it is improper to speak of physiology, on the other hand, without talking about pathology, we talk about adaptation.

On the Moon and in the spacecraft, in conditions of absence of protective atmosphere and or in conditions of microgravity, alterations of human bodily functions are produced that are still under study. The known alterations are as follows.

Alterations of the cardiovascular system

In the Space Shuttle spacecraft and the orbiting space station there is an inversion of the normal clinostatism, i.e. the position of the body with respect to the center of gravity, which no longer exists and therefore the mass of blood liquid is redistributed in a different way on earth. While on Earth gravity retains most of the fluid in the lower limbs, in space, since there is no longer gravity, the liquid takes place in the small circle that is at the level of the pulmonary circle and at the level of the head. Consequences are water retention at the pulmonary level and at the level of the face and brain.

The mechanisms of adaptation make sure that everything works the same but in the photos you can clearly see this phenomenon in the so-called lunar faces or face swollen, round and tend to rubizzo. In short, the astronauts live in space as a person who lived on the earth upside down.

When they come back to Earth, the problems happen when they move from microgravity to gravity, that is when they go from living upside down and suddenly everything turns upside down, at a certain height gravity starts to be felt and the astronauts hanging from the seat practically they fall into the seat. This step is not gradual because they travel at speeds of 27,000 kilometers per hour. The blood from the head drains rapidly in the lower limbs and this sudden depletion of blood from the brain causes a brief and temporary fall of brain functions. It is not a real loss of senses, it does not happen in all the crew members but someone for a few seconds does not see us anymore and when this happened to the Shuttle pilot, the first times he gave thought.

The definitive return to normality, however, takes place in a couple of days.

There is no equivalent pathology on Earth that causes the same symptom.

Hand Posture Analyzer (HPA)

In microgravity fatigue has important repercussions on the hands and forearms of the astronauts. Considering that the upper limbs are the main tool of locomotion in space, this can have a significant impact on the performance of astronauts during ordinary work on board the ISS and during extra-vehicular activities. This is one of the reasons why experiments concerning the use of the upper limbs are becoming increasingly important in the context of medical research in space.

Using different scientific protocols it will be possible to determine the degradation of the performance of the musculoskeletal apparatus in microgravity and to favor the studies on the learning mechanisms for motor control.

The results of these experiments will be useful in the development of methods to combat fatigue with the aim of maintaining the condition and improving the performance of the astronauts; this is extremely important from the perspective of future long-term missions. These methods can be used on Earth for the treatment of subjects with local trauma, muscle atrophy, or those suffering from diseases of the Central Nervous System.

Biography

Dario Furnari is a Clinic Spa Manager, Lecturer, Researcher, Consultant Neuroscience at AESTHETICS INC, Ambassador, Neuroscientist, Instructor Lagree Fitness at Lagree Fitness and Head of Clinical Research, Prof Neuroscience and Psycophysiology at Clinica dental.