

## BIOLOGICAL REQUIREMENTS IN EFFORT AND BODY RECOVERY

**Ion ANDREI, PhD**

Colonel, Professor, “Carol I” National Defence University  
ionandreiunap@yahoo.com

**Elvira Gabriela ANDREI**

First grade teacher, Technological Railway Transports High school, Craiova  
elviragabrielaandrei@yahoo.com

**Abstract:** *During physical effort, regardless of its nature, a series of processes take place in the body that can lead to energy consumption that can unbalance homeostasis. After physical effort, the body needs a period of recovery, for the preparation of future physical efforts at optimal parameters and the creation of conditions to increase the capacity of effort, being part of the training process, with a role in creating storage conditions. To help the body be prepared to perform the next physical effort at optimal parameters, it is necessary to apply some means and methods of recovery. Recovery is natural, and can be supplemented and accelerated by guided recovery if the physical effort has led to the depletion of the energy substrate used and there is no time to be restored naturally.*

**Keywords:** *biological requirements; guided recovery; homeostasis; natural recovery; physical effort; rehabilitation.*

Homeostasis is a regulatory process by which the body must take measures to maintain its functions and biochemical processes in a state of dynamic equilibrium, translated by a continuous constancy of physiological functions, within the limits of normal values<sup>1</sup>. The organs - the brain (hypothalamus, pituitary gland – through the secretion of hormones), heart, liver, lungs, kidneys, pancreas, intestine – and muscle tissue, through their permanent activity, work to maintain this balance and intervene when a stimulus acts on the body. The mechanism of the intervention is simple: the stimulus is sent in an afferent way to the control center, which determines an adequate response to the stimulus, a response that is sent in an afferent way to organs or muscle tissue. The response causes changes to correct the deficiency caused by the stimulus through positive (regenerative) feedback or negative (degenerative) feedback. Both types of feedback tend to keep or lead the body in a steady state to preserve life. If this balance cannot be achieved, diseases and even death occur.

One of the stimuli that acts on the body is physical effort, which causes arousal or change in the body. These changes are multiple and more significant as the duration and intensity of effort increase. During physical effort, changes take place in the body:

- in the composition of the blood and its properties<sup>2</sup>:
  - plasma volume decreases (hypovolemia):
    - total proteins decrease (proteinuria);
    - blood urea and uric acid increase;
    - blood sugar drops;
    - plasma inorganic substances increase (potassium, sodium, chlorine);
    - red blood cells and leukocytes increase;
    - pH decreases (acid) in high intensity efforts and increases (alkaline) in low intensity efforts;
  - in muscle contractions;

<sup>1</sup> Ion Andrei, Viorel Ceascai, *Efortul fizic pe înțelesul tuturor*, ”Carol I” National Defence University Publishing House, Bucharest, 2017, p. 7.

<sup>2</sup> Gabriela Raveica, Gheorghe Maxim, *Fiziologie generală – Note de curs*, University of Bacău Publishing House, Bacău, 2006, pp. 78-79.

- of energy factors - heart rate, systolic volume, heart rate, blood pressure, oxygen consumption and transport, respiratory rate, respiratory amplitude, respiratory flow, oxygen consumption, refresh rate - all increase;
- of digestive functions<sup>3</sup>:
  - the secretory and enzymatic processes of the digestive tract decrease both quantitatively and qualitatively:
    - the liver is better irrigated;
    - bile secretion increases;
  - of the excretory system:
    - diuresis decreases:
      - phosphaturia increases;
      - urinary pH becomes more acidic;
      - the amount of creatine and creatinine eliminated increases;
  - of the metabolic system - the secretion of hormones increases;
  - of the nervous system - somatic and vegetative;
  - of the endocrine system:
    - plasma concentrations of catecholamines increase.

The overloads during intense physical effort are sometimes so great that the body cannot return to normal the values of physiological functions and thus the effects can be devastating:

- the onset of a heart attack due to the maladaptation of the coronary arteries to increase myocardial oxygen demand – the oxygen debt is so high that it can no longer be paid by the body (there are countless episodes in which professional or amateur athletes have died on the field due to effort);

- excessive accumulation of H<sup>+</sup> (hydrogen ions) in the muscle cell due to insufficient oxygen leads to increased acidity, slowing of enzymatic activity and degradation of glucose. Thus, the muscle cell will be unable to contract, in severe cases it can even lead to coma;

- the decrease of the blood pH below 7 and its increase over 7,8 is incompatible with survival (7,30-7,42 – normal pH). After a high-intensity 5-minute run, the pH drops to 7,15;

- loss of fluids and minerals through sweating (approximately 10% of body weight) can lead to dehydration, collapse and stroke due to overheating of the body.

Being a stress throughout the body, physical effort produces many changes in the body, so recovery is necessary to be able to be supported again at an optimal level in order to create performance. A clear distinction must be made between recovery and rehabilitation. Thus, recovery is addressed to the healthy body as a result of physical effort, and rehabilitation is addressed to the sick body, as a result of trauma due to physical effort. It can be stated that when after a physical effort, the recovery has not been sufficient to support a new effort, it creates unwanted premises for the body to be stressed and to reach a certain trauma for which only recovery is no longer enough, rehabilitation is needed. Recovery supports biologically physical effort by overcompensation (homeostasis of the body returns to a higher level than before physical effort), rehabilitation does not, because not only is there no overcompensation, but it also passes into the sphere of sports pathology. There are two types of body recovery:

- natural – which is the main form of restoring the functional balance of the body after physical effort. It depends on the central nervous system and is conditioned by several factors:

- the sports branch in which the physical effort is performed;

- energy sources used depending on the effort (intensity, duration): ATP (adenosine triphosphoric acid), the body's energy currency is found in a limited amount in the muscles, so after a few seconds of effort they are completely exhausted. Resynthesis occurs with the help of CP

---

<sup>3</sup> *Ibidem*, pp. 85-86.

(creatine phosphate) - macroergic reservoir, anaerobic glucose degradation (Embden-Mayerhoff reactions) and degradation of glucose, fatty acids and aerobic amino acids;

- muscle fibers used – type I, slow-twitch, tonic, oxidative, red and type II, fast-twitch, phasic, glycolytic, white;

- psyche – positive, optimistic thinking reduces recovery time;

- age, sex and experience of the subject;

- the environment in which the physical effort is performed;

- the stage in which it is applied: in training, between trainings, in microcycle or in training macrocycle;

- guided – completes and accelerates the natural recovery according to the biological substrate required in the effort, the type of effort and the belonging of the means and actions used:

Table no. 1. Means of recovery of the body after performing a physical effort<sup>4</sup>

The biological substrate required in the effort	Neuropsychiatric	Neuromuscular	Endocrinometabolic	Cardiovascular and respiratory
Belonging to the field of recovery	Balneophysiokinetotherapy, nutrition, pharmacology, psychotherapy, rest			
Specific actions	Psychotherapy (demonstration, desensitization, relaxation, activation, conversations, relaxation techniques, concentration, self-suggestion, suggestion, psychosomatic training), acupuncture, acupressure, massage, medication			
	Active and passive rest, warm hydrotherapy	-	-	Active and passive rest, warm hydrotherapy
	Oxygenation	-	Oxygenation	
	-	Hydroelectrolytic rebalancing		
	Negative aerionization	-	Negative aerionization	-
	-	Sauna, diet	-	Sauna, diet
	-	-	Neuromuscular relaxation	-
Types of effort	Anaerobic effort			-
	-	Aerobic effort (without endocrine recovery)		-
	Mixed effort (without endocrine recovery)			

Recovery is considered as an optimization factor between physical effort and rest, in the sense that the effort must ensure the achievement of objectives and not lead to overload of functional systems. It can be addressed:

- during the workout – breaks between repetitions are short and generally with incomplete recovery of the energy substrate that supports the effort;

- between two workouts – whether they take place on the same day or on different days

- the duration is generally quite long so that the recovery is often complete (especially if the workouts take place on different days);

- in a training microcycle (with stages objectives), in which recovery is very important to reach the maximum sports form (overcompensation) at the end of it;

- in a training macrocycle (with objectives over a year), in which recovery is very important to ensure the decompensation necessary for the accumulations in the next training macrocycle.

<sup>4</sup> Ion Andrei, *Recovery of the fighter's body after effort*, Bulletin of "Carol I" National Defence University, no. 3, "Carol I" National Defence University Publishing House, Bucharest, 2020, p. 195.

Recovery must be done scientifically by observing the subject's behavior in terms of training disposition, fatigue during and after effort, quality and quantity of sleep. Also, in this process, it is important to control body weight, perform stress tests and restoration tests after effort, perform laboratory tests and measure respiratory parameters.

Physical effort is a stimulus that acts on the body, destabilizing it. A number of changes occur during physical effort, depending on intensity and duration of the effort. The body struggles to maintain physiological functions within the limits of normal values. This process is achieved by natural recovery and guide recovery (completes the natural one). It is different from the rehabilitation process, addressing to the healthy body and is a component part of sports training, leading to accumulations and increased sports performance.

### **BIBLIOGRAPHY**

1. ALEXE N., *Teoria și metodică antrenamentului sportiv modern*, România de Măine Foundation Publishing House, Bucharest, 2002.
2. ANDREI I., *Recovery of the fighter's body after effort*, Bulletin of "Carol I" National Defence University, no. 3, "Carol I" National Defence University Publishing House, Bucharest, 2020.
3. ANDREI I., CEASCAI V., *Efortul fizic pe înțelesul tuturor*, "Carol I" National Defence University Publishing House, Bucharest, 2017.
4. IONESCU A., ANTON B., *Dirijarea medicală a efortului*, National Center for Training and Professional Development for Coaches, National School for Coaches, Bucharest, 2004.
5. RAVEICA G., MAXIM Ghe., *Fiziologie generală – Note de curs*, University of Bacău Publishing House, Bacău, 2006.