SPORT & IMMUNITY

L'impatto dell'attività motoria sulle difese immunitarie.

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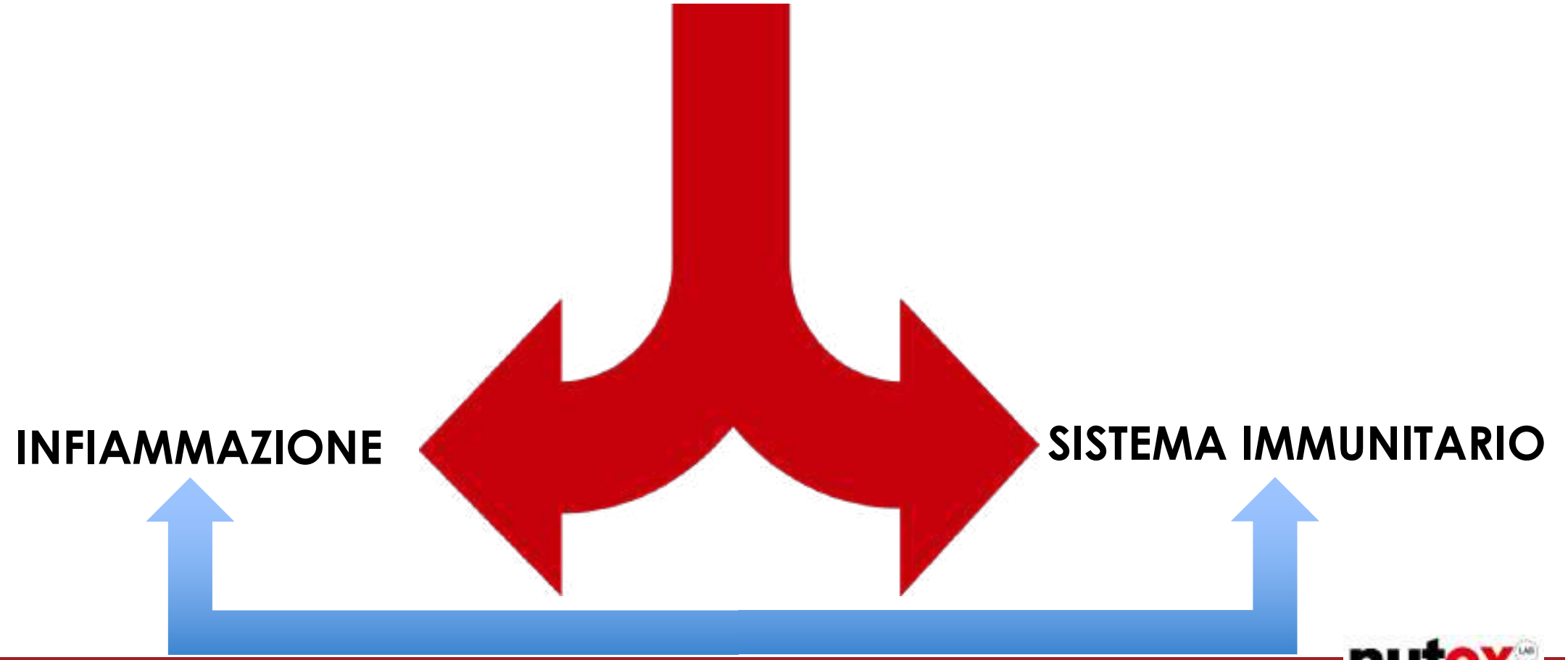
LOBACHEVSKY UNIVERSITY

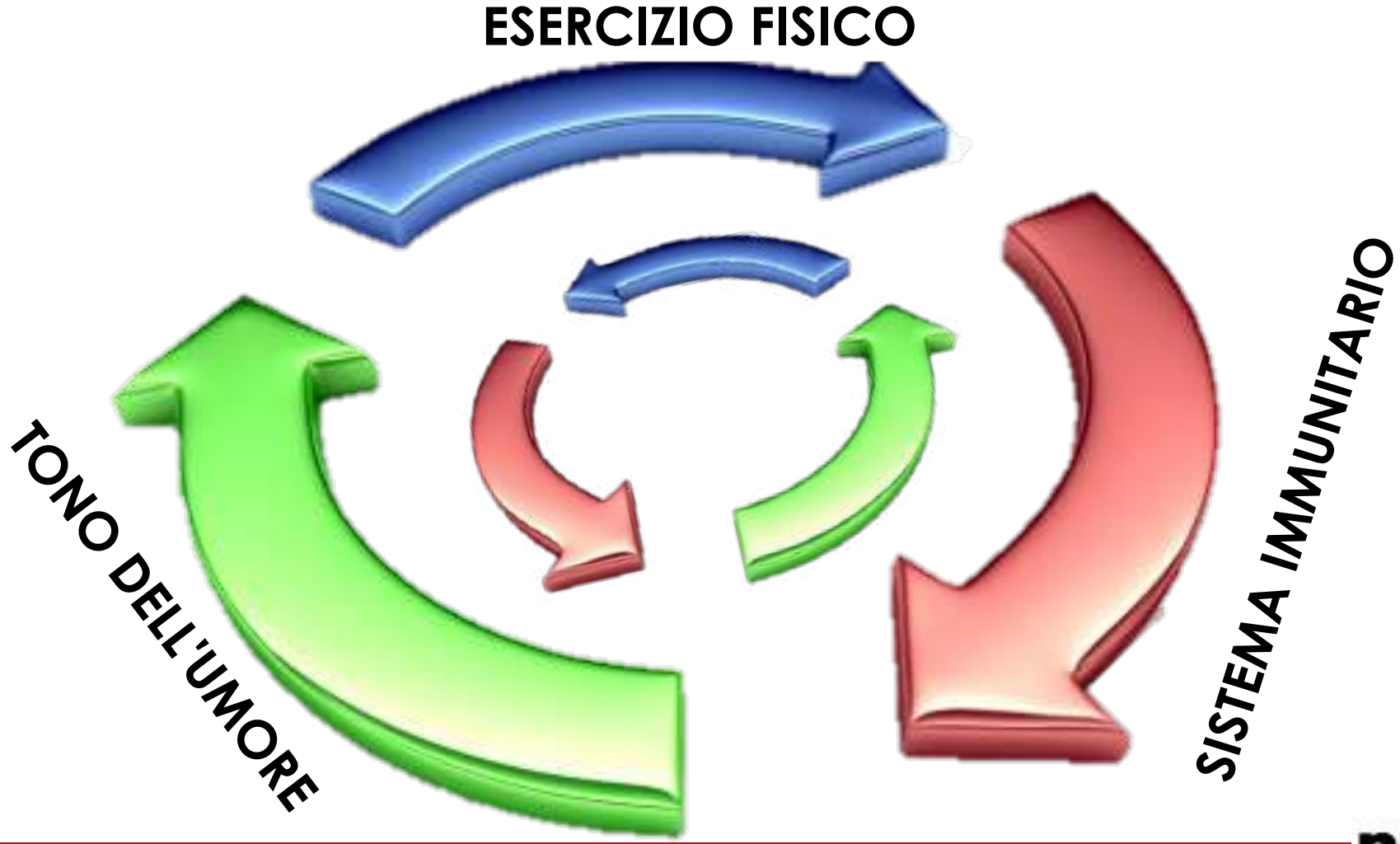
UCAM UNIVERSIDAD CATÓLICA DE MURCIA

UNA RELAZIONE COMPLESSA

ESERCIZIO FISICO



Una relazione complessa



DEFINIZIONI

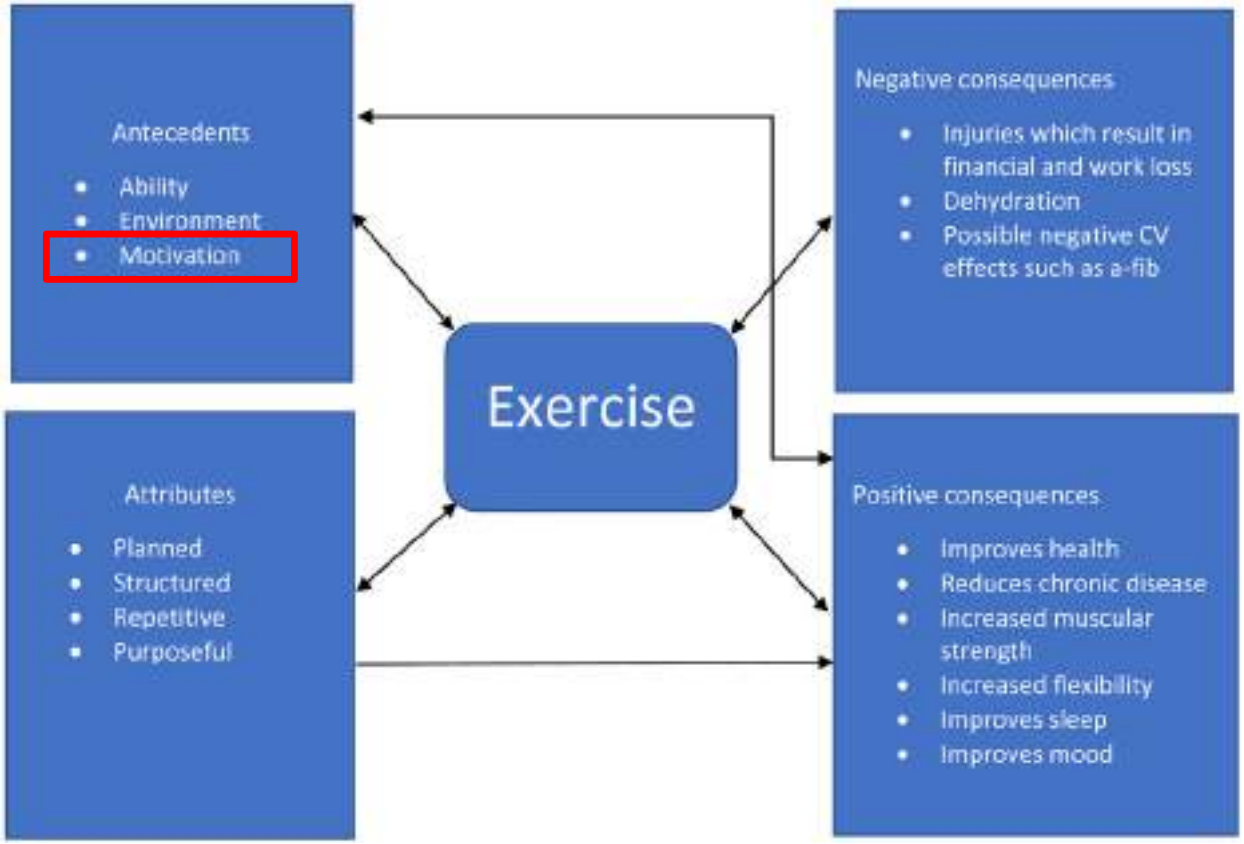
Attività fisica: qualunque sforzo esercitato dal sistema muscolo-scheletrico che si traduce in un consumo di energia superiore a quello in condizioni di riposo

Esercizio fisico: è una sottocategoria dell'attività fisica. Esso è pianificato, strutturato, ripetuto e finalizzato al miglioramento o mantenimento di una o più componenti della Fitness

Attività sportiva: comprende le prime due ma in situazioni competitive o non competitive ma strutturate e sottoposte a regole ben precise. È codificata in modo tale da essere riconosciuto e riconoscibile da tutti per regole e meccanismi, ai quali si fa riferimento per la sua pratica in contesti ufficiali o non ufficiali.

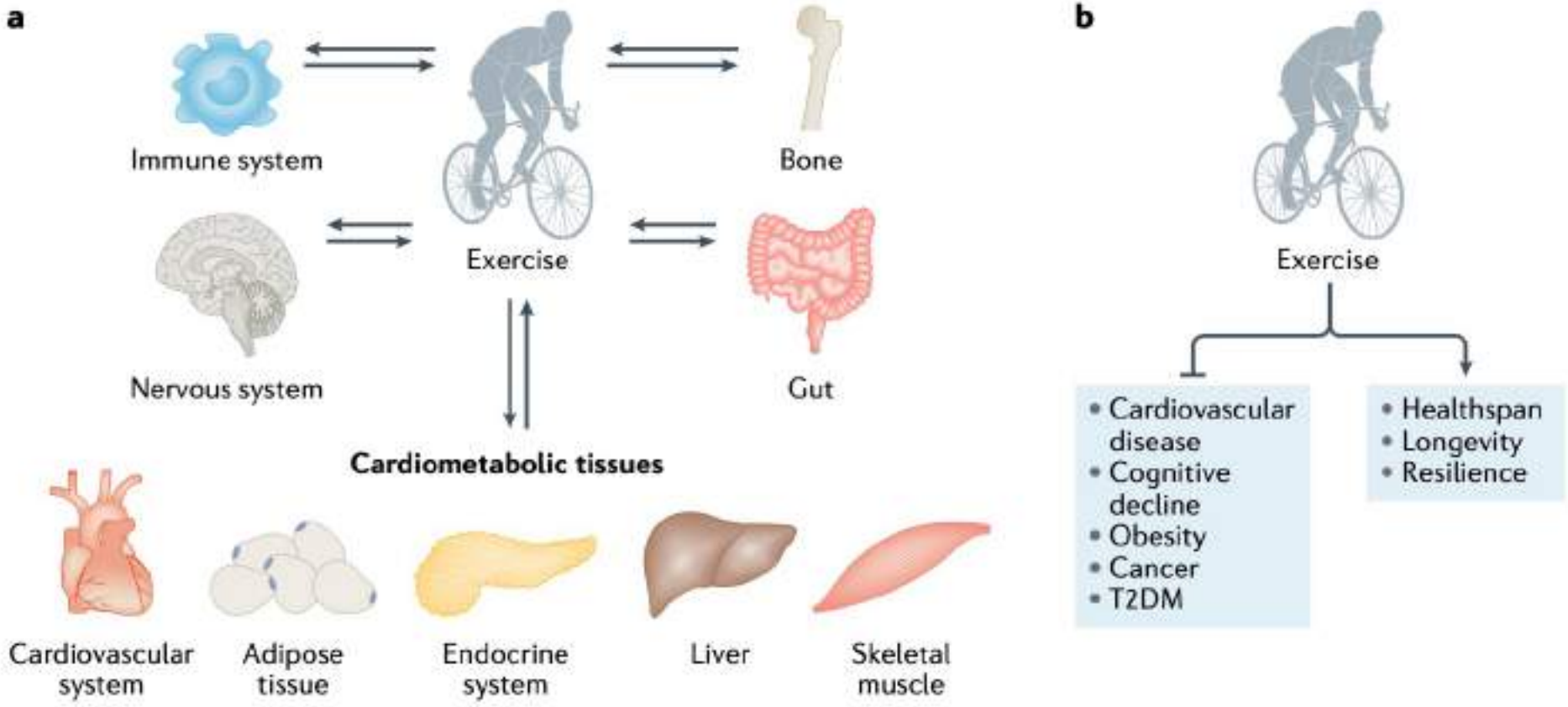
Dasso NA. Nurs Forum. 2019 Jan;54(1):45-52
WHO. Global recommendations on physical activity for health. 2010

Definizioni



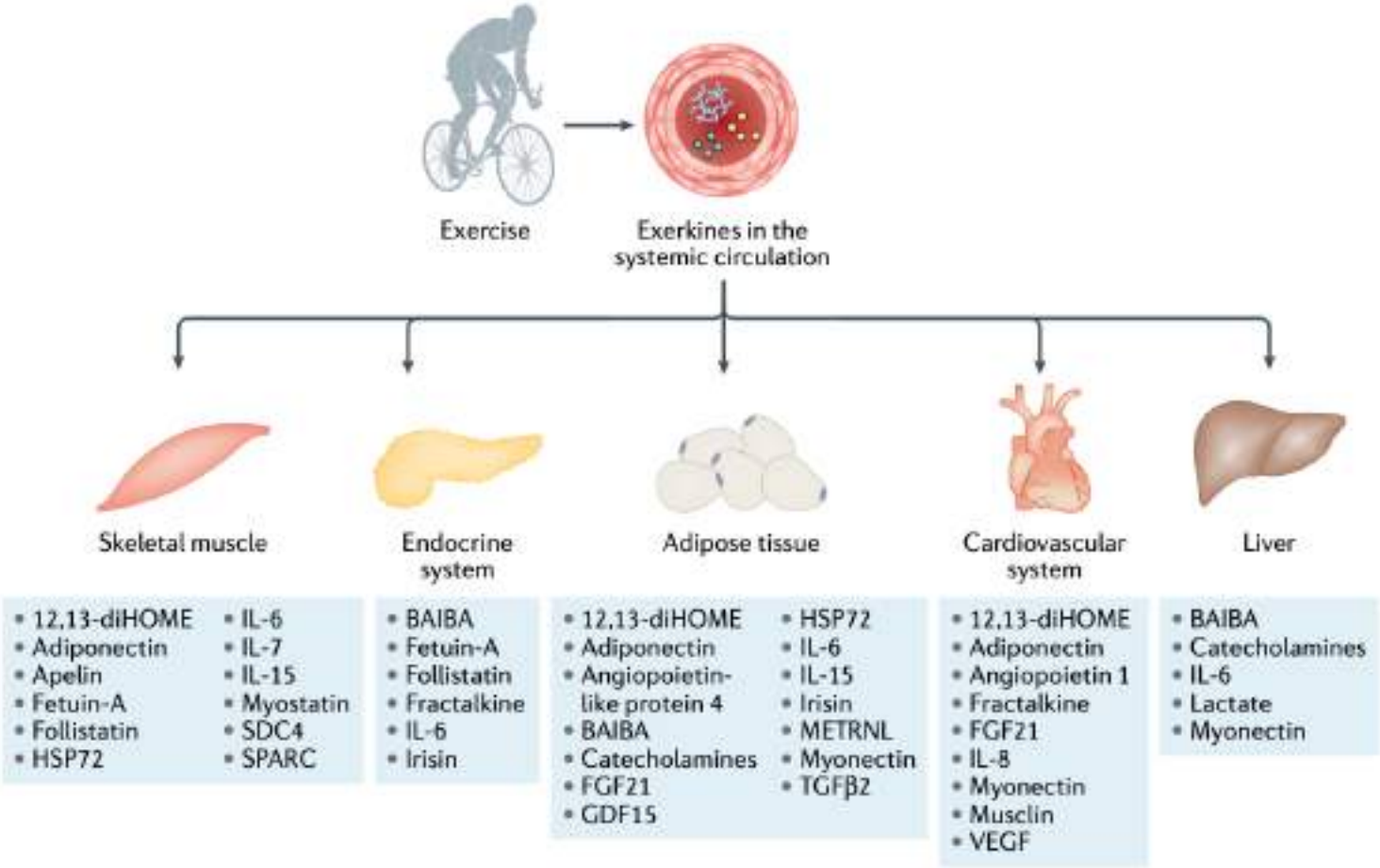
Dasso NA. Nurs Forum. 2019 Jan;54(1):45-52

EFFETTI ESERCIZIO



Chow et al. Nat Rev Endocrinol. 2022 May;18(5):273-289

Effetti esercizio



Chow et al. Nat Rev Endocrinol. 2022 May;18(5):273-289

Effetti esercizio

Resistance Training

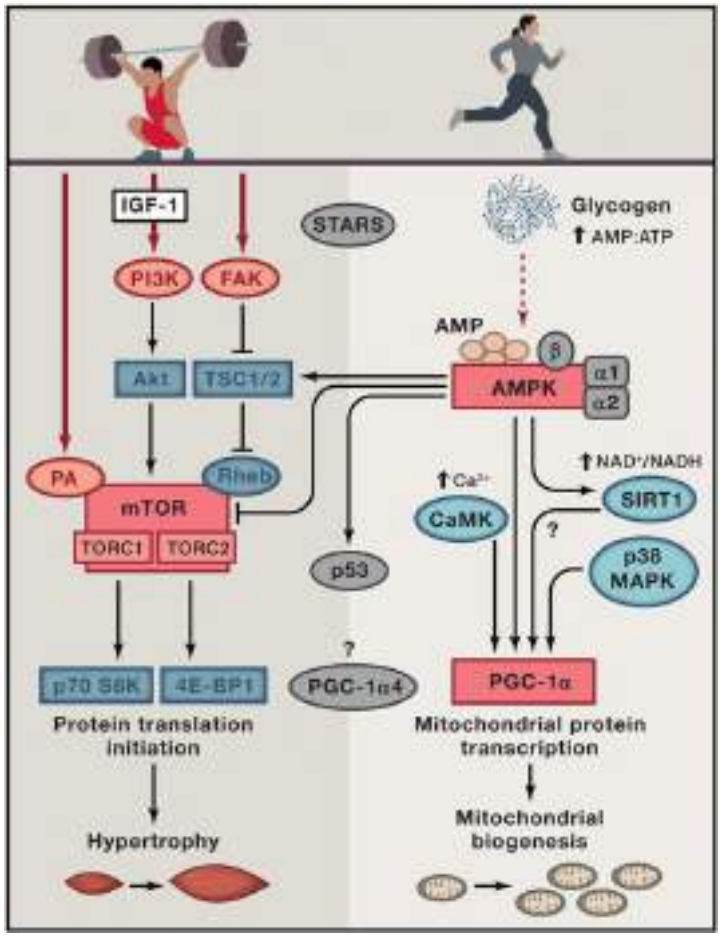
Lasha
Talakhadze
Height 197 cm
weight 168,65 kg

World Records
Snatch 220 Kg
C&J 264 Kg
Total 484

' unofficia

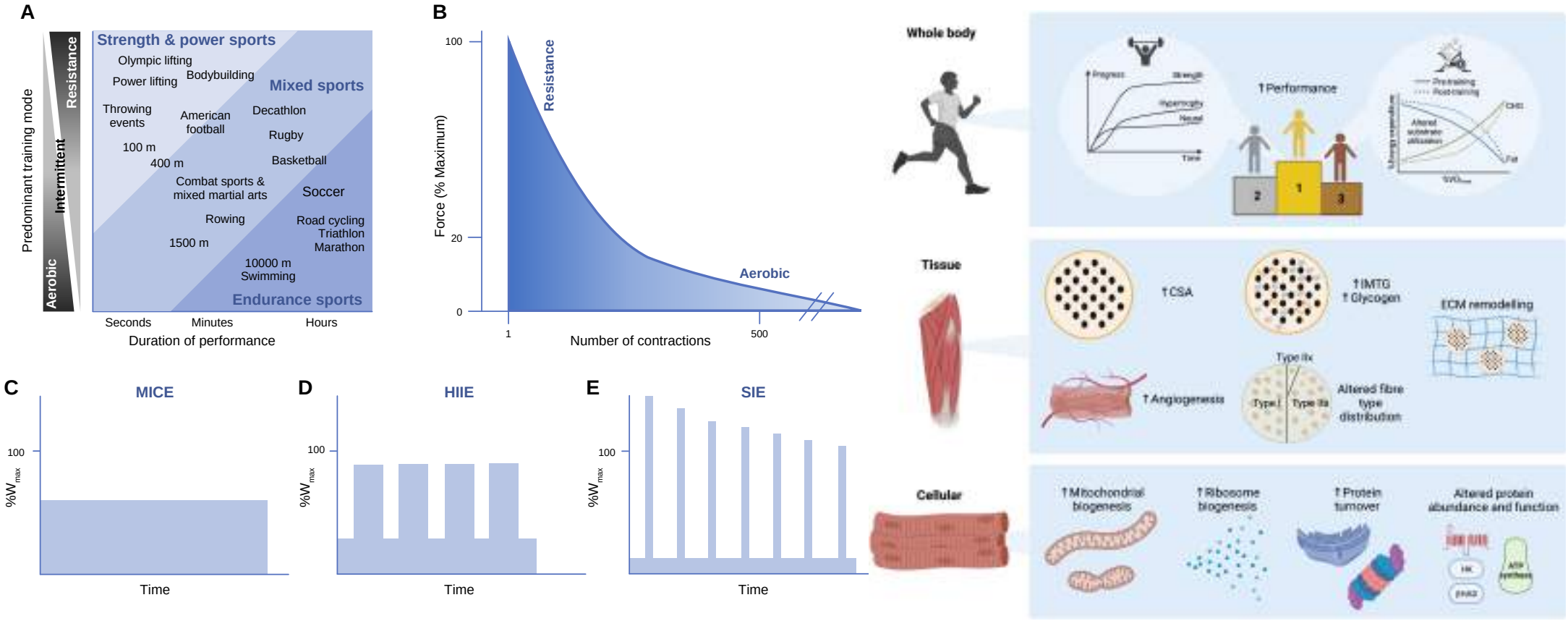
n01'35"

Effetti esercizio



Hawley et al. Cell. 2014;159(4):738-49

Effetti esercizio



Egan & Sharples Physiol Rev. 2023 Jul 1;103(3):2057-2170

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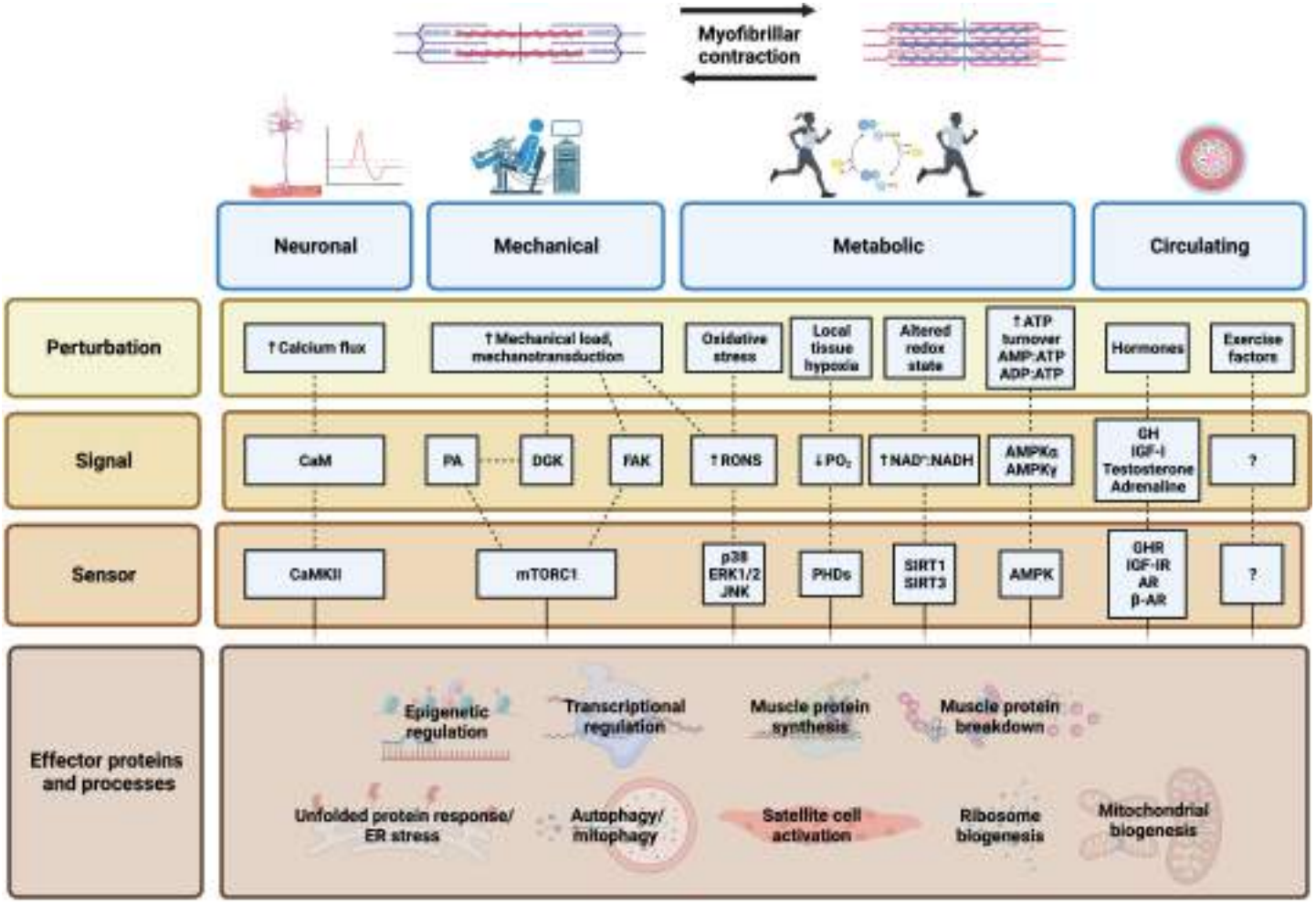
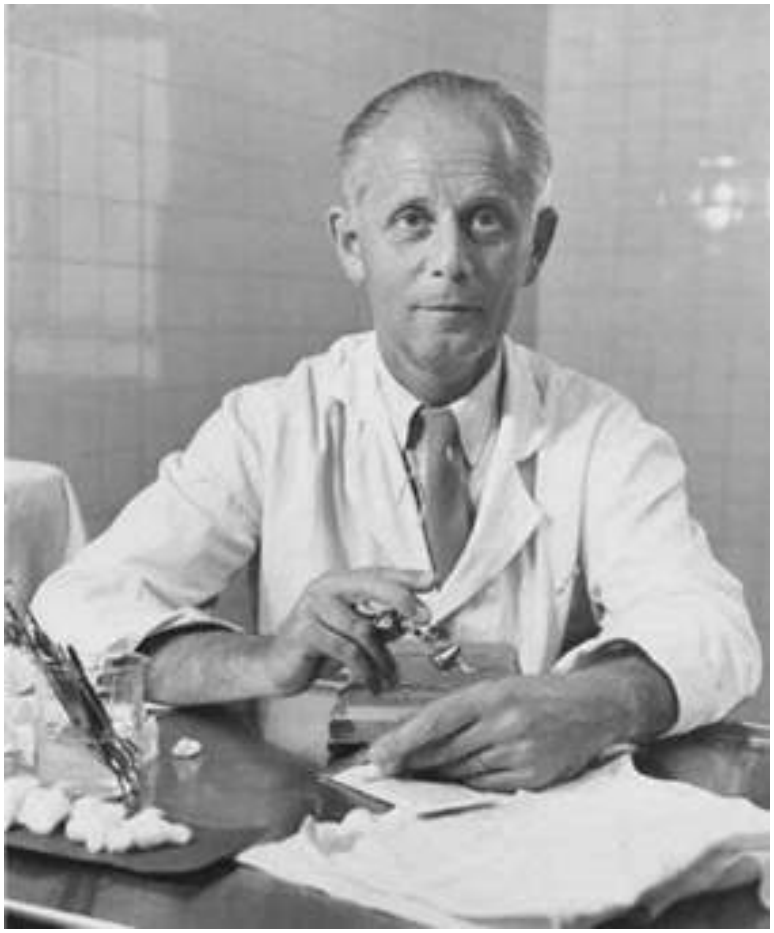
Effetti esercizio



Egan & Sharples Physiol Rev. 2023 Jul 1;103(3):2057-2170

CHE STRESS!



Hans Hugo Bruno Selye,
Vienna 26 Gennaio 1907
Montreal 16 Ottobre 1982

Esercizio fisico e stress

"Se un organismo è danneggiato da un agente nocivo aspecifico (es. freddo, agenti chimici, esercizio fisico eccessivo), appare una sindrome (un insieme di sintomi) tipica. Questa sindrome è indipendente dal tipo di danno e rappresenta così una risposta in se, generica."

32 NATURE JULY 4, 1936

(1) If tissue cells are brought from their liquid culture medium, after several washings, into a medium free from electrolytes, then within a few seconds the following phenomena, consisting of three main effects, take place: (a) an assumption of globular form by the cells; (b) the appearance of a vivid Brownian movement of the granules and vacuoles in the cytoplasm, as a sign of a maximal reduction of the viscosity in consequence of a discharge with simultaneous increasing absorption of water; (c) a process of slow coagulation in the cytoplasm, which manifests itself in the appearance of new particles in vivid Brownian movement, which continuously increase in size. The gradual multiplication and increase of the particles in best cases with their fibrillization, but the vivid Brownian movement is also well seen with chaotic fibrillization.

(2) In some of the cells which have become globular, there occurs a bursting of the cell, with extrusion of liquid containing numerous particles in Brownian movement (analogous to hypotonic haemolysis with extrusion of haemoglobin). Sometimes the torn parts adhere together again after dislocation of the intense pressure.

(3) The presence of non-electrolytes in the medium (c/20—c/12 dextrose; c/10—c/1 urea) does not hinder the appearance of the phenomena described, but distinctly reduces the activity of the Brownian movement in the cytoplasm.

(4) The phenomena described are reversible. The normal can be produced after several minutes by means of Ringer solution, c/10 sodium chloride, or c/10 sodium bromide. The cells regain their former shape extremely quickly, with immediate stoppage of the Brownian movement in the cytoplasm. The cells then show normal vital staining.

(5) The phenomena can only be produced with living and not with dead cells. Failure is a sure sign of cell death.

The results of these experiments prove the justness of the above assumptions. Furthermore, they show that hypotonic haemolysis is only a special case of a general phenomenon in tissue cells. They reveal, furthermore, a fundamental property of tissue cells in which the salt ions of the tissue liquid participate decisively in the maintenance of the particle charge of the protoplasm.

H. GRIESBACH.

Anatomical Institute,
Turin.

A Syndrome produced by Diverse Noxious Agents

EXPERIMENTS on rats show that if the organism is severely damaged by acute non-specific noxious agents such as exposure to cold, surgical injury, production of spinal shock (transection of the cord), excessive muscular exercise, or administration with sublethal doses of diverse drugs (adrenaline, atropine, nicotine, formaldehyde, etc.), a typical syndrome appears, the symptoms of which are independent of the nature of the damaging agent or the pharmacological type of the drug employed, and represent rather a response to damage as such.

The syndrome develops in three stages: during the first stage, 6–48 hours after the initial injury, one observes rapid decrease in size of the thymus, spleen, lymph glands and liver; disappearance of fat tissue; ulcera formation, especially in the thymus and loss of extracellular connective tissue; accumulation of pleural and peritoneal transudate; loss of muscular tone; fall of body temperature; formation of acute erosions in the digestive tract, particularly in the stomach, small intestine and appendix; loss of cortical lipoids and eosinophile substance from the adrenals; and sometimes hyperæmia of the skin, exophthalmos, increased lachrymation and salivation. In particularly severe cases, focal necrosis of the liver and dense clotting of the crystalline lens are observed.

In the second stage, beginning 48 hours after the injury, the adrenals are greatly enlarged but regain their lipoid granules, while the medullary chromaffin cells show recalcification; the oedema begins to disappear; eosinophil leucocytes appear in the pituitary; the thyroid shows a tendency towards hyperplasia (more marked in the guinea pig); general body growth ceases and the gonads become atrophic; in lactating animals, milk secretion stops. It would seem that the anterior pituitary causes production of growth and gonadotropic hormones and prolactin in favour of increased elaboration of thyrotropic and adrenotropic principles, which may be regarded as more urgently needed in such emergencies.

If the treatment be continued with relatively small doses of the drug or relatively slight injuries, the animals will build up such resistance that in the later part of the second stage the appearance and function of their organs returns practically to normal; but with further continued treatment, after a period of one to three months (depending on the severity of the damaging agent), the animals lose their resistance and succumb with symptoms similar to those seen in the first stage, the phase of exhaustion being regarded as the third stage of the syndrome.

We consider the first stage to be the expression of a general alarm of the organism when suddenly confronted with a critical situation, and therefore term it the 'general alarm reaction'. Since the syndrome as a whole seems to represent a generalized effort of the organism to adapt itself to new conditions, it might be termed the 'general adaptation syndrome'. It might be compared to other general defence reactions such as inflammation or the formation of mammalian bodies. The symptoms of the alarm reaction are very similar to those of histamine toxicosis or of surgical or anaphylactic shock; it is therefore not unlikely that an essential part in the initiation of the syndrome is the liberation of large quantities of histamine or some similar substance, which may be released from the tissues either mechanically in surgical injury, or by other means in other cases. It seems to us that more or less pronounced forms of this three-stage reaction represent the usual response of the organism to stimuli such as temperature changes, drugs, muscular exercise, etc., to which habituation or increased use occurs.

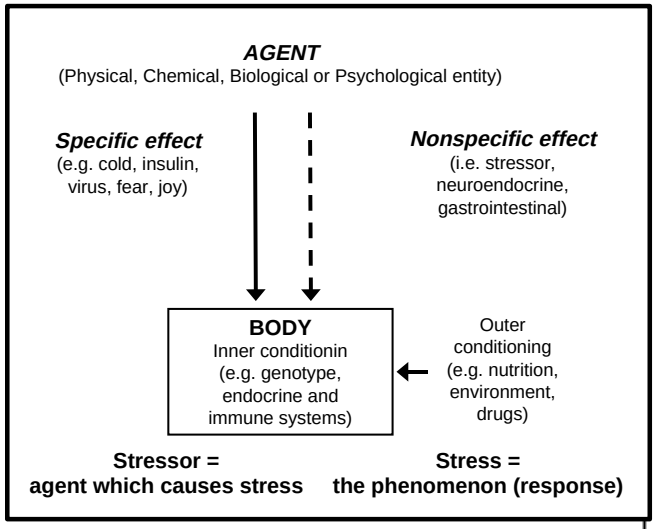
HANS SELYE.

Department of Biochemistry,
McGill University,
Montreal, Canada.
May 18.

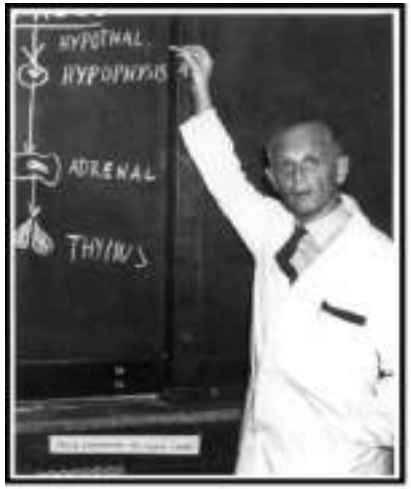
Estimation of Fatty Acids in Organic Mixtures

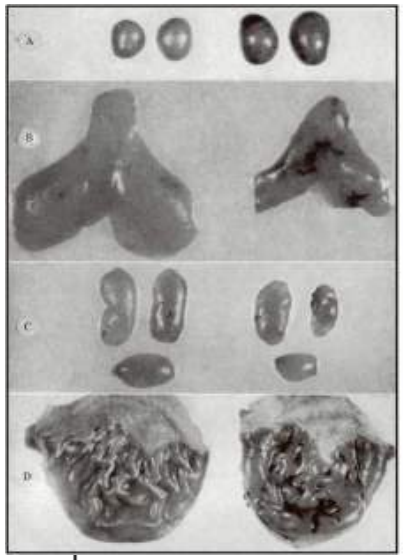
For the determination of the volatile fatty acids in cheese, it is usual to subject the acidified cheese mash to a normal steam distillation at constant volume. In this laboratory, it is the custom to collect a volume of distillate equal to three times the volume of the liquid in the distillation flask, and

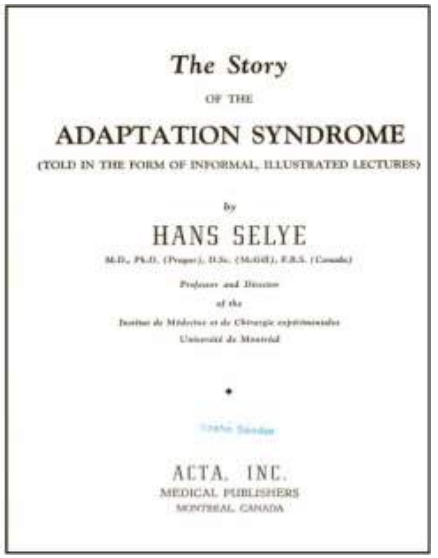
Esercizio fisico e stress

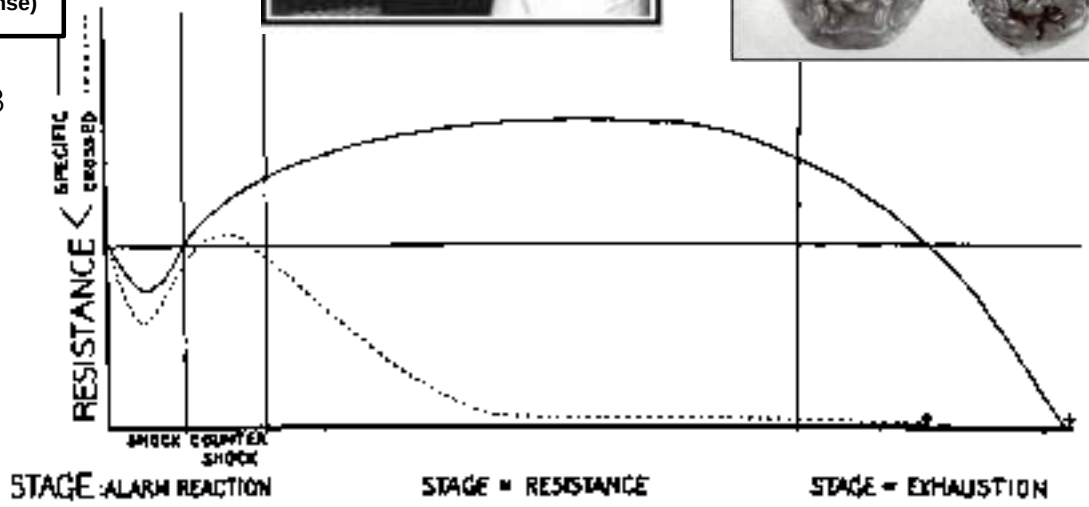


Szabo et al. Stress. 2012 Sep;15(5):472-8









Selye H. J Clin Endocrinol Metab. 1946 Feb;6:117-230

Box 4.1 Types of Stress

Positive stress

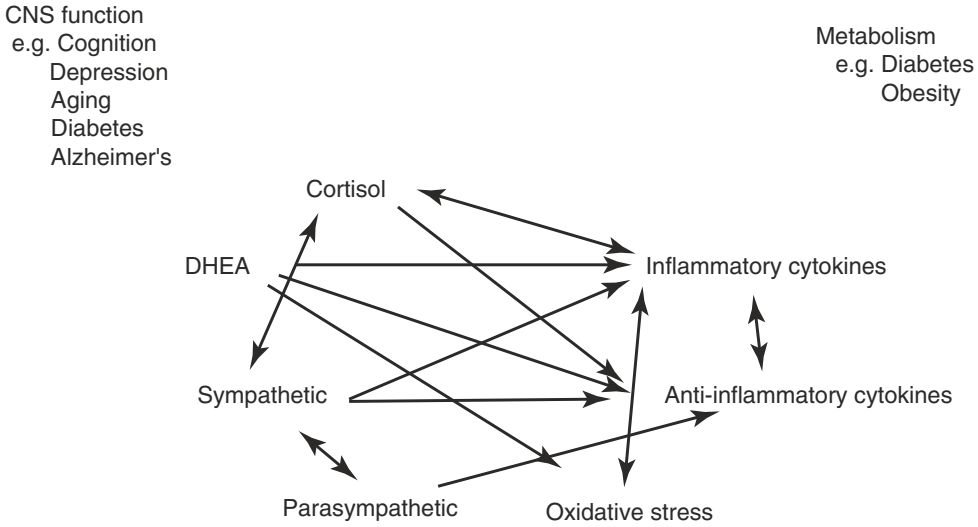
- A personal challenge that has a satisfying outcome
- Result: Sense of mastery and control
- HEALTHY BRAIN ARCHITECTURE
- Good self-esteem, judgment, and impulse control

Tolerable stress

- Adverse life events buffered by supportive relationships
- Result: Coping and recovery
- HEALTHY BRAIN ARCHITECTURE
- Good self-esteem, judgment, and impulse control

Toxic stress

- Unbuffered adverse events of greater duration and magnitude
- Result: Poor coping and compromised recovery
- Result: Increased life-long risk for physical and mental disorders
- COMPROMISED BRAIN ARCHITECTURE
- Dysregulated physiological systems



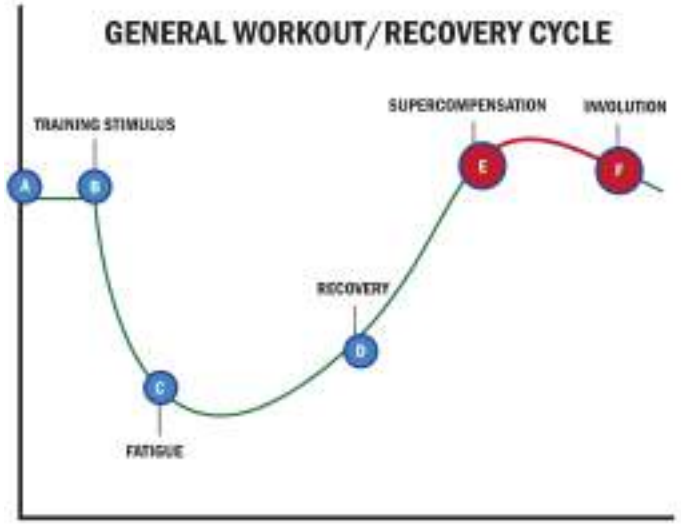
Seiler et al. "The impact of everyday stressors on the immune system and health." *Stress challenges and immunity in space: From mechanisms to monitoring and preventive strategies* (2020): 71-92.

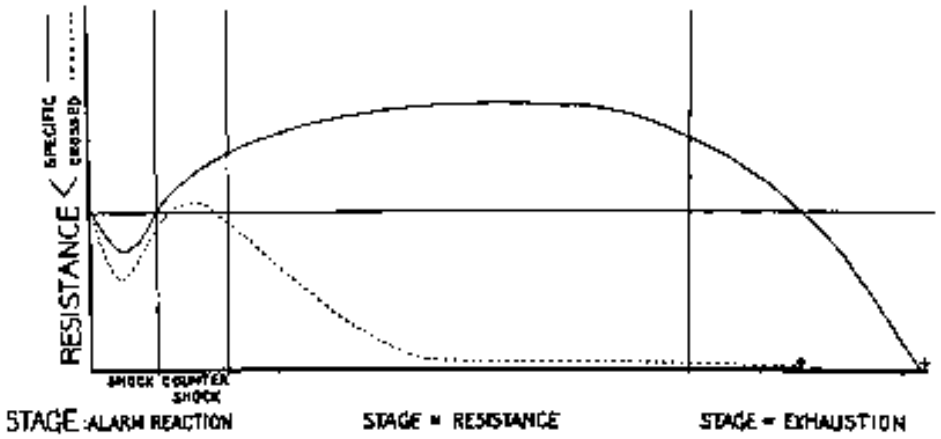
Esercizio fisico e stress

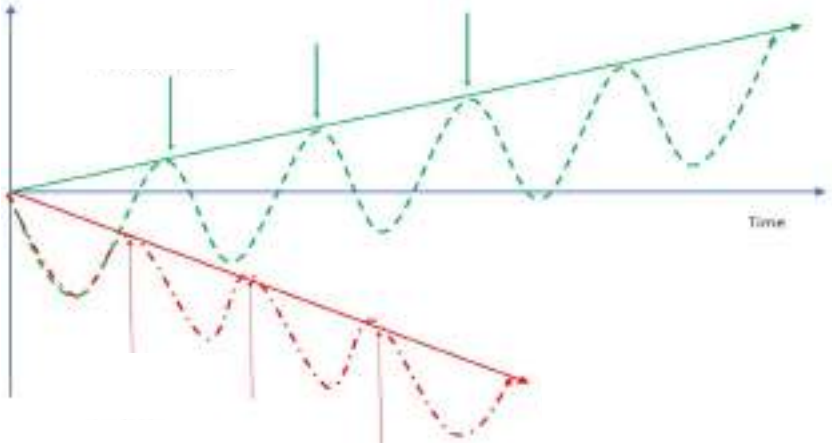
L'ESERCIZIO FISICO È UNA FORMA DI **STRESS** IN CUI L'ADATTAMENTO DEL NOSTRO ORGANISMO SEGUE, IN LINEA DI MASSIMA, LA SINDROME GENERALE DI ADATTAMENTO DESCRITTA DA SELYE

E SI TORNA A LUI…

Esercizio fisico e stress







Esercizio fisico e stress

MODULAZIONE SISTEMA IMMUNITARIO MIGLIORAMENTO UMORE

STRESS ECCESSIVO SUL SISTEMA IMMUNITARIO PEGGIORAMENTO UMORE

Esercizio fisico e stress

SISTEMA IMMUNITARIO

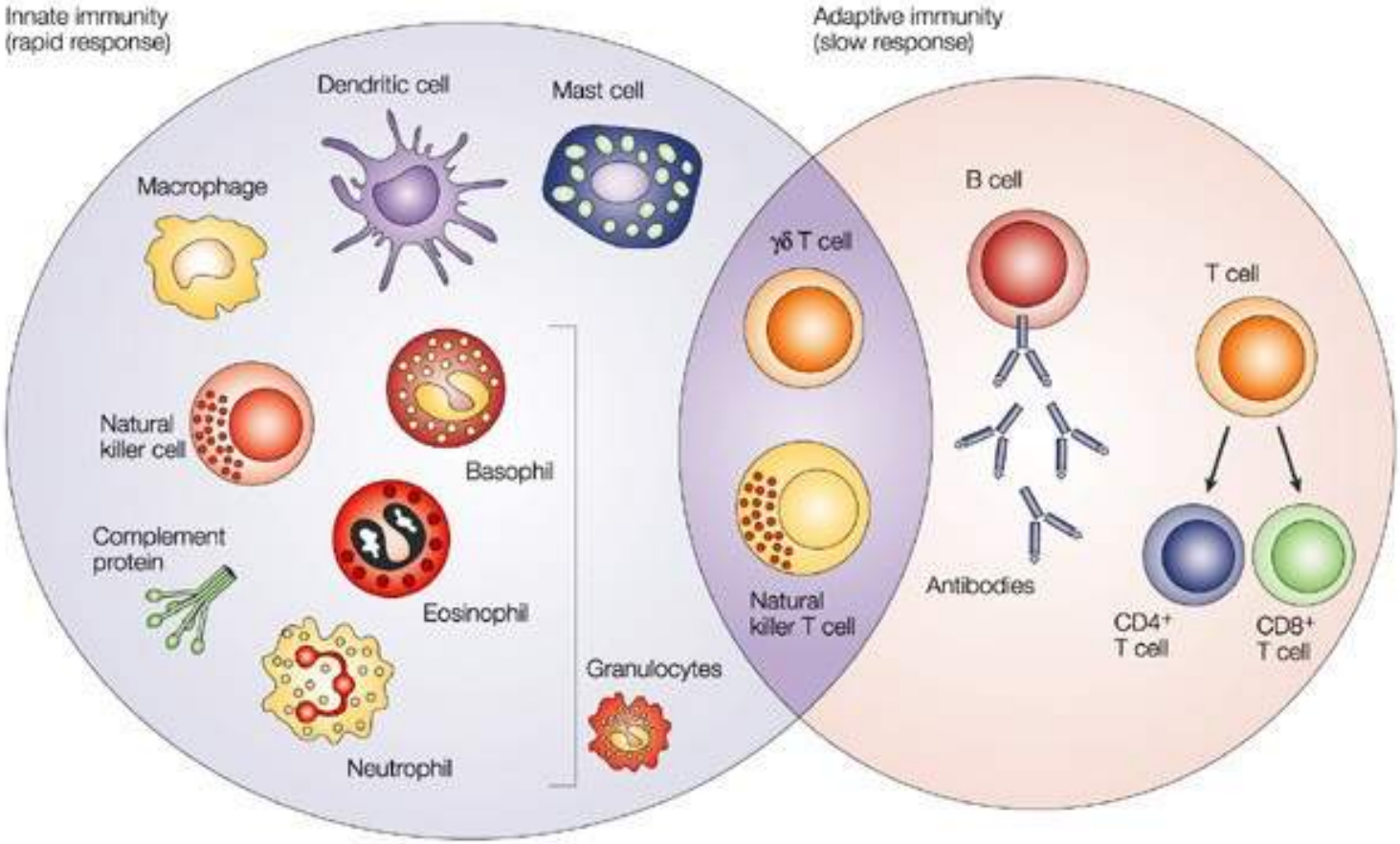
Immunità Innata

- **Prima linea di difesa:** è sempre presente e pronta a rispondere alle minacce.
- **Meccanismi aspecifici:** non distingue tra diversi patogeni.
- **Barriere fisiche e chimiche:** pelle, mucose, succhi gastrici, etc.
- **Cellule fagocitiche:** neutrofili, macrofagi, etc. inglobano e distruggono i patogeni.
- **Risposta infiammatoria:** arrossamento, gonfiore, calore e dolore.
- **Citochine:** proteine che orchestrano la risposta immunitaria.

Immunità Acquisita

- **Si sviluppa dopo l'esposizione a un patogeno.**
- **Specificità:** è rivolta contro un patogeno specifico.
- **Memoria immunologica:** ricorda i patogeni incontrati in passato.
- **Linfociti:** cellule B e T che producono anticorpi e mediano la risposta immunitaria.
- **Anticorpi:** proteine che si legano ai patogeni e li neutralizzano.
- **Vaccini:** stimolano l'immunità acquisita in modo sicuro e controllato.

Sistema immunitario



Nature Reviews | Cancer

Dranoff G. Nat Rev Cancer. 2004 Jan;4(1):11-22.

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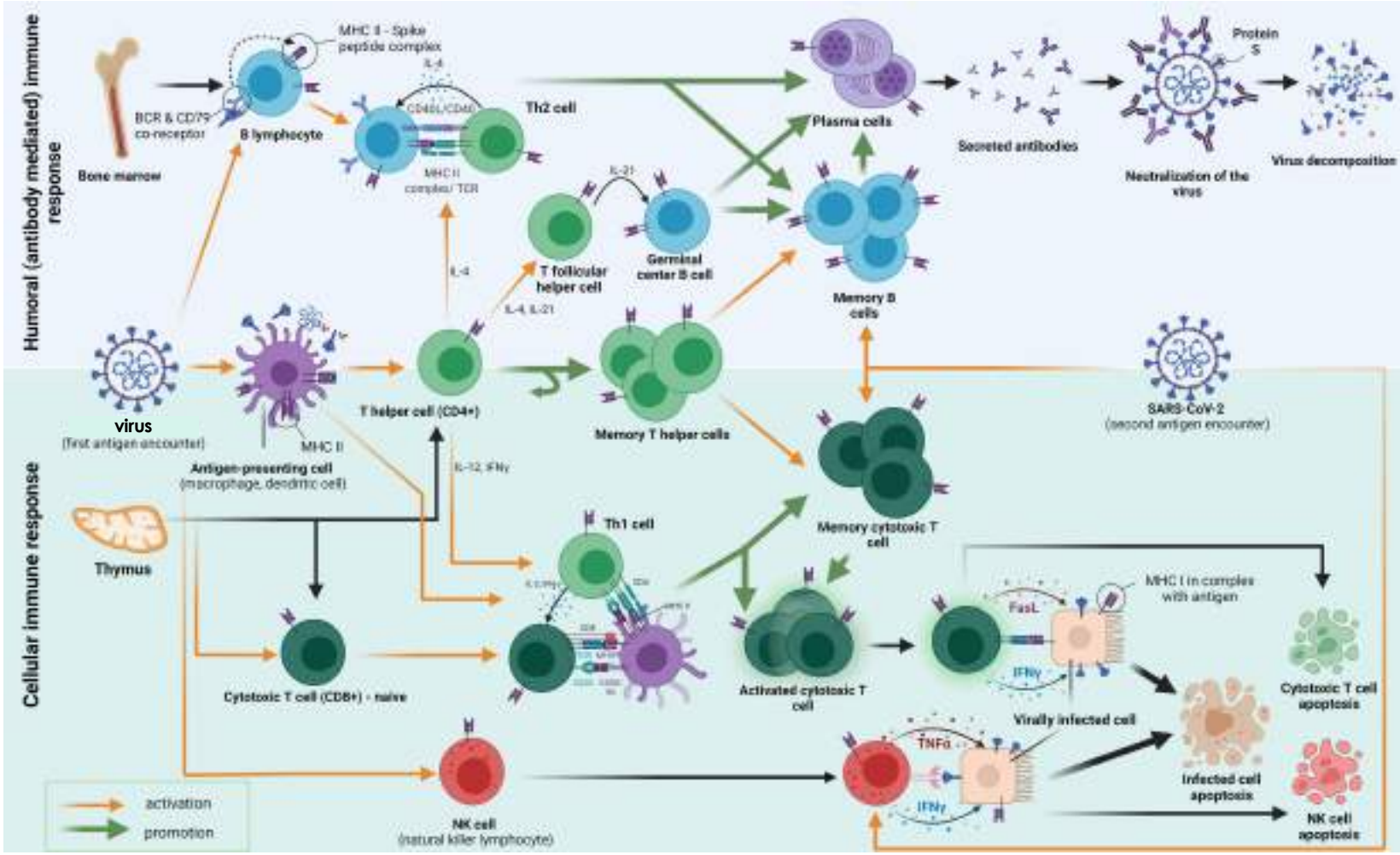
Sistema immunitario



Primorac et al. Front Immunol. 2022 May 4;13:848582

Esercizio, stress, cervello e immunità

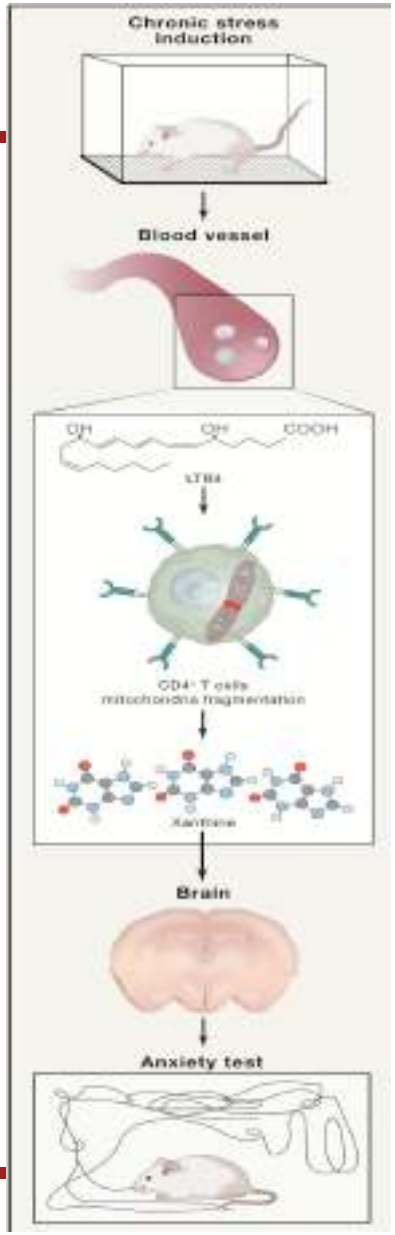
Leading Edge
Previews

Cell

The Immune-Mind Connection

Saiyu Hang[1] **and Jun R. Huh**[1,2,*]
[1]Department of Immunology, Blavatnik Institute, Harvard Medical School, Boston, MA 02115, USA
[2]Evergrande Center for Immunological Diseases, Harvard Medical School and Brigham and Women's Hospital, Boston, MA 02115, USA
*Correspondence: jun_huh@hms.harvard.edu
https://doi.org/10.1016/j.cell.2019.10.012

How does stress promote anxiety? In this issue of *Cell*, Fan et al. report that immune cells have a direct role in this process. They show that chronic stress promotes mitochondrial fission in $CD4^+$ T cells, causing increased synthesis of xanthine, which acts on the brain and induces anxiety-like behaviors.



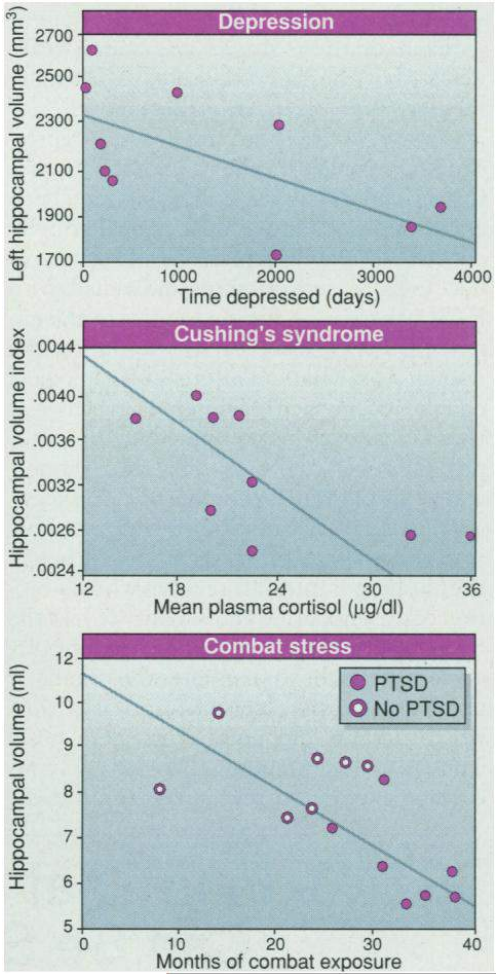
Esercizio, stress, cervello e immunità

SCIENCE • VOL. 273 • 9 AUGUST 1996

Why Stress Is Bad for Your Brain

Robert M. Sapolsky

Do stress-induced glucocorticoids cause brain atrophy? Relation between hippocampal volume and (**top**) duration of depression among individuals with a history of major depression [from (*4*)], (**middle**) extent of cortisol hypersecretion among Cushingoid patients [adapted from (*5*)], and (**bottom**) duration of combat exposure among veterans with or without a history of post-traumatic stress disorder [from (*7*)]. Cortisol is another term for the human GC hydrocortisone.



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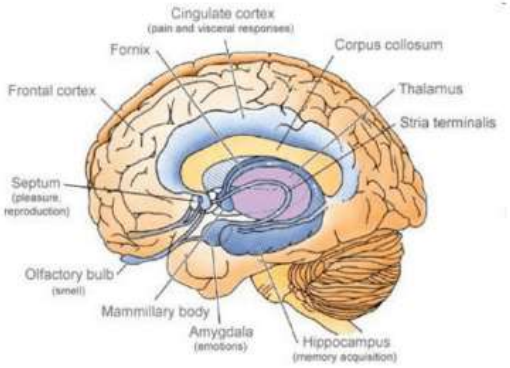
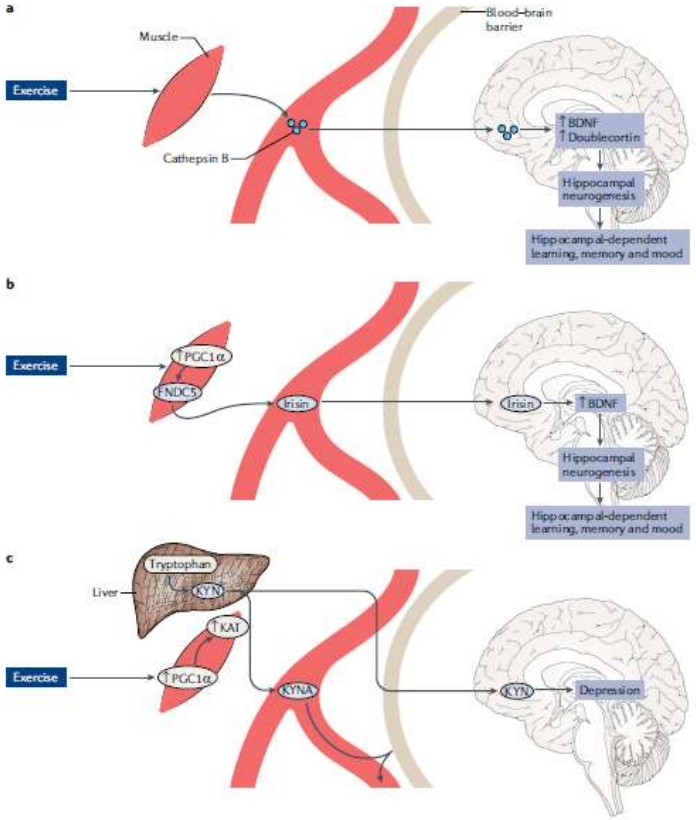
Esercizio, stress, cervello e immunità

The hippocampus is the most important (i.e., most obvious and interesting looking) structure in the limbic system, a collection of brain structures located on the inner border of the neocortex that process olfactory information, regulate emotion and encode memory.





Pedersen Nat Rev Endocrinol. 2019 Jul;15(7):383-392