

Sport come modulatore epigenetico del microbiota intestinale



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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

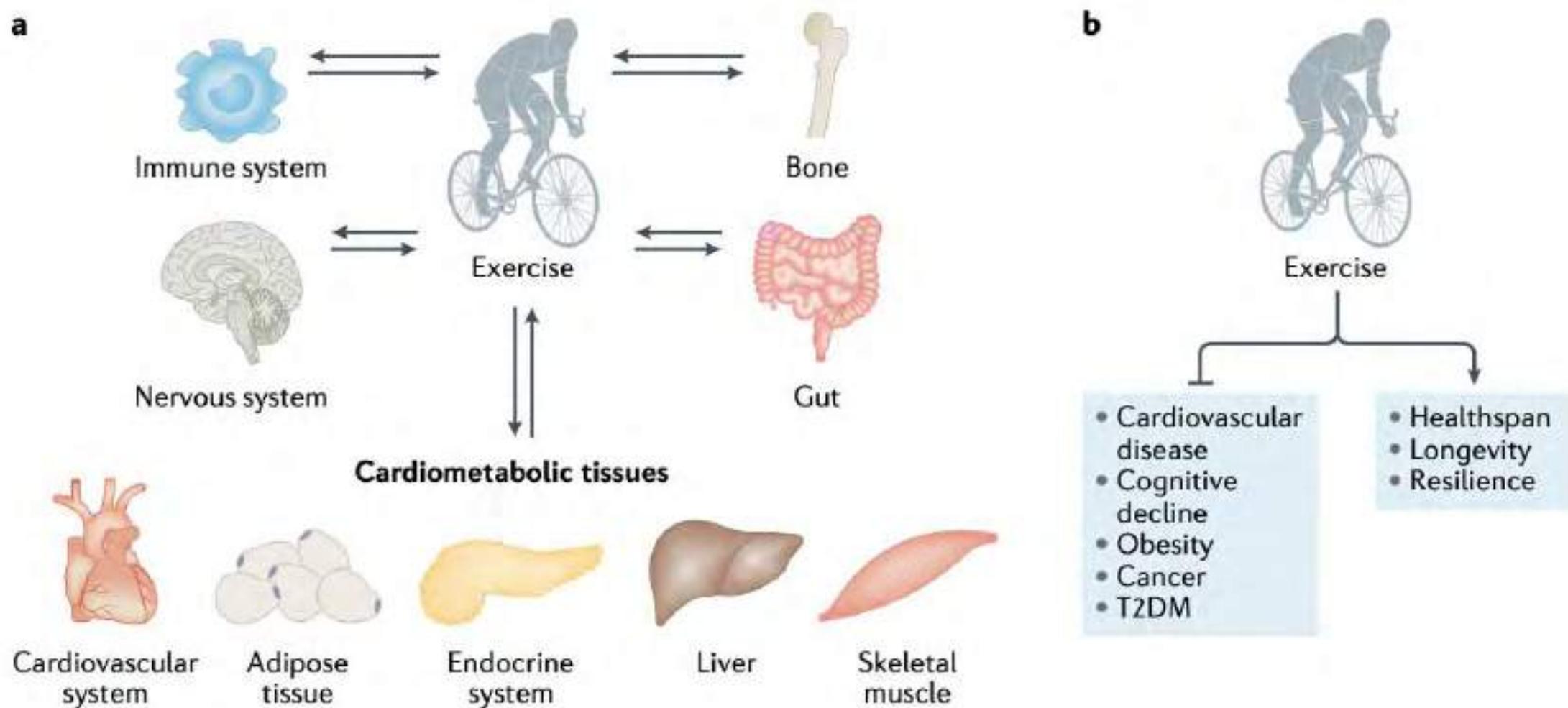
Esercizio fisico: è una sottocategoria dell'attività fisica. Esso è pianificato, strutturato, ripetuto e finalizzato al miglioramento o mantenimento di una o più componenti della Fitness

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.

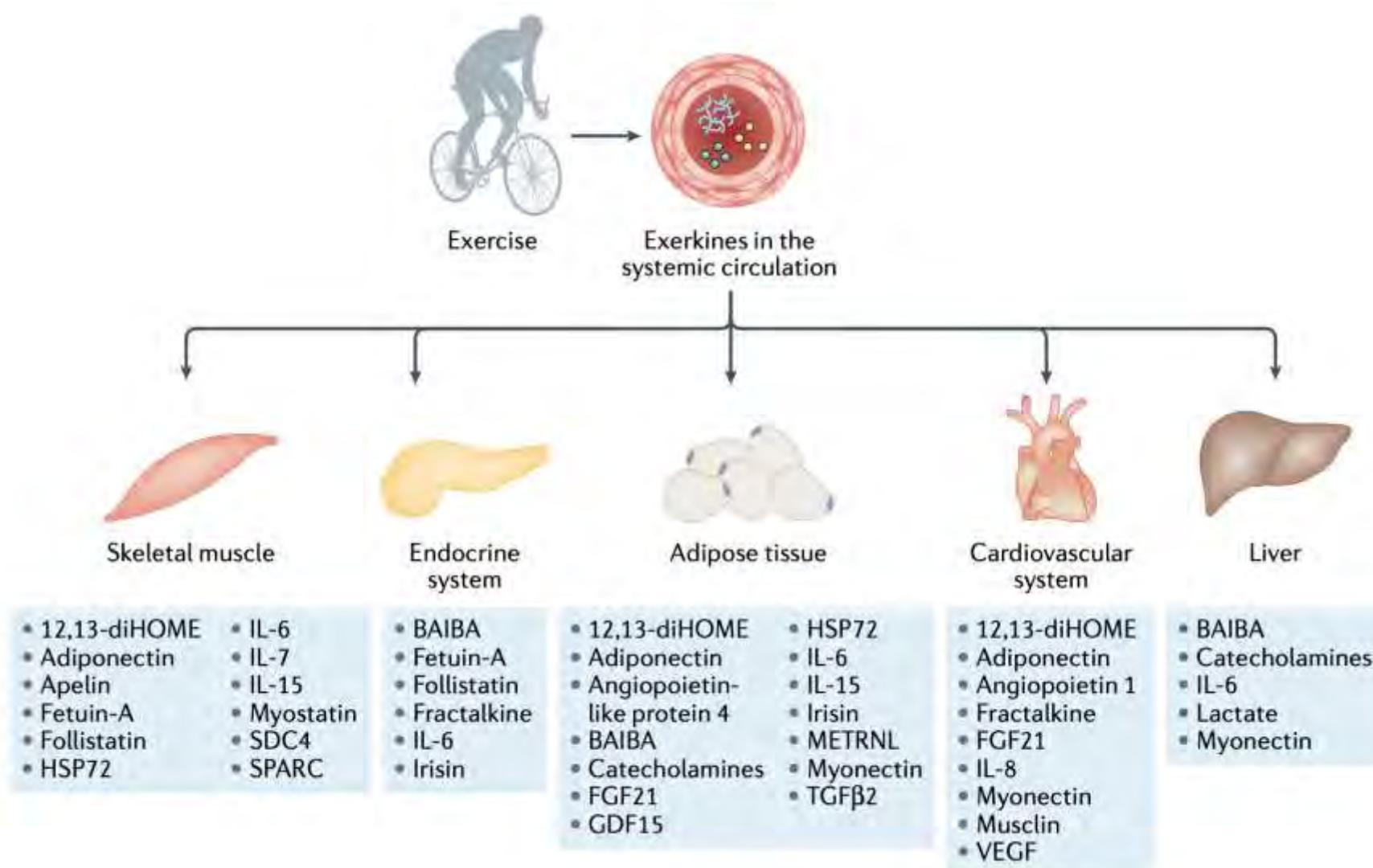
Dasso NA. Nurs Forum. 2019 Jan;54(1):45-52

WHO. Global recommendations on physical activity for health. 2010

EFFETTI ESERCIZIO



Effetti esercizio



Effetti esercizio



Effetti esercizio: quale esercizio?



Resistance Training

Lasha
Talakhadze
Height 197 cm
weight 168,65 kg

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

Endurance Training



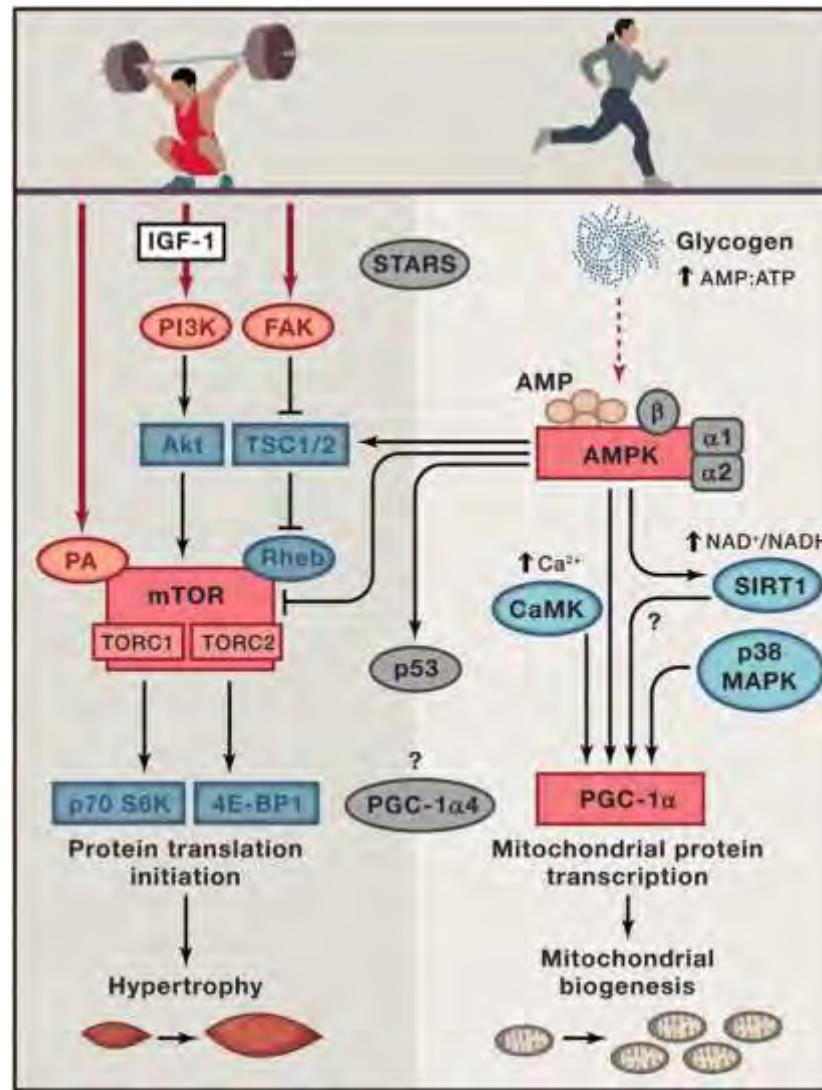
Eliud Kipchoge
Height 167 cm
weight 52 kg

World Records
Marathon 1h59'40" unofficial
30 km 1h27'13"

Kelvin Kiptum
Height 180 cm
weight 65 kg

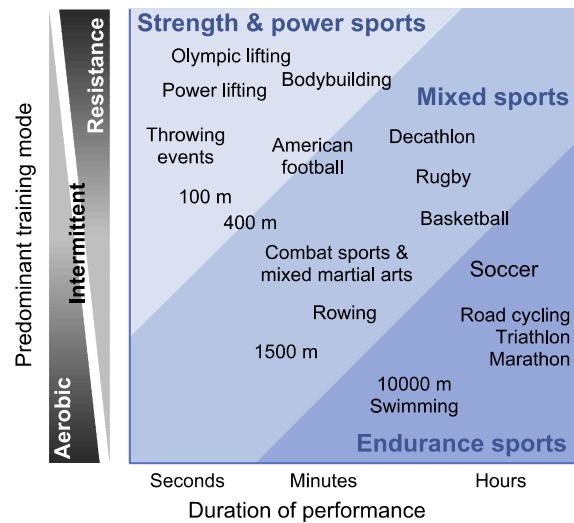
World record
Marathon IAAF 2h01'39"

Effetti esercizio: quale esercizio?

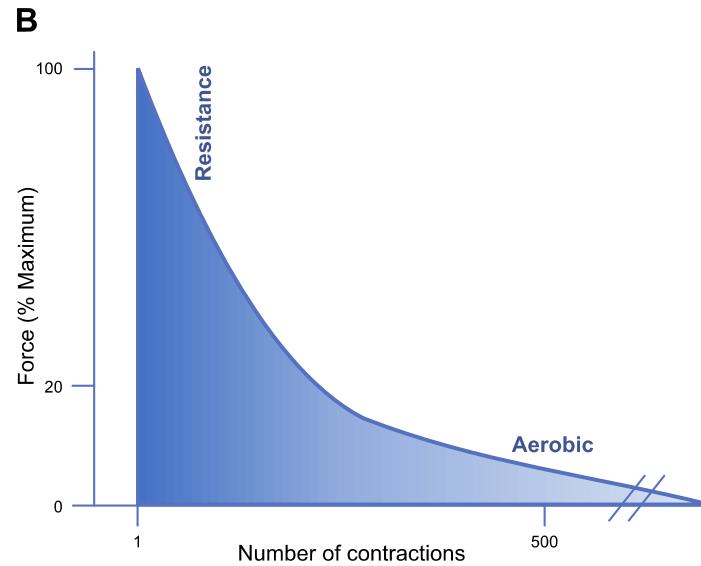


Effetti esercizio: quale esercizio?

A



B



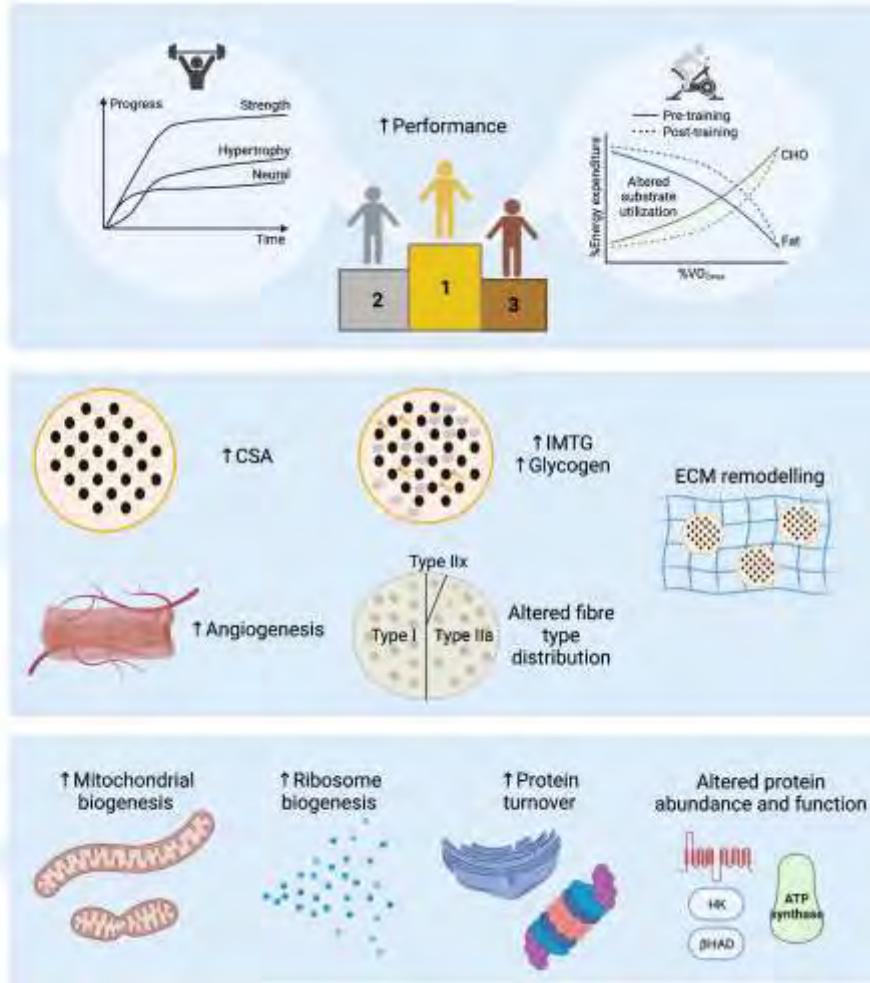
Whole body



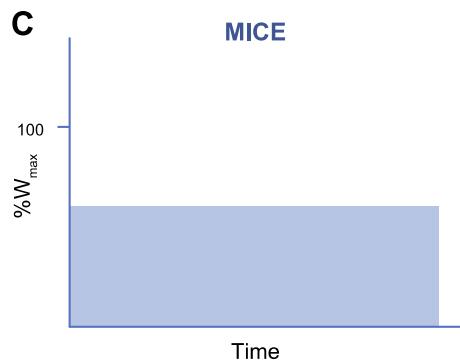
Tissue



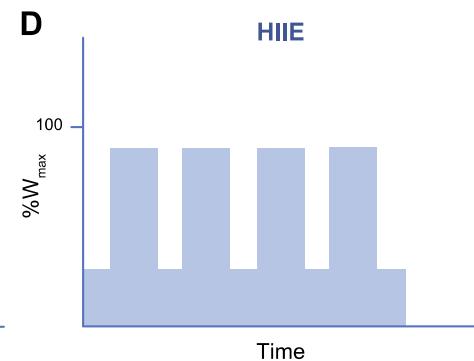
Cellular



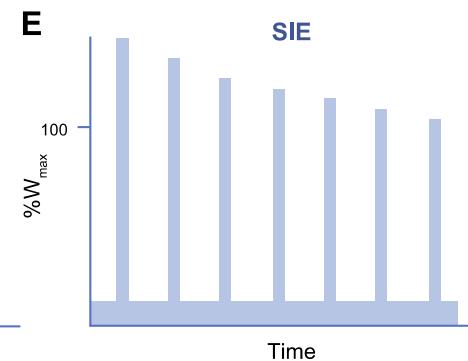
MICE



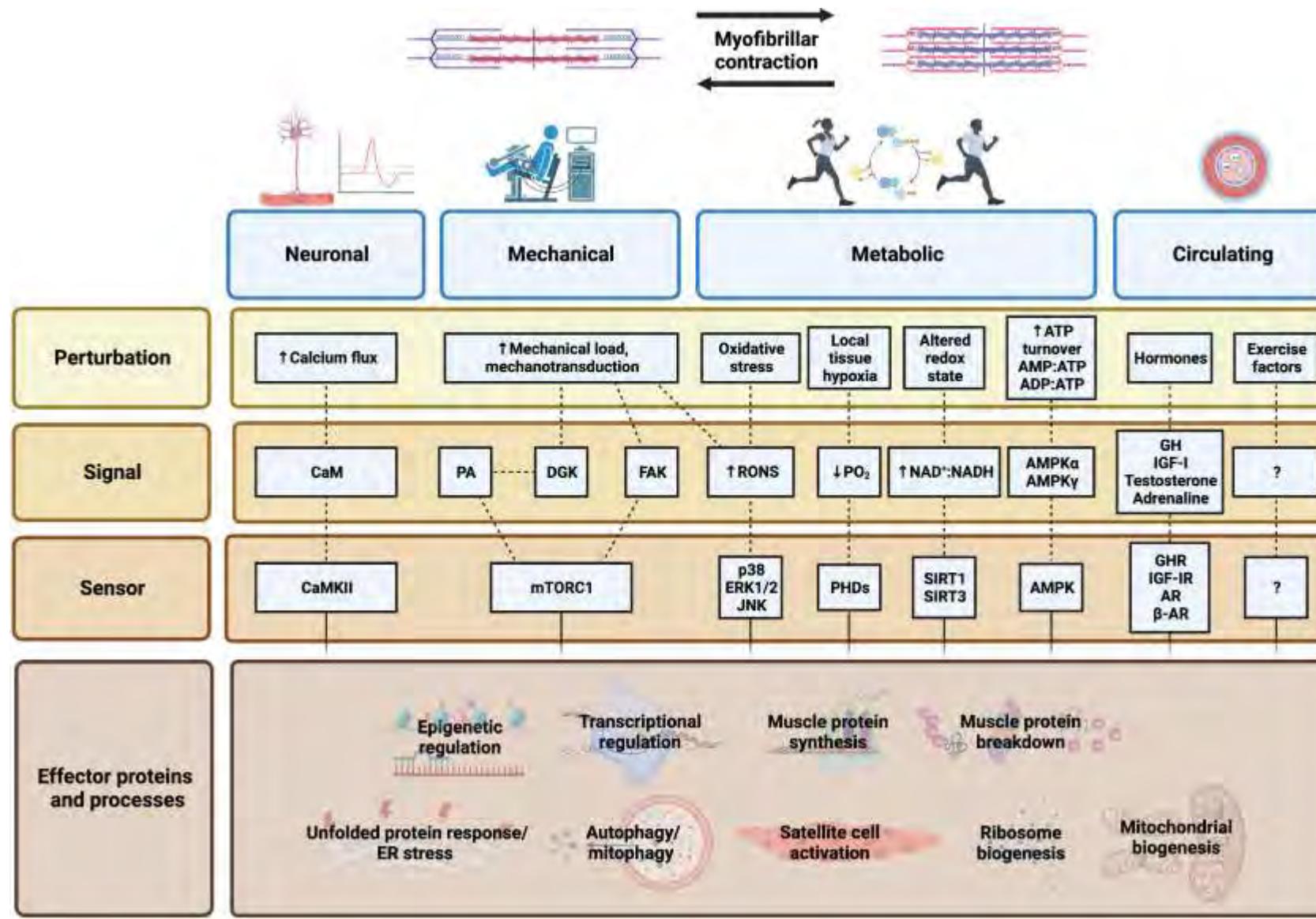
HIEE



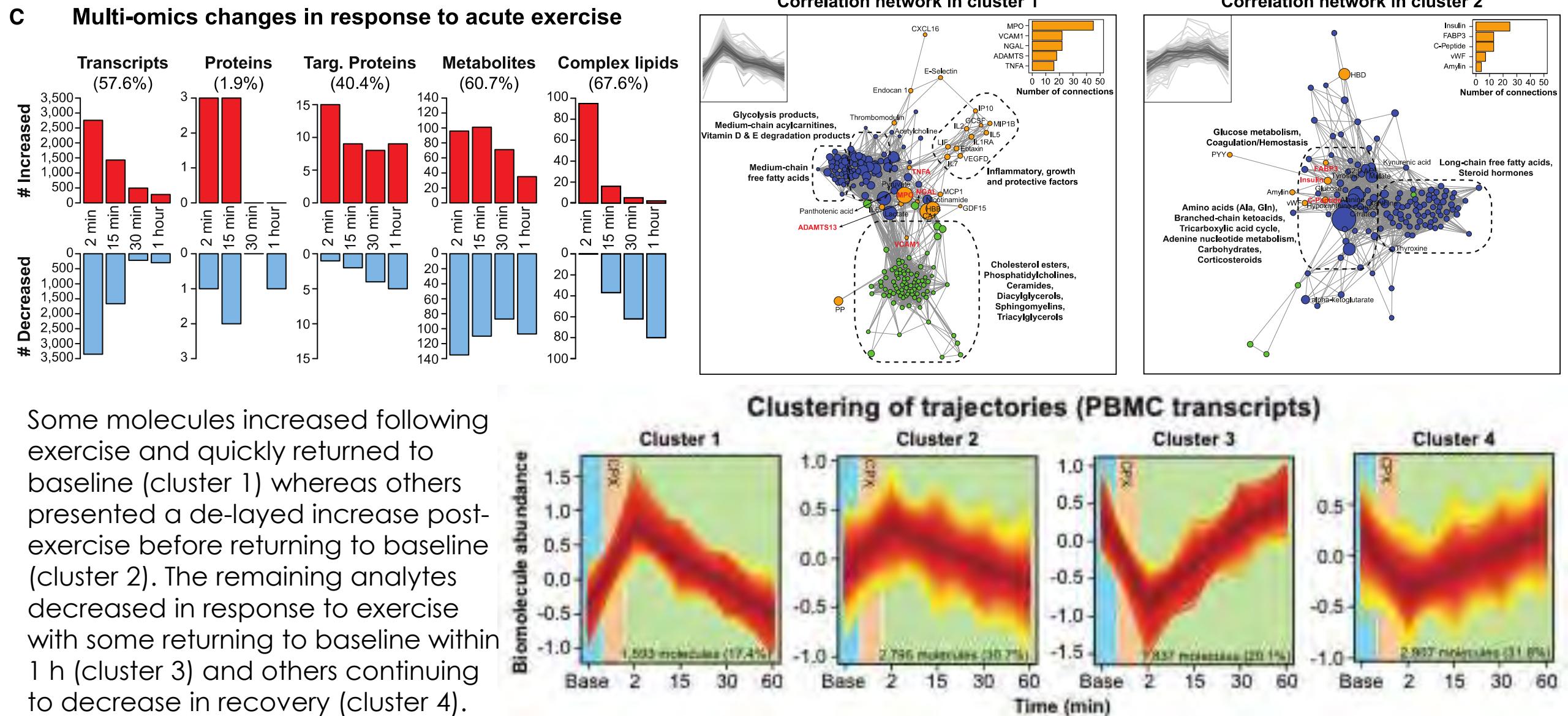
SIE



Effetti esercizio: quale esercizio?

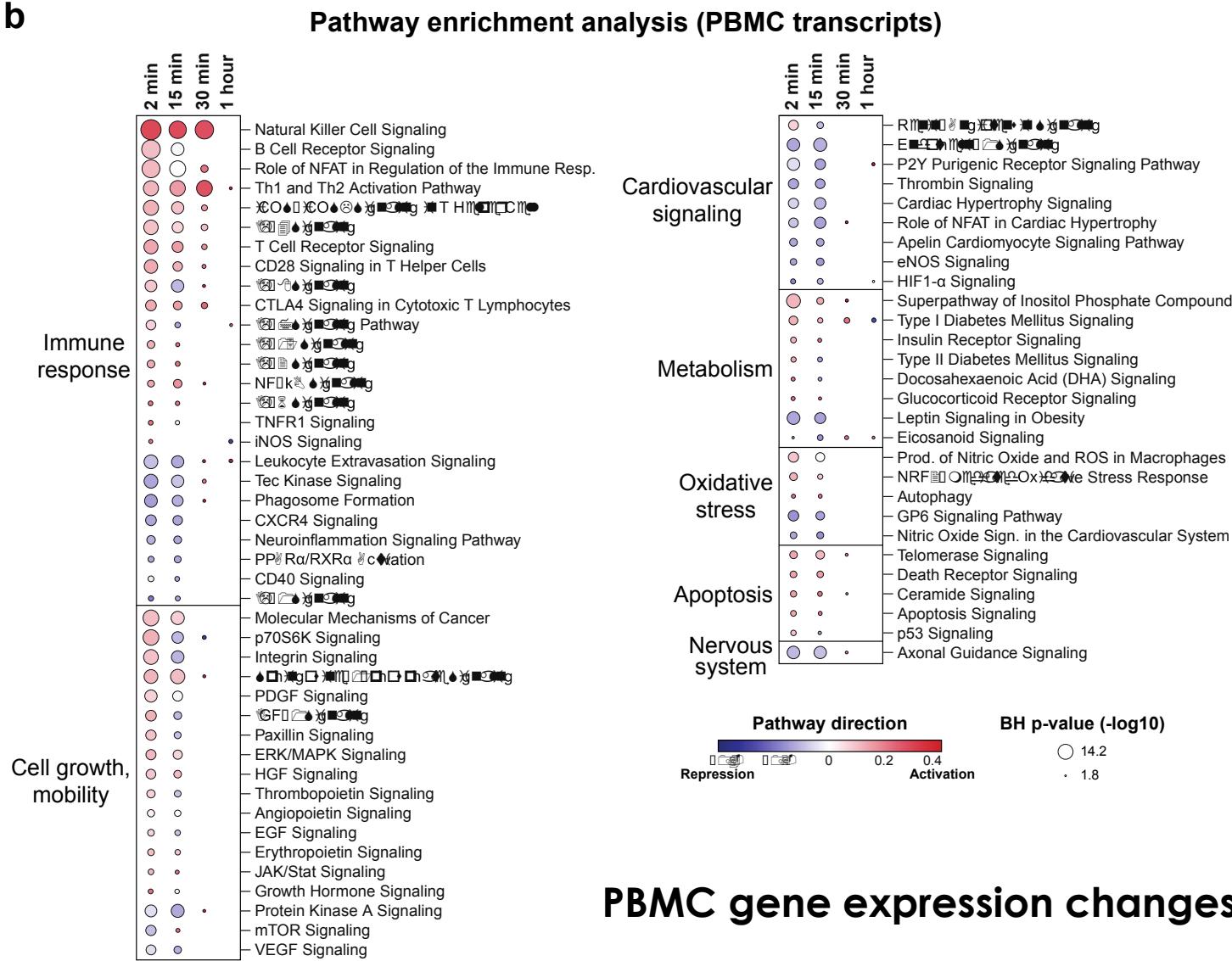


Effetti esercizio: timing



Effetti esercizio: timing

b

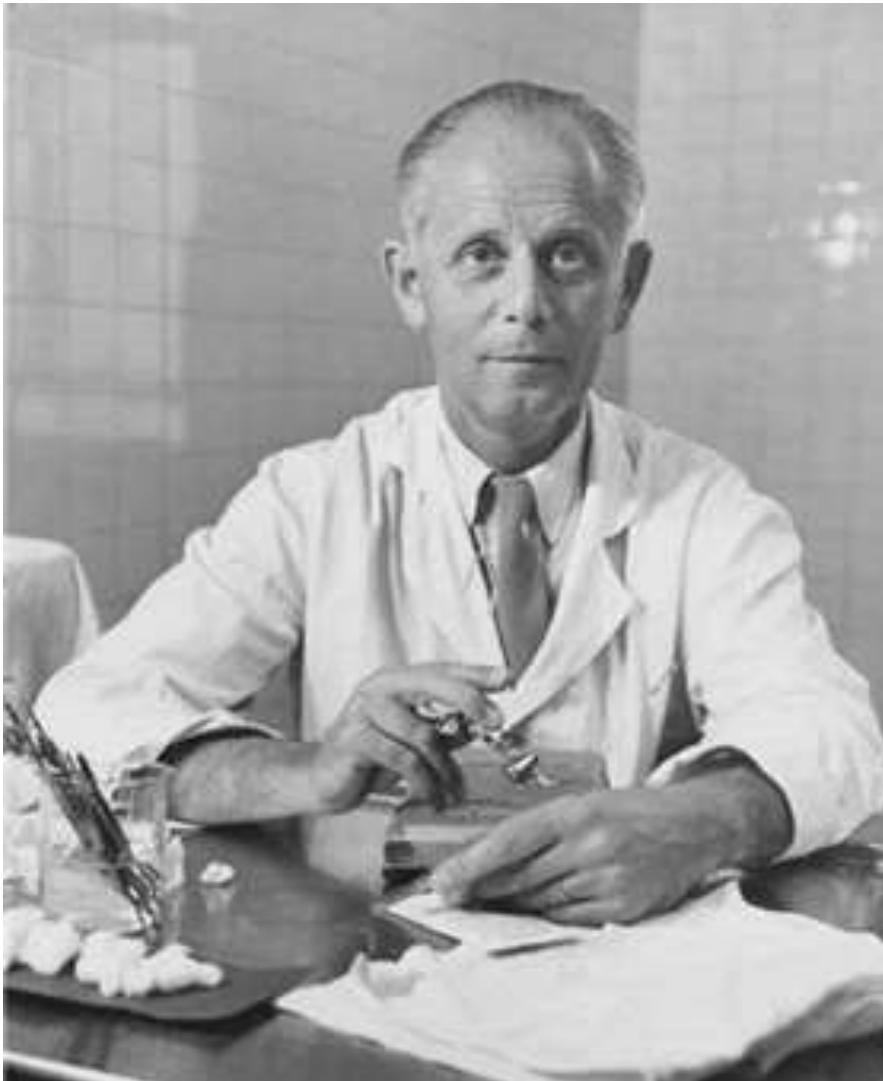


PBMC gene expression changes in response to acute exercise



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

CHE STRESS!



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

Montreal Star Board Mat Release No. 1024 For release on or after TUESDAY, April 23rd, 1957

Montreal Medical Scientist Explores "Stress" Selye Gives Medicine New Direction

In a busy research laboratory at Montreal University's Institute of Experimental Medicine and Surgery, a quiet giant sits, ruled by a kind of instinct and an aura of calm, in continuing experiments into the chemistry of life which herald a dramatic new approach to the study of disease and mental illness.

As a medical student at the University of Prague, Dr. Hans Selye first noticed how many symptoms of many diseases were identical: loss of appetite and insomnia, general aches and pains. He postulated this fact for 10 years, then in a moment of inspiration, in Canada he began to work to find out why. His discovery that "stress" can even stimulate the body's resistance to disease

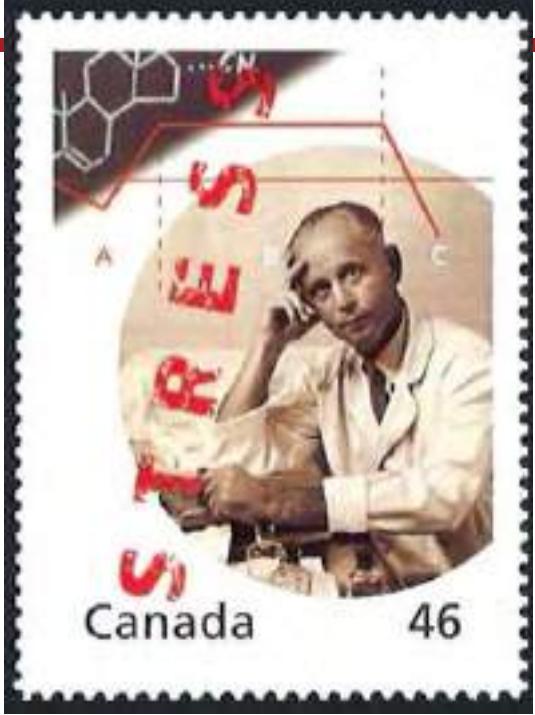
A remarkable composite organ for biological study -- the liver at the mystery of "stress" and before any specific damage, a flattened regulation of growth, sera health and perhaps disease. Every attack on the body imparts to chemical balance. By removing hormone balance one can be helped or a longer, fuller life.

Dr. Selye shows organ damage in the rat being "fed" "stress". Evidence about glands, hormones, nervous system. In certain situations where rats were exposed to varied forms of stress, both physical and emotional, the results were predictably similar.

With this a parallel between the reaction of the rat and the way in which the human body responds to attack! Dr. Selye believed there was and he formulated his now widely acclaimed theory of stress to show why.

Background: Paradoxical experiment in "starvation" test in which alcohol poisoning is used as a "stressor". Dr. Selye has shown patients of alcoholics living field up short in the human body to reach the same way of power and irritability. It is impossible to avoid stress, few stress factors to moderate its progress caused by alcohol abuse.

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 engorgement 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 is best seen with dark field illumination, but the vivid Brownian movement is also well seen with direct illumination.

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

(3) The presence of non-electrolytes in the medium ($n/16 - n/12$ dextrose; $n/5 - n/1$ urea) does not hinder the appearance of the phenomena described, but naturally reduces the activity of the Brownian movement in the cytoplasm.

(4) The phenomena described are reversible. The reversal can be produced after several minutes by means of Ringer solution, $n/10$ sodium chloride, or $n/10$ 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. GROSSMELN.

Anatomical Institute,
Turin.

A Syndrome produced by Diverse Nocuous 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 intoxications with sublethal doses of diverse drugs (adrenalin, atropine, morphine, 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.

This syndrome develops in three stages: during the first stage, 0-48 hours after the initial injury, one observes rapid decrease in size of the thymus, spleen, lymph glands and liver; disappearance of fat tissue; oedema formation, especially in the thymus and loose retroperitoneal 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 chromaffin substance from the adrenals; and sometimes hypoxemia of the skin, exophthalmos, increased lacrimation and salivation. In particularly severe cases, focal necrosis of the liver and dense clouding of the crystalline lens are observed.

In the second stage, beginning 48 hours after the injury, the adrenals are greatly enlarged but regain their lipid granules, while the medullary chromaffin cells show vacuolization; the oedema begins to disappear; numerous haemophiles 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 ceases 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 return 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, this 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 generalised 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 immune 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 laisser-aller can occur.

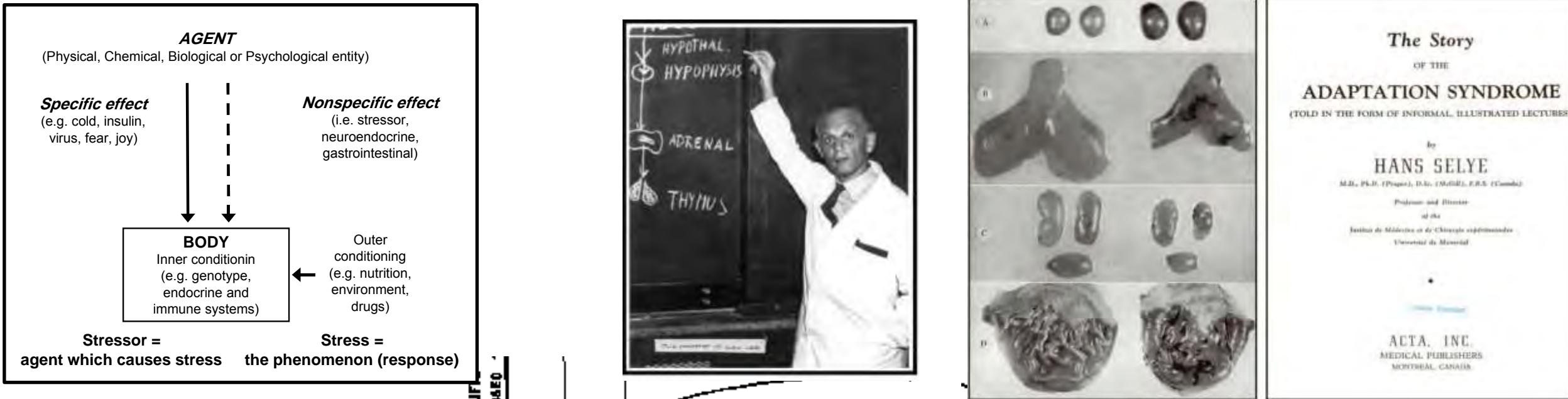
HANS SELYE.

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

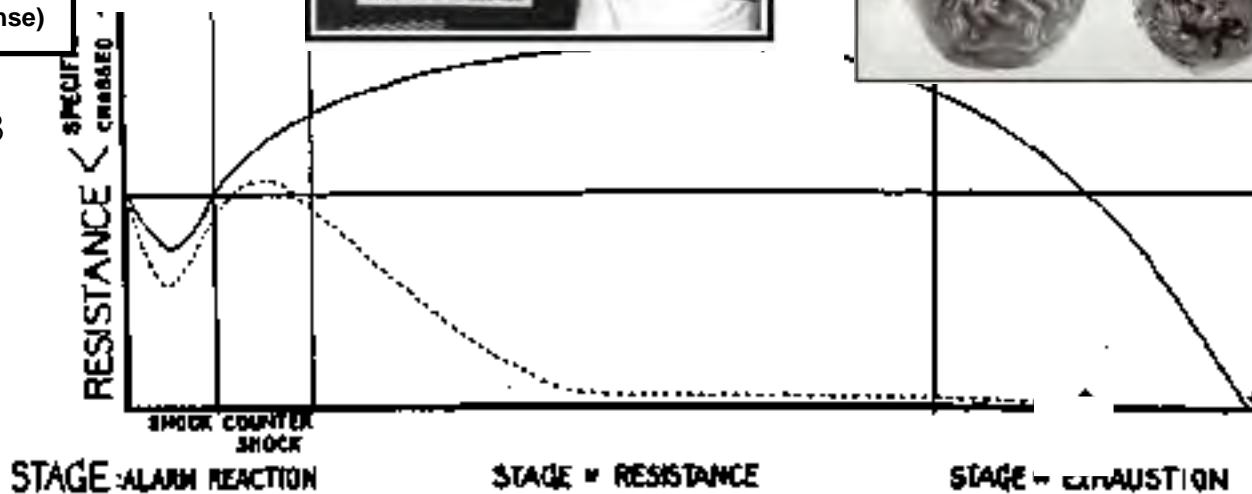


PLATE I. Schematic representation of the changes in specific (solid line) and crossed (dotted line) resistance during the three stages of the general adaptation syndrome

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

nutex^{LAB}

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

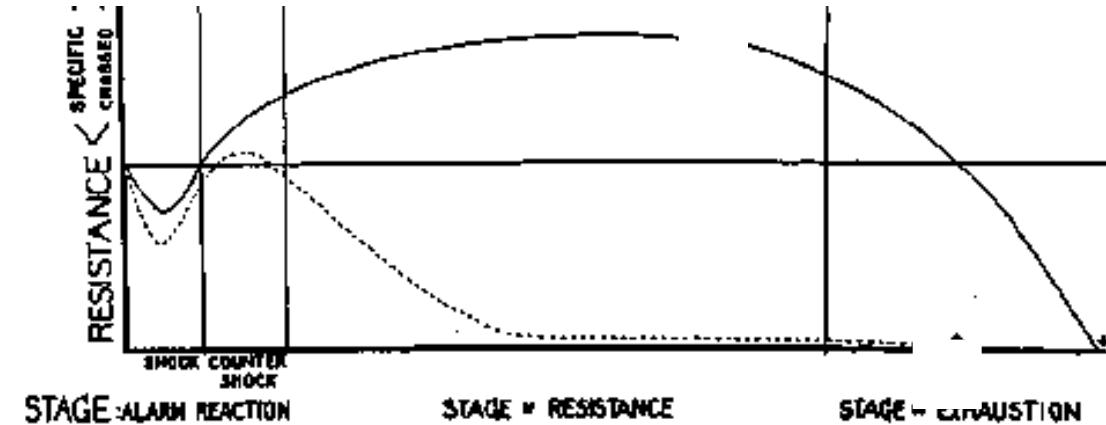
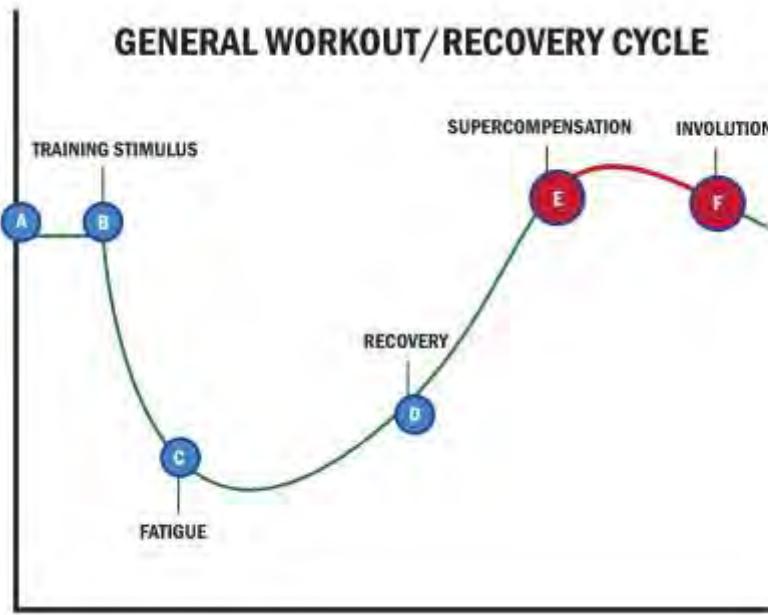
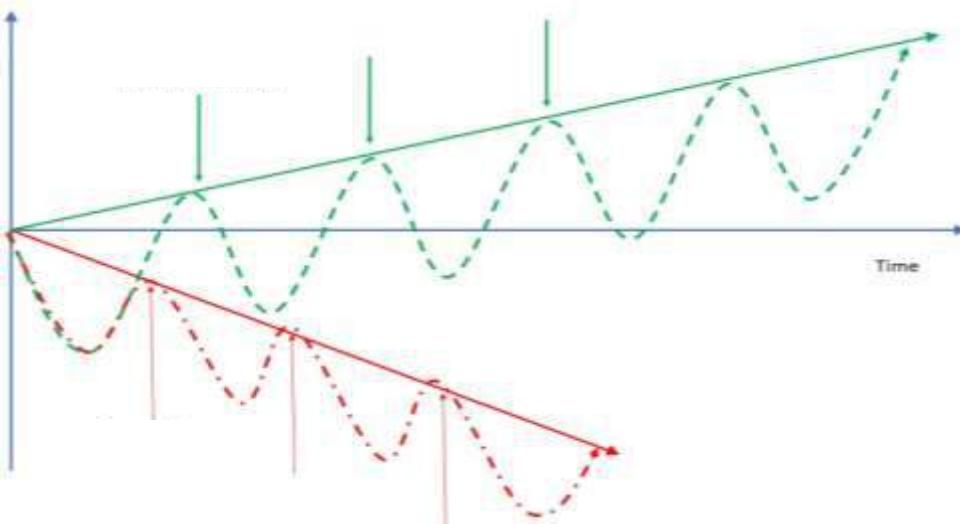


PLATE I. Schematic representation of the changes in specific (full line) and crossed (dotted line) resistance during the three stages of the general adaptation syndrome



Esercizio fisico e stress





SCIMMIE CHE DEVONO MUOVERSI

Fino a 2 mil anni fa scimmie sedentarie bipedi per lo più vegetariane con piante locali

Raffreddamento – ambiente secco,
incominciarono a cacciare e raccogliere

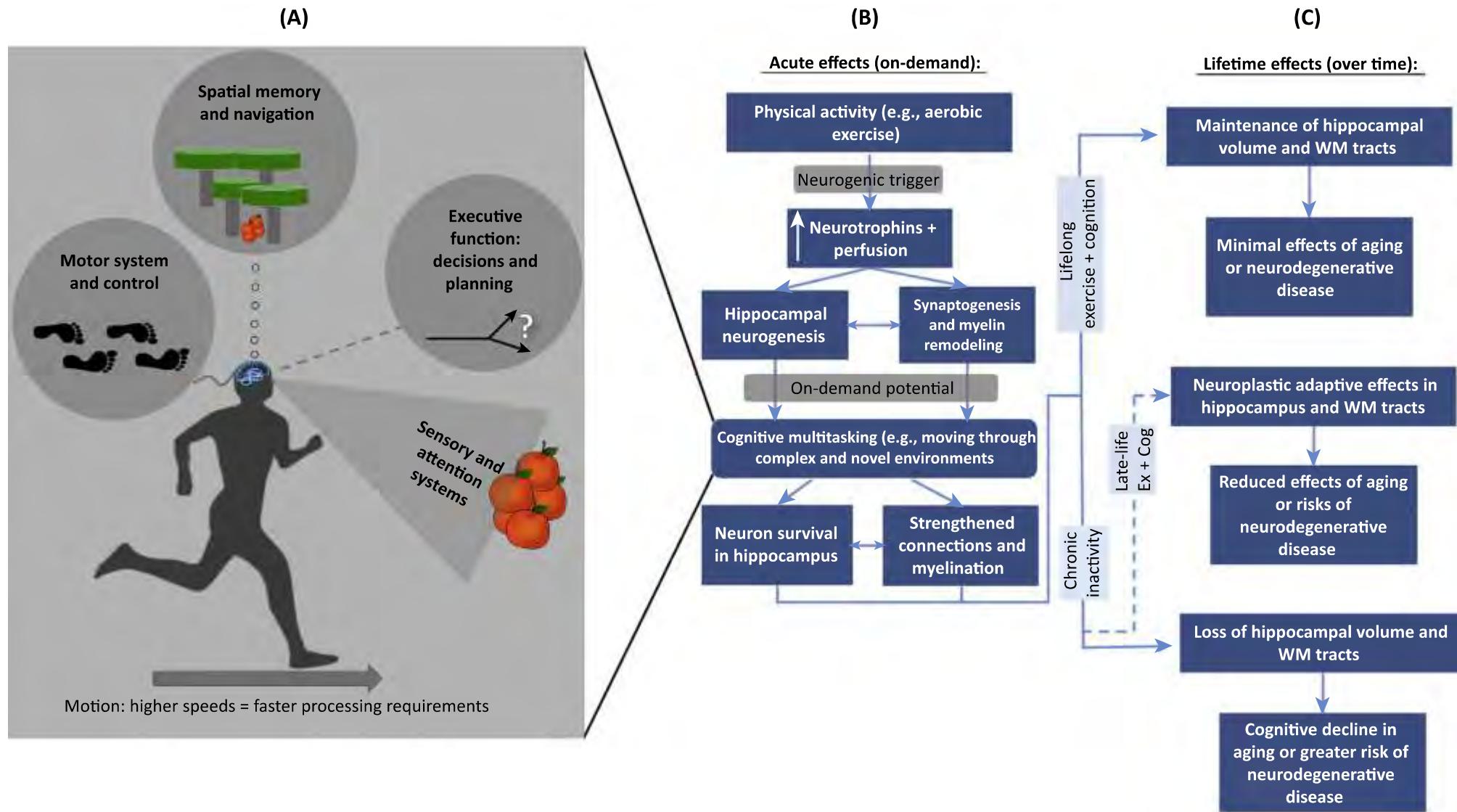
Aumento dell'impegno cognitivo per verificare la propria localizzazione. Questi compiti sono svolti dall'ippocampo (che viene stimolato da esercizio)

Anche la ricerca e riconoscimento del cibo e la verifica dell'ambiente hanno stimolato il cervello ed anche i circuiti della memoria a breve e lungo termine

Cacciatori-raccoglitori fino a 10000 anni fa.
Durante questa fase ci fu un aumento delle distanze percorse - > 20 Km (molta più attività aerobica rispetto ad altre scimmie)

Stimolo di ippocampo e corteccia prefrontale (coinvolta anche nel mantenimento della comunicazione tra simili mentre si svolgono altri compiti)

Scimmie che DEVONO muoversi





COME SI CAMBIA...

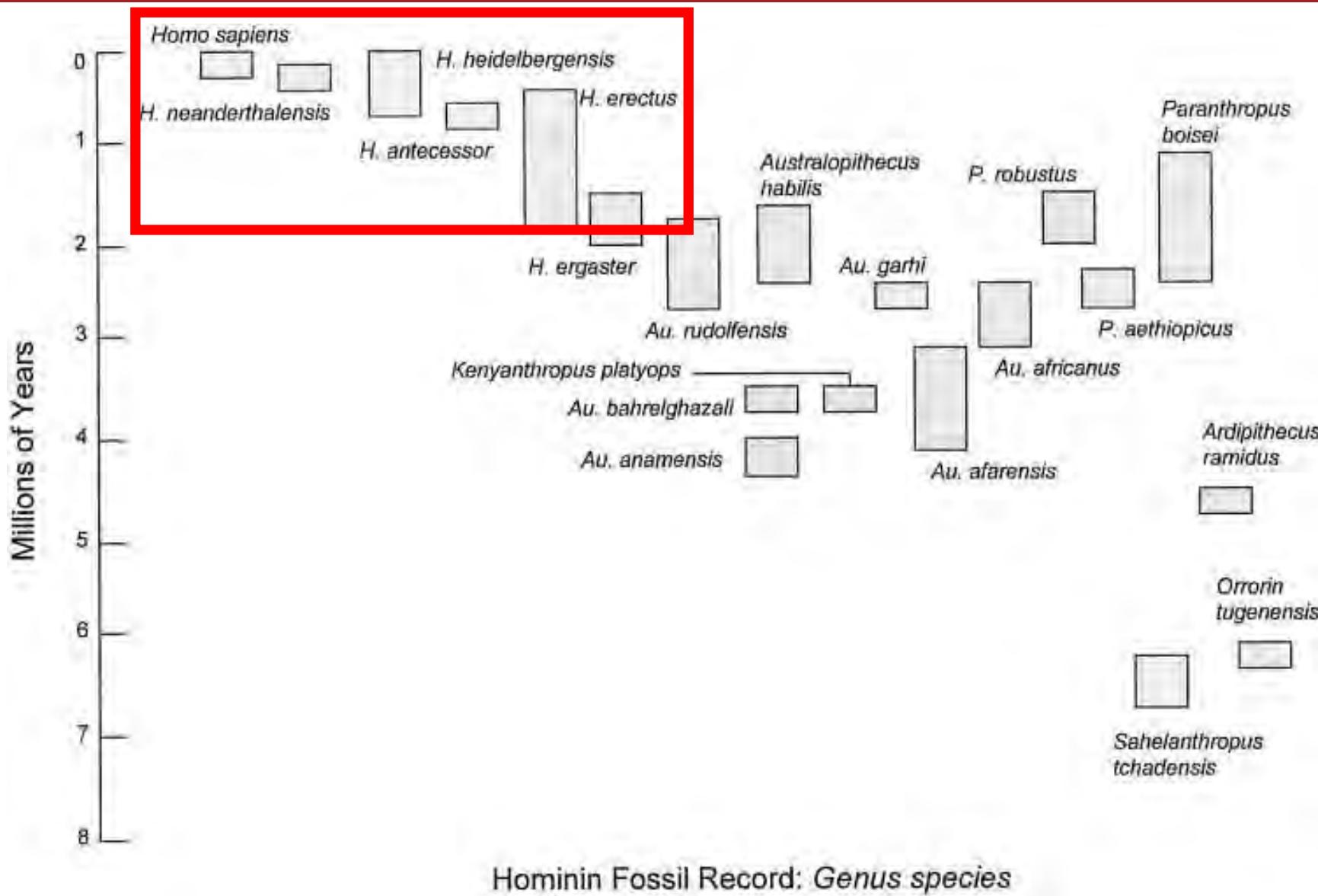


Siamo animali che si sono evoluti grazie allo sviluppo del cervello e della nostra adattabilità non certo grazie alle nostre doti fisiche.

L'adattabilità di manifesta nei comportamenti ma anche con l'adattamento dei meccanismi fisiologici.

Questi compromessi però comportano anche degli svantaggi tra cui quelli legati a sedentarietà (post rivoluzione industriale) e modifica alimentazione (cerealicoltura).

Come si cambia...



Come si cambia... cervello

the “Theory of Optimal Foraging”

La frutta non coltivata, i vegetali, fogliame e radici disponibili per i cacciatori-raccoglitori sono generalmente a bassa densità energetica.

Rapporto negativo spesa per raccogliere e preparare questi cibi/ energia ottenuta → cibi non utilizzabili come fonte primaria - *optimal foraging theory* -

Animali più vantaggiosi in termini di rapporto spesa/beneficio, solo frutta stagionale zuccherina e miele possono competere.

Come si cambia... cervello

L'aumento del volume del cervello umano da 650 cc a 1500 cc è stato causato anche dall'estinzione (a causa dell'uomo) dei grandi animali.

Questo ha costretto gli esseri umani a diventare più abili nel cacciare piccole prede più mobili e abituata ad essere prede.

Con l'avvento dell'agricoltura (10.000 anni fa) il cervello si ridusse a 1300-1400 cc.

La dimensione del cervello degli scimpanzè, ad esempio, è rimasto stabile per 7 milioni di anni; il cervello umano invece raggiunse la sua massima dimensione 300.000 anni fa.

