Fizinių pratimų taikymo atnaujinta „abėcėlė“!

Albertas Skurvydas
LSU, 2018
Albertas.skurvydas@lsu.lt

Pirmasis!

Kodėl reikalingas fizinių pratimų Intensyvumas?

Pagrindinė rekomendacija dėl FA *(iki 18-64 metų)*

Idealu 5 dienas per savaitę po 30 min. (150 min.) vidutiniu intensyvumu arba 5 dienas po 15 min. (75 min.) dideliu intensyvumu (įtraukiant jėgos pratimus)…. pačiam pasirenkant formą… ir viską darant savo noru.

TABLE 7.1. Methods of Estimating Intensity of Cardiorespiratory and Resistance Exercise

	Cardiorespiratory Endurance Exercise								Resistance Exercise
	Absolute Intensity	Absolute Intensity (MET) by Age			Relative Intensity				Relative Intensity
Intensity	MET	Young (20–39 yr)	Middle Age (40–64 yr)	Older (≥65 yr)	%HRR or $\%\dot{V}O_2R$	$\%HR_{max}$	$\%\dot{V}O_{2max}$	Perceived Exertion (Rating on 6–20 RPE Scale)	% One Repetition Maximum
Very light	<2	<2.4	<2.0	<1.6	<30	<57	<37	Very light (RPE ≤9)	<30
Light	2.0–<3	<4.8	<4.0	<3.2	30–<40	57–<64	37–<45	Very light to fairly light (RPE 9–11)	30–<50
Moderate	3.0–<6	4.8–<7.2	4.0–<6.0	3.2–<4.8	40–<60	64–<76	46–<64	Fairly light to somewhat hard (RPE 12–13)	50–<70
Vigorous	6.0–<8.8	7.2–<10.2	6.0–<8.5	4.8–<6.8	60–<90	76–<96	64–<91	Somewhat hard to very hard (RPE 14–17)	70–<85
Near maximal to maximal	≥8.8	≥10.2	≥8.5	≥6.8	≥90	≥96	≥91	≥ Very hard (RPE ≥18)	≥85

frontiers in Neuroscience

MINI REVIEW
published: 02 November 2017
doi: 10.3389/fnins.2017.00612

Session-RPE Method for Training Load Monitoring: Validity, Ecological Usefulness, and Influencing Factors

Monoem Haddad[1]*, Georgios Stylianides[2], Leo Djaoui[3], Alexandre Dellal[4] and Karim Chamari[5]

Borgo skalė

Rating		Descriptor
0		Rest
1	Training strain = Weekly TL x monotony	Very, Very Easy
2		Easy
3		Moderate
4	Monotony = weekly mean TL/SD	Somewhat Hard
5		Hard
6		
7	TL(A.U.) = RPE x session duration (min).	Very Hard
8		
9		
10		Maximal

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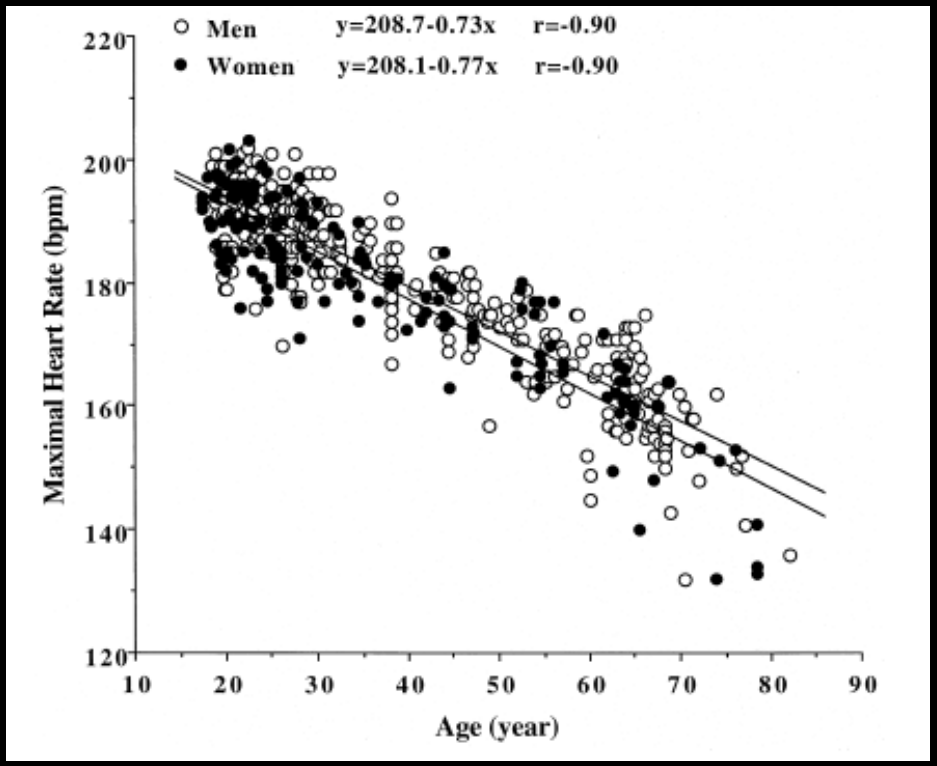
Journal of the American College of Cardiology
© 2001 by the American College of Cardiology
Published by Elsevier Science Inc.

Age-Predicted Maximal Heart Rate Revisited

Hirofumi Tanaka, PHD, Kevin D. Monahan, MS, Douglas R. Seals, PHD



209.3 – 0.72(age).

ŠSDmax=

(208 - 0.7 x amžius)

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MET

3.5 $ml \cdot kg^{-1} \cdot min^{-1}$

Sveikatinimo krūvis:

MET:

a) 3-6: ėjimas vidutiniu tempu (5 km/h)
b) 6-8: ėjimas spėriu ir labai spėriu tempu (7-8 km/h)

ŠSD:

a) 65-75 %

b) 75-95 % nuo maksimumo (220-amžius)

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ELSEVIER CrossMark

Canadian Journal of Cardiology 32 (2016) 514–522

Review

Practical Approaches to Prescribing Physical Activity and Monitoring Exercise Intensity

Jennifer L. Reed, PhD, MEd, CS, and Andrew L. Pipe, CM, MD

Talk test	MET level	Activity
Comfortable conversation possible	< 3	Walking, very slow (2 mph)
Comfortable conversation possible	3 to < 6	Walking the dog
Comfortable conversation not likely possible	6 to < 8.8	Jogging, basketball game, tennis singles, swimming laps moderate or light effort
Comfortable conversation not possible	≥ 8.8	Running fast (6 mph, 10 min/mile)

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Canadian Journal of Cardiology 32 (2016) 514–522

Review

Practical Approaches to Prescribing Physical Activity and Monitoring Exercise Intensity

Jennifer L. Reed, PhD, MEd, CS, and Andrew L. Pipe, CM, MD

Table 6. Graduated step index[65]

Steps per day	Lifestyle classification
< 5000	Sedentary lifestyle
5000-7499	Low active
7500-9999	Somewhat active
≥ 10,000	Active
> 12,500	Highly active

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Ilgo darbo nepakanka, reikia ir intensyvumo!

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Rizika susirgti diabetu sumažėja, kai didiname ėjimo intensyvumą!

3.2 km/h – 1 Rizika

4 km/h – 0.6

>5 km/h – 0.3

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Jei nors vieną kartą per savaitę dideliu intensyvumu pasportuojate, tada jautrumas insulinui yra apie 40 procentų didesnis!

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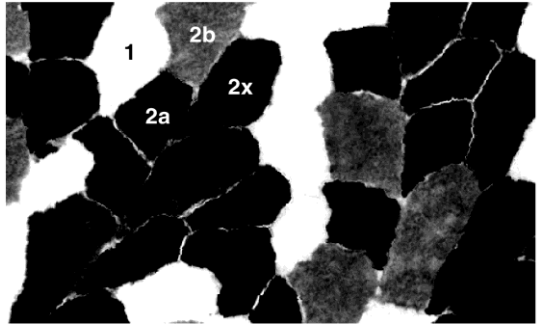
EXERCISE INTENSITY AND LONGEVITY IN MEN - THE HARVARD ALUMNI HEALTH STUDY

Tik didelio intensyvumo pratimai prailgina gyvenimo trukmę, kiti visi krūviai turi naudos daugybei sveikatos rodikliams.

1

Motorinio vieneto tipas	FF	FR	S
Histocheminis tipas	FG II B	FOG II A	SO I



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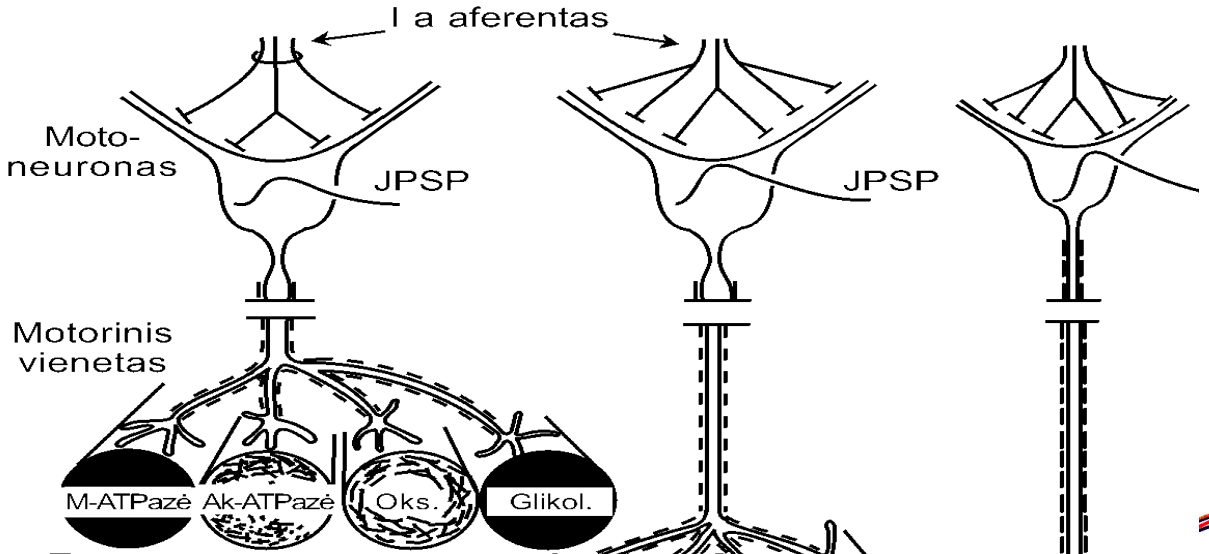

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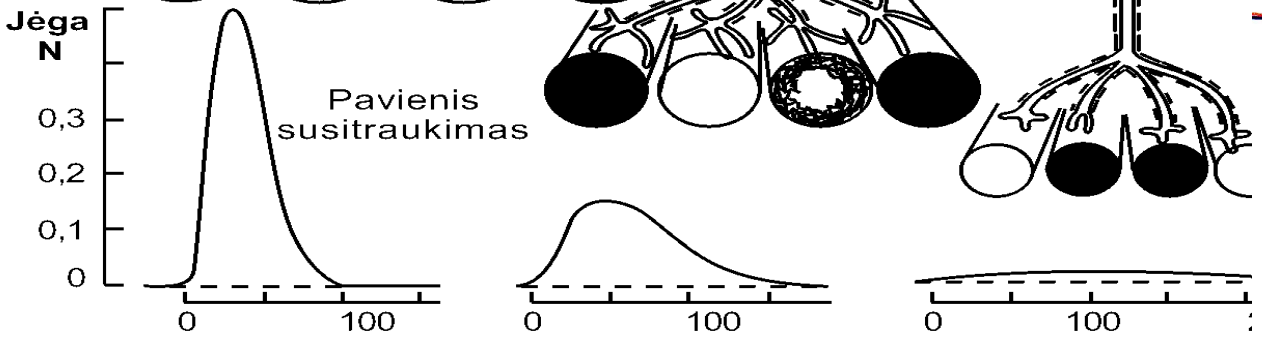

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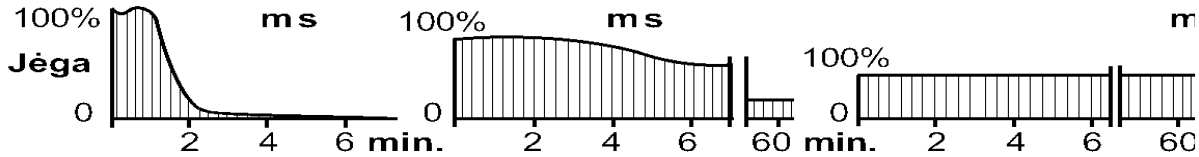

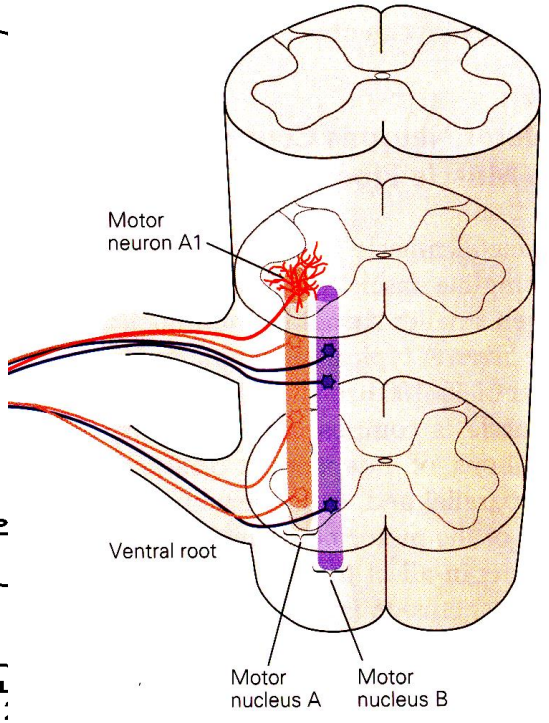

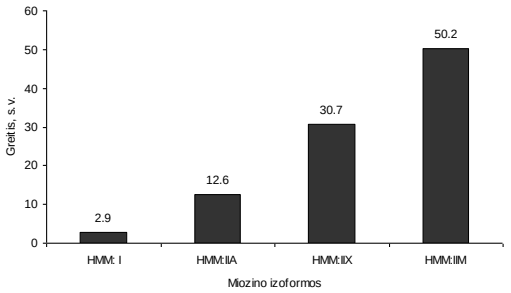

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Jamaica
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behandlingen

Biogerontology (2016) 17:485–496
DOI 10.1007/s10522-015-9627-3

REVIEW ARTICLE

Age-dependent motor unit remodelling in human limb muscles

Mathew Piasecki · Alex Ireland · David A. Jones · Jamie S. McPhee

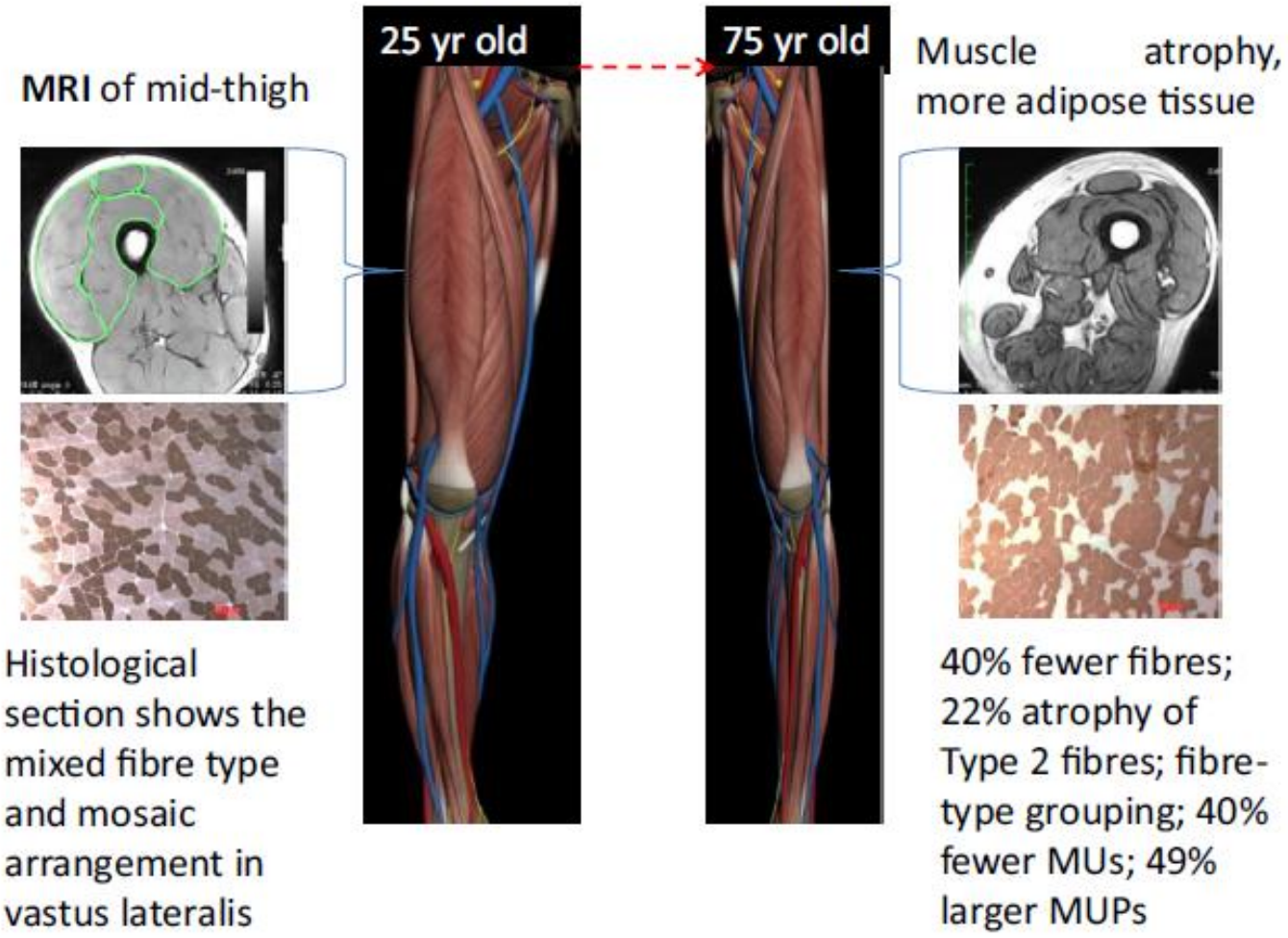

Fig. 4 Atrophic muscles in older age. Compared with young, a typical healthy 75 year old man has around 15 % lower appendicular lean mass (McPhee et al. 2013); 30 % smaller knee extensor muscles (Maden-Wilkinson et al. 2014); 35 % lower knee extension strength (McPhee et al. 2013) and 35 % lower leg power (Stenroth et al. 2015); 20–40 % fewer muscle fibres in the VL, fibre-type grouping and small, angular fibres (Lexell et al. 1988; Lexell and Downham 1991)

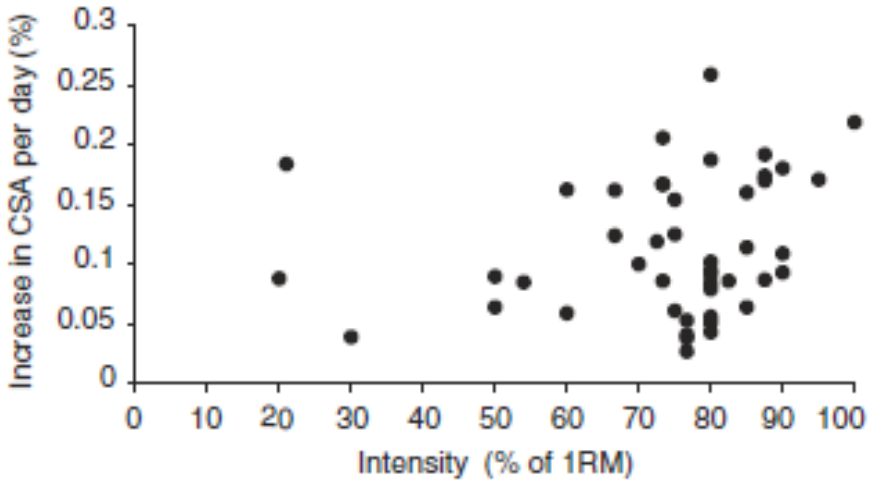

Fig. 2. Peak intensity of training vs percentage increase in cross-sectional area (CSA) per day of the quadriceps during dynamic external resistance training (number of study groups = 46). **RM** = repetition maximum.

REVIEW ARTICLE

Sports Med 2007; 37 (3): 225-264
0112-1642/07/0003-0225/$44.95/0

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The Influence of Frequency, Intensity, Volume and Mode of Strength Training on Whole Muscle Cross-Sectional Area in Humans

Mathias Wernbom,[1] *Jesper Augustsson*[1,2] and *Roland Thomeé*[1,2]

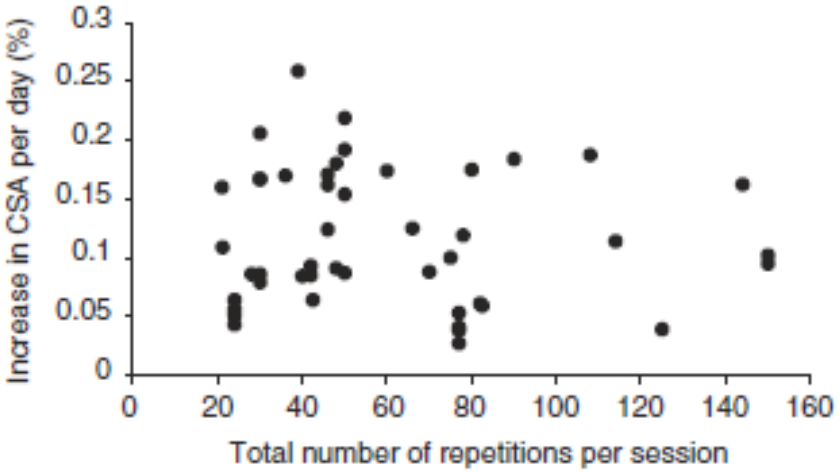


Fig. 3. Total number of repetitions vs percentage increase in cross-sectional area (CSA) per day of the quadriceps during dynamic external resistance training (number of study groups = 45).

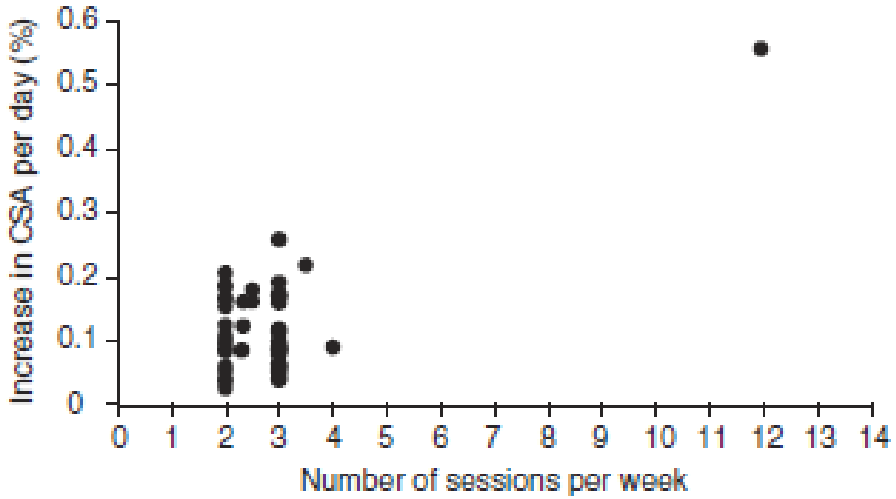


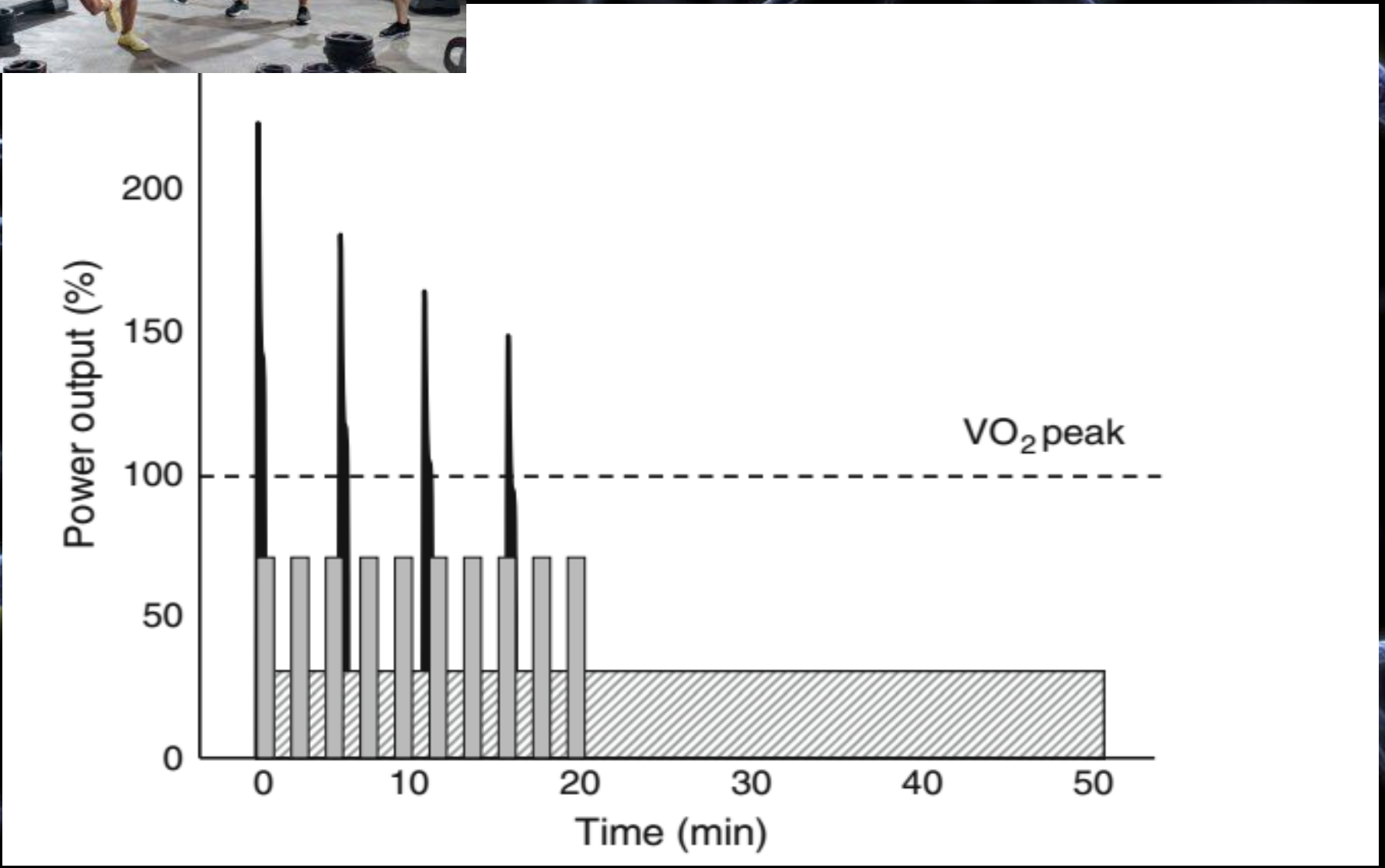
Fig. 1. Frequency of training vs percentage increase in cross-sectional area (CSA) per day of the quadriceps during dynamic external resistance training (number of study groups = 47).

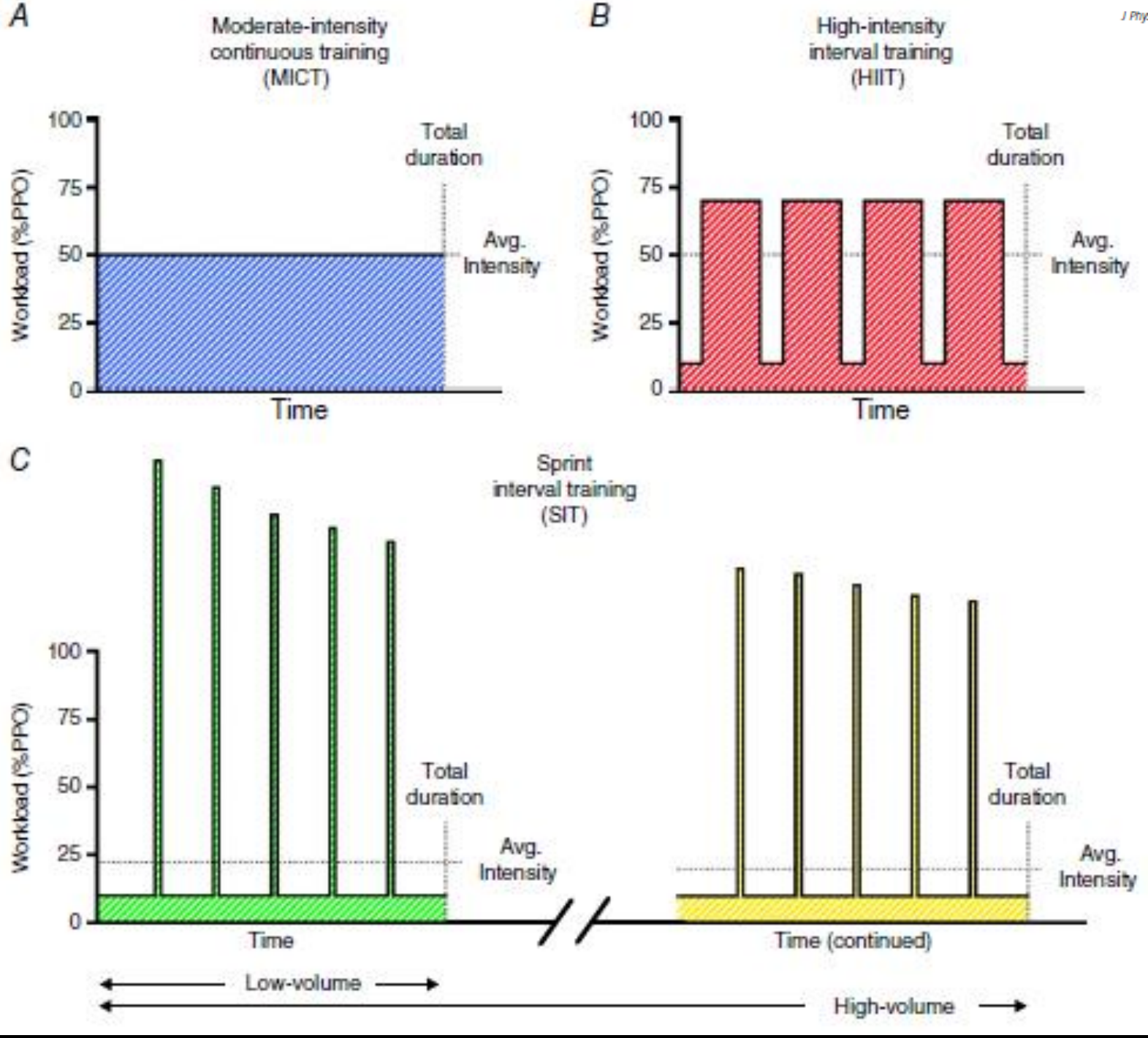
Sports Med (2014) 44 (Suppl 2):S127–S137
DOI 10.1007/s40279-014-0259-6

REVIEW ARTICLE

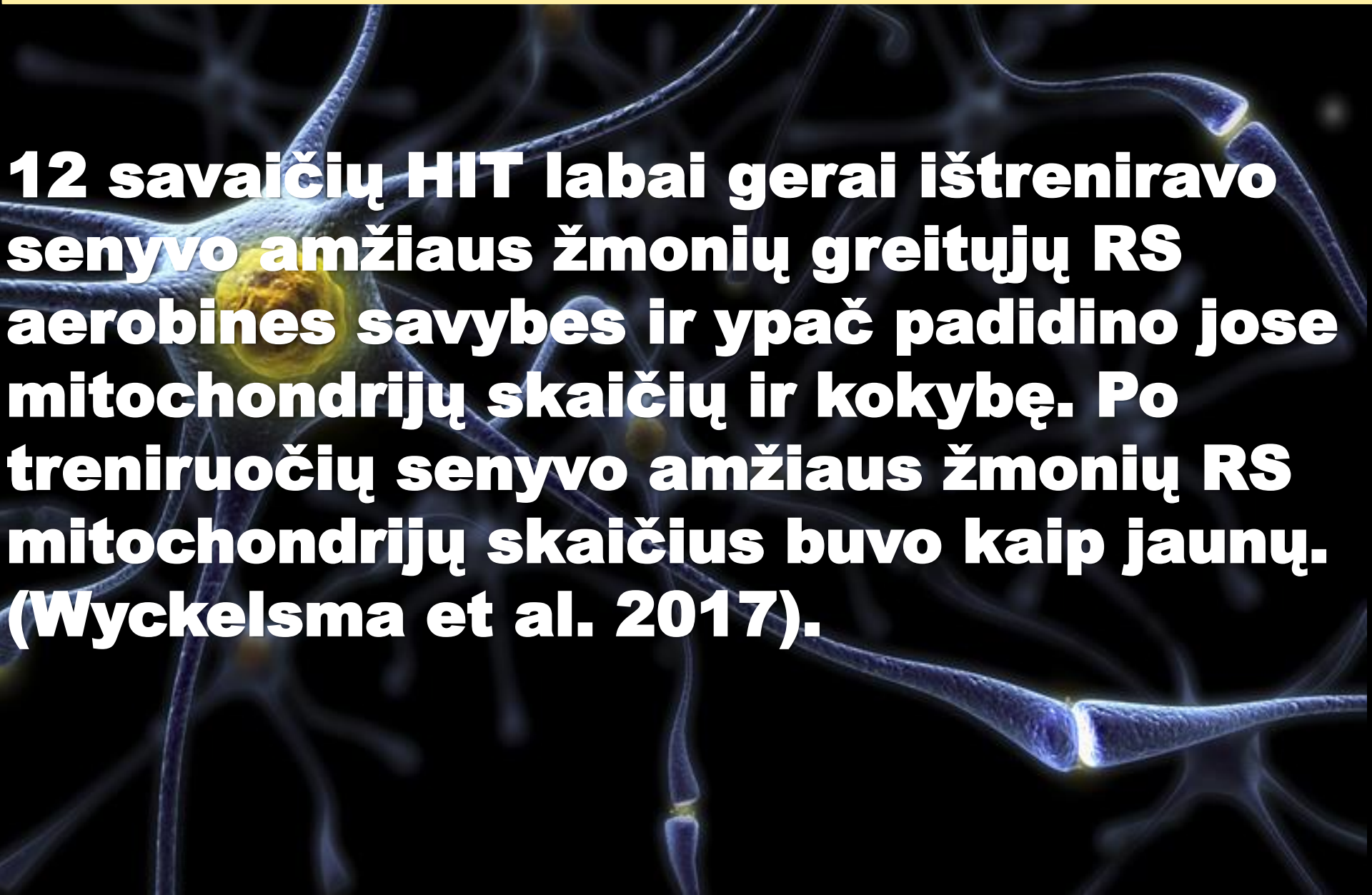
Physiological and Health-Related Adaptations to Low-Volume Interval Training: Influences of Nutrition and Sex

Martin J. Gibala · Jenna B. Gillen · Michael E. Percival




A
Moderate-intensity continuous training (MICT)
Workload (%PPO)
100
75
50
25
0
Total duration
Avg. Intensity
Time
B
High-intensity interval training (HIIT)
Workload (%PPO)
100
75
50
25
0
Total duration
Avg. Intensity
Time
C
Sprint interval training (SIT)
Workload (%PPO)
100
75
50
25
0
Total duration
Avg. Intensity
Time
Total duration
Avg. Intensity
Time (continued)
Low-volume
High-volume

Fizinio aktyvumo Medicina



12 savaičių HIT labai gerai ištreniravo senyvo amžiaus žmonių greitųjų RS aerobines savybes ir ypač padidino jose mitochondrijų skaičių ir kokybę. Po treniruočių senyvo amžiaus žmonių RS mitochondrijų skaičius buvo kaip jaunų. (Wyckelsma et al. 2017).

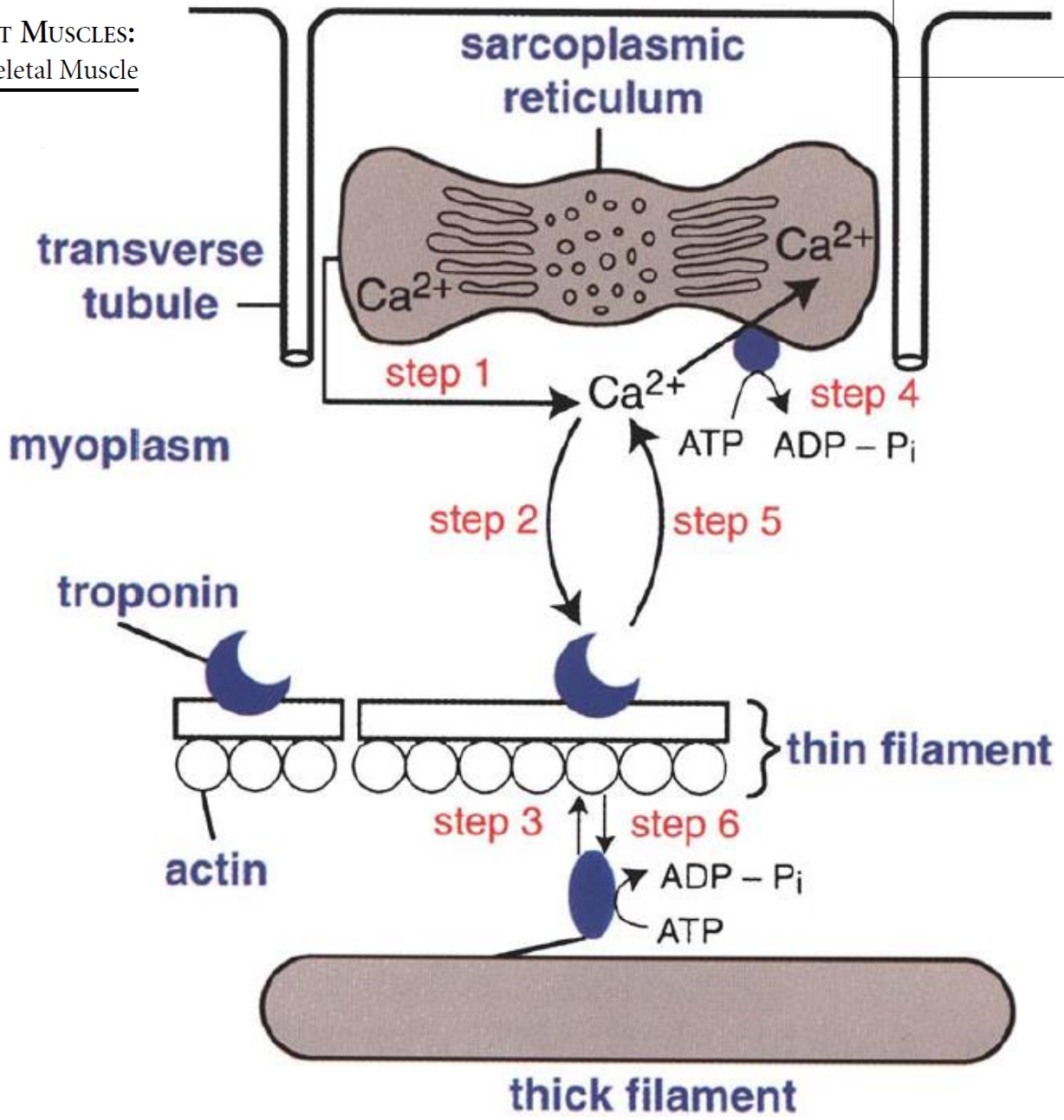
Antrasis!

Raumens darbo energetika?

Annu. Rev. Physiol. 2006. 68:193–221
doi: 10.1146/annurev.physiol.68.040104.105418
Copyright © 2006 by Annual Reviews. All rights reserved
First published online as a Review in Advance on October 24, 2005

DESIGN AND FUNCTION OF SUPERFAST MUSCLES: New Insights into the Physiology of Skeletal Muscle

Lawrence C. Rome



Raumens atsipalaidavimui tiek pat reikia energijos, kaip ir susitraukimui!

REVIEW ARTICLE

Sports Med 2005; 35 (9): 757-777
0112-1642/05/0009-0757/$34.95/0

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Multiple Sprint Work

Physiological Responses, Mechanisms of Fatigue and the Influence of Aerobic Fitness

Mark Glaister

$$ATP \underset{ATPase}{\rightleftharpoons} ADP + P_i + energy$$

$$PCr + ADP + H^+ \underset{\text{Creatine kinase}}{\rightleftharpoons} ATP + Cr$$

$$Glycogen + 3\ ADP + 3\ P_i \longrightarrow 3\ ATP + 2\ lactate^- + 2\ H^+$$

$$C_6H_{12}O_6\ (glucose) + 6O_2 + 38\ ADP + 38\ P_i \longrightarrow 6\ CO_2 + 6\ H_2O + 38\ ATP$$

Laktatas – geriausias smegenų maistas

J Muscle Res Cell Motil (2017) 38:143–155
DOI 10.1007/s10974-017-9467-7

REVIEWS

Energy demand and supply in human skeletal muscle

C. J. Barclay[1]

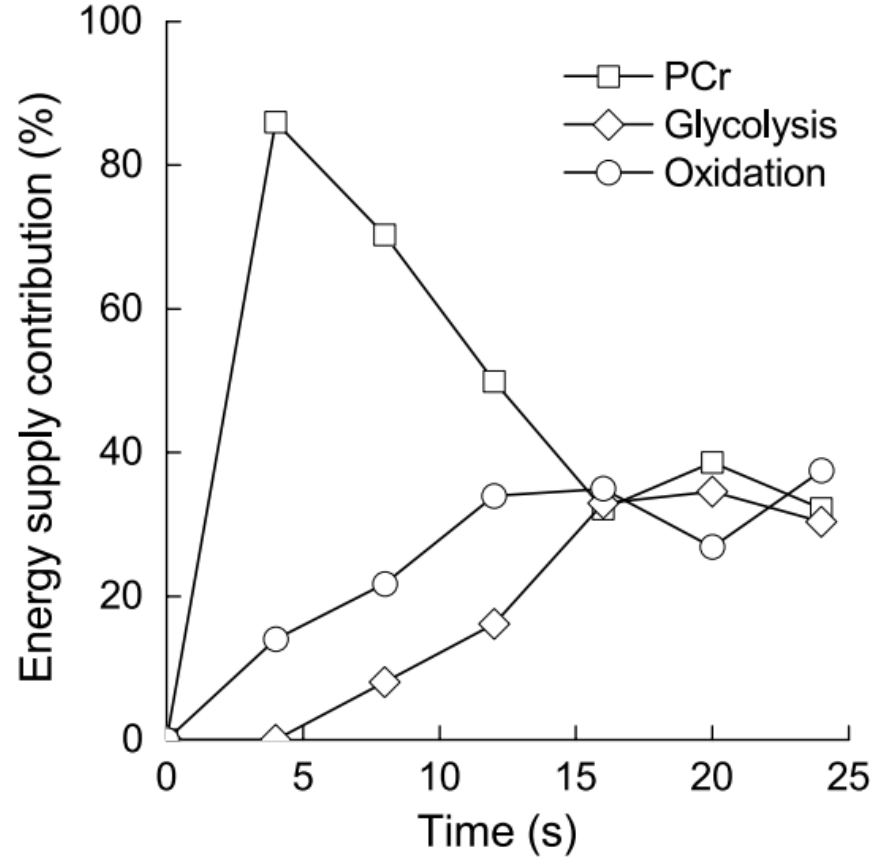

Fig. 5 Contributions to energy supply during 24 s maximal voluntary contraction of vastus lateralis muscle. Relative contributions of PCr, oxidative ATP supply and glycolytic ATP supply determined from magnetic resonance spectroscopy. Contributions are quantified

REVIEW ARTICLE

Sports Med 2005; 35 (9): 757-777
0112-1642/05/0009-0757/$34.95/0
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Multiple Sprint Work

Physiological Responses, Mechanisms of Fatigue and the Influence of Aerobic Fitness

Mark Glaister

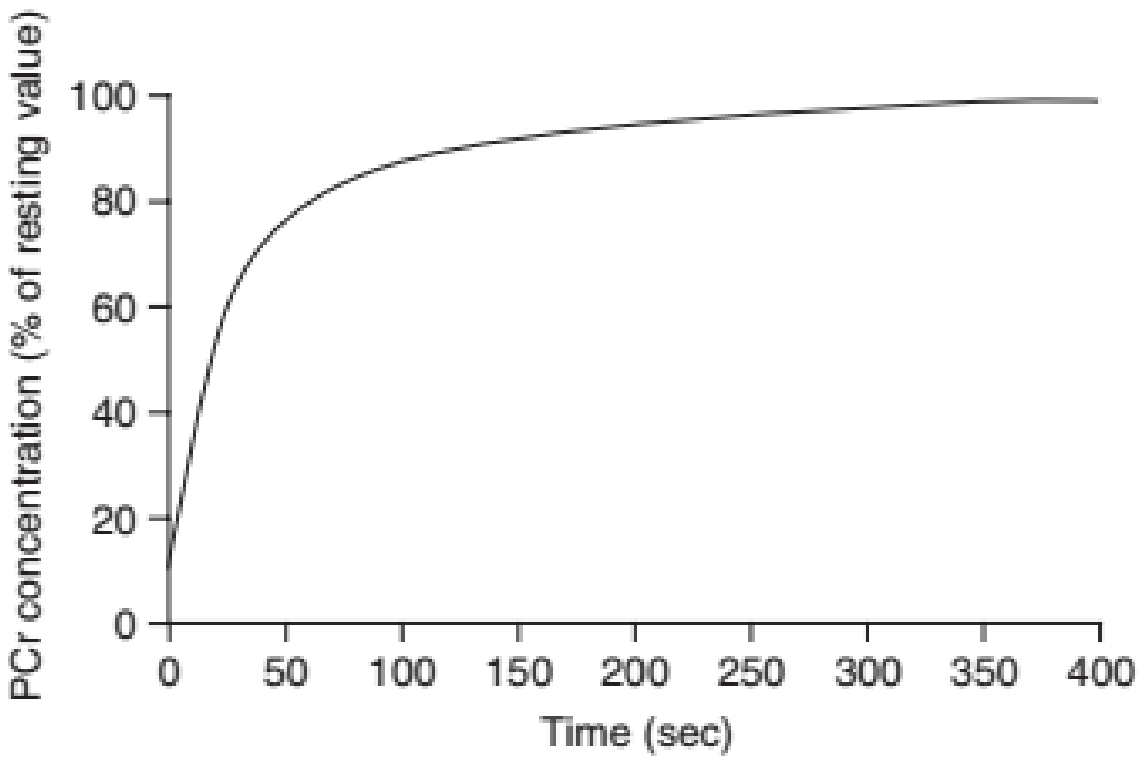

Fig. 3. Phosphocreatine (PCr) recovery kinetics of the medial gastrocnemius following 30 seconds of repeated maximal plantar flexions of the foot determined from localised nuclear magnetic resonance imaging (reproduced from Walter et al.,[36] with permission).

REVIEW ARTICLE
Sports Med 2005; 35 (9): 757-777
0112-1642/05/0009-0757/$34.95/0
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Multiple Sprint Work

Physiological Responses, Mechanisms of Fatigue and the Influence of Aerobic Fitness

Mark Glaister

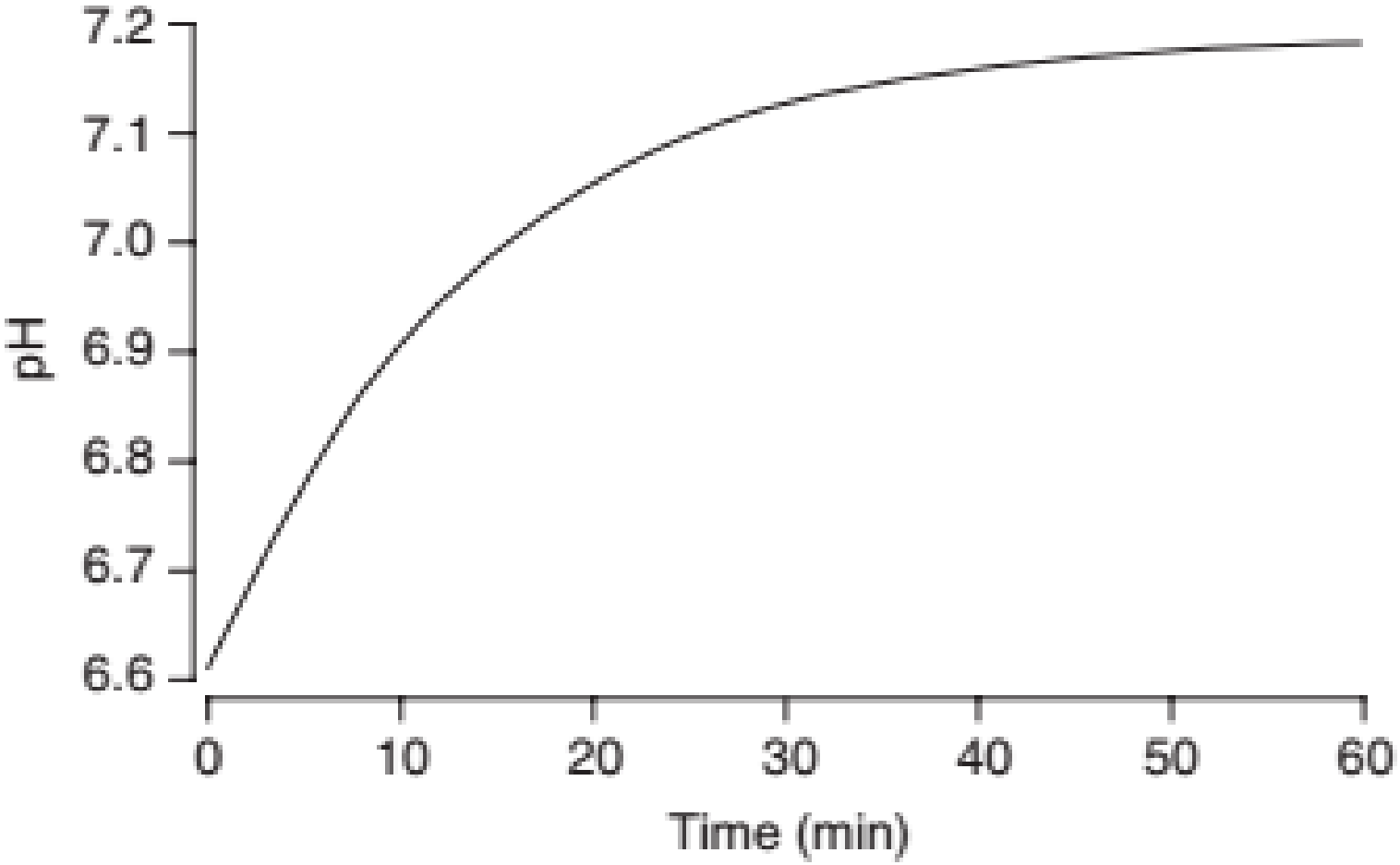


Fig. 4. Time course of muscle pH during passive recovery from 6 minutes of exhaustive dynamic exercise.[84]

LIETUVOS SPORTO UNIVERSITETAS

Sports Med
DOI 10.1007/s40279-013-0029-x

REVIEW ARTICLE

High-Intensity Interval Training, Solutions to the Programming Puzzle

Part I: Cardiopulmonary Emphasis

Martin Buchheit · Paul B. Laursen

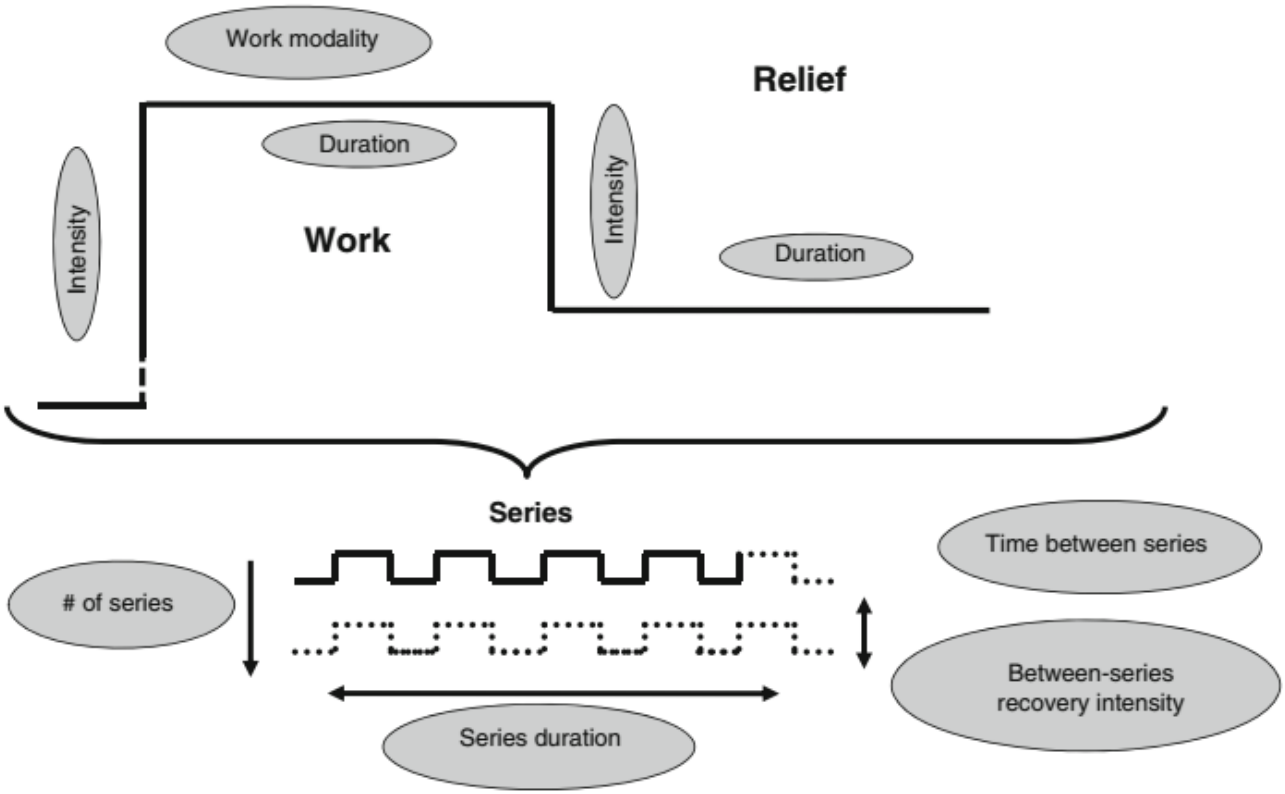
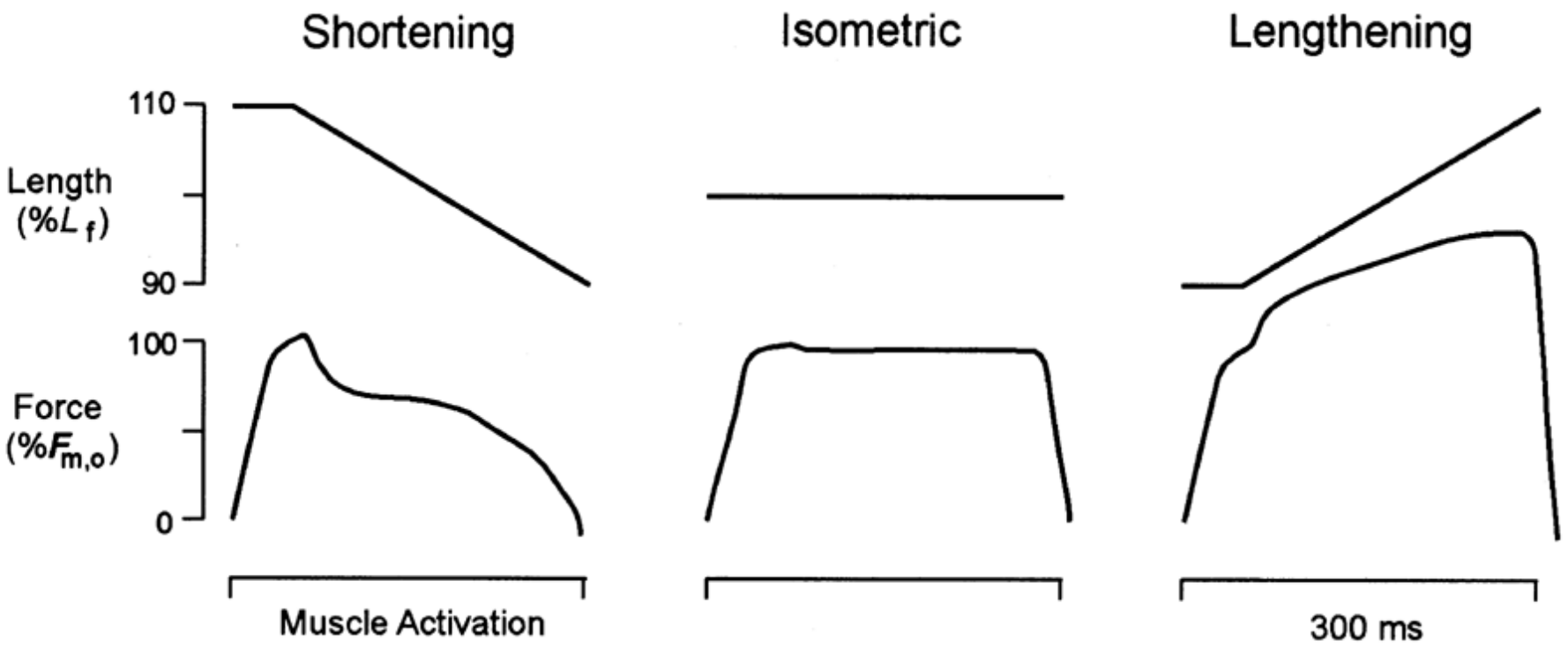


Fig. 2 Schematic illustration of the nine variables defining a HIT session adapted from Buchheit [35]. *HIT* high-intensity interval training

Trečiasis!

Raumens darbo rėžimai?

Figure 6.32



Redrawn from McCully & Faulkner, 1985

Eccentric contractions require unique activation strategies by the nervous system

ROGER M. ENOKA

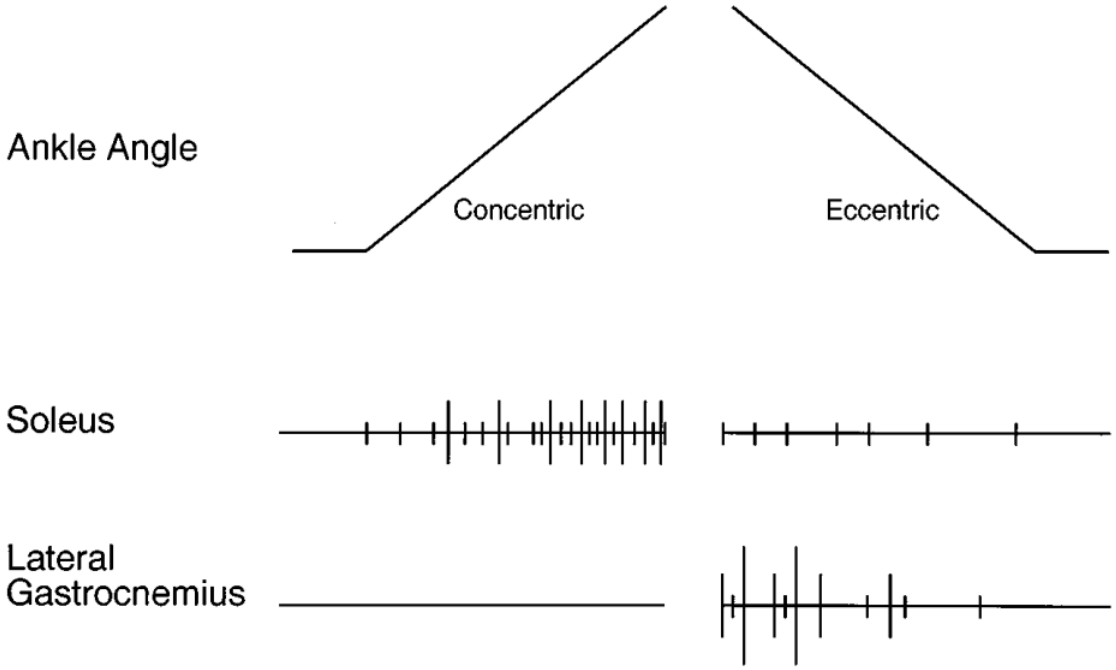
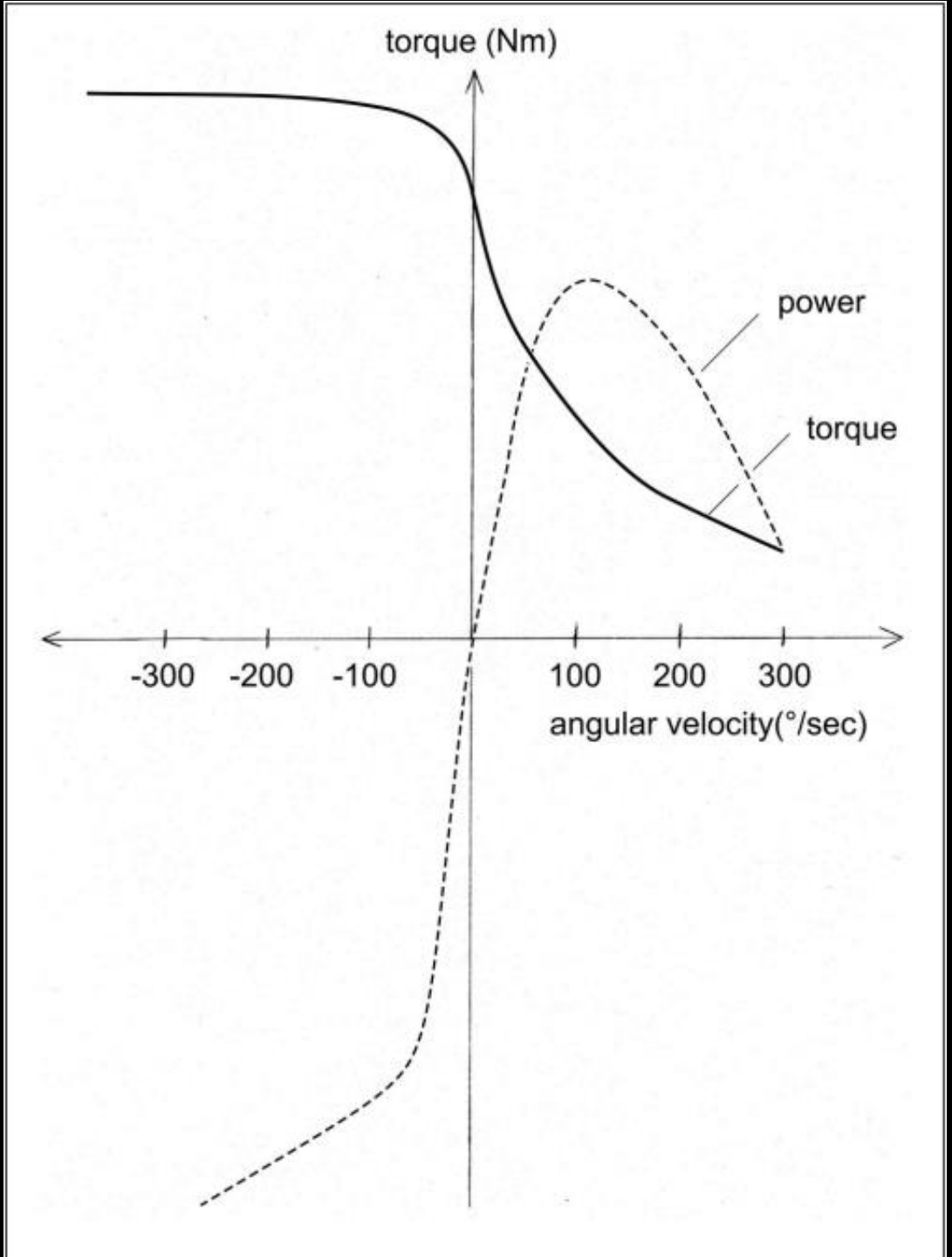


Fig. 4. Motor unit activity (idealized action potentials) in soleus and lateral gastrocnemius muscles of a human volunteer as ankle angle increased (concentric contraction) and decreased (eccentric contraction) to raise and lower a load. Eccentric contractions involved activation of high-threshold motor units with large-amplitude action potentials (see Ref. 31).



frontiers in Physiology

REVIEW
published: 16 November 2016
doi: 10.3389/fphys.2016.00483

Moderate Load Eccentric Exercise; A Distinct Novel Training Modality

Hans Hoppeler **

Eccentric contractions require unique activation strategies by the nervous system

ROGER M. ENOKA

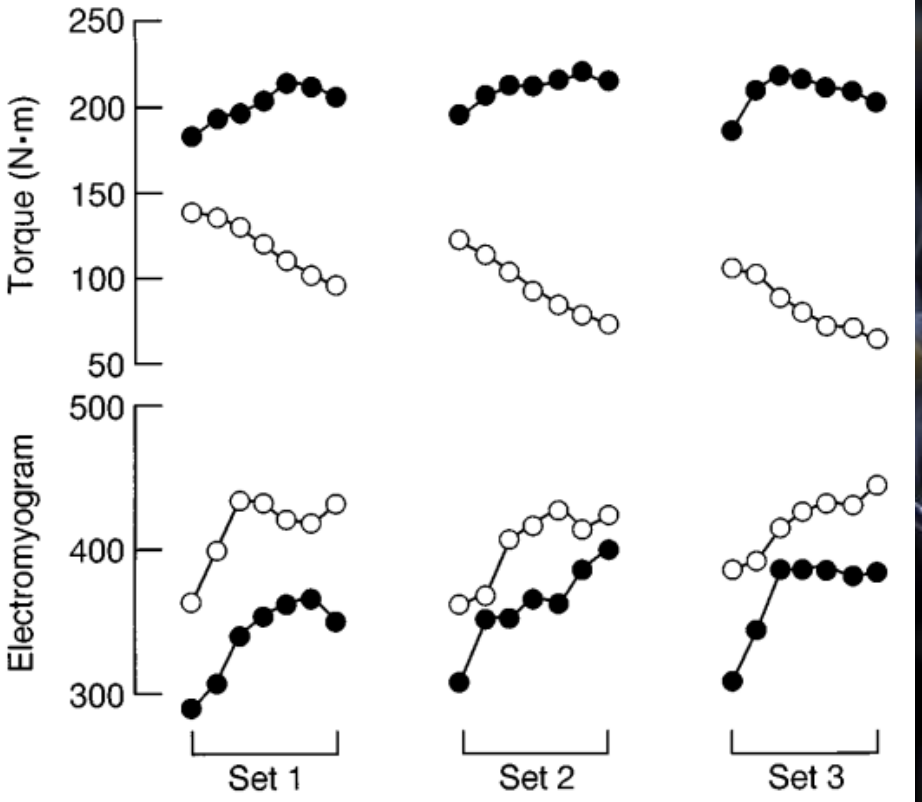


Fig. 5. Torque exerted by knee extensor muscles and EMG recorded in vastus lateralis muscle during 3 sets of 32 maximal contractions performed on an isokinetic device (see Ref. 44). ●, Eccentric contractions; ○, concentric contractions.

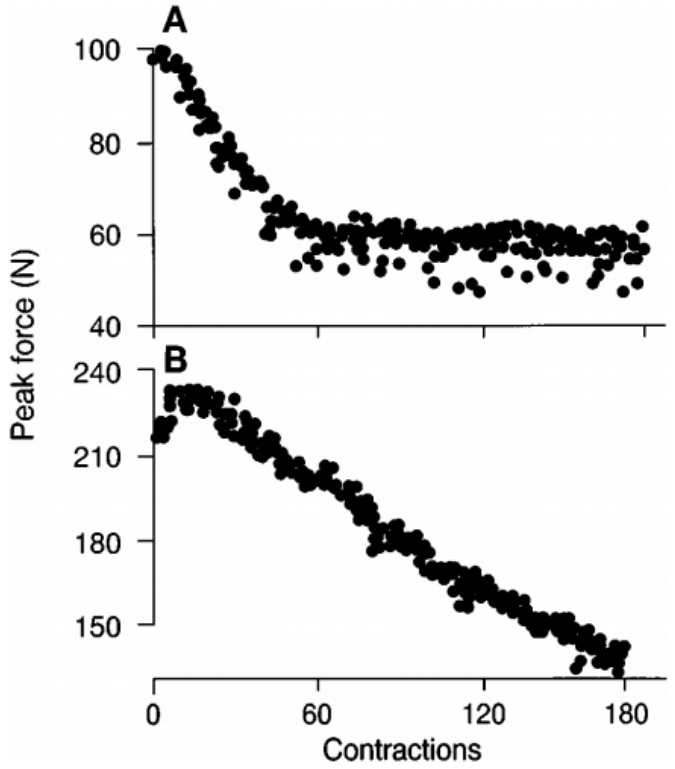


Fig. 6. Decline in force during concentric (*A*) and eccentric (*B*) contractions performed by quadriceps femoris muscle. Muscle was activated by percutaneous electrical stimulation, and contractions were performed on an isokinetic dynamometer. [Redrawn from Binder-Macleod and Lee (5)]

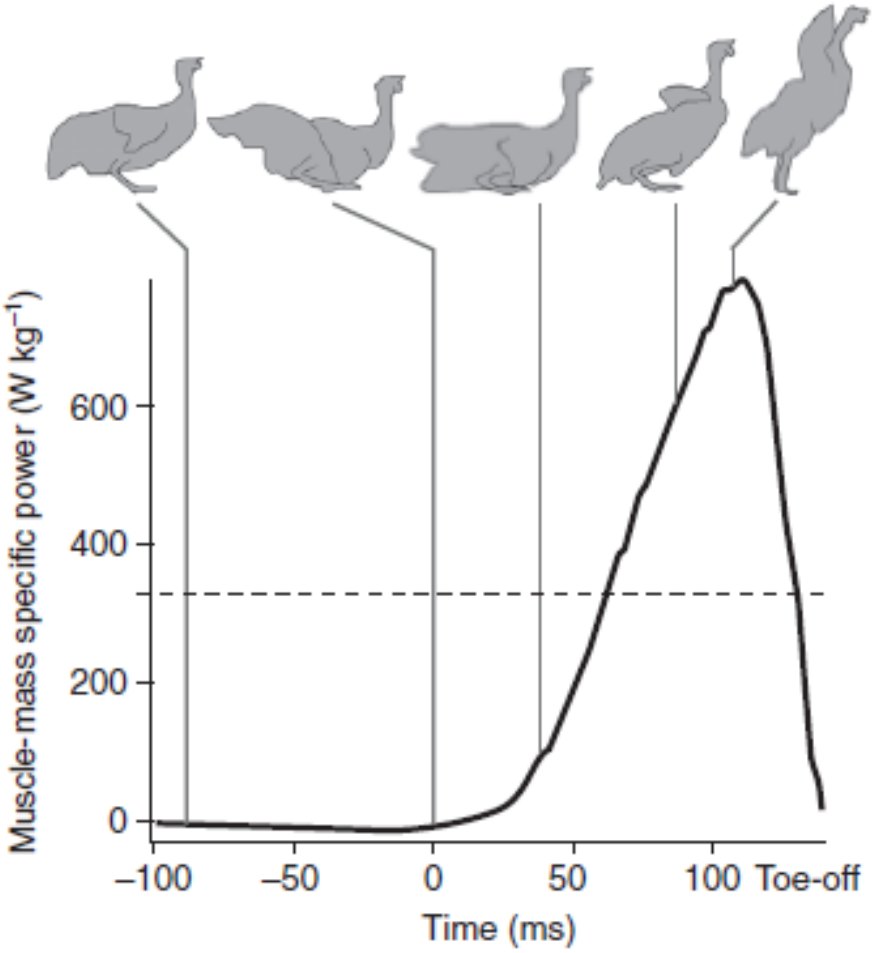


Fig. 4. Profiles of amplified power. Muscle-mass specific power output in a jumping guinea fowl. The power developed during a jump shows an asymmetric profile with peak power occurring late in the jump. In addition, the power achieved during the jump exceeds the estimated peak power output of the hindlimb muscles (dotted line) by more than a factor of two. Taken together, the patterns observed in this jump are consistent with the use of elastic mechanisms to amplify power output (modified from Henry et al., 2005).

The Journal of Experimental Biology 214, 353-361
© 2011. Published by The Company of Biologists Ltd
doi:10.1242/jeb.038588

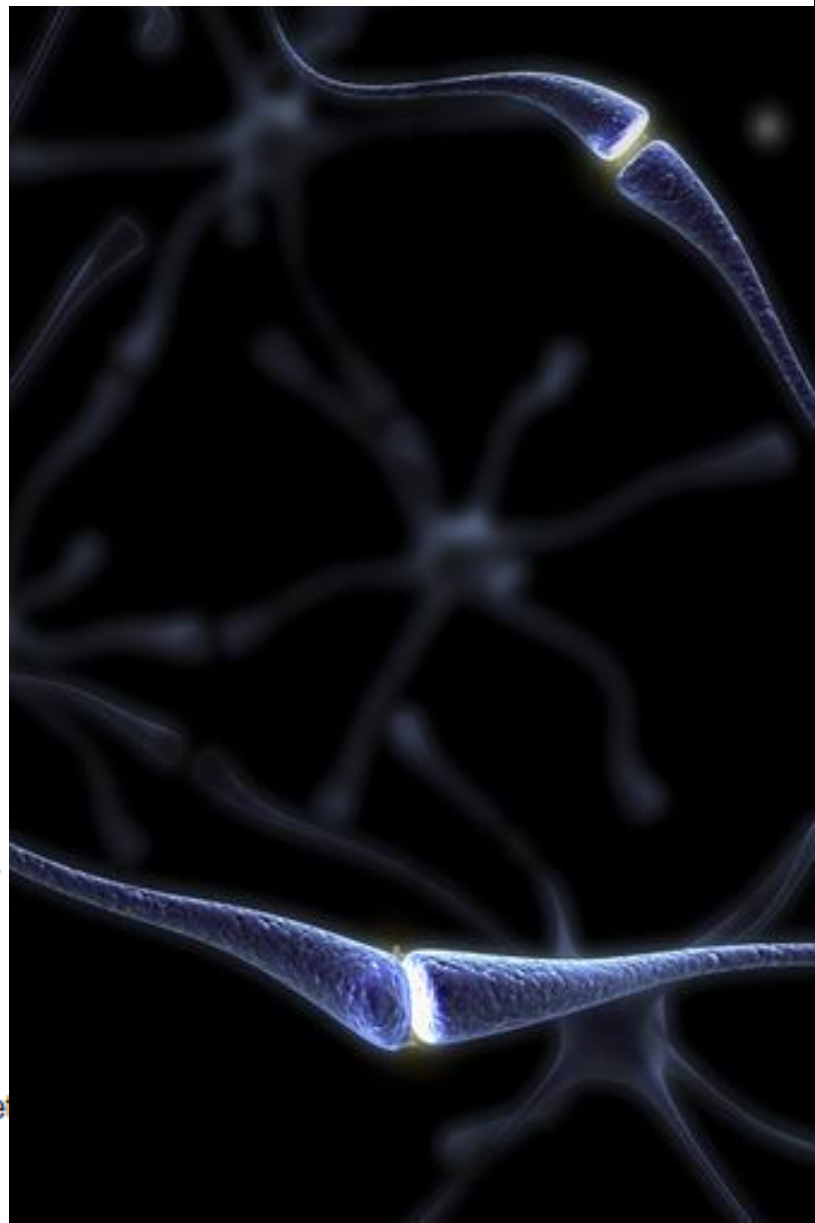
COMMENTARY

Flexible mechanisms: the diverse roles of biological springs in vertebrate movement

Thomas J. Roberts[1,*] and Emanuel Azizi[2]

[1]Department of Ecology and Evolutionary Biology, Brown University, Providence, RI 02912, USA and [2]Department of Biology, The College of New Jersey, Ewing, NJ 08628, USA

*Author for correspondence (roberts@brown.edu)



Annu. Rev. Physiol. 2017. 79:4.1–4.22

Huxleys' Missing Filament: Form and Function of Titin in Vertebrate Striated Muscle

Stan Lindstedt[1] and Kiisa Nishikawa[2]

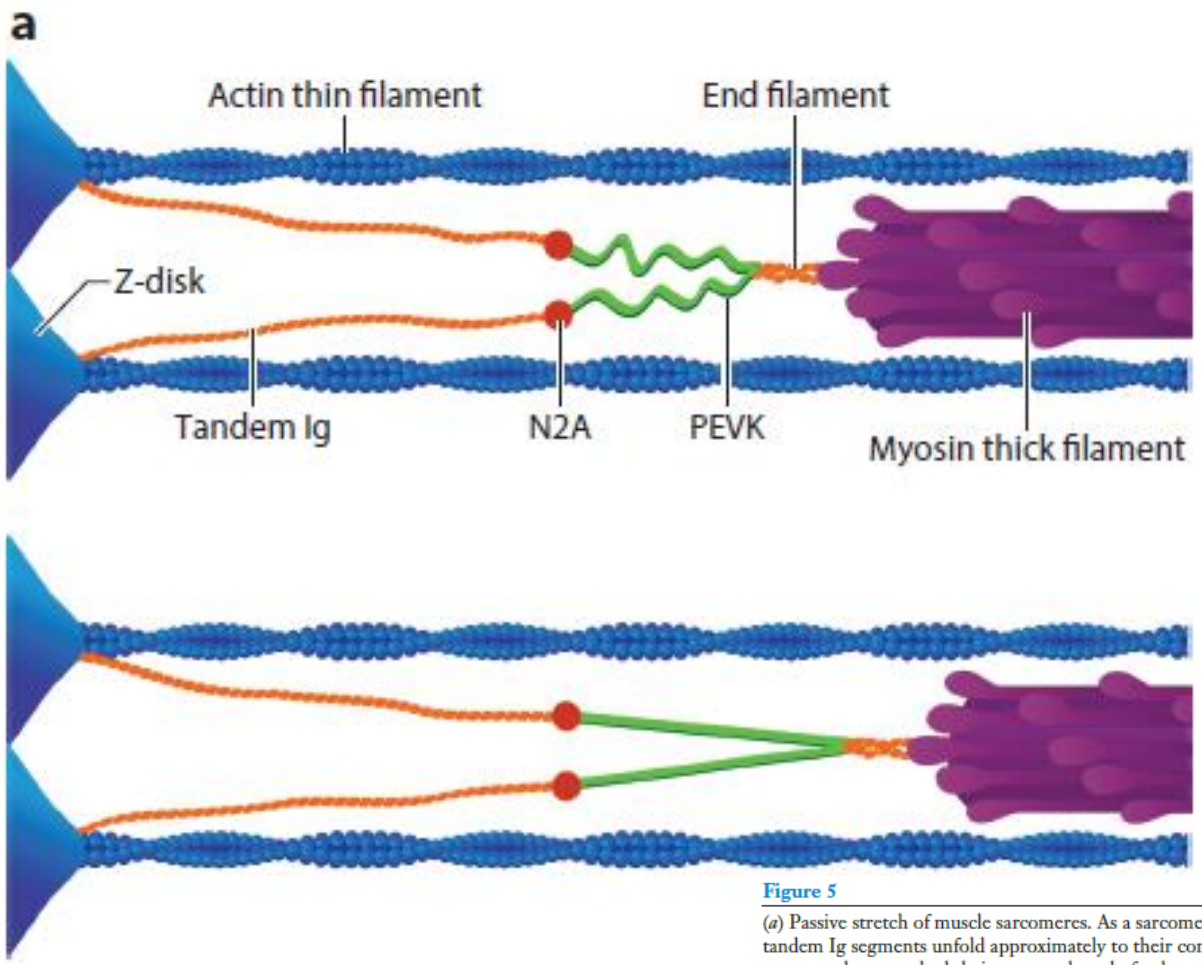


Figure 5

(*a*) Passive stretch of muscle sarcomeres. As a sarcomere is stretched beyond its slack length, the proximal tandem Ig segments unfold approximately to their contour length (*above*). After the proximal tandem Ig segments have reached their contour length, further stretching extends the PEVK segment (*below*). Adapted from Granzier & Labeit (58). (*b*) Active stretch of muscle sarcomeres. Upon activation, N2A titin binds to actin (*above*). Only the PEVK segment (*green*) extends when active muscle is stretched (*below*), due to binding of N2A to thin filaments. Reproduced with permission from Nishikawa et al. (99). Copyright 2012, The Company of Biologists Ltd. Abbreviations: Ig, immunoglobulin; PEVK, proline-glutamate-valine-lysine.

Annu. Rev. Physiol. 2017. 79:4.1–4.22

Huxleys' Missing Filament: Form and Function of Titin in Vertebrate Striated Muscle

Stan Lindstedt[1] and Kiisa Nishikawa[2]

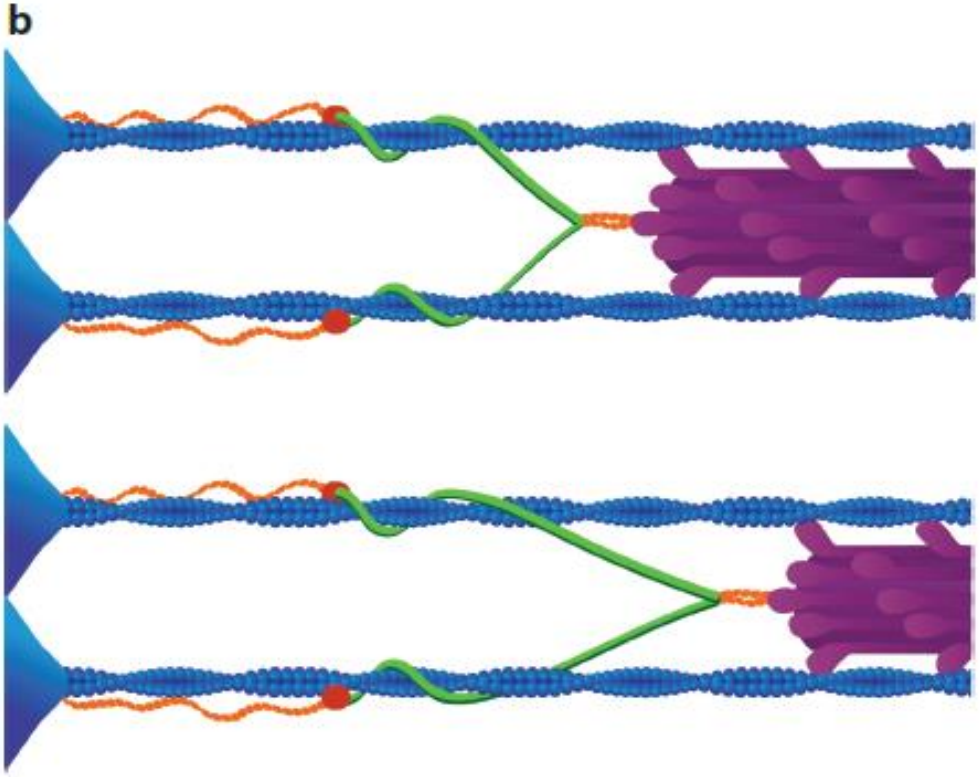
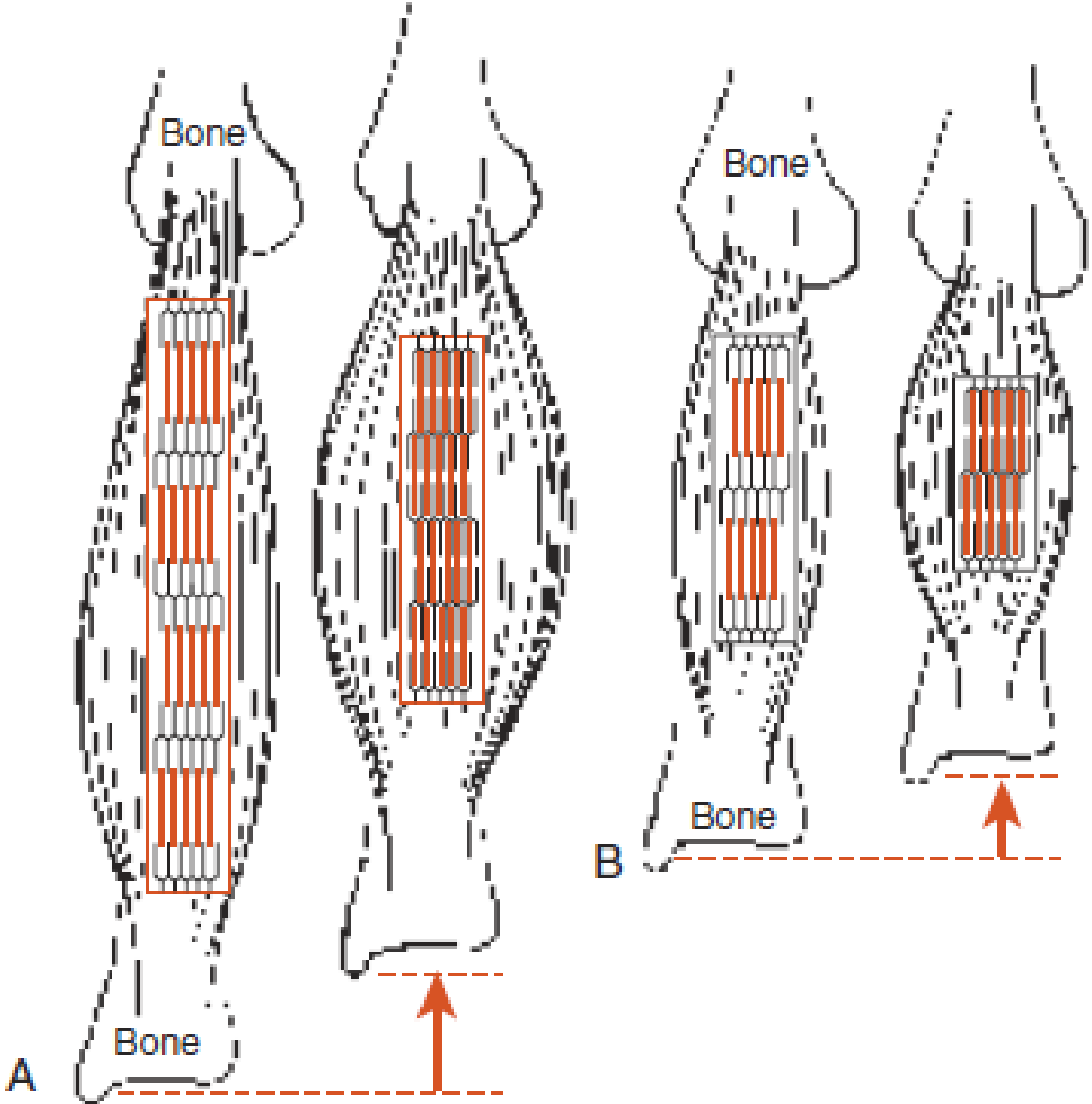


Figure 5

(*a*) Passive stretch of muscle sarcomeres. As a sarcomere is stretched beyond its slack length, the proximal tandem Ig segments unfold approximately to their contour length (*above*). After the proximal tandem Ig segments have reached their contour length, further stretching extends the PEVK segment (*below*). Adapted from Granzier & Labeit (58). (*b*) Active stretch of muscle sarcomeres. Upon activation, N2A titin binds to actin (*above*). Only the PEVK segment (*green*) extends when active muscle is stretched (*below*), due to binding of N2A to thin filaments. Reproduced with permission from Nishikawa et al. (99). Copyright 2012, The Company of Biologists Ltd. Abbreviations: Ig, immunoglobulin; PEVK, proline-glutamate-valine-lysine.


Bone
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A
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frontiers in Physiology
REVIEW
published: 04 July 2017
doi: 10.3389/fphys.2017.00447

Skeletal Muscle Remodeling in Response to Eccentric vs. Concentric Loading: Morphological, Molecular, and Metabolic Adaptations

Martino V. Franchi[1,2*], Neil D. Reeves[2] and Marco V. Narici[1]

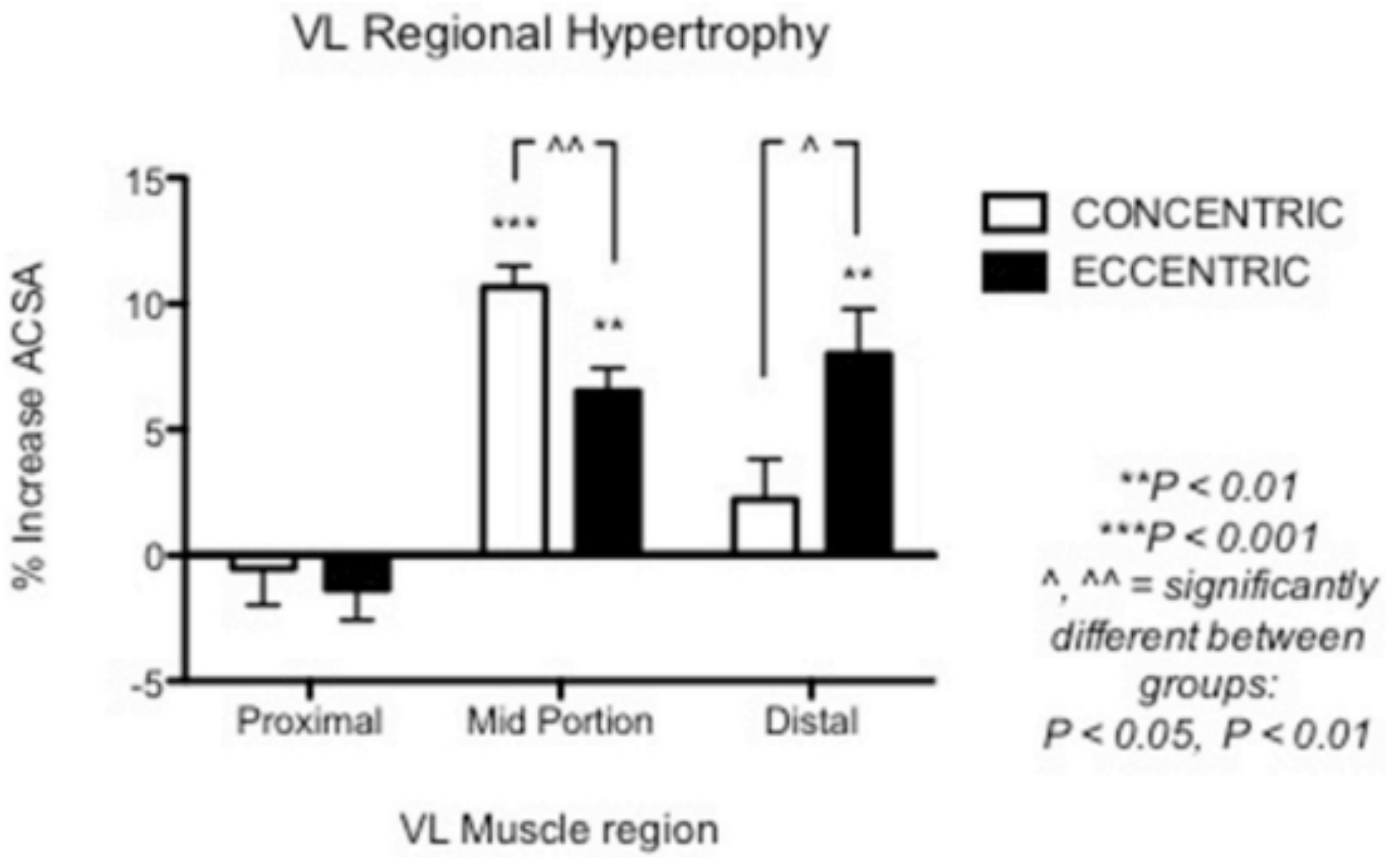
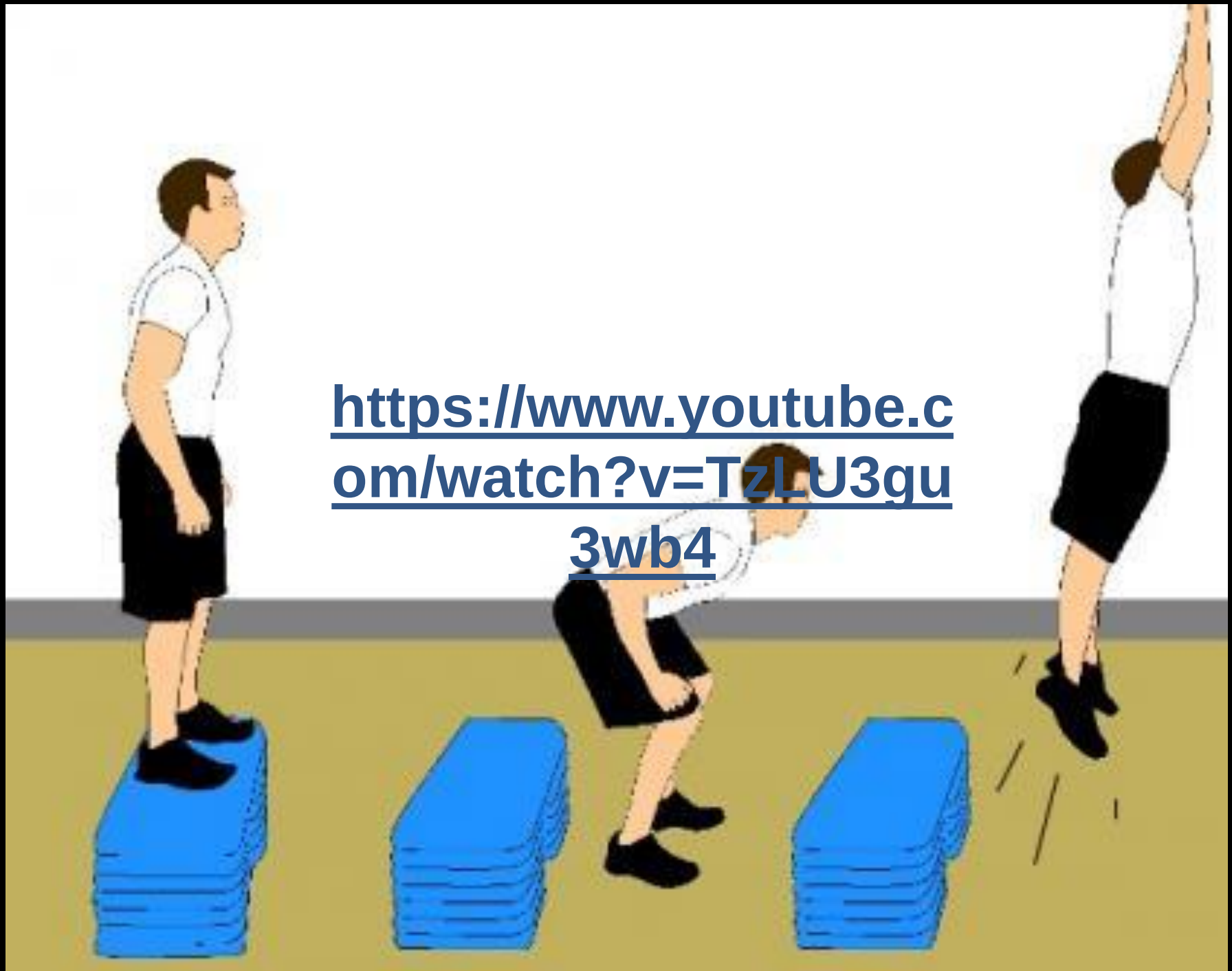


FIGURE 3 | From Franchi et al. (2014): VL Regional hypertophic adaptations to ECC vs. CON RT programs are shown, ECC resulting in greater distal hypertrophy while CON presents larger mid muscle belly increase of CSA.

SSC – balistiniai pratimai

https://www.youtube.com/watch?v=AVmi6gjMdvs


https://www.youtube.com/watch?v=TzLU3gu3wb4

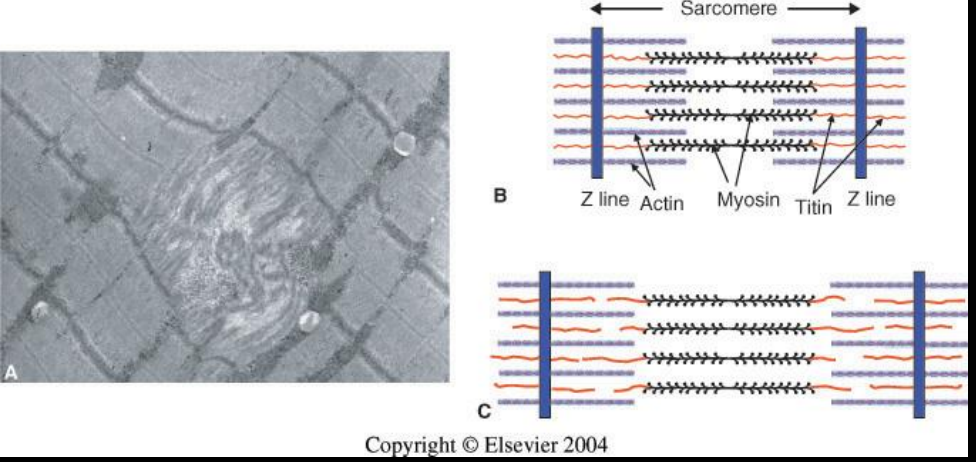
3025
163
jamaica
2148

https://www.youtube.com/watch?v=-WweTmSXkkE

Kas greičiausas pasaulyje?

https://www.youtube.com/watch?v=js_Y4erhdPE

No Pain, No Gain!



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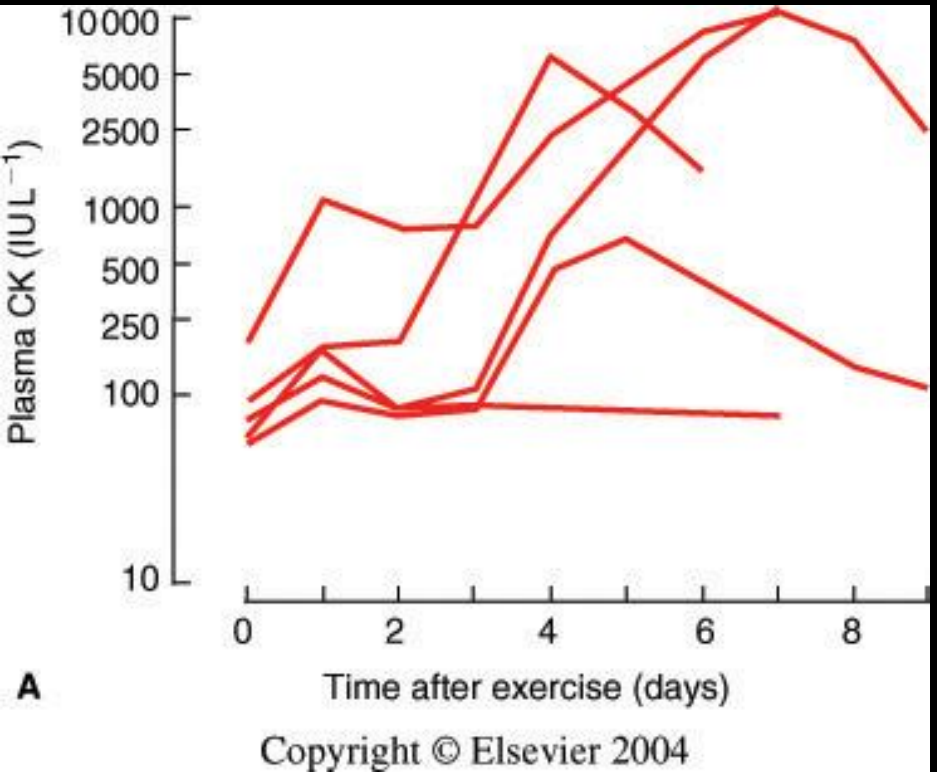

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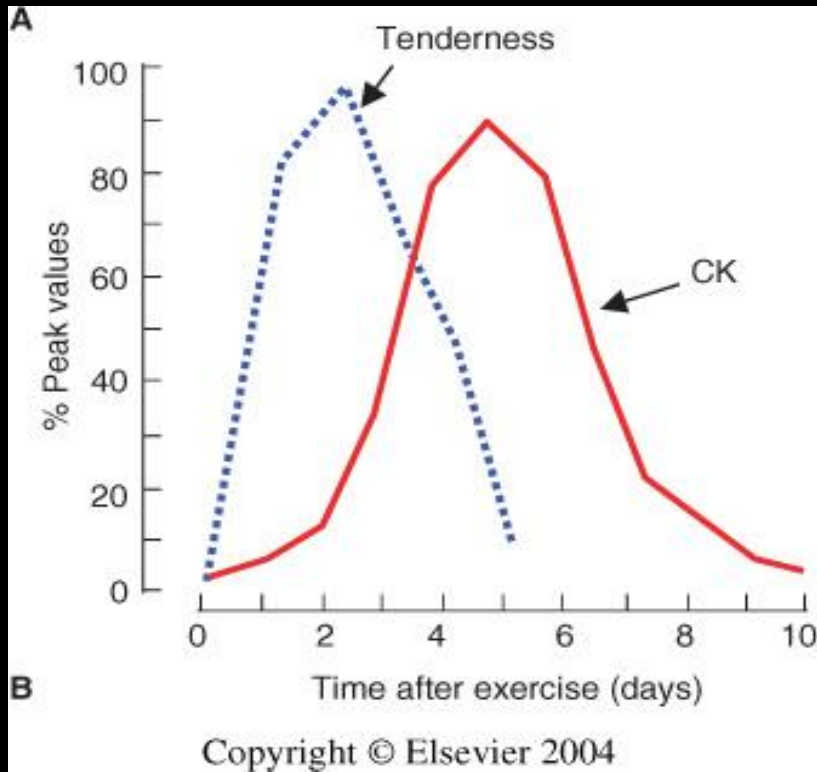

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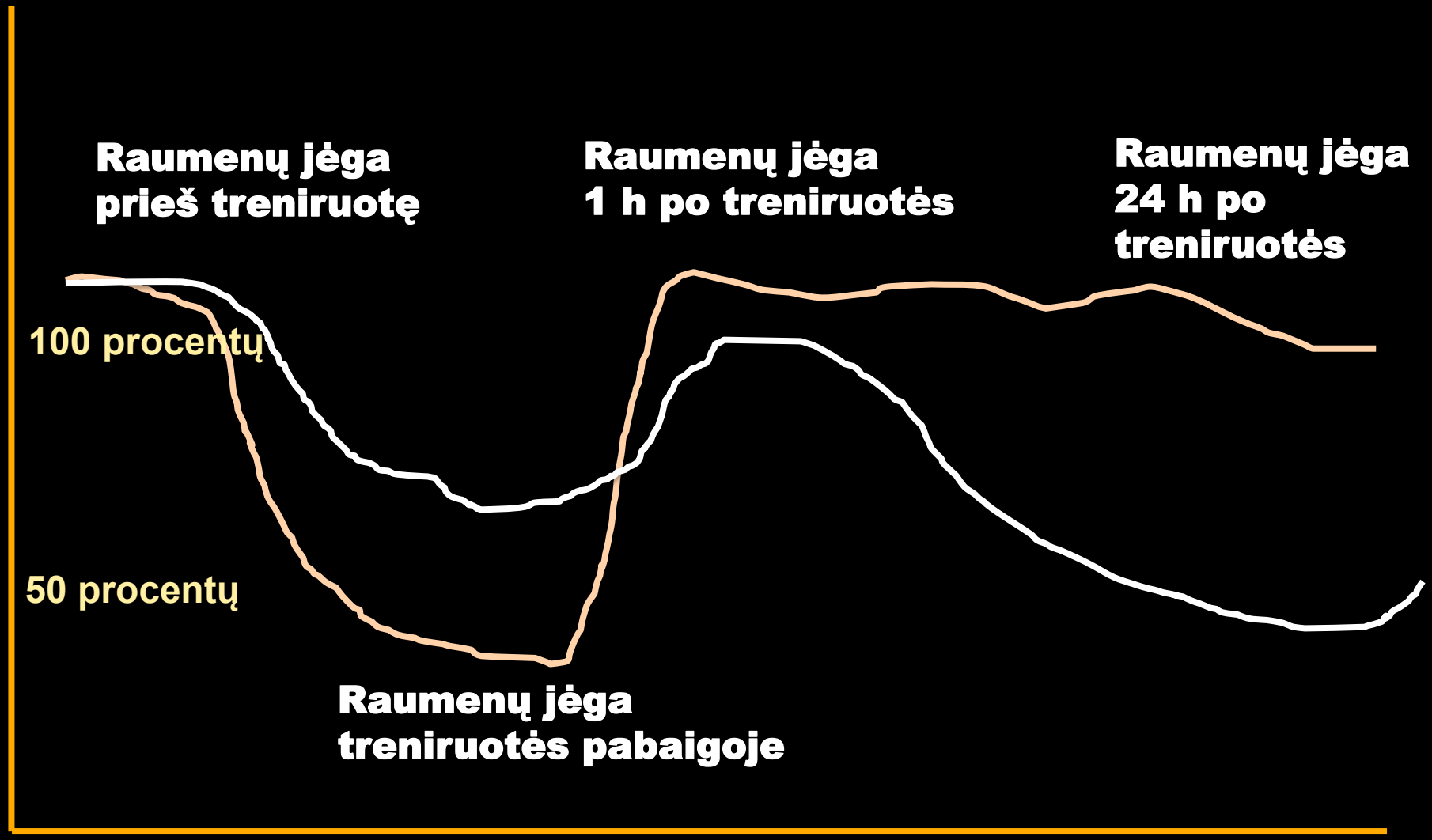

Raumenų jėga
prieš treniruotę
Raumenų jėga
1 h po treniruotės
Raumenų jėga
24 h po
treniruotės
100 procentų
50 procentų
Raumenų jėga
treniruotės pabaigoje

RICES technologija

- Rest
- Ice
- Compression
- Elevation
- Stabilization

Raumems šildymas!

Naujausi tyrimai parodė, kad raumens šildymas (priešingai nei šaldymas) pagreitina raumenų jėgos ir raumenų ištvermės atsigavimą po varginančio fizinio krūvio, kuris nesukelia raumenų mechaninės pažeidos (raumens skausmo)

(Cheng et al. 2017: *J Physiol. 2017 Oct 4. doi: 10.1113/JP274870. Post-exercise recovery of contractile function and endurance in humans and mice is accelerated*

Ketvirtasis!

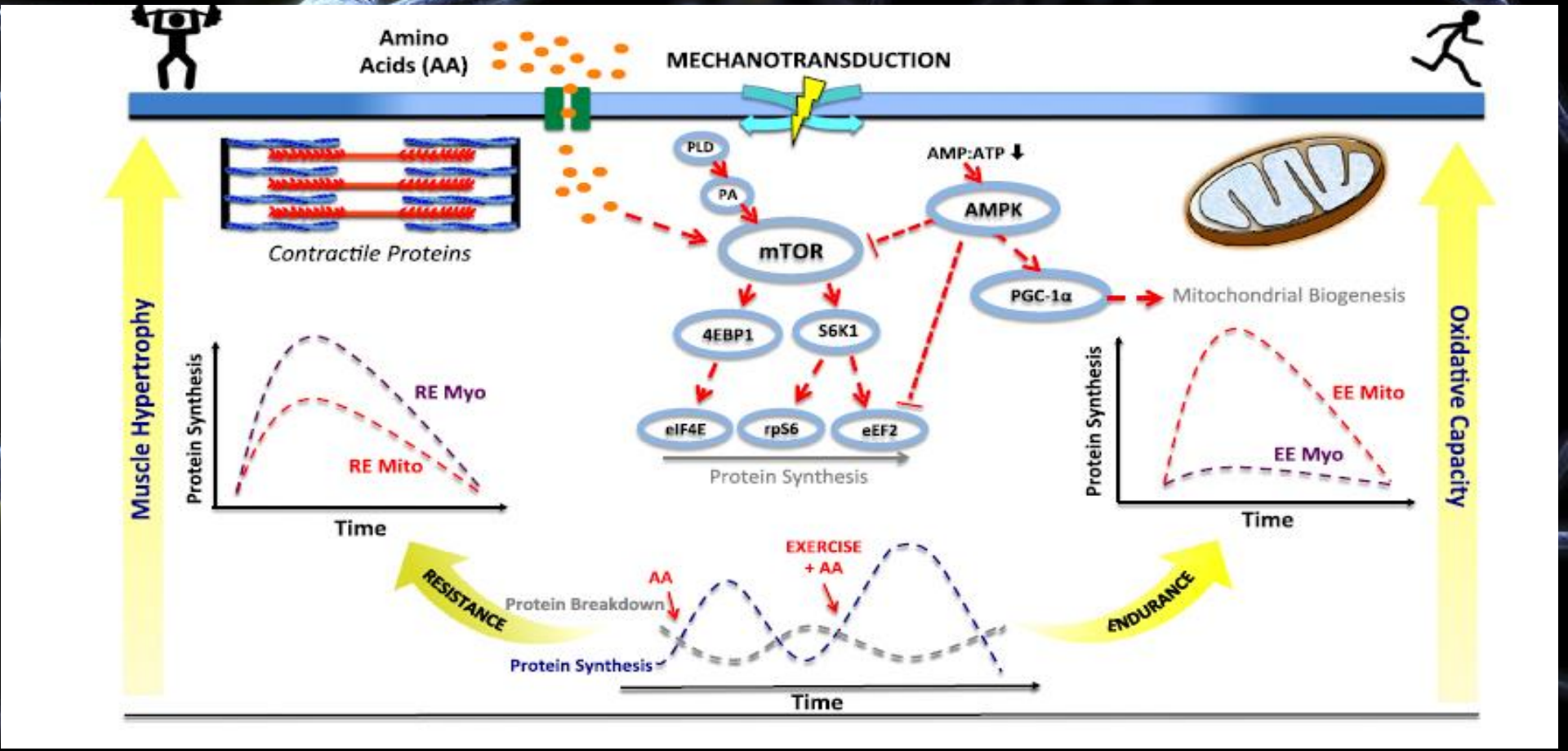
Nervų-raumenų plastiškumas!

ACTA PHYSIOLOGICA
Acta Physiol 2016, 216, 15–41

REVIEW

Skeletal muscle homeostasis and plasticity in youth and ageing: impact of nutrition and exercise

M. S. Brook,[1,*] D. J. Wilkinson,[1,*] B. E. Phillips,[1] J. Perez-Schindler,[2] A. Philp,[2] K. Smith[1] and P. J. Atherton[1]



2013 American Physiological

Mechanisms Modulating Skeletal Muscle Phenotype

Bert Blaauw,[1,2] Stefano Schiaffino,[2,3] and Carlo Reggiani[*1,3]*

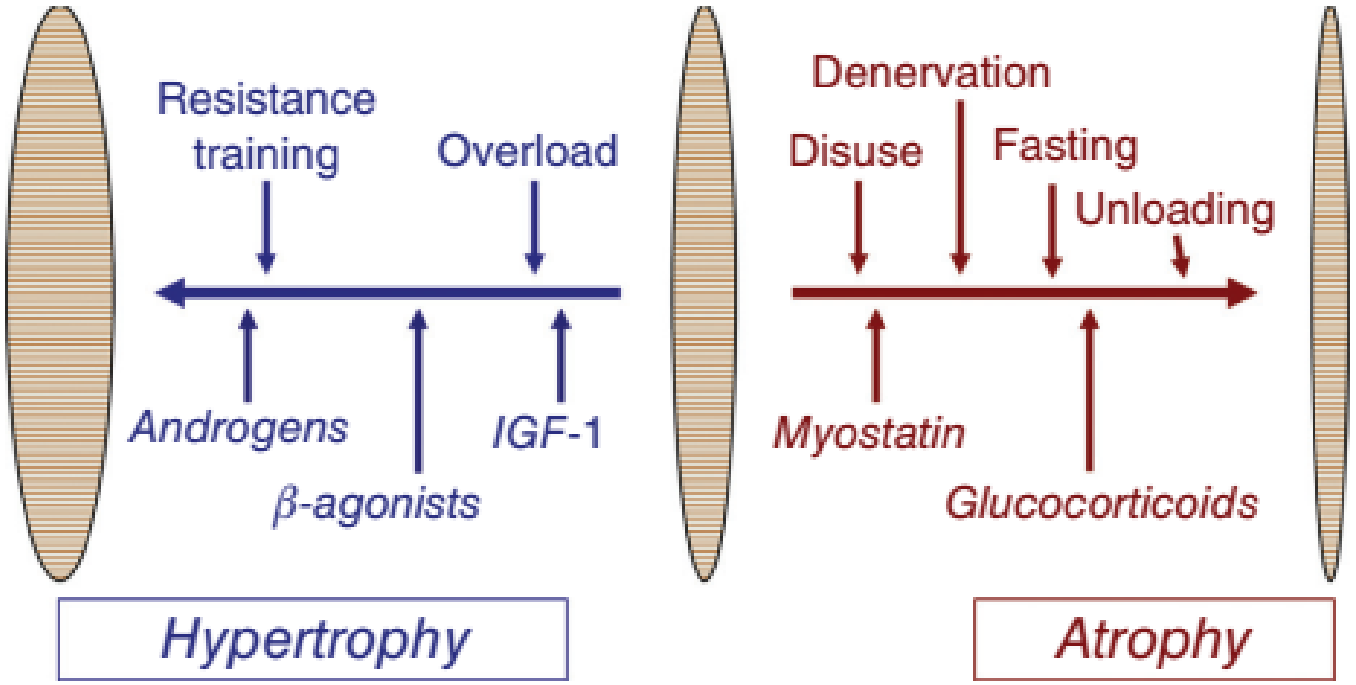
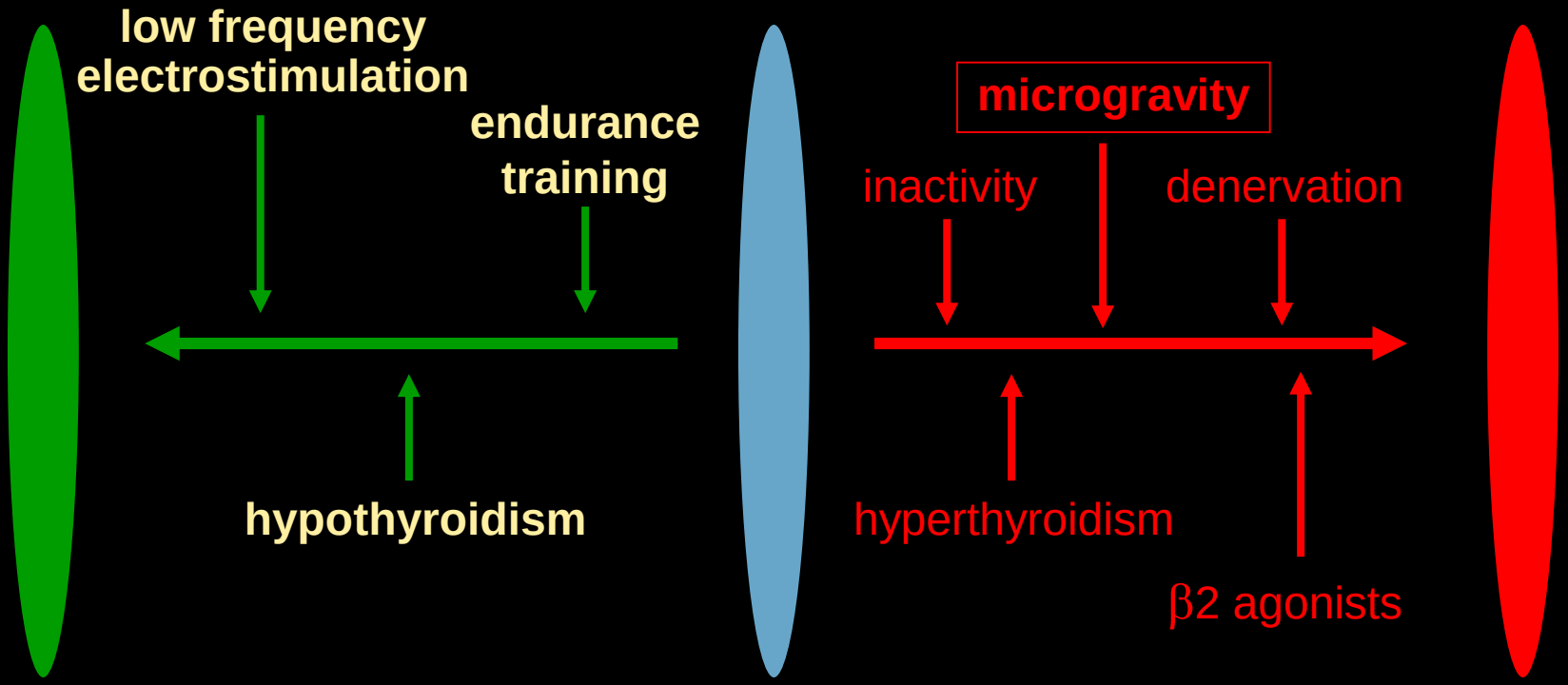


Figure 5 Summary of some conditions and factors able to induce skeletal muscle hypertrophy and atrophy. Overload: functional overload imposed by elimination of synergistic muscles; unload: muscle unloading induced by hindlimb suspension or in conditions of microgravity.

Factors controlling the fast/slow muscle phenotype



Slow-oxidative phenotype

Fast-glycolytic phenotype

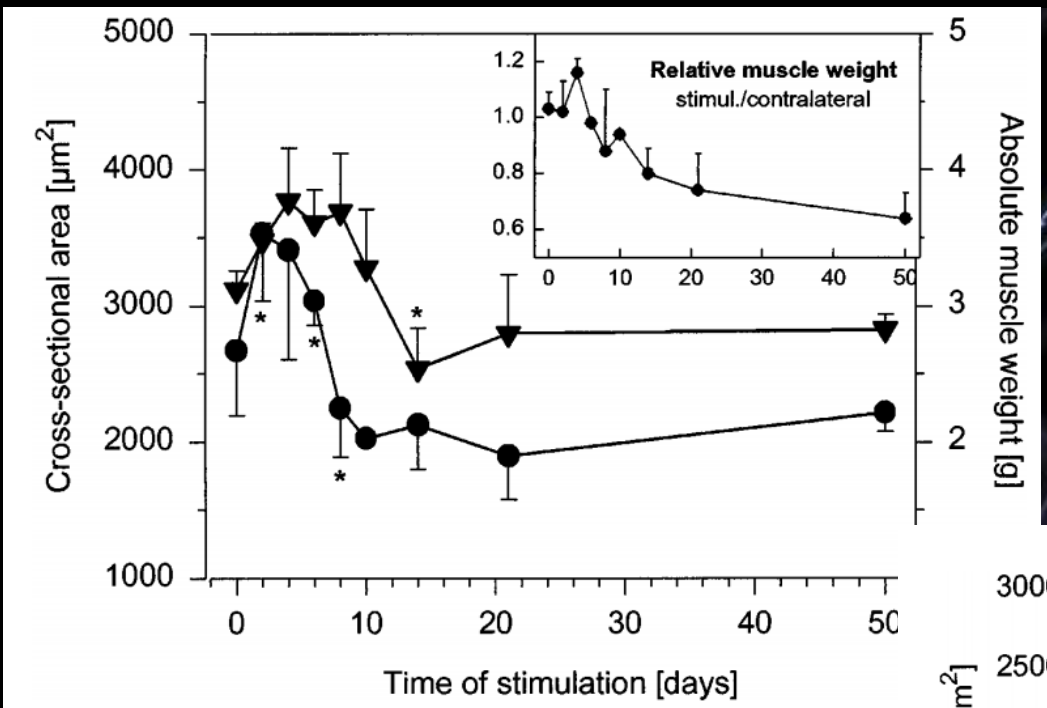
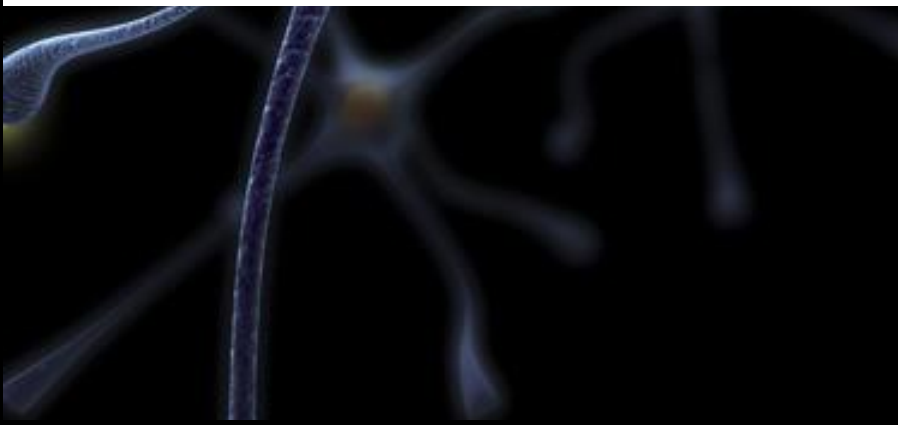
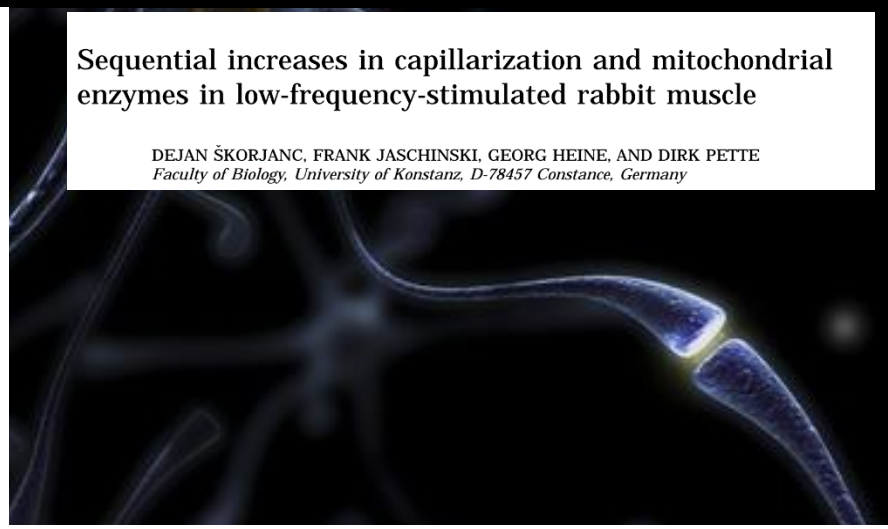


Fig. 3. Time-dependent changes in muscle weight (▼) and in of chronically stimulated rabbit tibialis anterior (TA) musc weight changes of stimulated muscles were referred to the v contralateral muscles. * Significant differences between tim ($P < 0.05$).





Sequential increases in capillarization and mitochondrial enzymes in low-frequency-stimulated rabbit muscle

DEJAN ŠKORJANC, FRANK JASCHINSKI, GEORG HEINE, AND DIRK PETTE
Faculty of Biology, University of Konstanz, D-78457 Constance, Germany

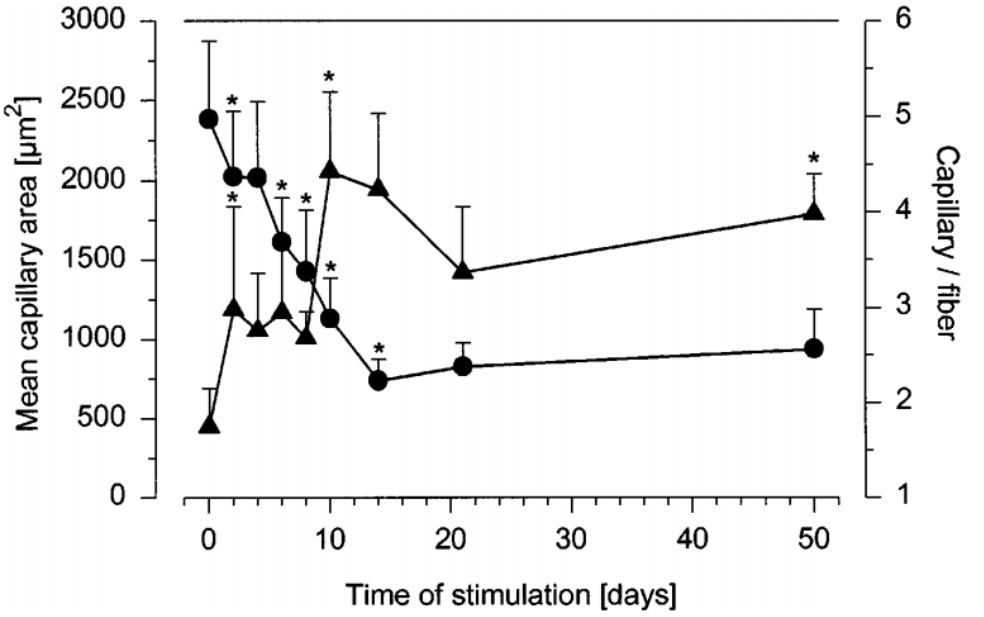


Fig. 5. Time course of changes in mean capillary area (●) and capillary-to-fiber ratio (▲) in low-frequency-stimulated rabbit TA muscle. * Significant differences between time points ($P < 0.05$).

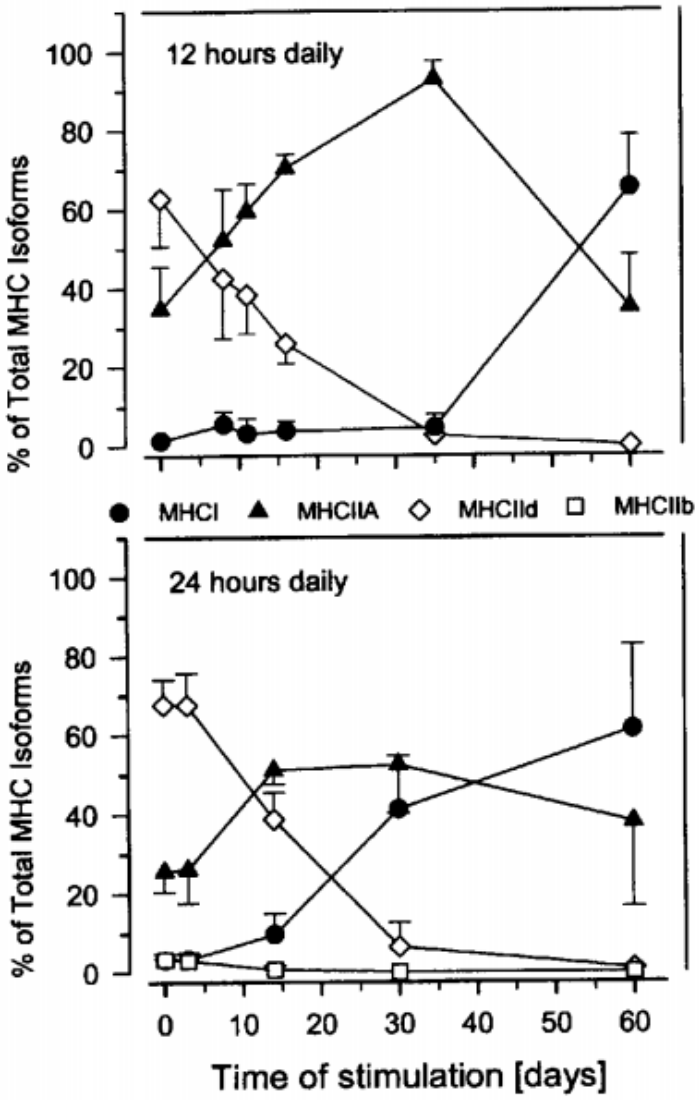
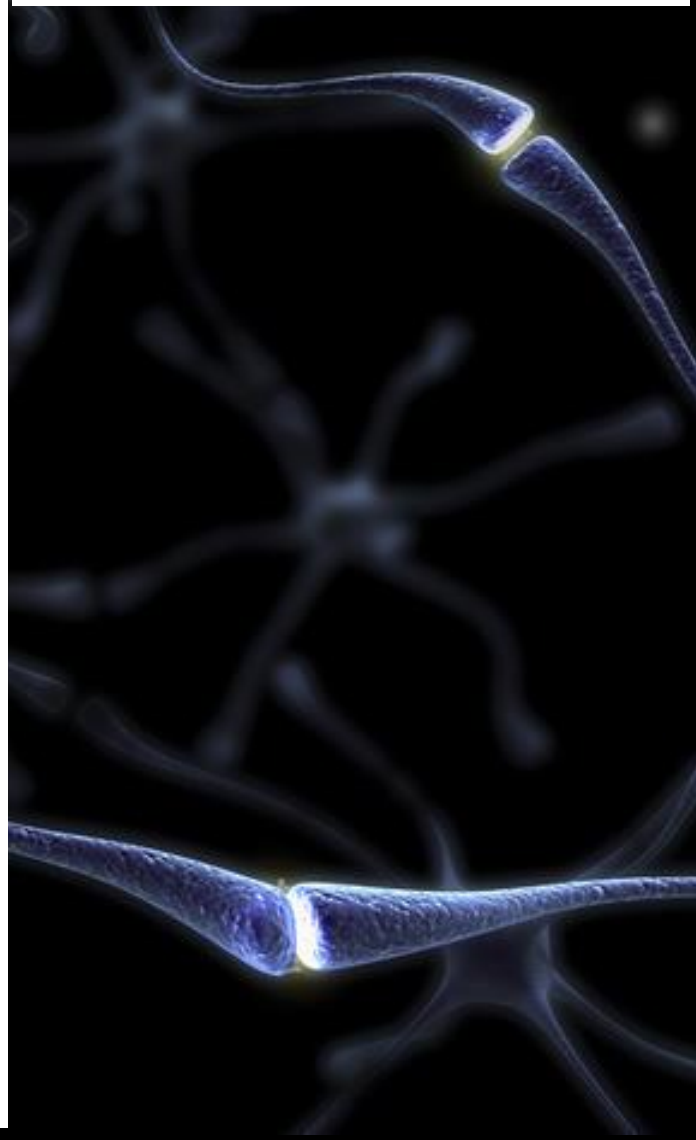


Figure 4. Time-dependent changes in relative concentrations of MHC isoforms in rabbit tibialis anterior muscle exposed to intermittent (12 hours per day) or continuous (24 hours per day) low-frequency (10 Hz) stimulation. Values are means ± SD. Modified from Peuker et al., 1999.

The Adaptive Potential of Skeletal Muscle Fibers

Dirk Pette



The Adaptive Potential of Skeletal Muscle Fibers

Dirk Pette

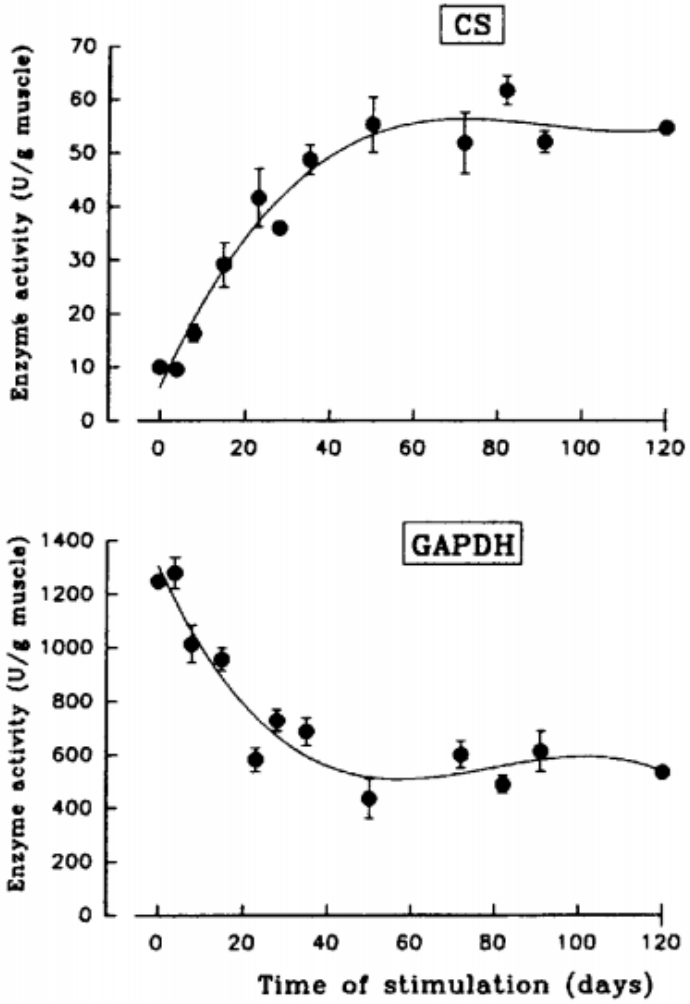


Figure 9. Time course of changes in the activity levels of two representative enzymes of aerobic-oxidative (citrate synthase, CS) and anaerobic-glycolytic (glyceraldehyde-phosphate dehydrogenase, GAPDH) energy metabolism in rabbit tibialis anterior muscle exposed to low-frequency (10 Hz, 12 hours daily) stimulation. Values are means ± SE, n = 3-5 for each time point. Modified from Hood and Pette, 1989.

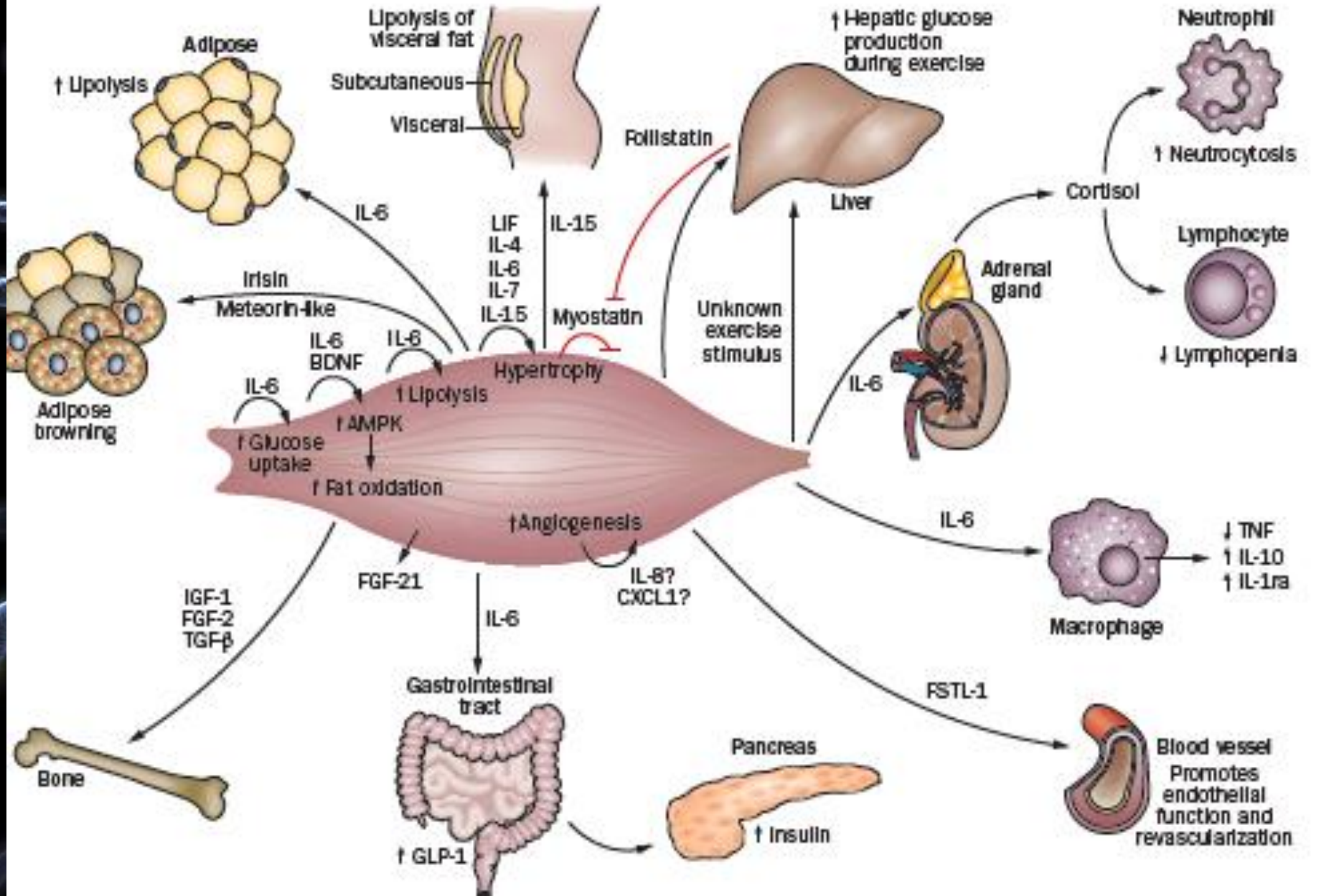
Pratimai, BDNF ir irizinas, neurogenezė!

https://www.ted.com/talks/gregoire_courtine_the_paralyzed_rat_that_walked/transcript?language=en#t-934295

Benatti, F. B. & Pedersen, B. K. Nat. Rev. Rheumatol. 11, 86–97 (2015);

Exercise as an anti-inflammatory therapy for rheumatic diseases—myokine regulation

Fabiana B. Benatti and Bente K. Pedersen



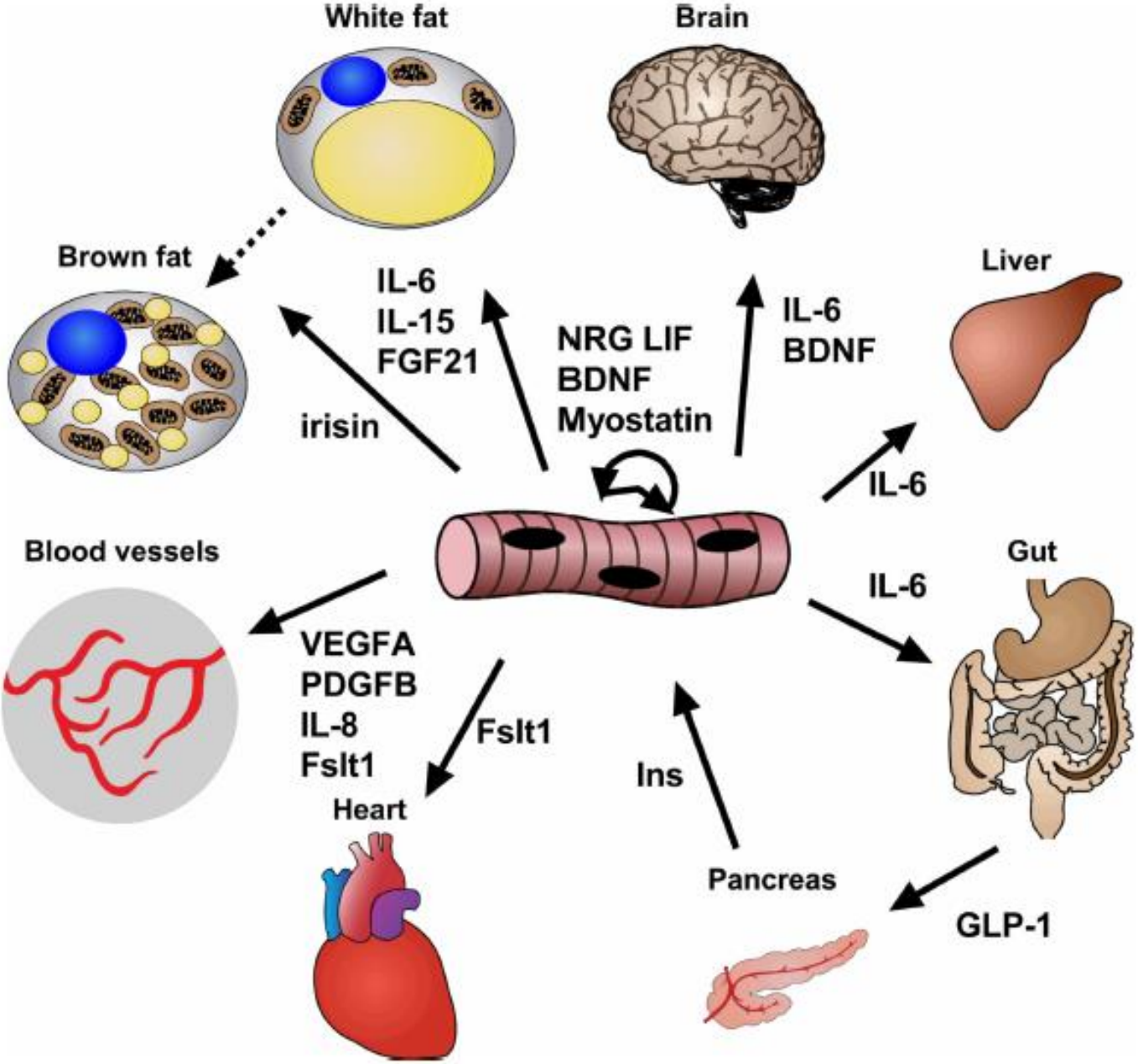
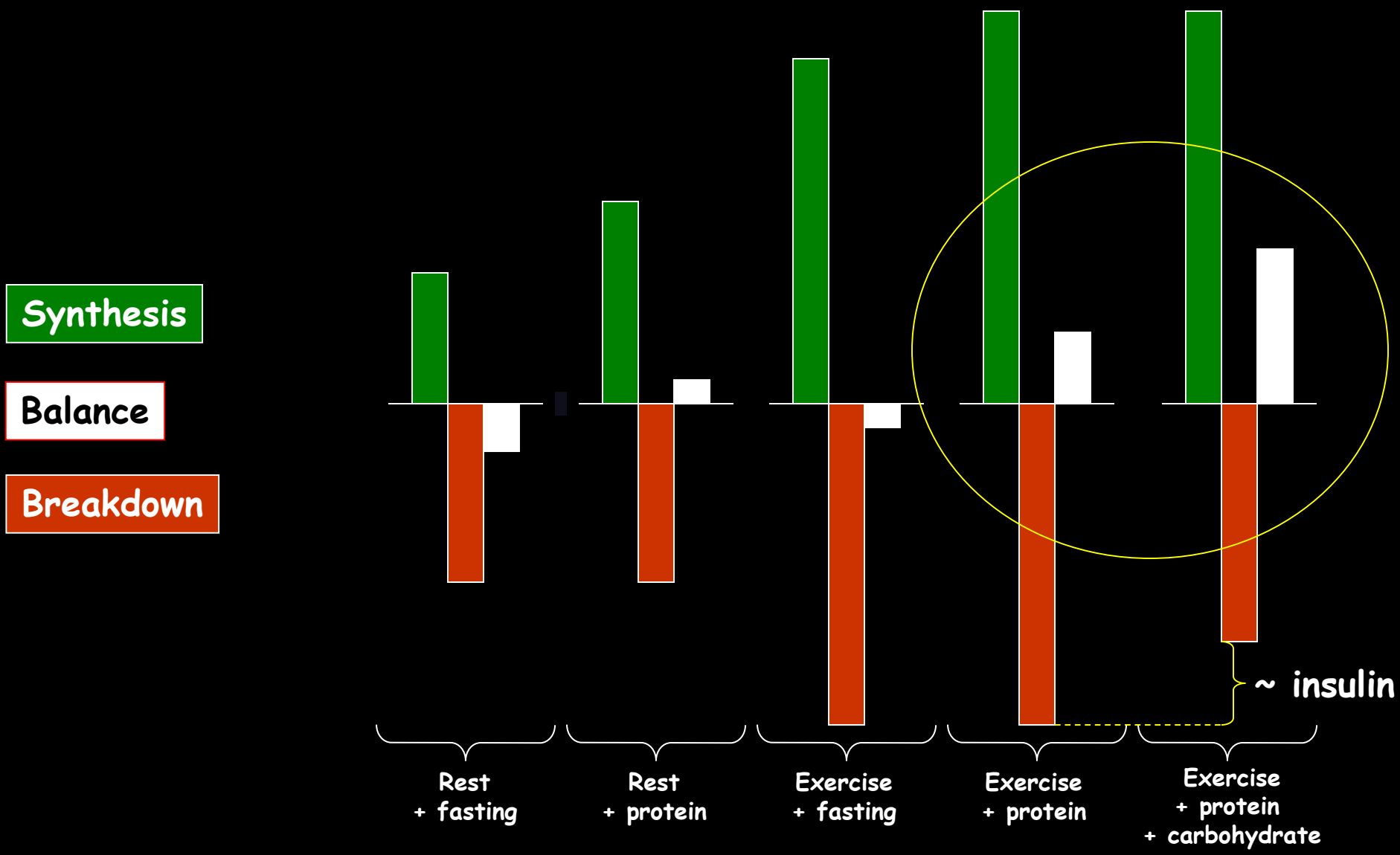


Figure 5.
Muscle as an endocrine organ. Exercise triggers the secretion from muscle of numerous factors that impinge on systemic function. See text for details.

Pratimai ir mityba



Muzika ir smegenų potenciacija!

https://www.youtube.com/watch?v=GRxofEmo3HA&t=735s

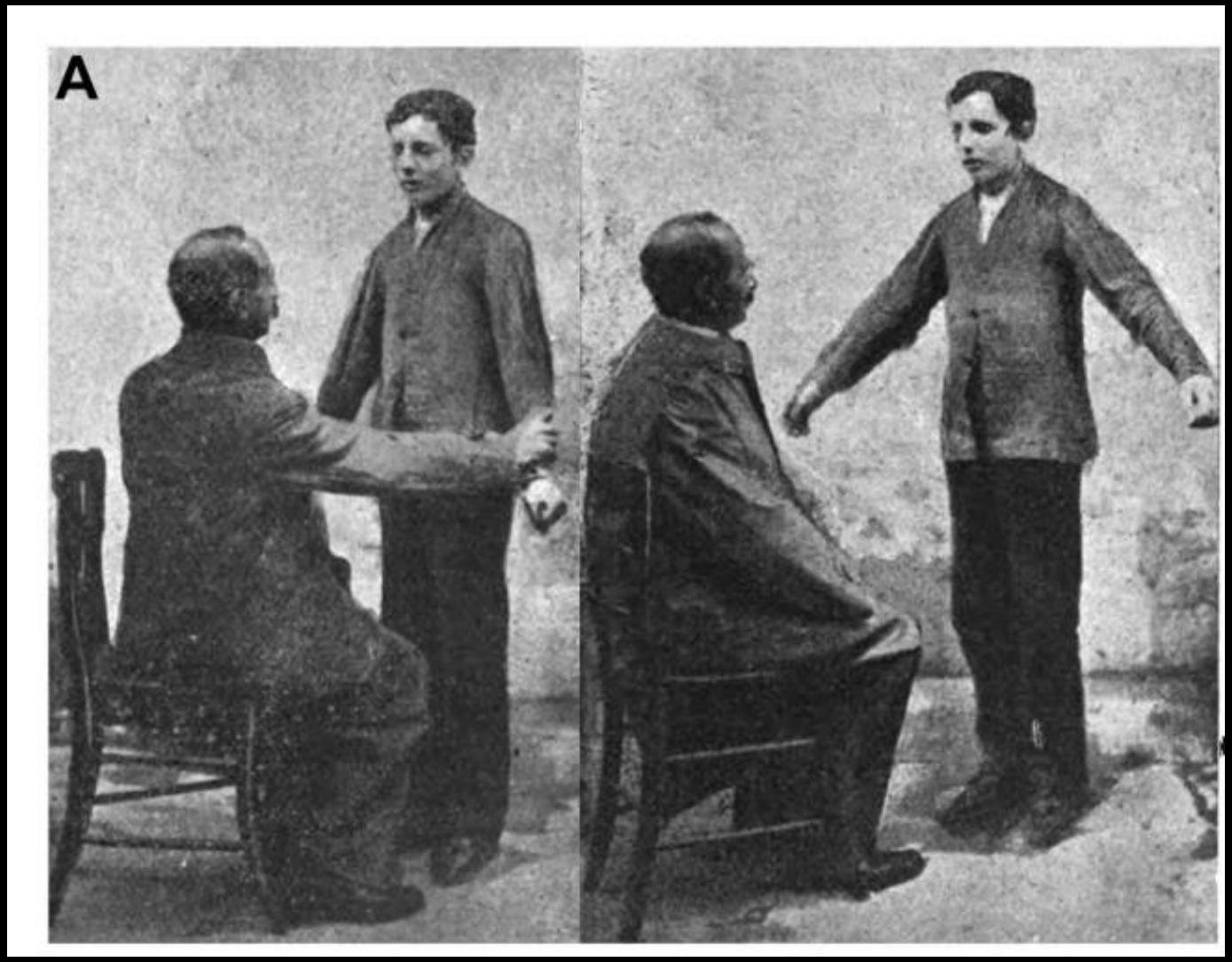
Temperetūra ir potenciacija!

Exp Brain Res (2017) 235:1953–1997
DOI 10.1007/s00221-017-4950-3

REVIEW

Experimental investigations of control principles of involuntary movement: a comprehensive review of the Kohnstamm phenomenon

Jack De Havas[1] · Hiroaki Gomi[2] · Patrick Haggard[1]



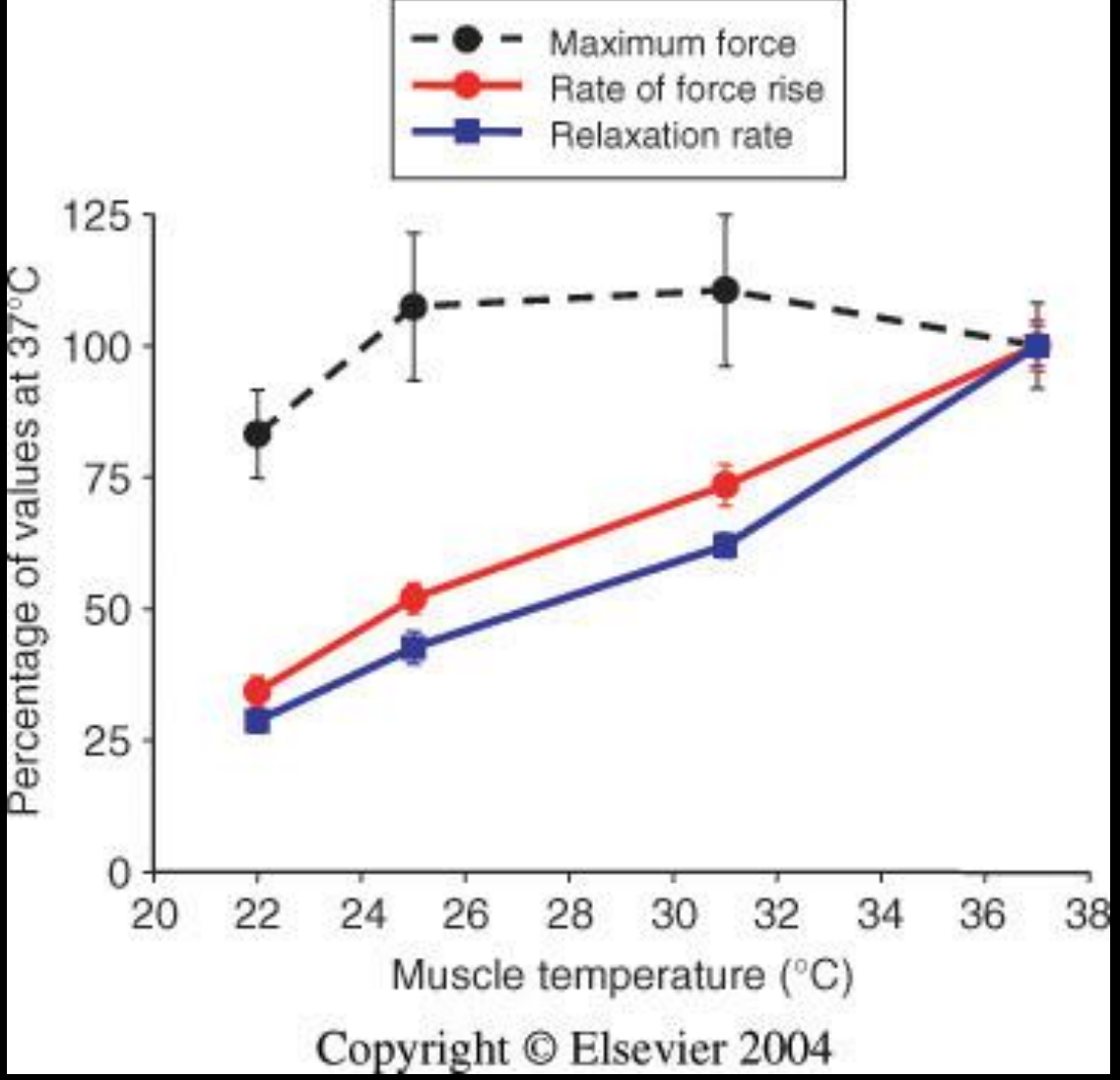


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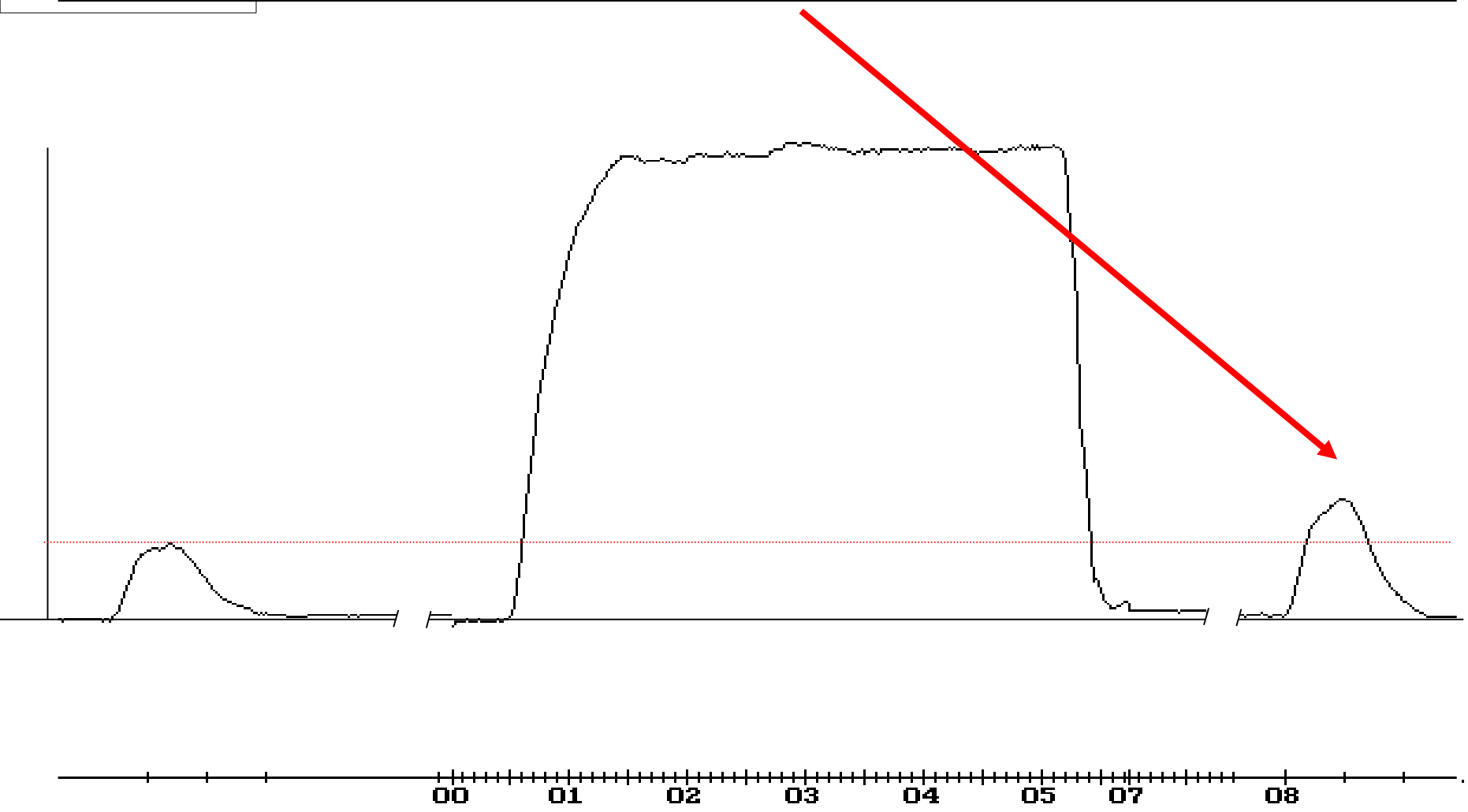
Fig. 8-1 Effects of temperature on maximal isometric force, maximal rate of force rise and maximal relaxation rate of human adductor pollicis muscle . (Redrawn from the data of de Ruiter et al 1999.)

PTP



Grange et al. 1998

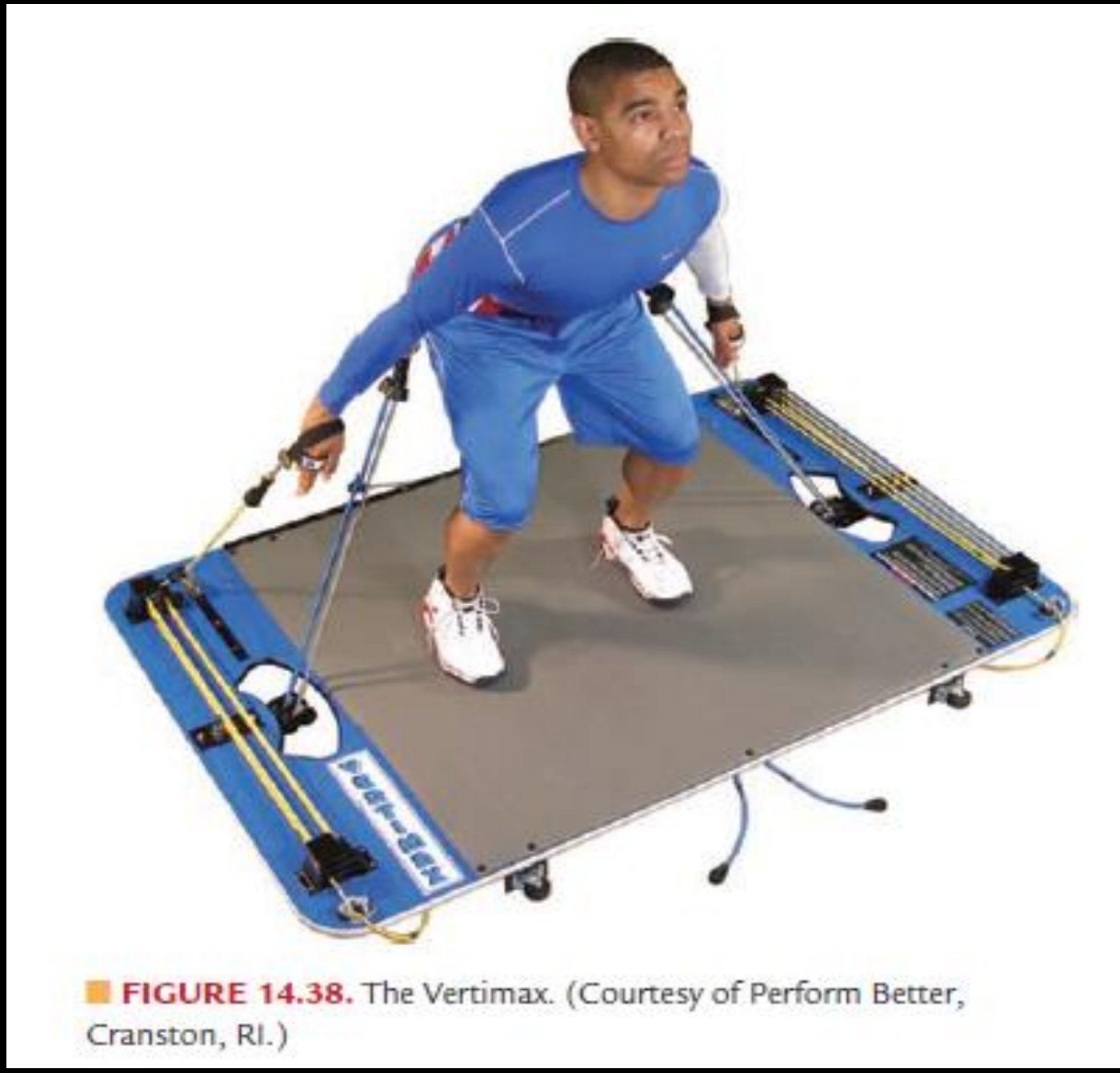


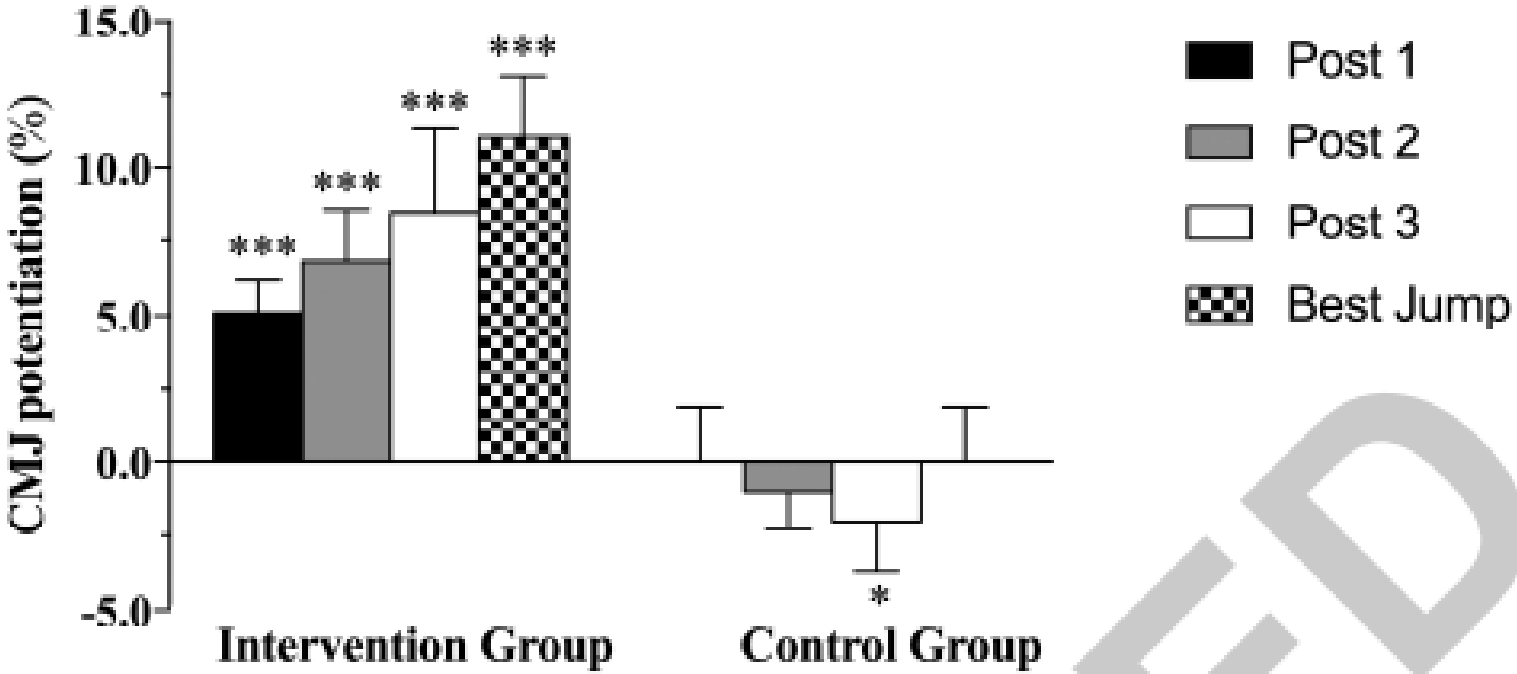
FIGURE 14.38. The Vertimax. (Courtesy of Perform Better, Cranston, RI.)

Journal of Strength and Conditioning Research Publish Ahead of Print
DOI: 10.1519/JSC.0000000000002437

Potentiation Effects of the French Contrast Method on the Vertical Jumping Ability

Running head: French Contrast and vertical jumping ability

Joseba Andoni Hernández-Preciado[1], Eneko Baz[1,2], Carlos Balsalobre-Fernández[3], David Marchante[3], Jordan Santos-Concejero[1]



ACCEPTED

Penktasis!

Judėjimo įvairovė: stimulas raumenims, nervams ir visam organizmui!

NATURE REVIEWS | NEUROSCIENCE

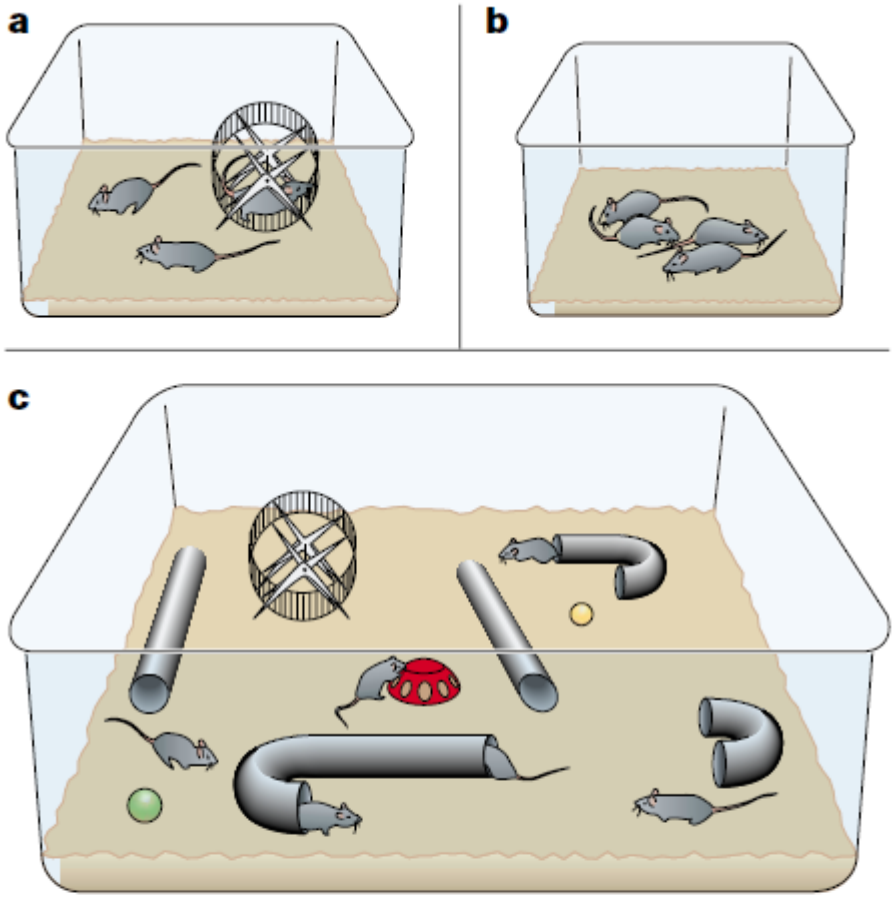
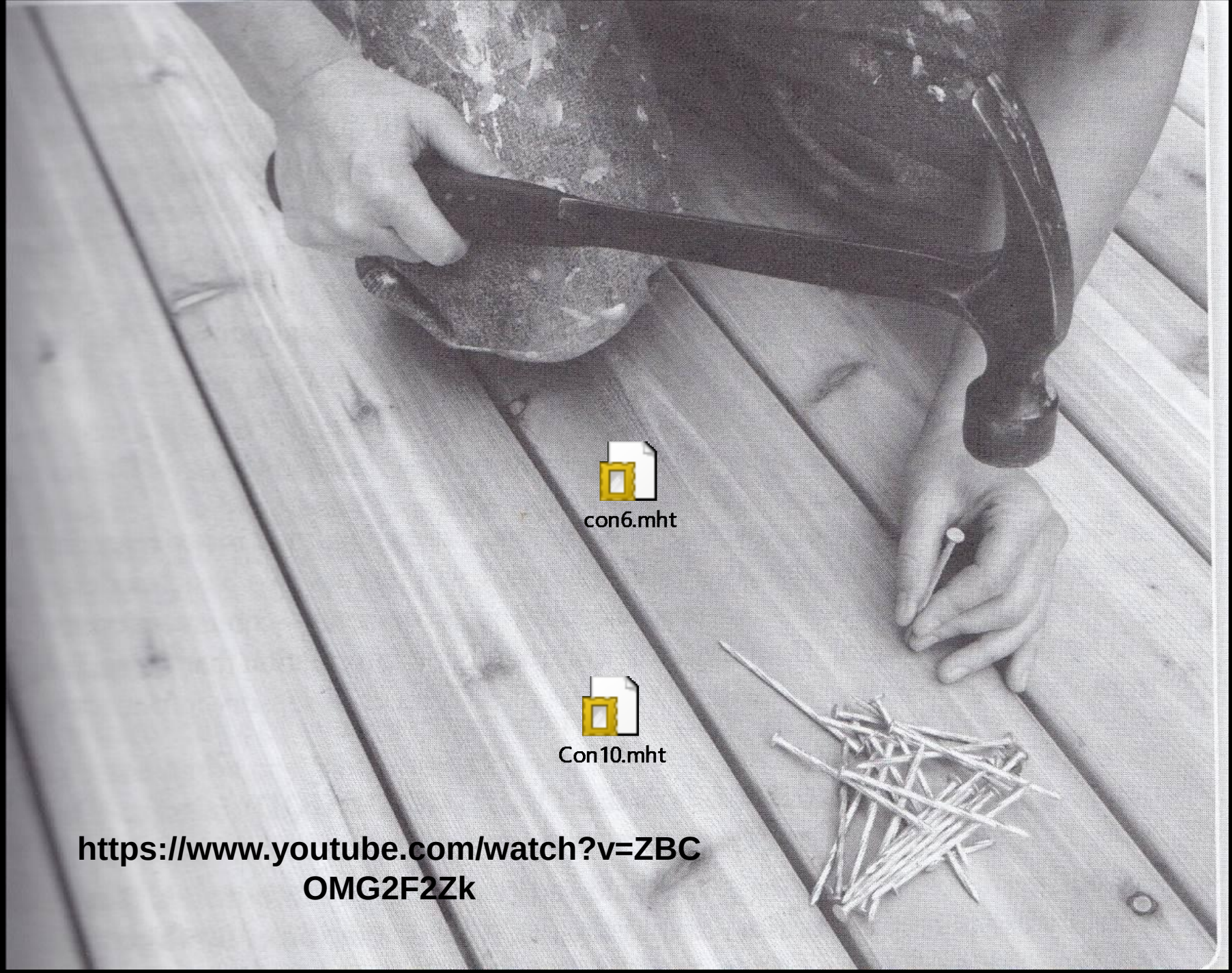
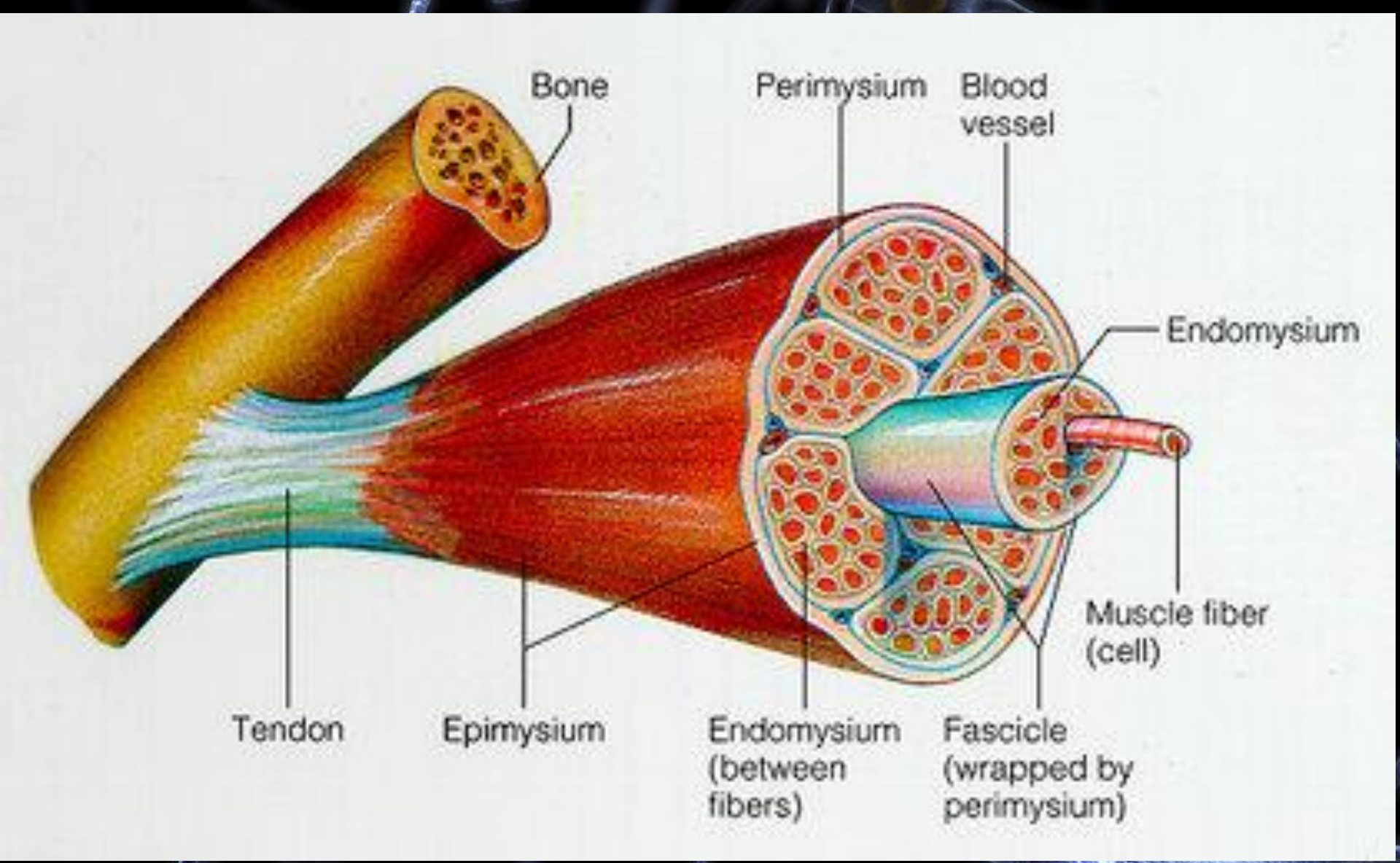


Figure 1 | **Living conditions in different experimental groups. a** | A cage containing a running wheel for voluntary

NEURAL CONSEQUENCES OF ENVIRONMENTAL ENRICHMENT



https://www.youtube.com/watch?v=ZBCOMG2F2Zk


Bone
Perimysium
Blood vessel
Endomysium
Muscle fiber (cell)
Tendon
Epimysium
Endomysium (between fibers)
Fascicle (wrapped by perimysium)

Fizinio aktyvumo keturi scenarijai

Aerobiniai/rekreaciniai fiziniai krūviai

Sveika mityba

Jėgos ir galingumo fiziniai krūviai

Sveika mityba

Tempimo pratimai

Sveika mityba

Judesių valdymą lavinantys krūviai

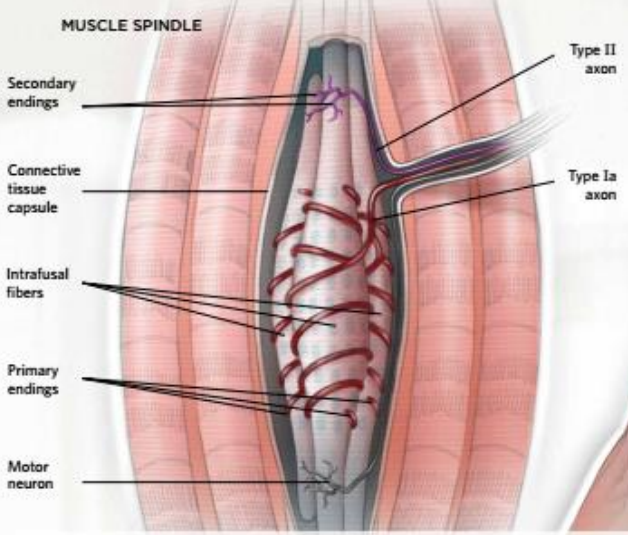
Sveika mityba

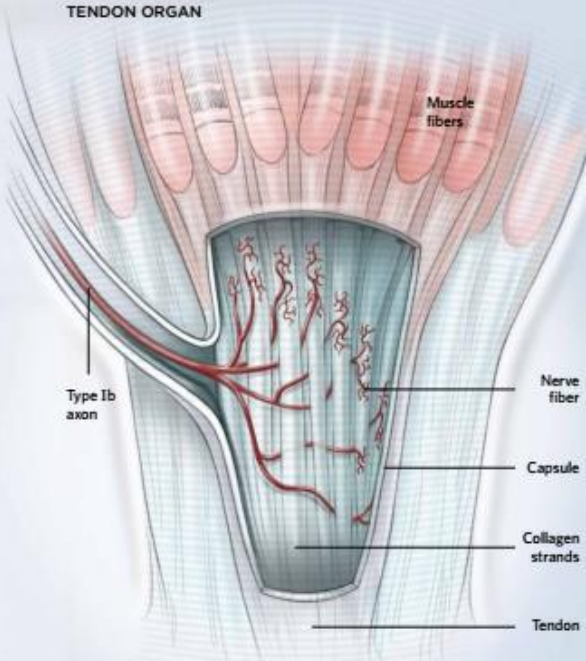
Šeštasis!

Kinestezija ir propriocepcija!

PROPRIOCEPTIVE RECEPTORS

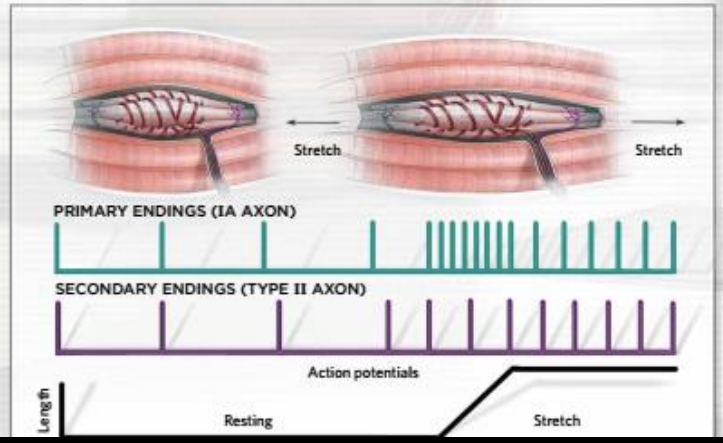
There are several different types of proprioceptors, two of which are the muscle spindle and the tendon organ. Feedback from these sensors provides information about where our bodies are in space and whether or not they are moving.





MUSCLE SPINDLES

Scattered throughout skeletal muscle, the muscle spindles are composed of connective tissue capsules containing bundles of specialized muscle fibers called intrafusal fibers. Wrapped around the middle of these fibers are the spiral terminals of a large sensory neuron, the type Ia axon. To one side of these spiral terminals, collectively called the primary endings, are the secondary endings, the terminals of a smaller sensory neuron, the type II axon. Both types of nerve endings serve as stretch sensors that send feedback about muscle contraction and length changes to the brain.



TENDON ORGANS

Tendons attach muscles to bones. At the junction between muscle fibers and tendons lie the tendon organs, small bundles of tendon strands enclosed within a connective tissue capsule, similar to that in muscle spindles. The axon of a large sensory neuron, the type Ib axon, penetrates the capsule and terminates on the collagen strands. Each strand is attached to a single muscle fiber. In a typical tendon organ there are 10–20 innervated tendon strands with attached muscle fibers

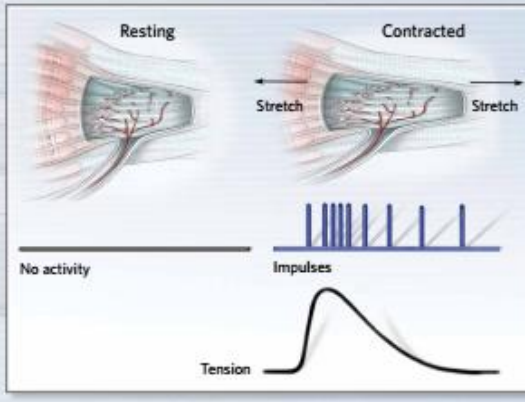


Table 1 Fascial mechanoreceptors in myofascial manipulation

	Responsiveness to manipulation	Results of stimulation
Golgi	Probably only responsive to muscular contraction or to very **strong** manipulation.	**Tonus decrease** in related striated motor fibers.
Pacini	Only responsive to **high velocity** or vibratory techniques	• Increased local **proprioceptive attention**
Ruffini	Specially responsive to **lateral stretch**	• Increased local **proprioceptive attention** • **Inhibition of sympathetic** activity
Interstitial	• 50% of these are **high** threshold pressure units (HTP) • Other 50% are sensitive to **low pressure** (LTP)	• Increased local **proprioceptive attention** • Increase in **vasodilation** and respiration • Stimulation of HTP may produce **pain** and increase plasma **extravasation**

>30 procentų jėgos ir galingumo judesio metu generuoja fascijos

ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation
journal homepage: www.archives-pmr.org
Archives of Physical Medicine and Rehabilitation 2016;97:454-61

REVIEW ARTICLE

What Is Evidence-Based About Myofascial Chains: A Systematic Review

Jan Wilke, MA, Frieder Krause, MA, Lutz Vogt, PhD, Winfried Banzer, PhD, MD

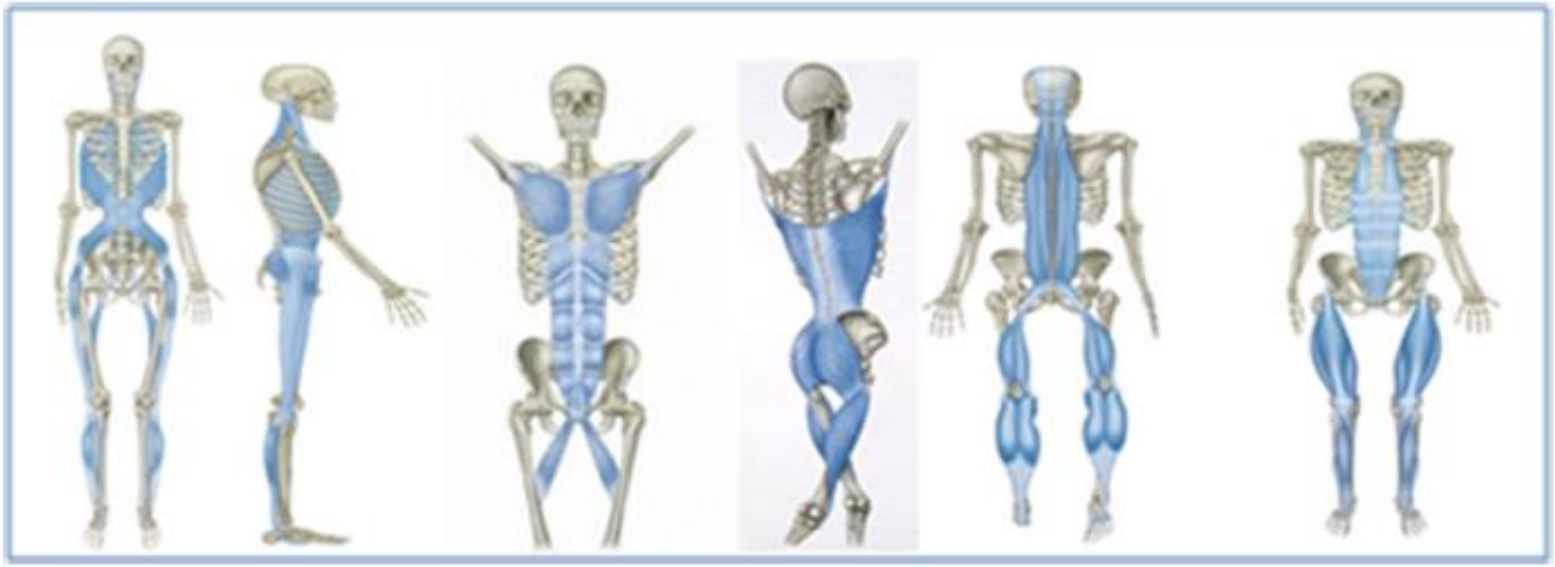


Fig 1 The 6 examined myofascial meridians (from left to right: spiral line, lateral line, front functional line, back functional line, superficial back line, and superficial front line). Adapted with permission. These figures were published in Myers TW. Anatomy trains: myofascial meridians for manual and movement therapists. 3rd ed. New York: Churchill Livingstone; 2014. Copyright Elsevier.

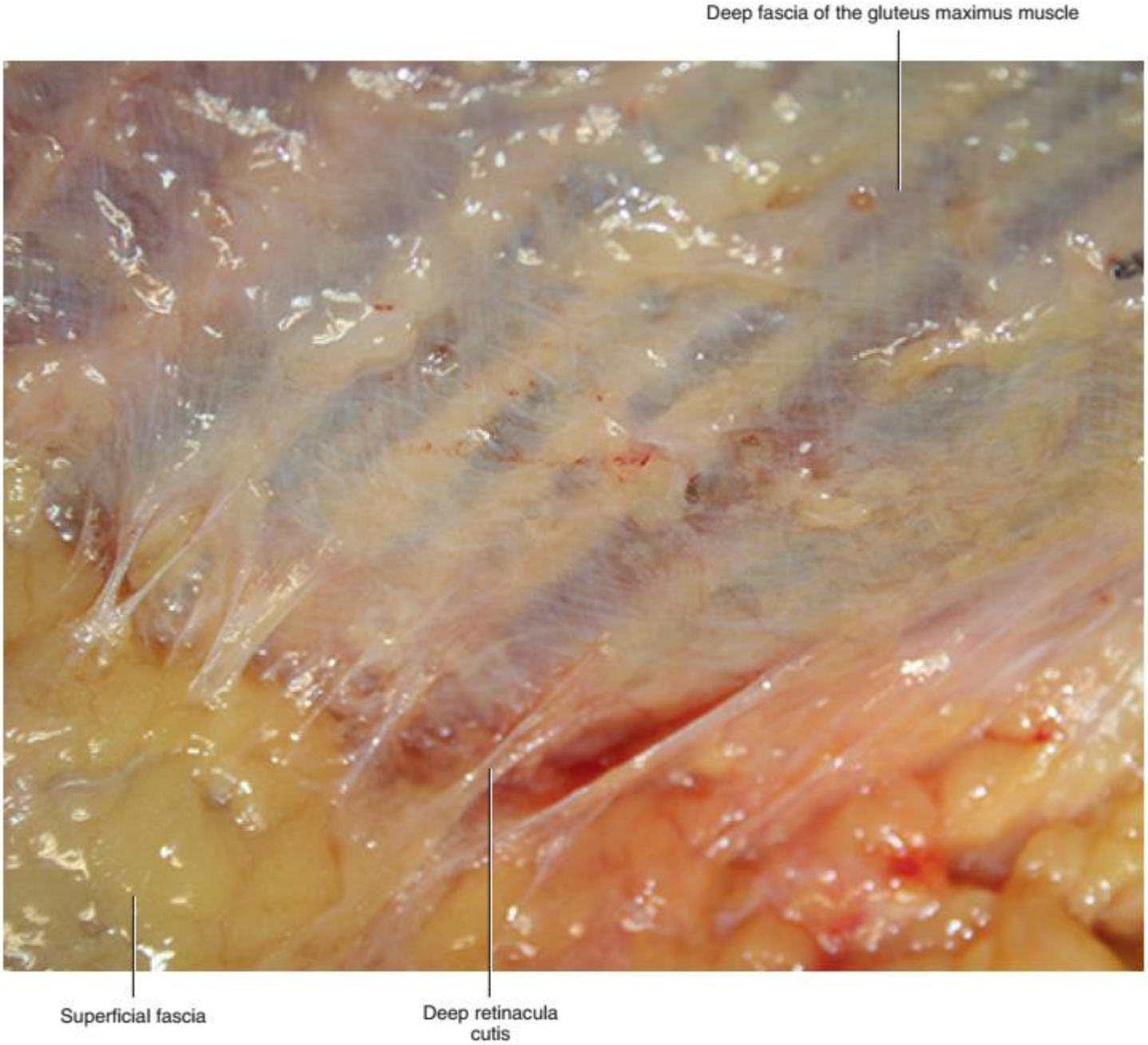


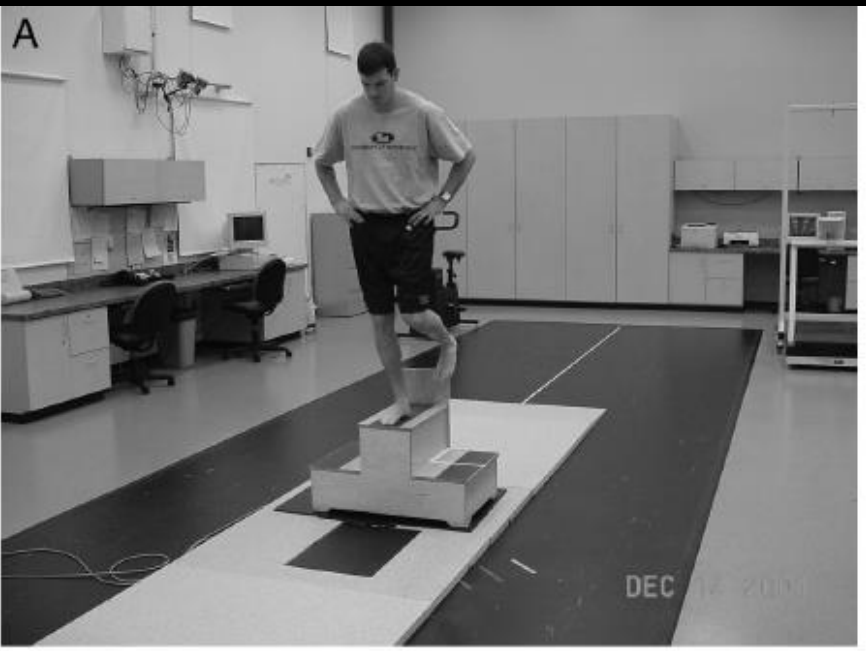
FIGURE 2.16 Dissection of the gluteal region. Transverse adhesions between the superficial and deep fascia at the gluteal fold. At this level, the skin adheres to the deeper planes. As the skin is stretched, the tension is transmitted to the underlying muscles, thanks to the adhesion of the superficial fascia with the underlying planes.

Propriocepcijos ir sąnarių stabilumo testai

Journal of Athletic Training 2002;37(1):85–98
© by the National Athletic Trainers' Association, Inc
www.journalofathletictraining.org

Sensorimotor System Measurement Techniques

Bryan L. Riemann; Joseph B. Myers; Scott M. Lephart



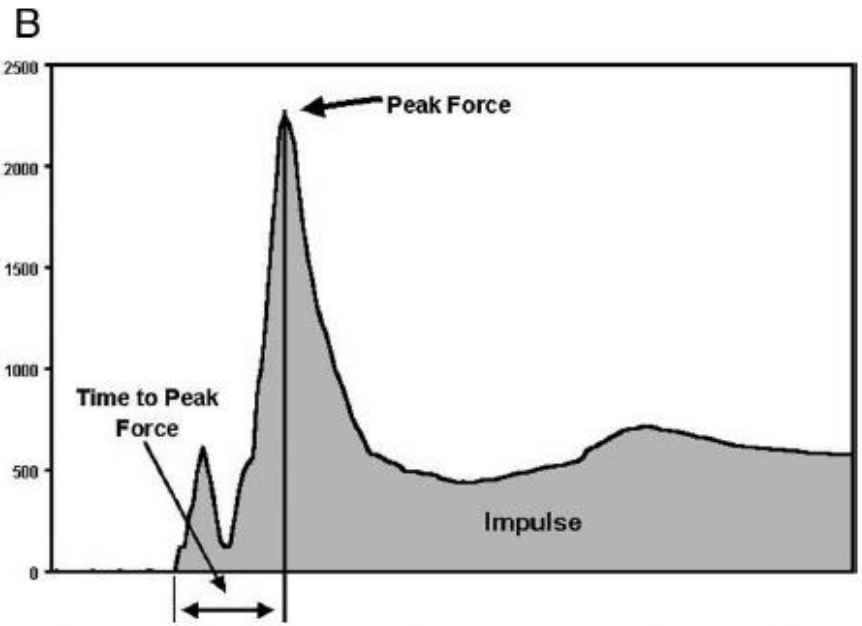


Figure 7. A, Assessment of ground reaction forces during a landing task. B, Typical vertical ground reaction forces during landing.

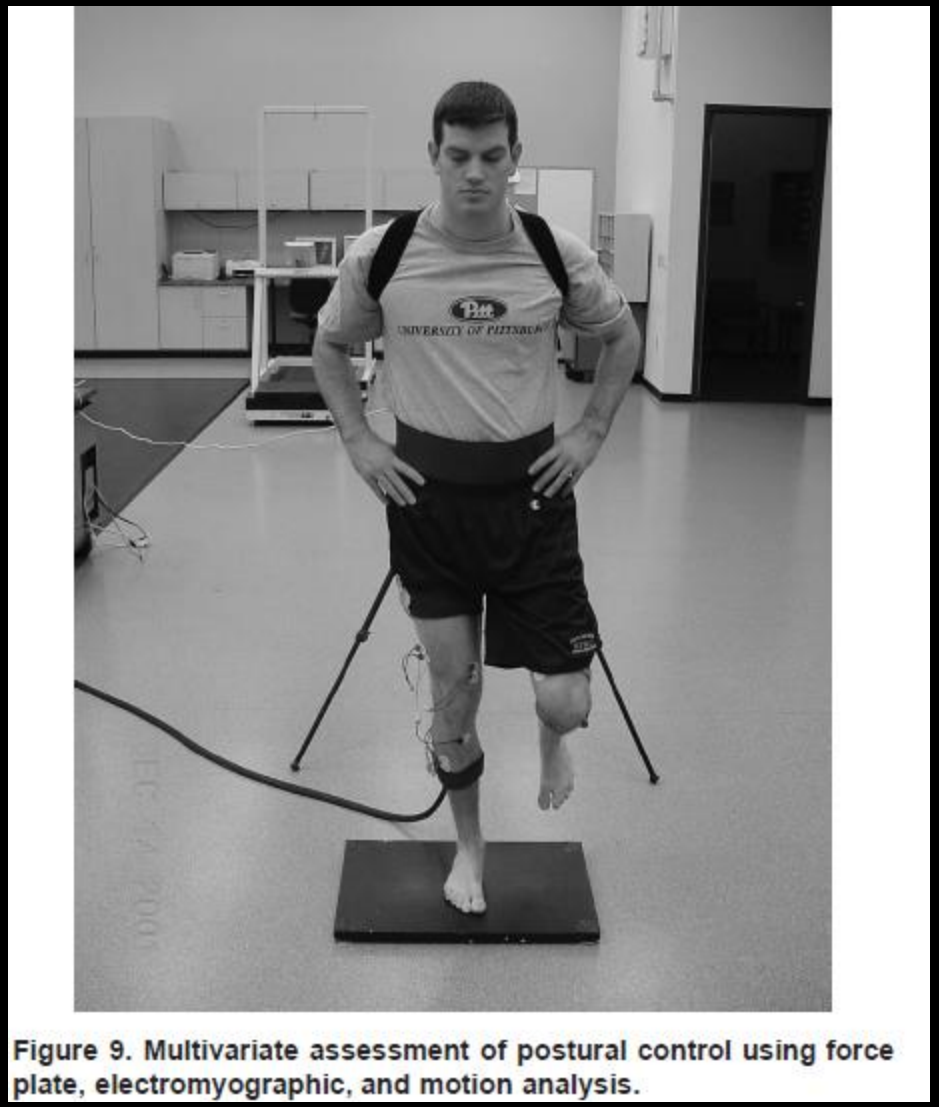
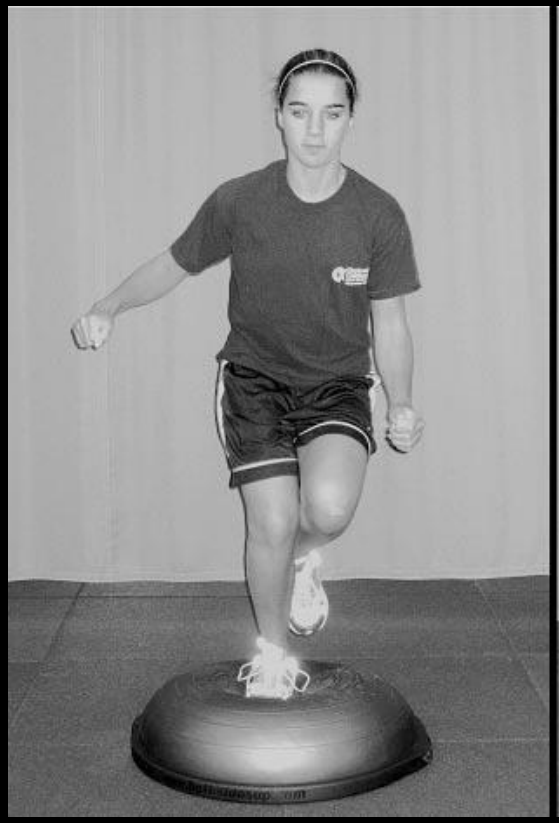


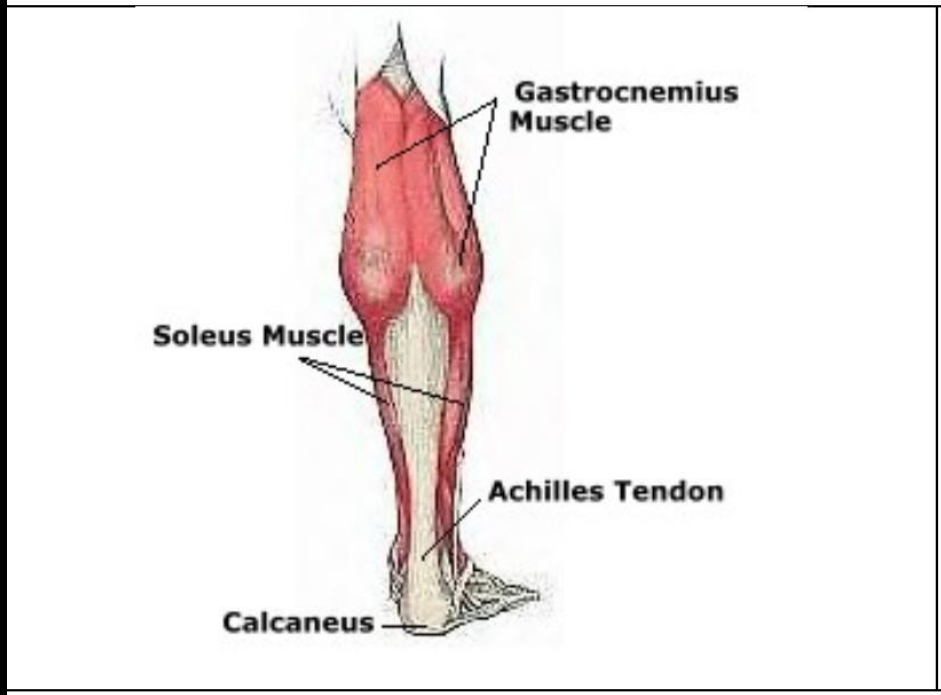
Figure 9. Multivariate assessment of postural control using force plate, electromyographic, and motion analysis.

Treniravimo pavyzdys



Fascijų atpalaidavimas/stimuliavimas

GASTROCNEMIUS



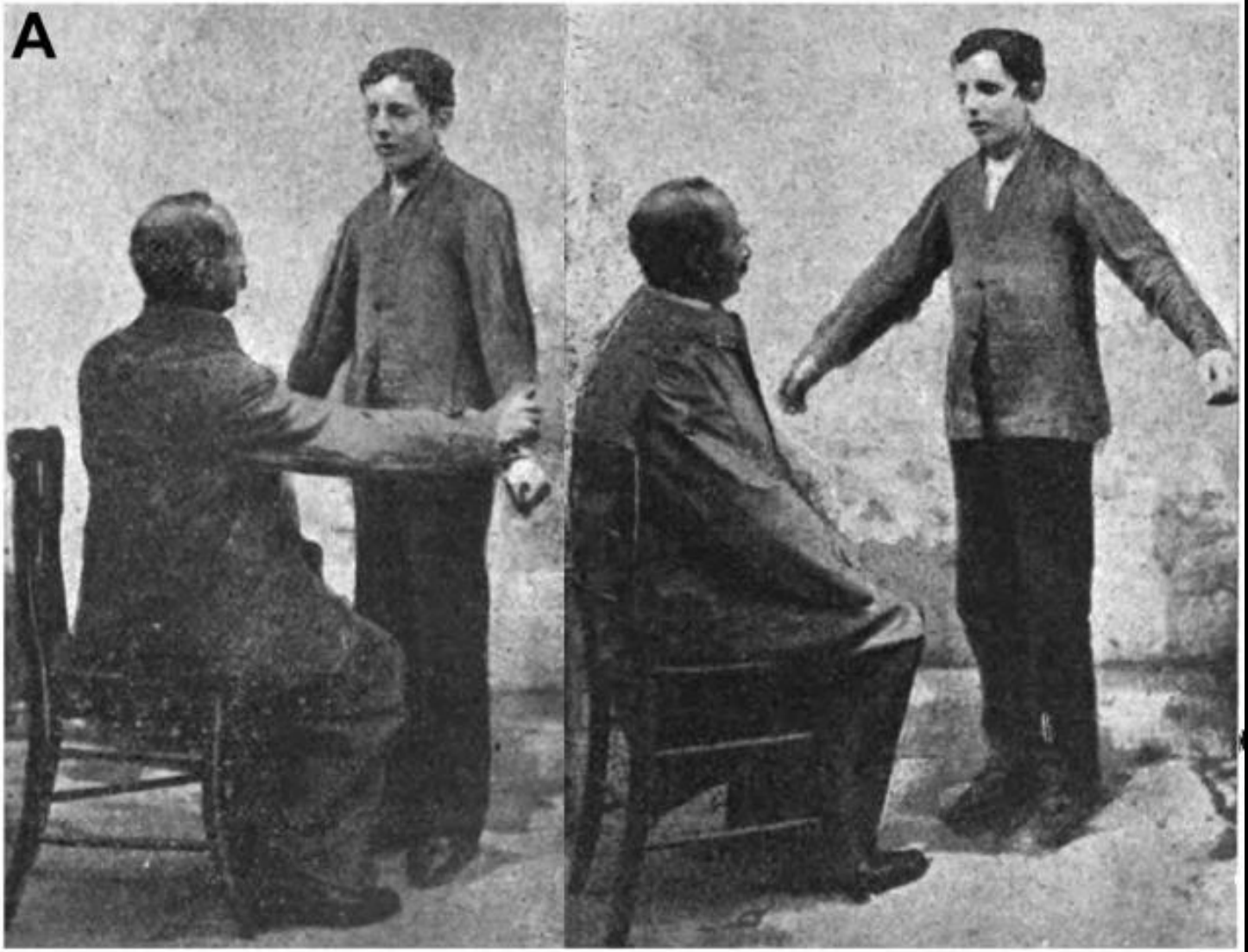
Judesių iliuzijos!

Exp Brain Res (2017) 235:1953–1997
DOI 10.1007/s00221-017-4950-3

REVIEW

Experimental investigations of control principles of involuntary movement: a comprehensive review of the Kohnstamm phenomenon

Jack De Havas[1] · Hiroaki Gomi[2] · Patrick Haggard[1]



Physiol Rev 92: 1651–1697, 2012
doi:10.1152/physrev.00048.2011

THE PROPRIOCEPTIVE SENSES: THEIR ROLES IN SIGNALING BODY SHAPE, BODY POSITION AND MOVEMENT, AND MUSCLE FORCE

Uwe Proske and Simon C. Gandevia

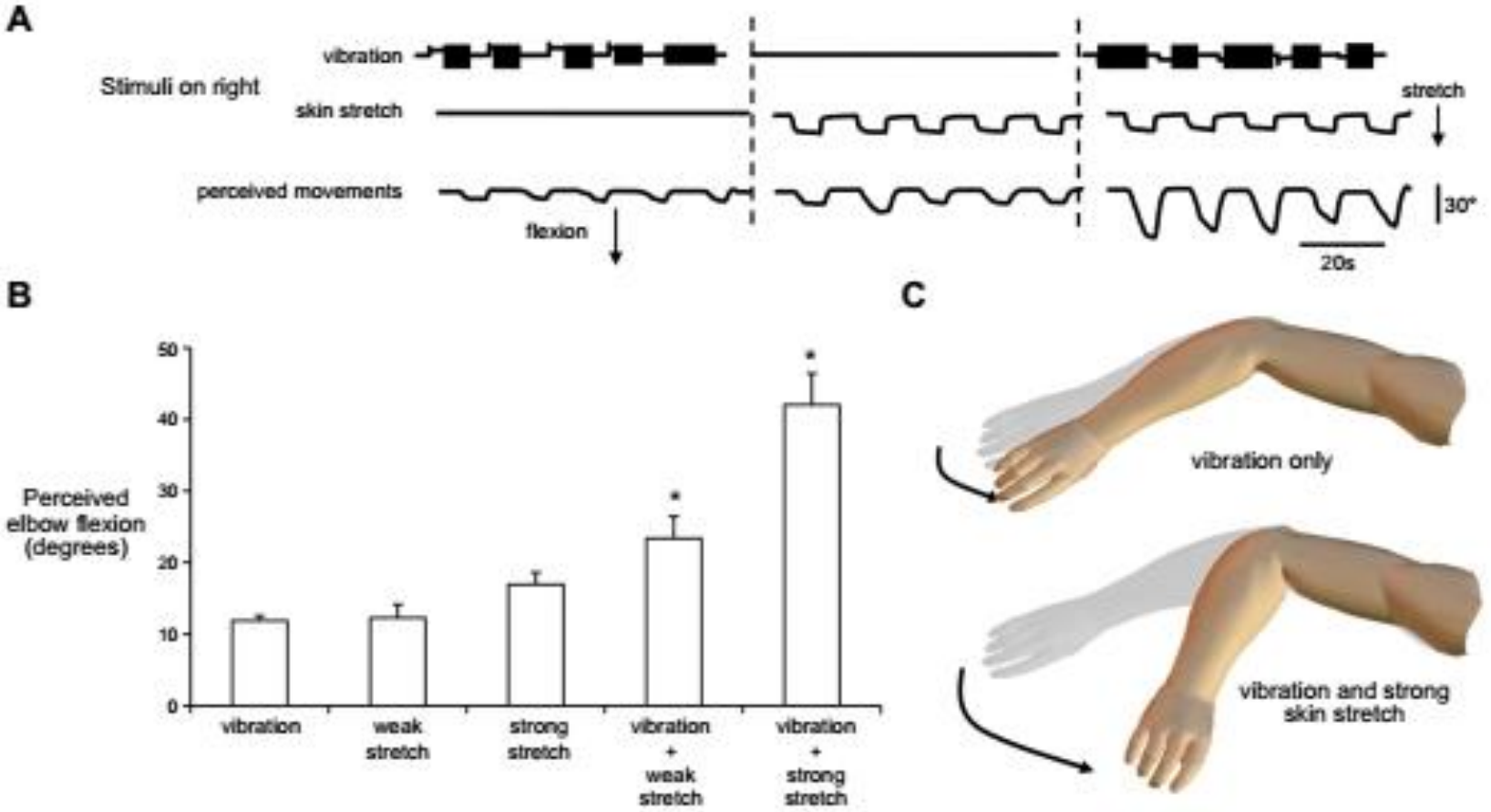


FIGURE 6. Illusory motion at the right elbow produced by muscle vibration, skin stretch, and combined vibration and stretch. *A*: stimuli delivered to the right arm, perceived as movements and indicated by the left arm. *B*: mean amplitude of perceived movements for all trials (vibration, $n = 15$ cycles; all others, $n = 10$ cycles). Asterisk indicates significant differences from vibration alone. Diagrams in *C* show the position of the right elbow during the experiment (gray silhouette) and the average perceived position when vibration was applied by itself (*top*) and simultaneously with strong skin stretch near the elbow (*bottom*). [From Collins et al. (80).]

Physiol Rev 92: 1651–1697, 2012
doi:10.1152/physrev.00048.2011

THE PROPRIOCEPTIVE SENSES: THEIR ROLES IN SIGNALING BODY SHAPE, BODY POSITION AND MOVEMENT, AND MUSCLE FORCE

Uwe Proske and Simon C. Gandevia

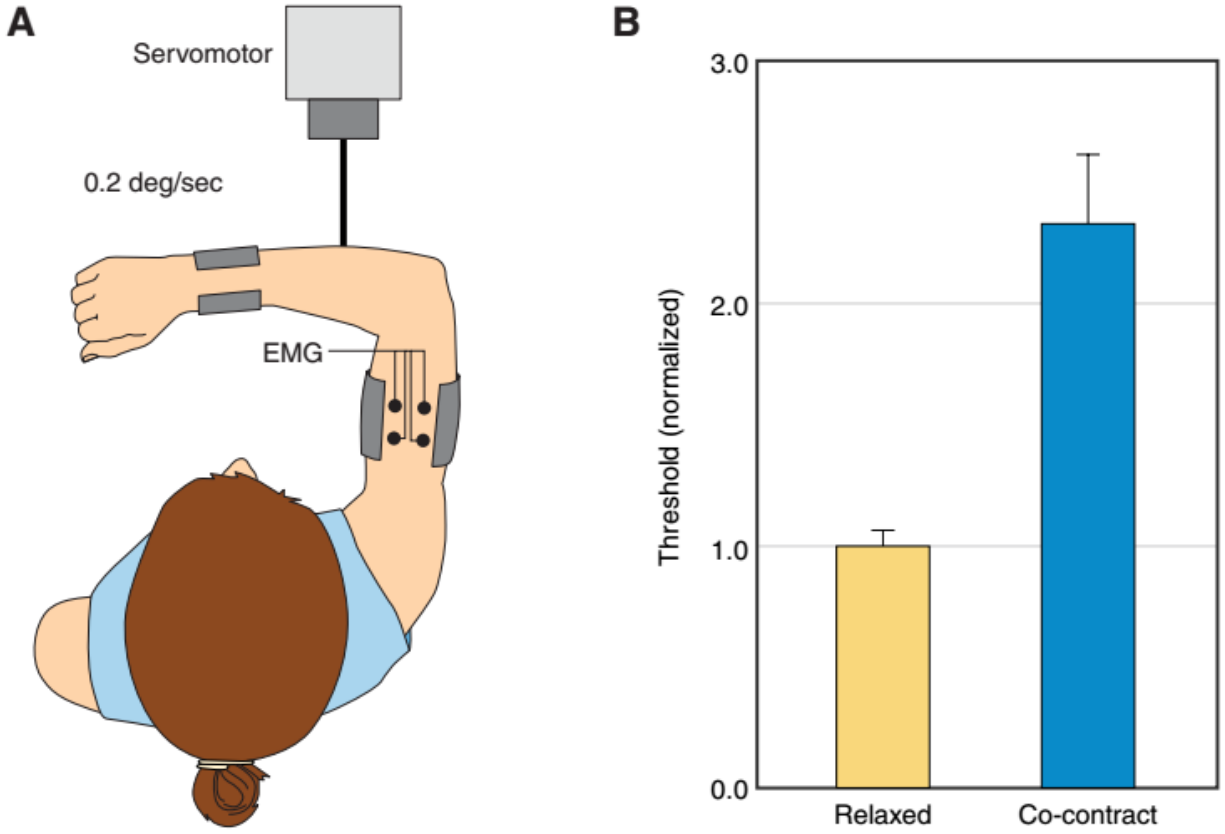


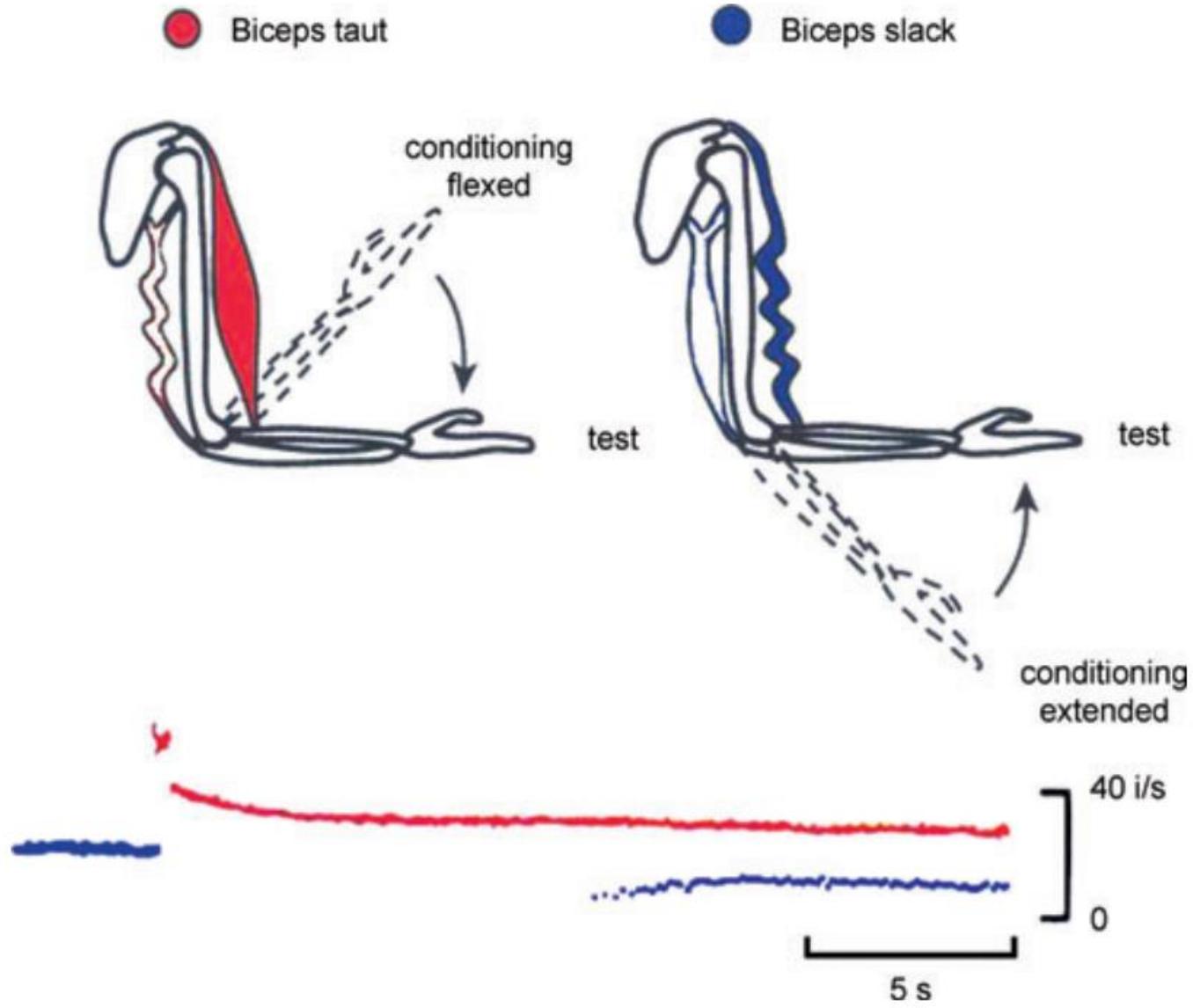
FIGURE 7. Measurement of movement detection thresholds. *A*: blindfolded subjects were required to indicate the direction of small movements (0.2°/s) applied to the right forearm with a servomotor. Detection thresholds were measured for elbow extension and flexion movements under relaxed and cocontraction conditions (15% MVC cocontraction of elbow flexors and extensors, monitored as EMG). *B*: average thresholds measured for 7 subjects. There were no differences between thresholds for flexion and extension movements, and values have been pooled. Thresholds have been normalized with respect to the average threshold measured for the relaxed condition. Thresholds measured during cocontractions of elbow muscles (blue bar) were significantly higher than when the arm was relaxed (orange bar). [Redrawn from Wise et al. (420).]

J Physiol 587.17 (2009) pp 4139–4146

TOPICAL REVIEW

The kinaesthetic senses

Uwe Proske[1] and Simon C. Gandevia[2]



Physiol Rev 92: 1651–1697, 2012
doi:10.1152/physrev.00048.2011

THE PROPRIOCEPTIVE SENSES: THEIR ROLES IN SIGNALING BODY SHAPE, BODY POSITION AND MOVEMENT, AND MUSCLE FORCE

Uwe Proske and Simon C. Gandevia

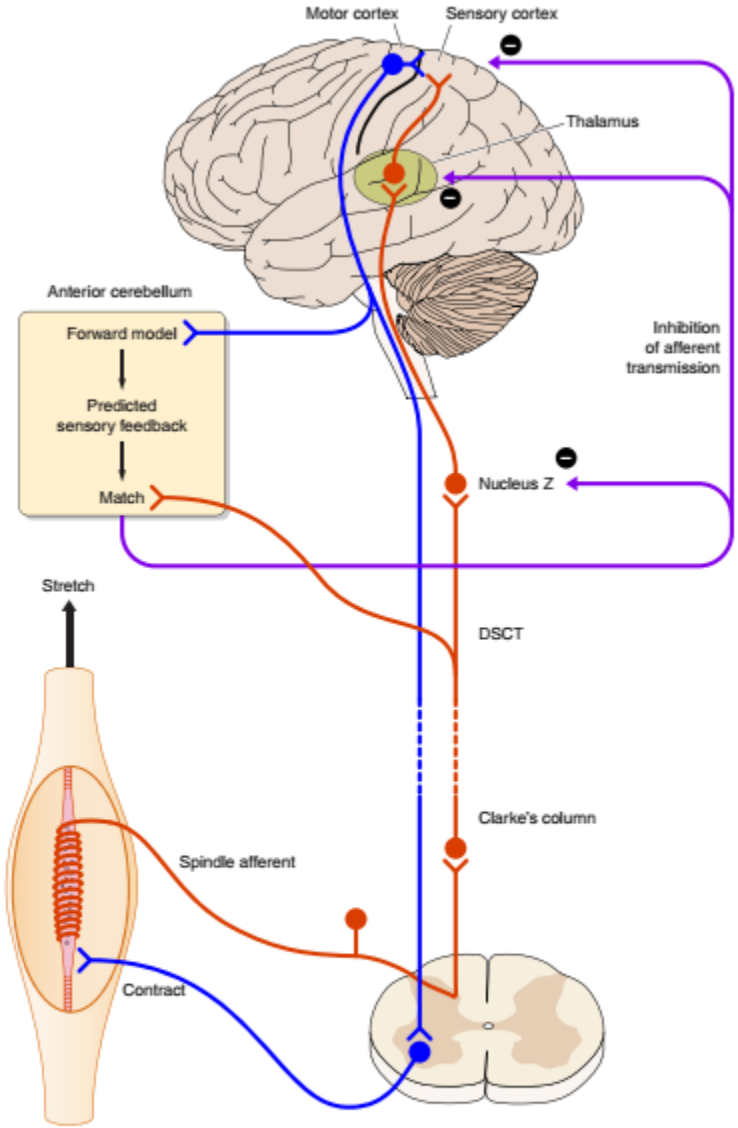


FIGURE 16. Possible mechanism (shown in diagrammatic form) for how the brain distinguishes between impulses coming from muscle spindles that are generated by muscle stretch (exafference) or by fusimotor activity (reafference). When the muscle is stretched, spindle impulses travel to sensory areas of the cerebral cortex via Clarke's column, the dorsal spinocerebellar tract (DSCT), Nucleus Z, and the thalamus (shown in red). Collaterals of DSCT cells project to the anterior cerebellum. When a motor command is generated, it leads to coactivation of skeletomotor and fusimotor neurons (shown in blue). A copy of the motor command is sent to the anterior cerebellum where a comparison takes place between the expected spindle response based on that command and the actual signal provided by the DSCT collaterals. The outcome of the match is used to inhibit reafferent activity, preventing it from reaching the cerebral cortex. Sites of inhibition could be at Nucleus Z, the thalamus, or the cortex itself. For further details, see text.

Septintasis!

Progresyvus ir specifinis krūvis!

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Superkompensacija

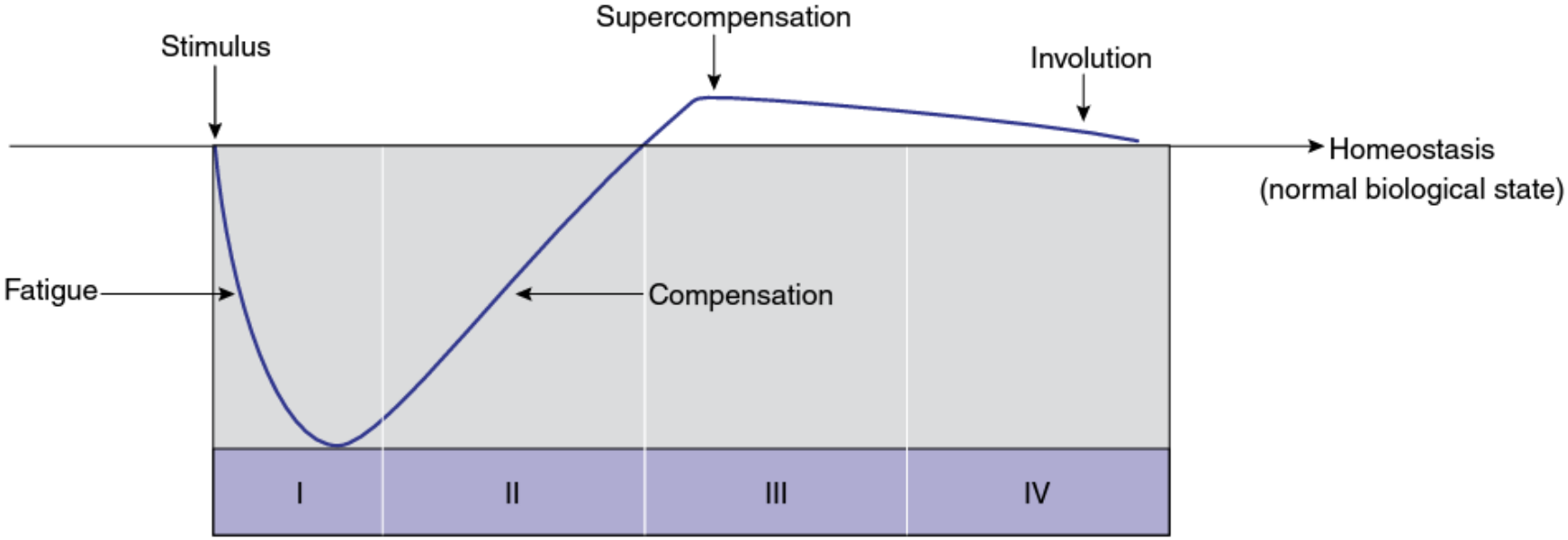

FIGURE 11.2 Supercompensation cycle of a training session.

Reprinted, by permission, from T.O. Bompa, 2009, *Periodization*, 5th ed. (Champaign, IL: Human Kinetics), 16. Adapted from N. Yakovlev, 1967, *Sports biochemistry* (Leipzig: Deutche Hochschule fur Korpekultur).

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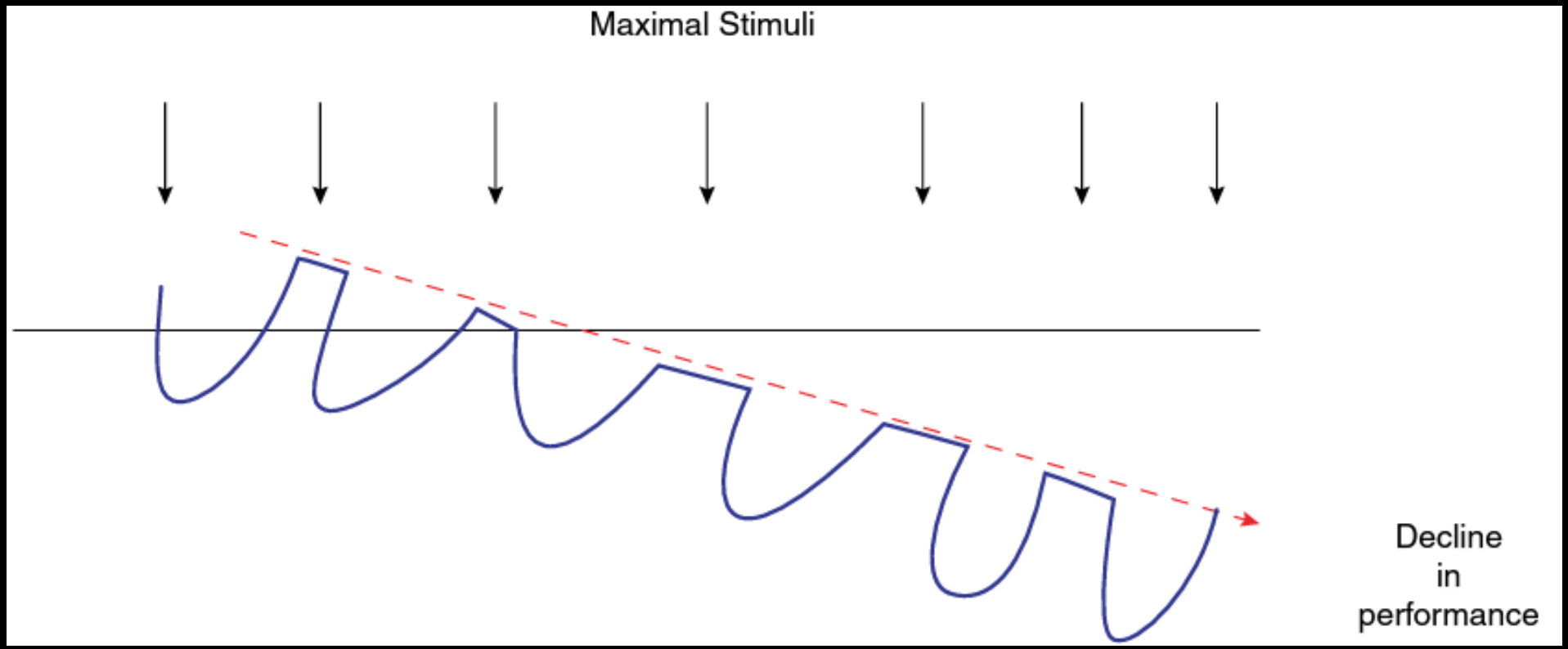
Treniravimo suma



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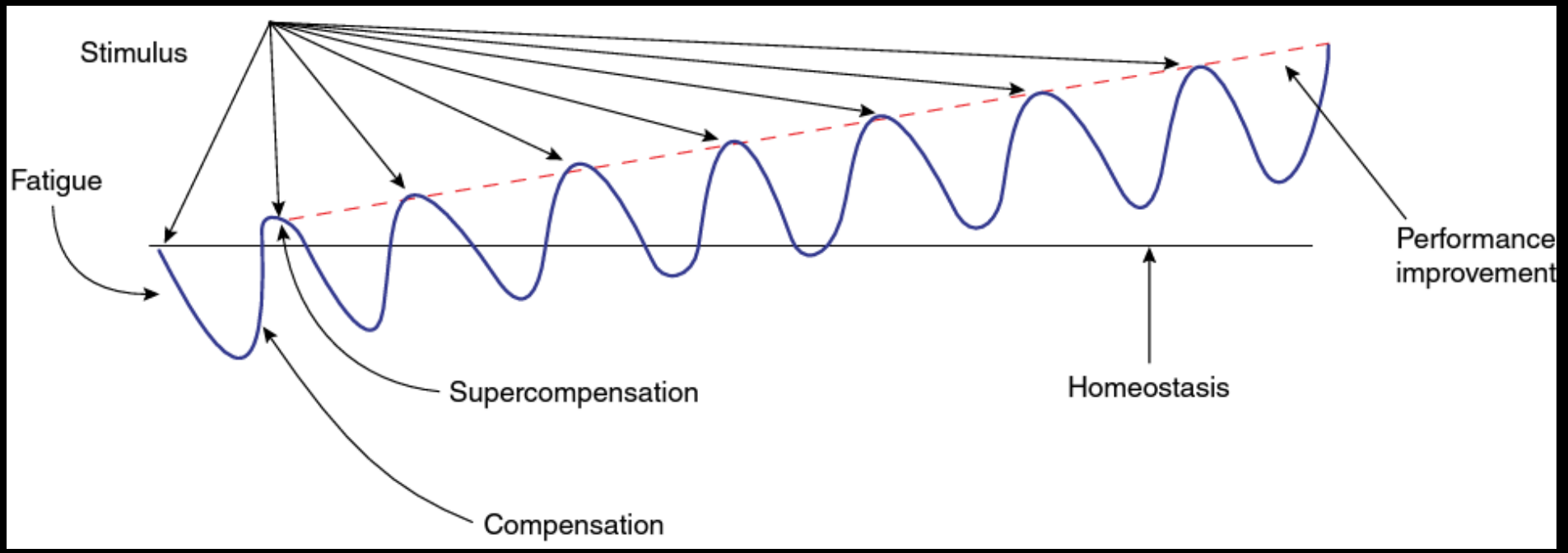
Treniravimo suma



PSYCHIATRIC DISEASES
- Depression
- Anxiety
- Stress
- Schizophrenia

NEUROLOGICAL DISEASES
- Dementia
- Parkinson's disease
- Multiple sclerosis

METABOLIC DISEASES
- Obesity
- Hyperlipidemia
- Metabolic syndrome
- Polycystic ovarian syndrome
- Type 2 diabetes
- Type 1 diabetes

CARDIOVASCULAR DISEASES
- Cerebral apoplexy
- Hypertension
- Coronary heart disease
- Heart failure
- Intermittent claudication

PULMONARY DISEASES
- Chronic obstructive pulmonary disease
- Bronchial asthma
- Cystic fibrosis

Scand J Med Sci Sports 2015: (Suppl. 3) 25: 1–72
doi: 10.1111/sms.12581

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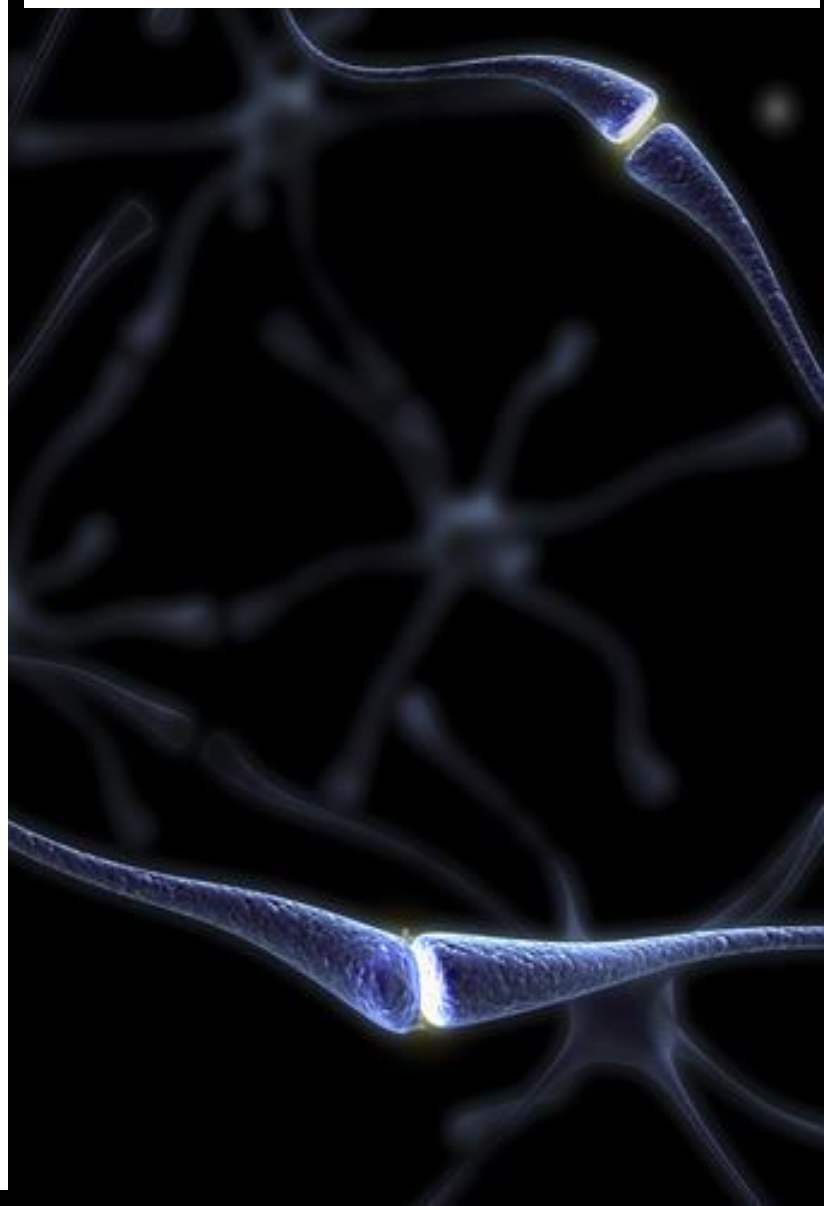
SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS

Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases

B. K. Pedersen[1], B. Saltin[2]



Aštuntasis!

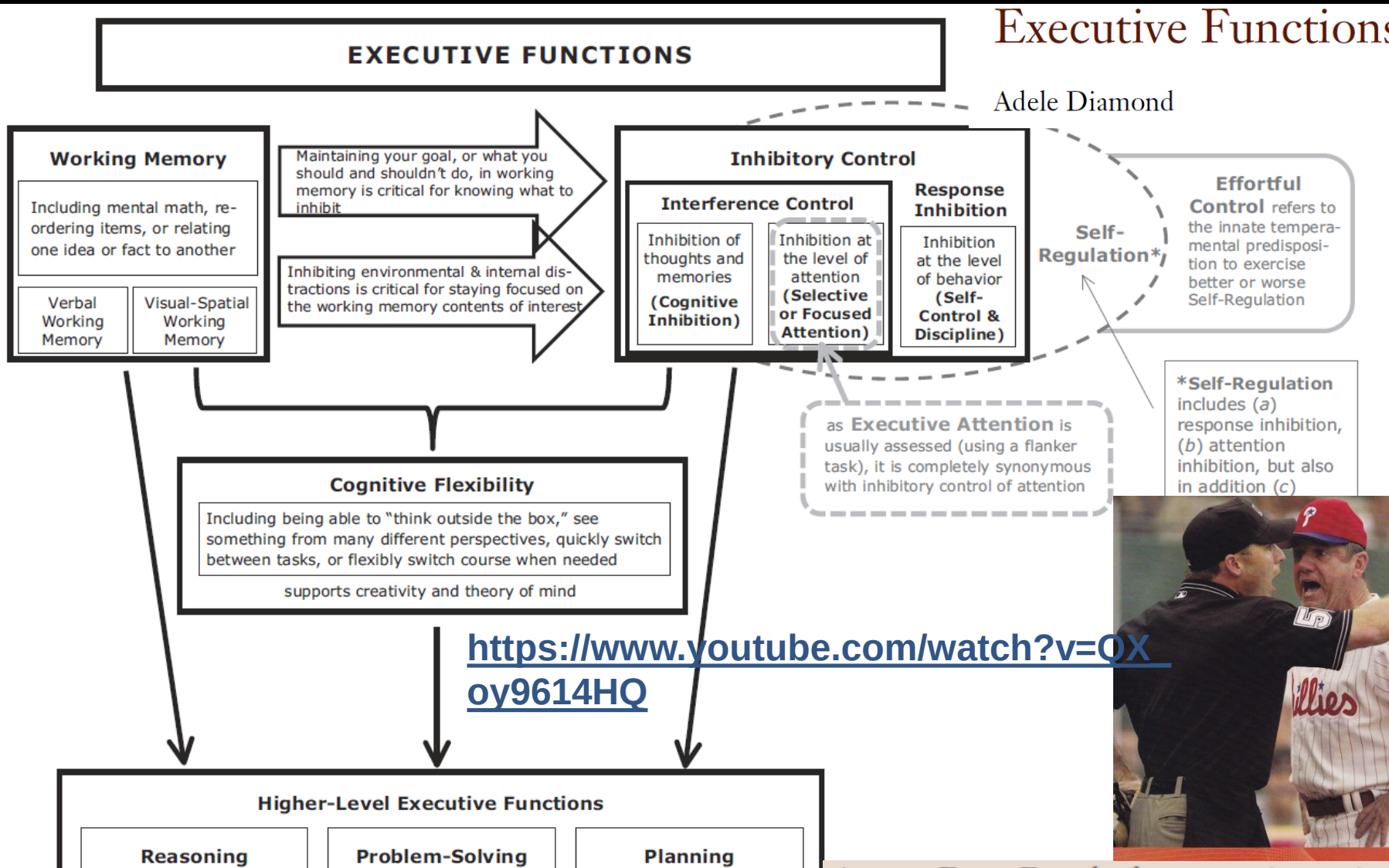
Poilsis:
Raumenims vs nervams,
Aktyvus vs pasyvus!

Skandinavų poilsio paradigma!

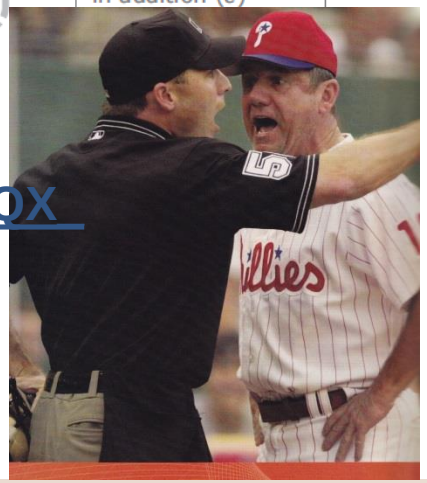
Devintasis!

Savęs valdymas ir vykdomoji funkcija!

Kognityvinės funkcijos pratimai



https://www.youtube.com/watch?v=QXoy9614HQ



Am J Physiol Heart Circ Physiol 293: H133–H141, 2007.
First published March 2, 2007; doi:10.1152/ajpheart.00062.2007.

Parasympathetic reactivation after repeated sprint exercise

Martin Buchheit,[1] Paul B. Laursen,[2] and Saïd Ahmaidi[1]

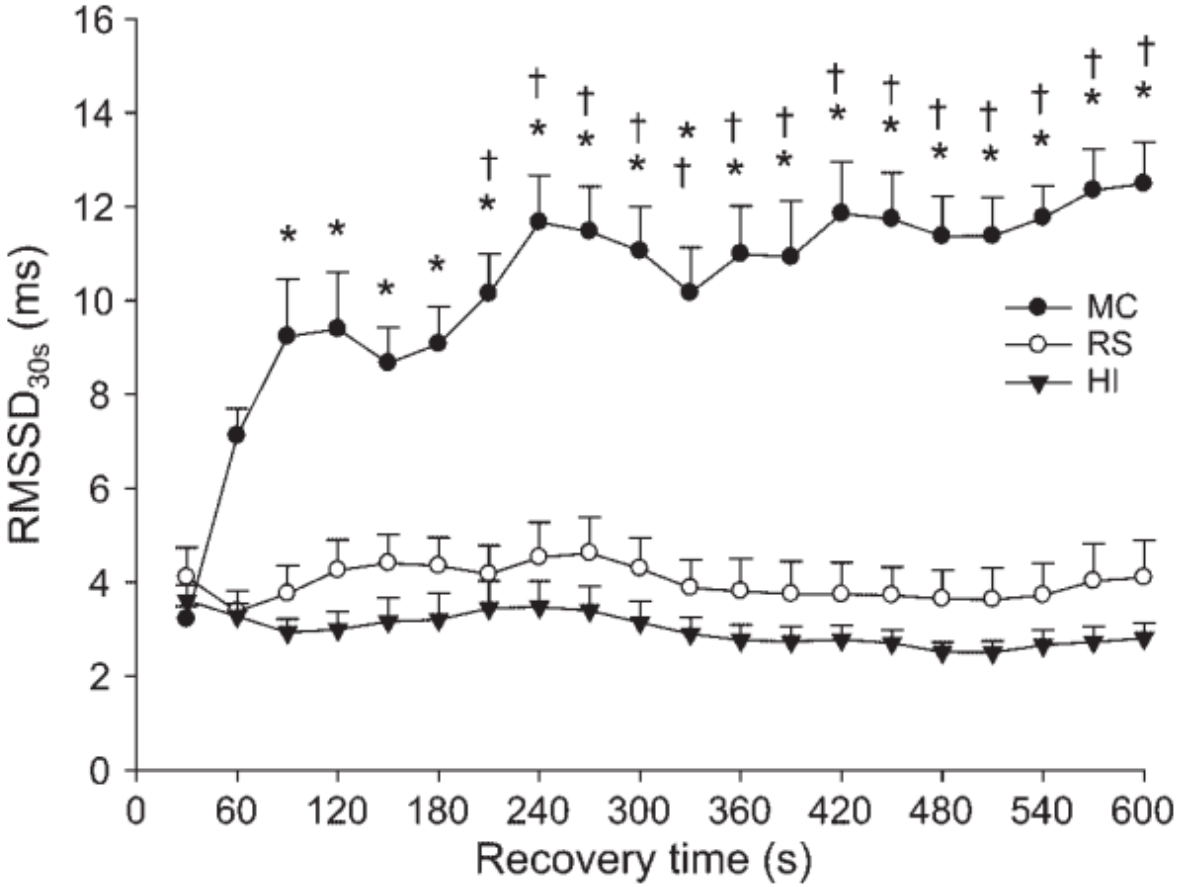


Fig. 3. Mean ± SE root mean square of successive difference of the R-R intervals measured on successive 30-s segments ($RMSSD_{30s}$) during the 10-min recovery period, as calculated for each of the 3 exercise trials: RS, MC, and HI exercise. *Significant difference vs. $RMSSD_{30s}$ at the end of exercise ($P < 0.001$). †Significant difference vs. RS ($P < 0.001$).

7 min krūvio sumažina stresą kelis kartus valandai

Go-Nog-Go Testas: reaguoti tik į X

x

x

x

0

0

x

0

0

x

x

x

x

0

0

x

0

0

Stroop testas:

reaguoti į raudonas raides

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. Journal of Experimental Psychology,18:643-662.

Mėlynas

Raudonas

Žalias

Baltas

Mėlynas

Mėlynas

Raudonas

Raudonas

Stroop testas:

reaguoti į žodį: „raudonas“

Raudonas

Raudonas

Raudonas

Raudonas

Raudonas

Raudonas

Geltonas

Raudonas

Raudonas

Raudonas

Raudonas

Mėlynas

Raudonas

Stroop testas:

reaguoti į žodį: „baltas“,
užrašytą baltai

Baltas

Baltas

Baltas

Baltas

Baltas

Juodas

Juodas

Baltas

Baltas

Juodas

Baltas

Pilkas

Juodas

Baltas

Raudonas

Baltas

Baltas

Baltas

Baltas

„Alfa Span“

testas: kuo daugiau atsiminti žodžių ir juos pasakyti abėcėlės tvarka

Mokslas, Antanas, abstrakcija, užrašai, šalis, kelionė, opelis, degutas, karalienė, svajonė, judėjimas, akmenys, kardas, žvakė, laimė, inkaras, raumenys, jūra, kamuolys.

Abstrakcija

Akmenys

Antanas

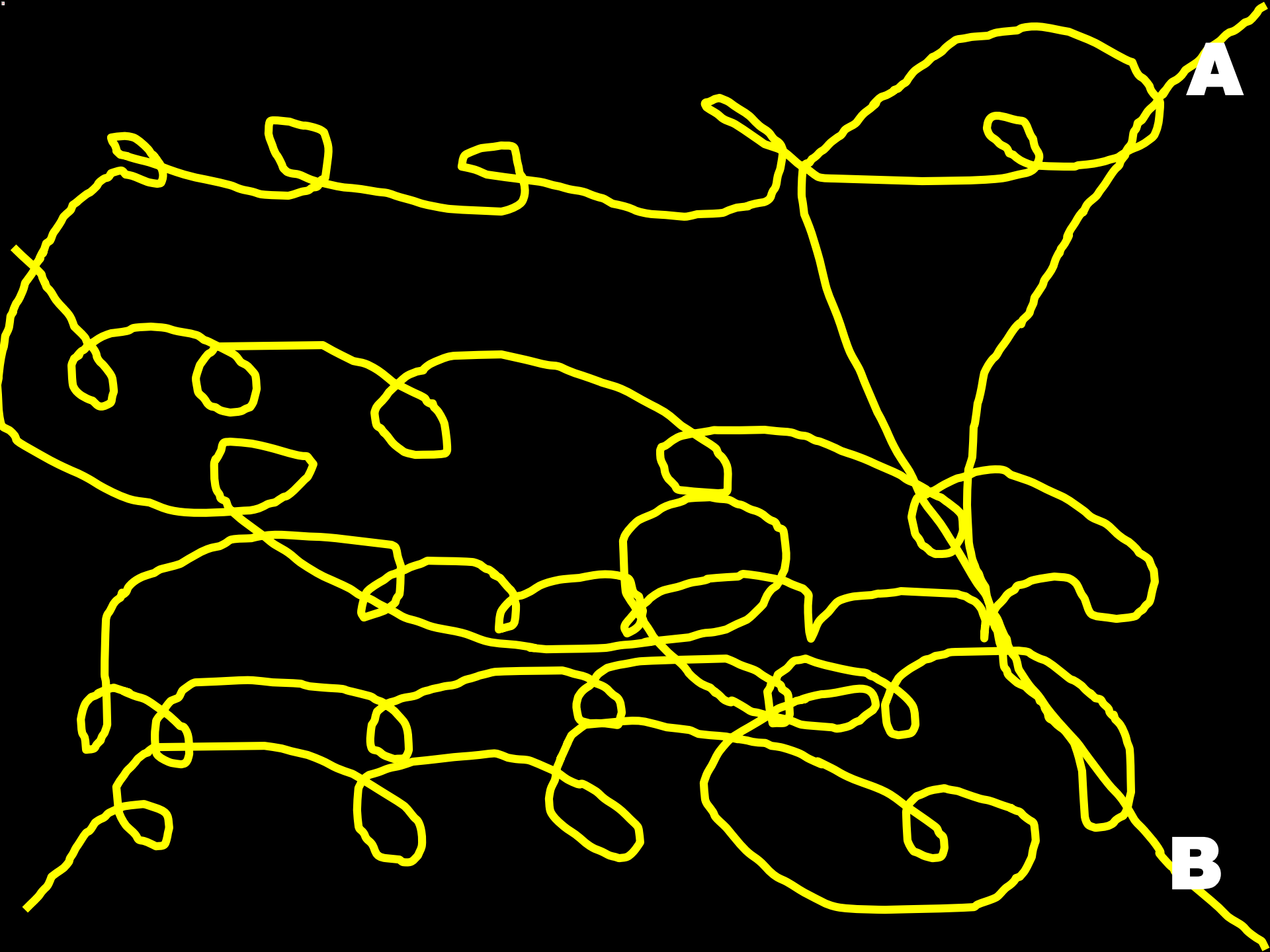
Degutas

Inkaras

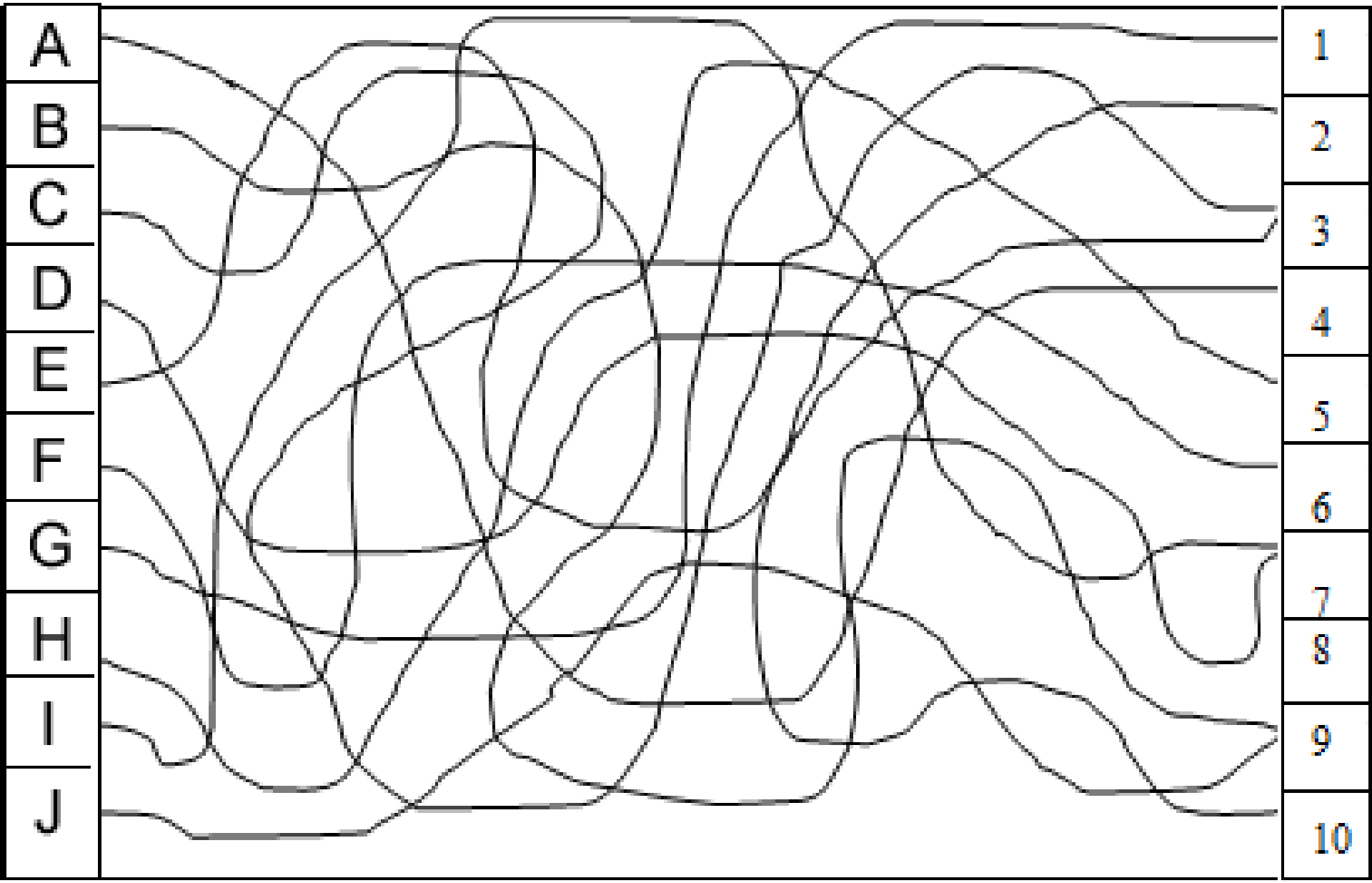
Judėjimas

Jūra

Stresas nužudo
smegenis!


A
B

A
B


A
B
C
D
E
F
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J
1
2
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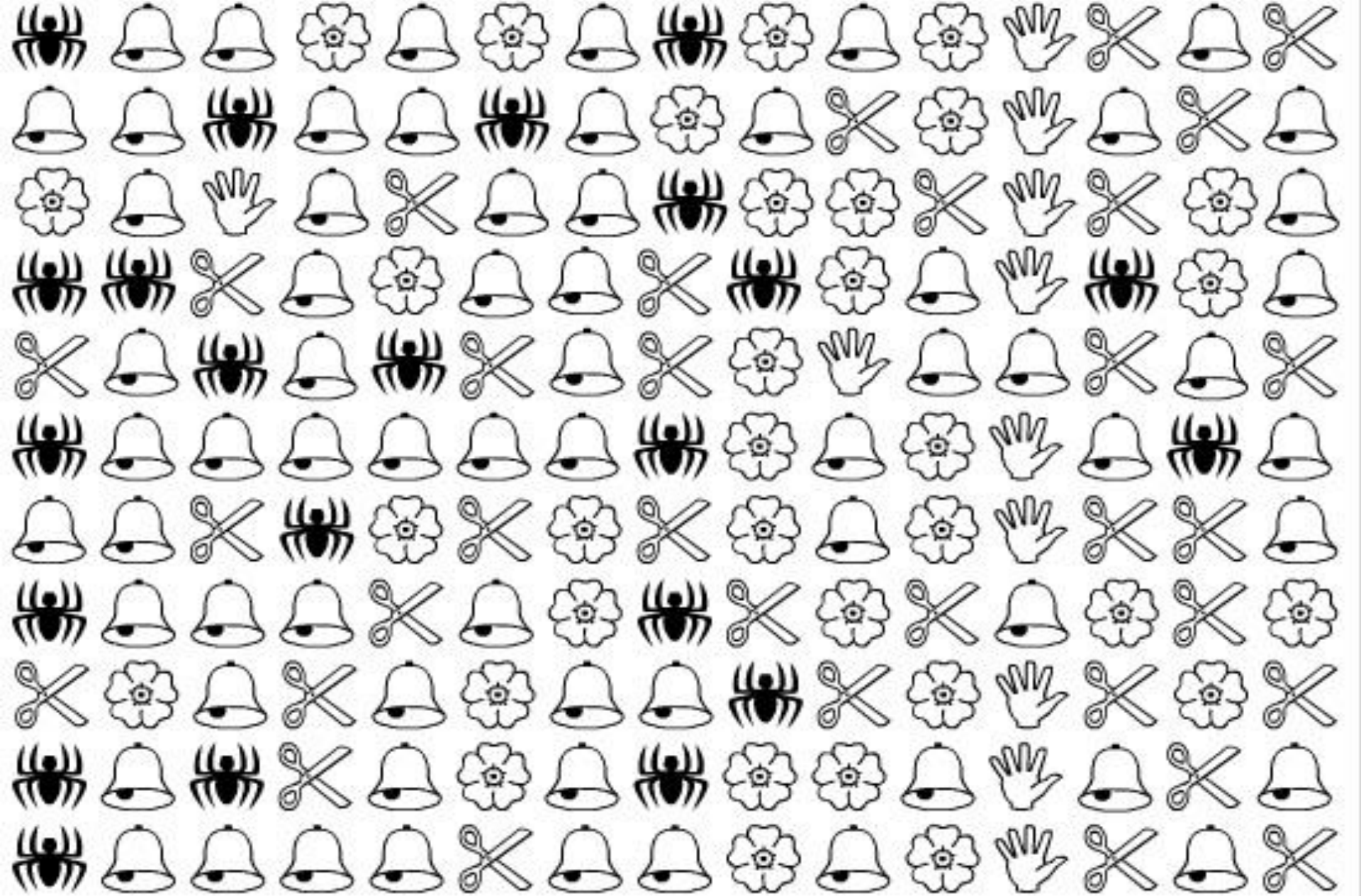
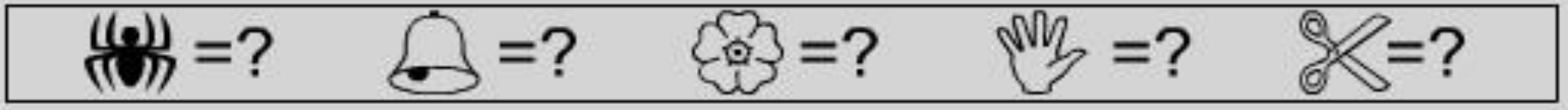
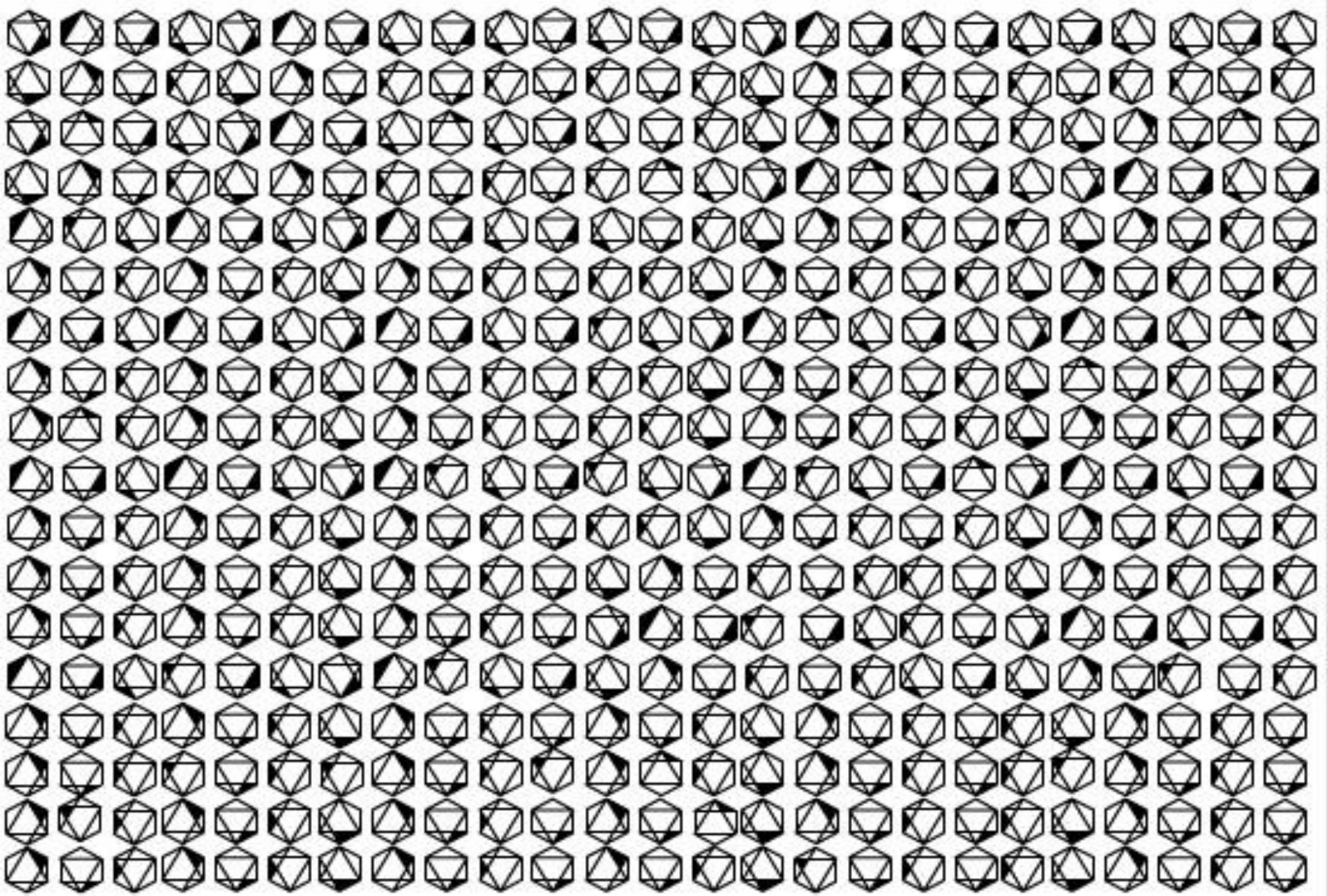
7
8
9
10

GEDEAH

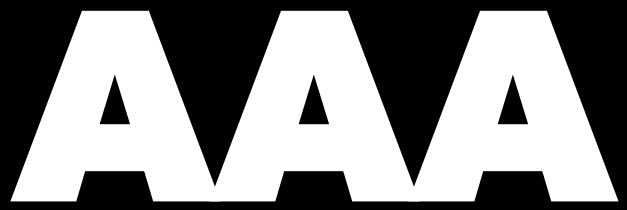


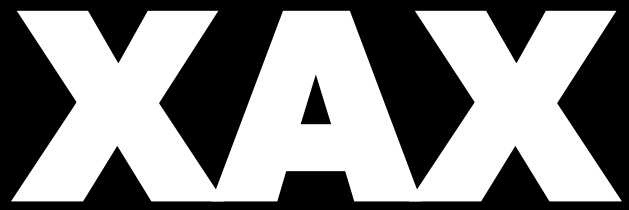




Flanker Testas

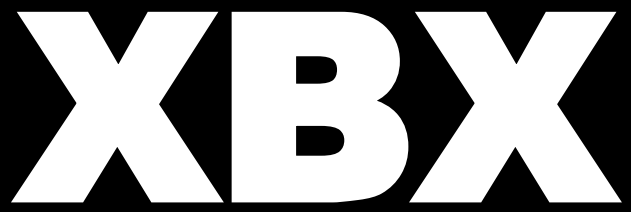
Kai A raidė centre, pvz. AAA – pakelti kairę ranką, kai B, pvz., ARBA – pakelti dešinę ranką


AAA


XAX

BAB

BBB


XBX

ABA

ABB

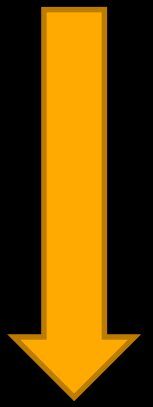
XAB

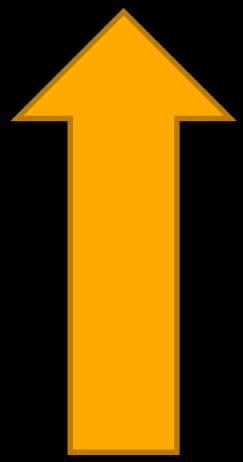
BAA

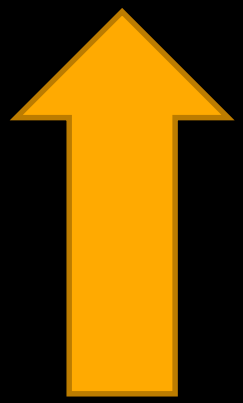
Simon Testas

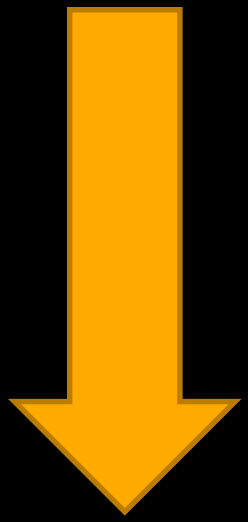
Kairę ranką pakelti į viršų, kai

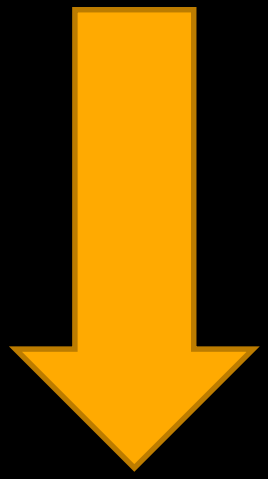
Dešinę ranką pakelti, kai

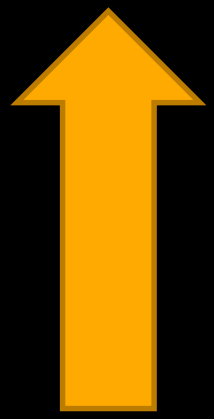


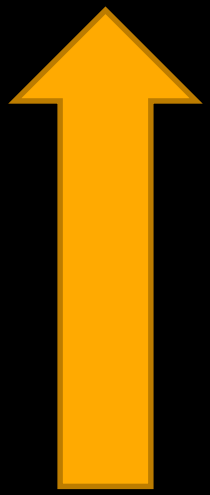


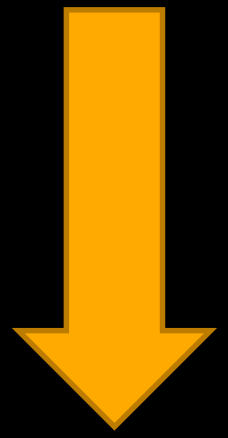


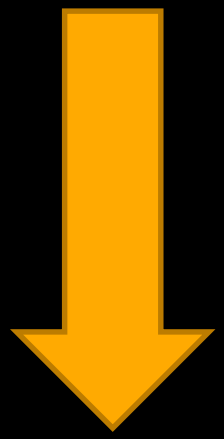


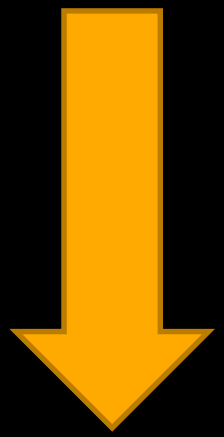












by glucocorticoids). Reproduced from reference 1: McEwen BS. Protective and damaging effects of stress mediators. *N Engl J Med*. 1998; 338:171-179. Copyright © Massachusetts Medical Society 1998.

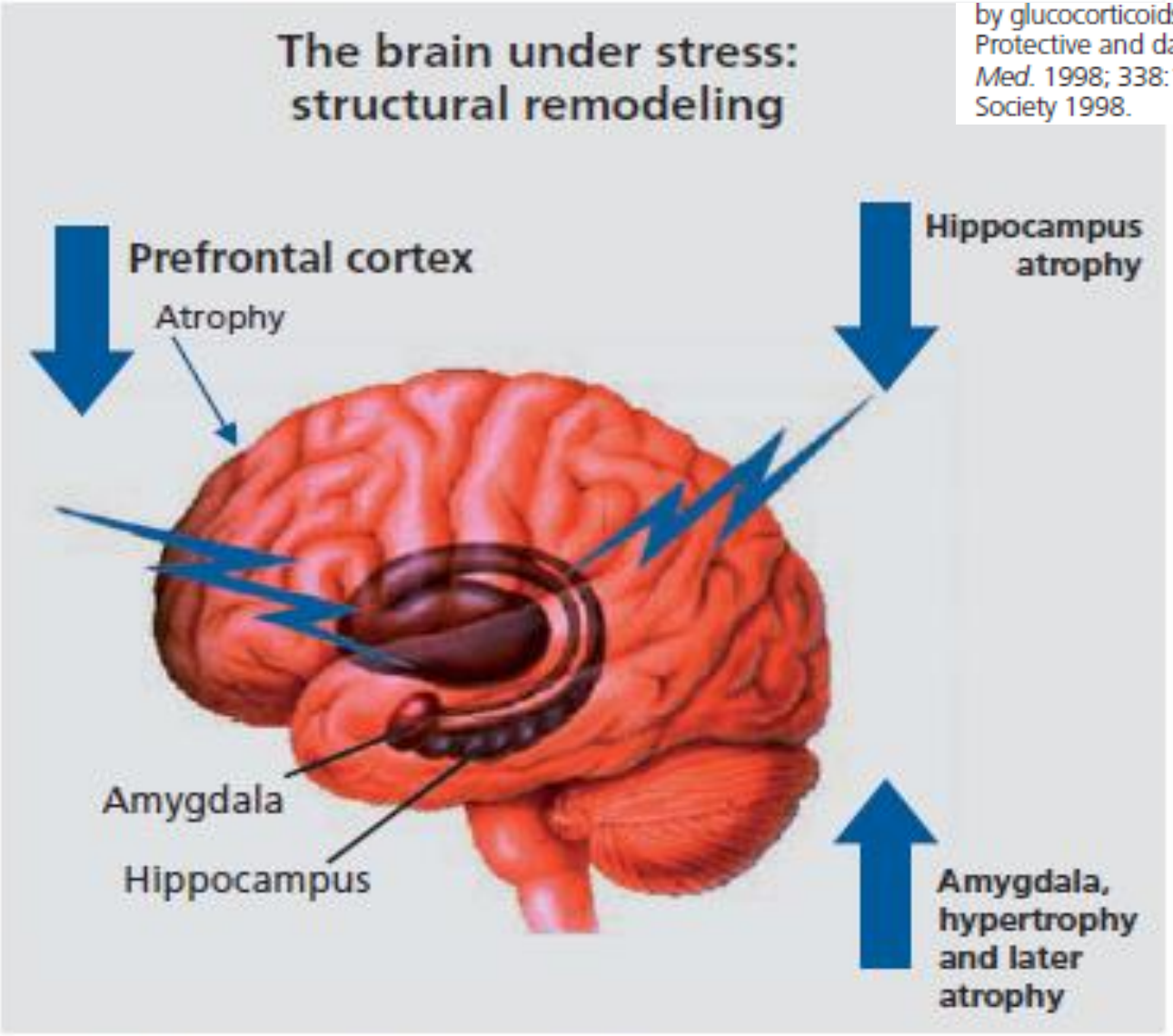


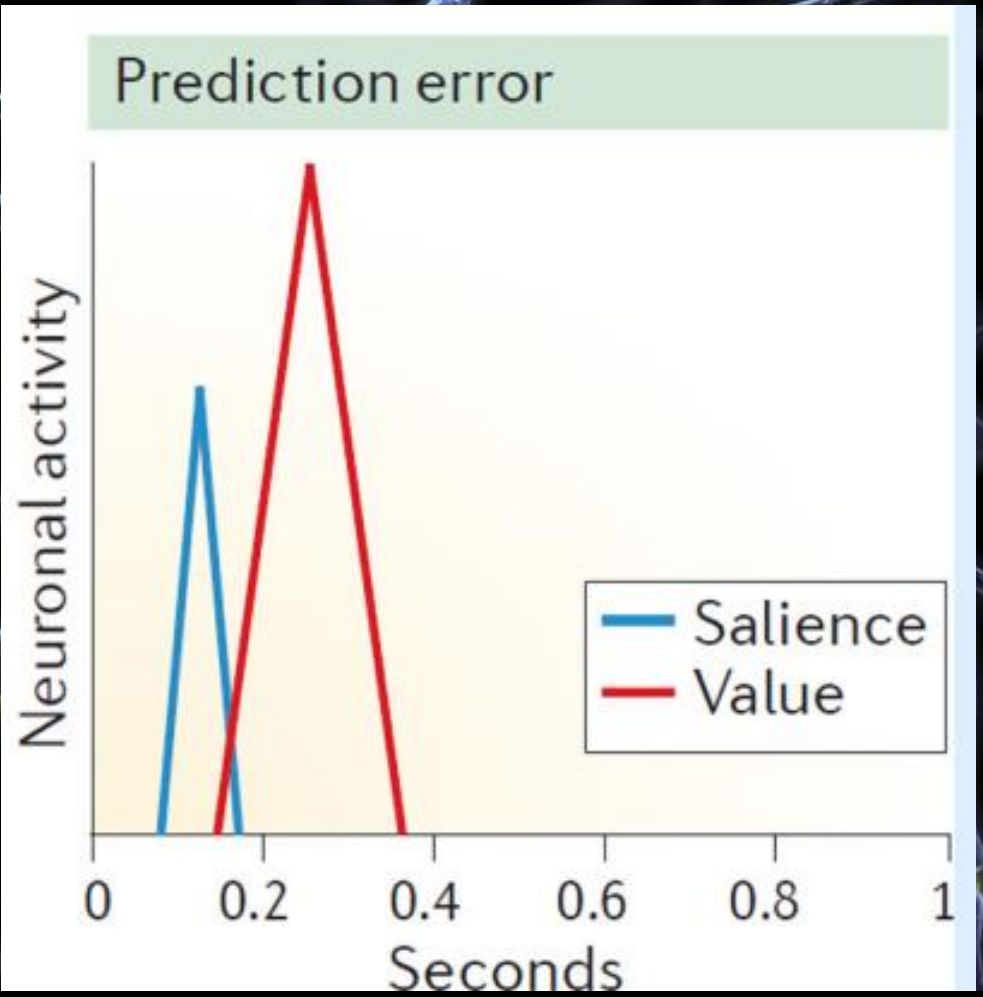
Figure 4. Brain regions that are involved in perception and response to stress, and which show structural remodeling as a result of stress.

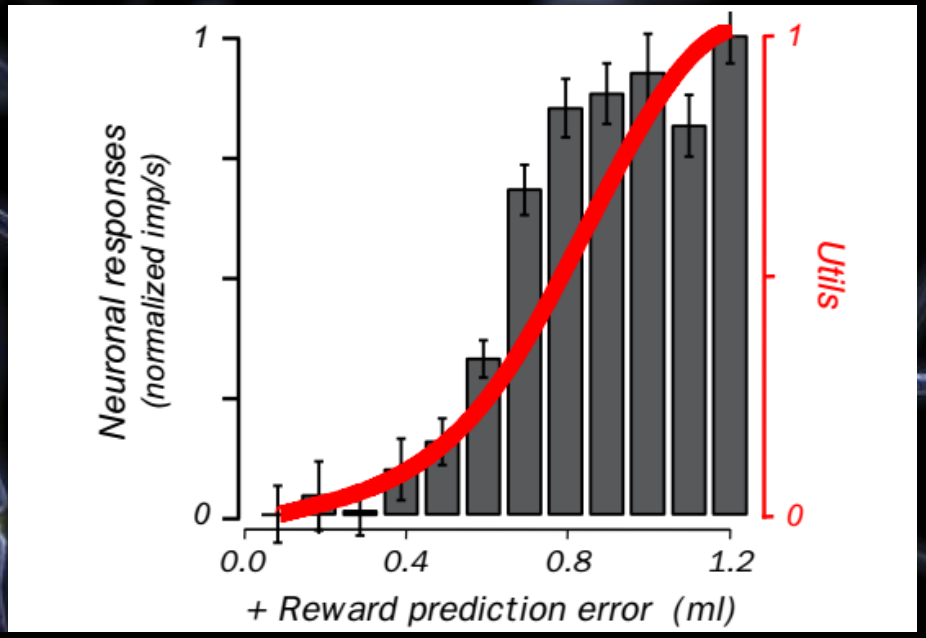
Dešimtasis!
Atpildas, dopaminas ir vidinė motyvacija!

Nat Rev Neurosci. 2016 March ; 17(3): 183–195. doi:10.1038/nrn.2015.26.

Dopamine reward prediction-error signalling: a two-component response

Wolfram Schultz





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Psichologinis krūvis!

Padidėjęs psichologinis krūvio jausmas reikšmingai sumažina atletų ištvermės rezultatą. Norint, kad ištvermės sporto šakų atletų rezultatas būtų geresnis, būtina, kad kuo mažesnį krūvį jaustų jų galvos smegenys

(Pageaux and Lepers, 2016).

Jei tik pradėsi galvoti apie detales, tai pralaimėjimas garantuotas!

Vidinė vs išorinė motyvacija!

Jei treniruotėse nepatirsi savo tobulėjimo, tai tada mesk arba trenerį, arba sportą....

Vienuoliktasis!
Optimali Atletų mityba!

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Atletų mityba!

1) Norint pagreitinti atletų organizmo atsigavimą po didelės apimties treniruočių krūvių, rekomenduojama sunaudoti **8-12 g/kg kūno svorio angliavandenių** per dieną.

2) Norint, kad organizmas atsigautų labai greitai (greičiau nei per 4 h po krūvio), rekomenduojama:
a) suvartoti aukšto glikemijos indekso **(>70) angliavandenius (1,2 g/kg/h)**;
b) **kofeino (3-8 mg/kg); c) angliavandenių (0,8 g/kg/h) + baltymų** (0,2-0,4 g/kg/h).

3) Norint, kad mažiau pavargtų galvos smegenys ir raumenys >60 min trunkančio krūvio metu (intensyvumas >70 procentų nuo MDS), rekomenduojama vartoti **angliavandenius kartu su 6-8 procentų elektrolitų tirpalu kas 10-15 min (30-60 g/h angliavandenių)**.

4) Norint suintensyvinti baltymų sintezę, rekomenduojama **kas 3-4 h per dieną suvartoti baltymų (0,2-0,4 g/kg)**. Prieš miegą suvartojant 30-40 gramų kazeino baltymų (kurio labai daug yra piene) pagreitėja baltymų sintezė miego metu.

(Kerksick CM, Arent S, Schoenfeld BJ, Stout JR, Campbell B, Wilborn CD, Taylor L, Kalman D, Smith-Ryan AE, Kreider RB, Willoughby D, Arciero PJ, VanDusseldorp TA, Ormsbee MJ, Wildman R, Greenwood M, Ziegenfuss TN, Aragon AA, Antonio J. International society of sports nutrition position stand: nutrient timing. J Int Soc Sports Nutr. 2017 Aug 29;14:33. doi: 10.1186/s12970-017-0189-4. eCollection 2017. Review).

Dvyliktasis!
Sportinės formos „užaštrinimas“!

Scientific Bases for Precompetition Tapering Strategies

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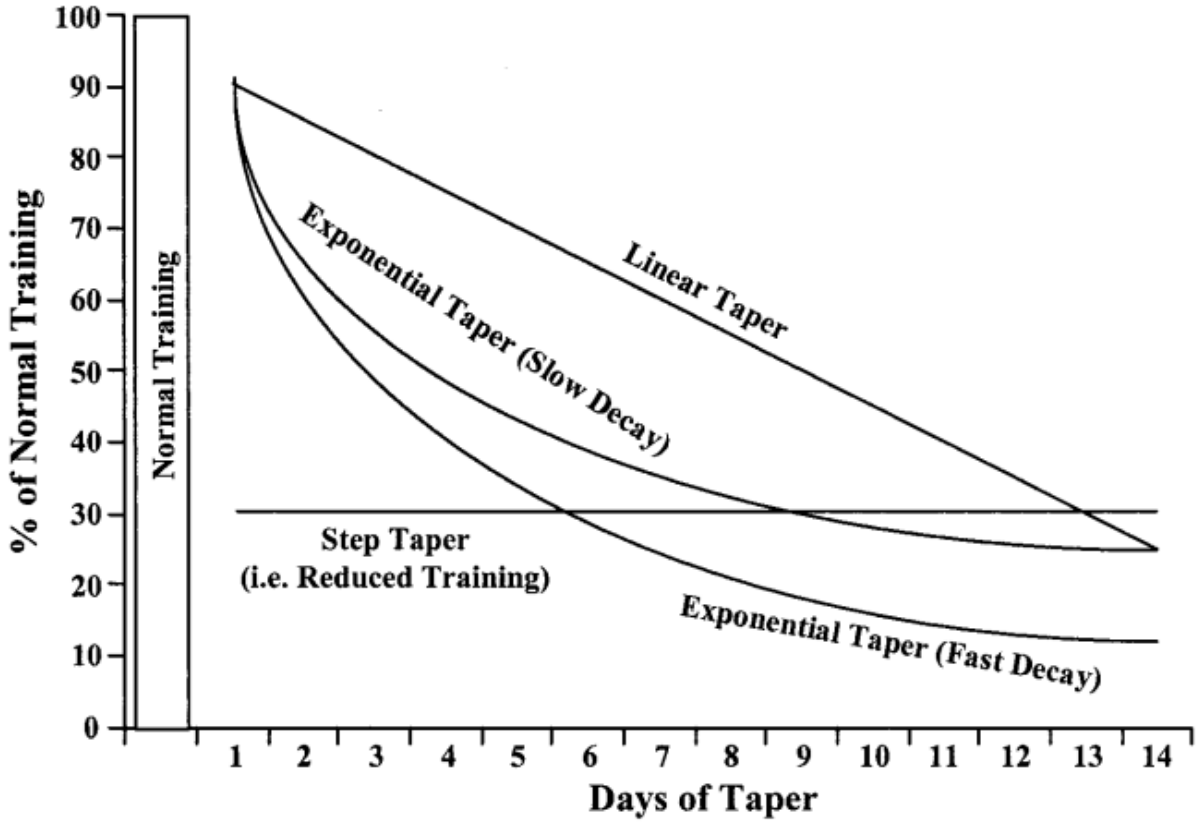

FIGURE 1—Schematic representation of the different types of tapers: linear taper, exponential taper with slow or fast time constants of decay of the training load, and step taper (also referred to as *reduced training*).

Scientific Bases for Precompetition Tapering Strategies

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TABLE 1. Summary of optimal tapering strategies.

Tapering Strategy
Minimize fatigue without compromising fitness
Maintain training intensity
Reduce training volume by 60–90%
Maintain training frequency at >80%
Individualize taper duration between 4 and 28 d
Use progressive, nonlinear tapering designs
Expect performance improvements of ≈3% (range 0.5–6.0%)