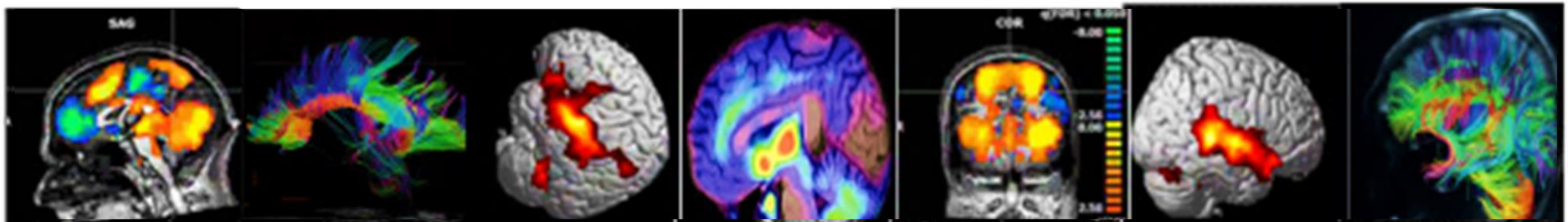
UNIVERSIDAD MAYOR PARA ESPÍRITUS EMPRENDEDORES

Neurociencia y Neuroeducación

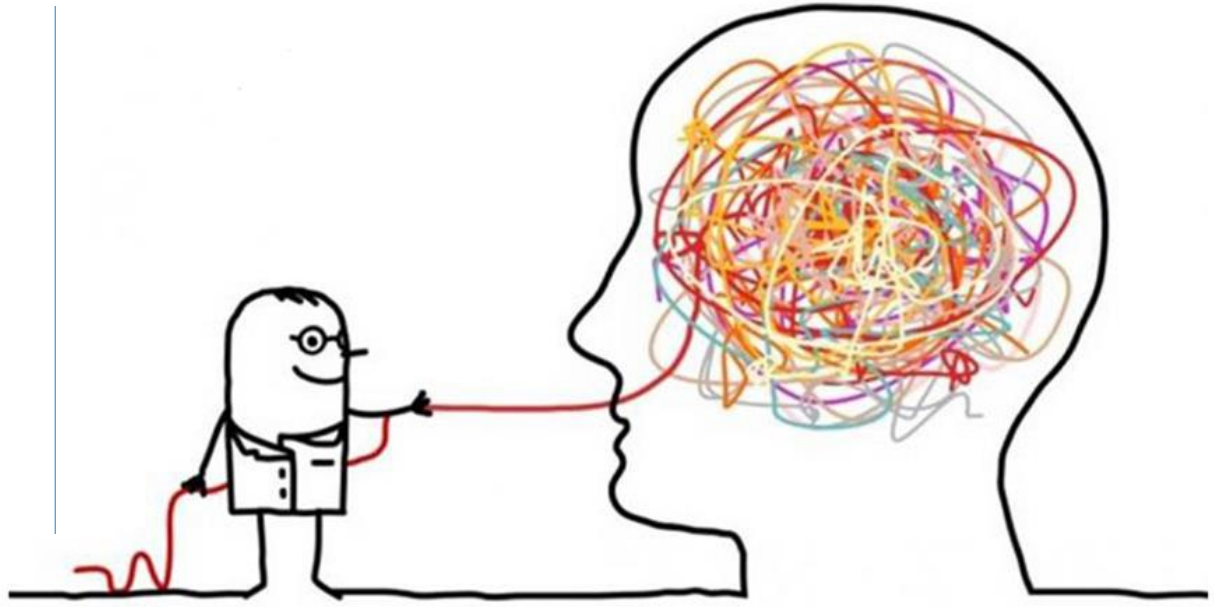
Prof. Alejandro Ducassou Varela, Med / MSc
Director Regional Académico **UNIVERSIDAD MAYOR**
Miembro Asociación Chilena Profesores de Educación Física **ACHIPEF**
alejandro.ducassou@umayor.cl

Neurociencia

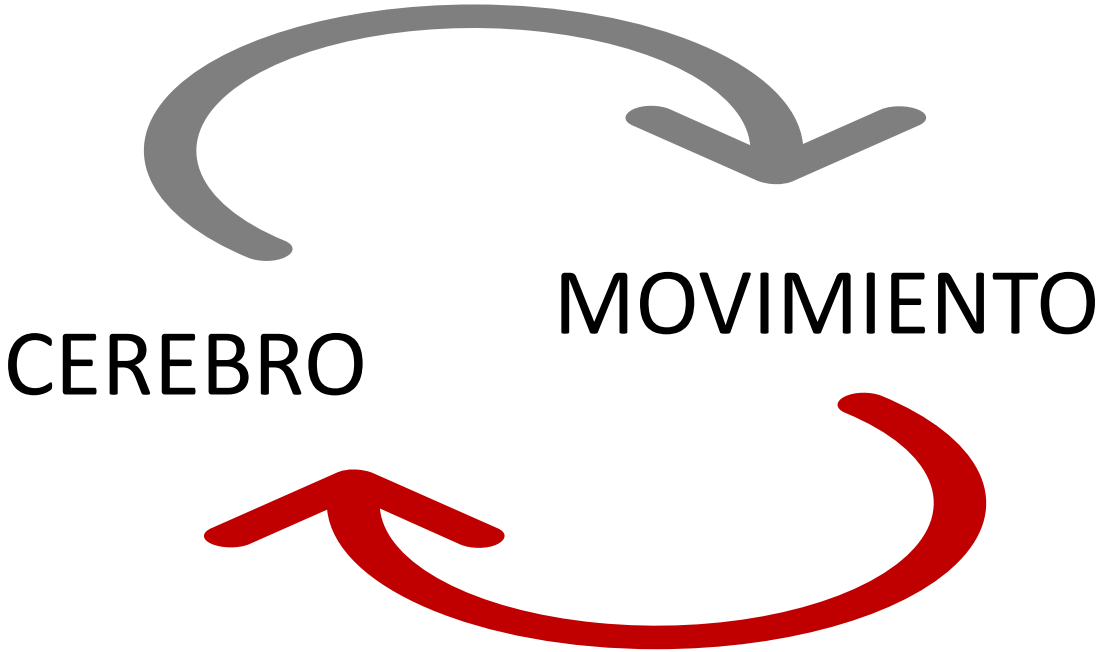


Neuroeducación

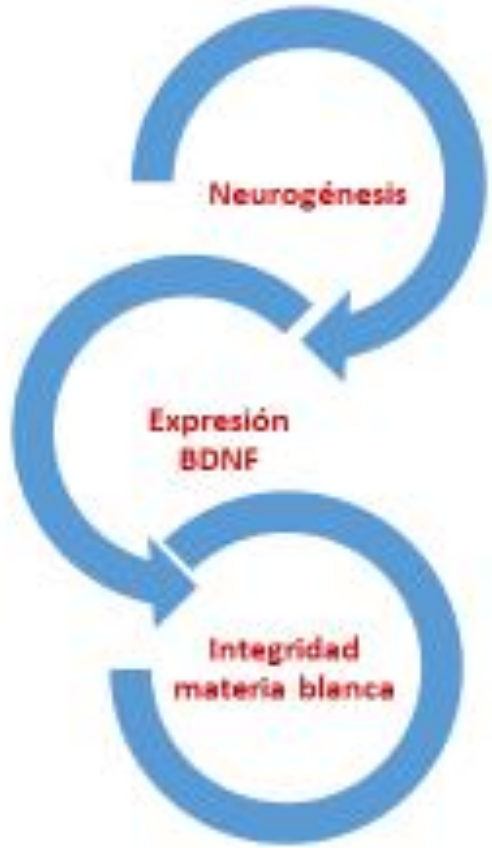
¿cómo aprendemos?
¿cómo funcionan los sistemas de memoria?
¿cómo funcionan los sistemas de atención?
¿cómo se gestionamos nuestras emociones?
¿cómo de desarrollan nuestras funciones ejecutivas…



UNIVERSIDAD MAYOR



UNIVERSIDAD MAYOR



Pereira, A., Huddleston, D., Small, S. An in vivo correlate of exercise-induced neurogenesis in the adult dentate gyrus. PNAS, 2007

Thomas A., Dennis A., Bandettini P., Johansen-Berg H. Front Psychol. (2012)

Chaddock, L., Hillman, Ch., Buck, S., Cohen, N. Aerobic Fitness and Executive Control of Relational Memory in Preadolescent Children. MEDICINE & SCIENCE IN SPORTS & EXERCISE (2011). DOI: 10.1249/MSS.0b013e3181e9ef48.

Erickson KI, Prakash RS, Voss MW, Chaddock L, Hu L, Morris KS, White SM, Wójcicki TR, McAuley E, Kramer AF. Aerobic fitness is associated with hippocampal volume in elderly humans. Hippocampus. 2009 Oct;19(10):1030-9. doi: 10.1002/hipo.20547.

Singh AS, Saliasi E, van den Berg V, et al. Br J Sports Med Epub ahead of print: [please include Day Month Year]. doi:10.1136/bjsports-2017-098136

van Praag H., Christie B., Sejnowski T., Gage, F. Running enhances neurogenesis, learning, and long-term potentiation in mice. Neurobiology Proc Natl Acad Sci U S A. 1999 Nov 9; 96(23): 13427–13431.

Patrick J. Smith, MA, James A. Blumenthal, PhD, Benson M. Hoffman, PhD, Harris Cooper, PhD, Timothy A. Strauman, PhD, Kathleen Welsh-Bohmer, PhD, Jeffrey N. Browndyke, PhD, and Andrew Sherwood, PhD Aerobic Exercise and Neurocognitive Performance: a Meta-Analytic Review of Randomized Controlled Trials. Psychosom Med. 2010 Apr; 72(3): 239–252.

Palacios, E., Clavijo-Prado. Inferior longitudinal fasciculus: A new look at language. Report med cir. 2016;25(4):251–254

Chaddock-Heyman, L., Erickson, K. I., Holtrop, J. L., Voss, M. W., Pontifex, M. B., Raine, L. B., ... Kramer, A. F. (2014). Aerobic fitness is associated with greater white matter integrity in children. Frontiers in human neuroscience, 8, 584. http://doi.org/10.3389/fnhum.2014.00584

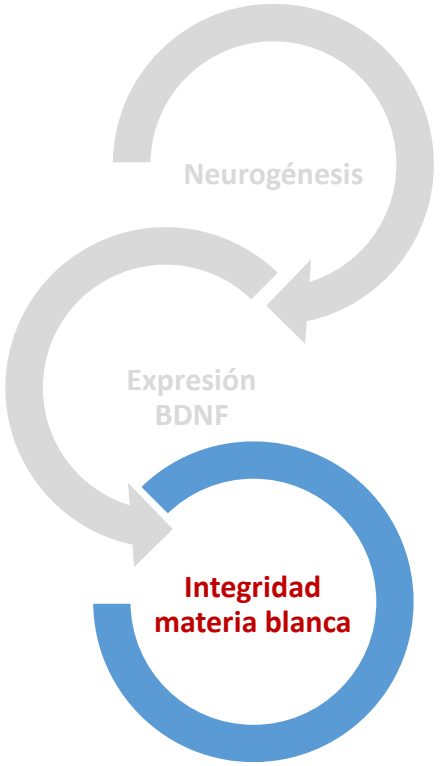
Schaeffer DJ, Krafft CE, Schwarz NF, Chi L, Rodrigue AL, Pierce JE, Allison JD, Yanasak NE, Liu T, Davis CL, McDowell JE (2014). An 8-month exercise intervention alters frontotemporal white matter integrity in overweight children. Psychophysiology. 2014 Aug;51(8):728-33. doi: 10.1111/psyp.12227

Cano-Galindo S, Vélez-García A, Orozco-Calderón G, Cruz-Pérez F. Implications of the uncinate fasciculus function in epilepsy. Rev Mex Neurol Septiembre-Octubre, 2014; 15(5): 277-281

Winter, B. (2007). High impact running improves learning Neurobiology of Learning and Memory, Volume 87, Issue 4, doi.org/10.1016/j.nlm.2006.11.003

UNIVERSIDAD MAYOR






frontiers in HUMAN NEUROSCIENCE

ORIGINAL RESEARCH ARTICLE
published: 19 August 2014
doi: 10.3389/fnhum.2014.00584

Aerobic fitness is associated with greater white matter integrity in children

Laura Chaddock-Heyman[1,2], Kirk I. Erickson[3], Joseph L. Holtrop[2,4], Michelle W. Voss[5], Matthew B. Pontifex[6], Lauren B. Raine[7], Charles H. Hillman[2,7] and Arthur F. Kramer[1,2]*

[1] Department of Psychology, University of Illinois at Urbana-Champaign, Urbana, IL, USA
[2] Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, USA
[3] Department of Psychology, University of Pittsburgh, Pittsburgh, PA, USA
[4] Department of Bioengineering, University of Illinois at Urbana-Champaign, Urbana, IL, USA
[5] Department of Psychology, University of Iowa, Iowa City, IA, USA
[6] Department of Kinesiology, Michigan State University, East Lansing, MI, USA
[7] Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Urbana, IL, USA

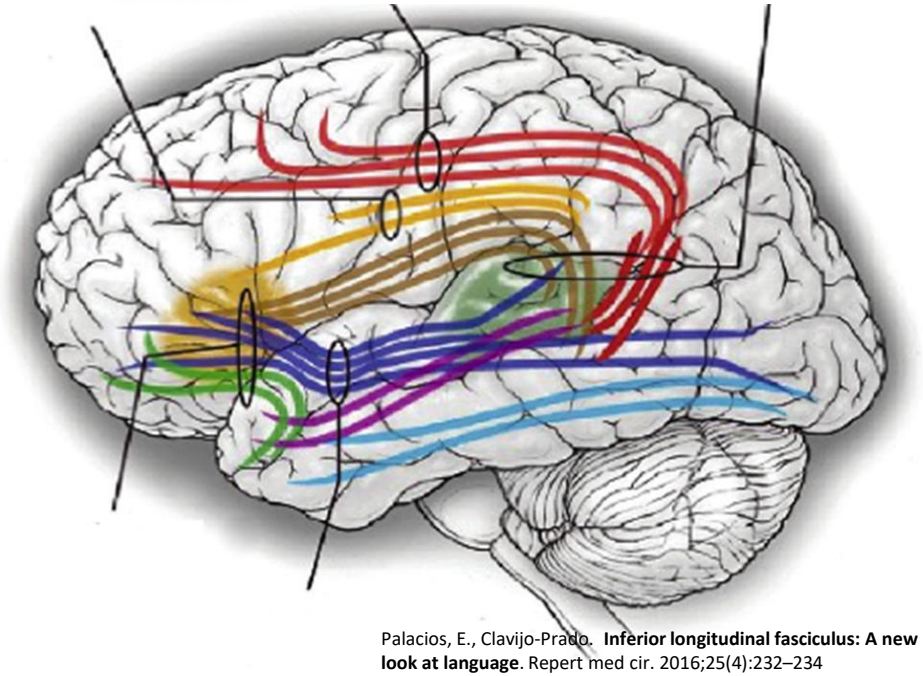
Edited by:
Francesco Di Russo, University of Rome "Foro Italico", Italy

Reviewed by:
Giancarlo Zito, San Giovanni Calibita Fatebenefratelli Hospital, Italy
Tomas Paus, University of Toronto, Canada

***Correspondence:**
Laura Chaddock-Heyman, Department of Psychology and Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, 405 North Mathews Avenue, Urbana, IL 61801, USA
e-mail: lchaddo2@illinois.edu

Aerobic fitness has been found to play a positive role in brain and cognitive health of children. Yet, many of the neural biomarkers related to aerobic fitness remain unknown. Here, using diffusion tensor imaging, we demonstrated that higher aerobic fitness was related to greater estimates of white matter microstructure in children. Higher fit 9- and 10-year-old children showed greater fractional anisotropy (FA) in sections of the corpus callosum, corona radiata, and superior longitudinal fasciculus, compared to lower fit children. The FA effects were primarily characterized by aerobic fitness differences in radial diffusivity, thereby raising the possibility that estimates of myelination may vary as a function of individual differences in fitness during childhood. White matter structure may be another potential neural mechanism of aerobic fitness that assists in efficient communication between gray matter regions as well as the integration of regions into networks.

Keywords: cardiorespiratory fitness, development, diffusion tensor imaging, fiber tracts, microstructure



Palacios, E., Clavijo-Prado. **Inferior longitudinal fasciculus: A new look at language**. Repert med cir. 2016;25(4):232–234

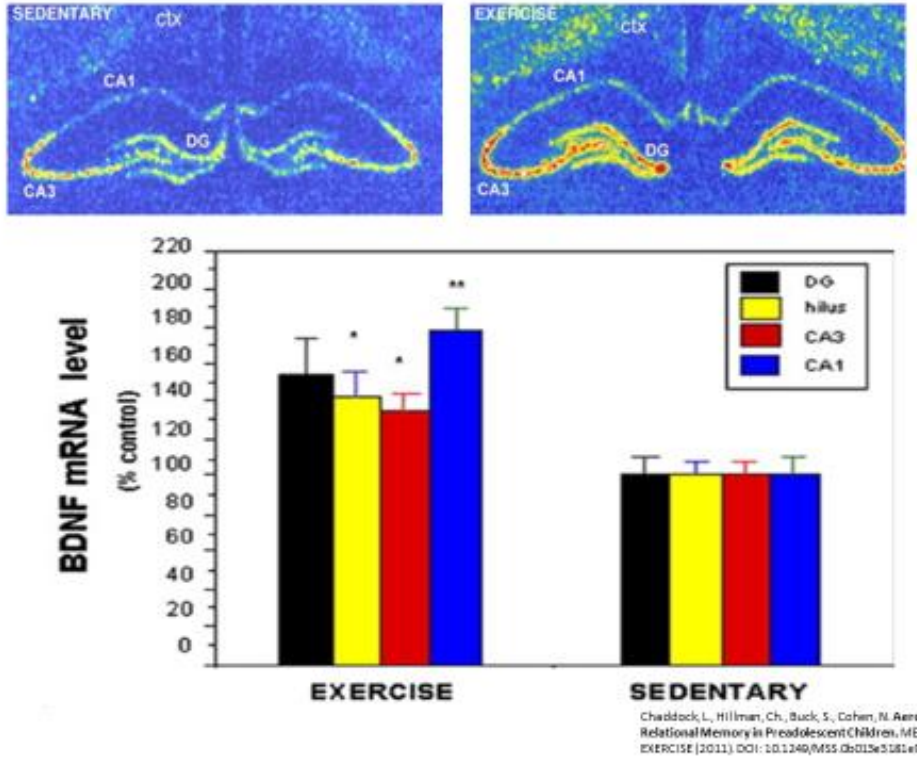
Chaddock-Heyman, L., Erickson, K. I., Holtrop, J. L., Voss, M. W., Pontifex, M. B., Raine, L. B., ... Kramer, A. F. (2014). **Aerobic fitness is associated with greater white matter integrity in children**. *Frontiers in Human Neuroscience*, *8*, 584. http://doi.org/10.3389/fnhum.2014.00584

Neurogénesis

Expresión BDNF

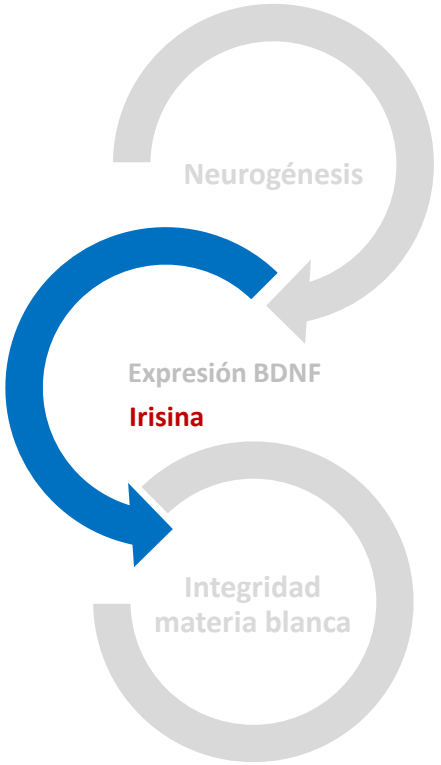
Irisina

Integridad materia blanca

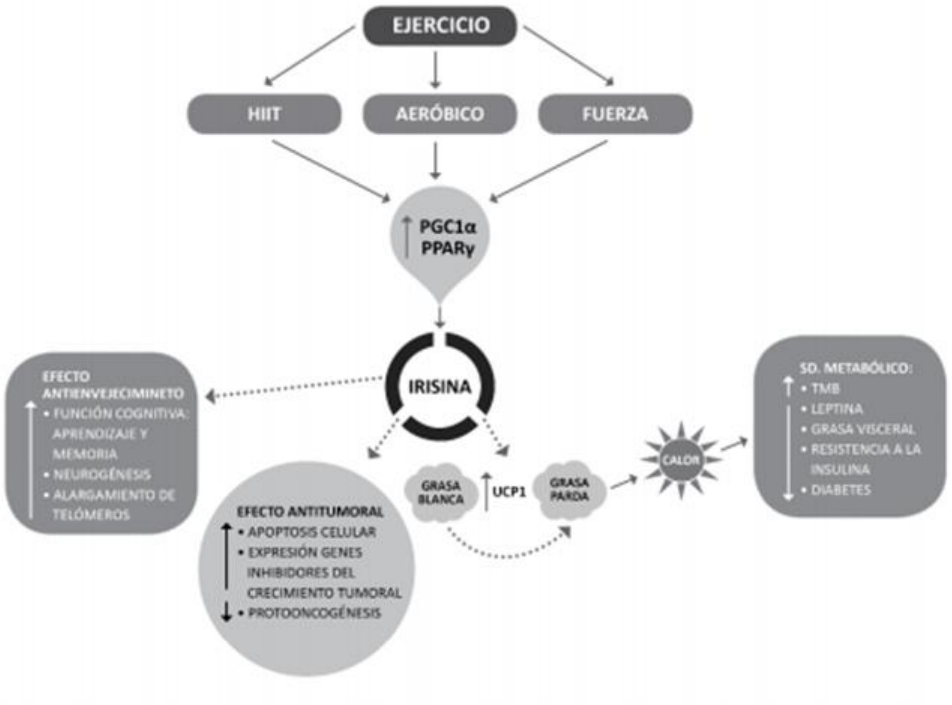


Chaddock, L., Hillman, Ch., Buck, S., Cohen, N. **Aerobic Fitness and Executive Control of Relational Memory in Preadolescent Children.** MEDICINE & SCIENCE IN SPORTS & EXERCISE (2011). DOI: 10.1249/MSS.0b013e3181e9ef48.





HIIT: Ejercicio de intervalo de alta intensidad por sus siglas en inglés. PGC-1α: coactivador 1 α. PPARγ: receptor activado por proliferador de peroxisomas γ. UCP1: Proteína de desacoplamiento mitocondrial 1. SD.METABÓLICO: Síndrome metabólico. TMB: Tasa Metabólica Basal.

Trujillo, L.M., García, D., von Oetinger, A. (2016). **Actualizaciones sobre irisina: la nueva mioquinasa.** *Rev Chil Nutr Vol.43, N°3.*

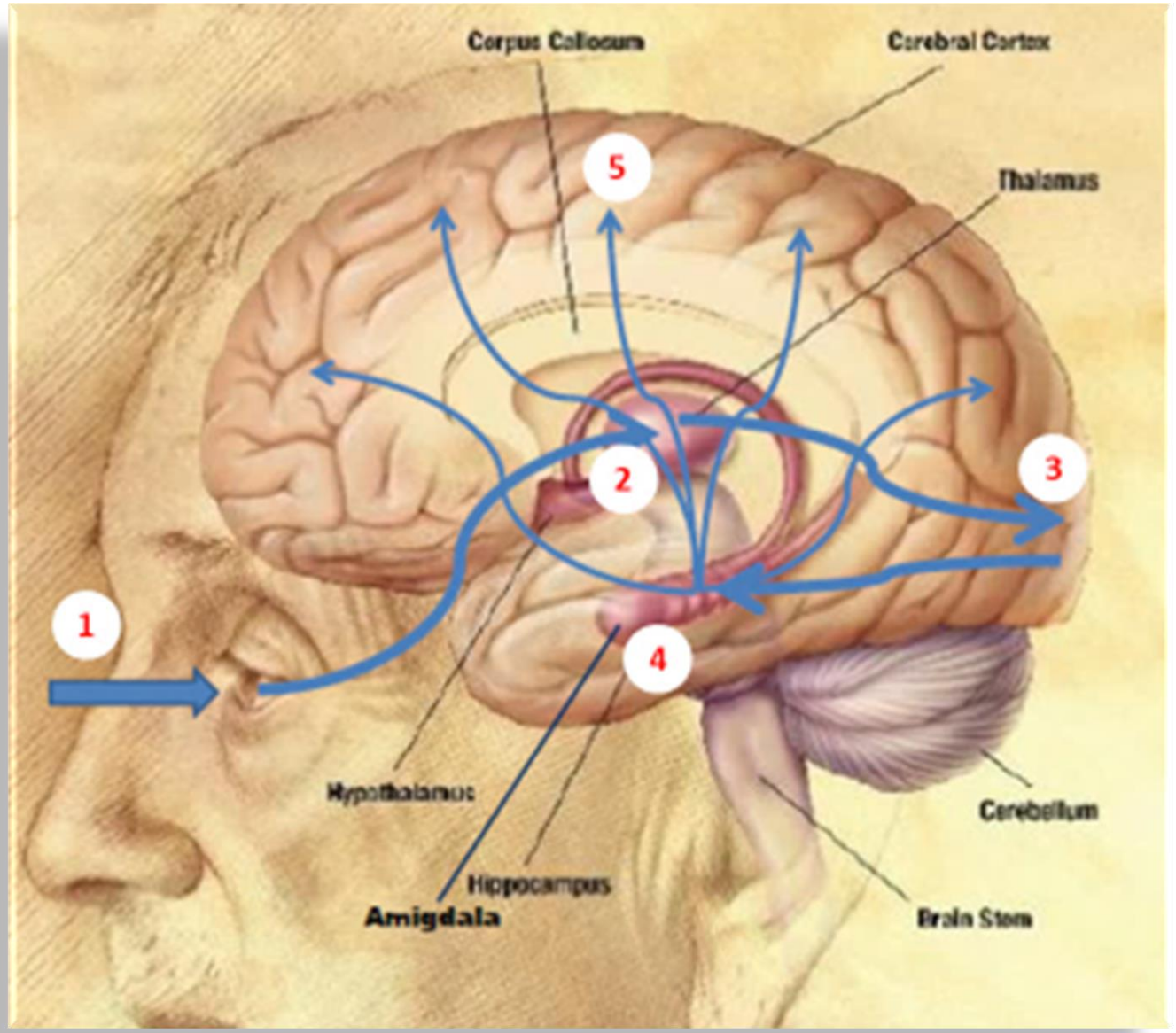
Neurogénesis

Expresión
BDNF

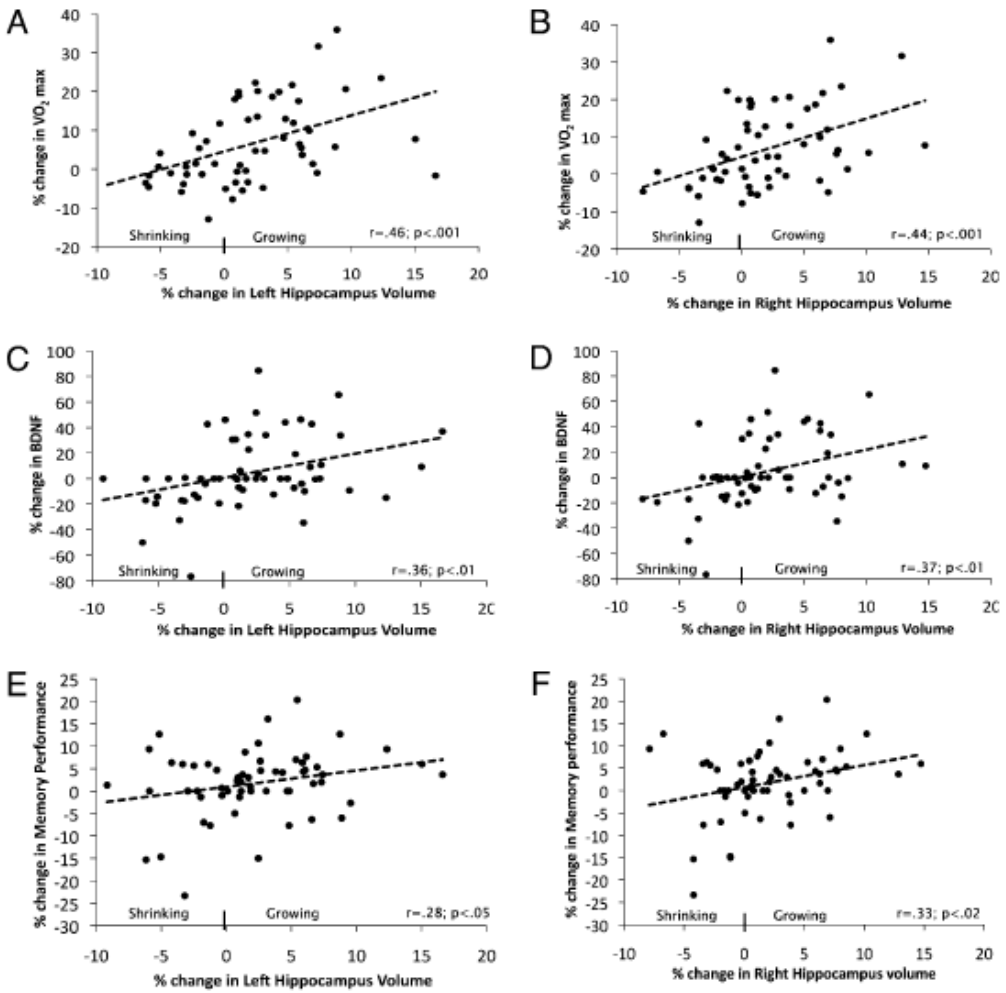
Integridad
materia blanca

UNIVERSIDAD MAYOR

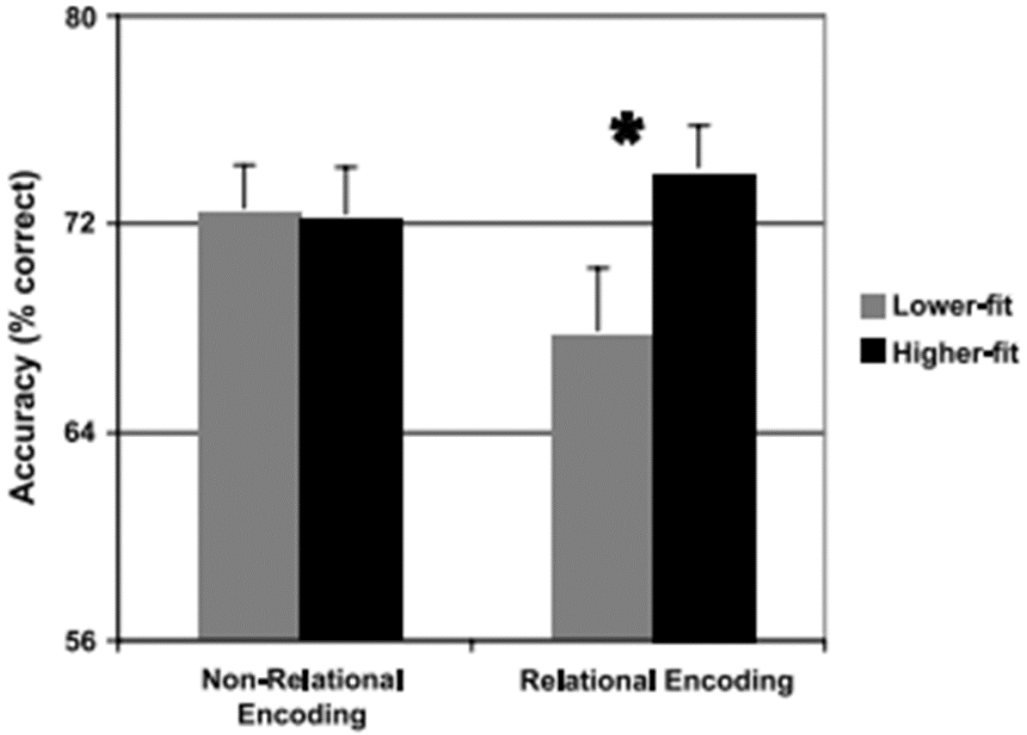
NEUROGÉNESIS DEL HIPOCAMPO:
SIN MEMORIA NO HAY APRENDIZAJE



UNIVERSIDAD MAYOR

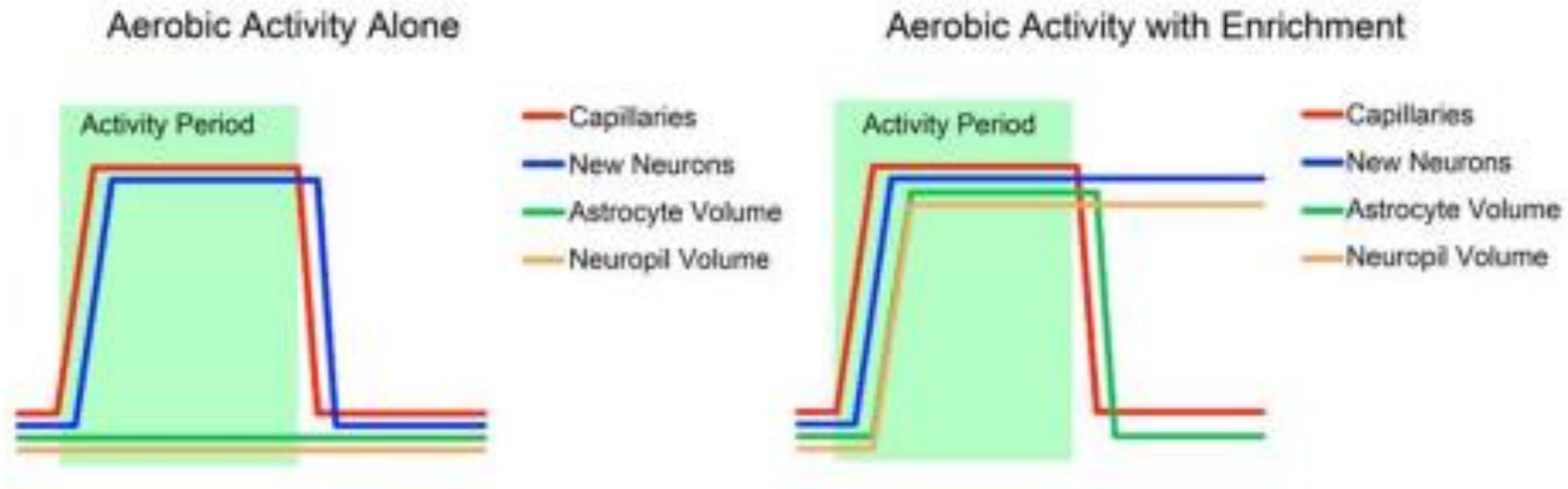


Erickson KI, Prakash RS, Voss MW, Chaddock L, Hu L, Morris KS, White SM, Wójcicki TR, McAuley E, Kramer AF. **Aerobic fitness is associated with hippocampal volume in elderly humans**. Hippocampus. 2009 Oct;19(10):1030-9. doi: 10.1002/hipo.20547.



Chaddock, L., Hillman, Ch., Buck, S., Cohen, N. **Aerobic Fitness and Executive Control of Relational Memory in Preadolescent Children.** MEDICINE & SCIENCE IN SPORTS & EXERCISE (2011). DOI: 10.1249/MSS.0b013e3181e9af48.

La supervivencia de las neurona depende del enriquecimiento ambiental



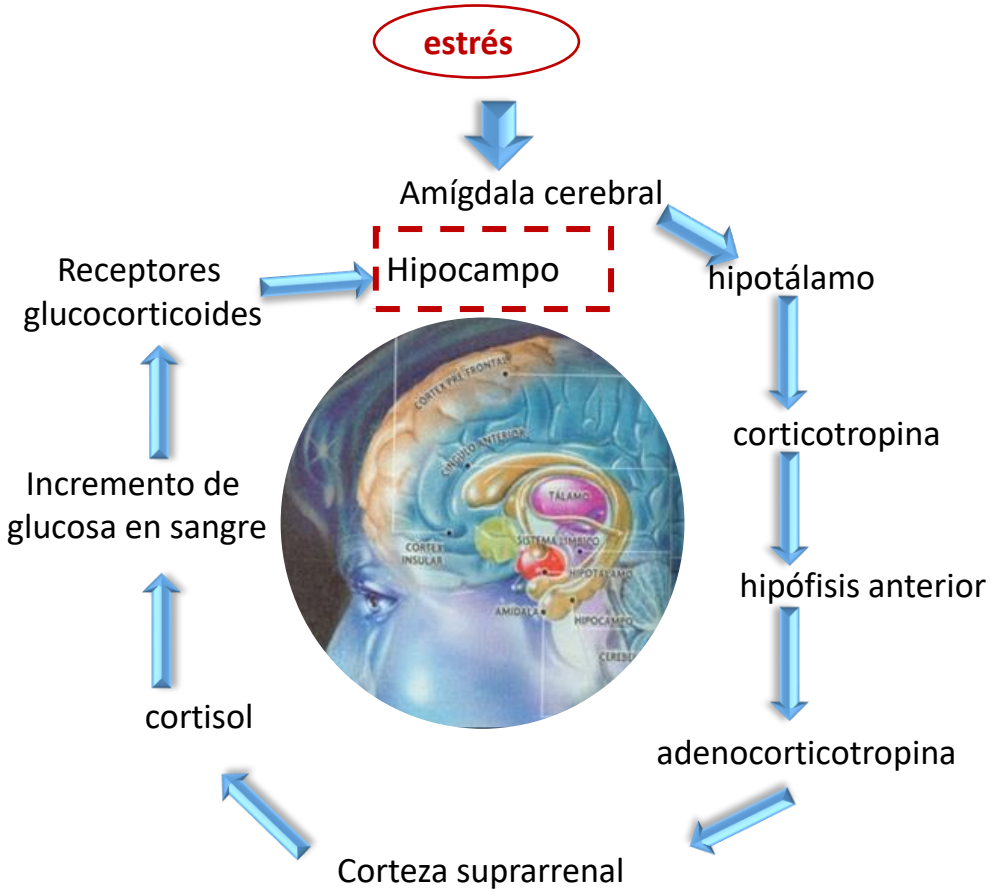
A schematic summary of the time courses of the different components of structural change associated with exercise and environmental enrichment, based on several studies discussed in this review.

Thomas A., Dennis A., Bandettini P., Johansen-Berg H.
The effects of aerobic activity on brain structure
Front Psychol. (2012)

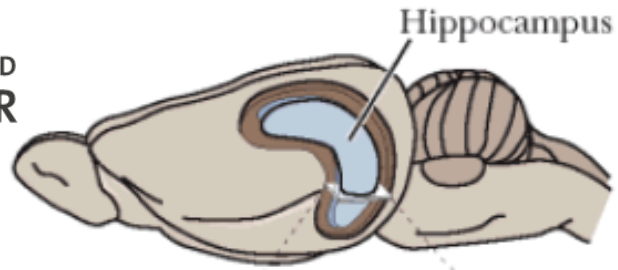
La escuela como espacio democrático para aprender

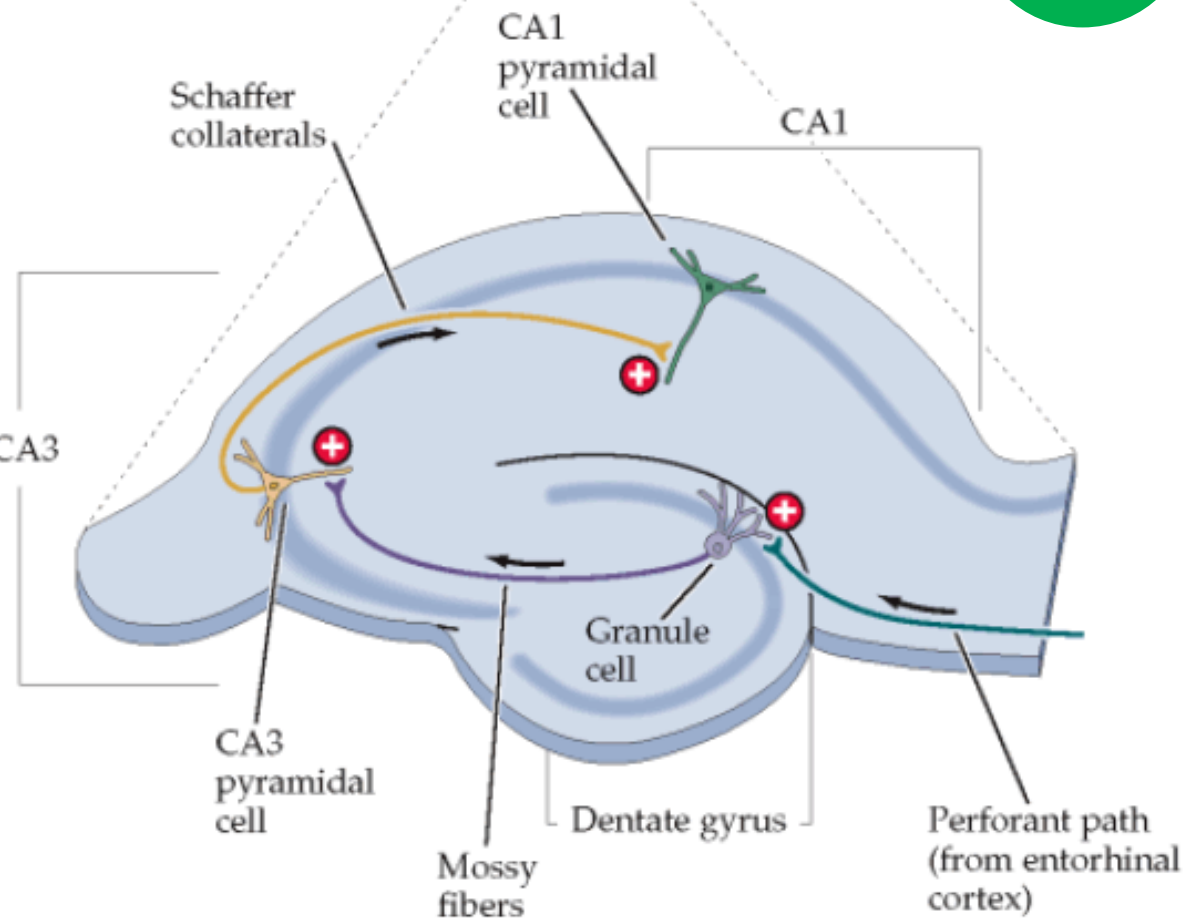
Un gran experimento global

angustia, ansiedad, dificultad para autoregular…estrés



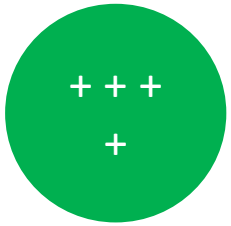
Champagne, Bale, Weaver, Zhang, McGowan (2010)
Zárate, S. et als (2014)
Meraz, M., et als (2009)



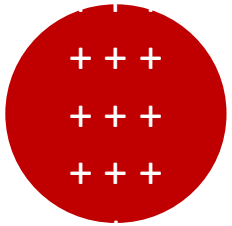


Glutamato = +AMPA → Na+

+NMDA → Ca = + sensibilidad



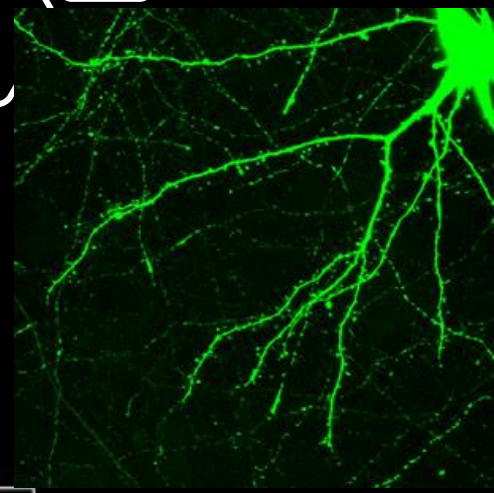
Glutamato

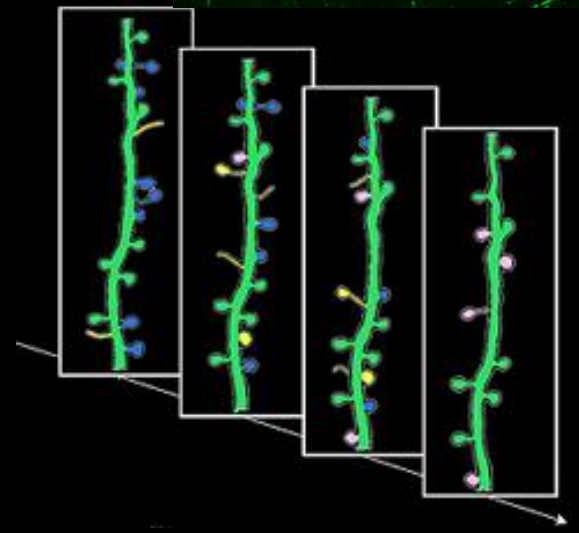


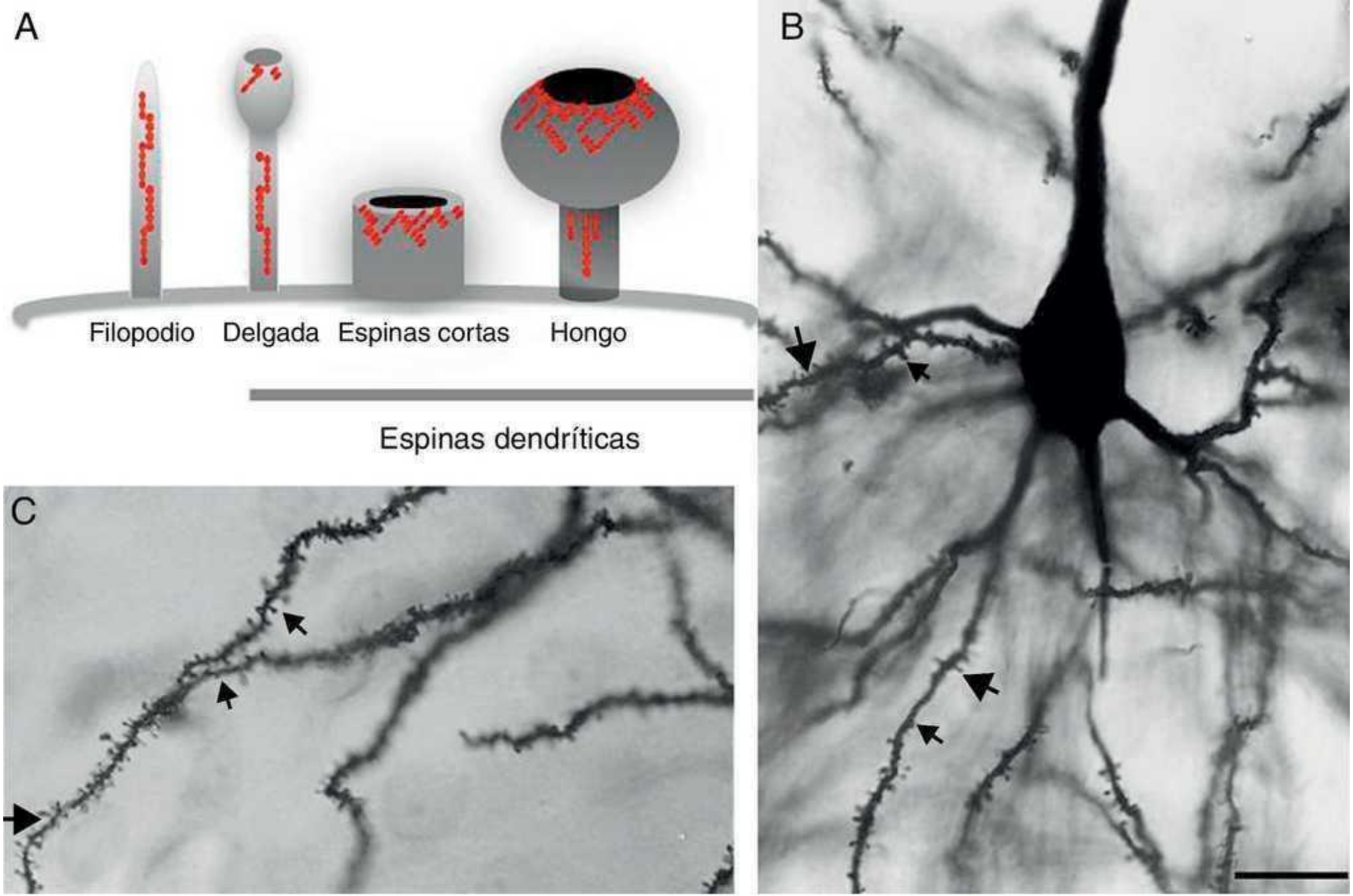
= exocitocidad

- AMPA
- NMDA

retracción de las espinas dendríticas







Neurologia. 2012;27:421–31

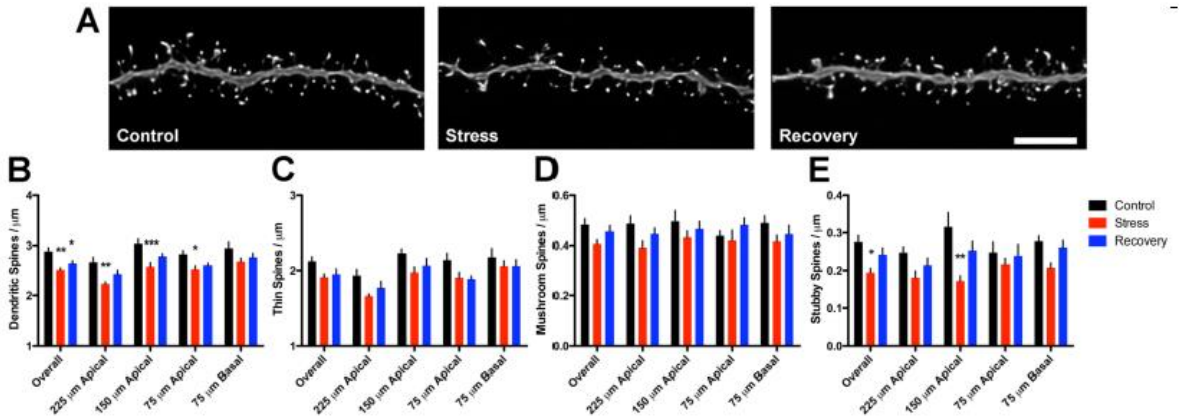
EFECTOS DEL EJERCICIO FISICO AERÓBICO EN LA MORFOLOGÍA Y DENSIDAD DE LAS ESPINAS DENDRITICAS DEL HIPOCAMPO

La exposición a ambientes de estrés reduce la densidad de espinas dendríticas en edades tempranas, no así en edades maduras.

La exposición a periodos de recuperación en ambientes enriquecidos puede compensar la reducción de espinas dendríticas.

A medida que ↑ la edad ↓ la plasticidad en la capa III del CPF.

La ↓ de espinas dendríticas se observa SOLO en espinas dendríticas delgadas.



NIH Public Access
Author Manuscript
J Neurosci. Author manuscript; available in PMC 2012 July 17.

Published in final edited form as:
J Neurosci. 2011 May 25; 31(21): 7831–7839. doi:10.1523/JNEUROSCI.0839-11.2011.

Evidence for reduced experience-dependent dendritic spine plasticity in the aging prefrontal cortex

Erik B. Bloss[1], **William G. Janssen**[1], **Daniel T. Ohm**[1], **Frank J. Yuk**[1], **Shannon Wadsworth**[1], **Karl M. Saardi**[1], **Bruce S. McEwen**[3], and **John H. Morrison**[1,2,*]

[1]Department of Neuroscience, Mount Sinai School of Medicine, New York, NY 10029

[2]Department of Geriatrics and Palliative Care, Mount Sinai School of Medicine, New York, NY 10029

[3]Laboratory of Neuroendocrinology, The Rockefeller University, New York, NY 10021

Abstract

Cognitive functions that require the prefrontal cortex are highly sensitive to aging in humans, non-human primates, and rodents, although the neurobiological correlates of this vulnerability remain largely unknown. It has been proposed that dendritic spines represent the primary site of structural plasticity in the adult brain, and recent data have supported the hypothesis that aging is associated with alterations of dendritic spine morphology and plasticity in prefrontal cortex. However, no study to date has directly examined whether aging alters the capacity for experience-dependent spine plasticity in aging prefrontal neurons. To address this possibility we used young, middle-aged, and aged rats in a behavioral stress paradigm known to produce spine remodeling in prefrontal cortical neurons. In young rats, stress resulted in dendritic spine loss and altered

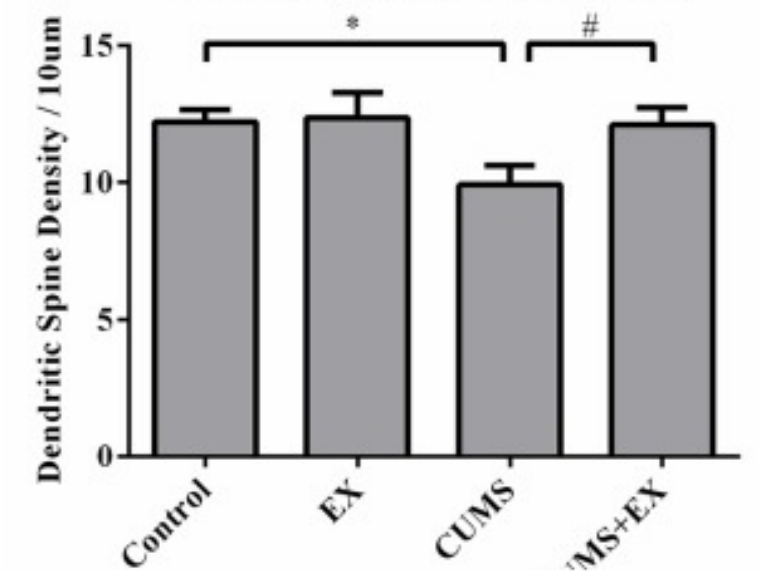
EFECTOS DEL EJERCICIO FISICO AERÓBICO EN LA MORFOLOGÍA Y DENSIDAD DE LAS ESPINAS DENDRITICAS DEL HIPOCAMPO

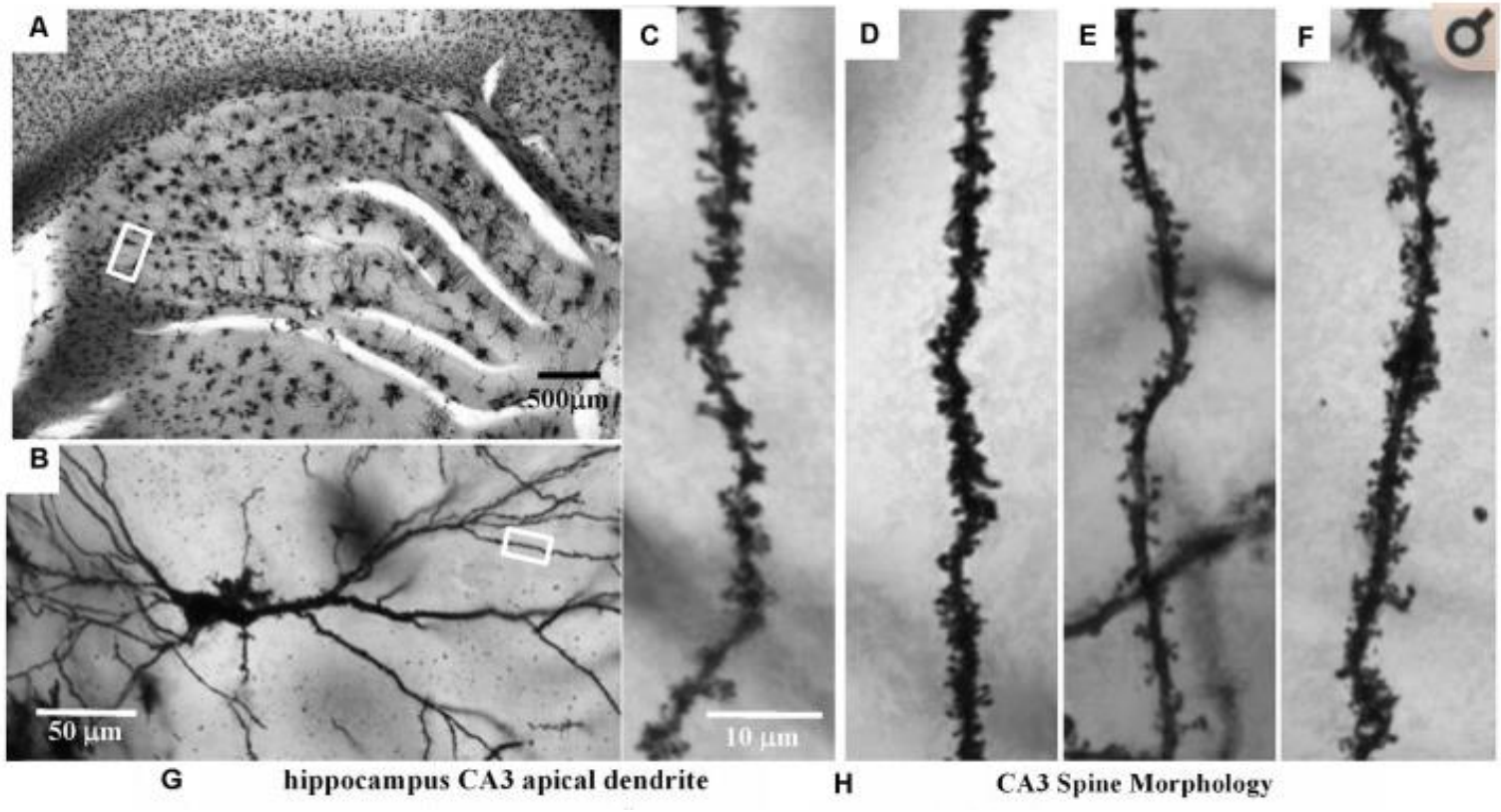
C. Espinas dendríticas grupo control

D. Espinas dendríticas grupo ejercicio

E. Espinas dendríticas grupo estrés

F. Espinas dendríticas grupo estrés + ejercicio





Zhuang, P. C., Tan, Z. N., Jia, Z. Y., Wang, B., Grady, J. J., & Ma, X. M. (2019). Treadmill Exercise Reverses Depression Model-Induced Alteration of Dendritic Spines in the Brain Areas of Mood Circuit. *Frontiers in behavioral neuroscience*, *13*, 93. https://doi.org/10.3389/fnbeh.2019.00093

UNIVERSIDAD MAYOR PARA ESPÍRITUS EMPRENDEDORES

Neurociencia y Neuroeducación

Prof. Alejandro Ducassou Varela, Med / MSc
Director Regional Académico **UNIVERSIDAD MAYOR**
Miembro Asociación Chilena Profesores de Educación Física **ACHIPEF**
alejandro.ducassou@umayor.cl