

Lernen ein Leben lang?

Das plastische Hirn



Prof. Dr. Dr. Lutz Jäncke

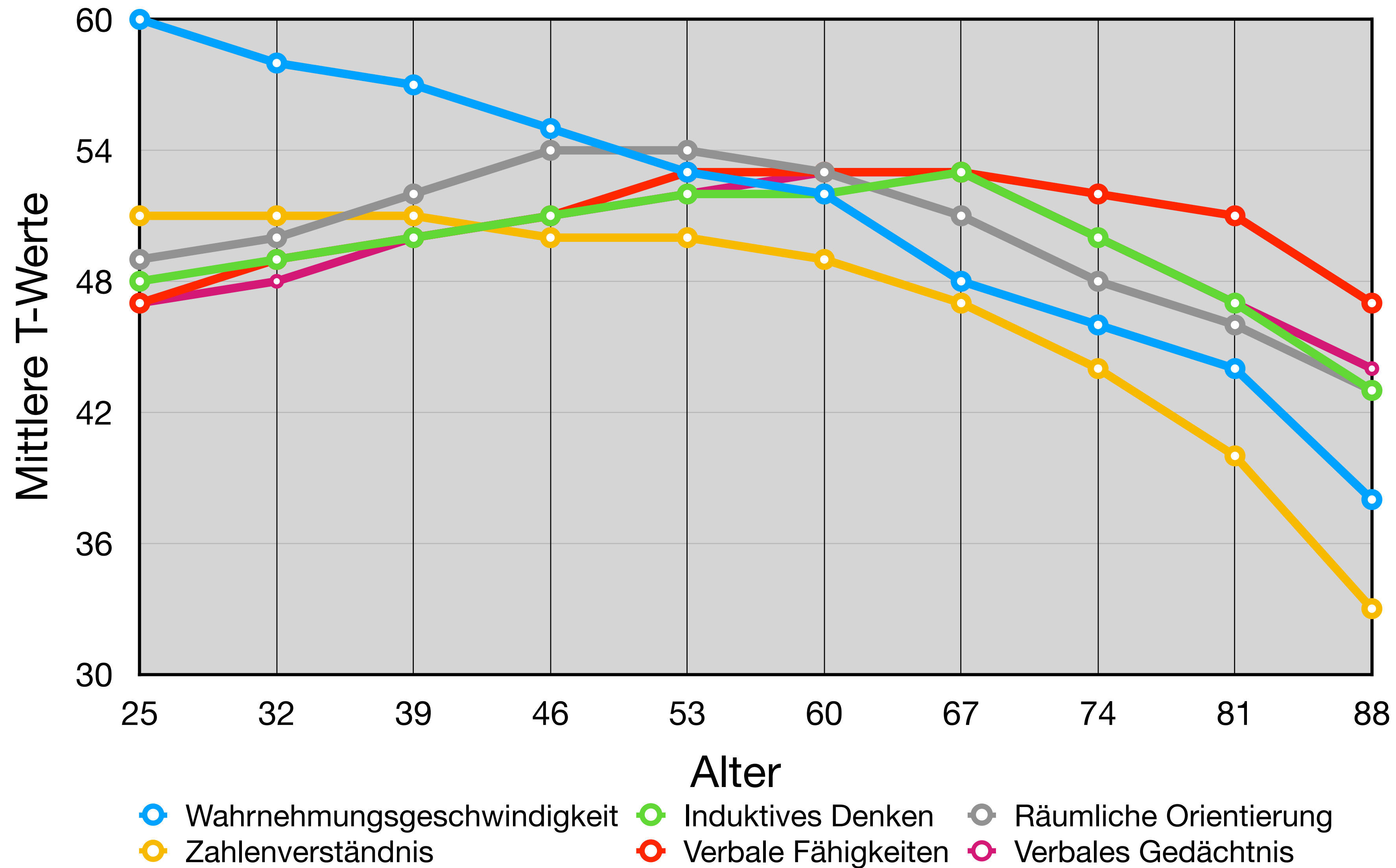
Prolog

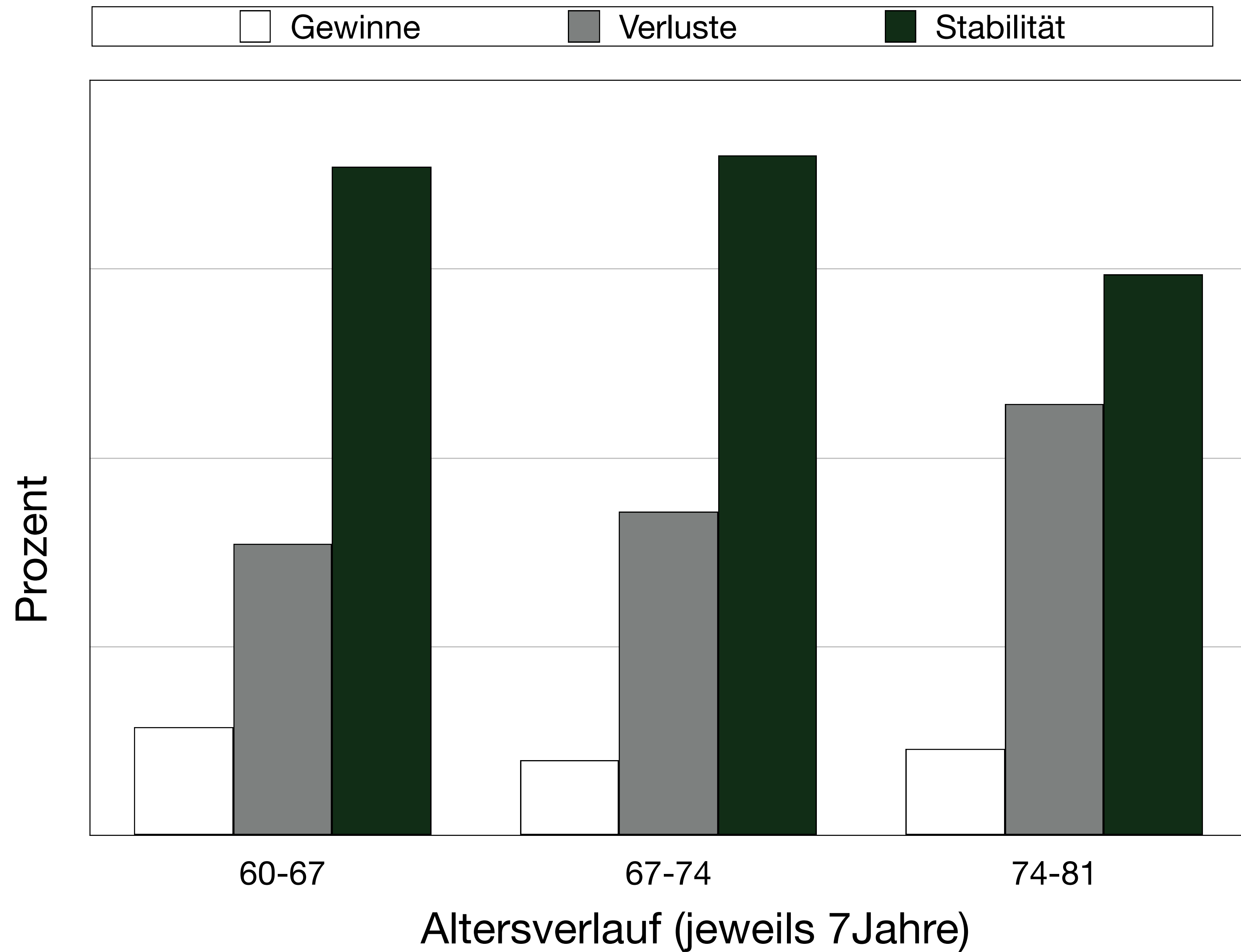
Die Lebensleiter



Alter = Schlechte Leistungen ?

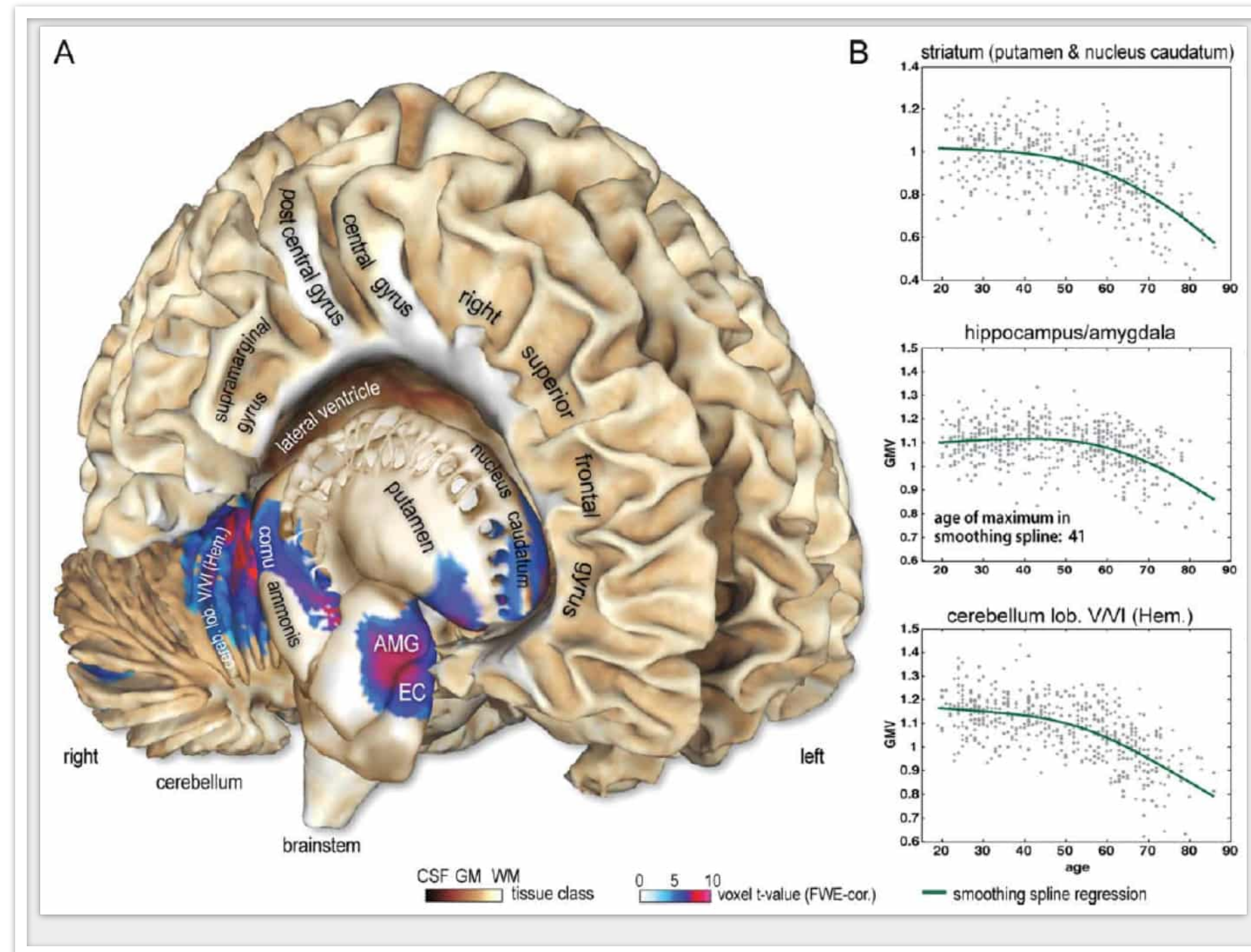
Leistungen in Tests zur Messung wichtiger kognitiver Leistungen





Alter = Hirndegeneration ?

Hirnanatomie im Alter ...



Anatomie, Hirndurchblutung und psychische Leistungen

Psychologische Tests	Varianz altersbedingter Abbau Hirnvolumen	Varianz altersbedingter Abbau Durchblutung
Intelligenz n=69, Alter 62-85 Jahre	38%	10%

Rabbitt, P., Scott, M., Thacker, N., Lowe, C., Jackson, A., Horan, M., & Pendleton, N. (2006). Losses in gross brain volume and cerebral blood flow account for age-related differences in speed but not in fluid intelligence. *Neuropsychology*, 20(5), 549–557.

Die IHAB-Studie in Zürich

**University of Zurich**^{UZH}

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International Normal Aging and Plasticity Imaging Center

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INAPIC Press Review

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Lehre

URPP Dynamics of Healthy Aging

The International Normal Aging and Plasticity Imaging Center

Processes of aging gain increasing interest in more and more areas of research worldwide. Considering the relatively large number of older workers and old persons in the near future, the amount of plasticity and developmental potentials of behaviors and abilities across normal aging is gaining increasing interest.

The key objective of the International Normal Aging and Plasticity Imaging Center (INAPIC) at the University of Zurich is to facilitate research on normal healthy behavioral and neural development and aging to explore the potential for plasticity and compensation across the lifespan. One central focus at the INAPIC thereby is on the possibilities and mechanisms for stabilization of life quality and health during adulthood as part of a health-focused research approach that extends and complements approaches only dealing with illness and illness-related processes (more information can be found [→ here](#); German only). Studies at the INAPIC use functional and structural MRI at a 3-Tesla scanner, EEG, transcranial magnetic stimulation and transcranial direct current stimulation to uncover neural plasticity. The INAPIC infrastructure also includes an MR simulator used to familiarize study participants with the scanner environment as well as training labs with computers, treadmills, and a driving simulator.

One important goal of the INAPIC is to promote neuroimaging research on healthy aging and plasticity through the establishment of international research collaborations facilitated by 'plug and play' access to the neurophysiological assessment infrastructure as well as technical support and assistance regarding data collection and analyses. The center invites research groups to [→ submit research proposals for cooperation](#) and use of measurement hours at the 3-Tesla scanner available to the INAPIC to establish international cooperation projects at the highest level of scientific quality.

The INAPIC is unique in Europe in combining the support of long-term longitudinal plasticity and aging research through a planning horizon of several years, the focus on potentials of normal development, and the provision of technical assistance and support to reduce the time of research groups needed to familiarize themselves with the available technical equipment. The INAPIC is supported by an international [→ advisory board](#) representing neuropsychological, gerontological, medical and dementia-related and imaging experts to ensure the highest quality standards for our research and research cooperations.

The INAPIC is [→ funded](#) primarily by the [Velux Stiftung](#).

STUDENTEILNAHME

→ Mehr Informationen finden Sie [hier](#)



Mock Scanner at the INAPIC



3rd International Conference Aging & Cognition 2015
1st conference of the European Cognitive Ageing Society (EUCAS)
Dortmund
23.04. to 25.04.2015

Conference

→ EUCAS 2015 (PDF, 277 KB)

→ [eucas.org](#)

Job Openings

Click [here](#) for more information

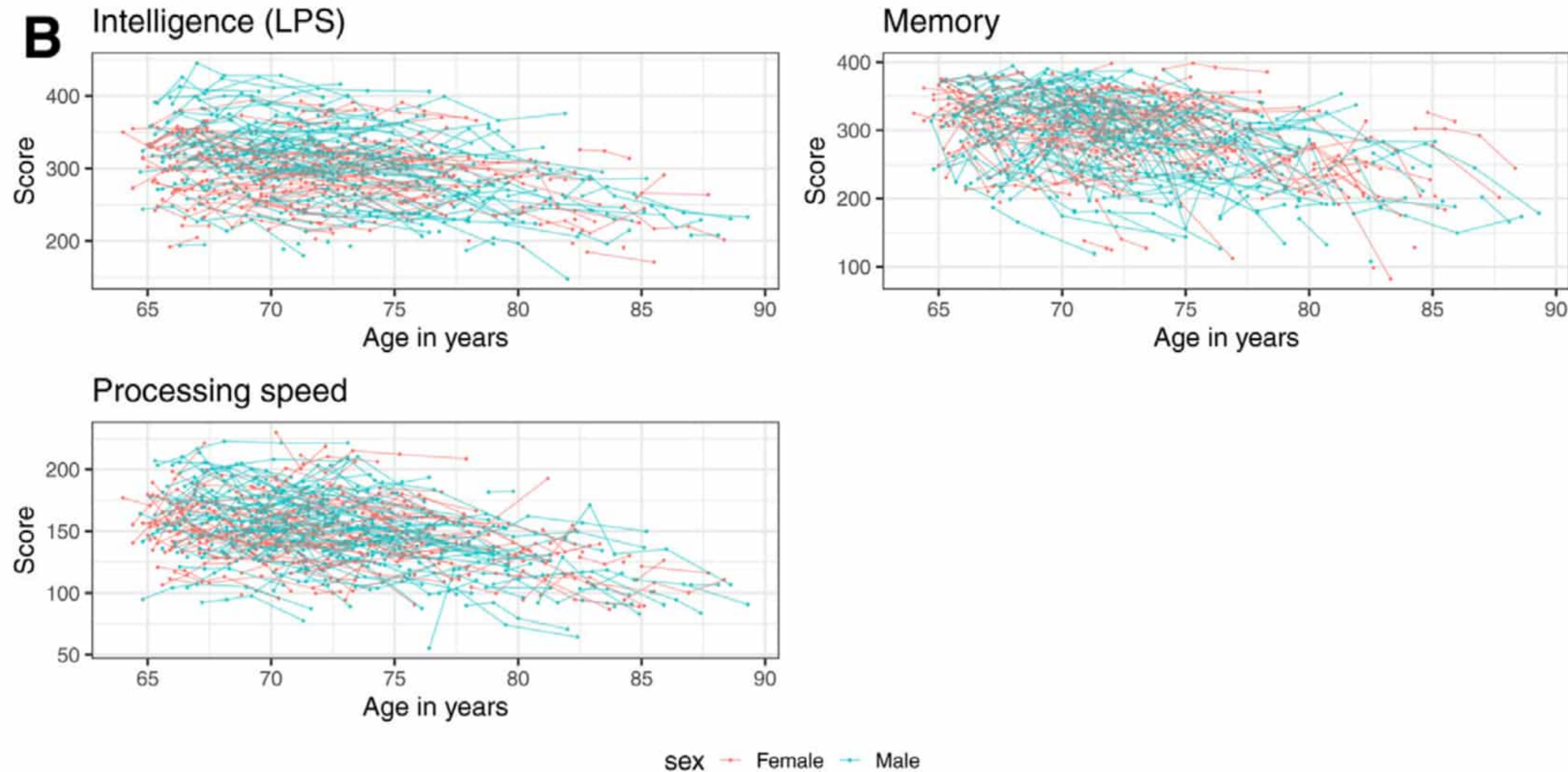
Research Internships for Students (German only)

For information regarding internship opportunities, please see [here](#).

INAPIC Agenda

→ Keine aktuelle Veranstaltung

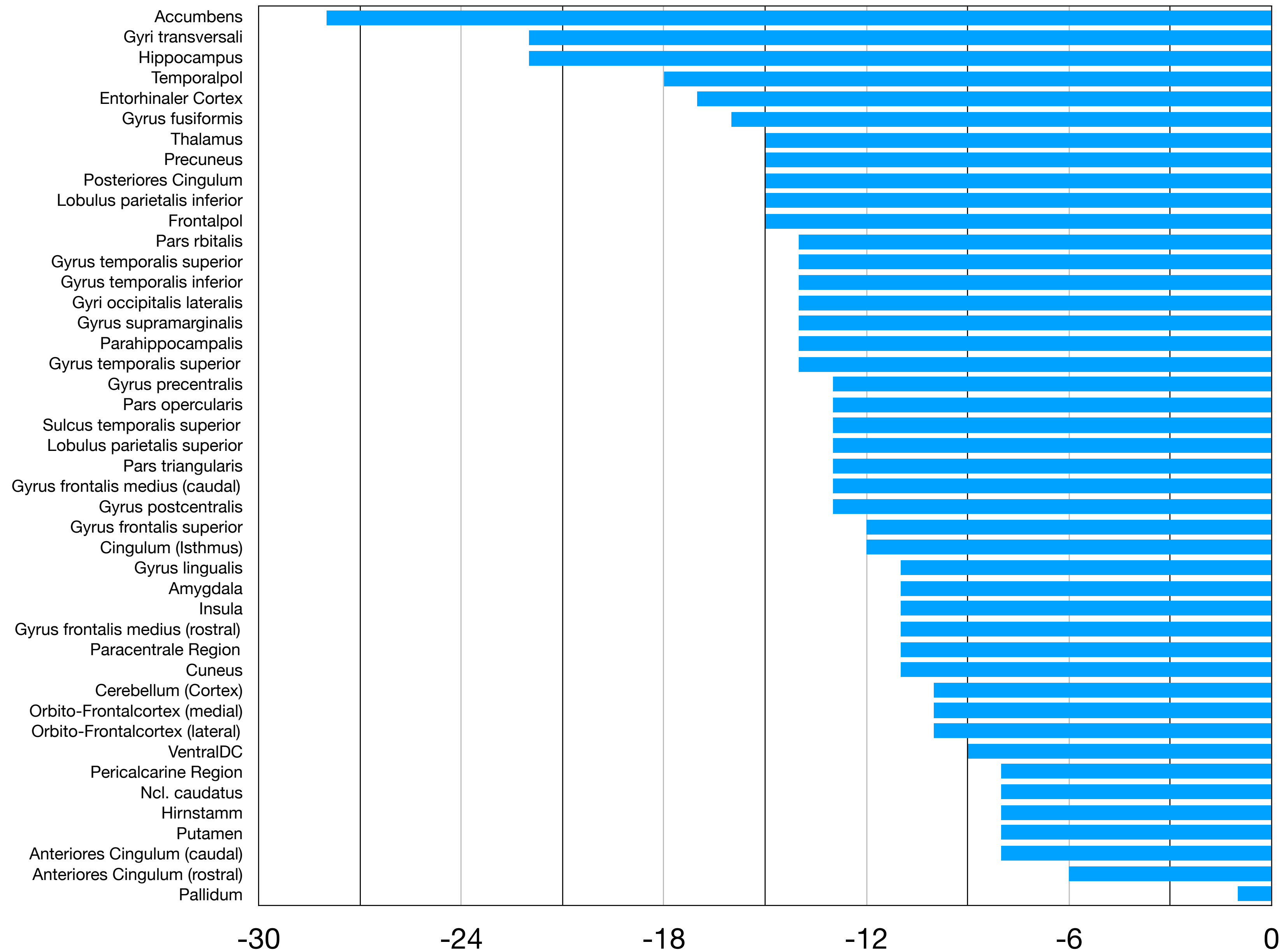
Veränderung der kognitiven Leistungen im Alter



Anatomischer Abbau und psychische Leistungen

Psychologische Tests	Varianz altersbedingter Abbau Hirnvolumen	Varianz altersbedingter Abbau Kortikale Dicke
General-Intelligenz	≈ 3%	≈ 0.1%
Geschwindigkeit	≈ 10%	≈ 5%
Gedächtnis	≈ 10%	≈ 5%
Fluency	≈ 15%	≈ 5%
Exekutive Funktionen	≈ 15%	≈ 10%

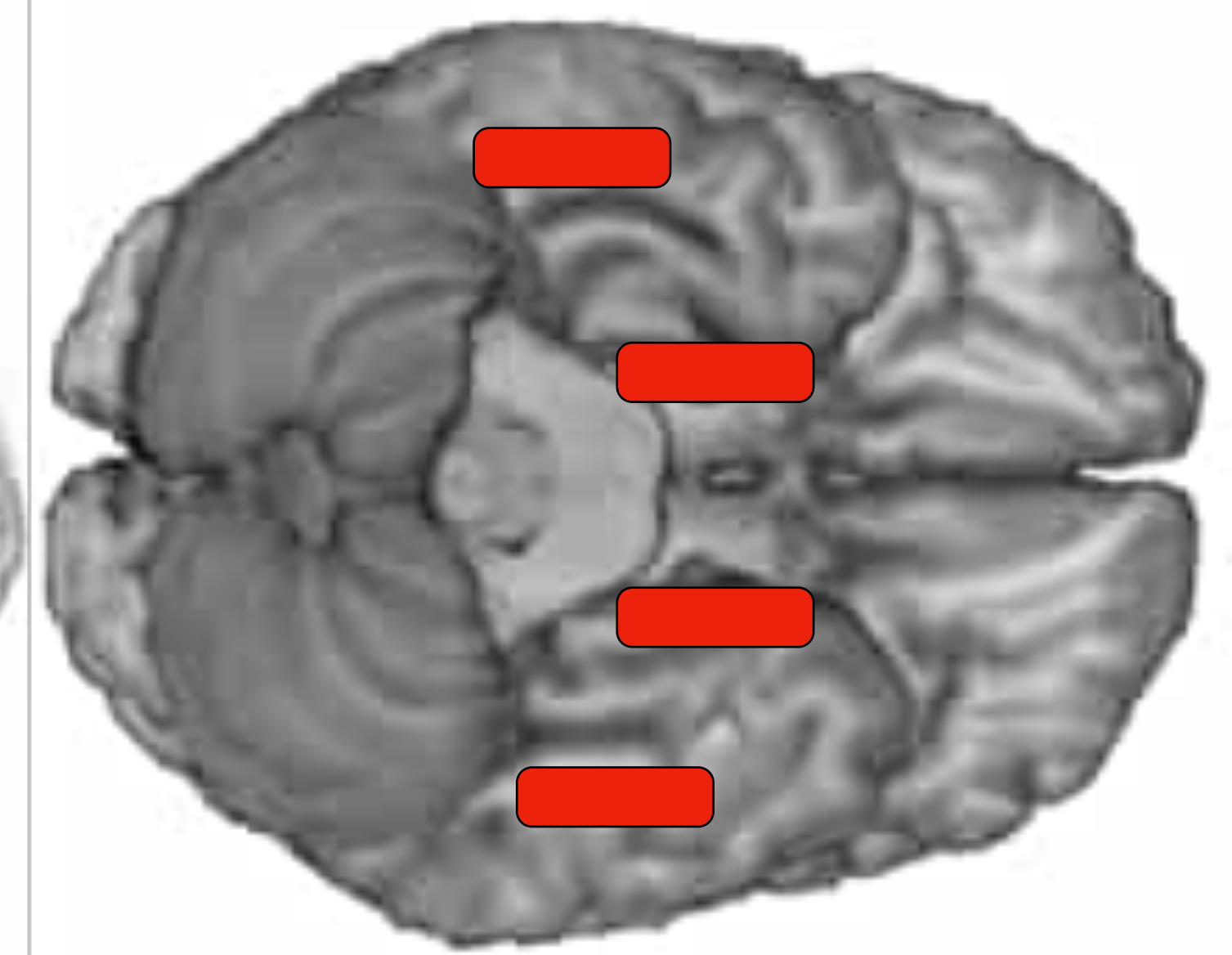
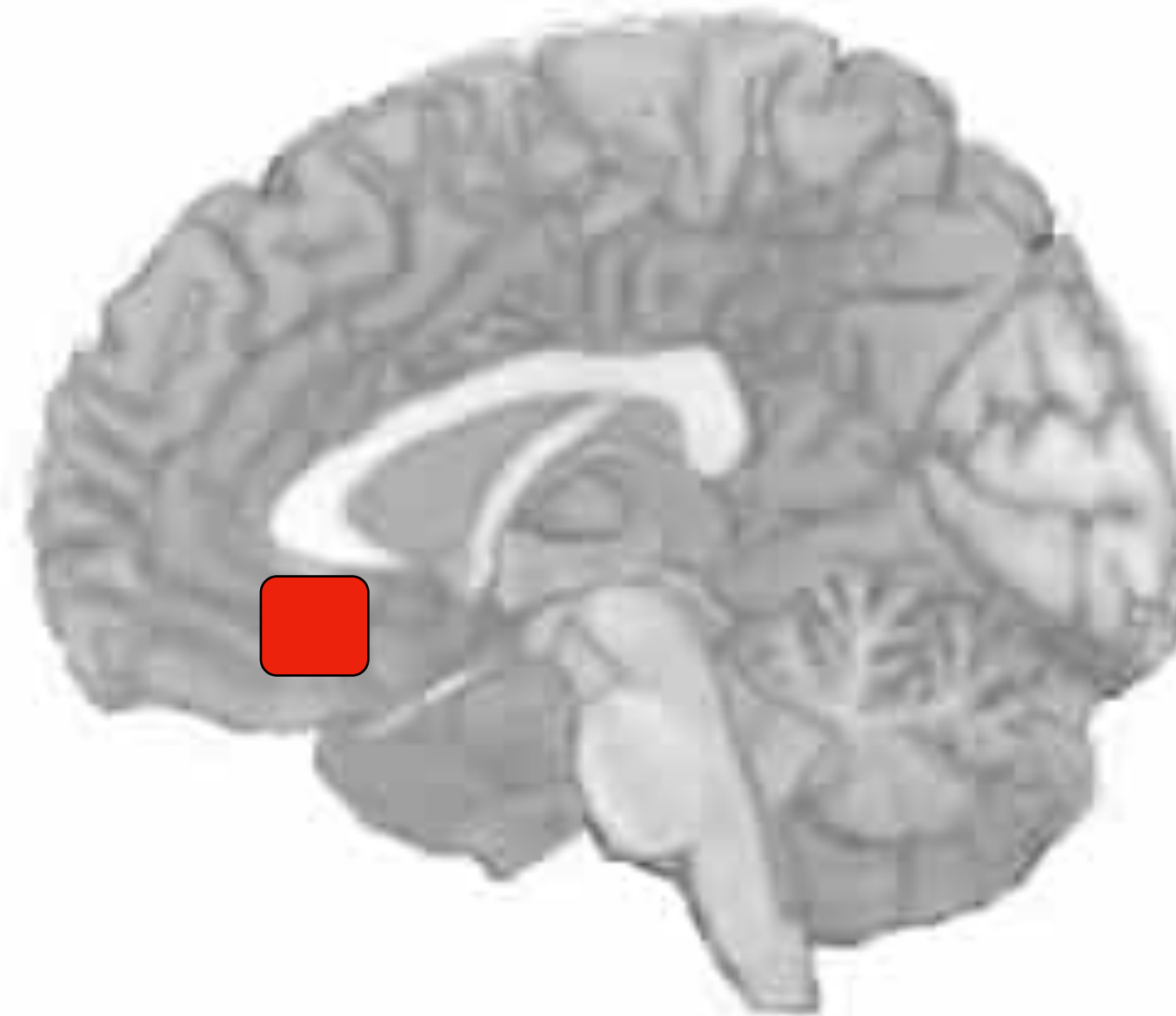
Sele, S., Liem, F., Mérillat, S., & Jäncke, L. (2021). Age-related decline in the brain: a longitudinal study on inter-individual variability of cortical thickness, area, volume, and cognition. *NeuroImage*, 240, 118370.



Volumen-Abbau in % beginnend mit 65 für die nächsten 20 Jahre

Ncl. accumbens

Hippocampus / Gyrus fusiformis

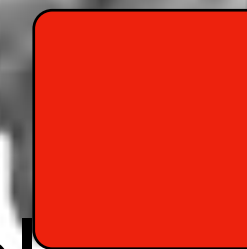


Lobulus parietalis inferior

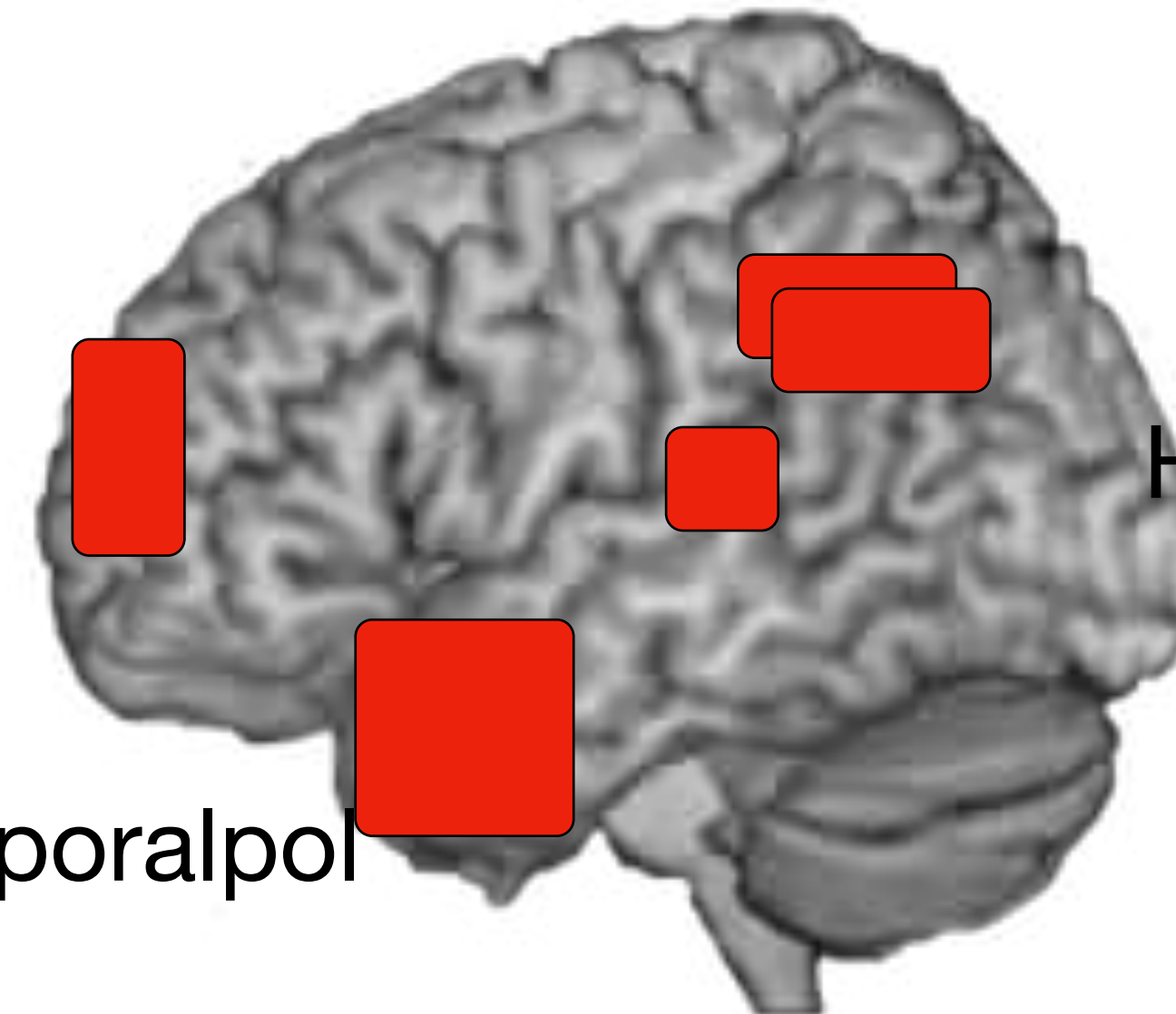
Frontalpol



Temporalpol



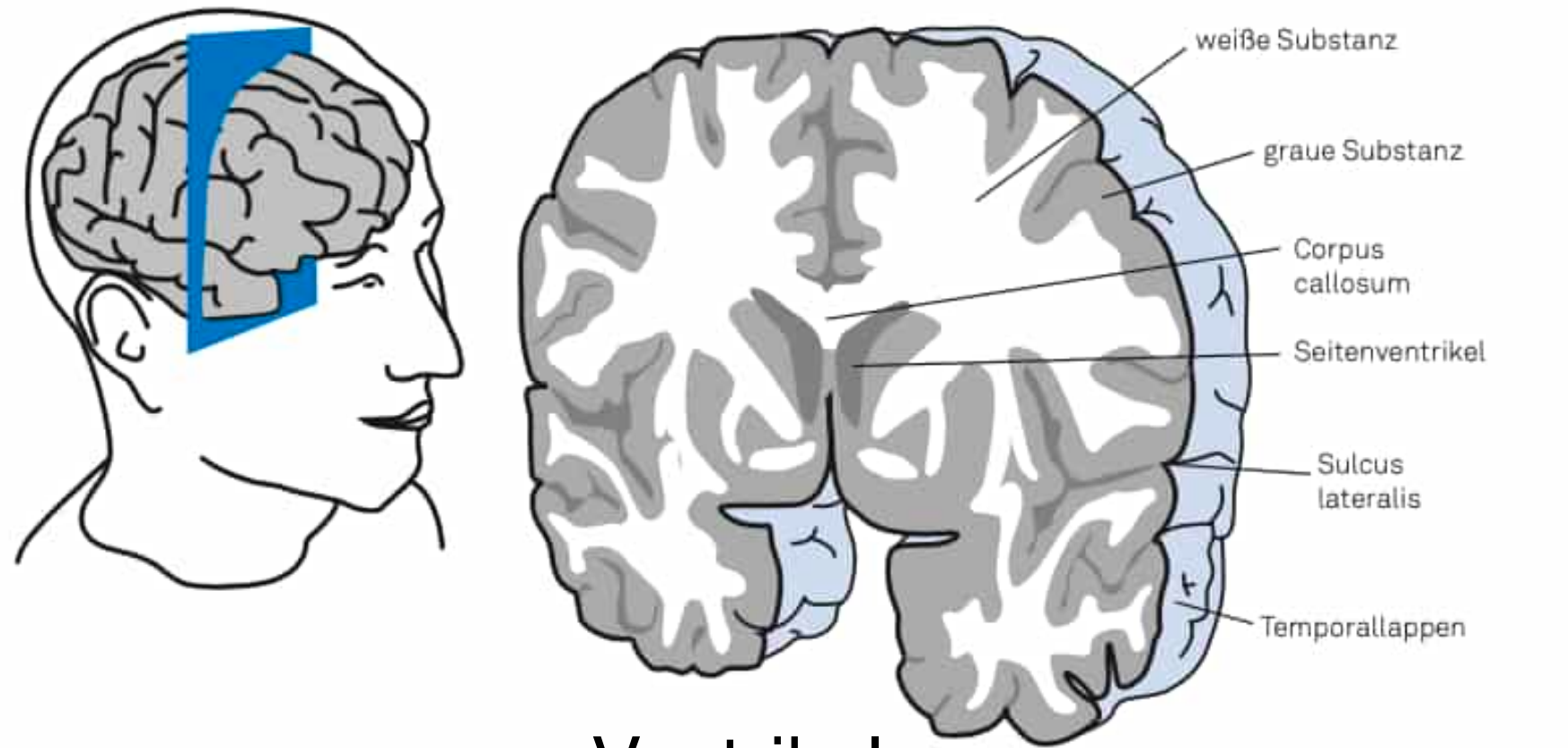
Heschlscher Gyrus



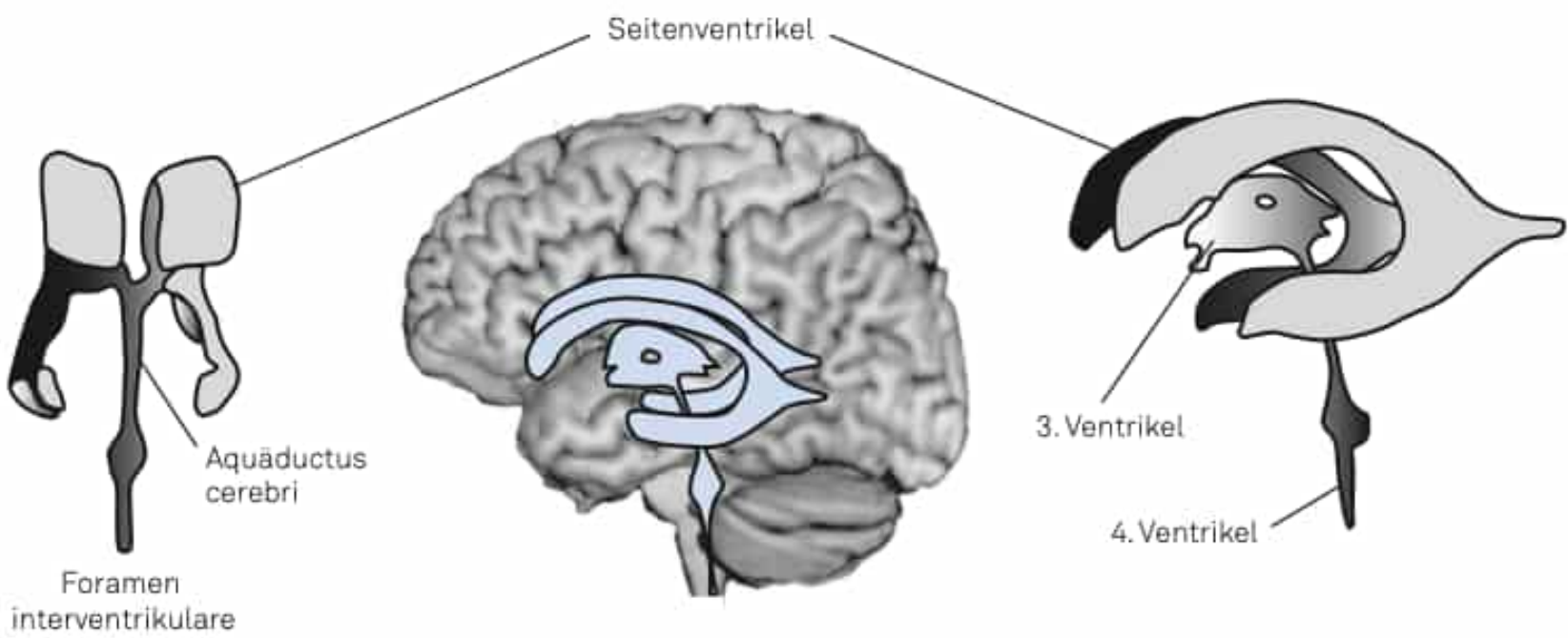
15 - 25 % Abbau von 65 - 85 Jahre!

Graue und weisse Substanz

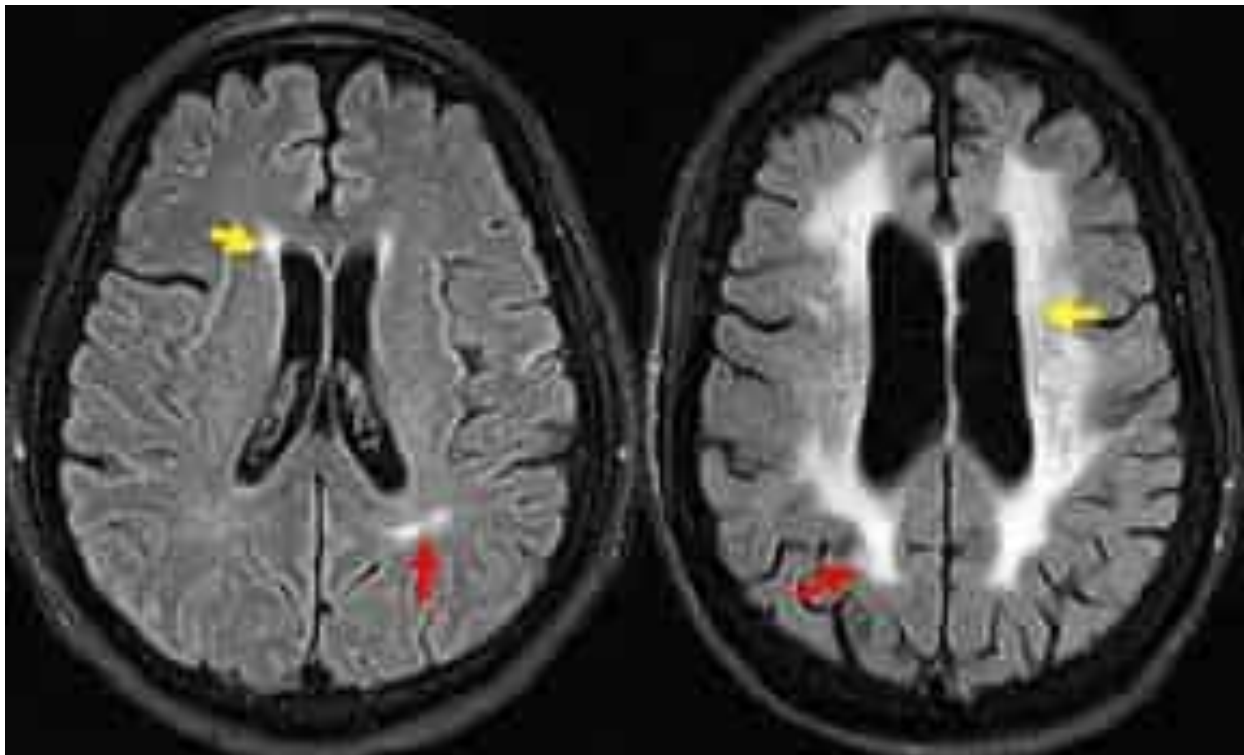
Graue und weiße Substanz



Ventrikel



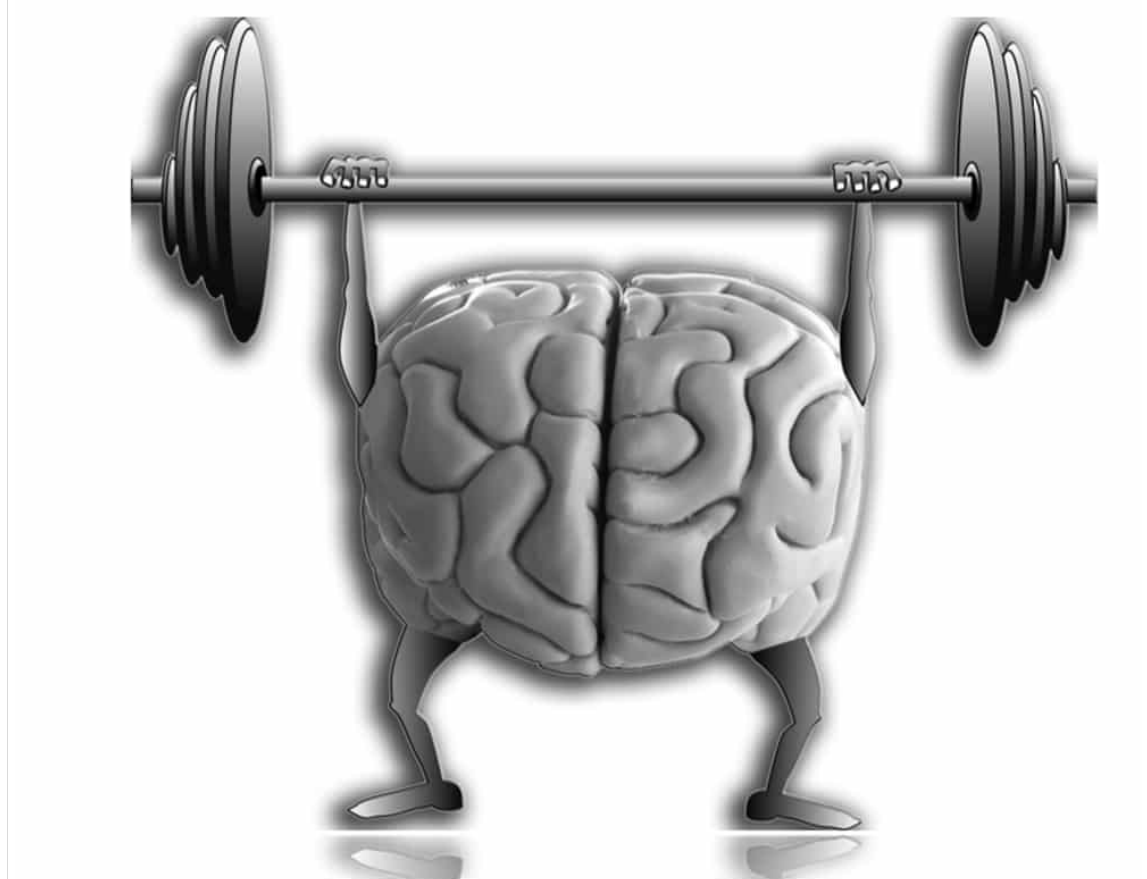
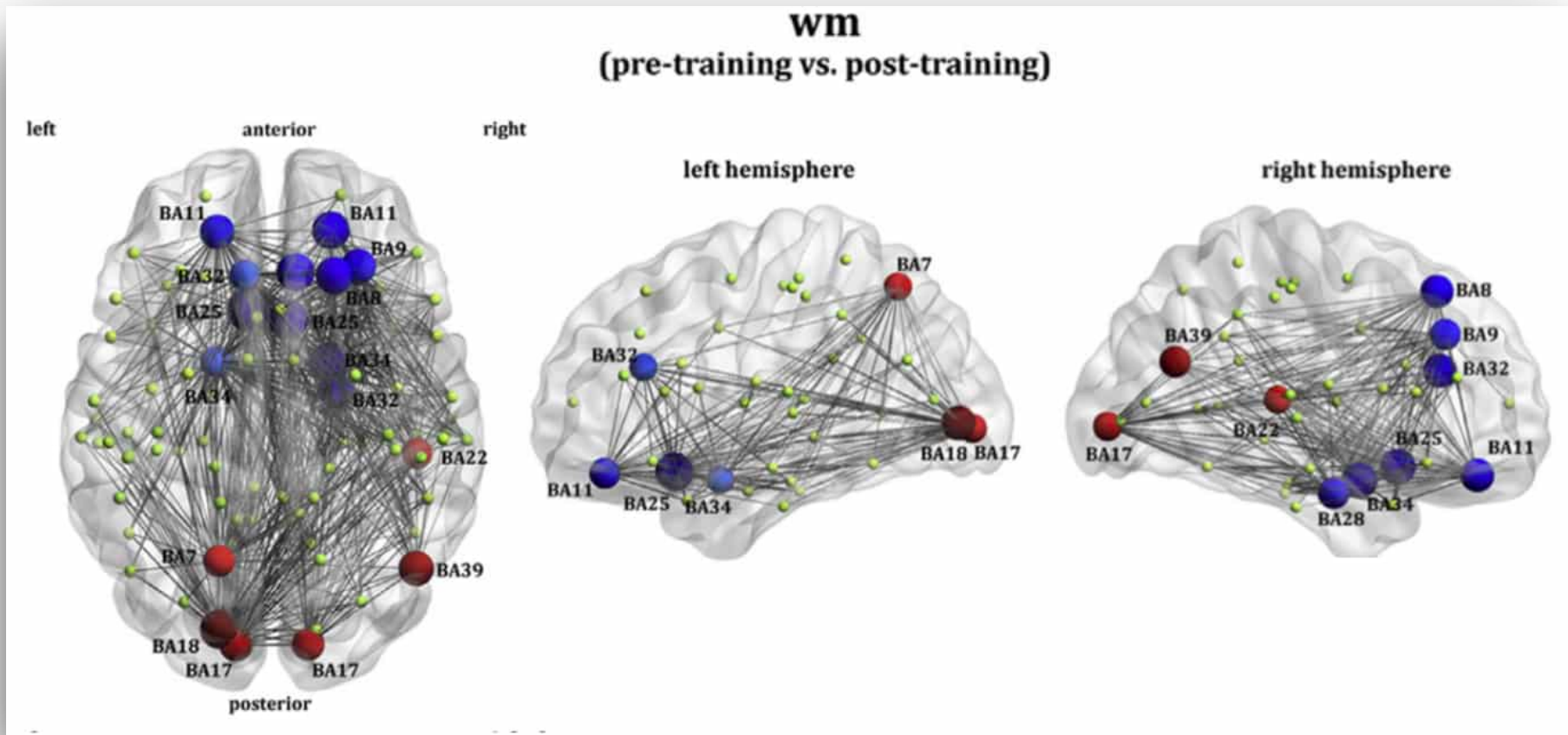
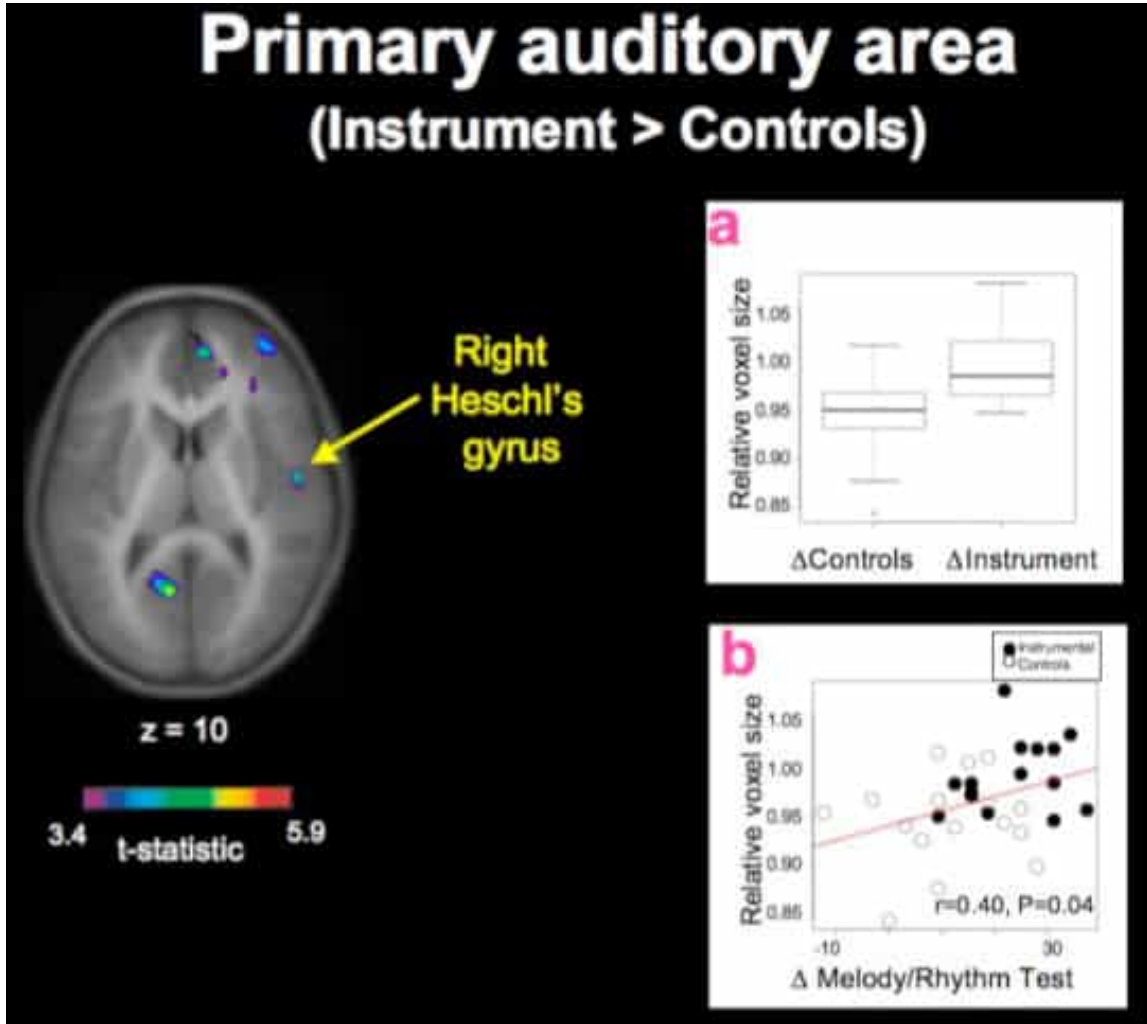
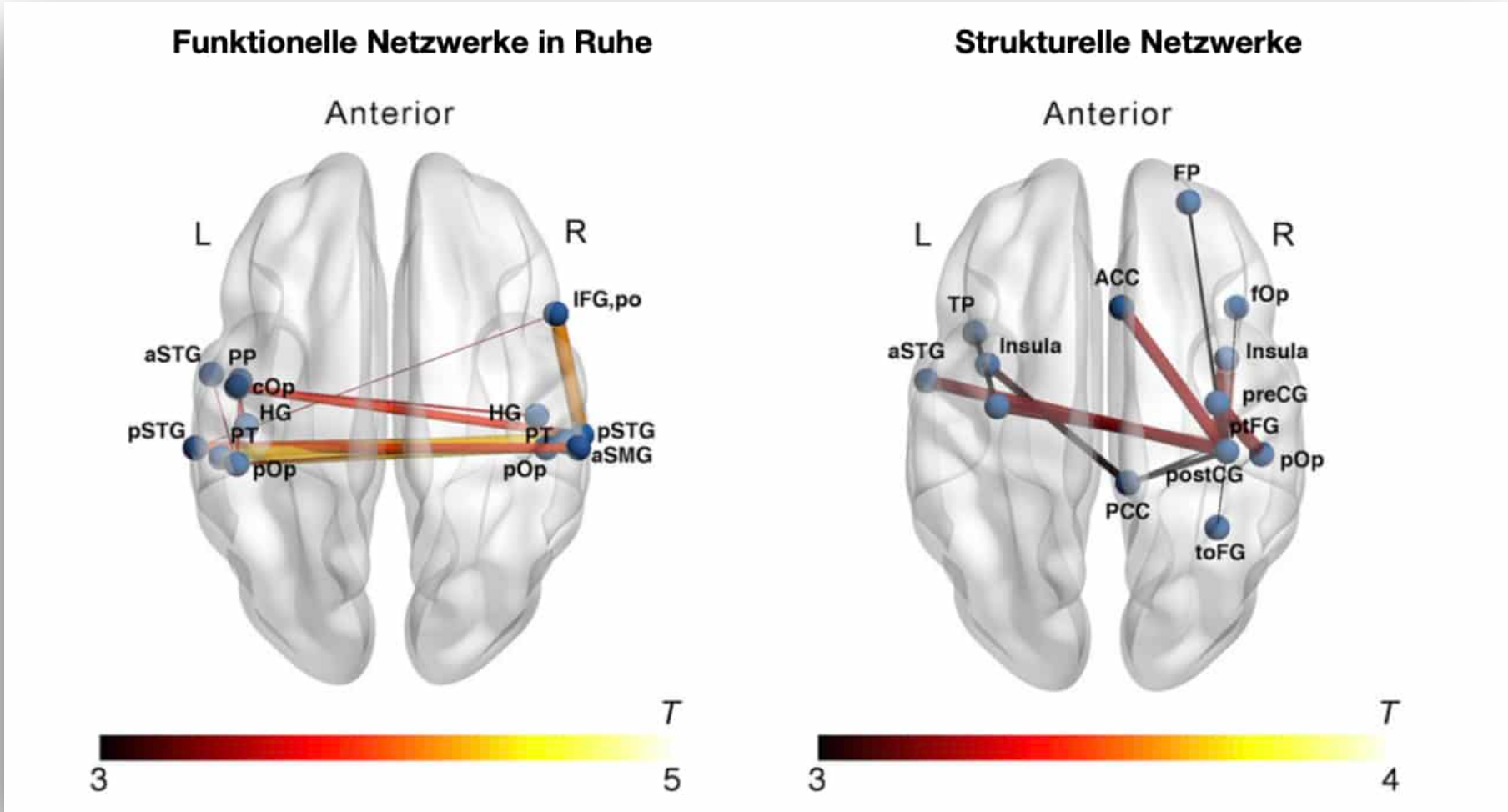
WMH



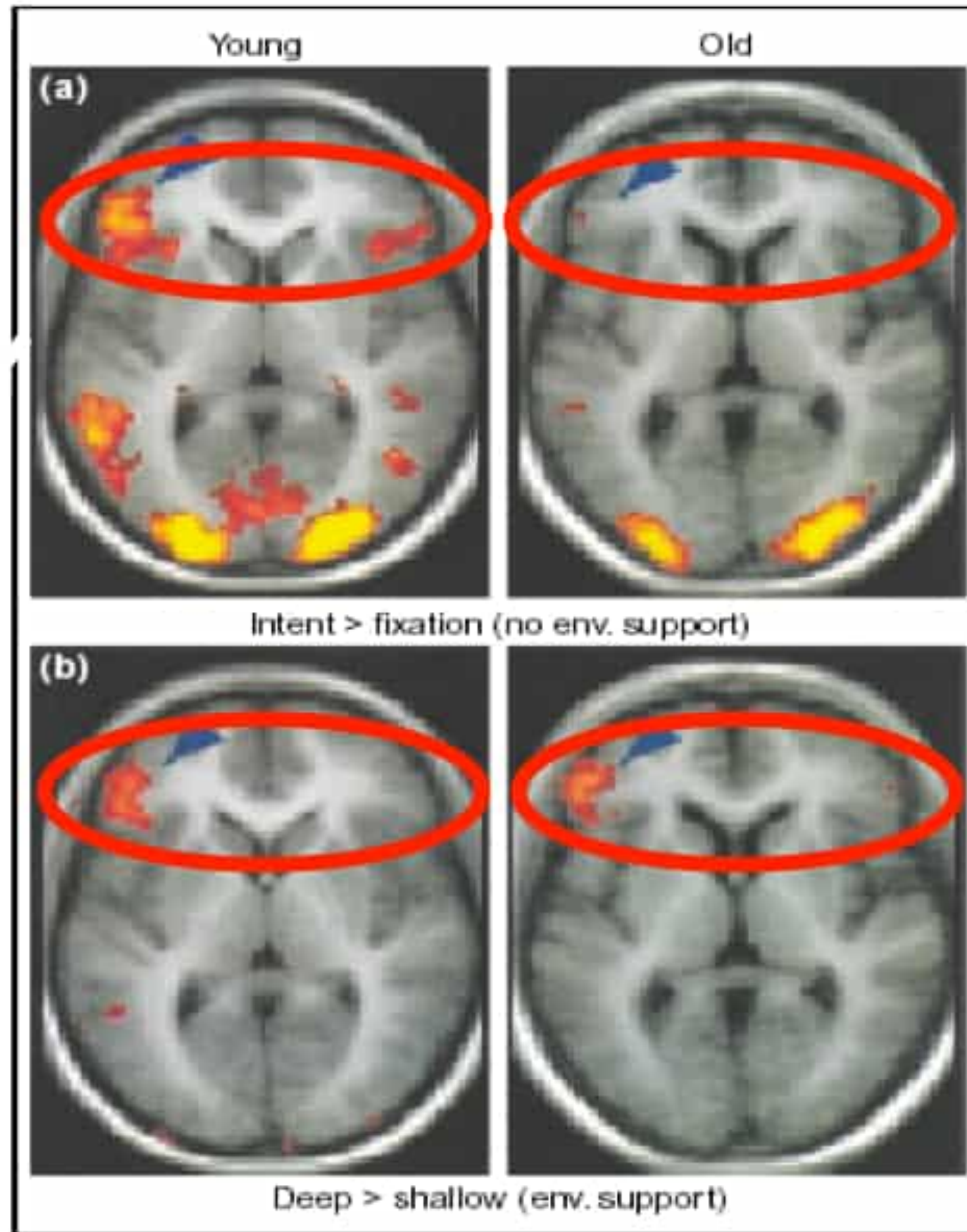
Region	Volumenänderung	Änderungsrichtung
Graue Substanz (GM)	0.73 %	Abnahme / Jahr
Weisse Substanz (WM)	0.79 %	Abnahme / Jahr
Seitenventrikel (SV)	4 %	Zunahme / Jahr
White-Matter-Hyperintensities (WMH)	7.3 %	Zunahme / Jahr

Lernen im Erwachsenenalter

Das plastische Hirn



Hirndurchblutung im Alter



Lernen ohne Strategie

**Lernen mit Strategie
(elaborierte Verarbeitung)**

Nordic Walking



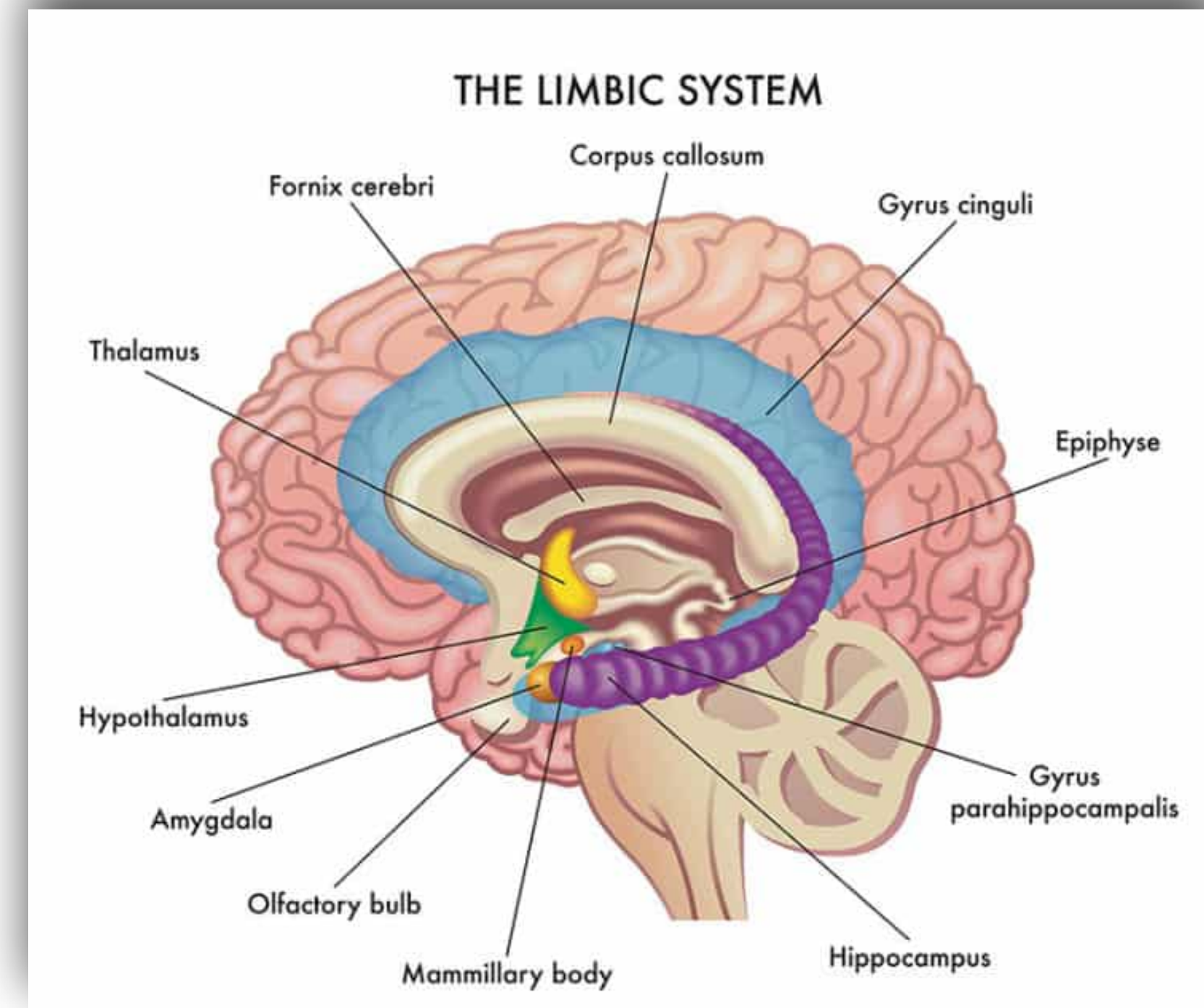
Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., Kim, J. S., Heo, S., Alves, H., White, S. M., Wojcicki, T. R., Mailey, E., Vieira, V. J., Martin, S. A., Pence, B. D., Woods, J. A., McAuley, E., & Kramer, A. F. (2011). Exercise training increases size of hippocampus and improves memory. *Proceedings of the National Academy of Sciences of the United States of America*, 108(7), 3017–3022.

Wichtige Ergebnisse

Hippocampus ↑

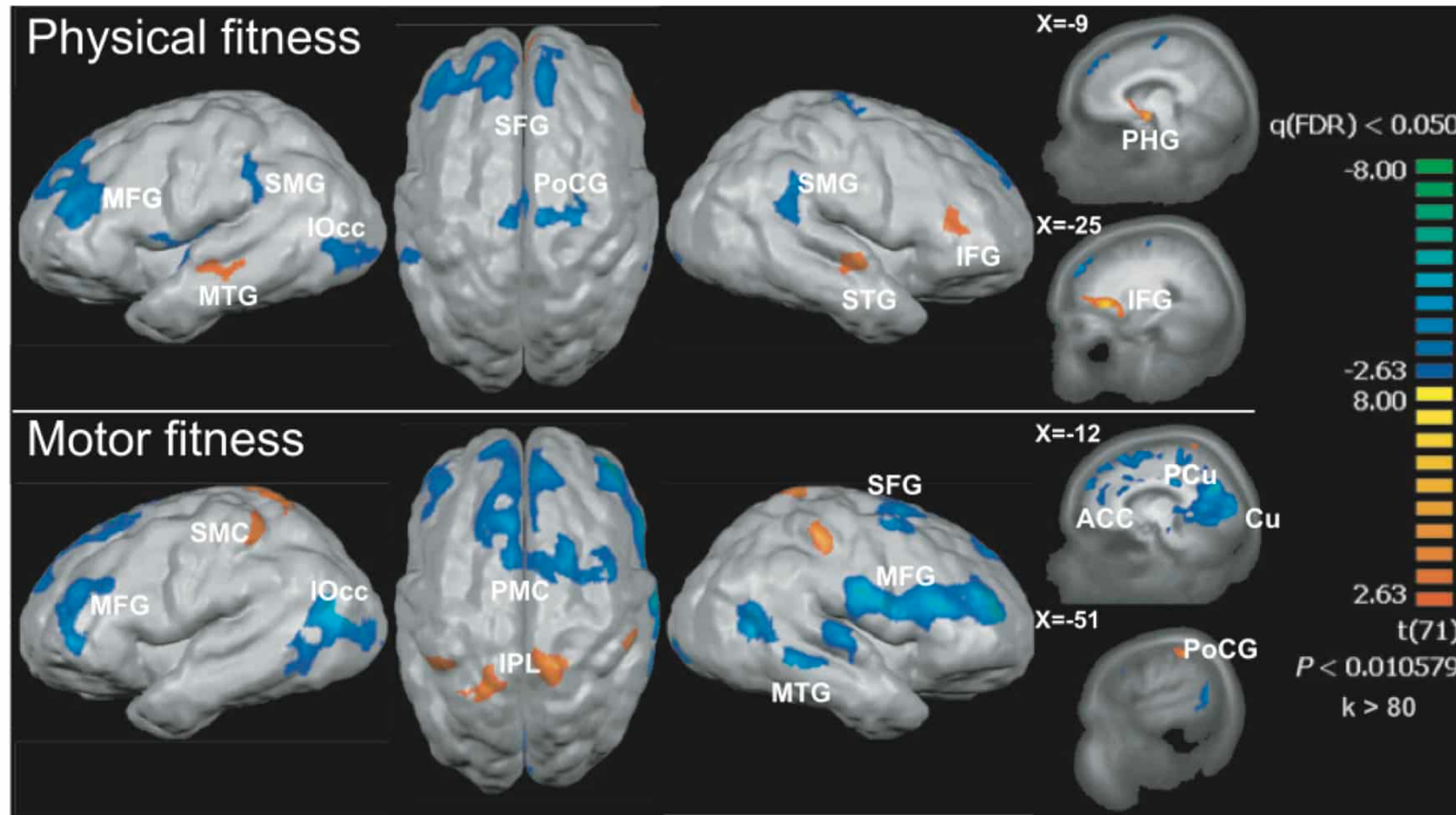
Gedächtnisfähigkeiten ↑

Serumspiegel von **BDNF** ↑



Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., Kim, J. S., Heo, S., Alves, H., White, S. M., Wojcicki, T. R., Mailey, E., Vieira, V. J., Martin, S. A., Pence, B. D., Woods, J. A., McAuley, E., & Kramer, A. F. (2011). Exercise training increases size of hippocampus and improves memory. *Proceedings of the National Academy of Sciences of the United States of America*, 108(7), 3017–3022.

Hirnaktivität beim Lösen von Aufgaben (Exekutive Funktionen)



Ballesteros, S., Voelcker-Rehage, C., & Bherer, L. (2018). *Cognitive and Brain Plasticity Induced by Physical Exercise, Cognitive Training, Video Games and Combined Interventions*. Frontiers Media SA.



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

NeuroImage

journal homepage: www.elsevier.com/locate/ynimg

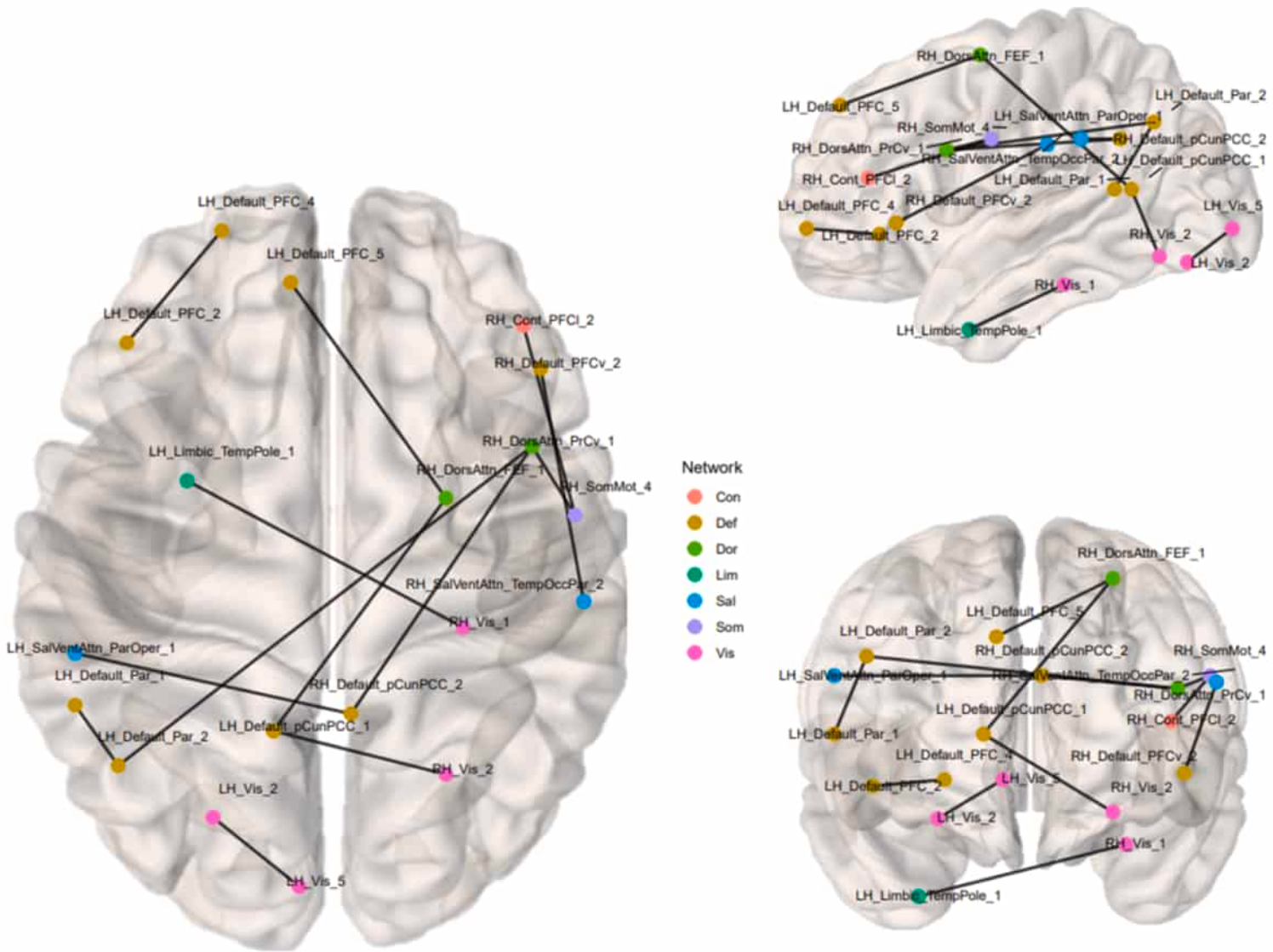
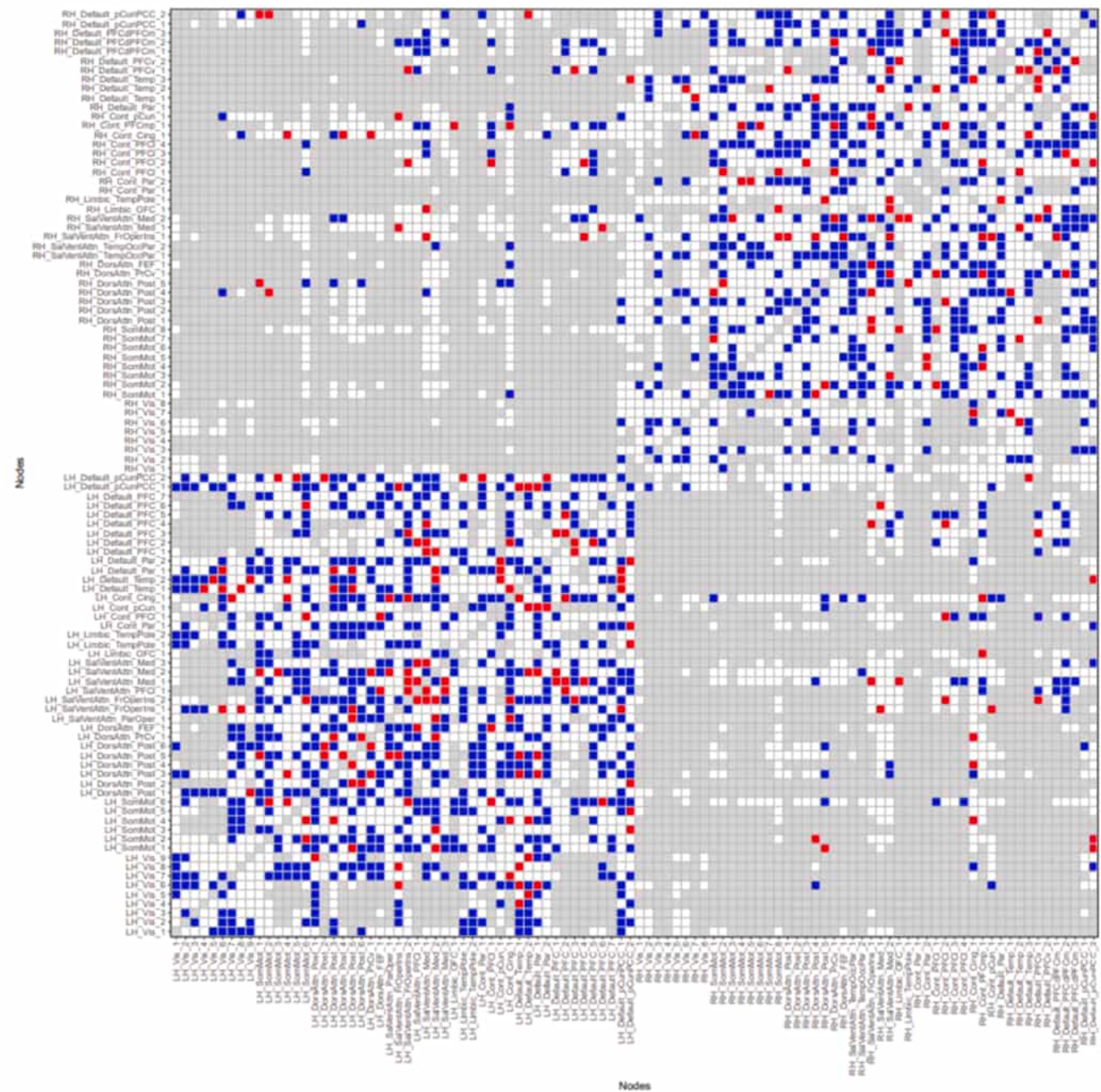


Functional connectivity-based compensation in the brains of non-demented older adults and the influence of lifestyle: A longitudinal 7-year study

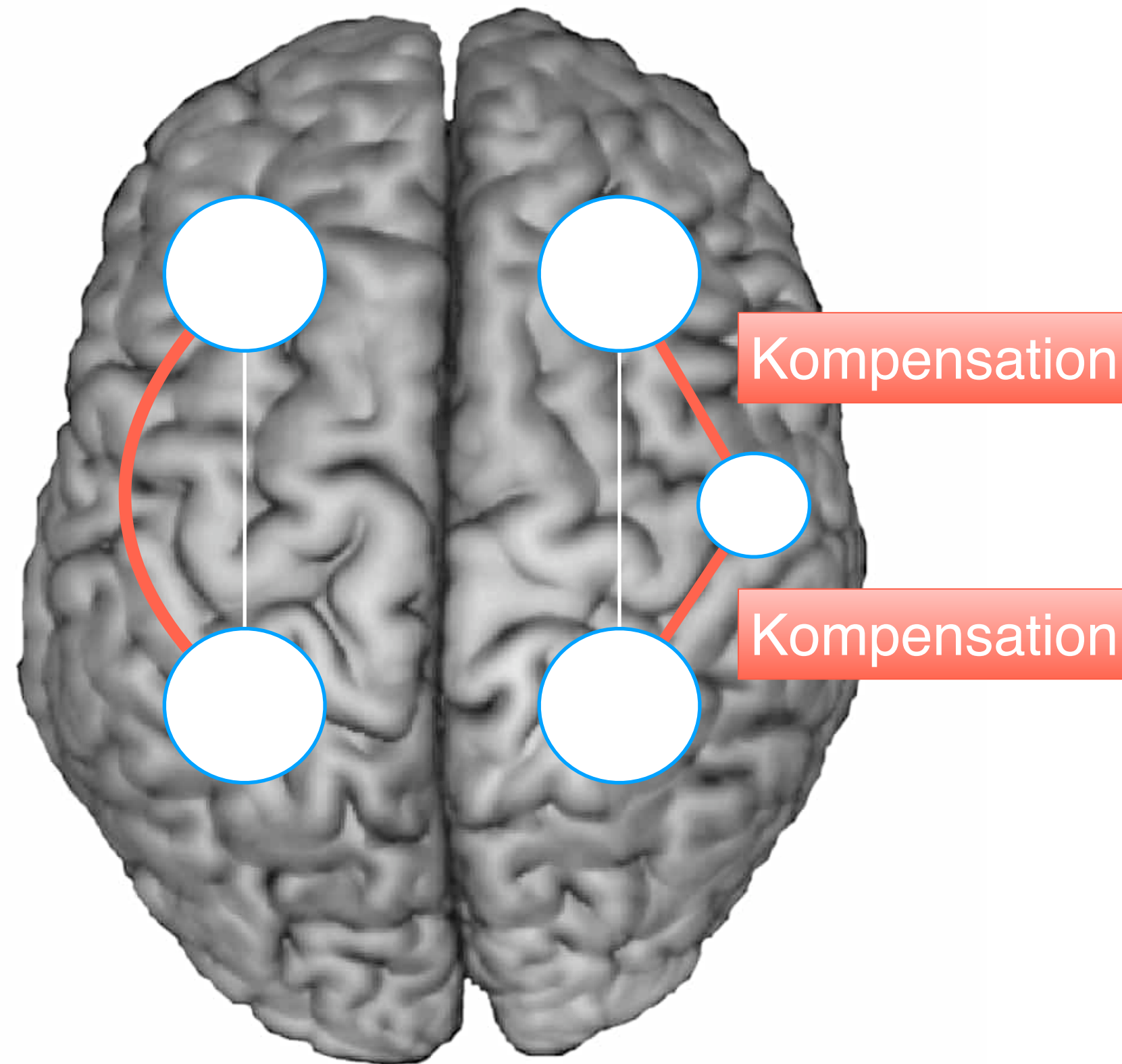
Pascal Frédéric Deschwanden^{a,*}, Isabel Hotz^a, Susan Mérillat^{a,b}, Lutz Jäncke^a

^a University Research Priority Program “Dynamics of Healthy Aging”, University of Zurich, Stampfenbachstrasse 73, Zurich CH-8006, Switzerland

^b Healthy Longevity Center, University of Zurich, Stampfenbachstrasse 73, Zurich CH-8006, Switzerland



Wesentliche Ergebnisse



- Manche Verbindungen schwächen sich ab.
- Andere werden stärker → Kompensation.
- Aktiver Lebensstil unterstützt neue Wege.



Contents lists available at [ScienceDirect](#)

NeuroImage

journal homepage: www.elsevier.com/locate/ynimg



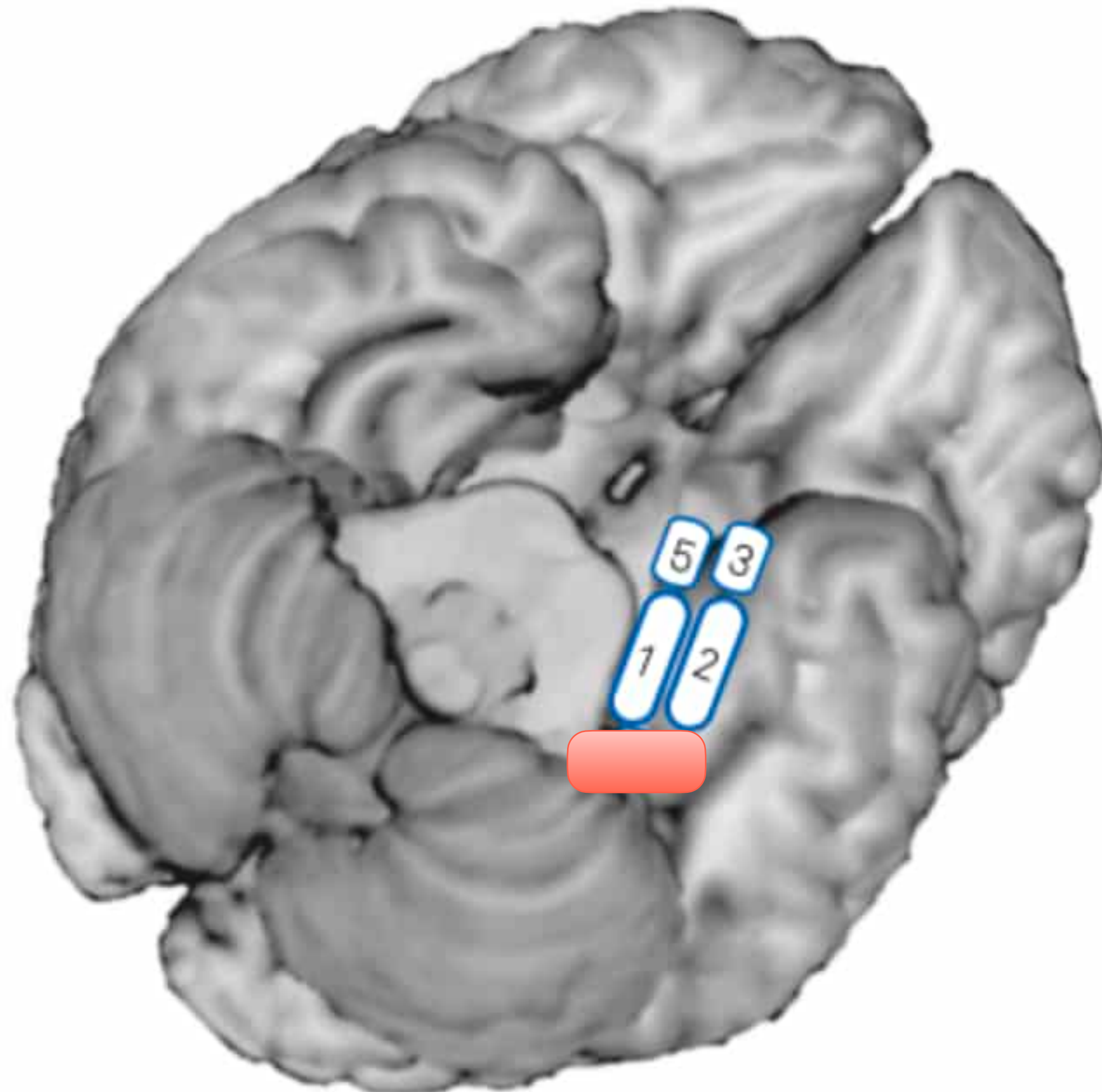
Associations between white matter hyperintensities, lacunes, entorhinal cortex thickness, declarative memory and leisure activity in cognitively healthy older adults: A 7-year study

Isabel Hotz^{1,*}, Pascal Frédéric Deschwanden¹, Susan Mérillat, Lutz Jäncke

Dynamics of Healthy Aging, University Research Priority Program (URPP), University of Zurich, Stampfenbachstrasse 73, Zurich CH-8006, Switzerland



Wichtige Ergebnisse



Ausdünnung des **entorhinalen Kortex**
= schlechtere Gedächtnisleistungen

Körperliche & soziale Aktivität mit 65
= geringere Ausdünnung des
entorhinalen Kortex

Gute Bildung = gute
Gedächtnisleistung

Leichter **Alkoholkonsum** reduziert
Abbau des entorhinalen Kortex

Rauchen steigert Abbau des
entorhinalen Kortex

Die Bronx-Studie

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Leisure Activities and the Risk of Dementia in the Elderly

Joe Verghese, M.D., Richard B. Lipton, M.D., Mindy J. Katz, M.P.H.,
Charles B. Hall, Ph.D., Carol A. Derby, Ph.D., Gail Kuslansky, Ph.D.,
Anne F. Ambrose, M.D., Martin Sliwinski, Ph.D., and Herman Buschke, M.D.

ABSTRACT

Alltagstätigkeiten und Demenz



Dalle-E-3 (26.10.2023)

+



Dalle-E-3 (26.10.2023)

+



Dalle-E-3 (26.10.2023)

+



?

Verghese et al. (2006). Leisure activities and the risk of amnesic mild cognitive impairment in the elderly. *Neurology*, 66(6), 821–827.

Verghese et al. (2003). Leisure activities and the risk of dementia in the elderly. *The New England Journal of Medicine*, 348(25), 2508–2516.

Chronologisches und biologisches Alter des Gehirns

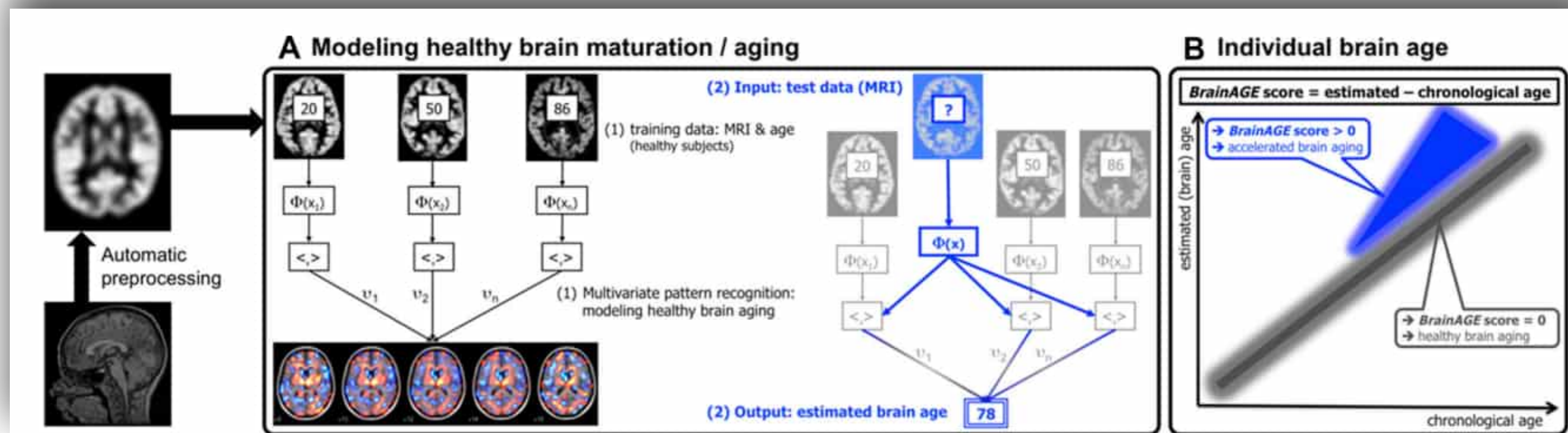
Brain Struct Funct (2018) 223:297–305
<https://doi.org/10.1007/s00429-017-1491-2>



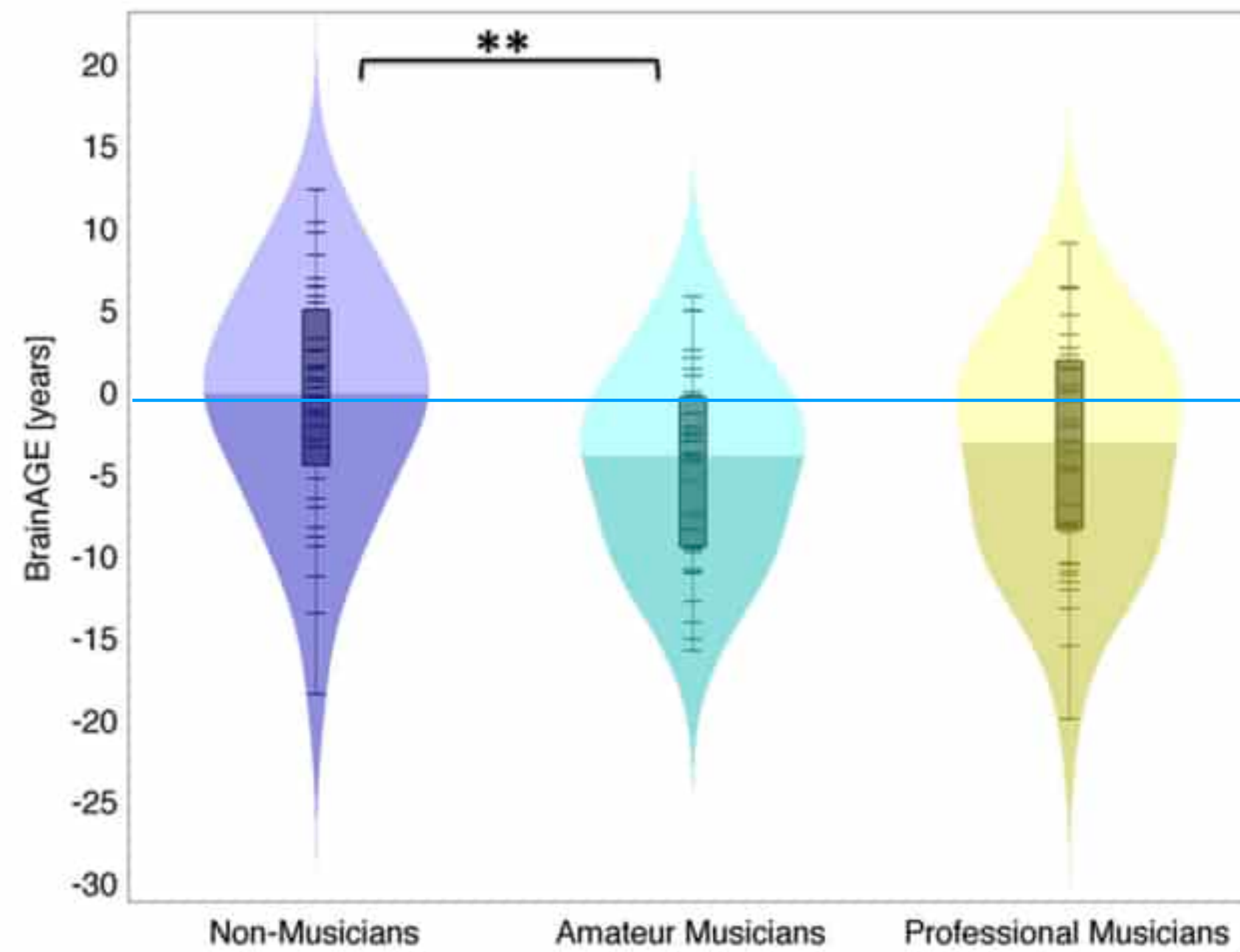
ORIGINAL ARTICLE

Keeping brains young with making music

Lars Rogenmoser¹ · Julius Kernbach^{1,2} · Gottfried Schlaug¹ · Christian Gaser³

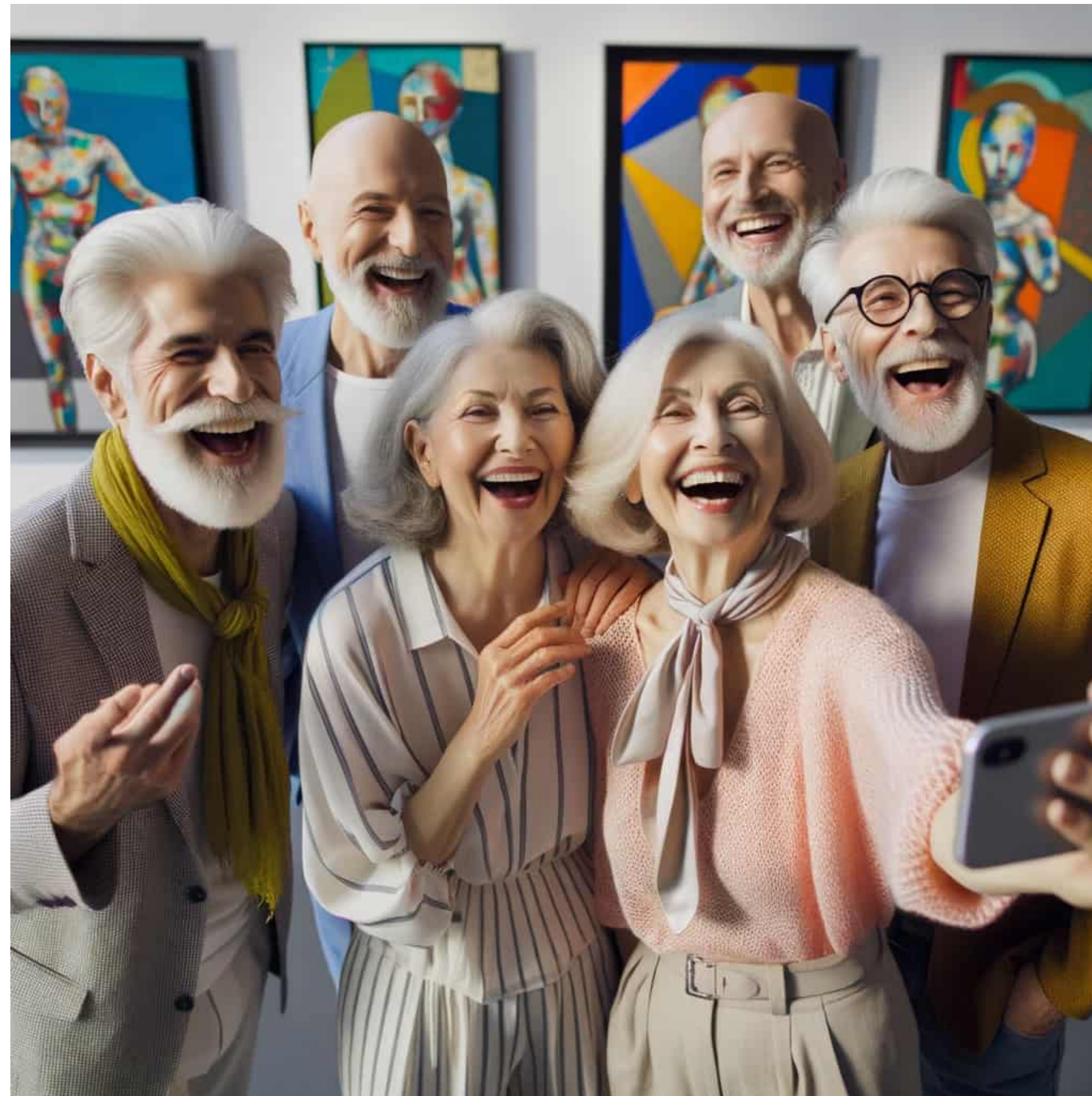


Musizierende haben ein „jüngeres“ Gehirn



**Was muss sich
ändern?**

Die Einstellung zum Alter muss sich ändern !



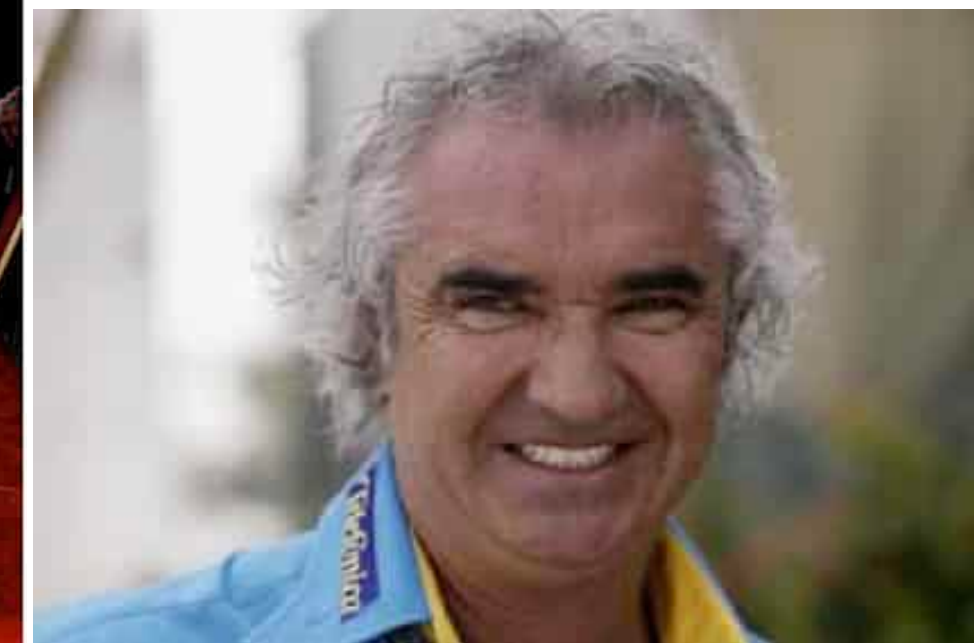
Dalle-E-3 (26.10.2023)

Lebenserwartung in Österreich 2024

Frauen = 84.3 Jahre

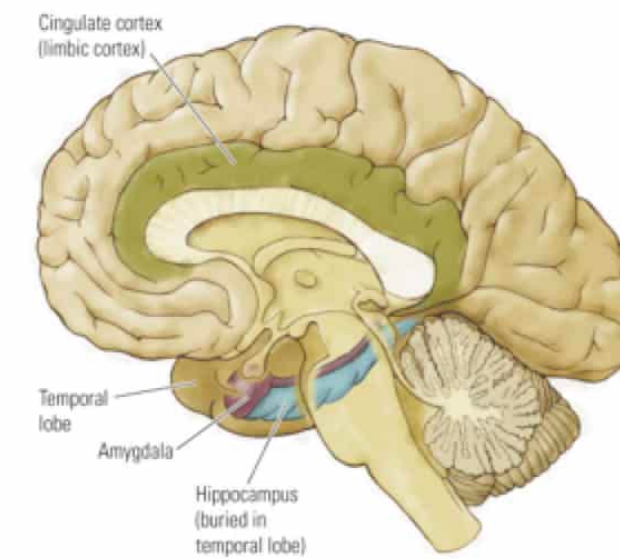
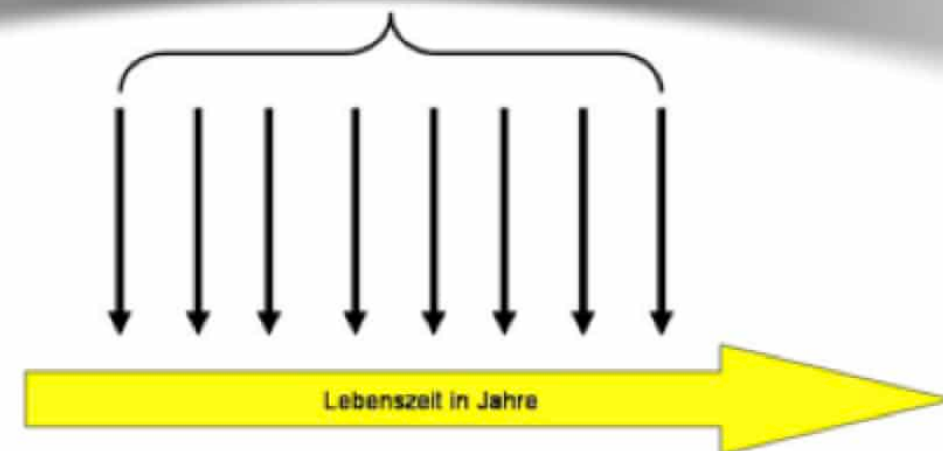
Männer = 79.8 Jahre

Alter im Wandel der Zeit



Stress ...

Stress, Belastungen, Krankheiten



Depression

Bewältigungsprobleme

Stress

Cortisol

Hippocampuszerstörung

Gedächtnisprobleme



**Welches sind die besten
Anti-Aging-
Interventionen?**

Untersuchte Einflussfaktoren

Ernährung

(Homocystin / Vit. B6, B12 & Folsäure / Antioxidantien / Fett / Ernährungsmuster, Vitamine, mediterrane Ernährung)

Soziale Kontakte, Freizeitaktivität & körperliche Betätigung

Hormonsubstitution

(Östrogen / Progesteron)

Aspirin und andere NSAIDs

(nonsteroidal antiinflammatory drugs)

Ginko Biloba

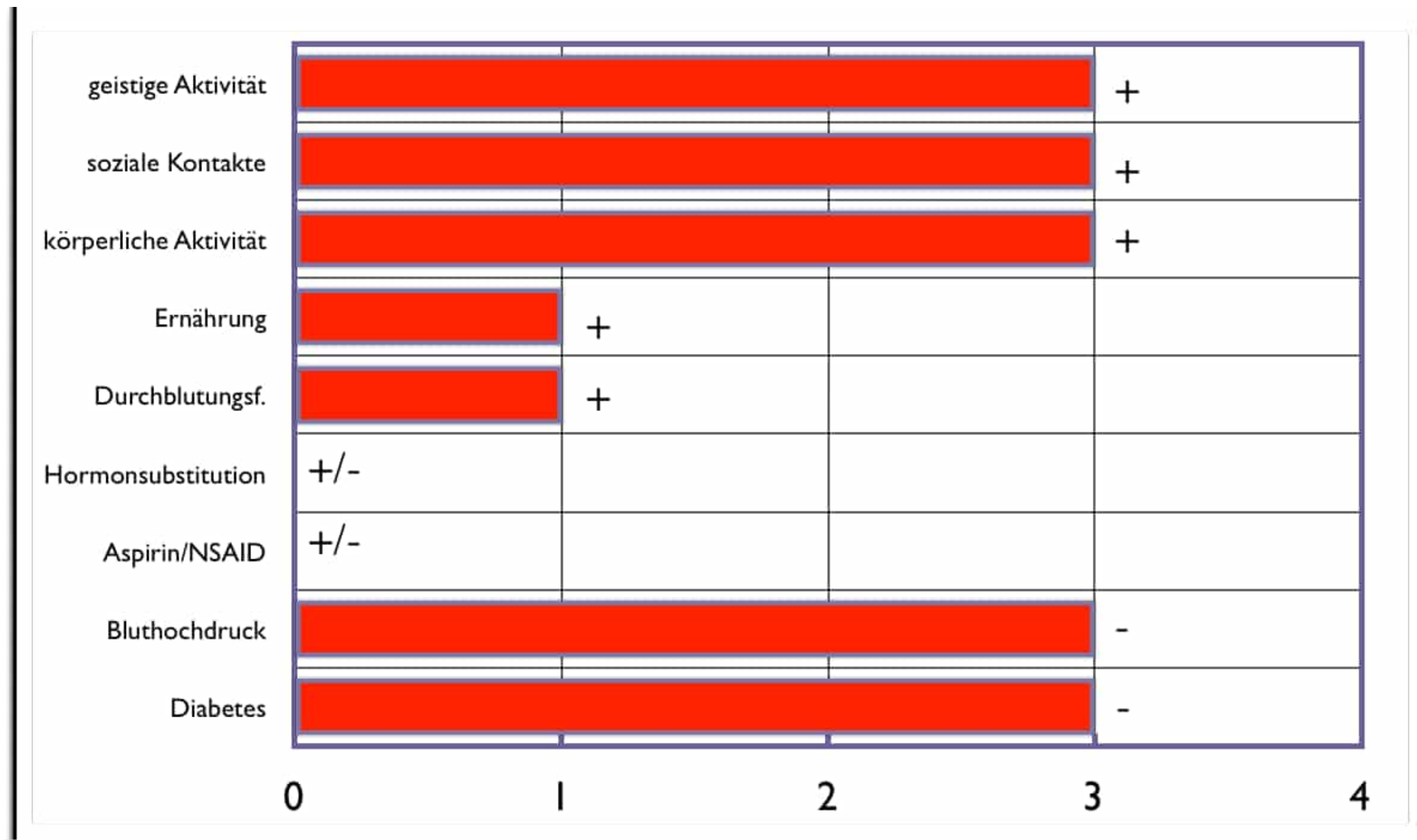
Andere Vasodilatoren

Bluthochdruck

Diabetes

Coley, N., Andrieu, S., Gardette, V., Gillette-Guyonnet, S., Sanz, C., Vellas, B., & Grand, A. (2008). Dementia prevention: methodological explanations for inconsistent results. *Epidemiologic Reviews*, 30, 35–66.

Einflussfaktoren auf geistige Fitness im Alter !



Konklusion



Fazit

- Das Gehirn ist plastisch auch im Alter.
- Wir können immer noch lernen.
- **Use it or lose it**
- Kognitive & anatomische Reserve
- Lebensfreude - Aktivität



Selbstdisziplin - Ästhetik



Dalle-E-3 (26.10.2023)

**Herzlichen Dank für
Ihre Aufmerksamkeit !**