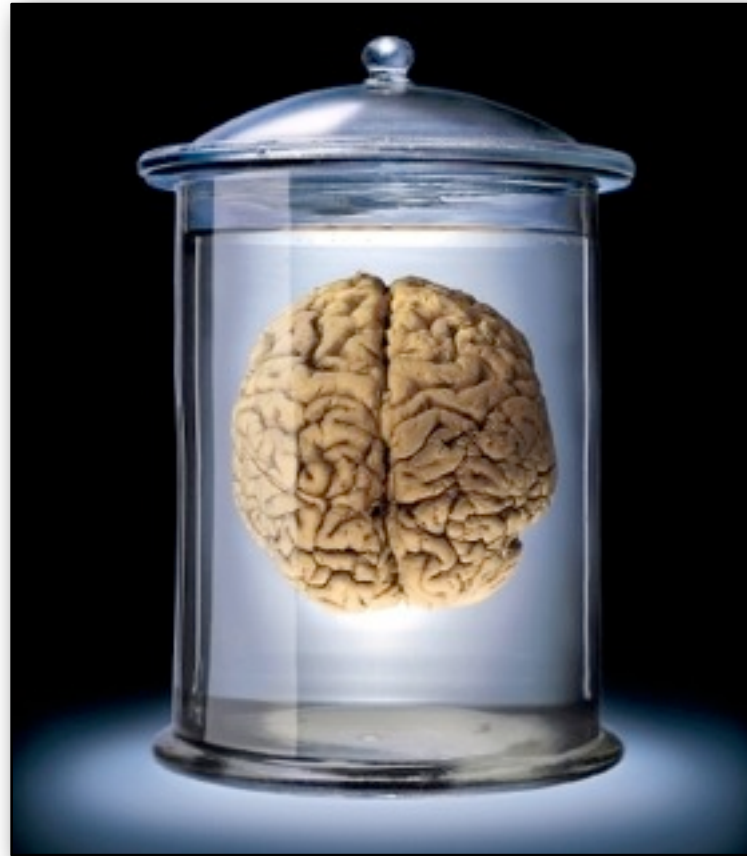




Hirn und Lernen



Inhaltsverzeichnis

- Das Gehirn
- Allgemeines zum Lernen
- Aufmerksamkeit
- Exekutive Funktionen
- Emotionen
- Epilog





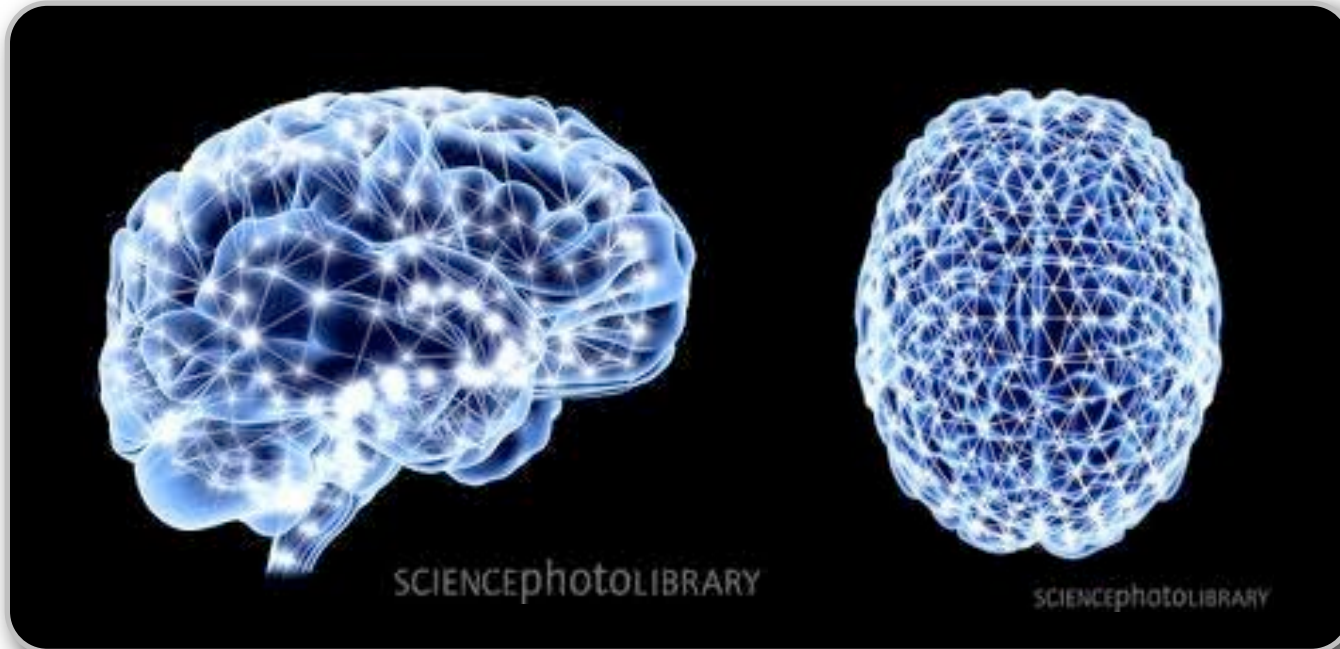
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Das Gehirn – ein komplexes Netzwerk



1.2 - 1.4 kg

2% des Körpergewichts

20% des Blutumsatzes

70% des Glucoseumsatzes

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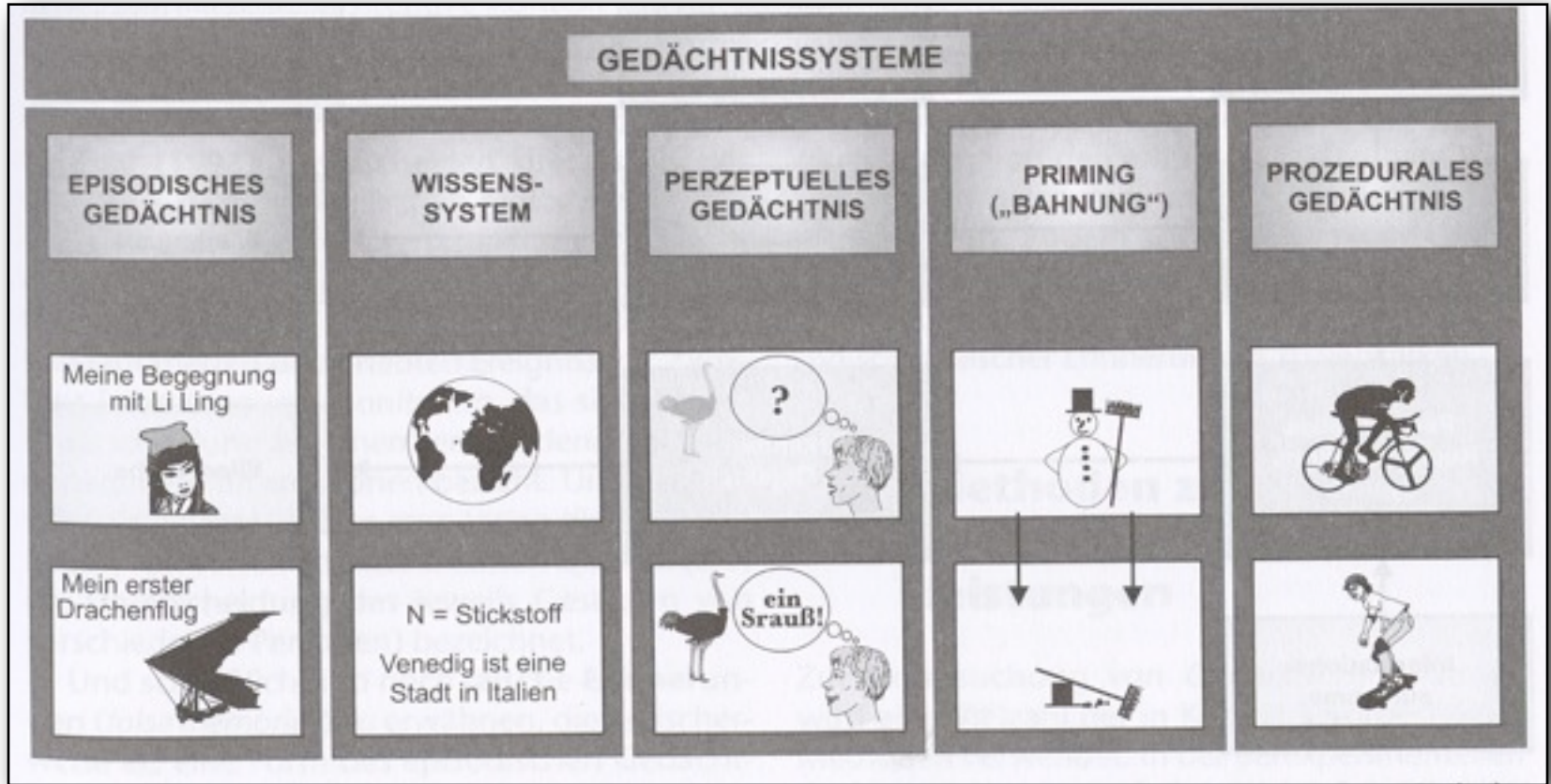




Lernen und Gedächtnis



Gedächtnissysteme



bewusst

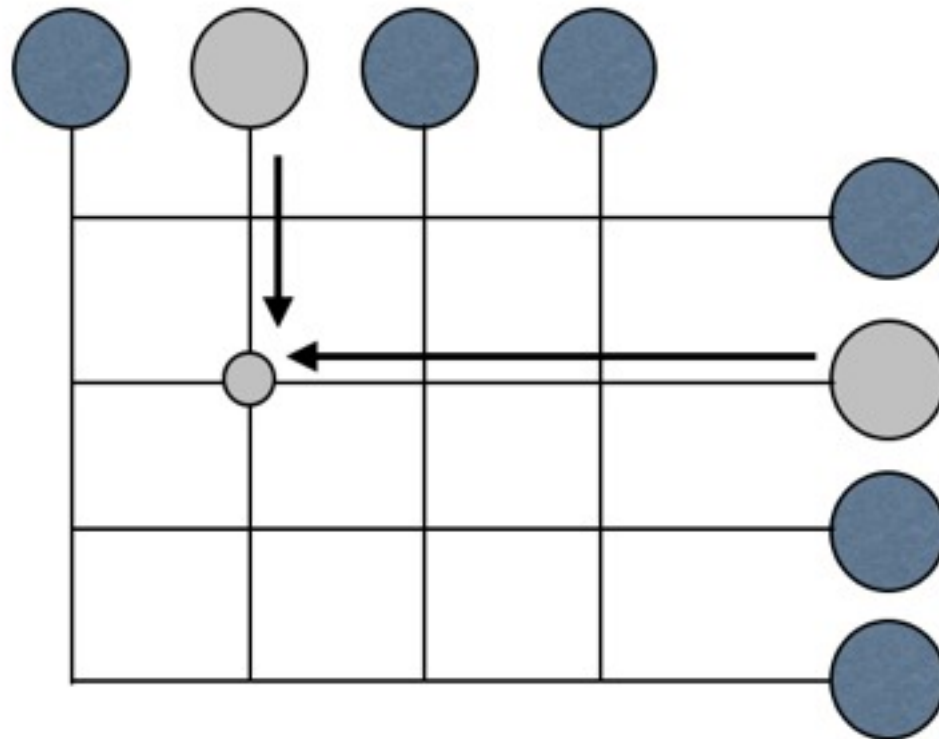
bewusst
unbewusst

unbewusst

fire together wire together !

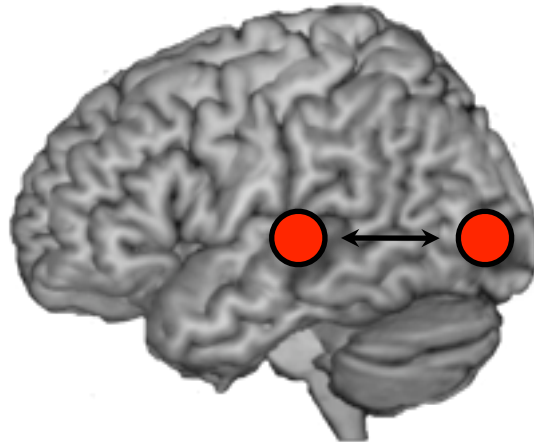


Donald Hebb

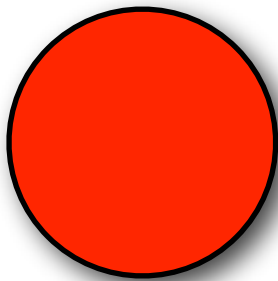




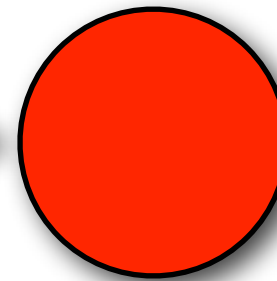
Lernzeit-Präsentationshäufigkeit



Nervenzellgruppe 1

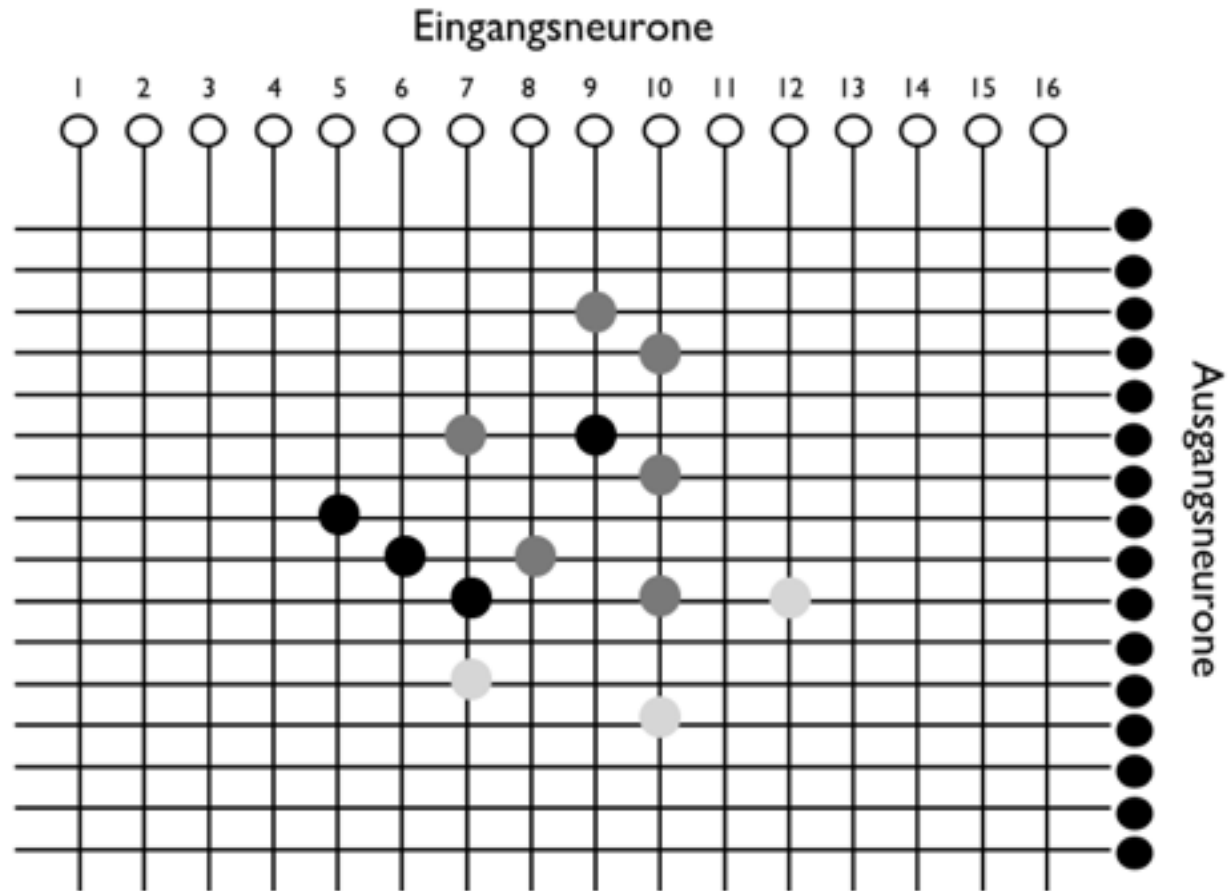


Nervenzellgruppe 2

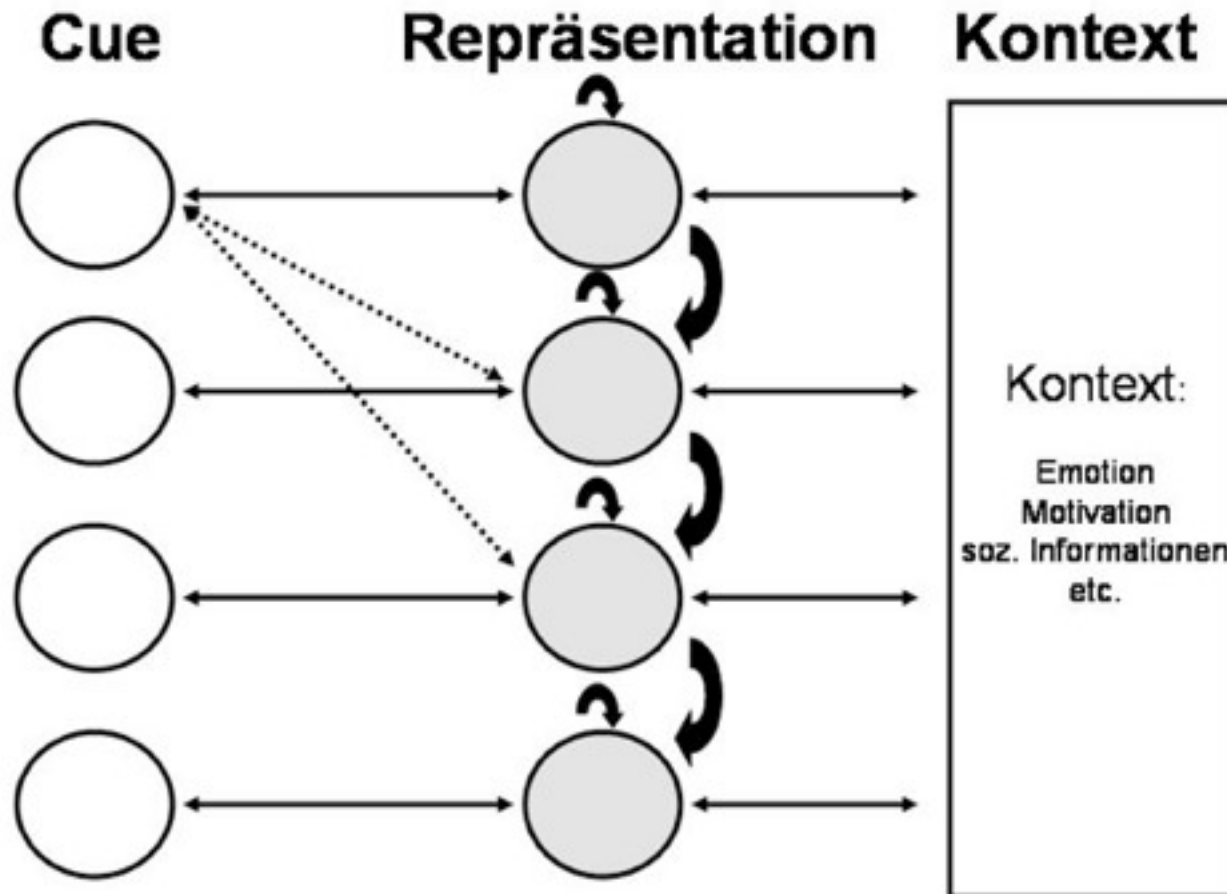




Neuronales Netz



Abruf-Struktur

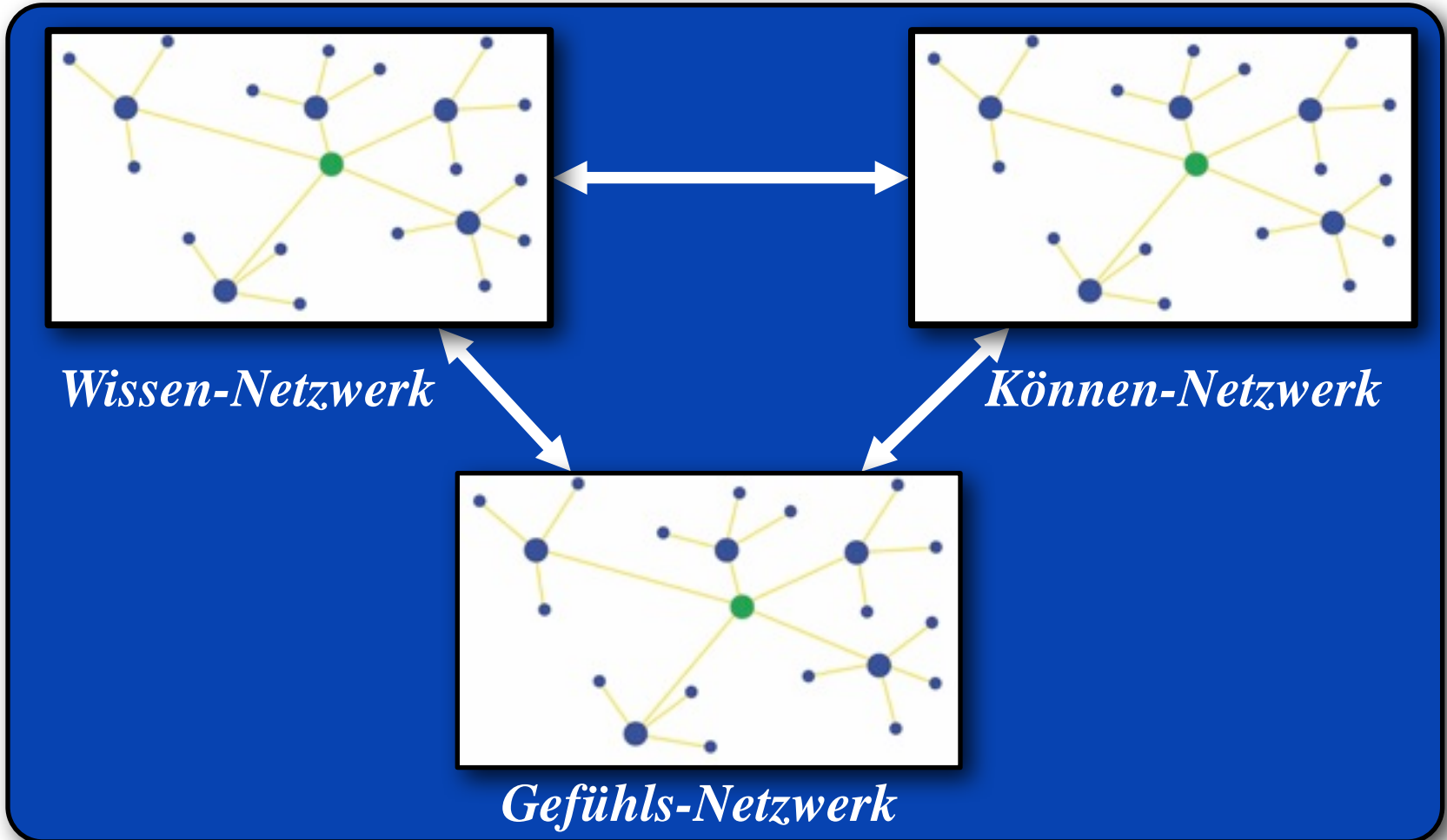


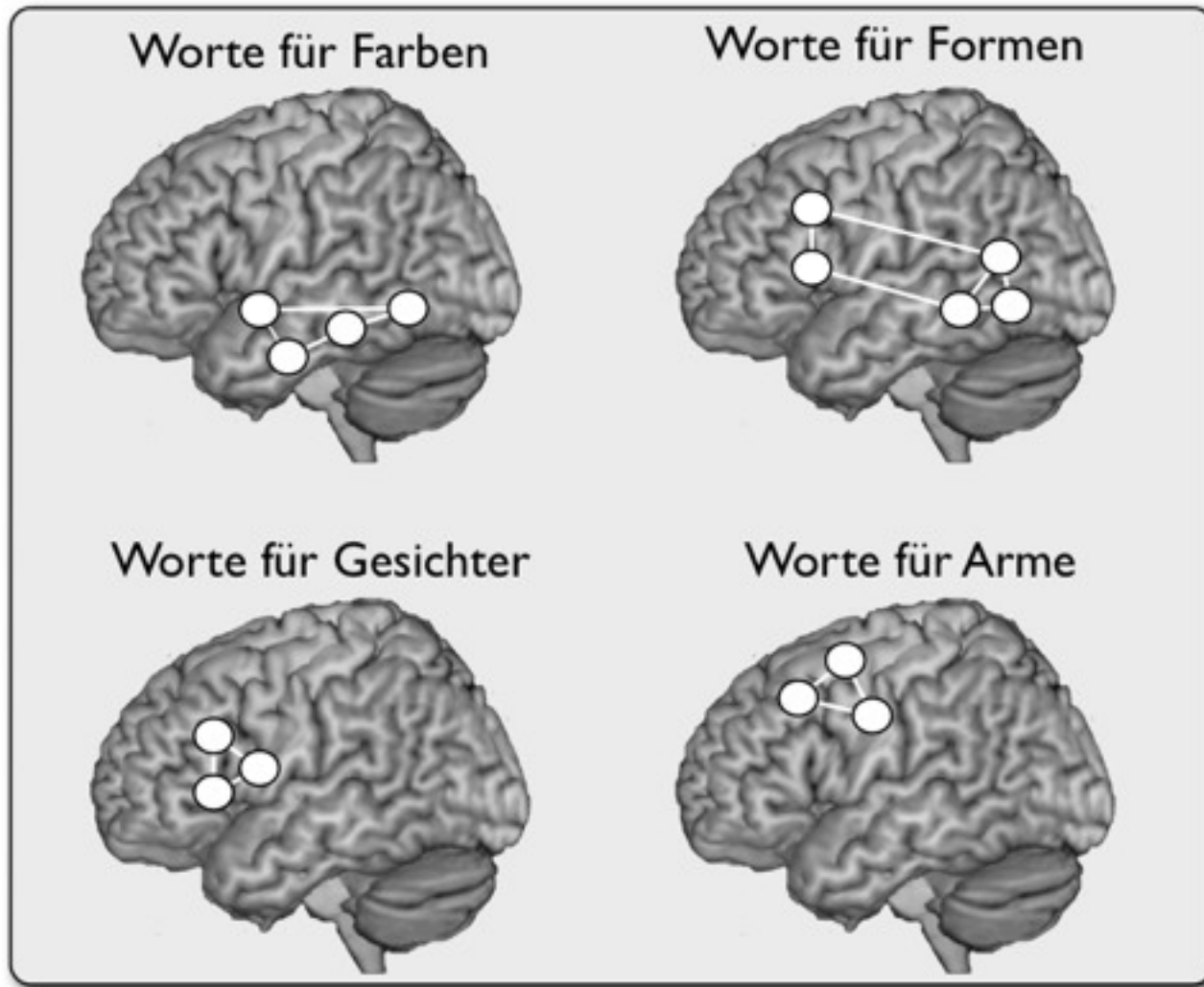


Gedächtnisstärke (GS)

$$GS = f(GS_Item, GS_Kontext, GS_Assoziationen)$$

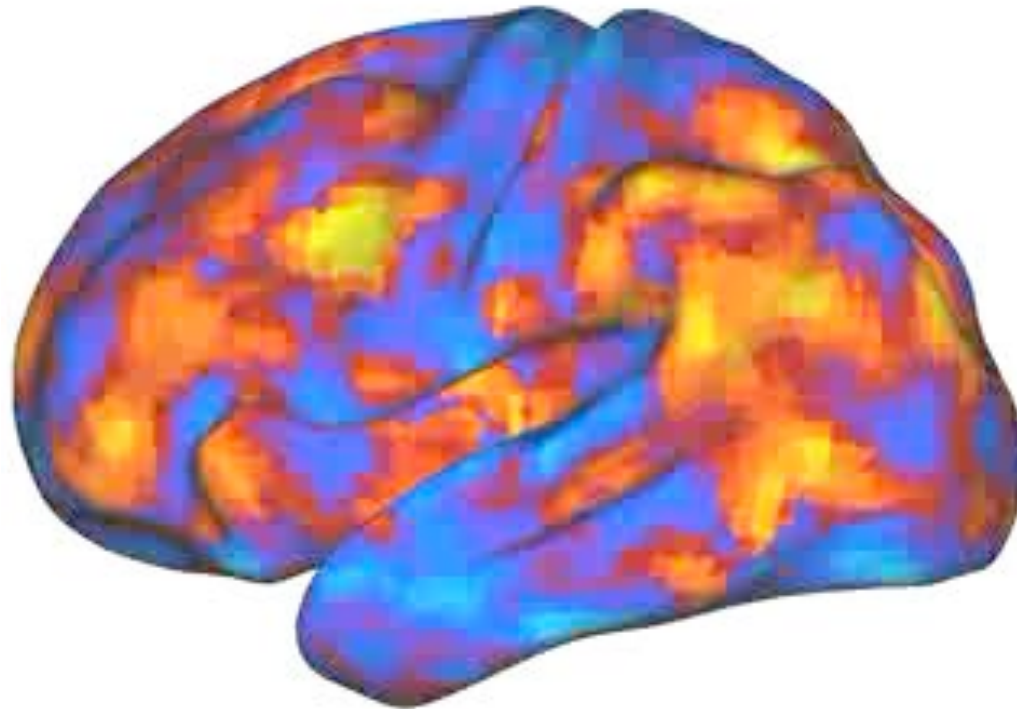
Netzwerke



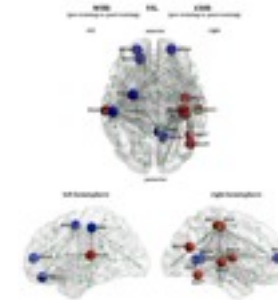




Elektrische Oszillationen beim Hören von Musik



Arbeitsgedächtnis-Trainierte vs. Nicht-Trainierte



Langer et al., in revision



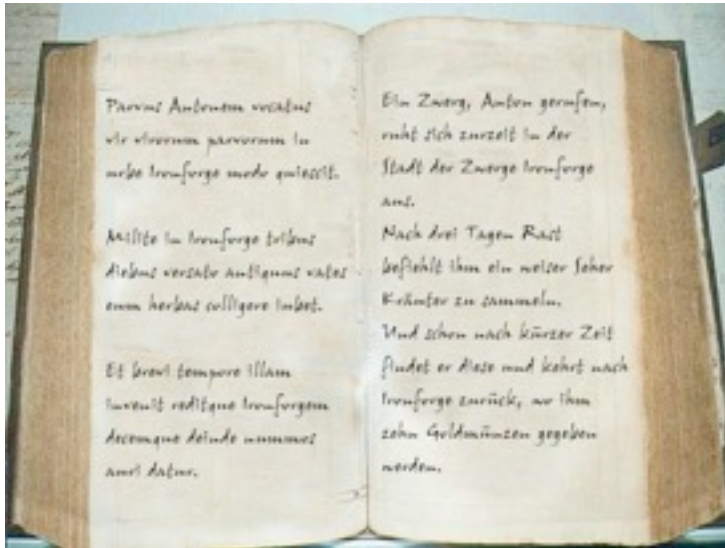
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Ablenkung ?



oder

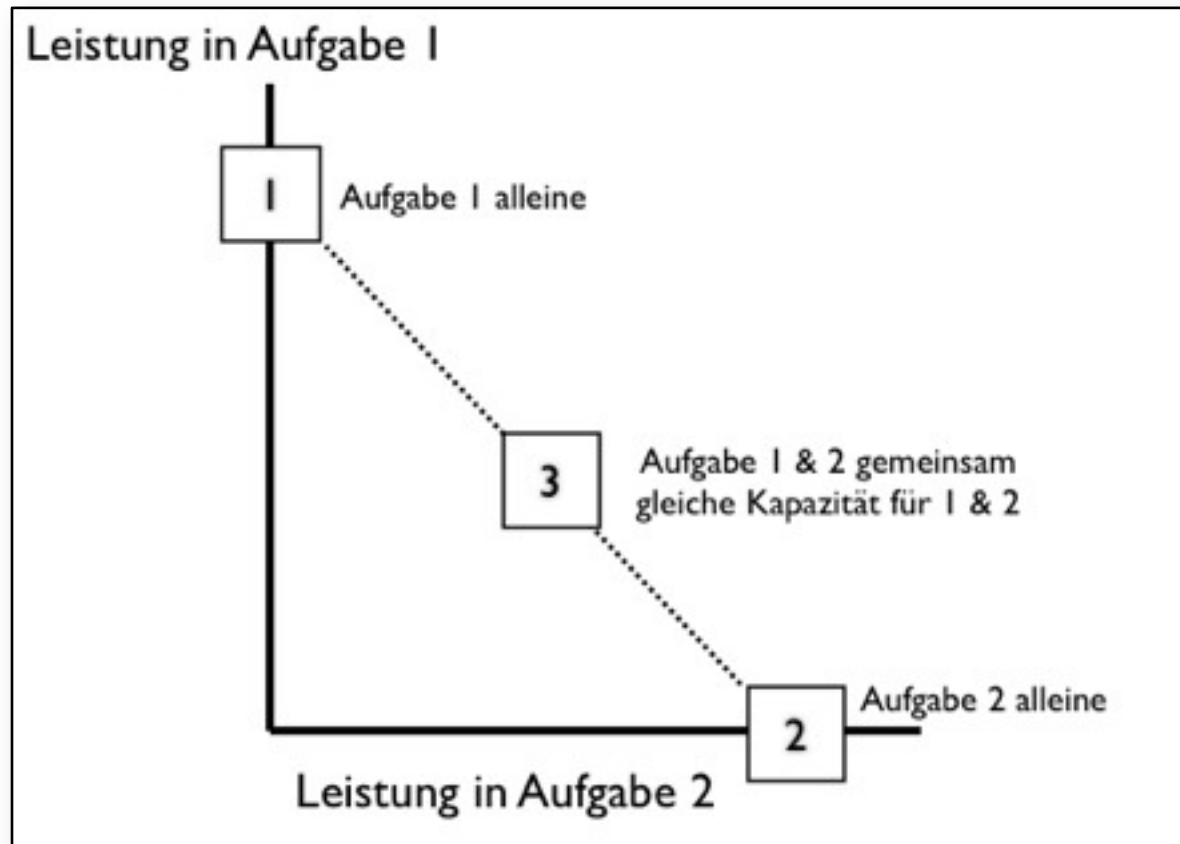


Ablenkung ?

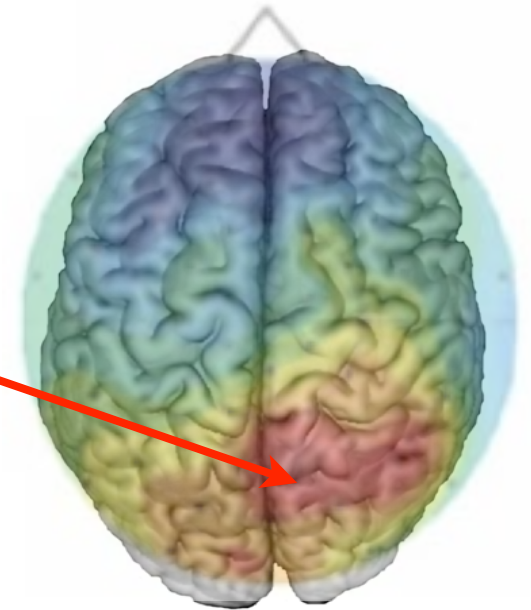
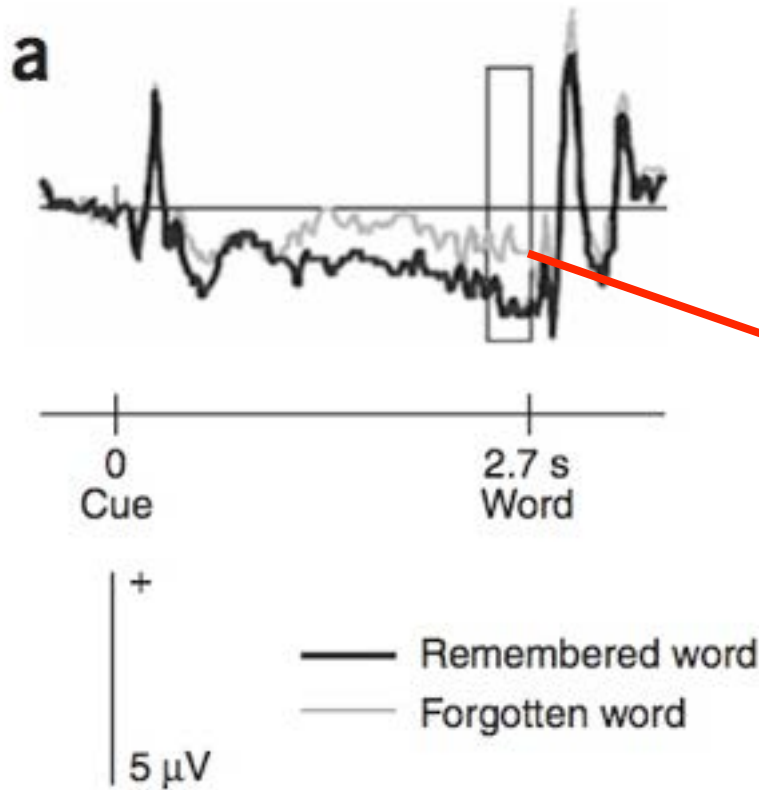
τῷ Ἀσ-
κληπιῷ ἀνέθηκε πλήκτην, ὃς τοὺς ἐπὶ στόμα
πίπτοντας ἐπιτρέχων συνέτριβεν.
Εἰώθει δὲ λέγειν τὰς τραγικὰς ἀρὰς αὐτῷ
σινηνητηκέναι· εἶναι γοῦν
ἄπολις, ἄοικος, πατρίδος ἐστερημένος,
πτωχός, πλανήτης, βίον ἔχων τοῦφ' ἡμέραν.
ἔφασκε δ' ἀντιτιθέναι τύχη μὲν θάρσος, νόμῳ δὲ
φύσιν, πάθει δὲ λόγον. ἐν τῷ Κρανείῳ ἡλιουμένῳ
αὐτῷ Ἀλέξανδρος ἐπιστάς φησιν, "αἴτησόν με
ὃ θέλεις." καὶ ὃς, "ἀποσκοπήσόν μου," φησί.

oder





Hirnaktivität vor dem Lernen !



Otten et al. 2006



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- Emotionen
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Multitasking !?





NASS PNAS PNAS

Cognitive control in media multitaskers

Eyal Ophir^a, Clifford Nass^{b,1}, and Anthony D. Wagner^c

^aSymbolic Systems Program and ^bDepartment of Communication, 450 Serra Mall, Building 120, Stanford University, Stanford, CA 94305-2050; and ^cDepartment of Psychology and Neurosciences Program, Jordan Hall, Building 420, Stanford University, Stanford, CA 94305-2130

Edited by Michael I. Posner, University of Oregon, Eugene, OR, and approved July 20, 2009 (received for review April 1, 2009)

Chronic media multitasking is quickly becoming ubiquitous, although processing multiple incoming streams of information is considered a challenge for human cognition. A series of experiments addressed whether there are systematic differences in information processing styles between chronically heavy and light media multitaskers. A trait media multitasking index was developed to identify groups of heavy and light media multitaskers. These two groups were then compared along established cognitive control dimensions. Results showed that heavy media multitaskers are more susceptible to interference from irrelevant environmental stimuli and from irrelevant representations in memory. This led to the surprising result that heavy media multitaskers performed worse on a test of task-switching ability, likely due to reduced ability to filter out interference from the irrelevant task set. These results demonstrate that media multitasking, a rapidly growing societal trend, is associated with a distinct approach to fundamental information processing.

attention | cognition | executive function | multitasking | working memory

media multitasking index to determine the mean number of media a person simultaneously consumes when consuming media and selected those individuals who were heavy media multitaskers (HMMs were one standard deviation or more above the mean) or light media multitaskers (LMMs were one standard deviation or more below the mean) on this index. We then examined these groups' abilities on cognitive control dimensions that could indicate a breadth-bias in cognitive control at different control loci: the allocation of attention to environmental stimuli and their entry into working memory, the holding and manipulation of stimulus and task set representations in working memory, and the control of responses to stimuli and tasks.

Filtering Environmental Distractions: Filter and AX-CPT Tasks. In a test of filtering ability (10)—an ability that can point to a breadth orientation in allowing stimuli into working memory—participants viewed two consecutive exposures of an array of rectangles and had to indicate whether or not a target (red) rectangle had changed orientation from the first exposure to the second, while ignoring distractor (blue) rectangles (Fig. 1A). We

PSYCHOLOGICAL AND
COGNITIVE SCIENCES

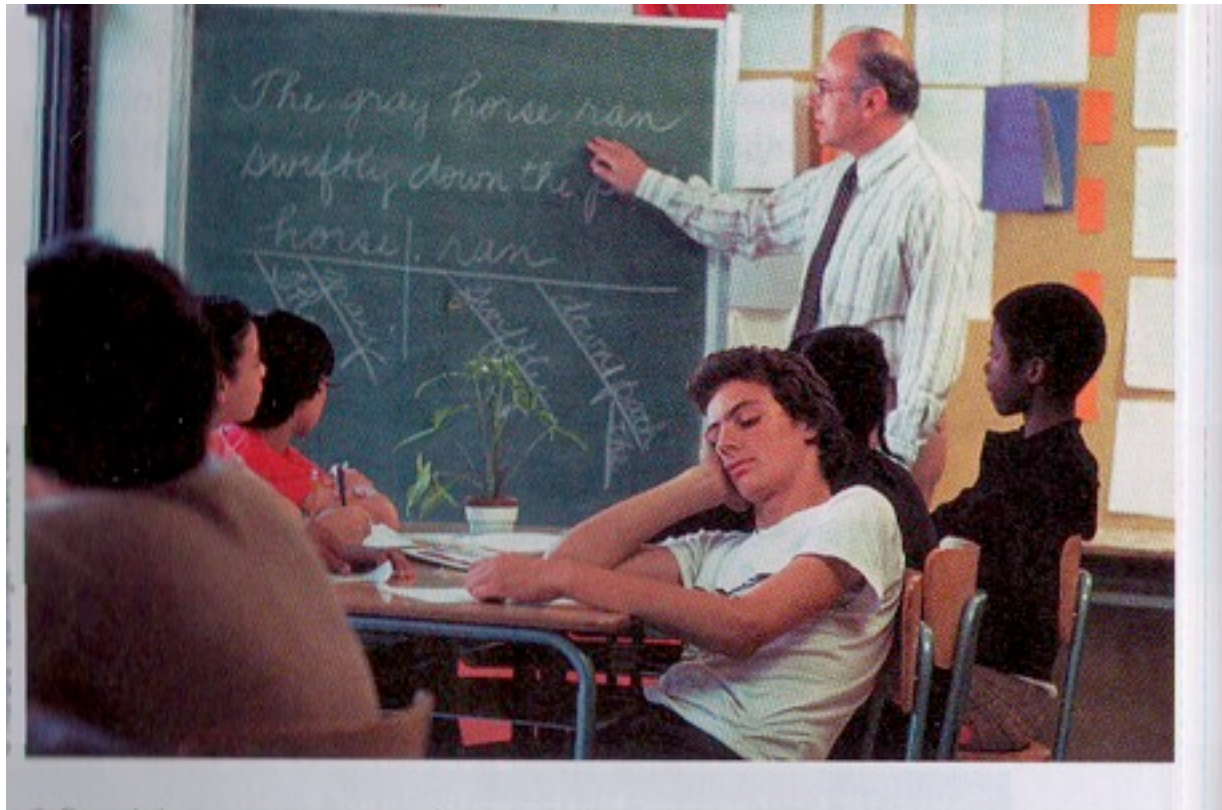


Wichtigste Ergebnisse

- Je mehr **Distraktoren** desto schlechter sind die *Heavy-Multimedia-User* !
- Je schwieriger die **Multitasking**-Aufgabe desto langsamer und fehleranfälliger arbeiten die *Heavy-Multimedia-User* !



Die Rolle der Motivation und Selbstdisziplin





IQ oder Selbstdisziplin ?

Intercorrelations Between Academic-Performance Indicators and Composite Self-Discipline Score and IQ

Academic-performance variable	Study 1 (N = 140)	Study 2 (N = 164)		Two-tailed <i>p</i> of difference between the IQ and self-discipline correlations
	Self-discipline	Self-discipline	IQ	
First-marking-period GPA	.52***	.66***	.34***	<.001
Final GPA	.55***	.67***	.32***	<.001
Spring achievement test	.29**	.43***	.36***	n.s.
Selection to high school	.42***	.56***	.26**	<.001
School absences	-.17*	-.26**	-.07	.06
Homework hours	—	.35***	-.09	<.001
Television hours	—	-.33***	-.06	.01
Time of day homework is begun	—	-.26**	.18*	<.001

Note. GPA = grade point average.
p* < .05. *p* < .01. ****p* < .001.

Duckworth and Seligman, 2006, Psychological Science



Wie entsteht Leistung ?

Leistung = Bereitschaft x Fähigkeit x Möglichkeit

$$L = f [B \times F \times M]$$

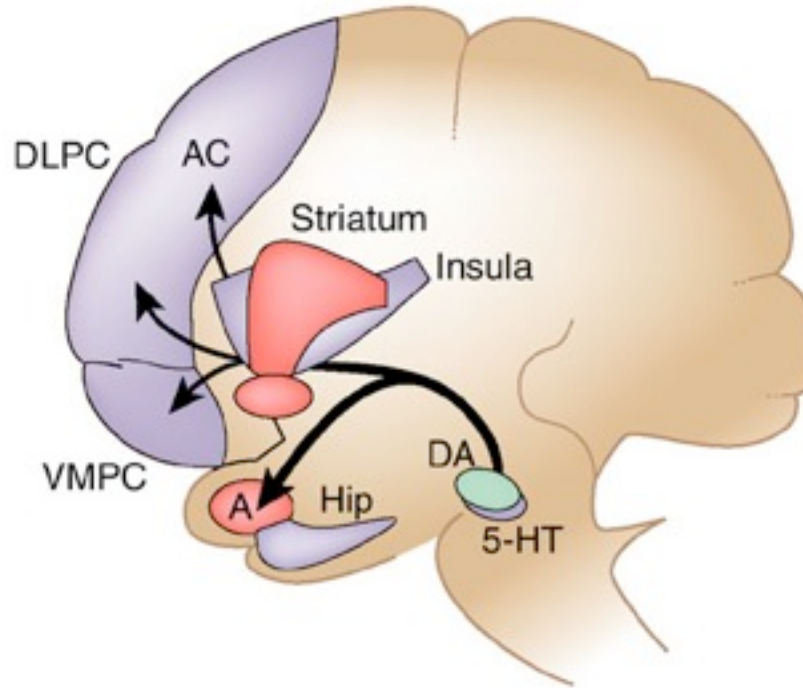
Fähigkeit = Begabung + Lernergebnis

Impulskontrollsystem

Erwachsene
normal

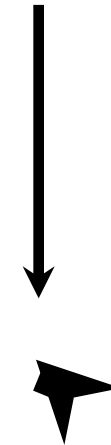


Dopamin



Bechara, 2006

Jugendliche
normal



Dopamin

Ann Thomson



Walter Mischel



Delay of Gratification in Children

Mischel, Walter; Shoda, Yuichi; Rodriguez, Monica L.
Science; May 26, 1989; 244, 4907; ProQuest Medical Library
pg. 933

Articles

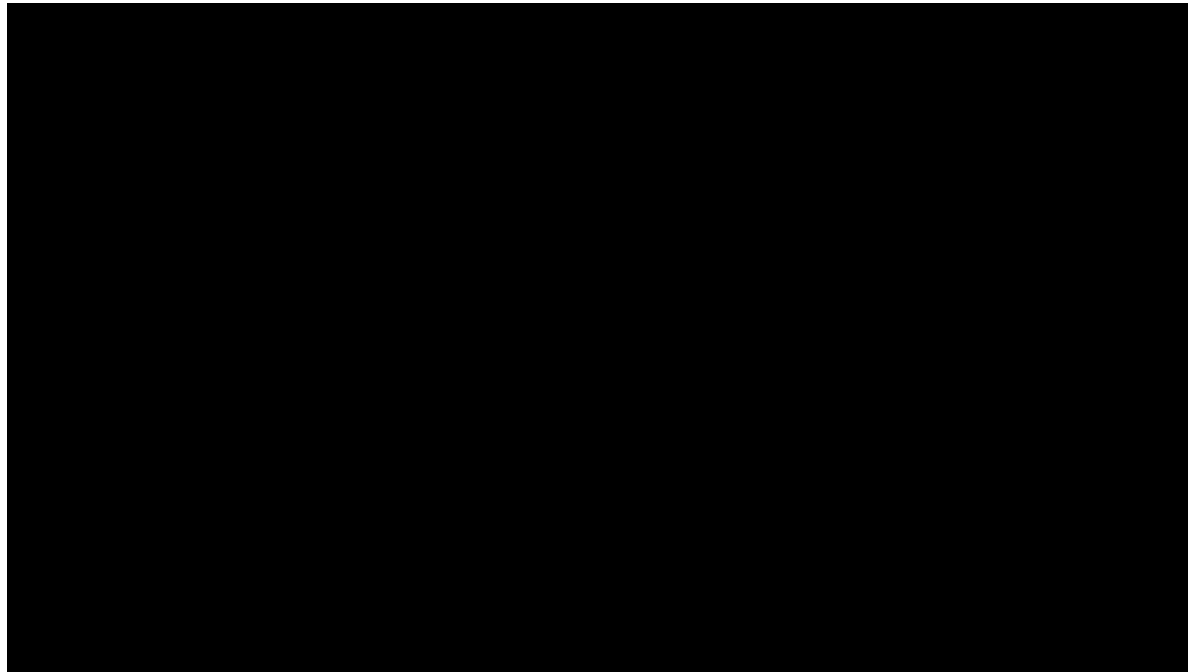
Delay of Gratification in Children

WALTER MISCHEL, YUICHI SHODA, MONICA L. RODRIGUEZ



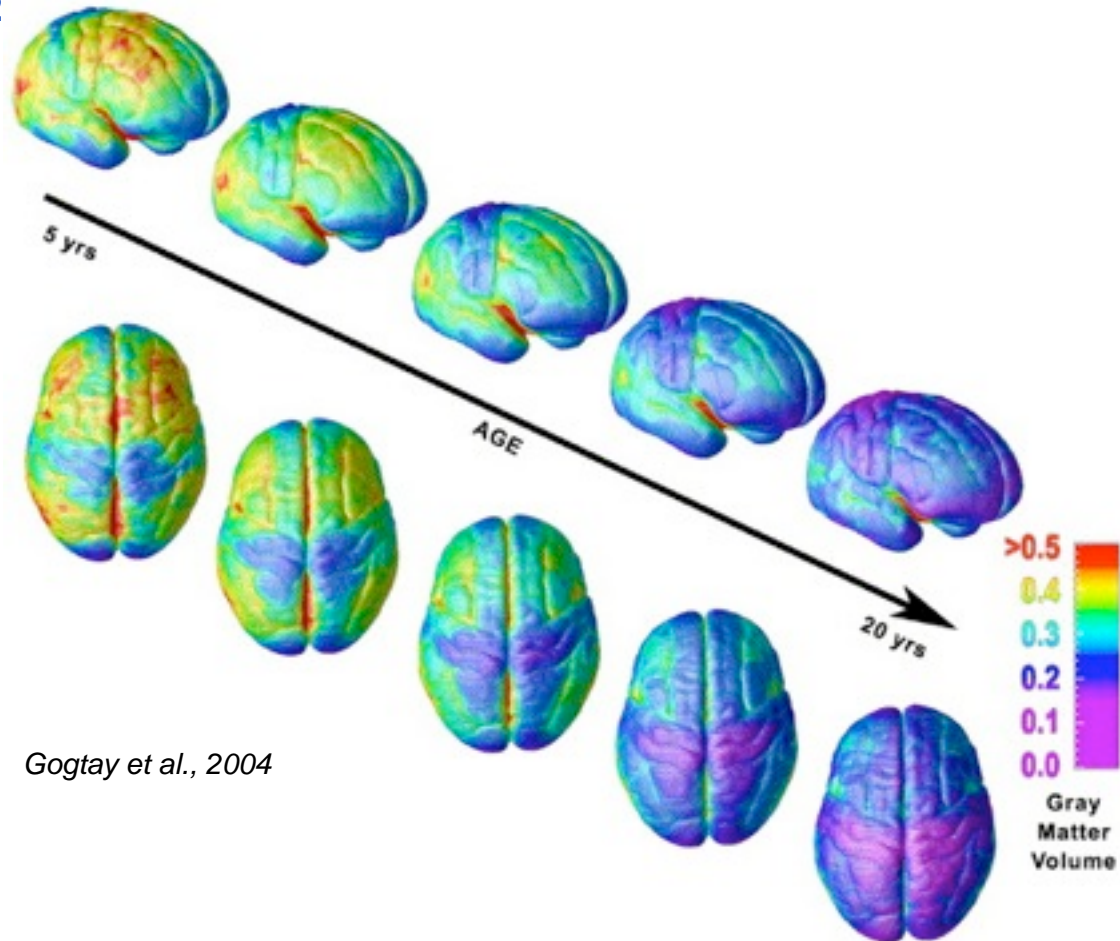
Belohnungsverzögerung

Marshmallows-Experiment



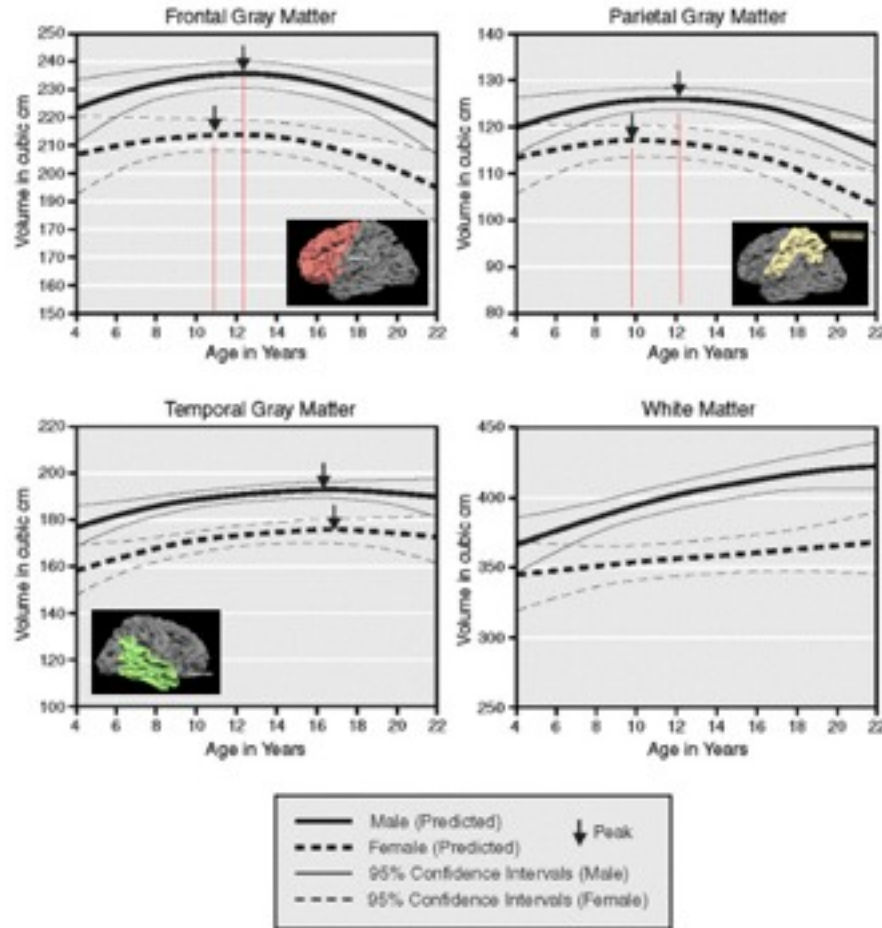
Längsschnittstudie

N=13 alle 2



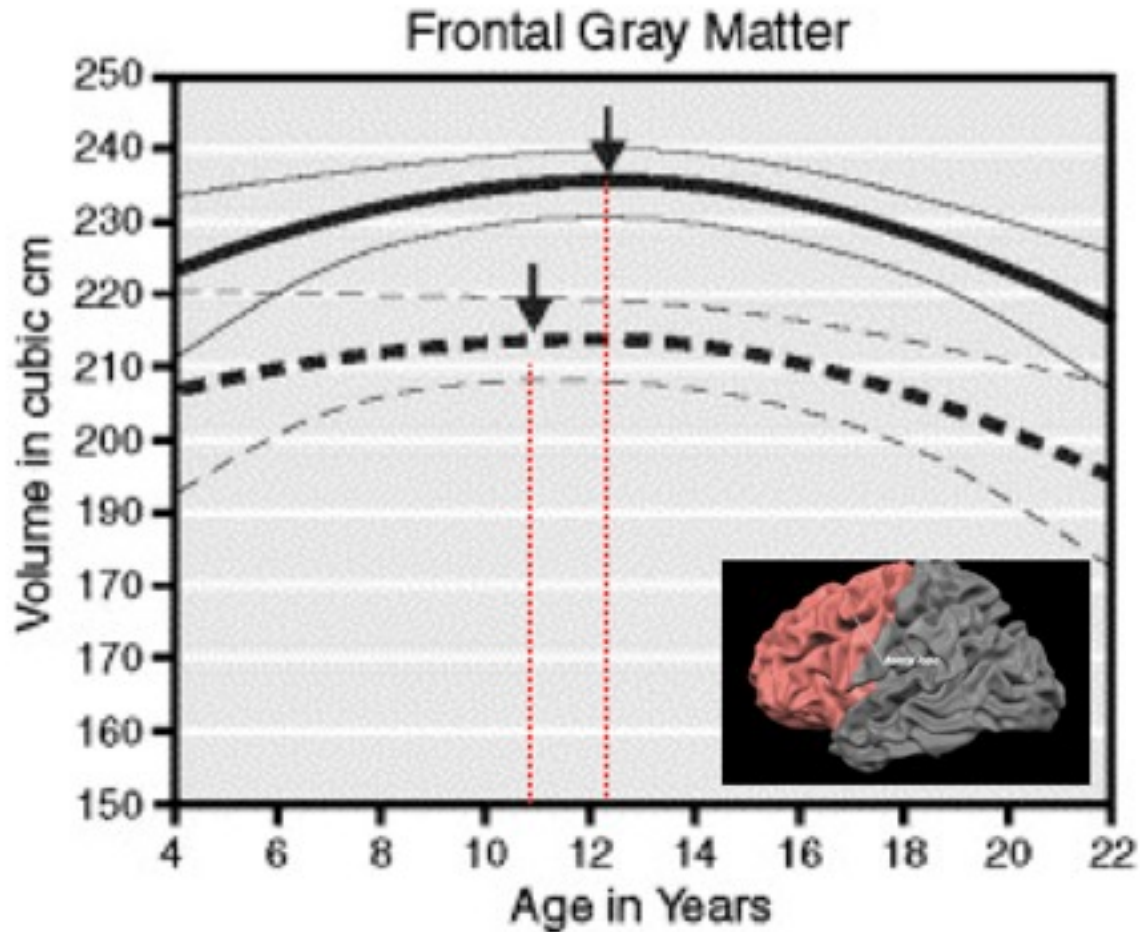
Graue und Weisse Substanz

NIH-Stud

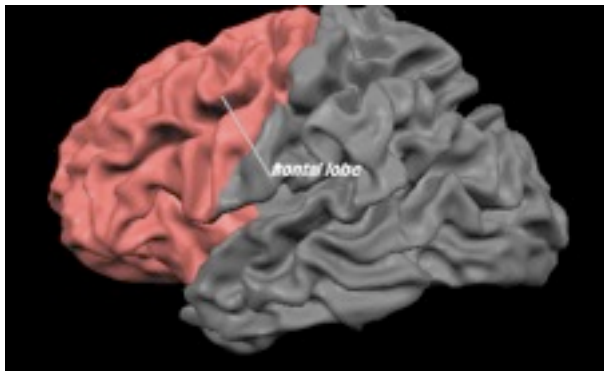
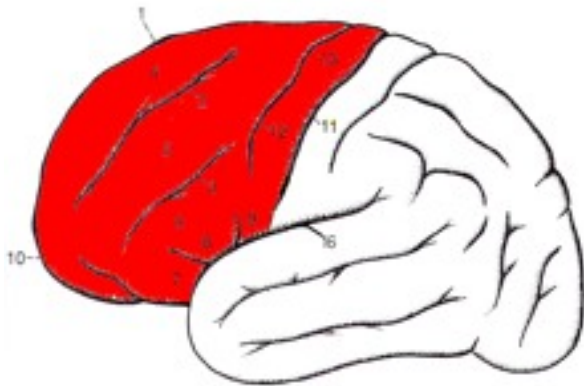


Graue und Weisse Substanz

NIH



Exekutive Funktionen



Aufmerksamkeit

Filtern - Hemmung

Arbeitsgedächtnis

Selbstkontrolle - Selbstdisziplin

Emotionskontrolle

Motivation

Sprachfunktionen

Planung

motorische Kontrolle



Neural predictors of individual differences in response to math tutoring in primary-grade school children

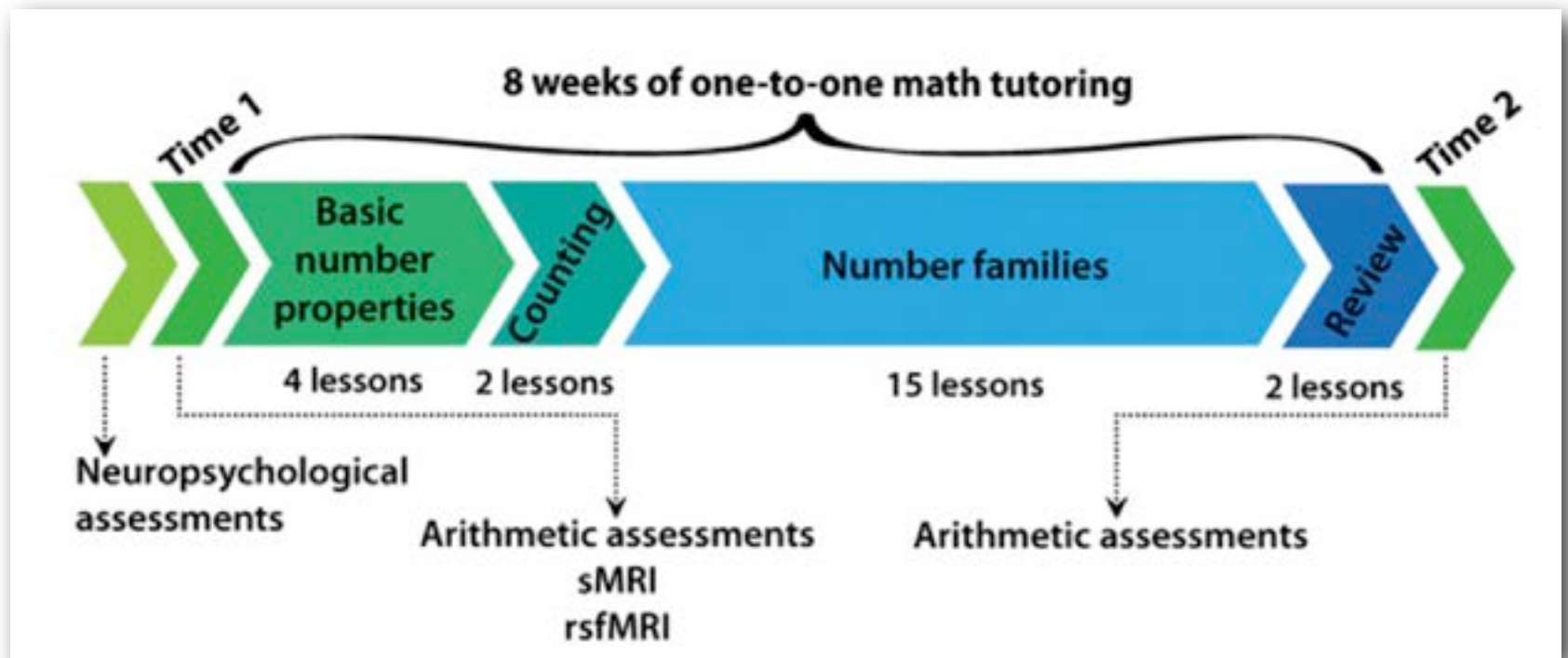
Kaustubh Supekar^{a,1,2}, Anna G. Swigart^{a,1}, Caitlin Tenison^a, Dietsje D. Jolles^a, Miriam Rosenberg-Lee^a, Lynn Fuchs^b, and Vinod Menon^{a,c,d,e,2}

Departments of ^aPsychiatry and Behavioral Sciences and ^bNeurology and Neurological Sciences, ^cProgram in Neuroscience, and ^dSymbolic Systems Program, Stanford University School of Medicine, Stanford, CA 94304; and ^eDepartment of Special Education, Vanderbilt University, Nashville, TN 37203

Edited* by Michael I. Posner, University of Oregon, Eugene, OR, and approved March 29, 2013 (received for review December 19, 2012)

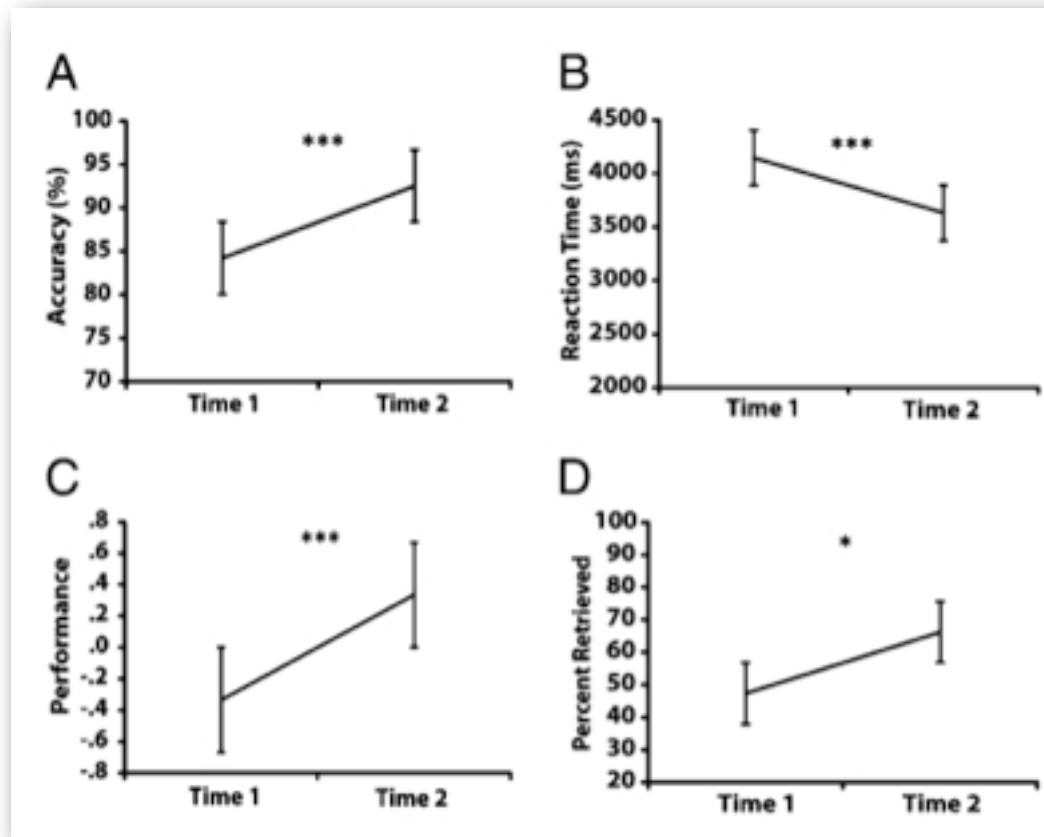
Now, more than ever, the ability to acquire mathematical skills efficiently is critical for academic and professional success, yet little is known about the behavioral and neural mechanisms that drive some children to acquire these skills faster than others. Here we investigate the behavioral and neural predictors of individual differences in arithmetic skill acquisition in response to 8-wk of one-to-one math tutoring. Twenty-four children in grade 3 (ages 8–9 y), a critical period for acquisition of basic mathematical skills, underwent structural and resting-state functional MRI scans pretutoring. A significant shift in arithmetic problem-solving strategies from counting to fact retrieval was observed with tutoring. Notably, the speed and accuracy of arithmetic problem solving increased with tutoring, with some children improving significantly more than others. Next, we examined whether pretutoring behavioral

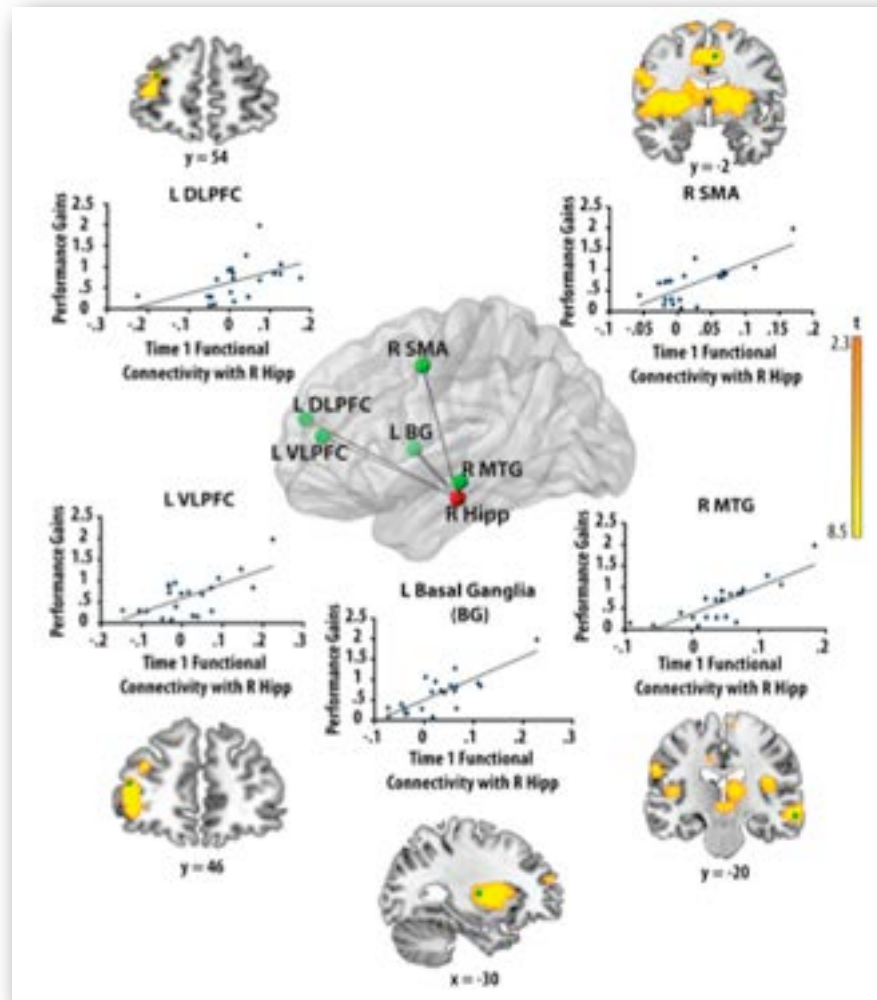
children by Fuchs and colleagues have shown that the combination of computer-aided intervention and one-to-one tutoring can significantly improve mathematical abilities (6, 9). Critically, they found that interventions emphasizing number knowledge and speeded practice with efficient counting strategies can improve math skills in primary-grade school children (9, 10, 13). Number knowledge is an important foundation in the development of arithmetic competence because it leads to efficient counting procedures and reasoning strategies for consistently pairing a problem with its correct answer. The inclusion of speeded practice to generate many correct responses then leads to more direct retrieval of arithmetic facts (15). For example, Fuchs and colleagues found that one-to-one number knowledge tutoring combined with speeded practice on counting strategies compared with number knowledge





Verbesserung der Matheleistung



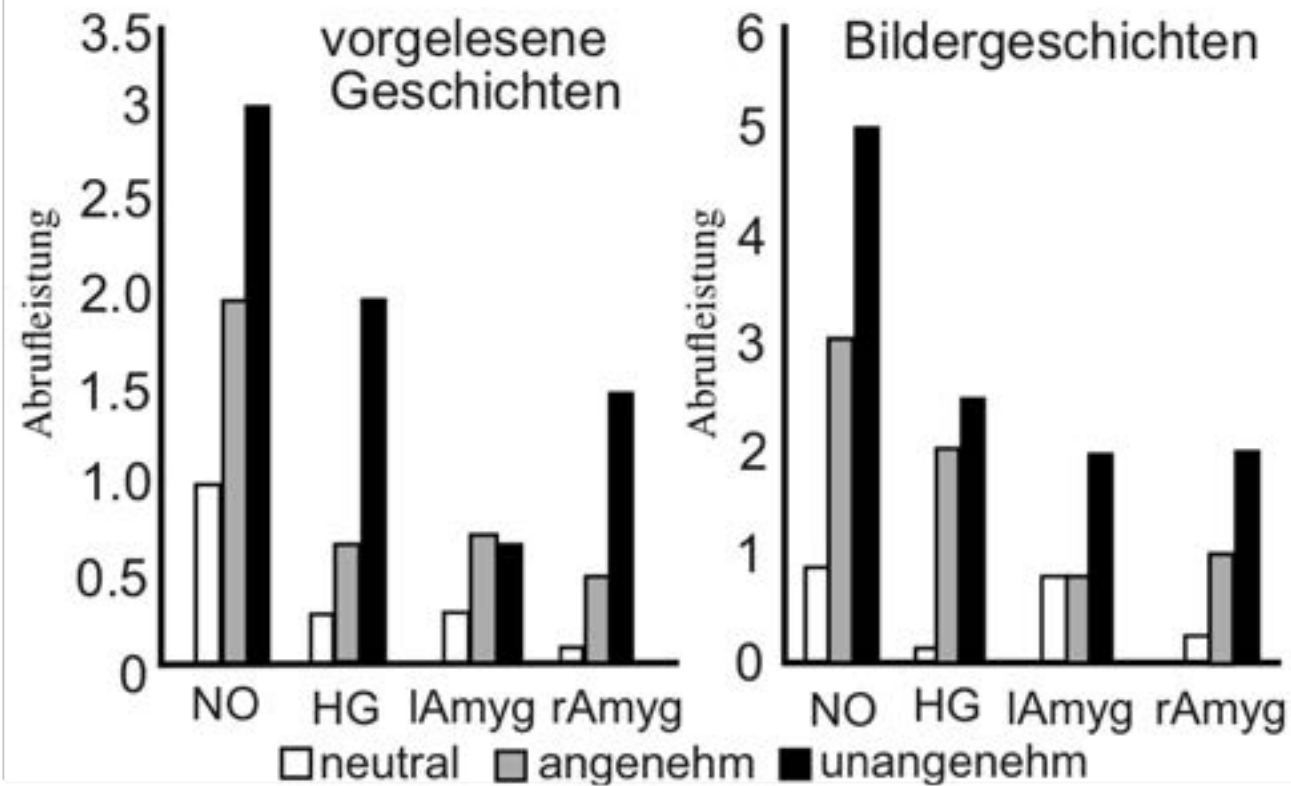


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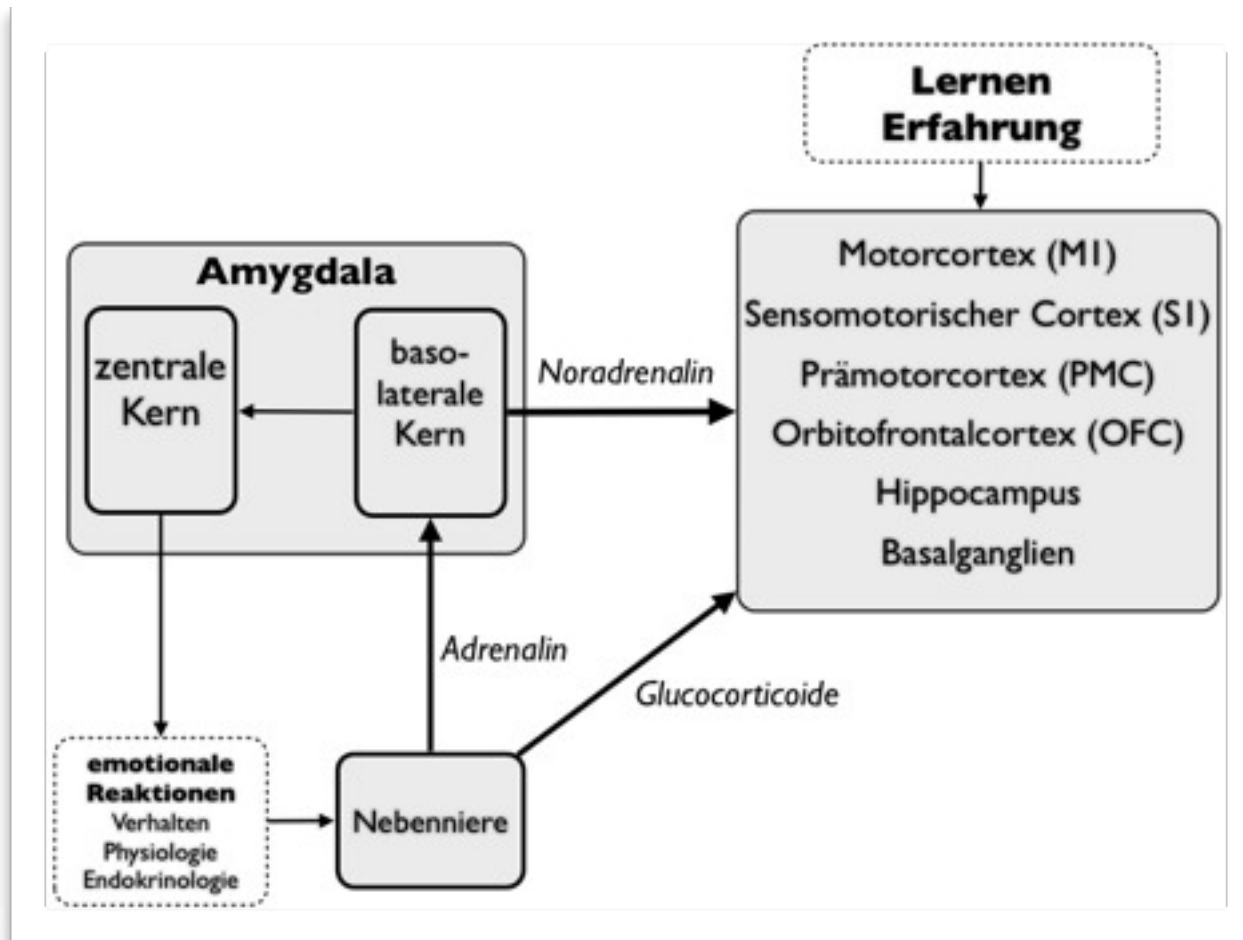
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- Emotionen
- Epilog



Emotionaler Verstärkungseffekt



Physiologische Mechanismen



Jäncke 2011

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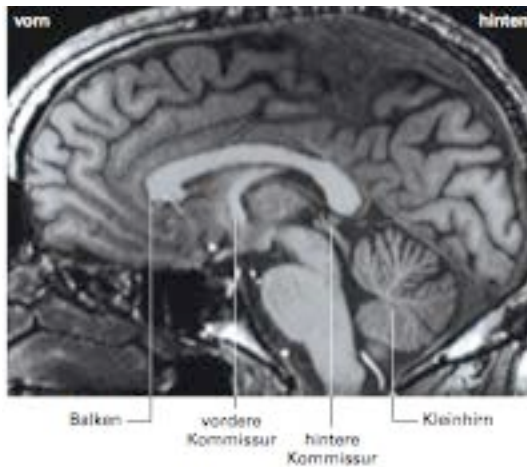


Kim Peek

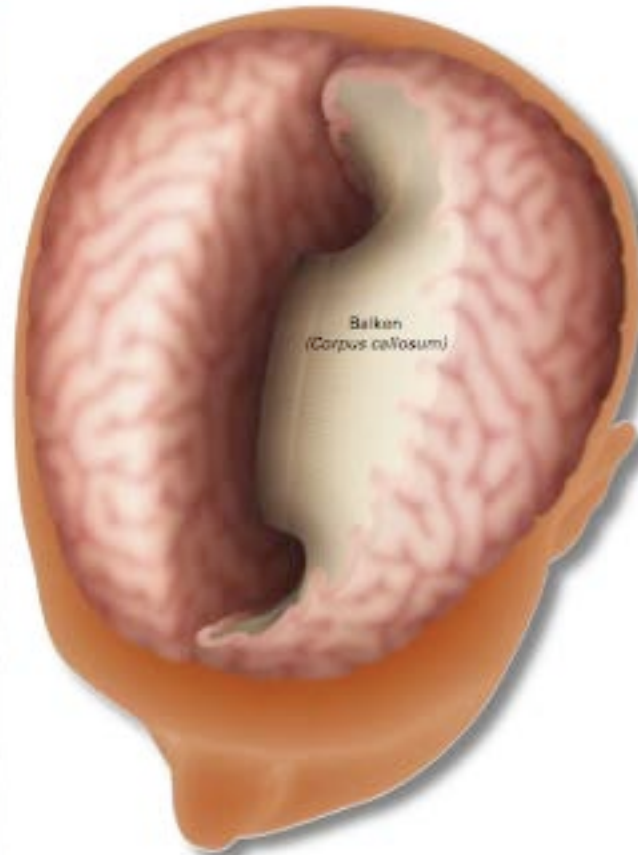
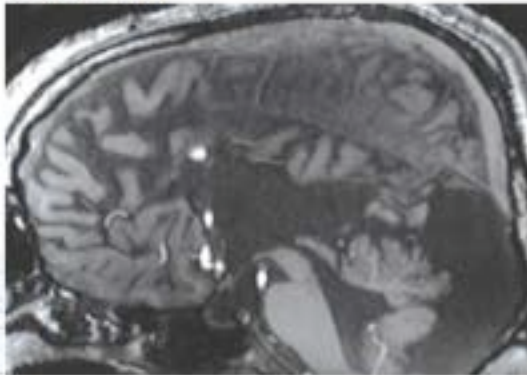


Hirn und Lernen, Lutz Jäncke

KP - CC-Agenesie



Gehirn von Kim Peek



Ein neuer Mozart ?



- Bemerkenswertes Gedächtnis für Tonhöhen
- kann alle Instrumente heraushören
- lernt ungeheuer schnell Klavier zu spielen
- erkennt bis zu 40 Jahre alte Musik
- stellt Verbindungen zu Musikern her etc.
- linkisch



Pathologisches Lernen !



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Herzlichen Dank für Ihre Aufmerksamkeit !

