Center of Functionally Integrative Neuroscience
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SPROG OG LATERALISERING I HJERNEN

Andreas Højlund

Folkeuniversitetet, Kolding/Odense, 7. & 9. marts 2017

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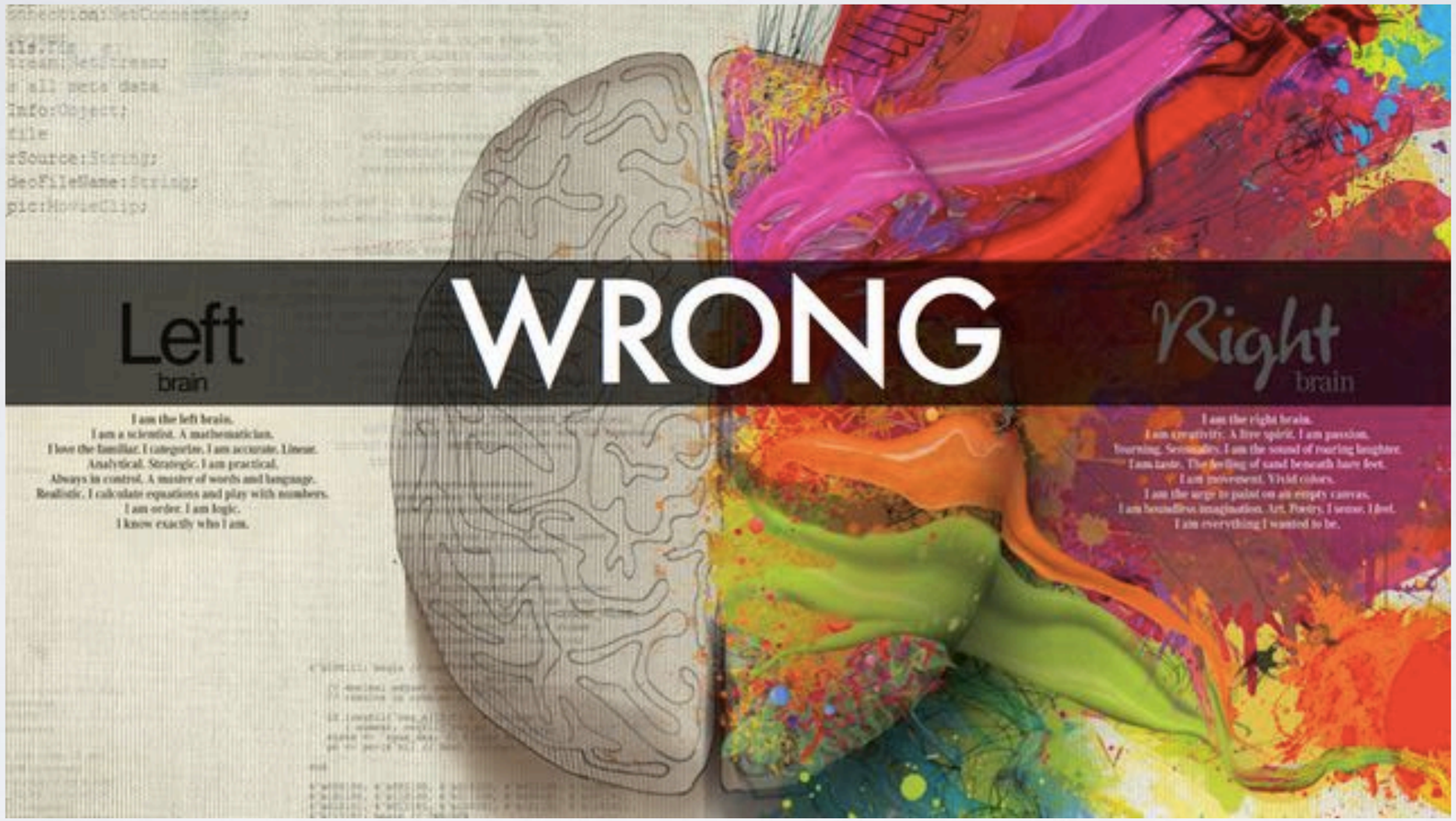

Kilde/copyright: Mercedes-Benz The best or nothing

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HJERNEFORSKER
- ER DU SÅ LÆGE?

Født **1983**

BA i lingvistik **2008**
KA i kognitiv semiotik **2011**
Ph.d. i neurolingvistik **2015**
Postdoc ved Aarhus Universitet
(Parkinson, DBS, sprog) **2015-**

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AFTENENS PROGRAM

Andreas snakker (ca. 45 min)

Pause (ca. 15 min)

Andreas snakker (ca. 40 min)

Spørgsmål (5 min)

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HJERNENS GÅDE #1

Hvor sidder sproget i hjernen?

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AFASI

NÅR SPROGET I HJERNEN GÅR I STYKKER

Fra græsk: 'uden tale' (a- = 'uden', phasis = 'tale', aphatos = 'målløs')

dvs. 'nedsat evne til at bruge (eller forstå) sproget'

Oftest pga.

- stroke (blodprop eller blødning i hjernen)
- hjernesvulst
- traume (slag mod hovedet)
- visse typer demens

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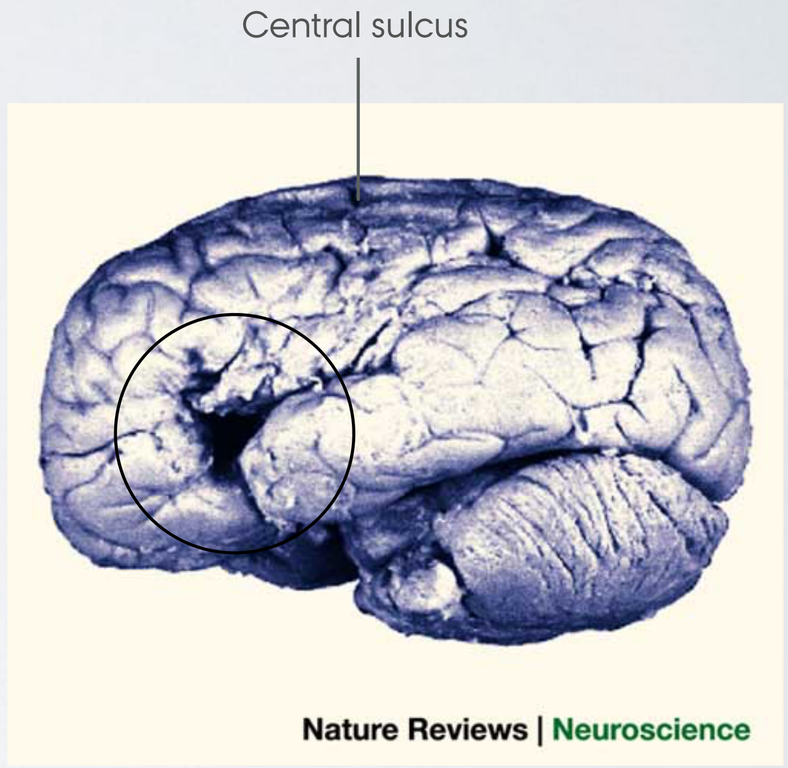
PAUL BROCA (1824-1880)

Kilde:
http://www.hypnose-kikh.de/museum_en/broca.gif

Patient Leborgne

- også kendt som “Tan”

Brocas post-mortem-undersøgelser af “Tan” førte til beskrivelsen af ‘Brocas afasi’



Rorden & Karnath (2004) Nature Reviews Neuroscience

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EKSEMPEL: BROCAS AFASI

Patient Tono:
https://www.youtube.com/watch?v=6CJWo5TDHLE

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AFASI EFTER STROKE

(BLODPROP ELLER BLØDNING I HJERNEN)

Table 1. Basic Patient Characteristics in Relation to Aphasia Severity

	No Aphasia	Mild Aphasia	Moderate Aphasia	Severe Aphasia	*p* Value
N (incidence)	551 (62.5%)	101 (11.5%)	56 (6.4%)	173 (19.6%)	
Age (yr) (SD)	73.1 (11.5)	76.5 (9.5)	75.8 (9.5)	77.1 (9.4)	<0.0001
Sex, male (%)	48%	48%	29%	45%	0.04
Handedness, right (%)	93%	92%	98%	94%	NS
Side of stroke lesion, left (%)	37%	93%	89%	87%	<0.00001
Mortality (%)	10%	10%	18%	47%	<0.00001
Prior stroke (%)	20%	26%	26%	36%	0.0004
Comorbidity (%)	21%	14%	25%	27%	NS
SSS on admission (SD)	43.9 (12.1)	41.8 (9.7)	33.5 (11.6)	15.5 (11.2)	<0.0001
SSS excluding language (SD)	29.2 (10.4)	31.2 (9.5)	28.0 (10.6)	15.0 (10.7)	<0.0001
BI on admission (SD)	61.6 (38.9)	63.6 (37.0)	44.3 (38.4)	16.1 (30.3)	<0.0001

SSS = Scandinavian Stroke Scale; SSS excluding language = SSS on admission excluding aphasia and orientation scores; BI = Barthel index; SD = standard deviation; NS = not significant.

Pedersen PM, Jørgensen HS, Nakayama H, Raaschou HO, Olsen TS. Aphasia in acute stroke: incidence, determinants, and recovery. Ann Neurol 1995;38:659–666

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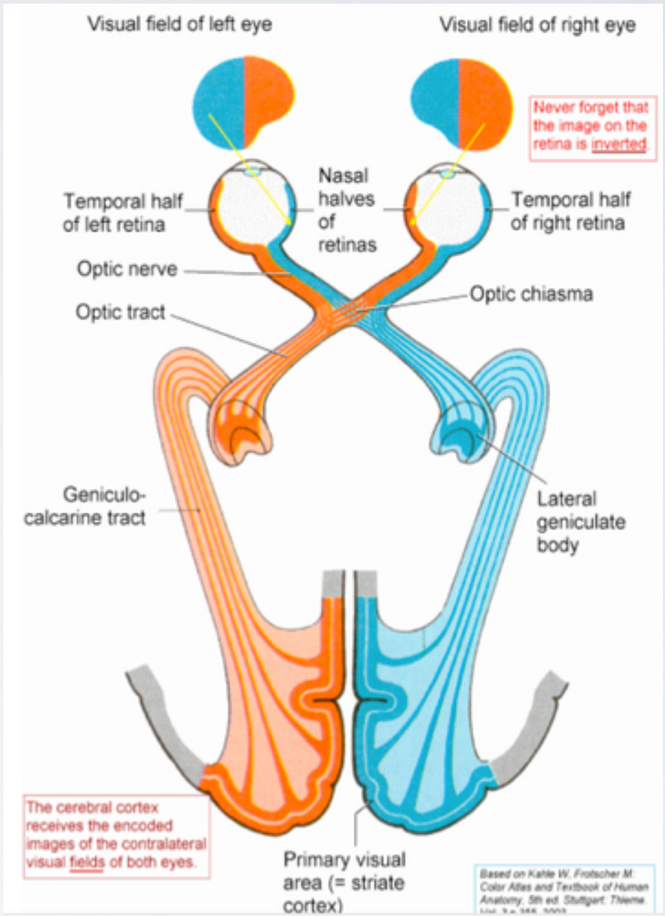
SPLIT-BRAIN-PATIENTER

A TALE OF TWO HALVES

Since the 1960s, researchers have been scrutinizing a handful of patients who underwent a radical kind of brain surgery. The cohort has been a boon to neuroscience — but soon it will be gone.

BY DAVID WOLMAN

260 | NATURE | VOL 483 | 15 MARCH 2012



Kahle & Frotscher (2005) Color Atlas and Textbook of Human Anatomy. Volume 3. 5th ed. Stuttgart, p. 355

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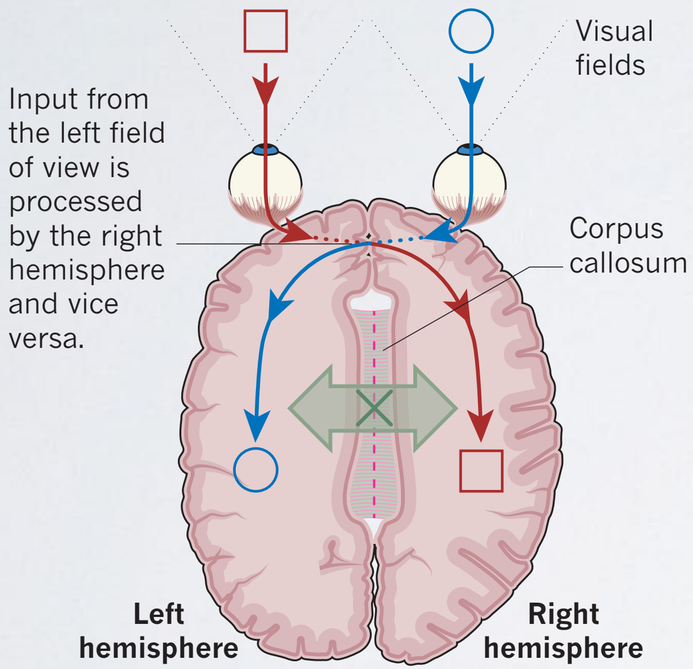
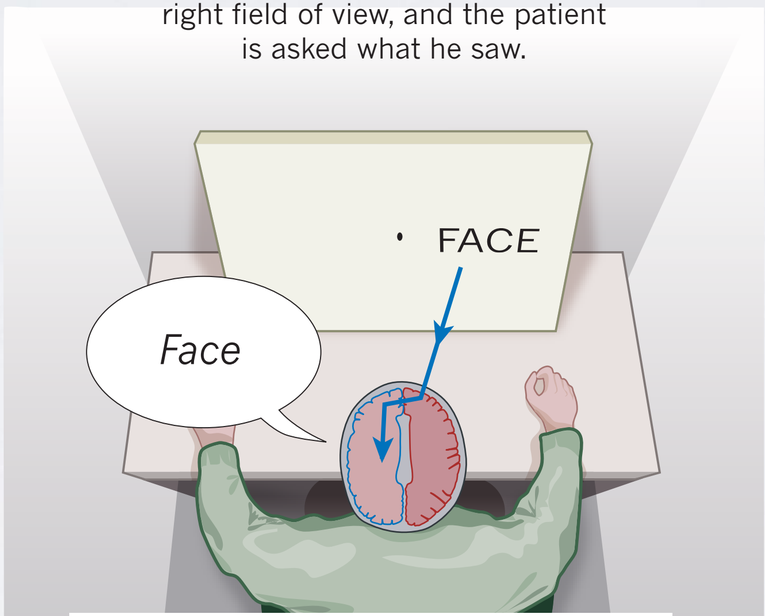
SPLIT-BRAIN-PATIENTER

Split-brain patients have undergone surgery to cut the corpus callosum, the main bundle of neuronal fibres connecting the two sides of the brain.

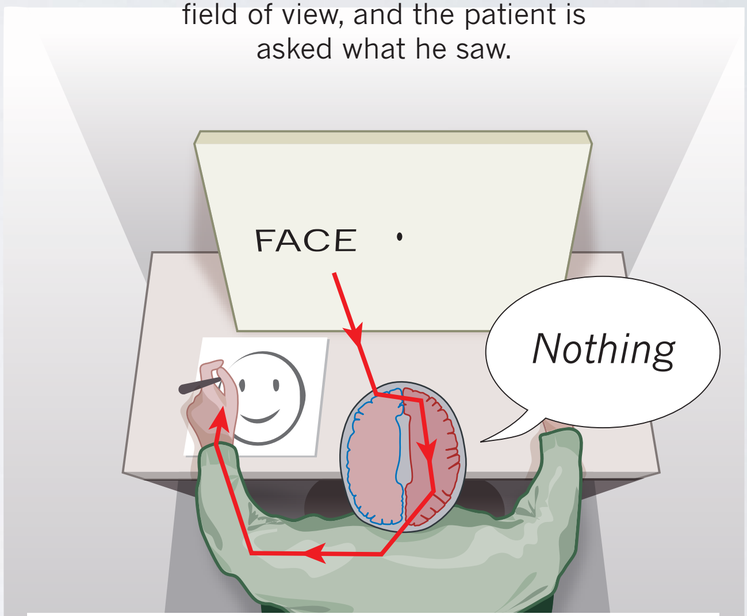


A word is flashed briefly to the right field of view, and the patient is asked what he saw.



Because the left hemisphere is dominant for verbal processing, the patient's answer matches the word.

Now a word is flashed to the left field of view, and the patient is asked what he saw.



The right hemisphere cannot share information with the left, so the patient is unable to say what he saw, but he can draw it.

Wolman (2012) Nature

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SPLIT-BRAIN-PATIENTER

Patient Joe & Prof. Gazzaniga:
https://www.youtube.com/watch?v=ZMLzP1VCANo

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HJERNENS GÅDE #1

Hvor sidder sproget i hjernen?

"Andreas-SVAR":
Visse områder i venstre side af hjernen er vigtigere for mange sproglige funktioner end de tilsvarende områder i højre side af hjernen

"Julefrokost-SVAR":
Sproget sidder primært i venstre side af hjernen

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HJERNENS GÅDE #2

Hvorfor sidder sproget (mest) til venstre?

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HÅNDETHED OG SPROG

Contents lists available at ScienceDirect

Brain & Language

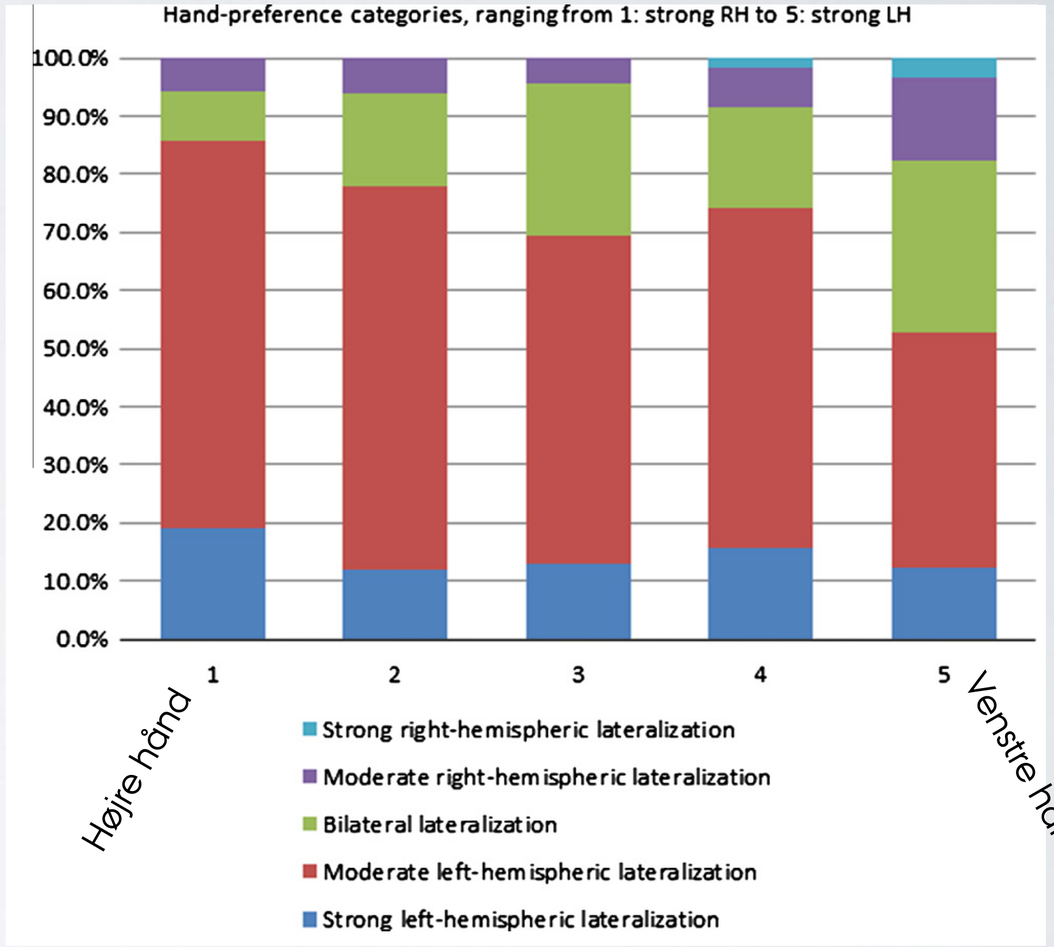
journal homepage: www.elsevier.com/locate/b&l

Short Communication

On the relationship between degree of hand-preference and degree of language lateralization

Metten Somers [a,*], Maartje F. Aukes [a], Roel A. Ophoff [a,b,c], Marco P. Boks [a], Willemien Fleer [a], Kees (C.) L. de Visser [d], René S. Kahn [a], Iris E. Sommer [a]

[a] Brain Center Rudolf Magnus, Department of Psychiatry, University Medical Center Utrecht, Utrecht, The Netherlands
[b] Department of Human Genetics, David Geffen School of Medicine at UCLA, University of California, Los Angeles, CA, USA
[c] Center for Neurobehavioral Genetics, Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, CA, USA
[d] Department of General Practice, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands



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HÅNDETHED OG SPROG

parental handedness		left-handed offspring	
father	mother	sons	daughters
R	R	10.4% (30 268)	8.5% (26 020)
R	L	22.1% (1815)	21.7% (1688)
L	R	18.2% (2308)	15.3% (2100)
L	L	27.0% (215)	21.4% (168)

handedness	monozygotic	dizygotic
R–R	2184	1951
R–L	629	585
L–L	87	53
observed/expected discordant pairs (%)	90.1	99.3

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2009) **364**, 881–894
doi:10.1098/rstb.2008.0235
Published online 5 December 2008

Why are some people left-handed? An evolutionary perspective

V. Llaurens[1,*], M. Raymond[1] and C. Faurie[1,2]

[1]*Institut des Sciences de l'Evolution de Montpellier (UMR CNRS 5554), Université de Montpellier II, C.C. 065, 34095 Montpellier Cedex 5, France*
[2]*Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2TN, UK*

HJERNENS GÅDE #2

Hvorfor sidder sproget (mest) til venstre?

HANDETHED?

Lateraliseringen er mangfoldig og kompliceret

Ingen entydig eller samlet genetisk forklaring

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PAUSE (15 MIN)

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Hvorfor sidder sproget (mest) til venstre?

HANDETHED?

Lateraliseringen er mangfoldig og kompliceret

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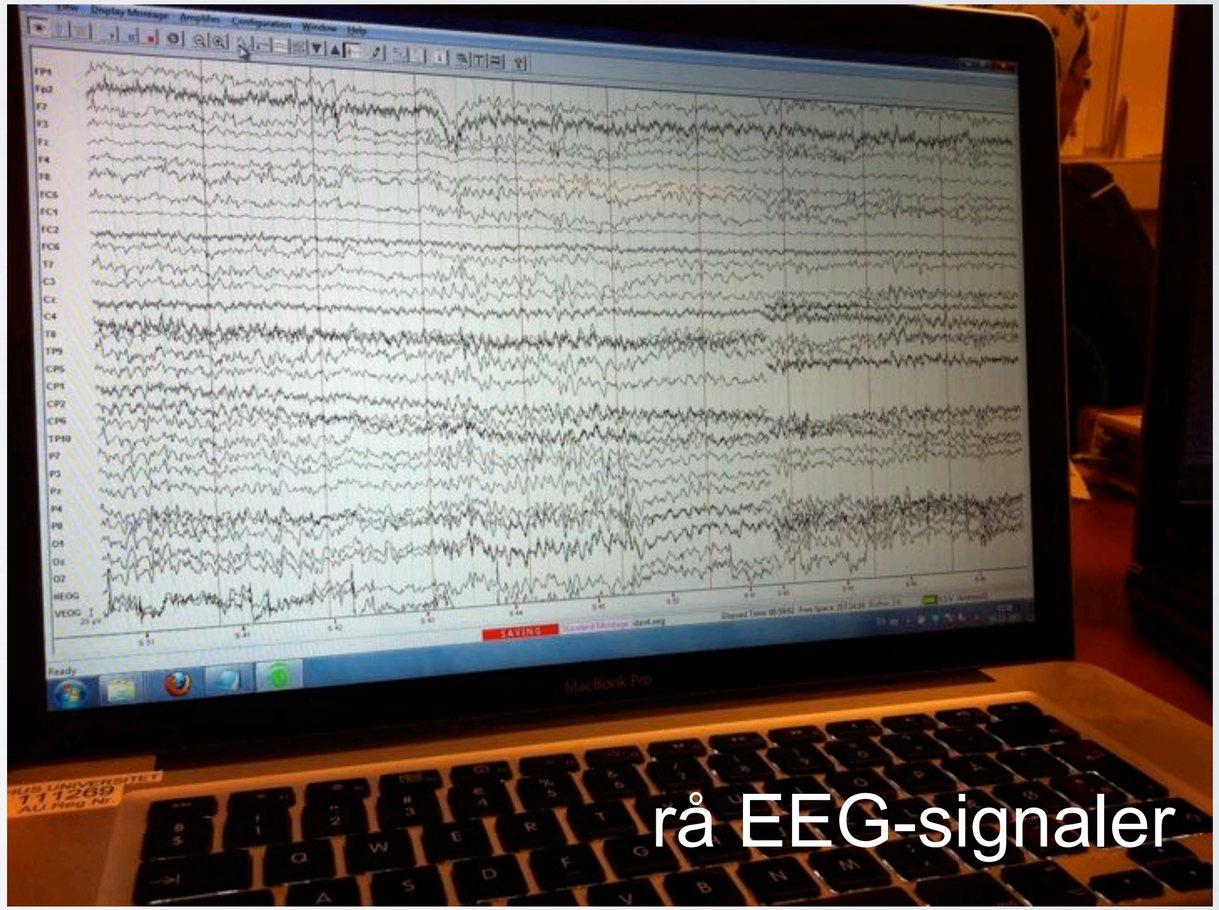
EEG

(ELEKTROENCEFALOGRAFI)



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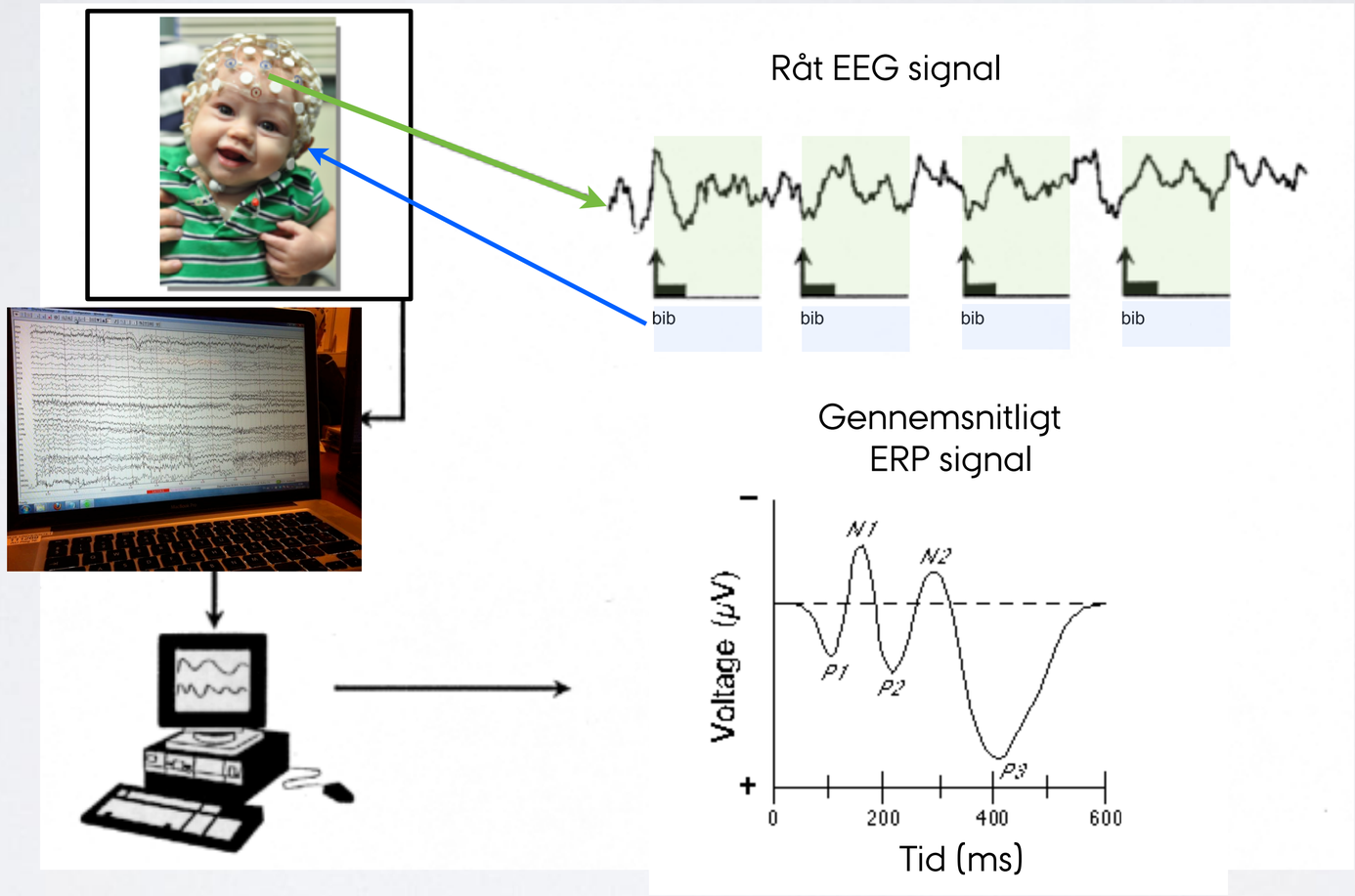
ERP

(EVENT-RELATEREDE POTENTIALER)



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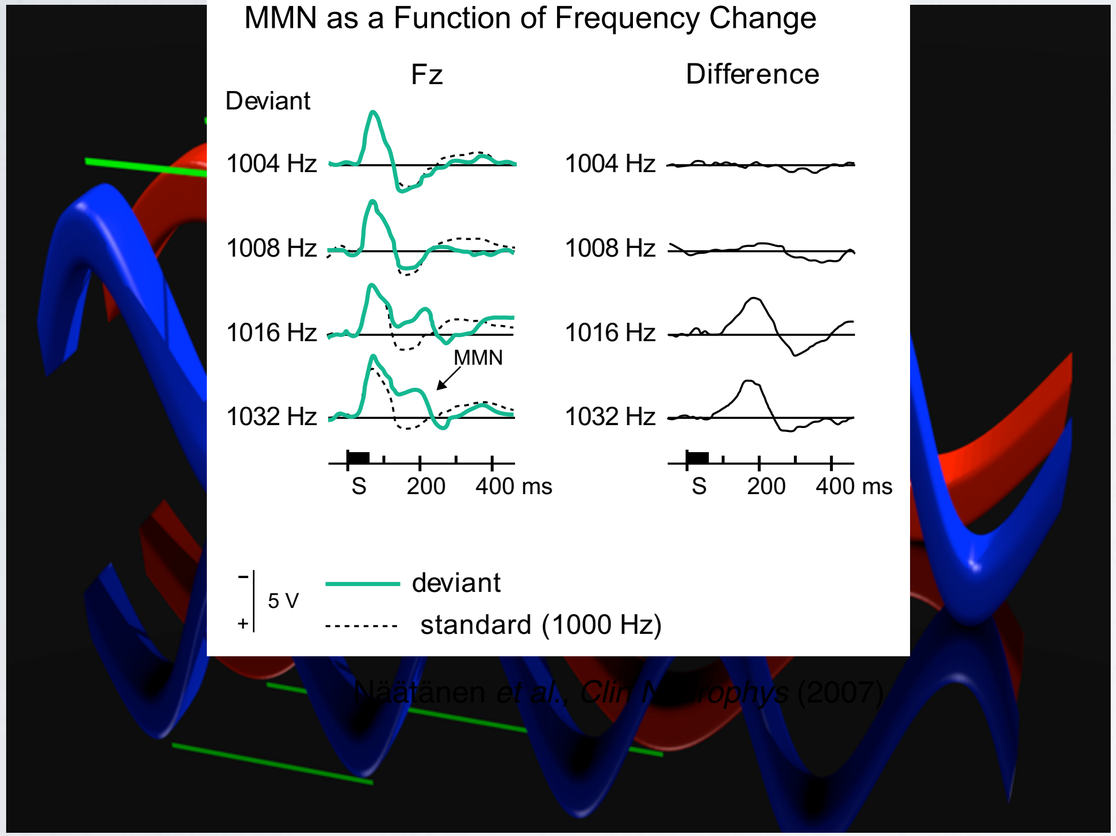
MISMATCH NEGATIVITY (MMN)

[. . . s s s s s s s s s s s s d s s s s d s s s s s d s s s s s d s s s s s s s d s s s . . .]

Näätänen (2007) Clinical Neurophysiology



Näätänen *et al., Clin Neurophys* (2007)

Oddball-paradigme

s = standard-tone

d = afvigende tone

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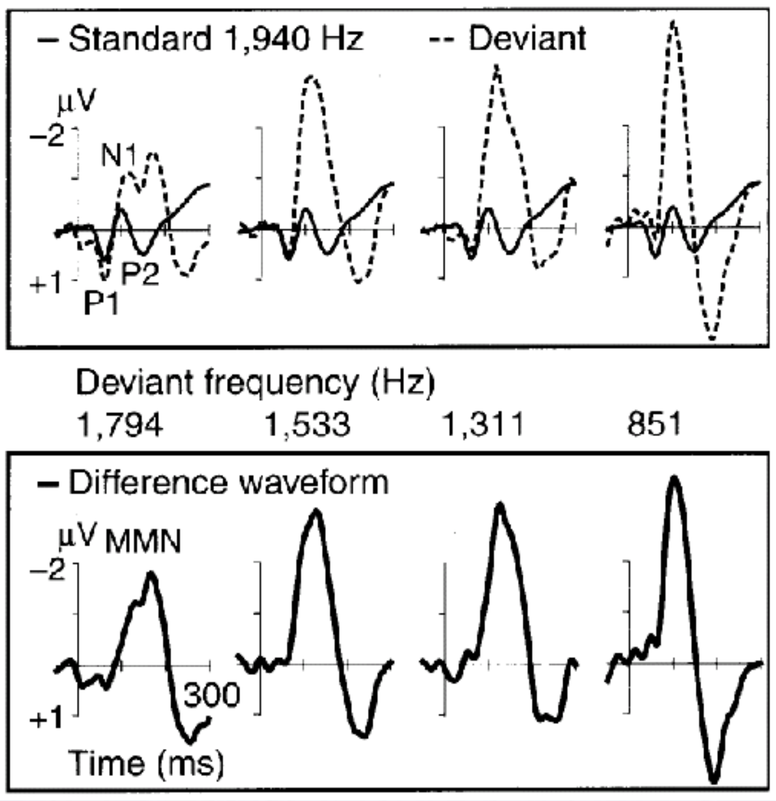
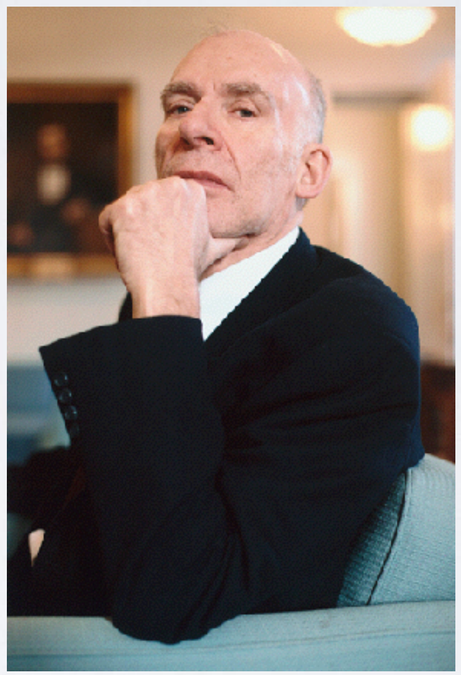
MISMATCH NEGATIVITY (MMN)

[. . . s s s s s s s s s s s s d s s s s d s s s s s d s s s s s d s s s s s s s d s s s . . .]





Jo større akustisk forskel, jo større MMN

Näätänen et al., Nature, 1997

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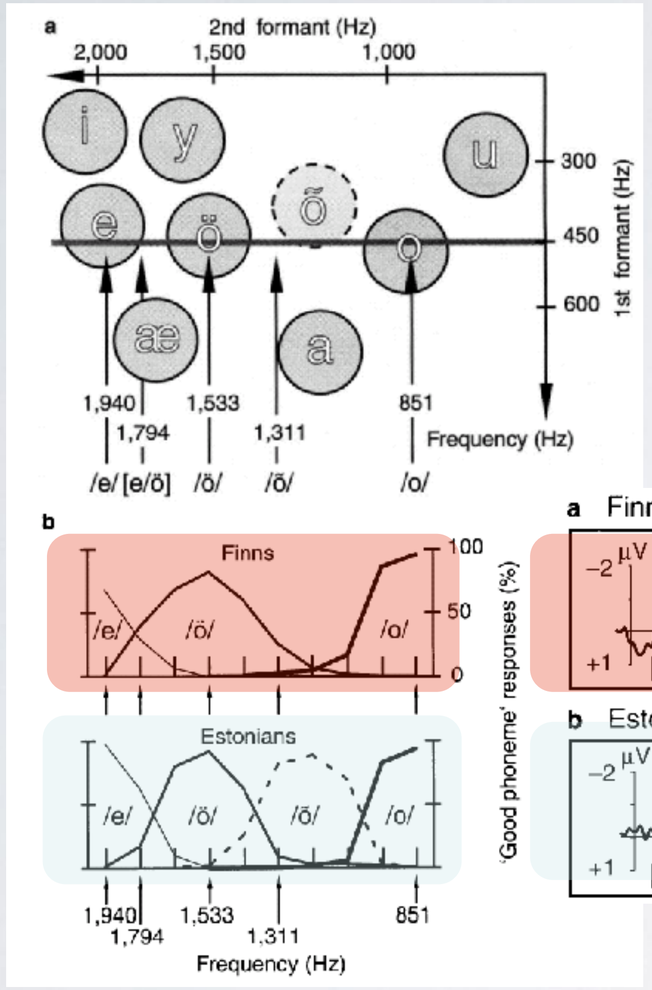
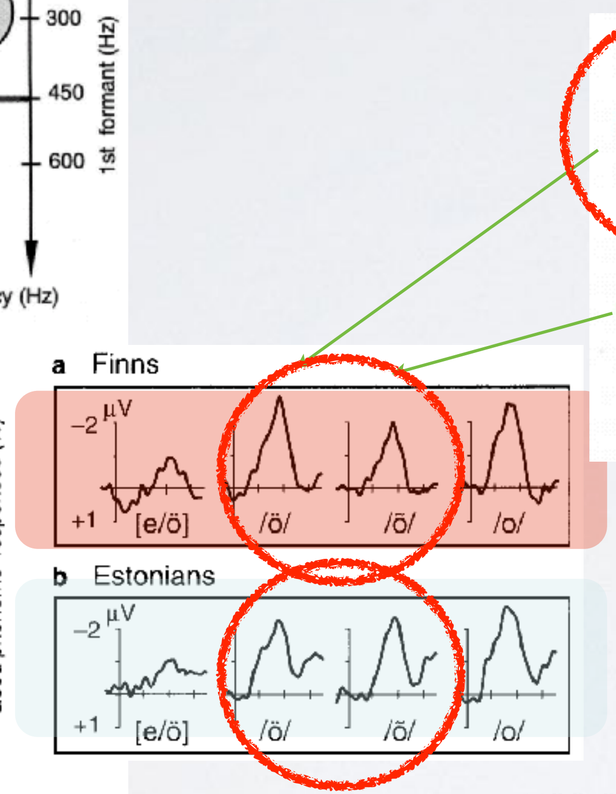
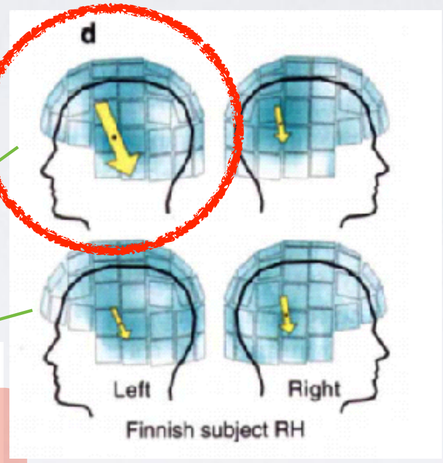
MMN & LÆRING

Forskel på finnere og estere







Kendt fonem
mere venstre-lateraliseret

Näätänen et al., Nature, 1997

Forstørret MMN
- ikke kun pga. akustisk forskel

... noget andet/mere?

> sprog

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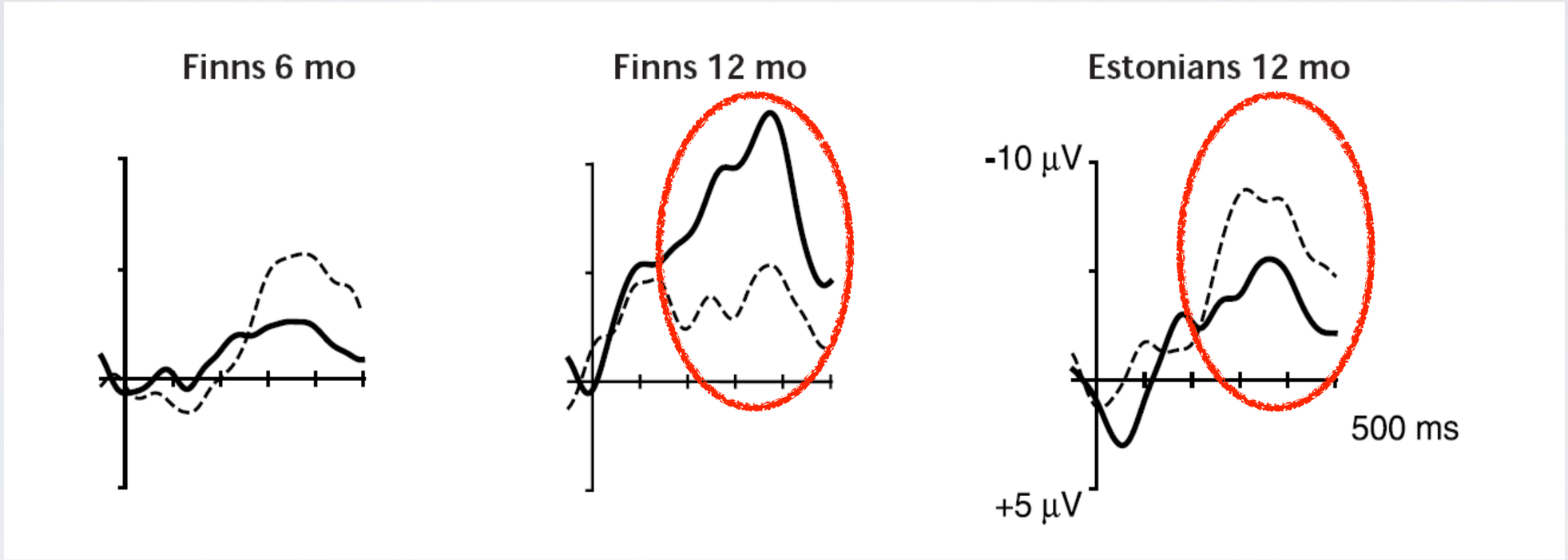
Finske og estiske børn



standard /e/ - deviant /ö/ [finsk & estisk]

standard /e/ - deviant /õ/ [kun estisk]

Cheour, et al. Nature Neurosci, 1998

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SPROG OG MORSE-KODE

NEUROREPORT Vol 14 No 13 15 September 2003

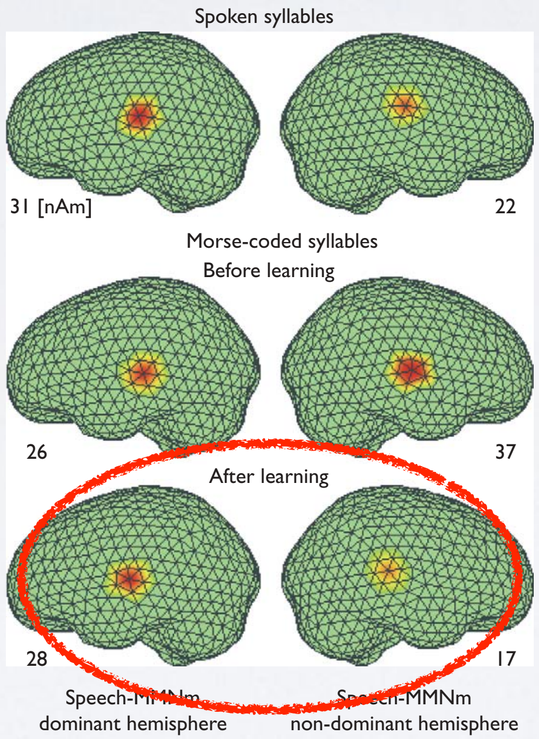
Plastic cortical changes induced by learning to communicate with non-speech sounds

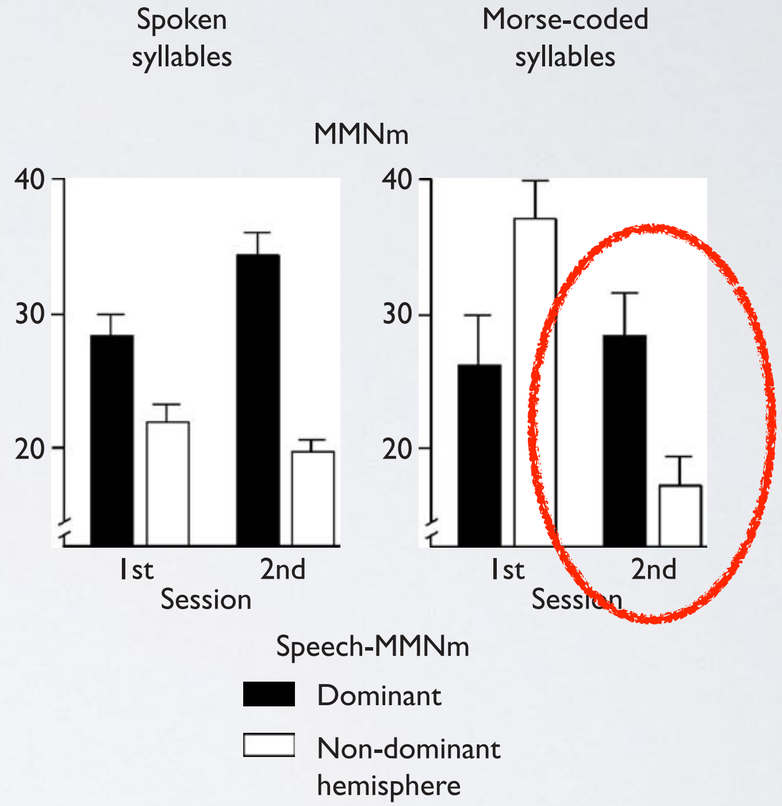
Anu Kujala,[1,2,CA] Minna Huotilainen,[1] Maria Uther,[1,3] Yury Shtyrov,[1,4] Simo Monto,[1,2,5] Risto J. Ilmoniemi[2,5] and Risto Näätänen[1,2,5]

Sprog

Morse før

Morse efter





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MUSIKERE

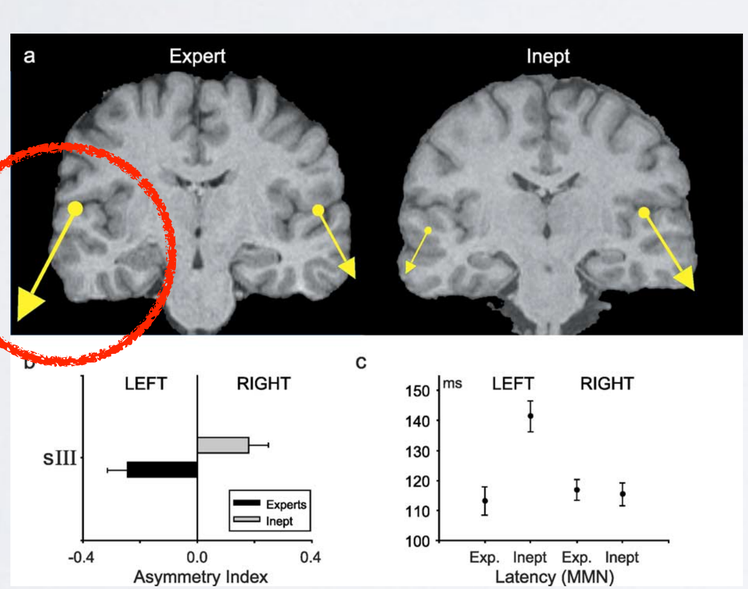
ELSEVIER

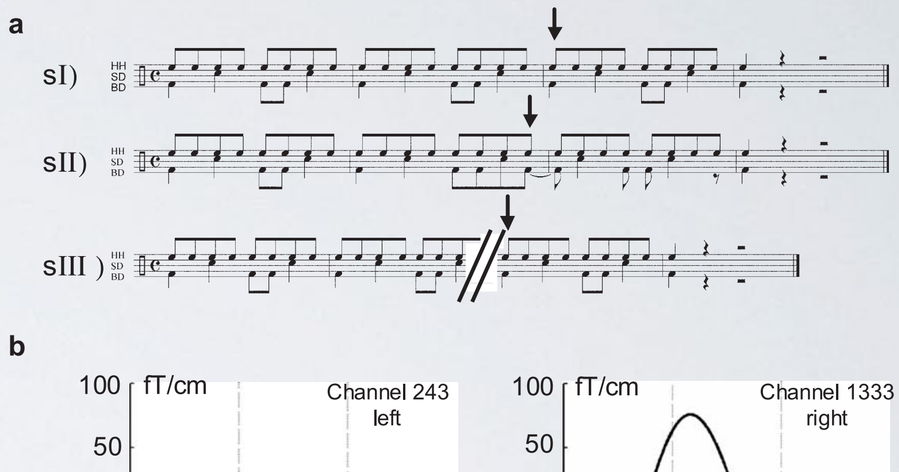
NeuroImage

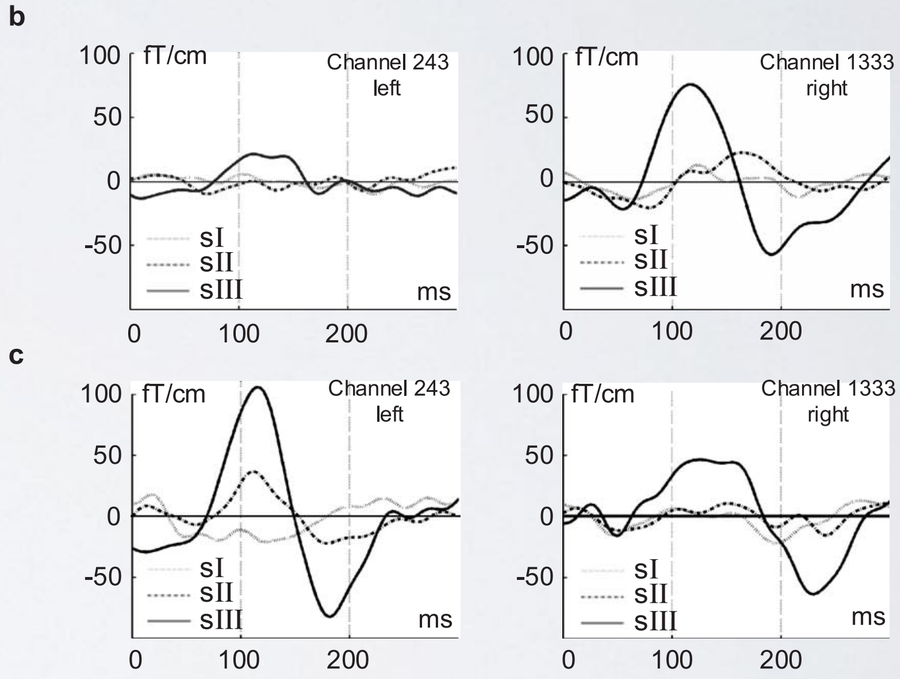
www.elsevier.com/locate/ynimg
NeuroImage 24 (2005) 560–564

To musicians, the message is in the meter
Pre-attentive neuronal responses to incongruent rhythm are left-lateralized in musicians

Peter Vuust,[a,b,*] Karen Johanne Pallesen,[a,c,d] Christopher Bailey,[a,c] Titia L. van Zuijen,[e] Albert Gjedde,[a] Andreas Roepstorff,[a,f] and Leif Østergaard[a]







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MMN "IN REAL LIFE"

Sprogofficerer lærer et fremmedsprog i løbet af 20 mdr

8 + 8 + 8 timer

600-700 nye ord
om uge

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Department of Linguistics,
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MMN "IN REAL LIFE"

Arabic (n=8) and Dari (n=12) learners

Arabic stimuli	Dari stimuli
[hæ]	[ʃa]
[ħæ]	[ʒa]

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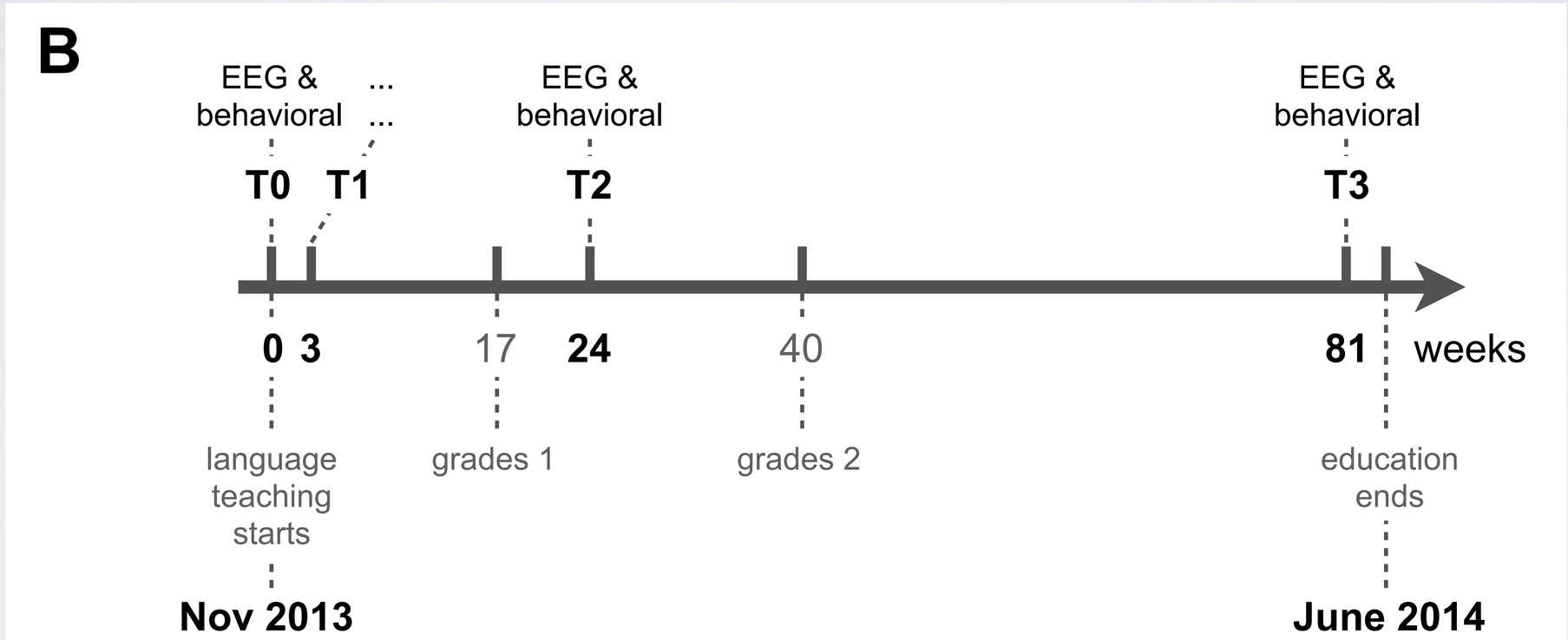

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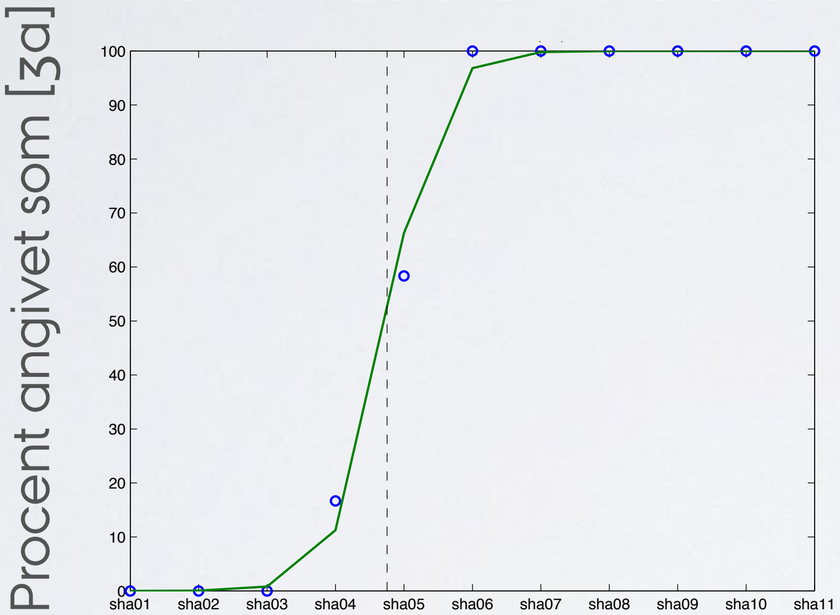
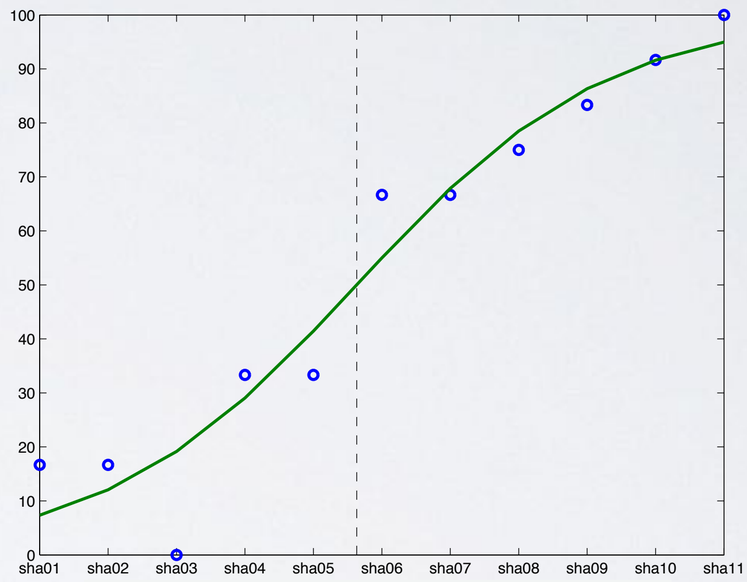
KATEGORISK PERCEPTION

Dari-modersmålstaler



Dari-learner ved start



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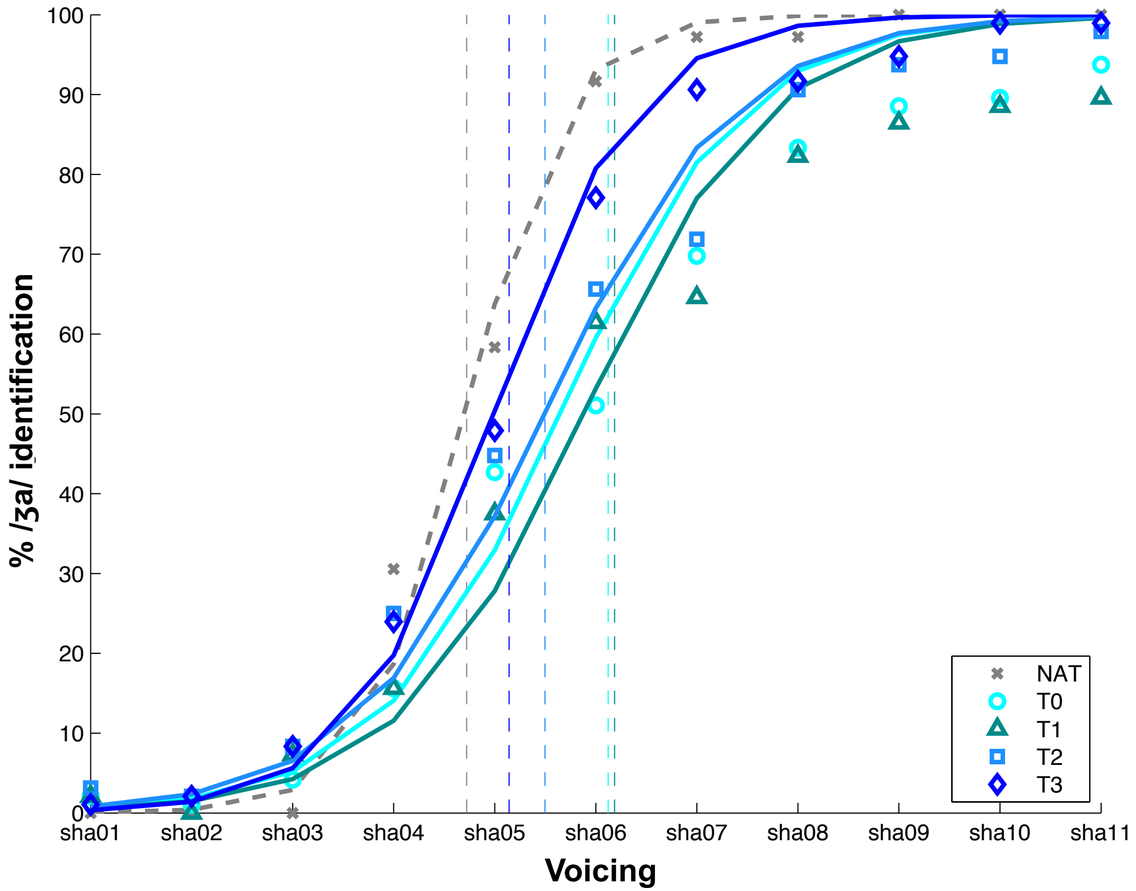
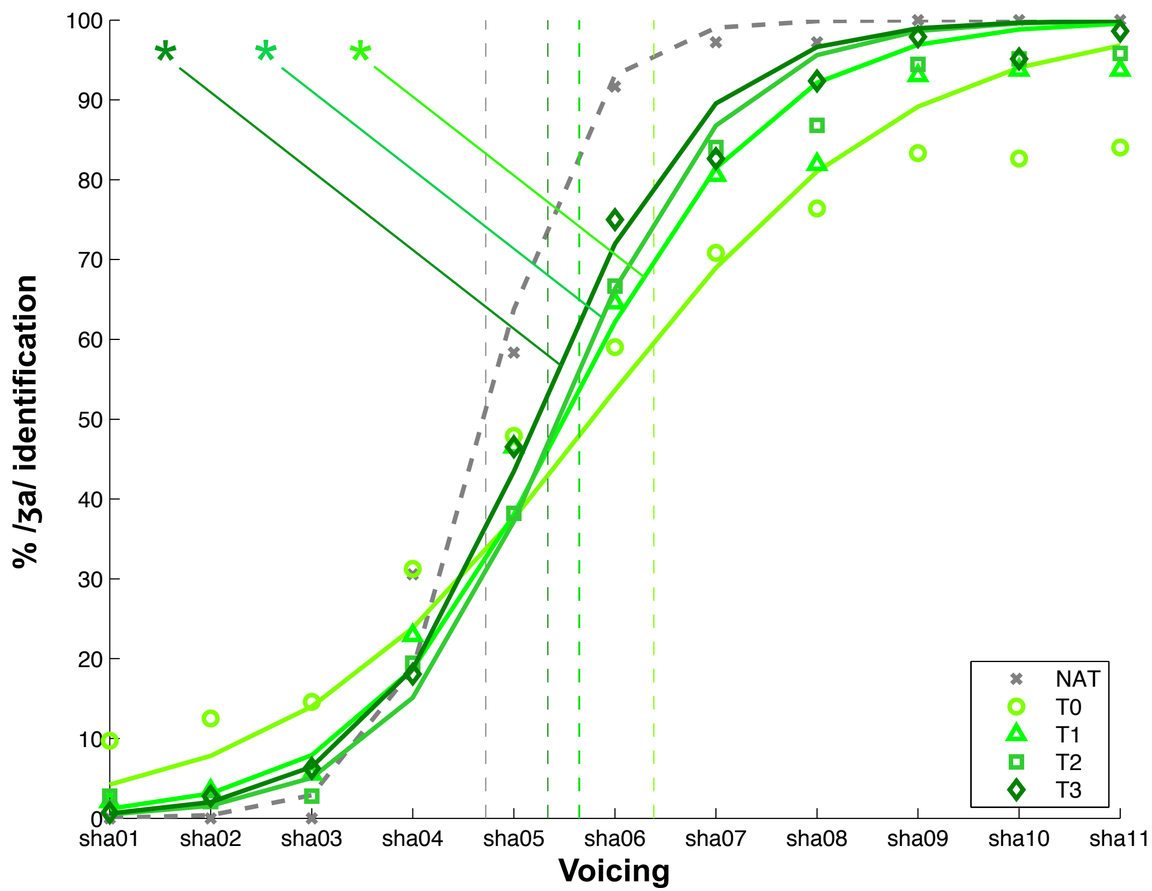
ii



iv



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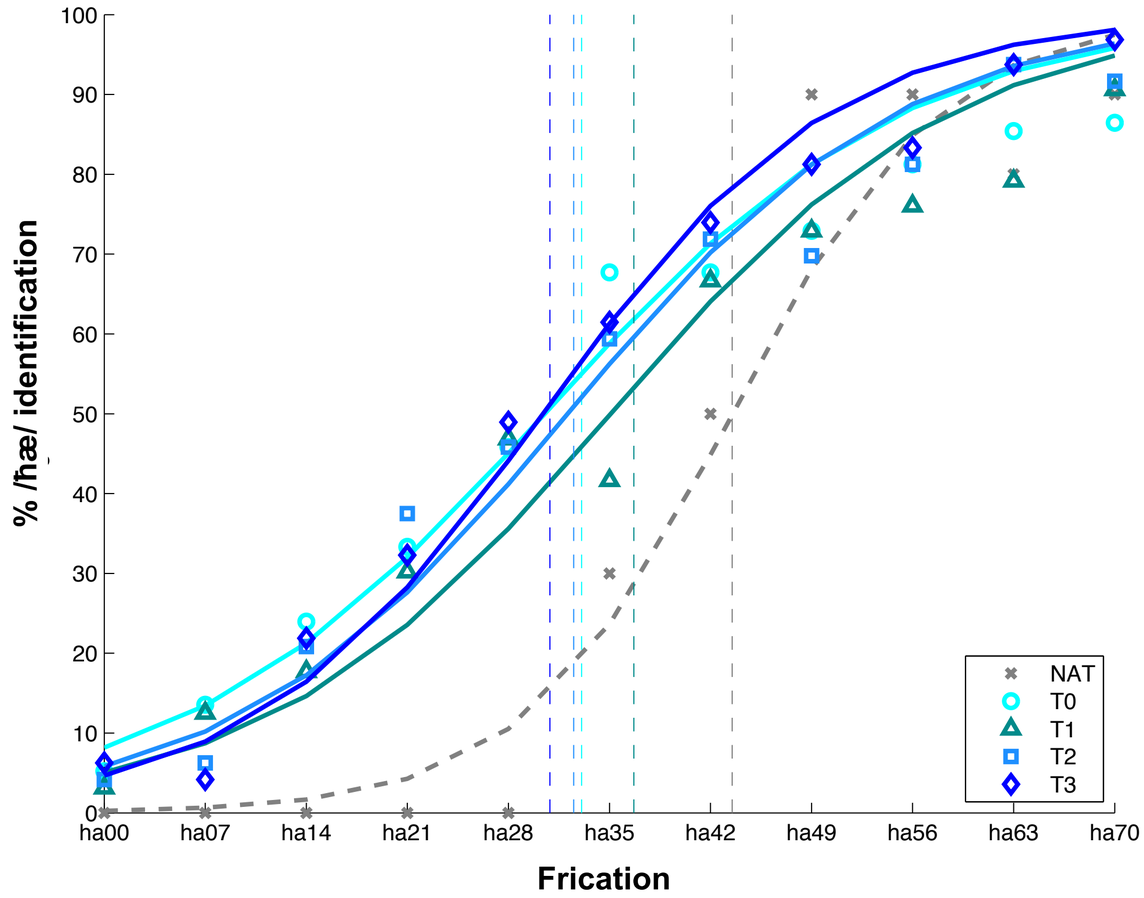
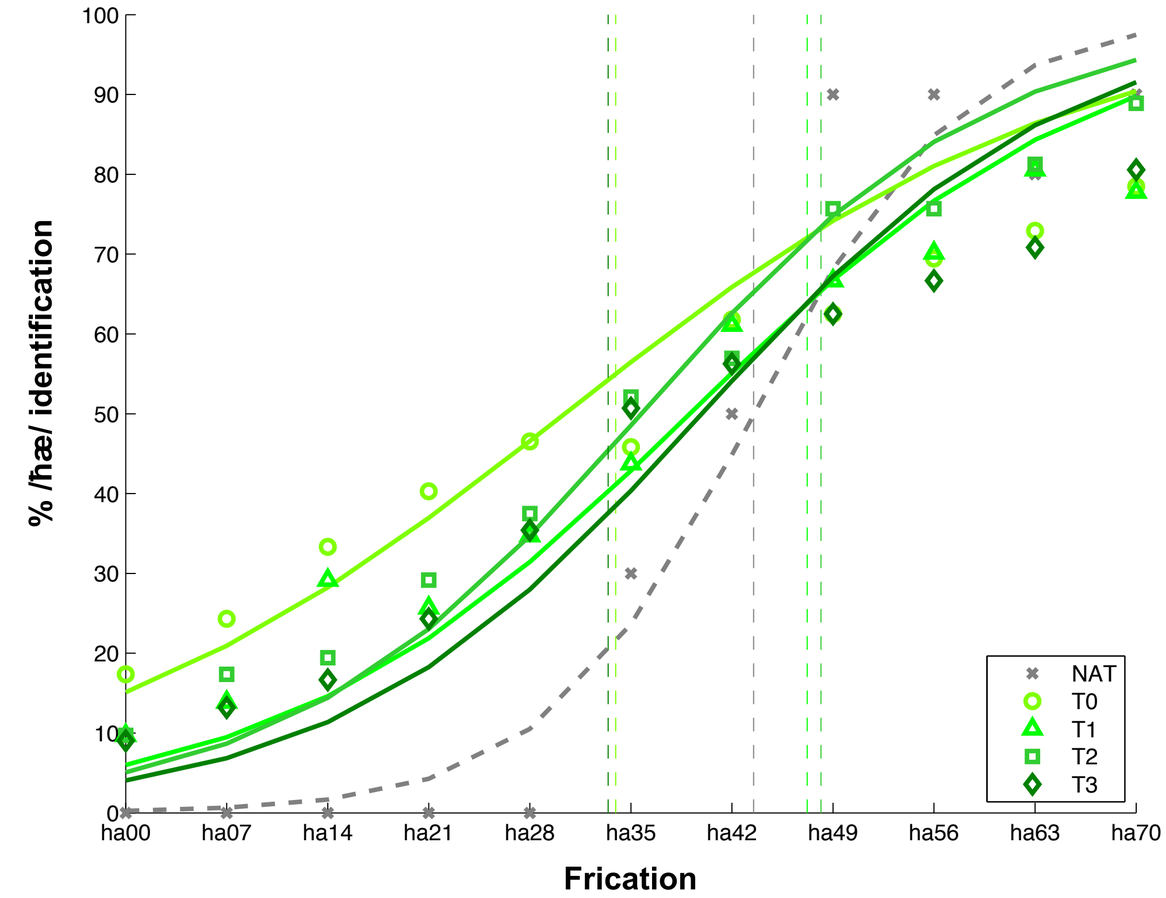
Arabic learners (n = 8)

i



Dari learners (n = 12)

iii



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Arabisk stimuli:
[ħæ] forskels-ERP'er

Dari-stimuli:
[ʒa] forskels-ERP'er

global field power (GFP) | *p-value* threshold = 0.001 | > duration threshold (= 0.05)

Arabisk-learnere

MMR (adjusted)
165-213 ms

MMR
104-152 ms

T0
T1
T2
T3

Dari-learnere

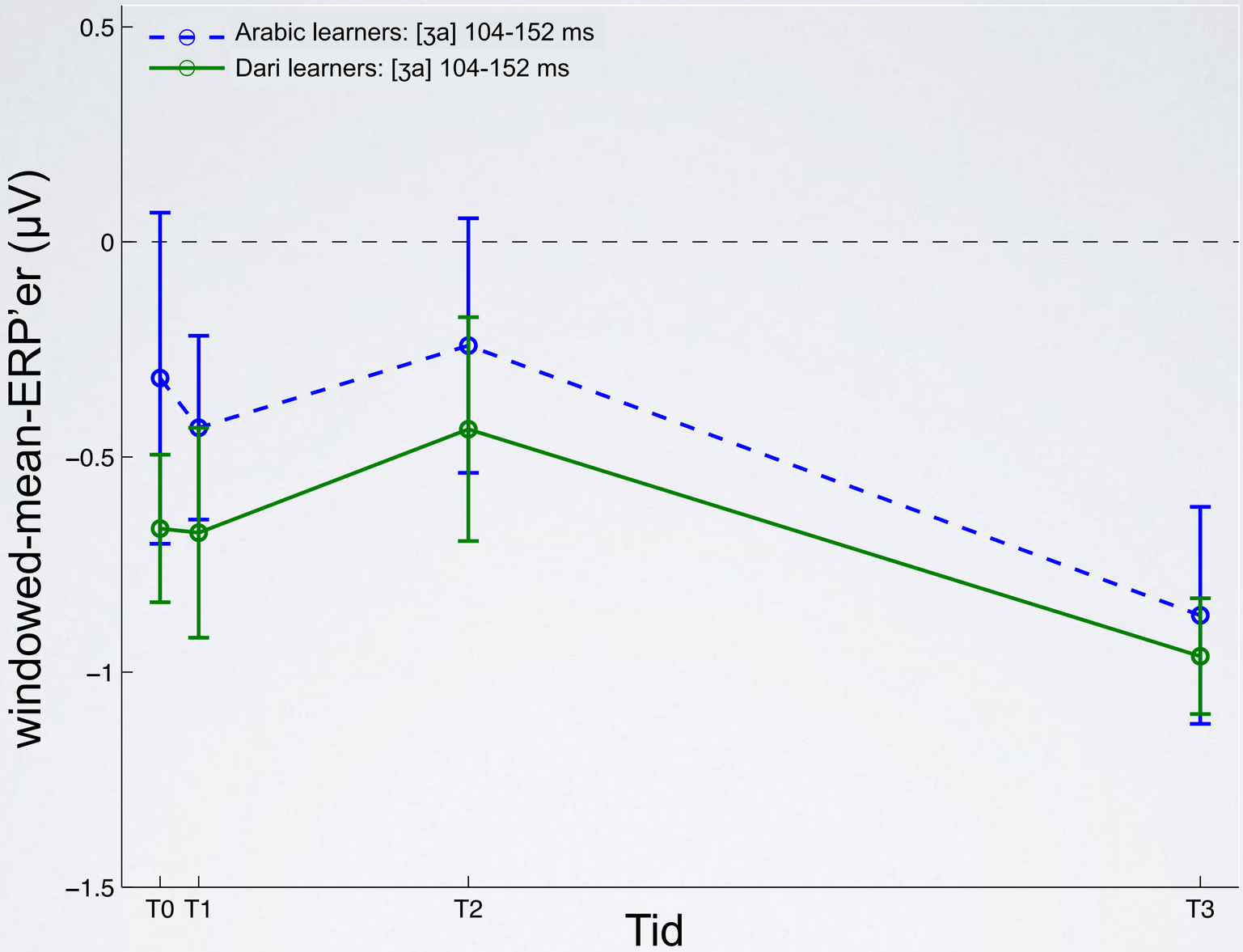
MMR (adjusted)
165-213 ms

MMR
104-152 ms

T0
T1
T2
T3

Dari-stimuli ([ʒa])

Windowed-mean-ERP'er



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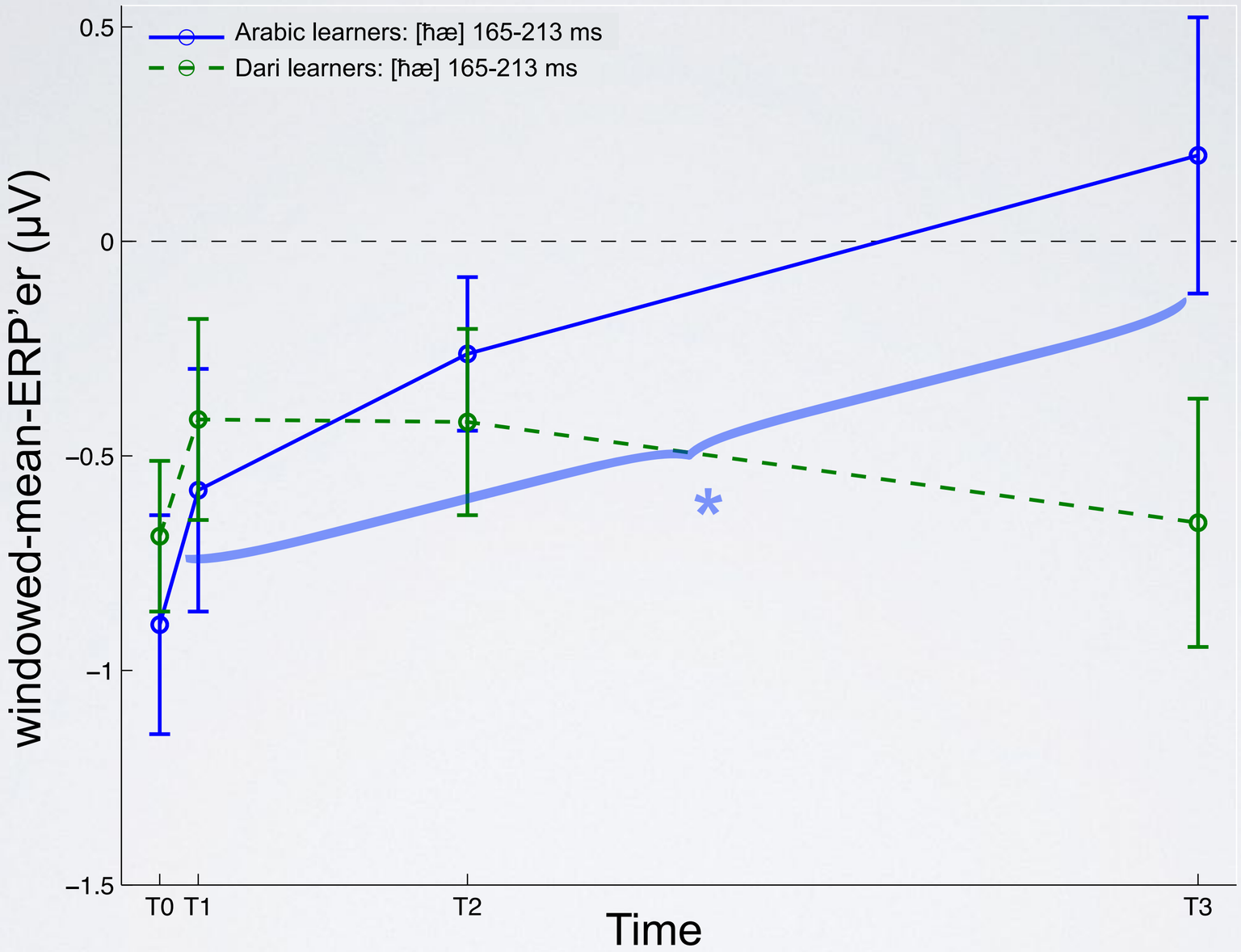
Arabisk stimuli ([ħæ])

Windowed-mean-ERP'er



?

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HJERNENS GÅDE #2

Hvorfor sidder sproget (mest) til venstre?

Trends in Cognitive Sciences May 2012, Vol. 16, No. 5

Review

Cell PRESS

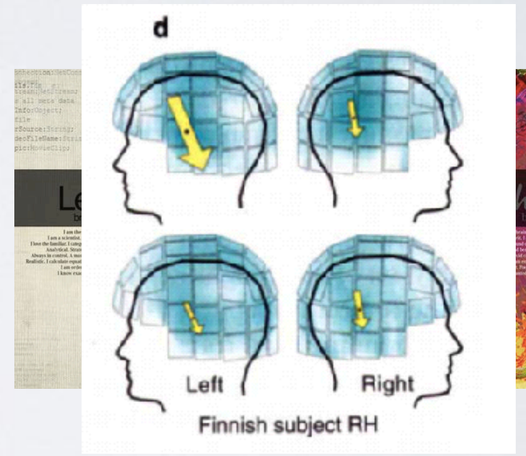
Cortical asymmetries in speech perception: what's wrong, what's right and what's left?

Carolyn McGettigan and Sophie K. Scott

Institute of Cognitive Neuroscience, University College London, 17 Queen Square, London WC1N 3AR, UK

HÅNDETHED?
Lateraliseringen er mangfoldig og kompliceret
Ingen entydig eller samlet genetisk forklaring

Læring og ekspertise spiller sandsynligvis en rolle



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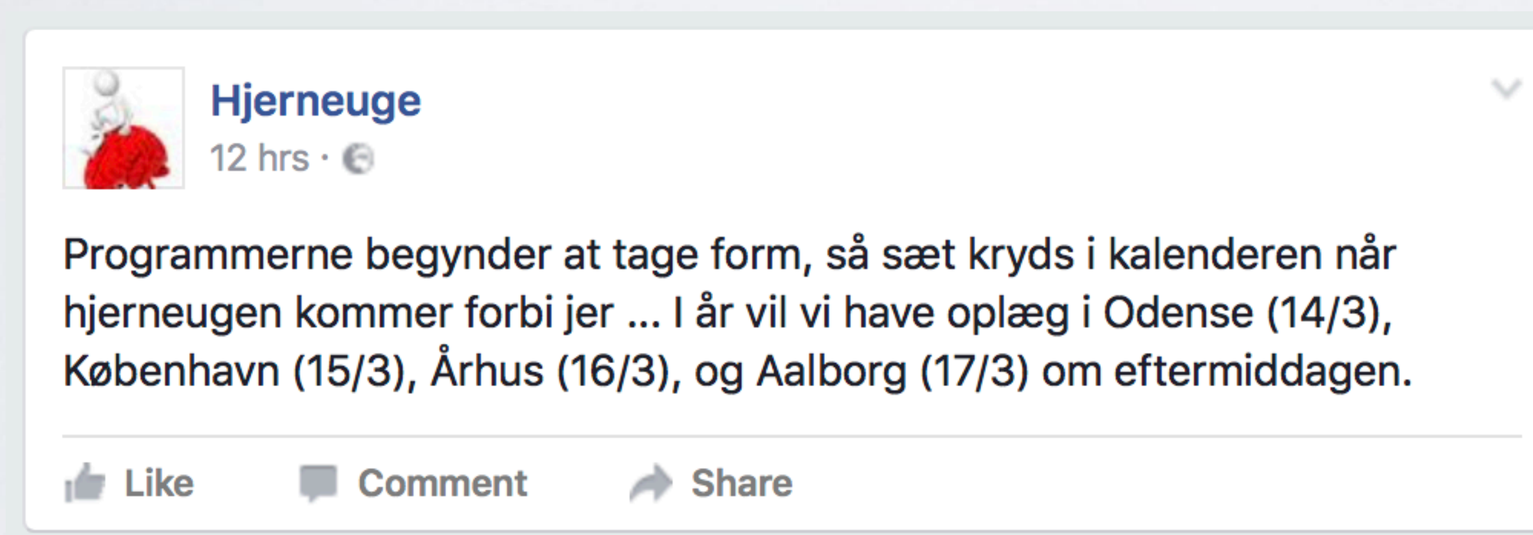
TAK FOR OPMÆRKSOMHEDEN

NB! Husk Hjerneugen i uge 11:

https://www.facebook.com/hjerneuge/



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SPØRGSMÅL?

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TAK FOR I AFTEN

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