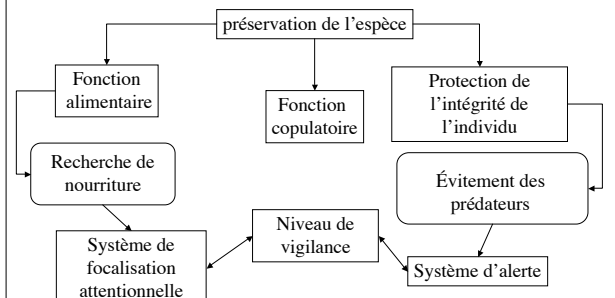


Neuropsychologie de l'attention

Une introduction à l'étude des déficits attentionnels chez l'adulte et l'enfant



Justification biologique de la notion de fonction attentionnelle

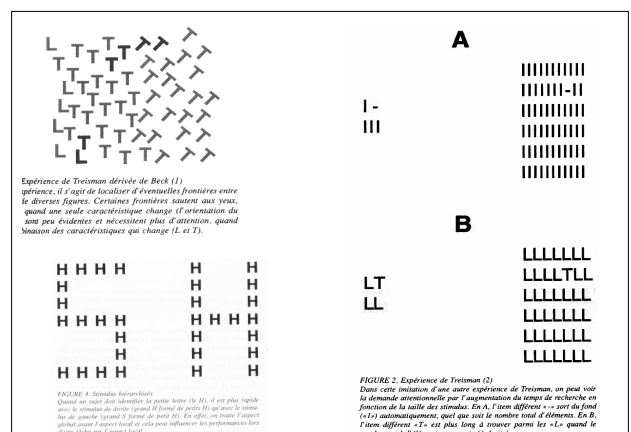
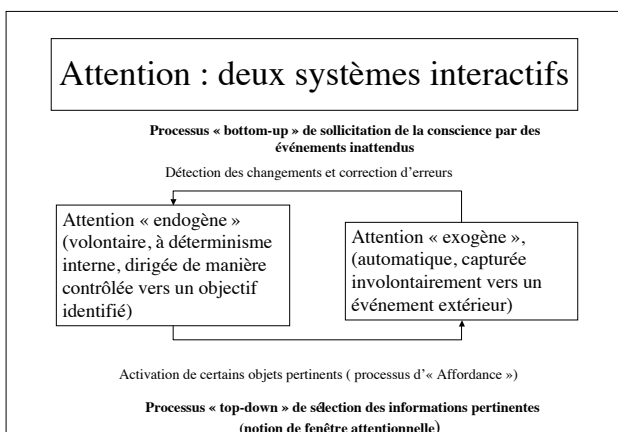
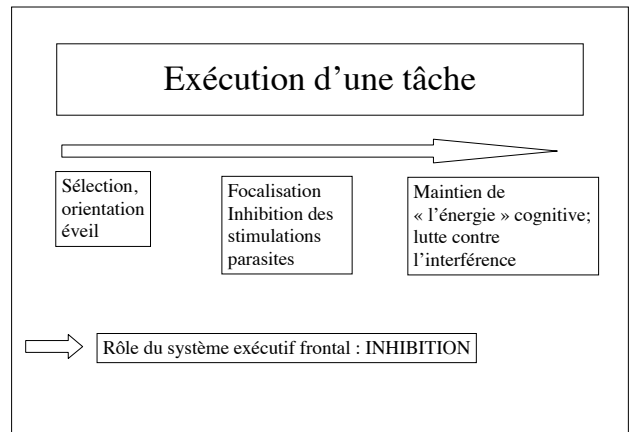
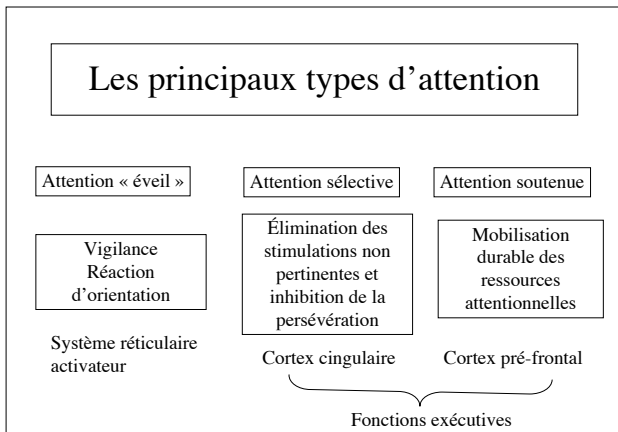


Attention : définitions

"the taking possession by the mind in clear and vivid form of one out of what seem several simultaneous objects or trains of thought." (Posner, 1994)

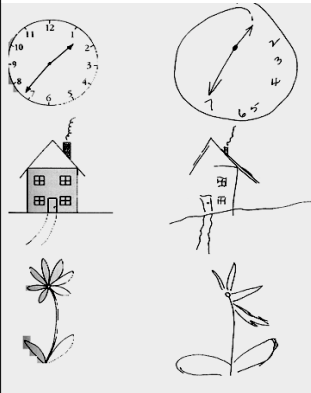
« preferential allocation of limited processing resources to events that have become behaviorally relevant » (Mesulam, 1999)

« L'attention permet à l'individu de diriger ses actions sur des objets spécifiques en des endroits sélectionnés, et de maintenir certaines informations ou certains objets à un haut niveau de traitement, dans la mémoire de travail, ou encore dans la conscience » (E. Siéroff, 2002)



Le syndrome d'héminégligence (ou négligence spatiale unilatérale):

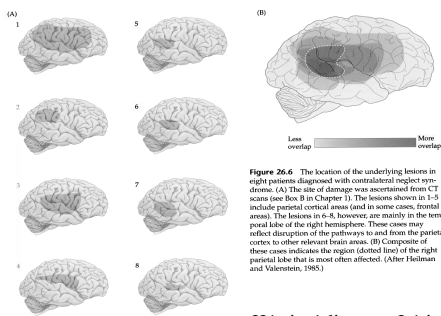
le cas particulier de l'attention spatiale



Non prise en compte des éléments de l'hémi-espace gauche

- Copie
- dessins de mémoire
- équivalents dans les autres modalités

Notion d'extinction bilatérale



Hémi-négligence : Lésion spécifique de la jonction temporo-pariétale droite

Interprétations du syndrome d'héminégligence

- Traduirait la dominance de l'hémisphère droit pour les fonctions attentionnelles
- Mais sans doute plus complexe qu'un simple trouble de l'attention
- Présence de troubles associés : spatiaux, émotionnels, voire quasi-psychiatriques (asosognosie, asomatognosie)
- Possibilités de perception inconsciente dans l'hémichamp négligé.

Hémi-négligence : comportements productifs (par excès) et non seulement déficitaires

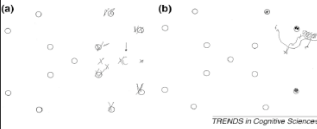

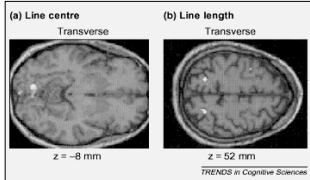


Fig. 2 Perseveration in circle cancellation by right-brain-damaged patients with left spatial neglect. This graphic perseveration, which occurs in the ipsilesional right side of space, includes the addition of lines, for example: (a) one target circle, which is successively crossed out, and more complex behaviour, such as unsolicited spontaneous drawings, for example: (b) a hen. This productive, rather than defective, manifestation of neglect illustrates its composite nature. (Reproduced from Ref. [67] with permission of Elsevier Science)

Hémi-négligence : La moitié gauche de chaque figure est omise (et non la figure de gauche)



Tâche de bissection de ligne



(a) Line centre Transverse
z = -8 mm

(b) Line length Transverse
z = 52 mm

La ligne est-elle coupée par le trait au milieu? Les parties droite et gauche de la ligne sont-elles égales?

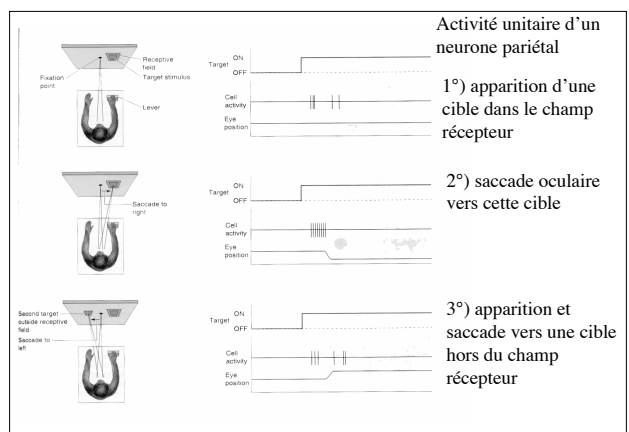
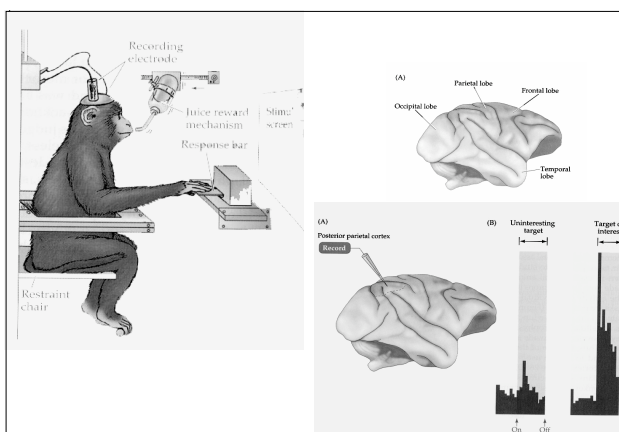
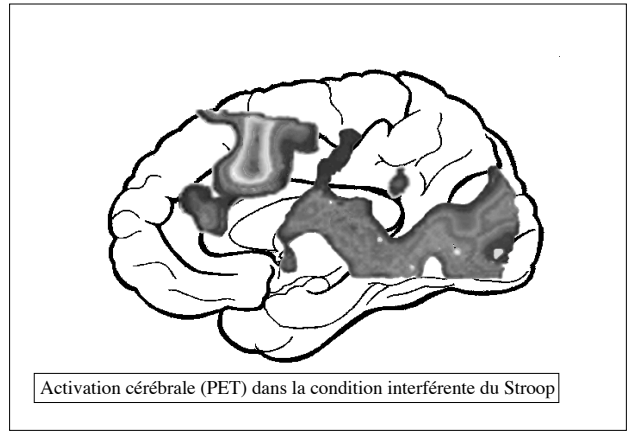
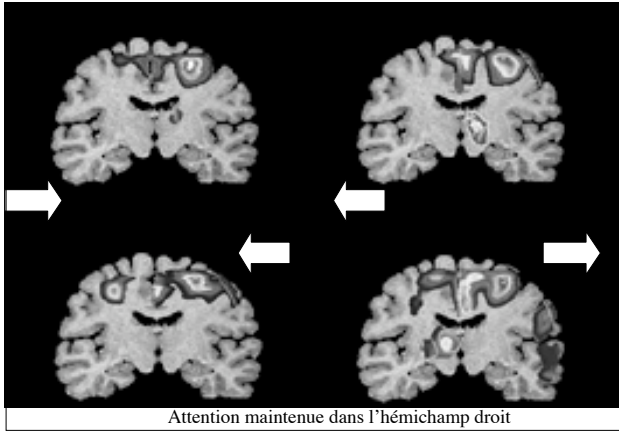
Torrefazione (tower-faction) (Roasting)

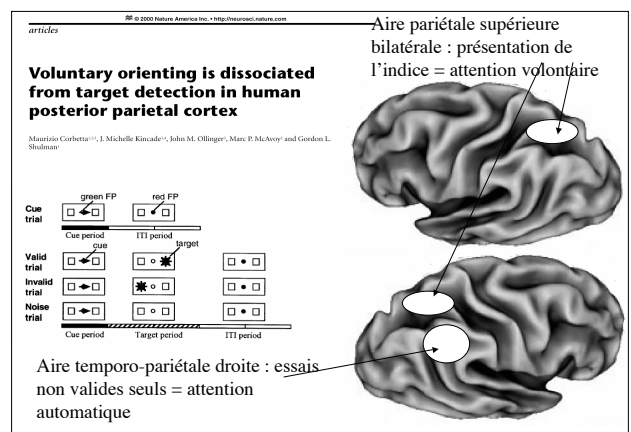
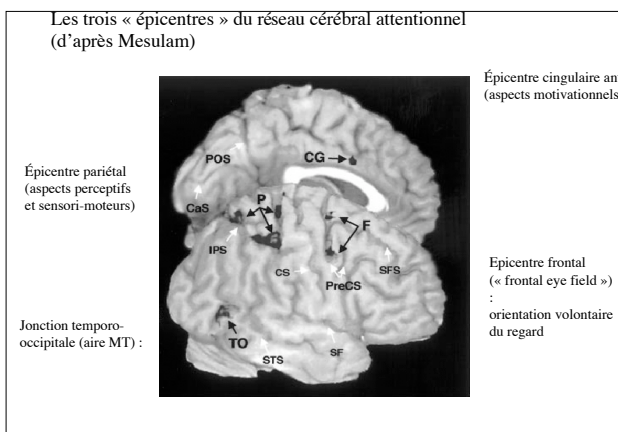
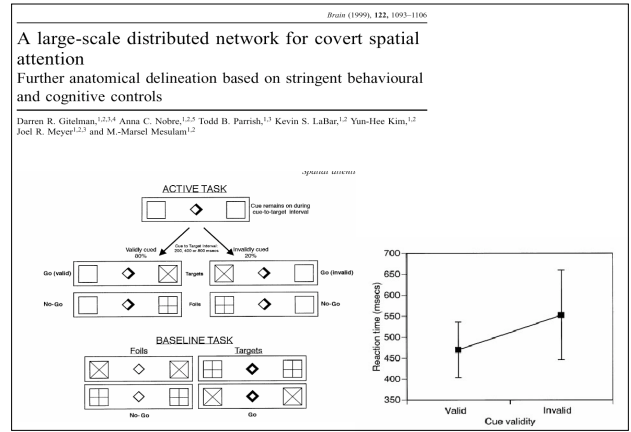
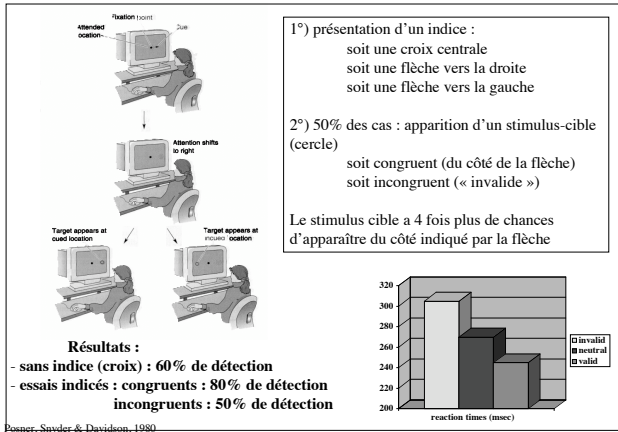
Association 'where coffee is roasted'

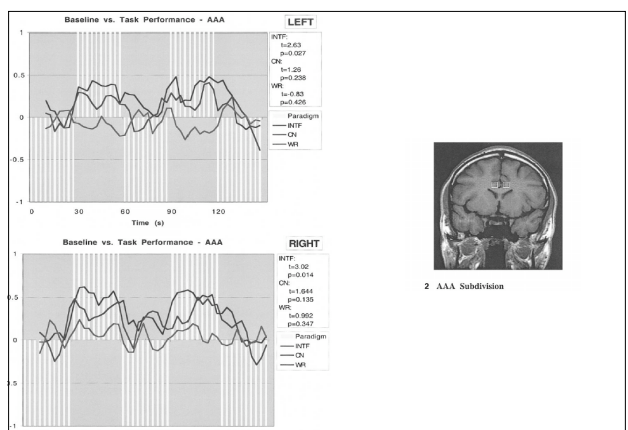
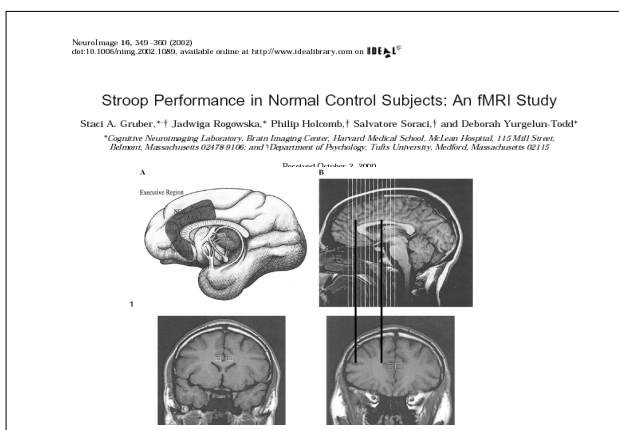
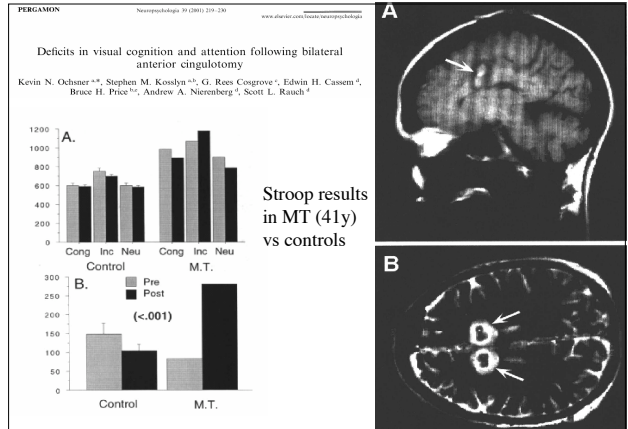
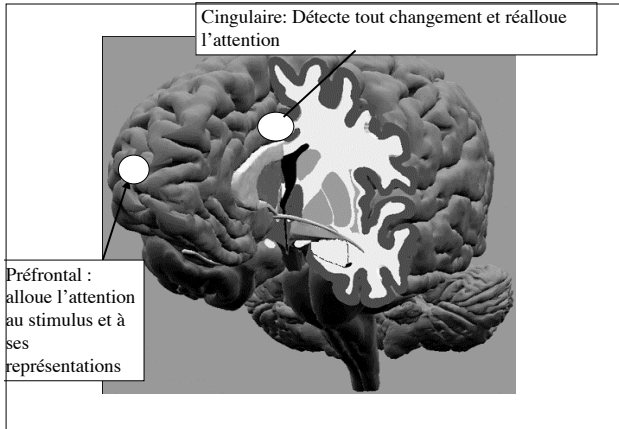
Reading 'nazione' (nation)

Fig. 7 Left-neglect dyslexia and the processing of neglected information. In reading aloud, right-brain-damaged patients with left hemineglect sometimes commit paralexical errors, omitting or substituting the initial letter(s) of both words and non-words. However, they might be able to produce appropriate associations to these words. In one study, right-brain-damaged patient E.S. was presented with words composed of two embedded words, one to the right and one to the left of the division point⁶⁸. The meaning of the whole stimulus word differed from that of the embedded words and could not be inferred from either of them. This example shows a paralexical error with the substitution of the initial letters in the reading task, and the production of a correct response in the association task.

Apport de l'imagerie cérébrale







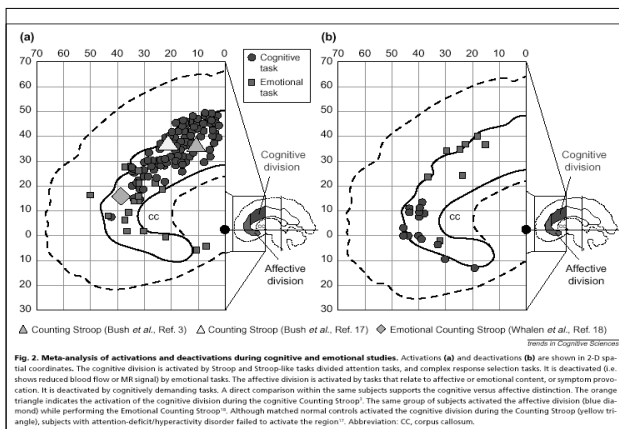
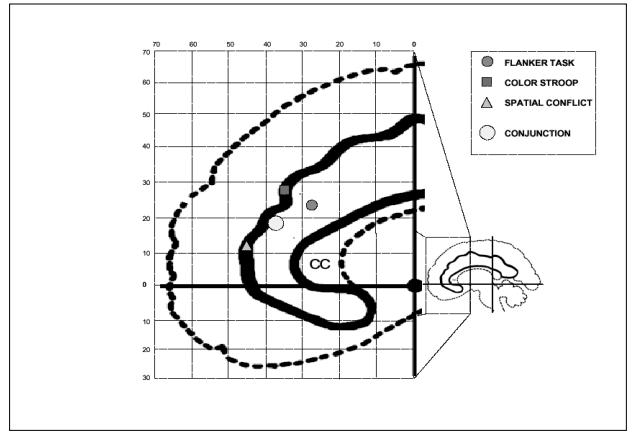
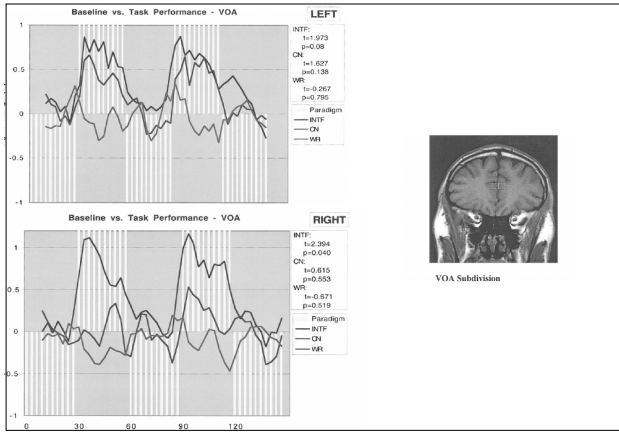
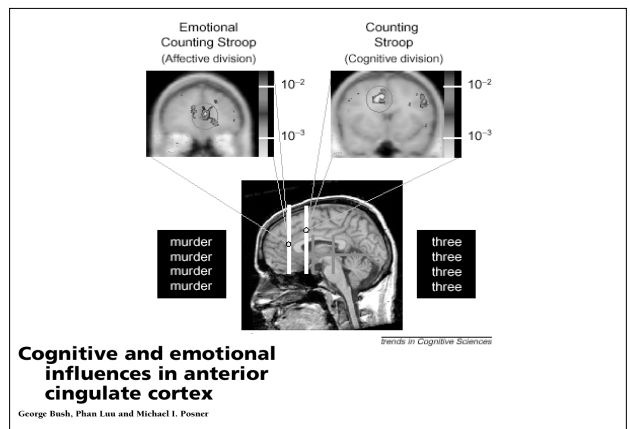
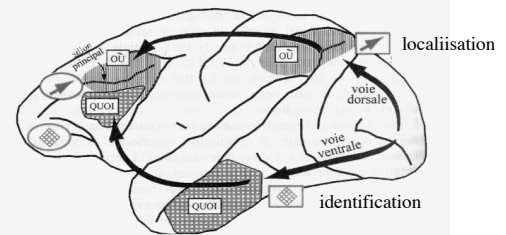


Fig. 2. Meta-analysis of activations and deactivations during cognitive and emotional studies. Activations (a) and deactivations (b) are shown in 2-D spatial coordinates. The cognitive division is activated by Stroop and Stroop-like tasks divided attention tasks, and complex response selection tasks. It is deactivated (i.e. shows reduced blood flow or MR signal) by emotional tasks. The affective division is activated by tasks that relate to affective or emotional content, or symptom provocation. It is deactivated by cognitively demanding tasks. A direct comparison within the same subjects supports the cognitive versus affective distinction. The orange triangle indicates the activation of the cognitive division during the cognitive Counting Stroop. The same group of subjects activated the affective division (blue diamond) while performing the Emotional Counting Stroop. Although matched normal controls activated the cognitive division during the Counting Stroop (yellow triangle), subjects with attention-deficit/hyperactivity disorder failed to activate the region. Abbreviation: CC, corpus callosum.



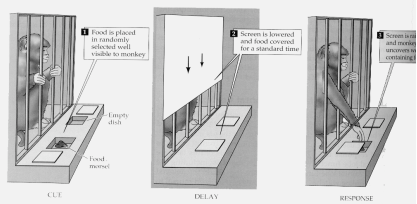
La mémoire de travail

Une fonction complexe des lobes frontaux à l'interface entre mémoire et attention

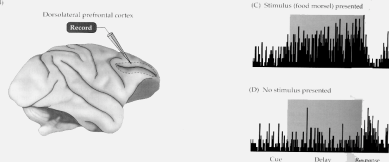


Les deux voies de la vision : le « où » et le « quoi » et leur connexions avec le cortex préfrontal latéral

Tâche d'alternance retardée : modèle de « mémoire de travail »



Enregistrement unitaire d'un neurone du sillon principal



182 PRINCIPLES OF FRONTAL LOBE FUNCTION

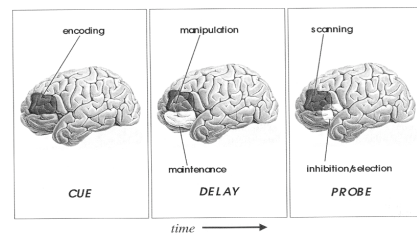
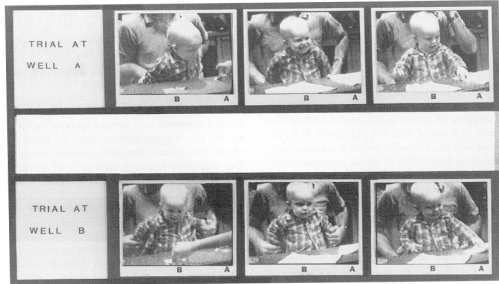


Figure 11-5. Schematic illustration that summarizes the findings from the functional magnetic resonance imaging (fMRI) studies presented in this chapter. Each panel illustrates dorsal and ventral prefrontal cortex areas that were active during different stages of delayed-response tasks.



Tâche d'alternance retardée (« A-non-B ») échouée par un bébé de 8 mois : ne réussit pas avant l'âge de 21 mois

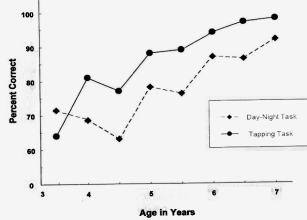
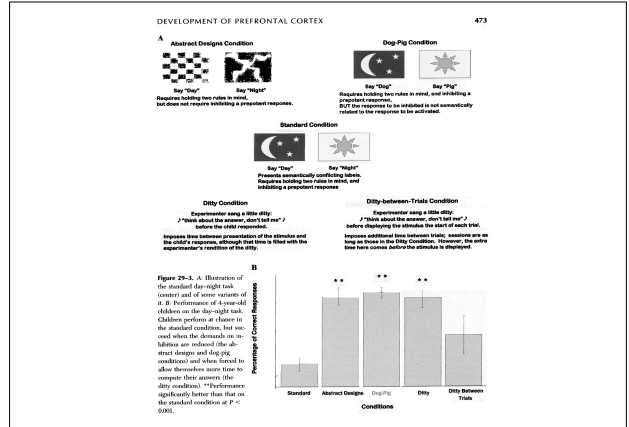


Figure 29-4. Illustration of the developmental progression of children on the day-night and tapping tasks (Source: reprinted with permission from Diamond & Taylor, 1996, Fig. 5)

Graspable objects grab attention when the potential for action is recognized

Todd C. Handy^{1,2}, Scott T. Grafford^{1,3}, Neha M. Shroff^{1,2}, Sarah Koenig^{1,2} and Michael S. Gazzaniga^{1,2}

¹Center for Cognitive Neuroscience, Department of Psychological and Brain Sciences, and ²Stanford Health Imaging Center, ³Johns Hopkins Bayview Medical Center, Baltimore, MD, USA
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Published online 17 March 2005; doi:10.1038/nrn1303

a Trial sequence

2,500 ms
650–850 ms
100 ms
400 ms
2,500 ms

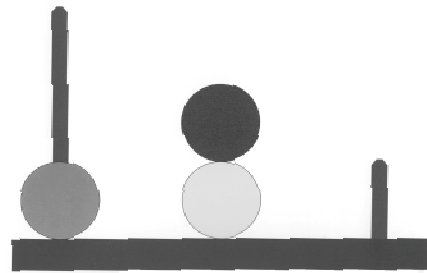
b Trial types

Tool-right
Tool-left
No tool
Both tool

« L'affordance motrice » d'un objet (outil ou non) est un puissant facteur de biais attentionnel à un niveau pré-attentif

Quelques exemples de tests sensibles à la dysfonction frontale

MODELE - ITEM D'EXEMPLE



Nous allons jouer avec ces trois boules. Montre moi la boule rouge, bleue, jaune. Tu peux déplacer ces boules d'un arbre en arbre comme ceci.

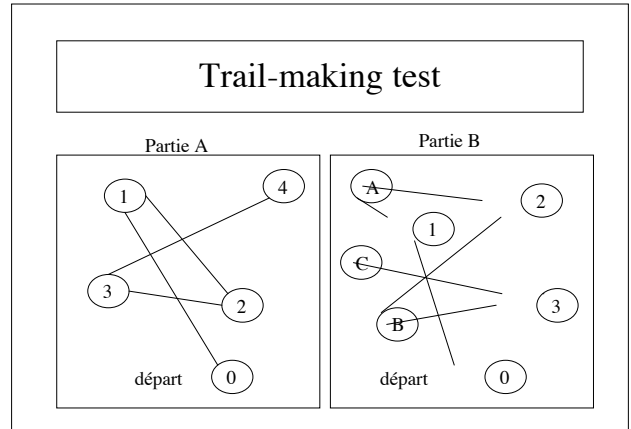
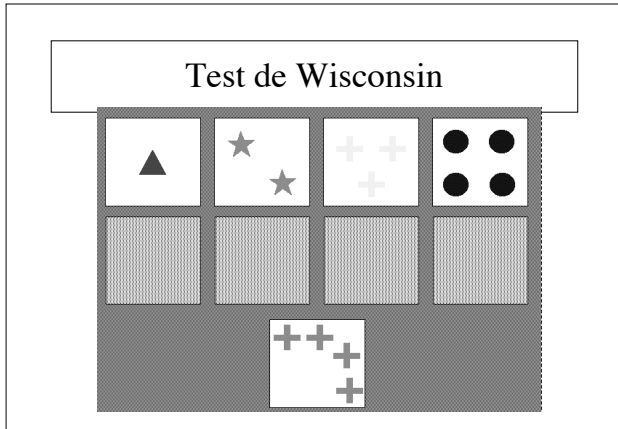
The diagram shows three spheres (dark, light, and dark) on a horizontal base. An inset shows the same setup as the 'MODELE' diagram.

POSITION DE DEPART POUR TOUS LES ESSAIS

Il était une fois 3 écureuils qui vivaient dans 3 arbres au-dessus de l'eau. Montre moi l'écureuil rouge, bleu, jaune. Imagine que ces boules sont les écureuils. Ils aiment sauter d'arbre en arbre comme ceci. Maintenant à toi, fais la même chose

The illustration shows three stylized trees of different heights above a dark pond. Three squirrels are positioned on the trees: one on the tallest tree, one on the shortest tree, and one on the medium tree.

5 - 6 ans



Elements of attention: summary of tests	
Attentional Element	Tests/Measures
Encode	Digit Span (WAIS-R or WAIS-III; WISC-R or WISC-III) Arithmetic (WAIS-R or WAIS-III; WISC-R or WISC-III)
Focus/Execute	Digit Symbol Substitution (WAIS-R or WAIS-III) Coding (WISC-R or WISC-III) Letter Cancellation Test Stroop Color-Word Interference Test Trail Making Test, Parts A and B
Shift	Wisconsin Card Sorting Test Reciprocal Motor Programs Test
Sustain, Stabilize	Visual CPT : Accuracy, Reaction Time Auditory CPT : Accuracy, Reaction Time

Études neuropsychologiques d'adultes hyperactifs

Authors	Groups	Significant differences found on:	No significant differences found on:
Mungas (1983)	ADHD & psychiatric patients vs. amputee & head-injured patients	ADHD less effective at list learning recall on Rey Auditory Verbal Learning Test	*****
Egstein <i>et al.</i> (1998)	ADHD Patients vs. Normals	ADHD more commission and commission errors on visual CPT	*****
Holdstock <i>et al.</i> (1995)	ADHD Patients vs. Normals	ADHD slower psychomotor speed, slower CPT reaction times, & lower recall on list learning (CVLT)	No difference on WCST variables
Sedman <i>et al.</i> (1998)	ADHD Patients vs. Normals	ADHD less effective on attention to auditory details, list learning, and CPT reaction time and omission errors	No difference on WCST variables, Stroop variables, visual memory (WMS-R), visual motor coordination, visual vigilance, and freedom from distractibility on the WAIS-R
Ganster <i>et al.</i> (1998)	ADHD Patients vs. Normals	ADHD less effective on CPT, slower speed in completing Trails A, tend to do less well on recall of consonant trigrams after interference	No difference on WCST variables, Trails B performance, the Progressive Planning Test, general intelligence, and memory variables from the WMS-R
Lovjoy <i>et al.</i> (1999)	ADHD Patients vs. Normals	ADHD less effective on freedom from distractibility measures from WAIS-R, slower on Stroop Color-Word Test, and slower on Trails A & B, lower in verbal fluency on the CVLT	No difference on learning variables from the CVLT

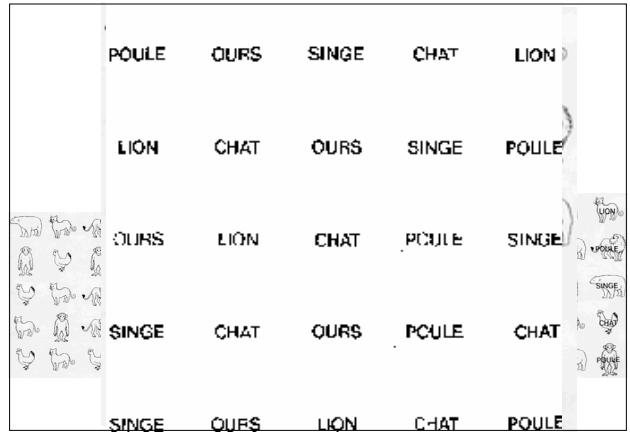
ABBREVIATIONS: CPT, Continuous Performance Test; CVLT, Controlled Oral Word Association Test; CVLT, California Verbal Learning Test; WAIS-R, Wechsler Adult Intelligence Scale-Revised; WCST, Wisconsin Card Sorting Test; WMS-R, Wechsler Memory Scale-Revised.

Test de Stroop

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

bleu vert jaune bleu rouge vert vert jaune
 vert rouge bleu rouge vert jaune jaune bleu

bleu vert jaune bleu rouge vert vert jaune
 vert rouge bleu rouge vert jaune jaune bleu



NEPSY : TEST D'ATTENTION AUDITIVE

PARTIE A : ATTENTION AUDITIVE

Tu vas entendre des mots. Quand tu entends le mot ROUGE, prends un carré ROUGE et mets le dans la boîte comme ceci (montrer). Quand tu entends un autre mot, n'importe quel mot, ne fais rien. Tu entendas beaucoup de mots ; donc écoute attentivement jusqu'à la fin. Ne touche les carrés que lorsque tu veux en mettre un dans le couvercle. Si tu te trompes, ne recommence pas, continue seulement à écouter, vas-y, essaie.

Lire l'item d'exemple : un mot/ seconde

Alors pose ça rouge là jaune bleu prends rouge chose alors

PARTIE B : REPONSES ASSOCIEES

(épreuve administrée immédiatement après l'épreuve d'attention auditive)

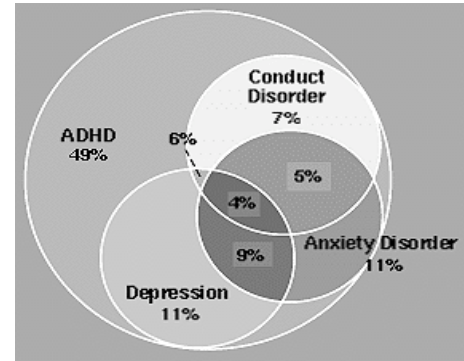
Ce jeu est un peu différent. Tu vas entendre d'autres mots. Cette fois, lorsque tu entends le mot ROUGE, mets un carré jaune dans la boîte comme ceci (montrer.sans vous tromper ;-). Lorsque tu entends le mot JAUNE, mets un carré rouge dans le boîte comme ceci (montrer). Lorsque tu entends le mot BLEU, mets un carré bleu dans la boîte comme ceci (montrer). Lorsque tu entends un autre mot, n'importe quel mot, ne fais rien. Tu entendas beaucoup d'autres mots, donc écoute attentivement jusqu'à la fin. Ne touche les carrés que lorsque tu veux en mettre un dans la boîte. Si tu te trompes, ne recommence pas, continue juste à écouter. Vas-y, essaie

Item exemple (lire 1 mot/seconde)

Ça là rouge chose prends jaune pose si alors bleu tôt alors

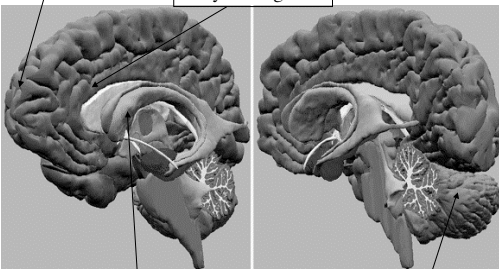
T.H.A.D.A.

Les bases cérébrales d'une pathologie comportementale et cognitive



2. Cortex préfrontal

1. Gyrus cingulaire

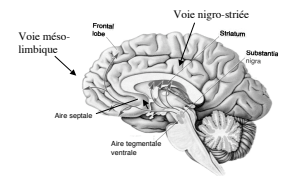
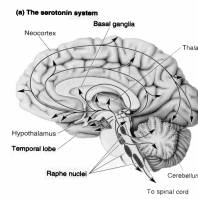


3. Noyau caudé

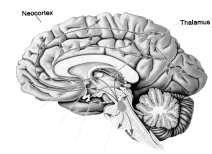
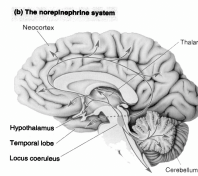
4. cervelet

THADA : Les 4 régions cérébrales cibles

Système sérotoninergique



Système dopaminergique

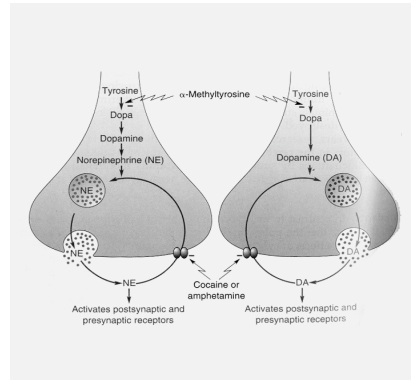


Système noradrénergique

Système cholinergique

THADA : les hypothèses neurochimiques

- Basées sur l'idée d'un défaut dans les catécholamines, une classe de neuromédiateurs
- Théorie du déficit en Dopamine
 - Proviens de la constatation d'un défaut du turnover de Dopamine
 - Jamais démontré d'efficacité de substances dopaminergiques, efficacité modérée d'antipsychotiques (antidopaminergiques)
- Théorie du déficit en sérotonine : peu de preuves
- Théorie du déficit en noradrénaline : la plus convaincante (effet des amphétamines qui miment l'effet de la NA ; occupant les récepteurs, ils contrent l'effet d'un éventuel excès)



Type d'étude	Appareil utilisé	Nombre d'études	Nombre de patients	Résultat
morphologique	Scanner rayons X	6	172	Discrète atrophie
Morphologique	IRM	14	291	Noyau caudé (> ou <) Corps calleux (<) Vermis cervelet (<)
Débit sanguin	Scintigraphie Xénon	3	43	Hypoperfusion frontale Noyau caudé
fonctionnel	Caméra à positrons (glucose)	4	65	Pas de baisse significative du métabolisme global
Débit sanguin	SPECT ou IRMf	10	107	Hypodébit frontal droit en particulier lors de tâches d'activation (go-no go, stroop) Effet régulateur inconstant du méthylphénidate

Etudes d'imagerie cérébrale chez des enfants ou adultes THADA

Type d'étude	Appareil utilisé	Nombre d'études	Nombre de patients	Résultat
morphologique	Scanner rayons X	6	172	Discrète atrophie
Morphologique	IRM	14	291	Noyau caudé (> ou <) Corps calleux (<) Vermis cervelet (<)
Débit sanguin	Scintigraphie Xénon	3	43	Hypoperfusion frontale Noyau caudé
fonctionnel	Caméra à positrons (glucose)	4	65	Pas de baisse significative du métabolisme global
Débit sanguin	SPECT ou IRMf	10	107	Hypodébit frontal droit en particulier lors de tâches d'activation (go-no go, stroop) Effet régulateur inconstant du méthylphénidate

Etudes d'imagerie cérébrale chez des enfants ou adultes THADA

Brief Report

Anatomic Brain Abnormalities in Monozygotic Twins Discordant for Attention Deficit Hyperactivity Disorder

F. Xavier Castellanos, M.D.
Wendy S. Sharp, M.S.W.
Rebecca E. Gottesman, M.D.
Deanna K. Greenstein, Ph.D.
Jay N. Giedd, M.D.
Judith L. Rapoport, M.D.

Objective: To examine brain-behavior relationships in attention deficit hyperactivity disorder (ADHD), the authors obtained

magnetic resonance imaging (MRI) scans of monozygotic twins discordant for ADHD.

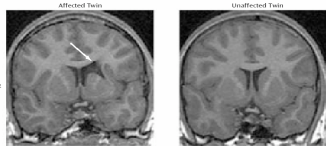
Method: National recruitment was followed by in-person assessment. MRI scans were measured algorithmically for nine pairs of monozygotic twins discordant for ADHD.

Results: The affected twins had significantly smaller caudate volumes (mean difference = -0.56 ml, CI: -0.92 to -0.21) than their unaffected co-twins.

Conclusions: These results provide further support for striatal models of ADHD pathophysiology.

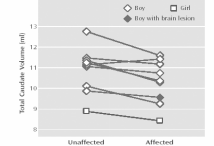
(Am J Psychiatry 2003; 160:1693-1696)

FIGURE 1. Coronal T₁-Weighted MRI Brain Images of a 15-Year-Old Boy With ADHD and a Brain Lesion and His Unaffected Monozygotic Twin*



*The focal abnormality was in the left caudate, putamen, and adjacent white matter (see arrow).

FIGURE 2. Total Caudate Volumes of Monozygotic Twins Discordant for ADHD*



*Both of the female twins were unmedicated.

Article

Effects of Methylphenidate on Functional Magnetic Resonance Relaxometry of the Cerebellar Vermis in Boys With ADHD

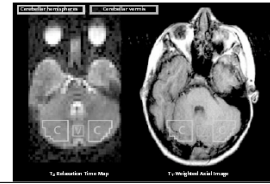
Carl M. Anderson, Ph.D.
Ann Pollock, K.N., Ph.D.
Steven D. Iacono, Ph.D.
Jerry J. Biedler, M.D., Ph.D.
Mark H. Scerif, M.D., Ph.D.

Objective: The authors used functional magnetic resonance imaging (fMRI) to measure the effects of methylphenidate on the effects of working memory on the cerebellar vermis in boys with attention deficit hyperactivity disorder (ADHD). This region was selected as being most sensitive to the effects of methylphenidate in children with ADHD, as previously reported in a functional magnetic resonance imaging study of ADHD.

Method: Twenty-two boys with ADHD and 22 boys with ADHD and ADHD medication were scanned with fMRI while performing a working memory task. The authors measured the effects of methylphenidate on the cerebellar vermis in ADHD boys with ADHD and ADHD medication.

Results: Methylphenidate significantly increased the cerebellar vermis blood flow in ADHD boys with ADHD and ADHD medication. This effect was not seen in ADHD boys with ADHD medication.

(Am J Psychiatry 2003; 160:1693-1696)



Anterior Cingulate Cortex Dysfunction in Attention-Deficit/Hyperactivity Disorder Revealed by fMRI and the Counting Stroop

George Bush, Jean A. Frazier, Scott L. Rauch, Larry J. Seidman, Paul J. Whalen, Michael A. Jenike, Bruce R. Rosen, and Joseph Biederman

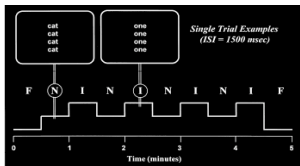
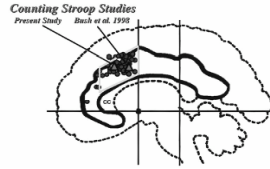
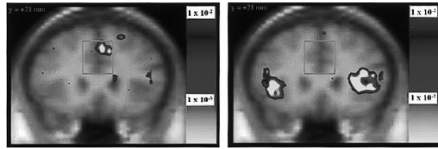


Figure 1. The Counting Stroop task: trial examples and block design. The top portion of this combination figure depicts examples of single trials for the two types of stimuli. Subjects were told that they would see sets of one to four identical words appear on the screen, and were instructed to report, via button-press, the number of words in each set, regardless of word meaning. During "neutral" trials, common animal names (dog, cat, bird, or mouse) were used. During "interference" blocks, the words consisted of number names (one, two, three, or four).

BIOL. PSYCHIATRY
1999;45:1542-1552

Normal Controls ADHD



Article

Neural Substrates of Decision Making in Adults With Attention Deficit Hyperactivity Disorder

Monique Ernst, M.D., Ph.D.

Objective: The characteristics of attention-making task in both the ADHD and

DECISION MAKING IN ADULTS WITH ADHD

FIGURE 1. Decision-Making Task in a Study of Neural Substrates of Decision-Making Deficits in Adults With Attention Deficit Hyperactivity Disorder^a



ERNST, KIMES, LONDON, ET AL.

TABLE 1. Characteristics of Healthy Comparison Subjects and Adults With Attention Deficit Hyperactivity Disorder (ADHD) in a Study of Neural Substrates of Decision-Making Deficits

Characteristic	Healthy Subjects (N=12)		Adults With ADHD (N=10)	
	Mean	SD	Mean	SD
Age (years) ^a	28.8	6.6	29.9	7.3
Sex ^a	N	%	N	%
Male	6	50	5	50
Female	6	50	5	50
Race				
Caucasian	6	50	9	90
African American	6	50	1	10
	Mean	SD	Mean	SD
Socioeconomic status ^b	4.3	1.0	3.7	0.9
IQ ^a	105.6	8.3	108.8	9.5
Conners Abbreviated				
Teacher's Rating Scale scores			18.0	3.9
Subjective on decision-making task ^{a,c}	6.3	28.5	4.3	22.2

^a No significant differences between groups.

FIGURE 2. Brain Regions With Significant Increase in Cerebral Blood Flow During a Decision-Making Task in Healthy Comparison Subjects and Adults With Attention Deficit Hyperactivity Disorder (ADHD)^a

