

Semaine du Cerveau 2016
Palais de la Découverte
Paris

Quelle conscience dans le coma et les états de conscience altérée?

COMA

SCIENCE GROUP

Sarah WANNEZ
Neuropsychologue, Doctorante

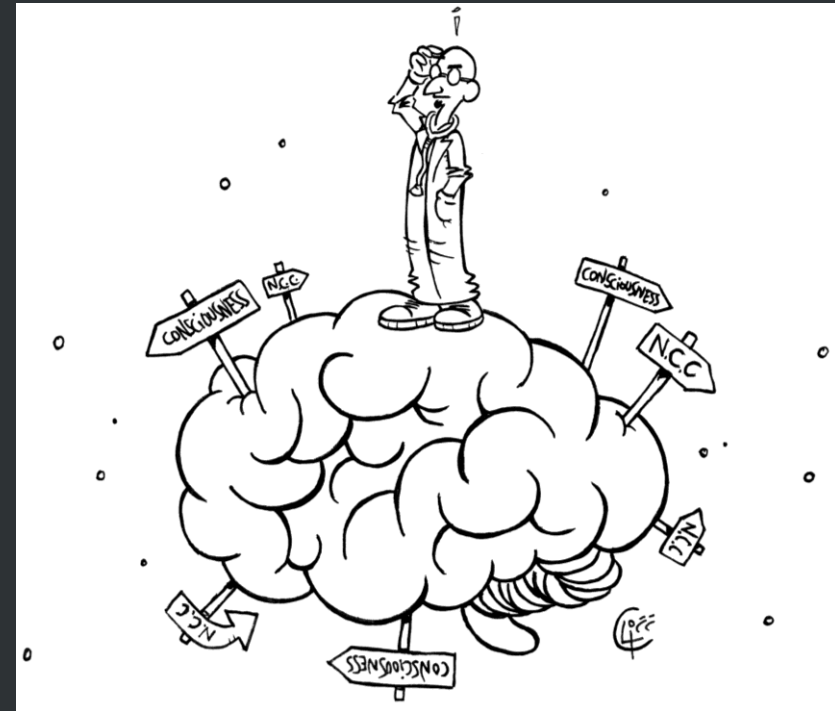
Coma Science Group
GIGA Research Centre,
Université de Liège, Belgique



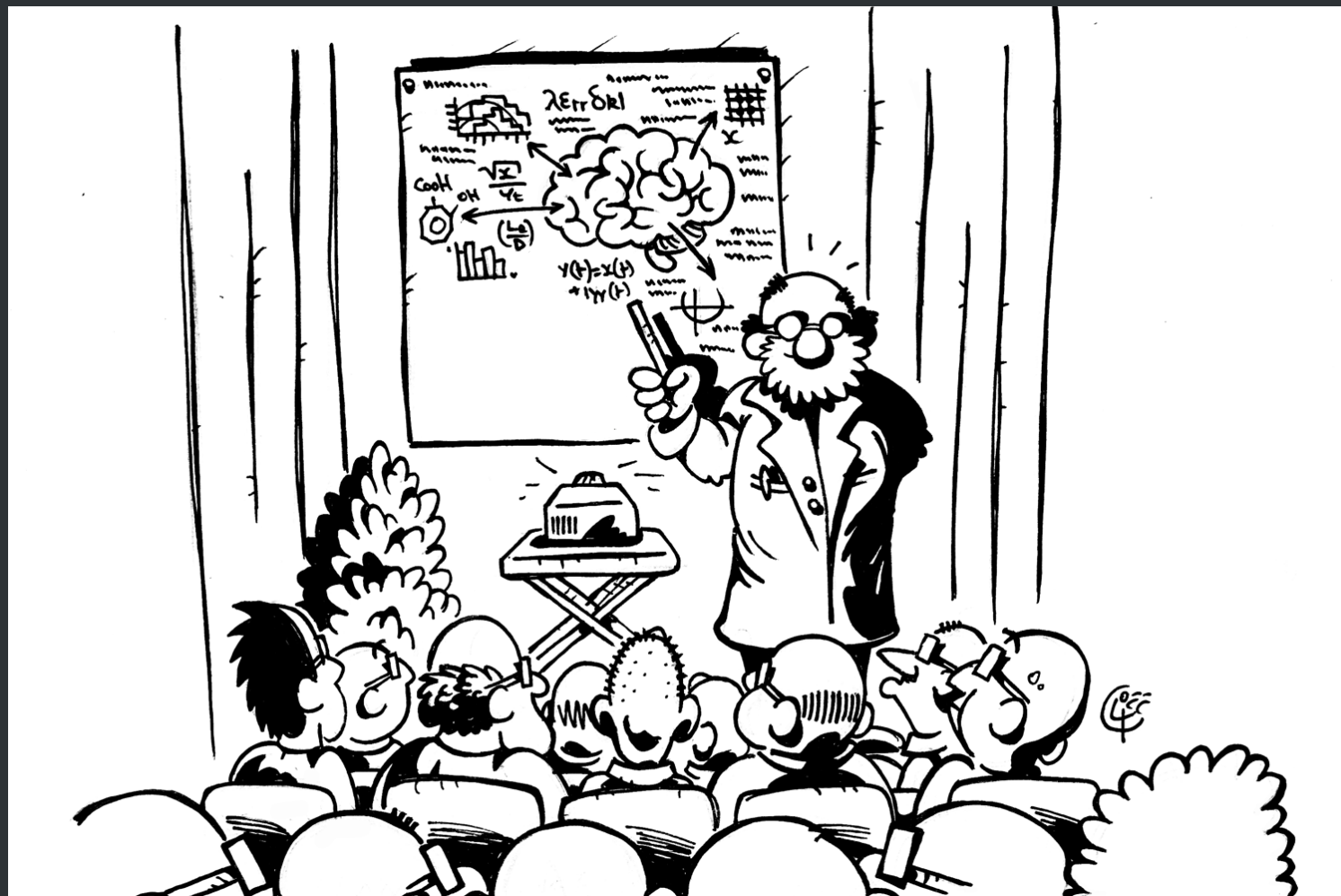
18 mars 2016



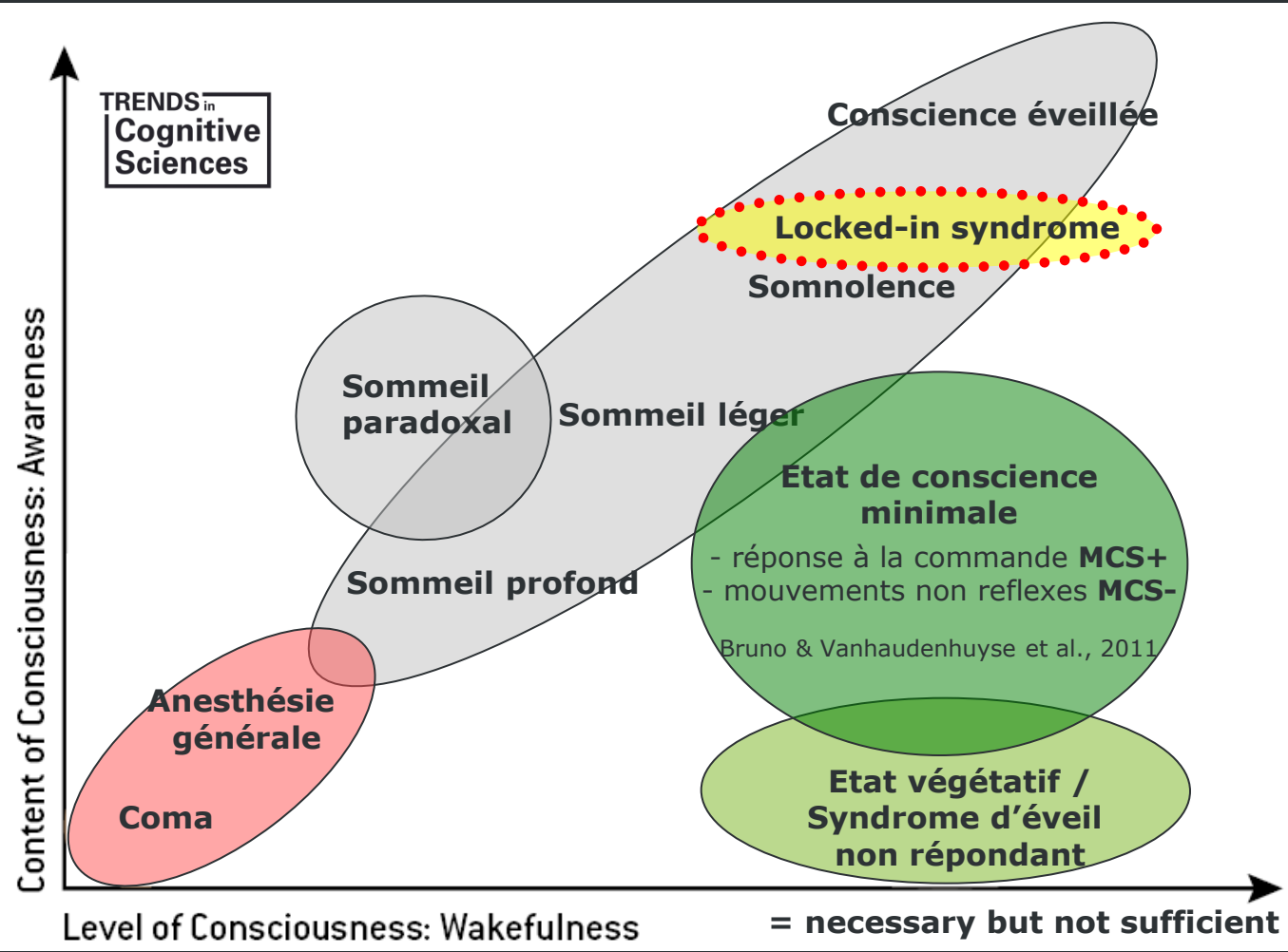
Conscience



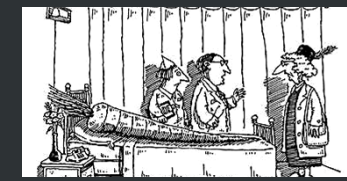
Comment la science peut-elle expliquer la conscience ?



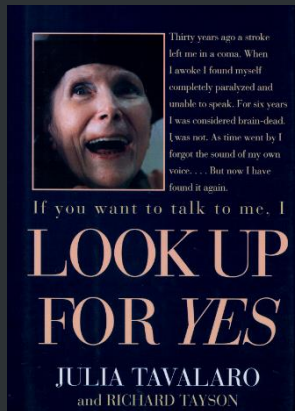
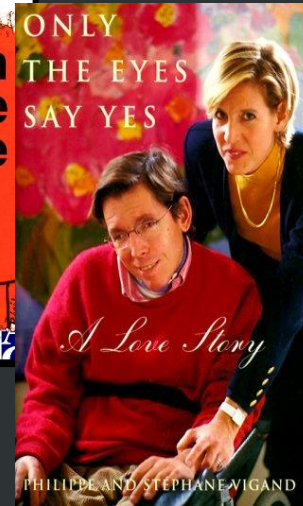
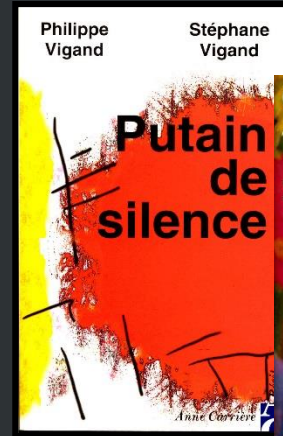
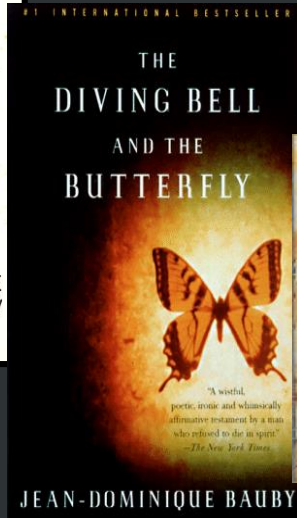
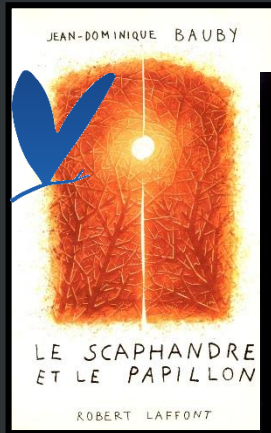
Conscience : 2 composantes



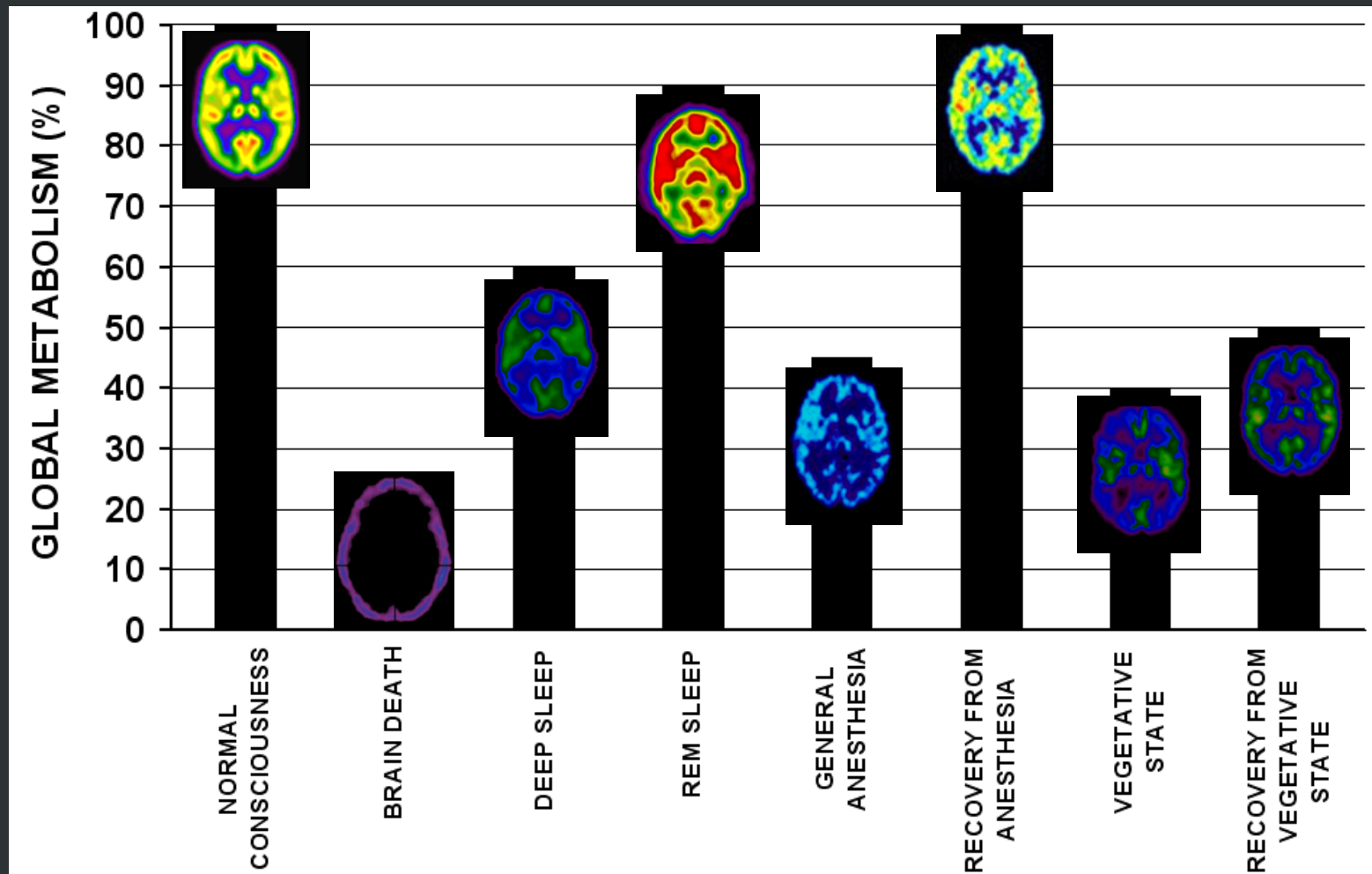
Syndrome d'éveil non répondant
Laureys et al., 2010



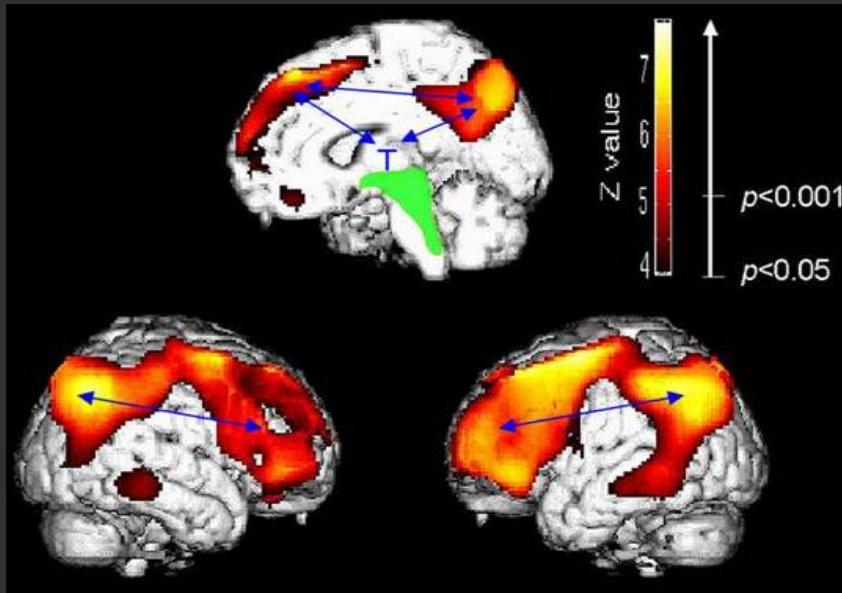
"There's nothing we can do... he'll always be a vegetable."



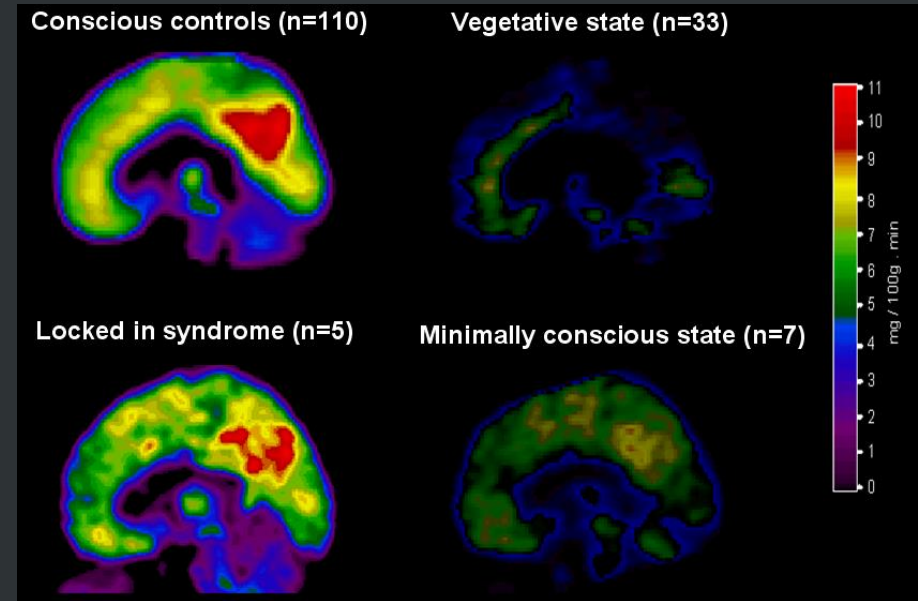
Conscience \neq cerveau entier



Conscience \approx réseau frontopariétal

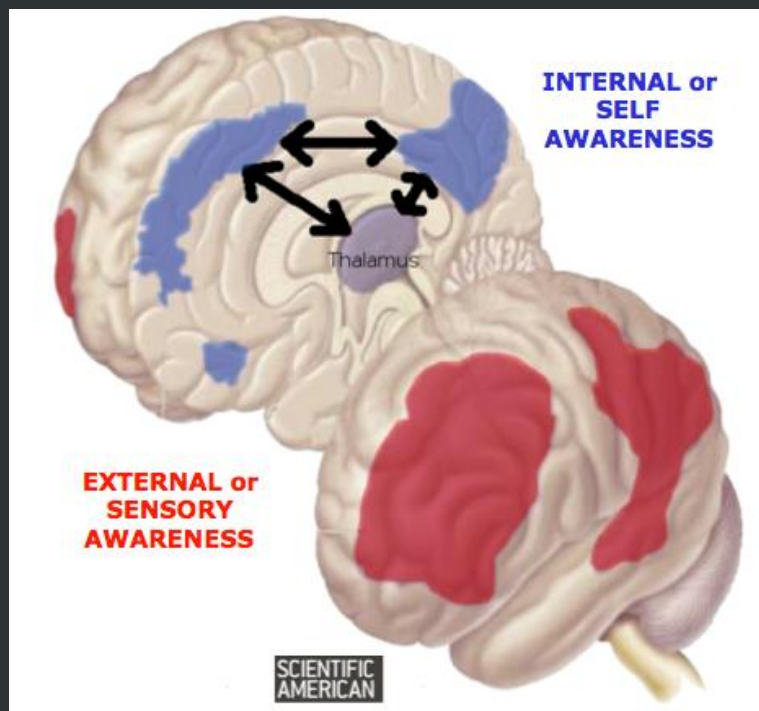


Laureys et al, Neuroimage 1999



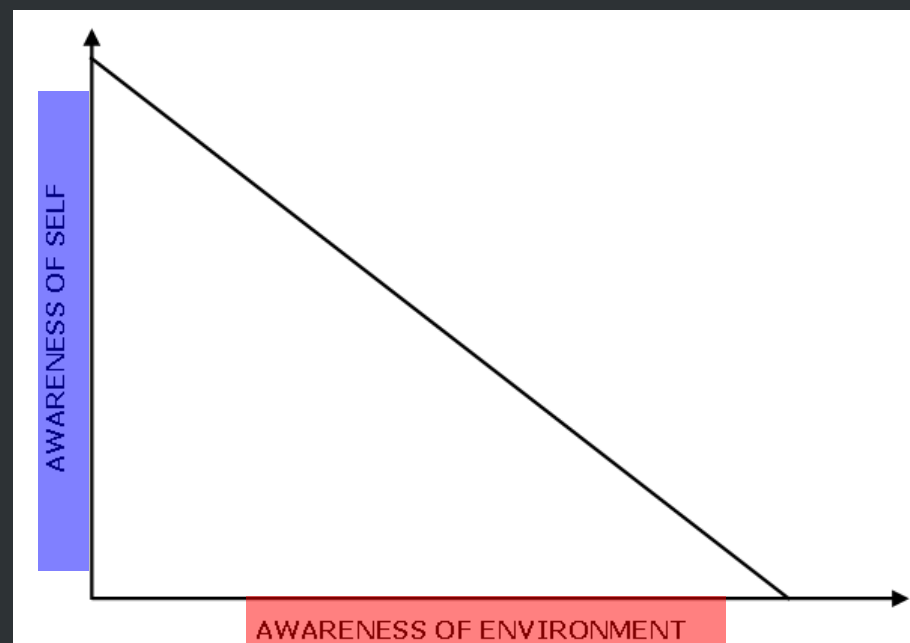
Laureys et al, Lancet Neurology, 2004

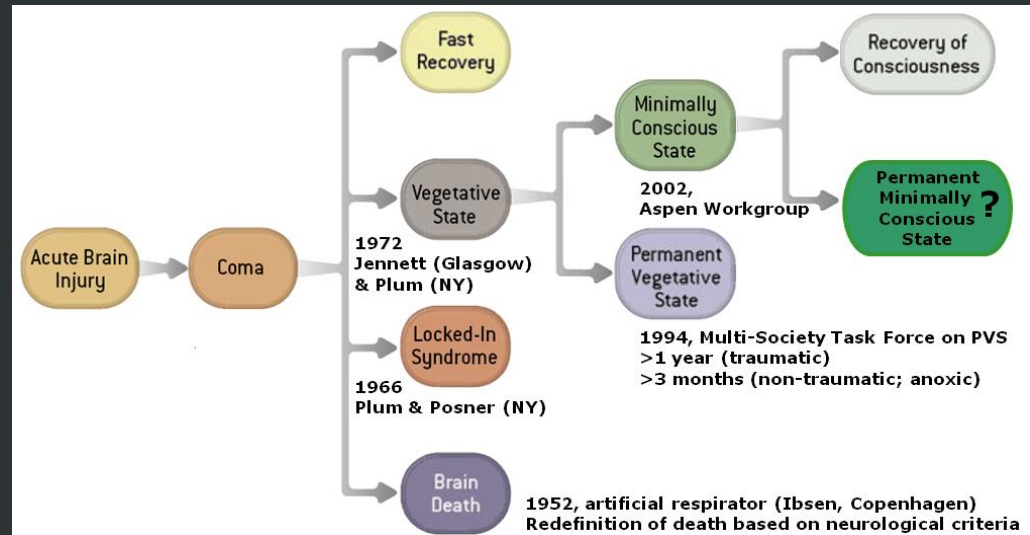
Interne et externe



Conscience EXTERNE: sensorielle
environnement

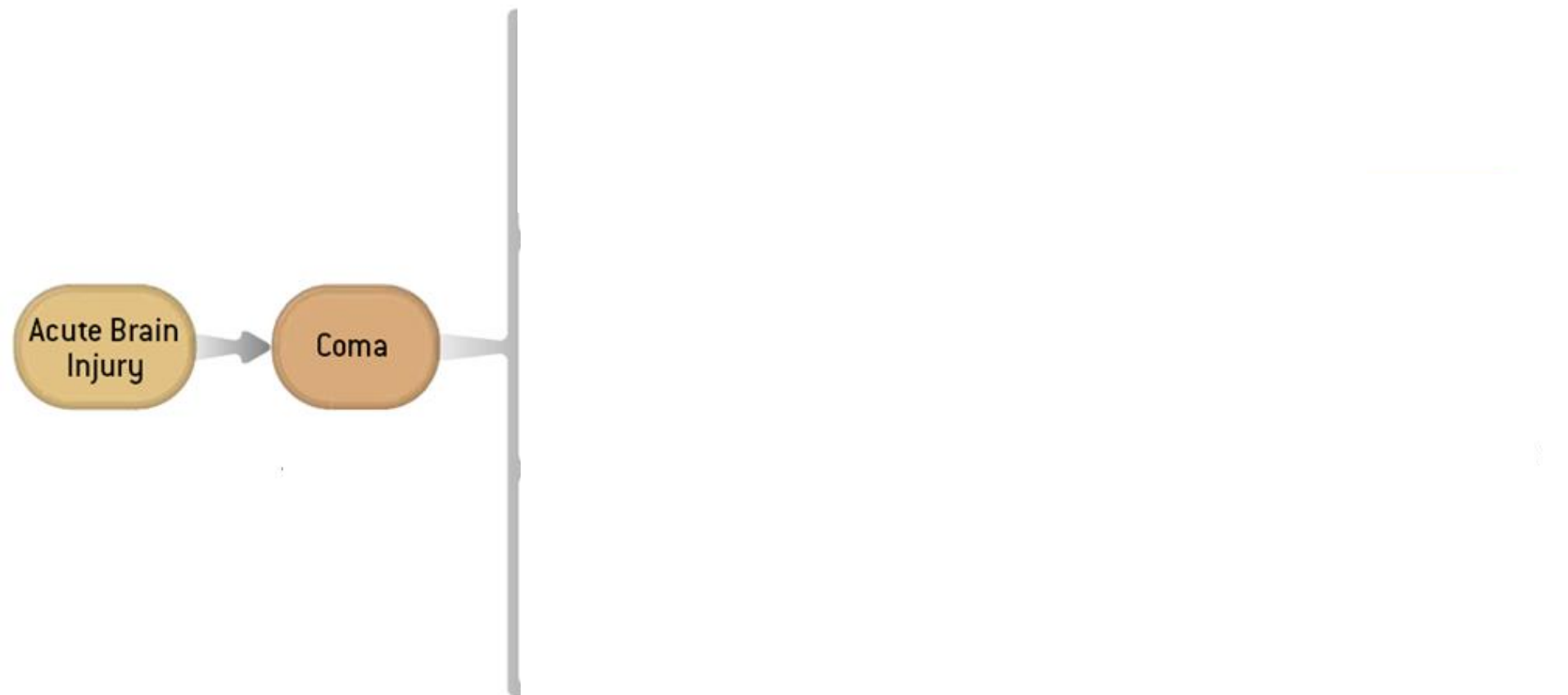
Conscience INTERNE: conscience de soi





Critères diagnostiques

Etat de conscience altérée chronique





JFK COMA RECOVERY SCALE - REVISED ©2004

Record Form

Patient:	Date:																		
AUDITORY FUNCTION SCALE																			
4 - Consistent Movement to Command *																			
3 - Reproducible Movement to Command *																			
2 - Localization to Sound																			
1 - Auditory Startle																			
0 - None																			
VISUAL FUNCTION SCALE																			
5 - Object Recognition *																			
4 - Object Localization: Reaching *																			
3 - Visual Pursuit *																			
2 - Fixation *																			
1 - Visual Startle																			
0 - None																			
MOTOR FUNCTION SCALE																			
6 - Functional Object Use †																			
5 - Automatic Motor Response *																			
4 - Object Manipulation *																			
3 - Localization to Noxious Stimulation *																			
2 - Flexion Withdrawal																			
1 - Abnormal Posturing																			
0 - None/Flaccid																			
OROMOTOR/VERBAL FUNCTION SCALE																			
3 - Intelligible Verbalization *																			
2 - Vocalization/Oral Movement																			
1 - Oral Reflexive Movement																			
0 - None																			
COMMUNICATION SCALE																			
2 - Functional: Accurate †																			
1 - Non-Functional: Intentional *																			
0 - None																			
AROUSAL SCALE																			
3 - Attention																			
2 - Eye Opening w/o Stimulation																			
1 - Eye Opening with Stimulation																			
0 - Unarousable																			
TOTAL SCORE																			

n=103 patients

- 45 diagnostic
- 18 signes de

→ 41% d'erreurs

Denotes emergence from MCS †

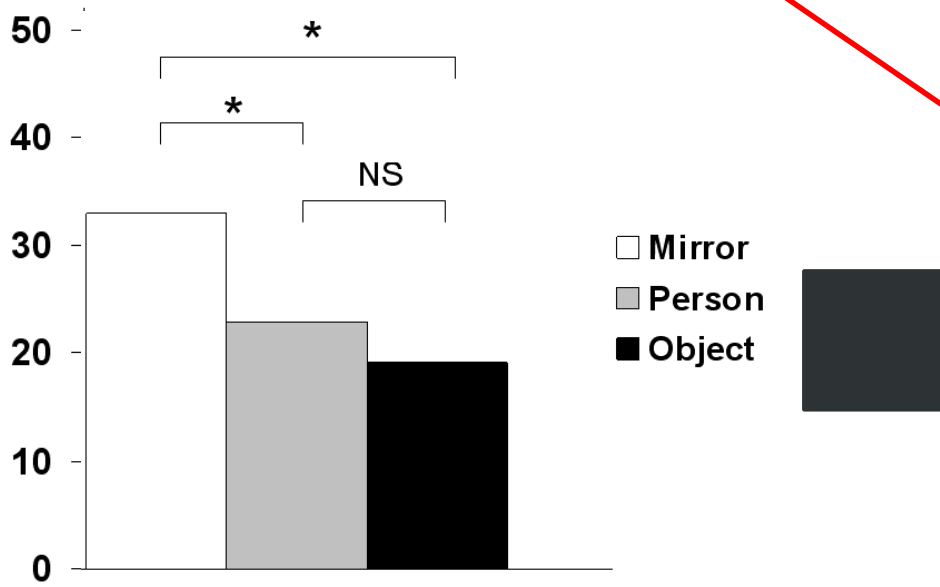
Denotes MCS *

Évaluation clinique



Vanhaudenhuyse et al., 2008

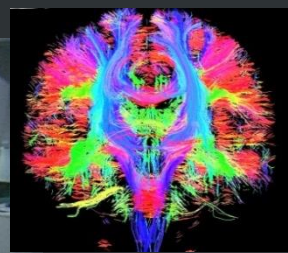
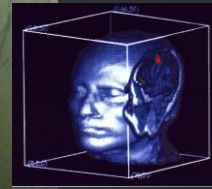
Number of MCS patients tracking



ÉCHELLE DE RÉCUPÉRATION DU COMA VERSION REVUE FRANÇAISE ©2004 Formulaire de rapport	
Patient :	Date atteinte cérébrale :
Etiologie :	Date admission :
Diagnostic initial :	Date :
Examineur :	
 FONCTION AUDITIVE 	
4 – Mouvement systématique sur demande*	
3 – Mouvement reproductible sur demande*	
2 – Localisation de sons	
1 – Réflexe de sursaut au bruit	
0 – Néant	
 FONCTION VISUELLE 	
5 – Reconnaissance des objets*	
4 – Localisation des objets : atteinte*	
3 – <u>Poursuite visuelle*</u>	
2 – Fixation*	
1 – Réflexe de dignement à la menace	
0 – Néant	
 FONCTION MOTRICE 	
6 – Utilisation fonctionnelle des objets*	
5 – Réaction motrice automatique*	
4 – Manipulation d'objets*	
3 – Localisation des stimulations nociceptives*	
2 – Flexion en retrait	
1 – Posture anormale stéréotypée	
0 – Néant / Flaccidité	
 FONCTION OROMOTRICE/VERBALE 	
3 – Production verbale intelligible*	
2 – Production vocale / Mouvements oraux	
1 – Réflexes oraux	
0 – Néant	
 COMMUNICATION 	
2 – Fonctionnelle : exacte*	
1 – Non fonctionnelle : intentionnelle*	
0 – Néant	
 ÉVEIL 	
3 – Attention	
2 – Ouverture des yeux sans stimulation	
1 – Ouverture des yeux avec stimulation	
0 – Aucun éveil	
 SCORE TOTAL 	



Diagnostic par neuroimagerie et électrophysiologie



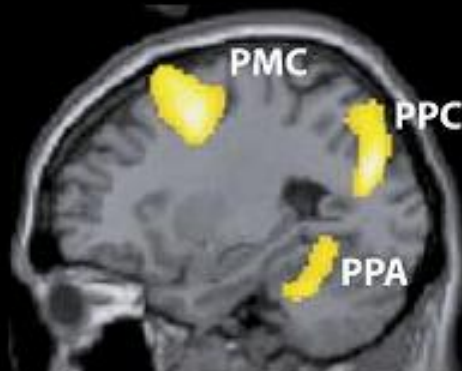
Signes de conscience avec l'IRMf

Tennis Imagery

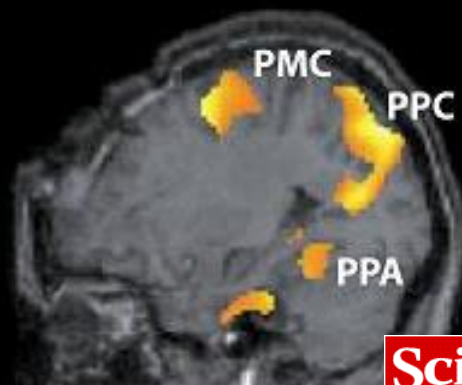
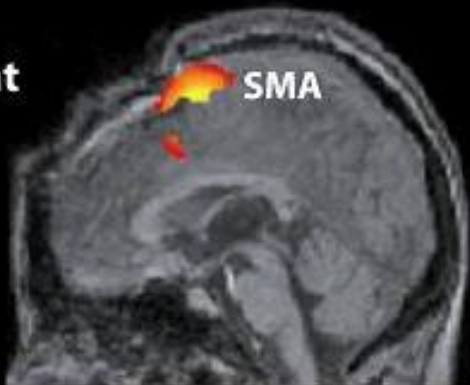
Controls



Spatial Navigation Imagery



Patient



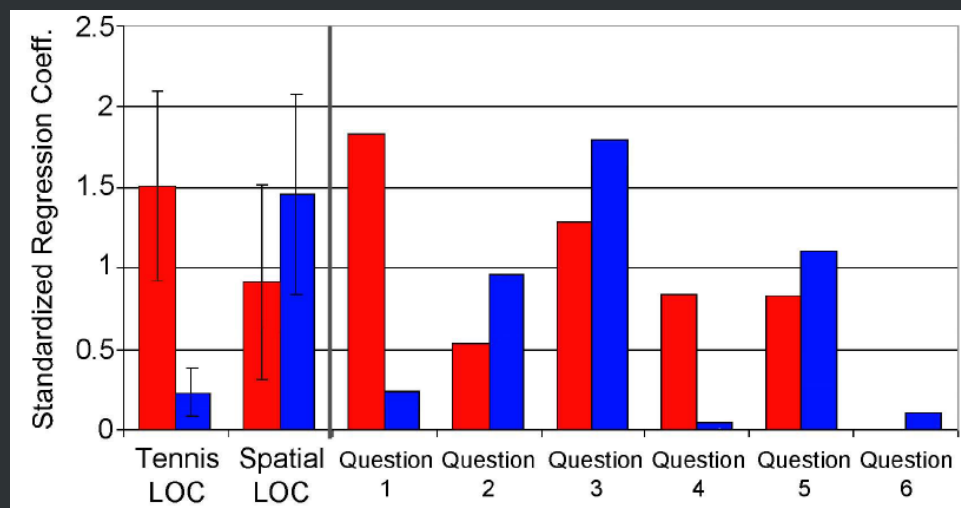
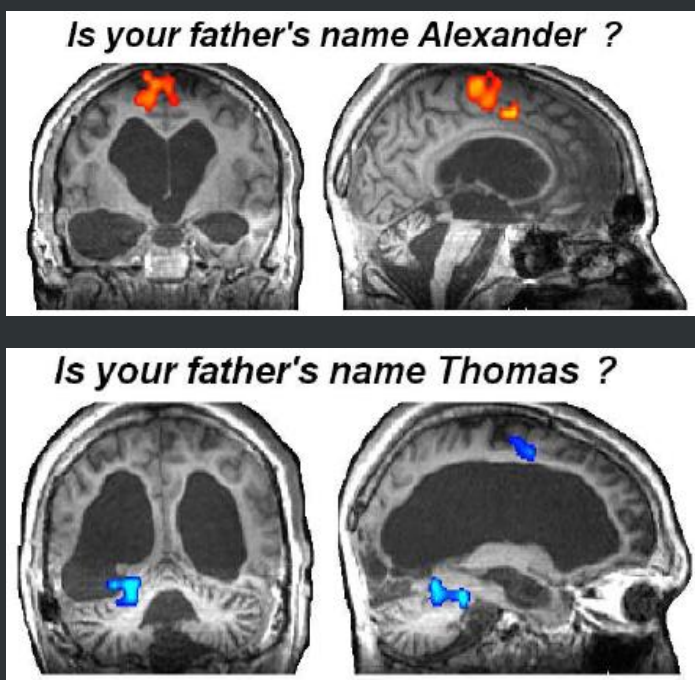
"He's not in coma...
he's playing tennis!"



Science

Communication oui/non avec l'IRMf

Imagine **Tennis** to answer 'YES'
 Imagine **Navigating** to answer 'NO'



Interface cerveau ordinateur : EEG

“MOVE YOUR FOOT”

“MOVE YOUR HAND”



HEALTHY
CONTROL
SUBJECT



“VEGETATIVE”
UNRESPONSIVE
PATIENT



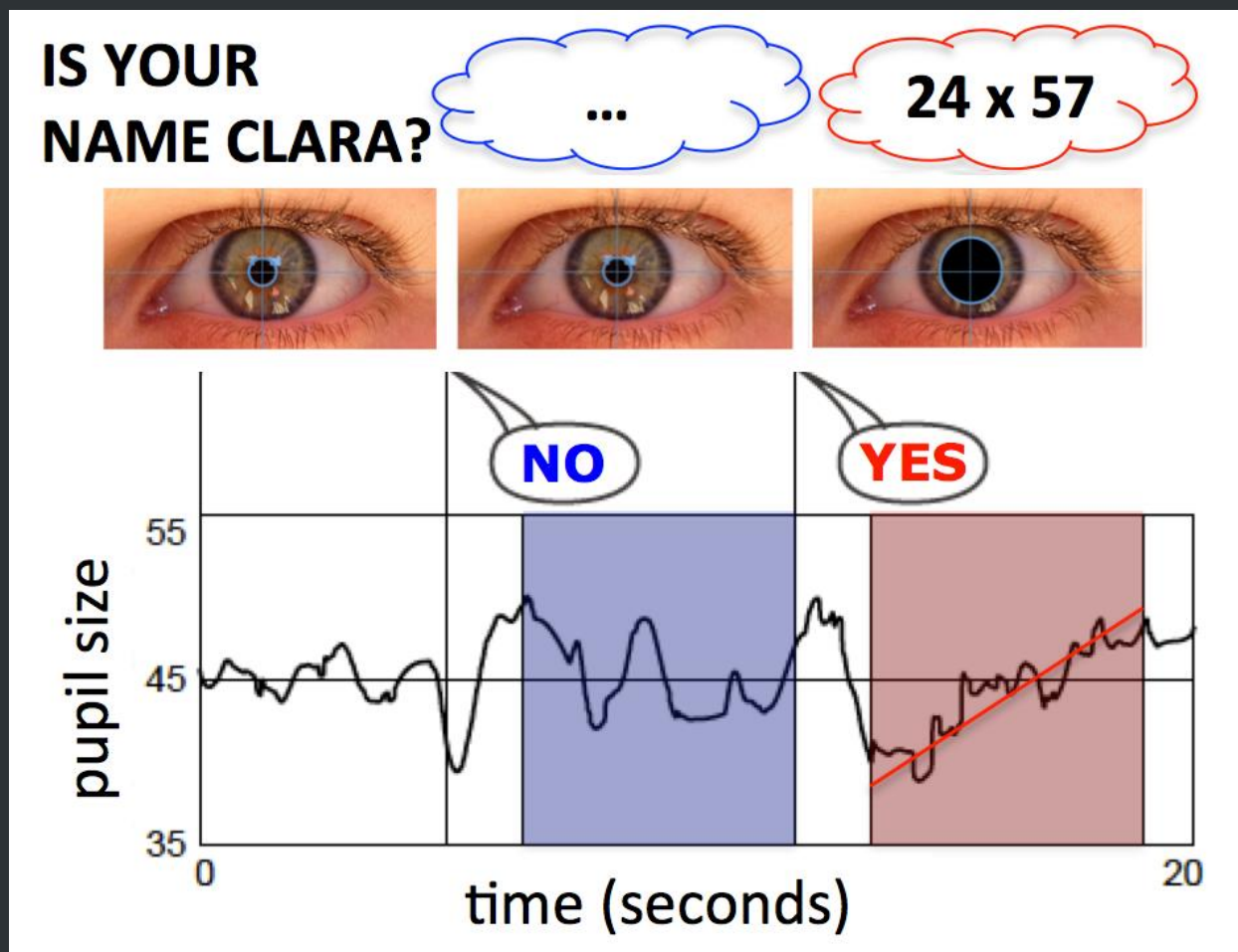
www.thelancet.com



Cruse et al, *Lancet* 2012
3/16 VS/UWS (19%)
- 2/5 traumatic (40%)
- 1/11 non-traumatic (9%)

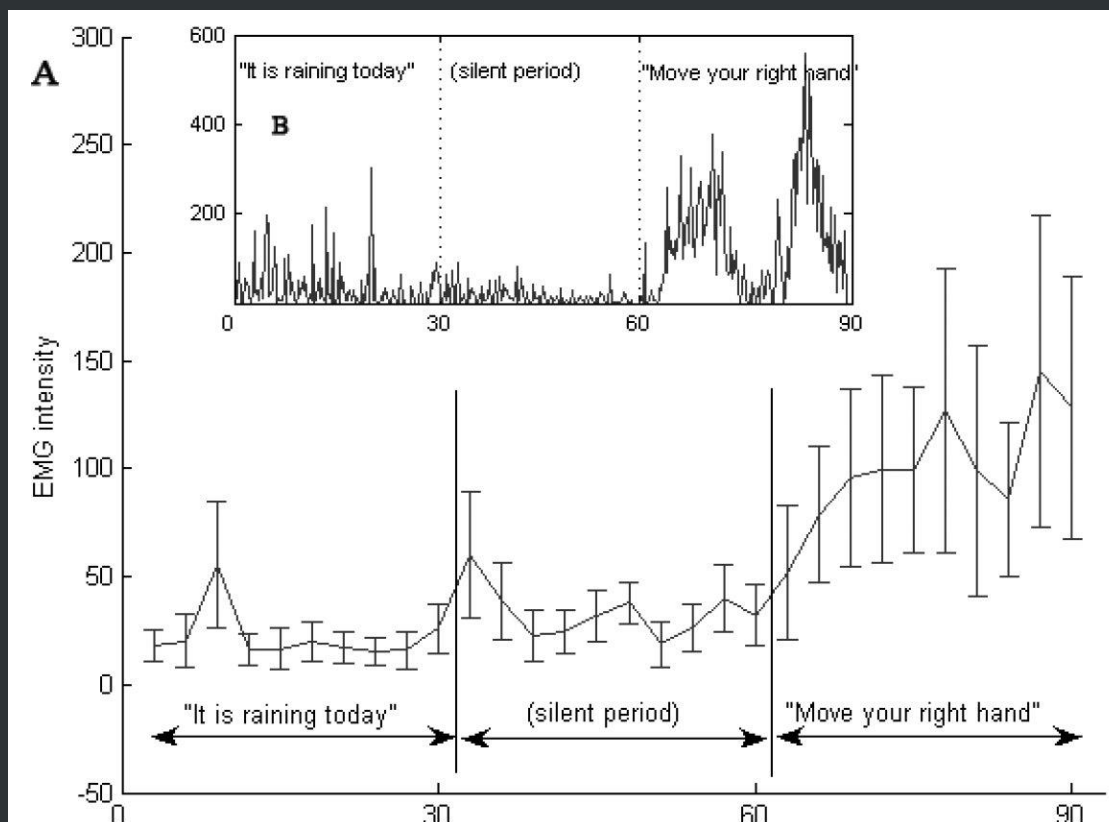
Cruse et al, *Neurology* 2012
7/23 MCS (30%)
- 7/15 traumatic (49%)
- 0/8 non-traumatic (0%)

Interface cerveau ordinateur : pupille



Interface cerveau ordinateur : EMG

« Bougez la main droite »

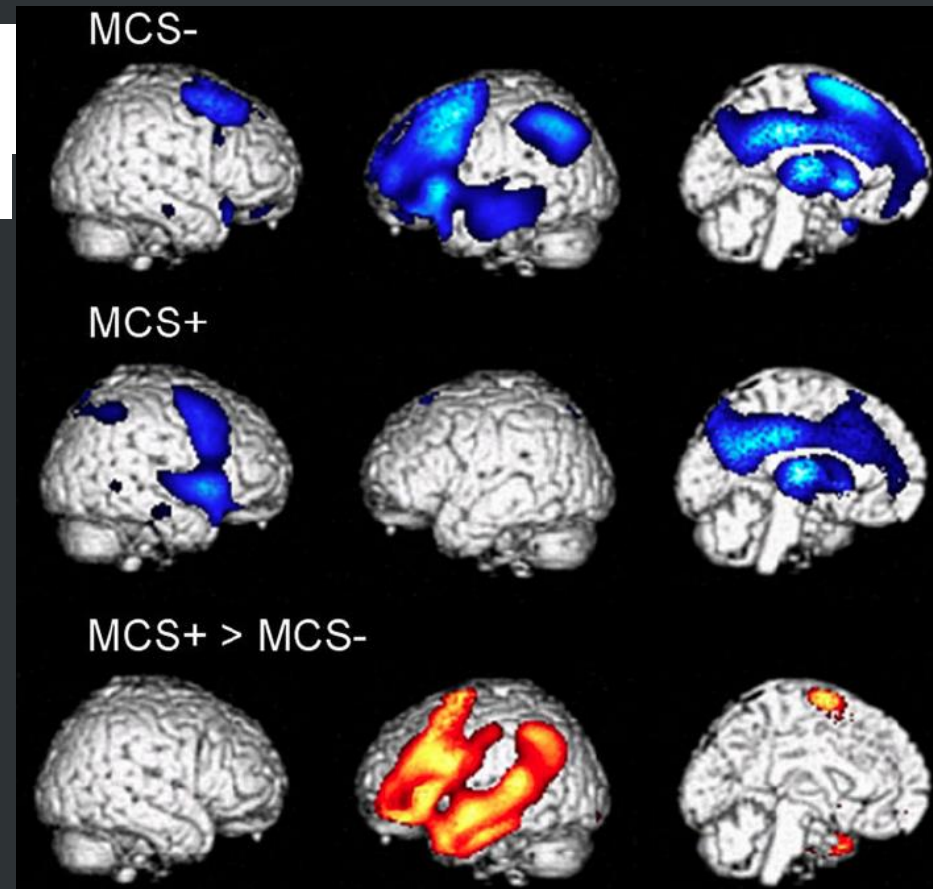
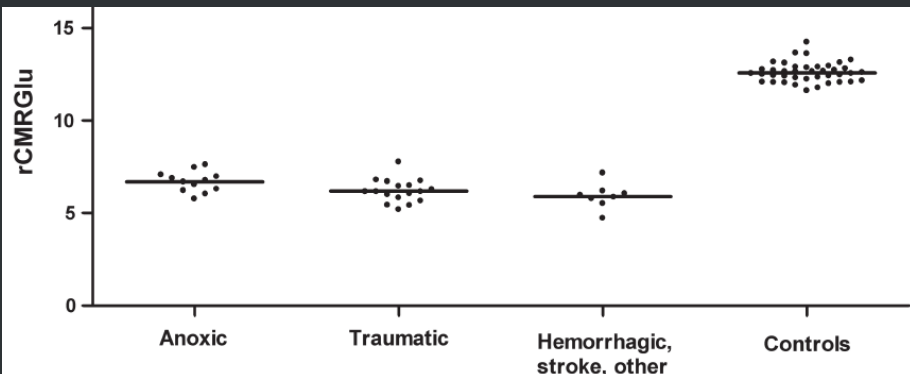


Aphasie

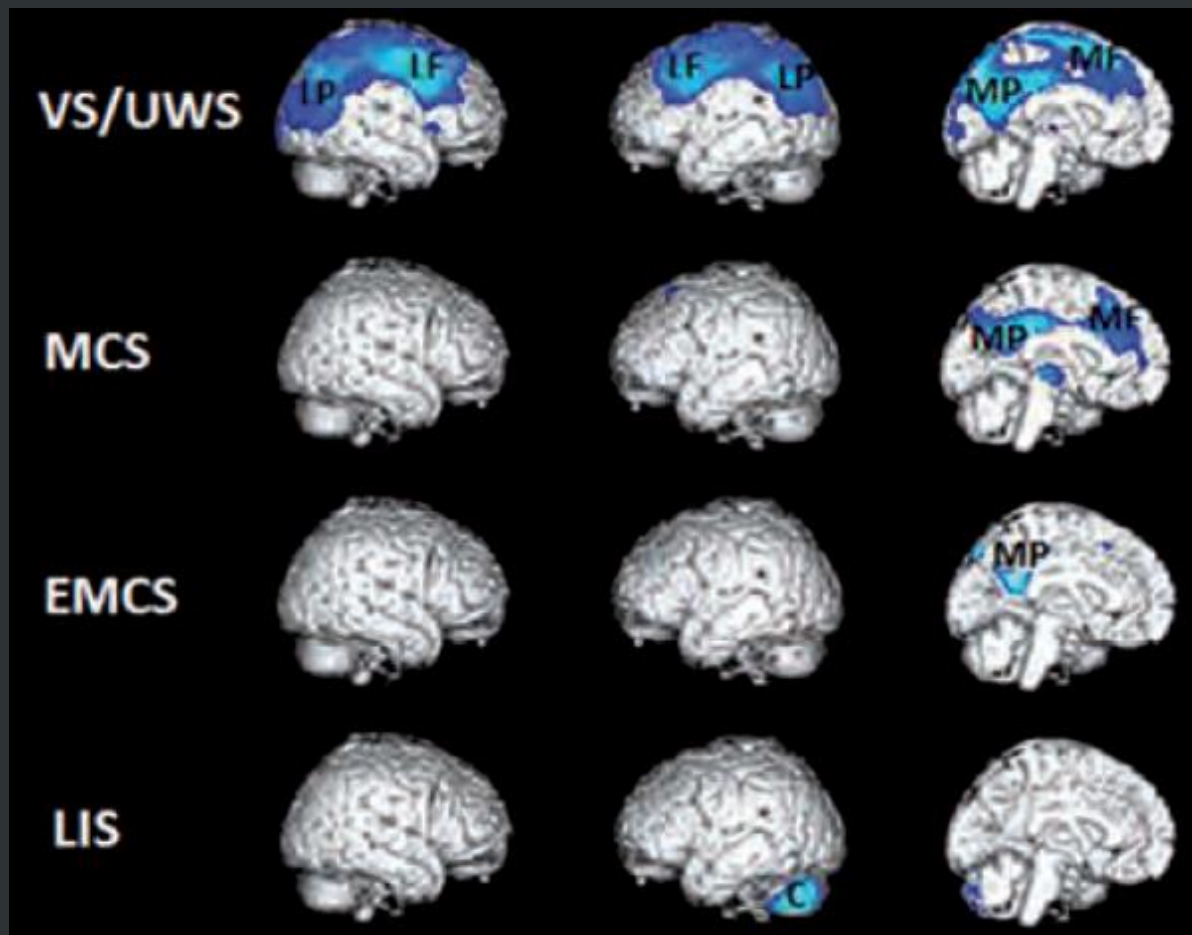
The problem of aphasia in the assessment of consciousness in brain-damaged patients ☆

Steve Majerus^{1,3}, Marie-Aurélié Bruno^{2,3}, Caroline Schnakers², Joseph T. Giacino⁴ and Steven Laureys^{2,3,*}

Progress in Brain Research, Vol. 177
Copyright © 2009 Elsevier



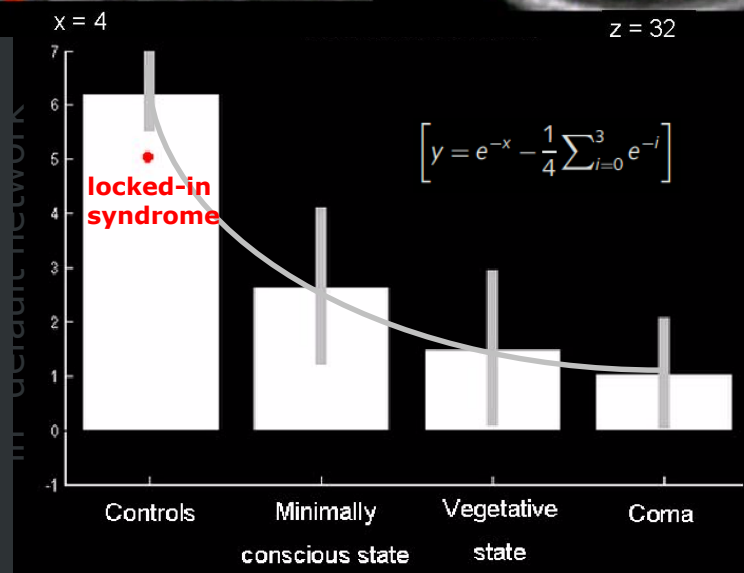
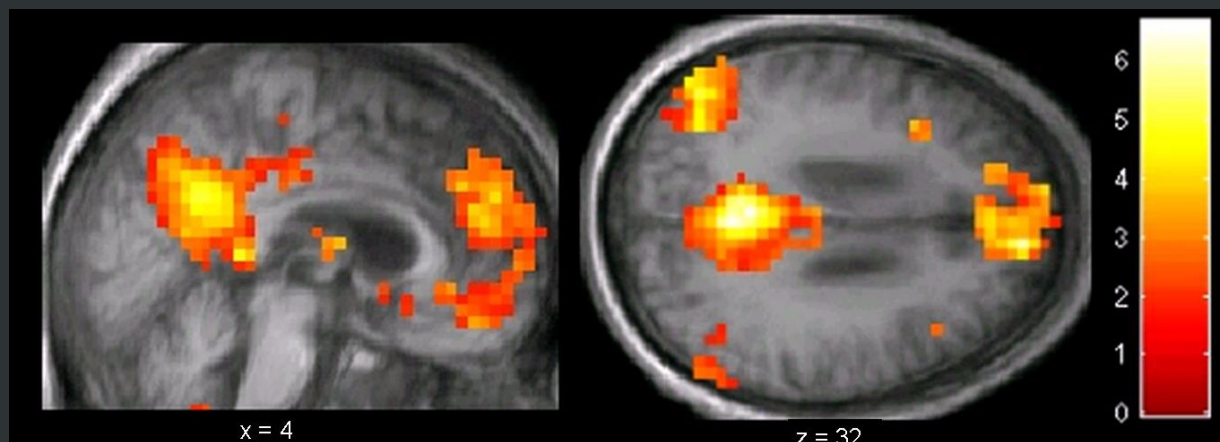
Metabolisme cérébral – PET scan



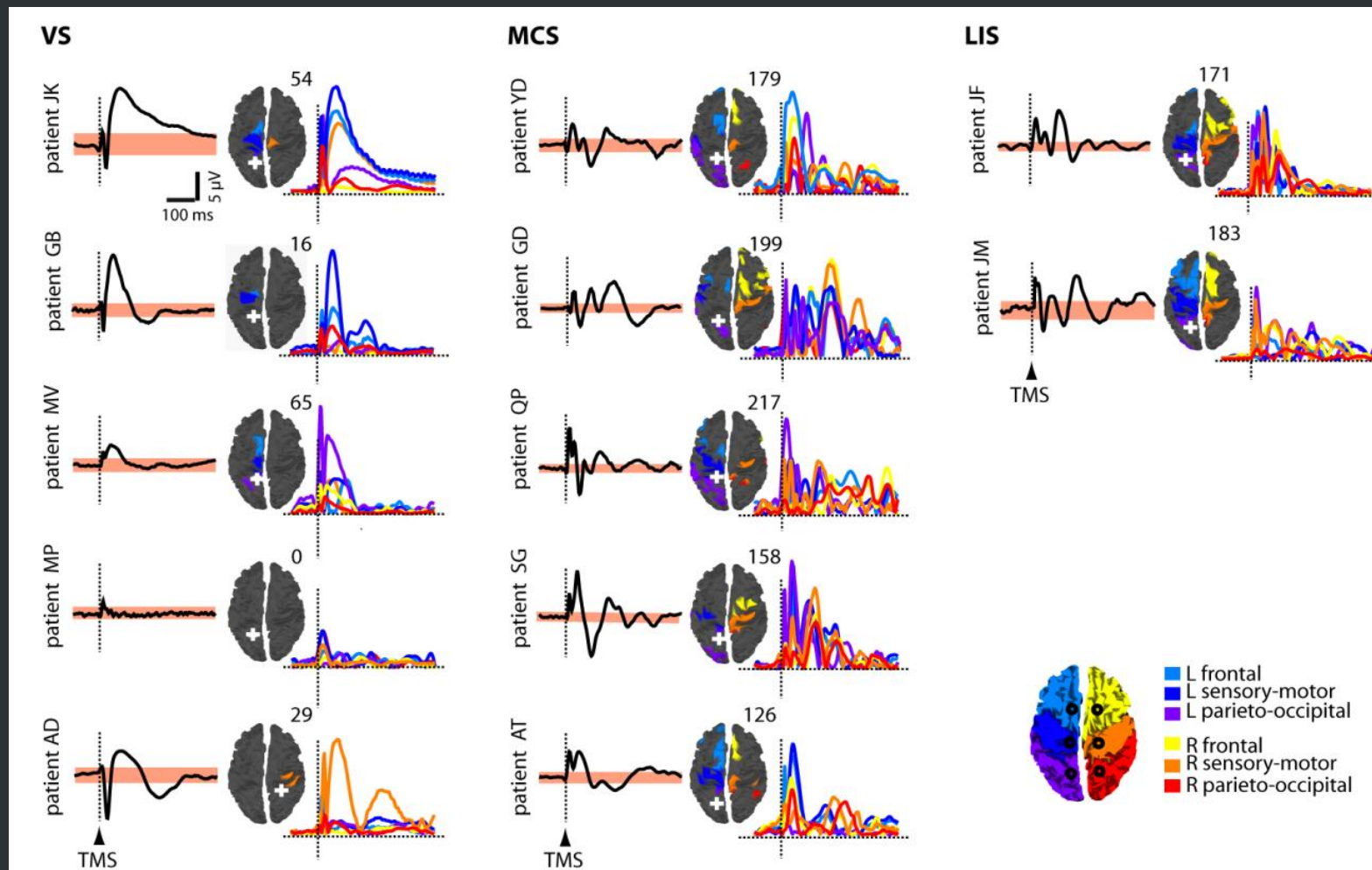
→ Réseaux conscience interne ET externe

→ Réseau conscience interne

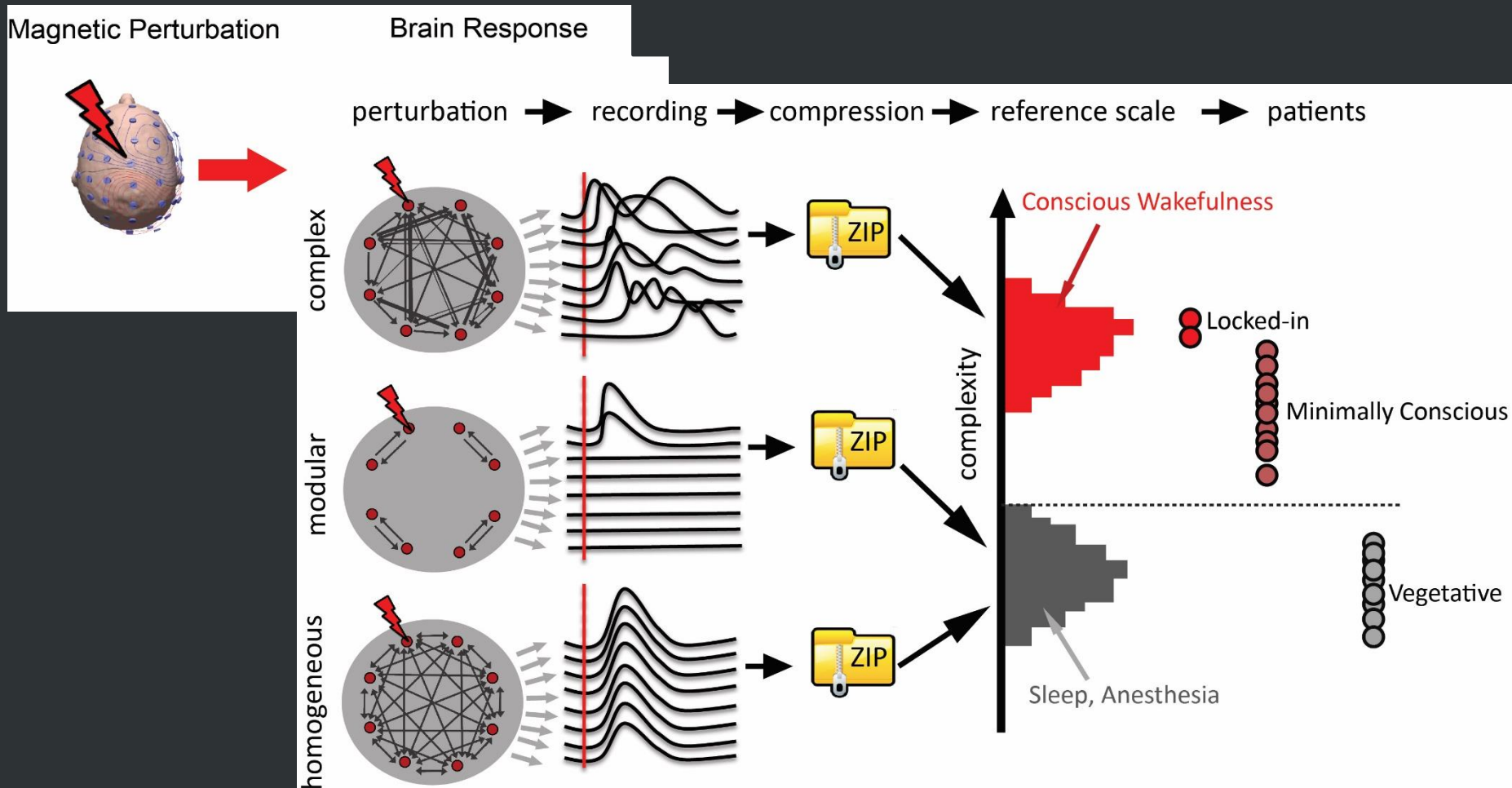
Réseau du mode par défaut : IRMf



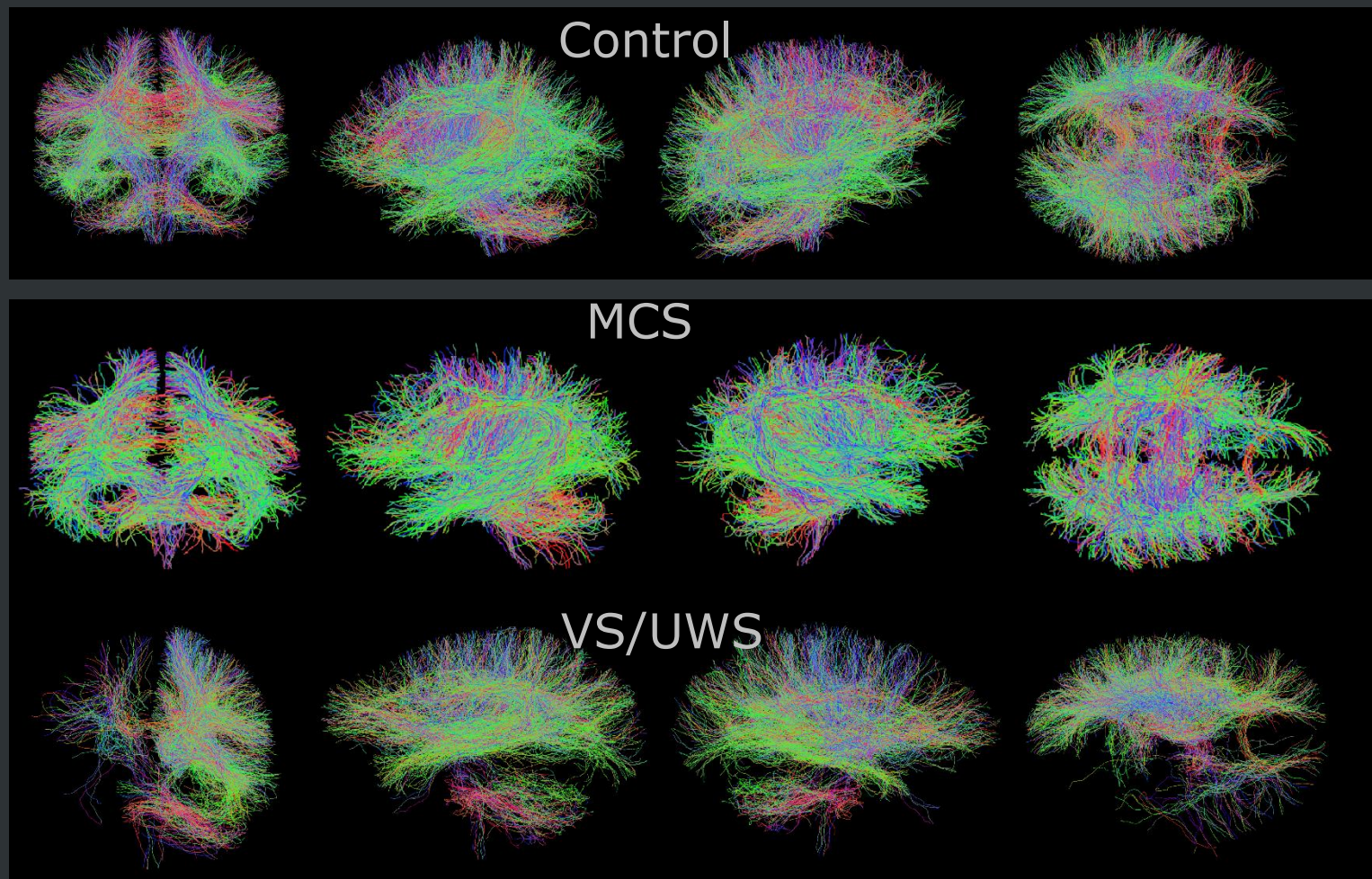
Stimulation Magnétique Transcranienne



Perturbational Complexity Index (PCI)



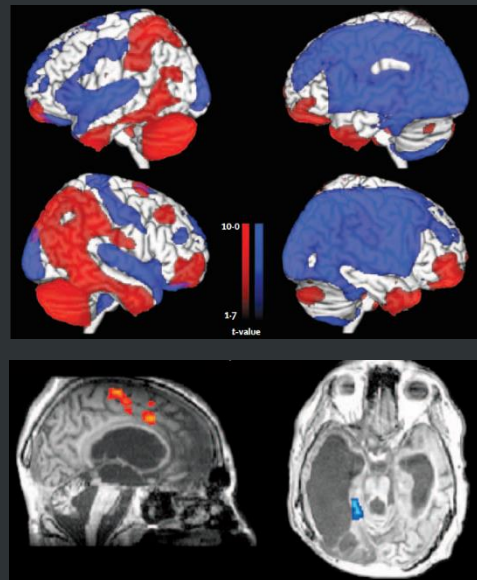
Imagerie par tenseur de diffusion



A/P
H/B
G/D

CRS-R vs. FDG-PET vs fMRI

130 patients (29/y)
 4 excluded (3%)
 81 MCS
 41 VS/UWS
 4 LIS
 110 chronic (87%)
 78 non-trauma (62%)



Coma Recovery Scale-Revised results			
	UWS	MCS	Total
Clinical consensus diagnosis			
VS/UWS	33 (37%)	18 (20%)	51 (57%)
MCS	2 (2%)	36 (40%)	38 (43%)
Total	35 (39%)	54 (61%)	89 (100%)
¹⁸F-FDG PET			
VS/UWS	24 (21%)	5 (4%)	29 (26%)
MCS	12 (11%)	71 (63%)	83 (74%)
Total	36 (32%)	76 (68%)	112 (100%)
Mental imagery fMRI			
VS/UWS	25 (36%)	23 (33%)	48 (69%)
MCS	3 (4%)	19 (27%)	22 (31%)
Total	28 (40%)	42 (60%)	70 (100%)

UWS=unresponsive wakefulness syndrome. MCS=minimally conscious state.

Table 2: Diagnostic results by modality

35% clinical misdiagnosis

32% CRS-R misdiagnosis

Douleur et émotions



NO RESPONSE



AWAKENING

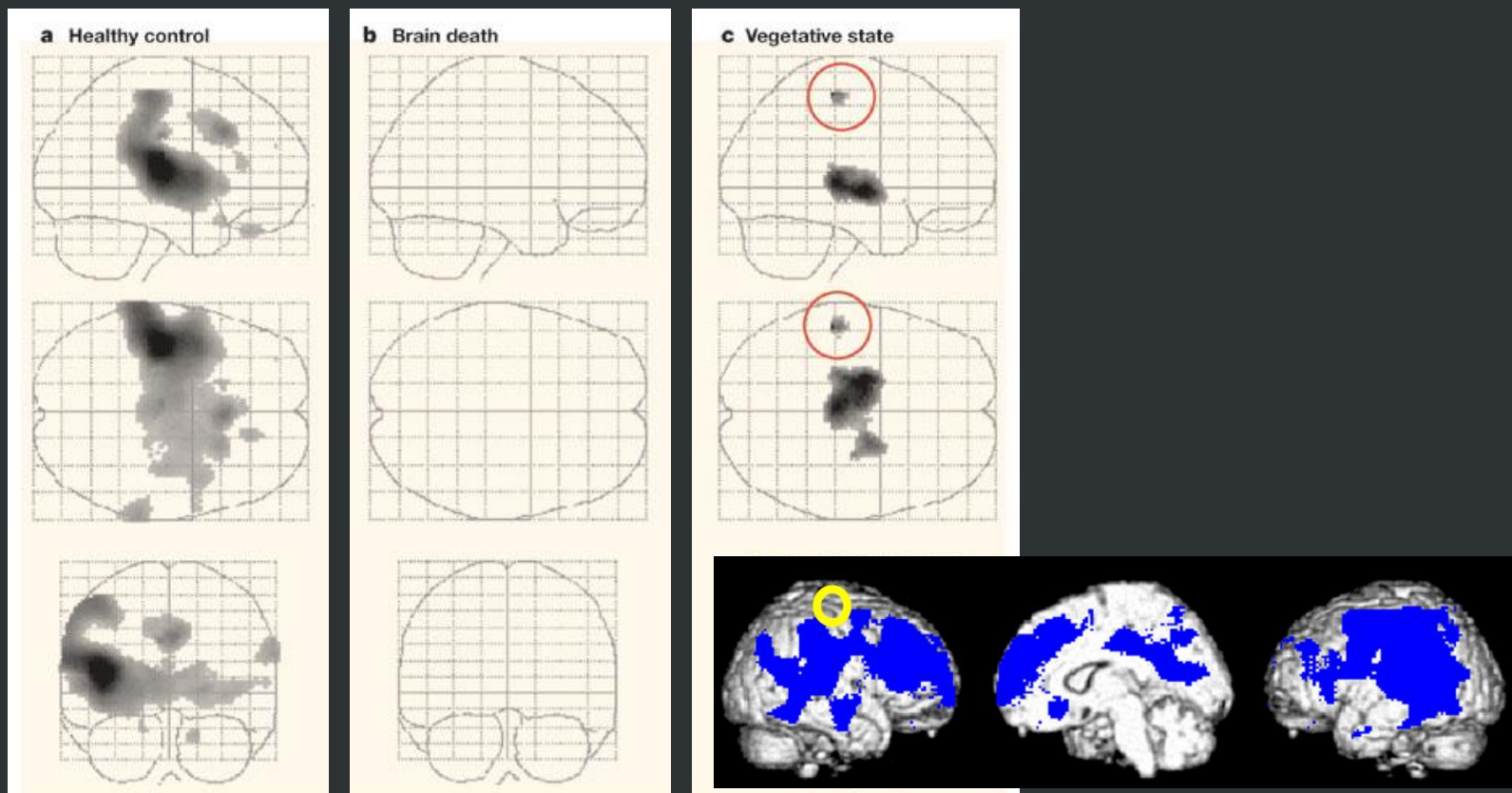


GRIMACING

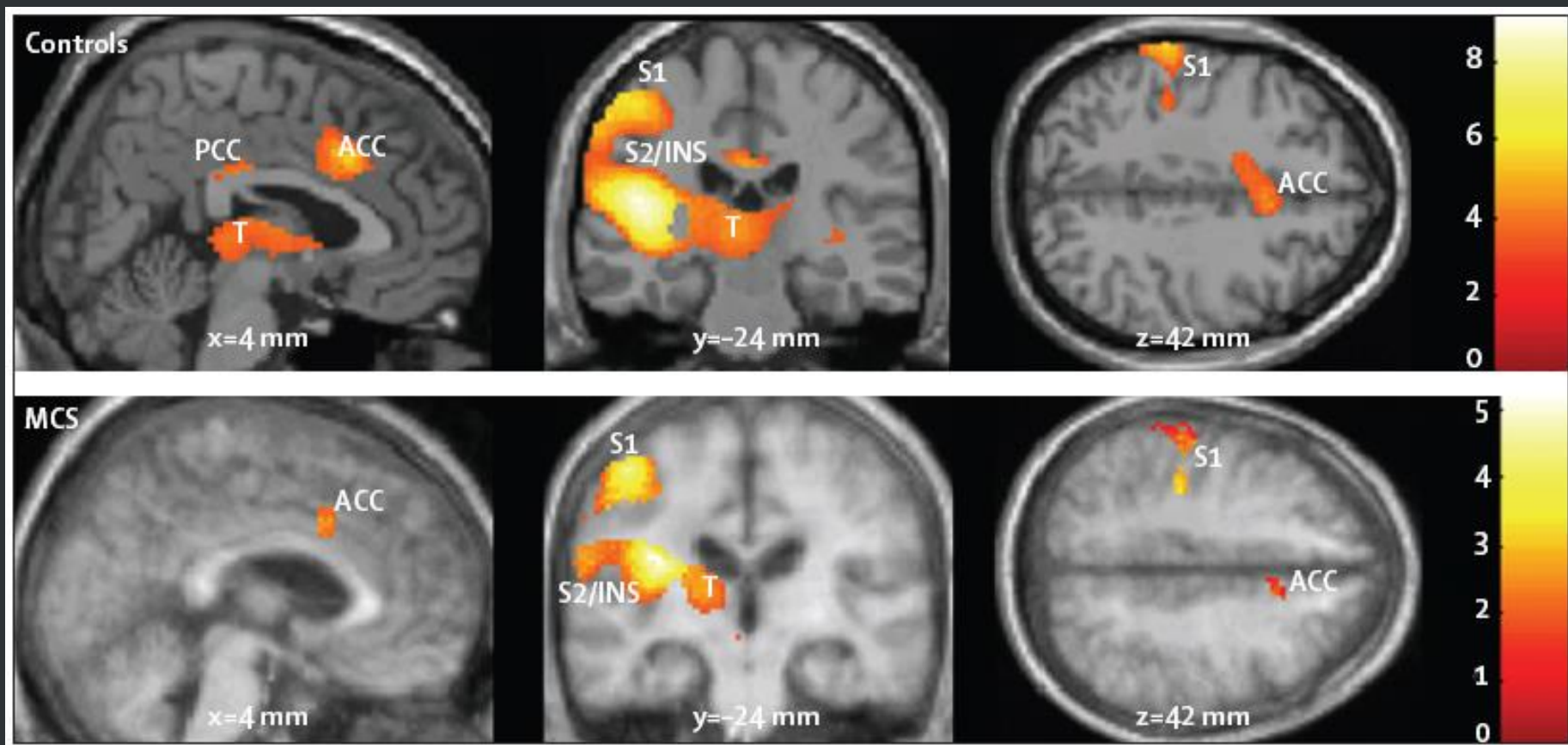


Douleur : mort cérébrale et VS

Stimulation nociceptive électrique



Douleur : état de conscience minimale



Evaluer la douleur

Nociception Coma Scale - Revised



NO RESPONSE



AWAKENING



GRIMACING

Motor response

- 3 - Localization to noxious stimulation
- 2 - Flexion withdrawal
- 1 - Abnormal posturing
- 0 - None/flaccid

Verbal response

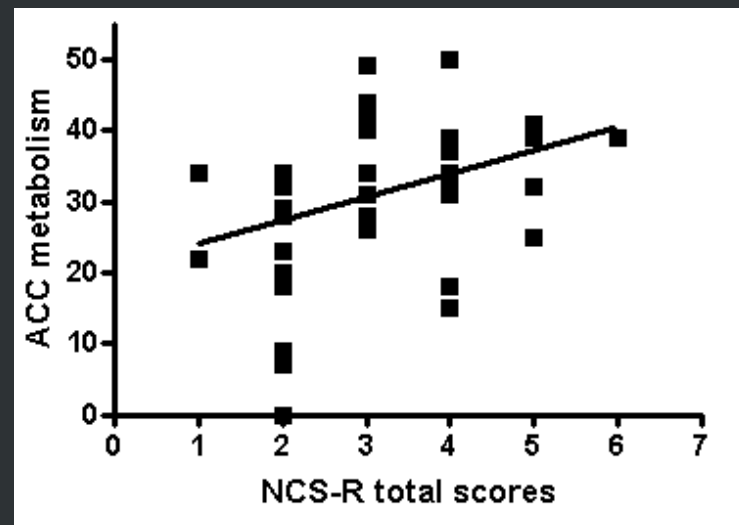
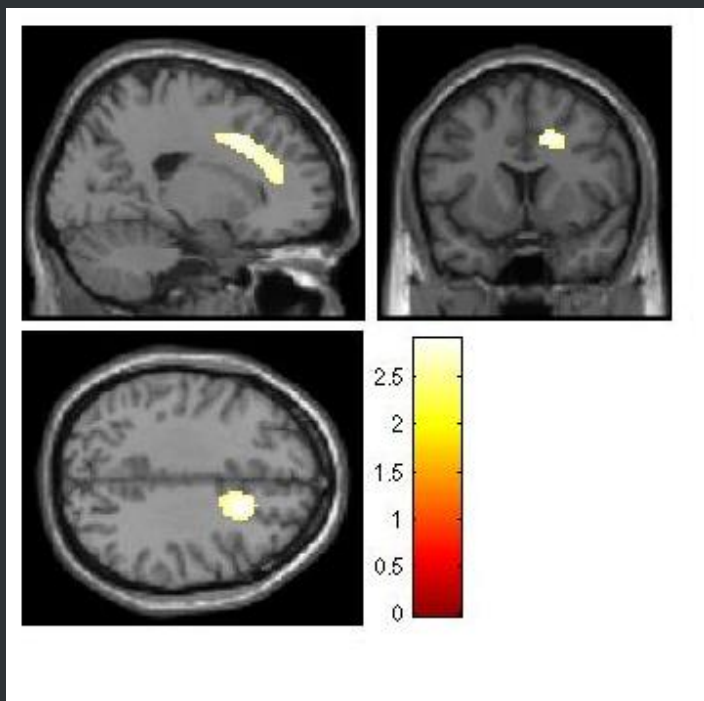
- 3 - Verbalisation (intelligible)
- 2 - Vocalisation
- 1 - Groaning
- 0 - None

Facial expression

- 3 - Cry
- 2 - Grimace
- 1 - Oral reflexive movement/startle response
- 0 - None

Score $>3/9$
= traitement
antalgique

Evaluer la douleur



Corrélation entre le métabolisme du cortex cingulaire antérieur (ACC – pain matrix) et le score à l'échelle d'évaluation de la douleur (NCS-R)

Nous entendent-ils?

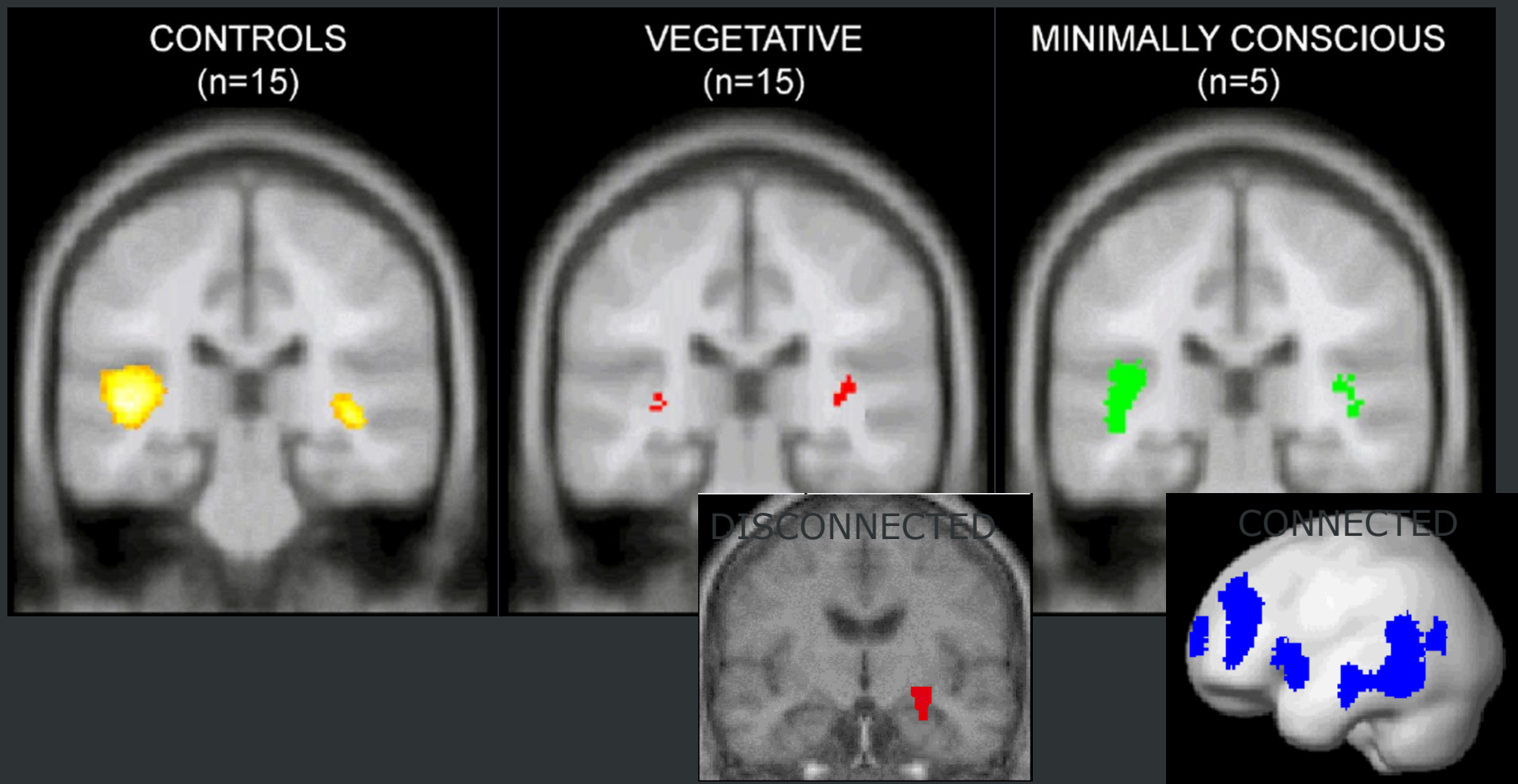


“Parle avec elle” (Hable con Ella)
Pedro Almodóvar

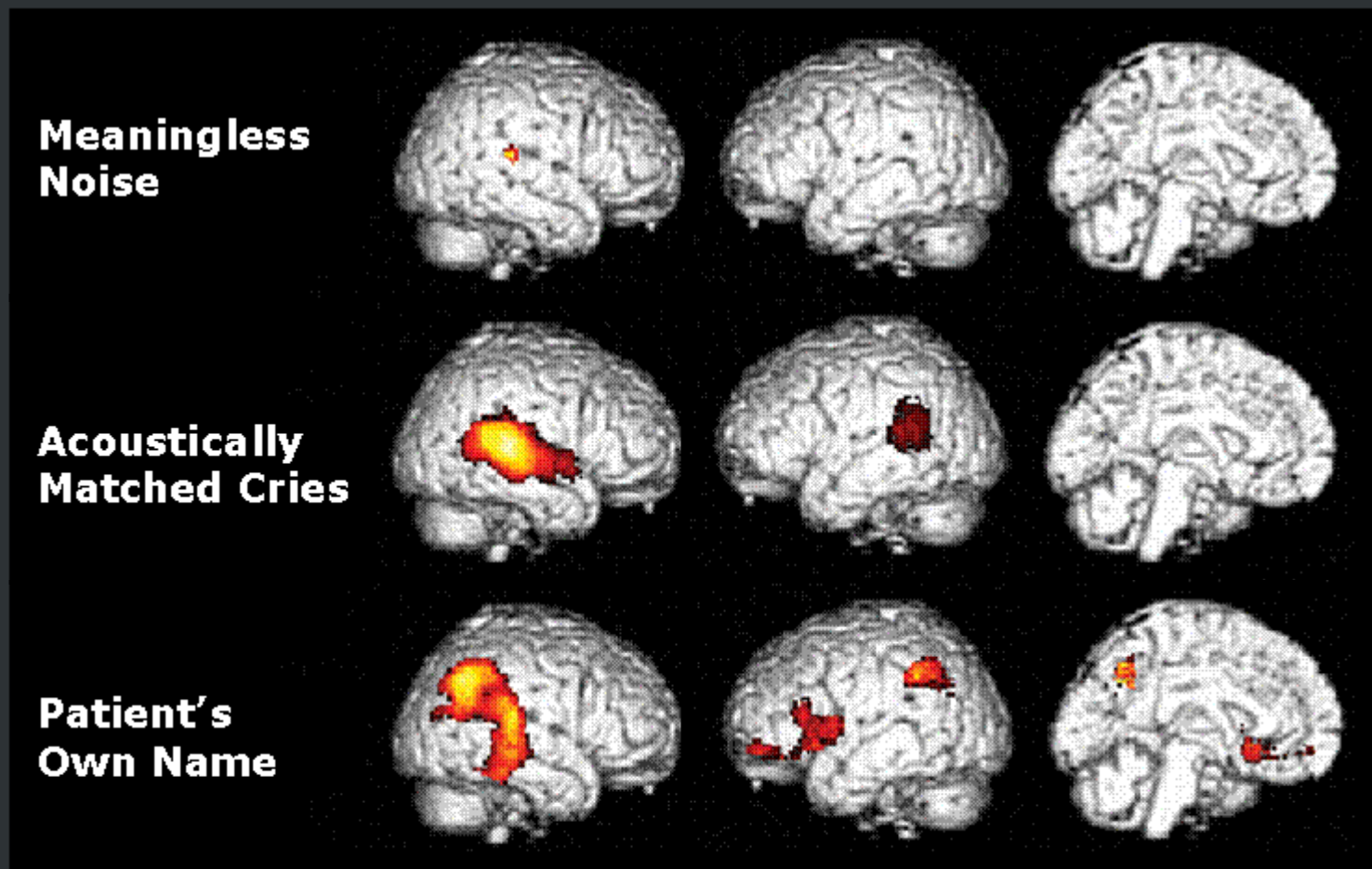
“...a (wo)men’s brain is a mystery...
and even more so in this state.”



Perception auditive



Emotions chez les patients en état de conscience minimale



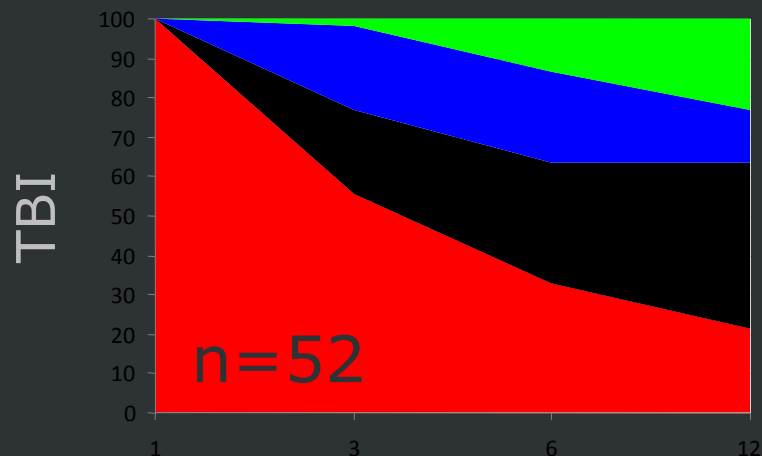
Pronostic



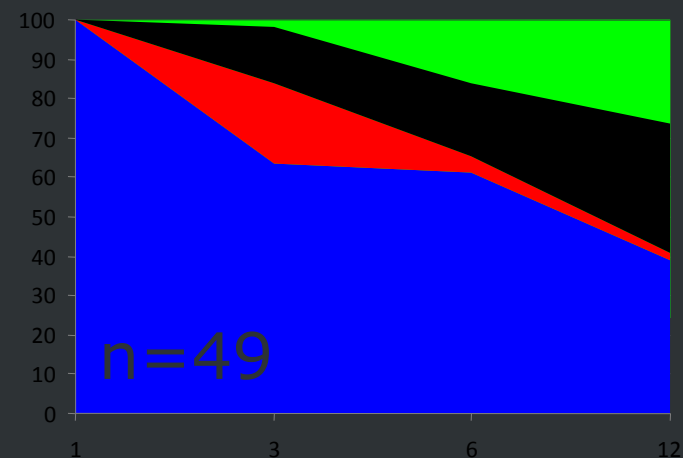
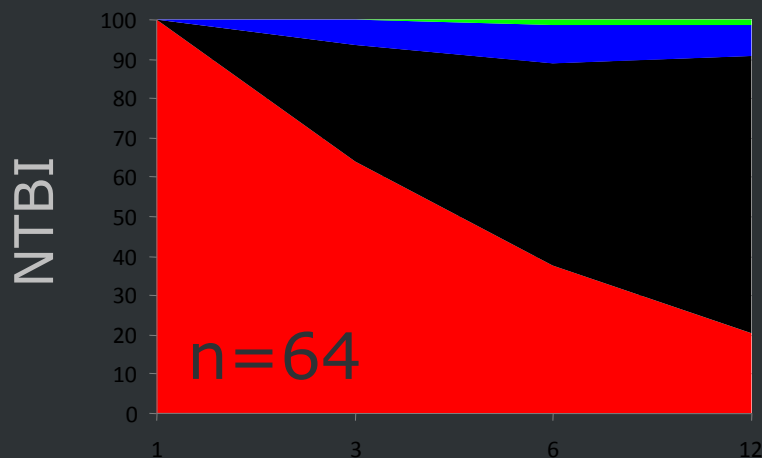
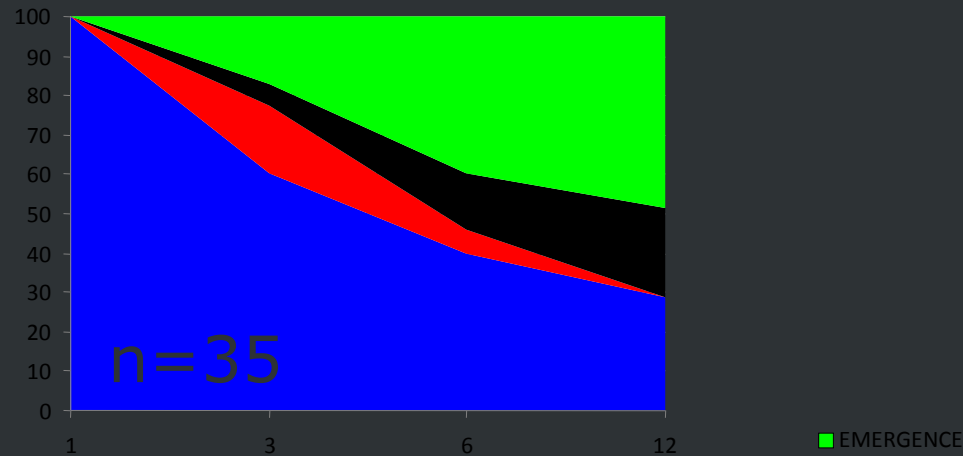
Laureys & Boly
What is it like to be vegetative or minimally conscious?
Curr Opin Neurol 20 (2007) 609-13

Pronostic (Projet fédéral belge)

VS/UWS (n=116)



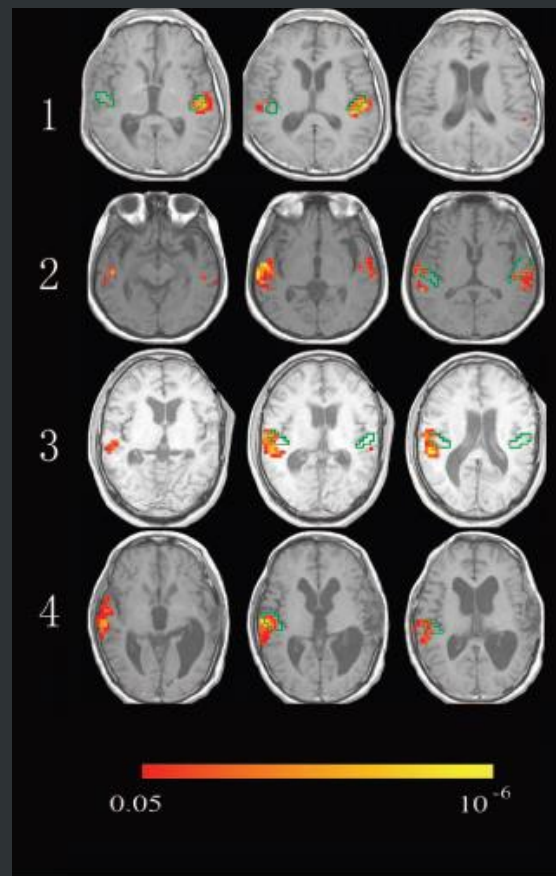
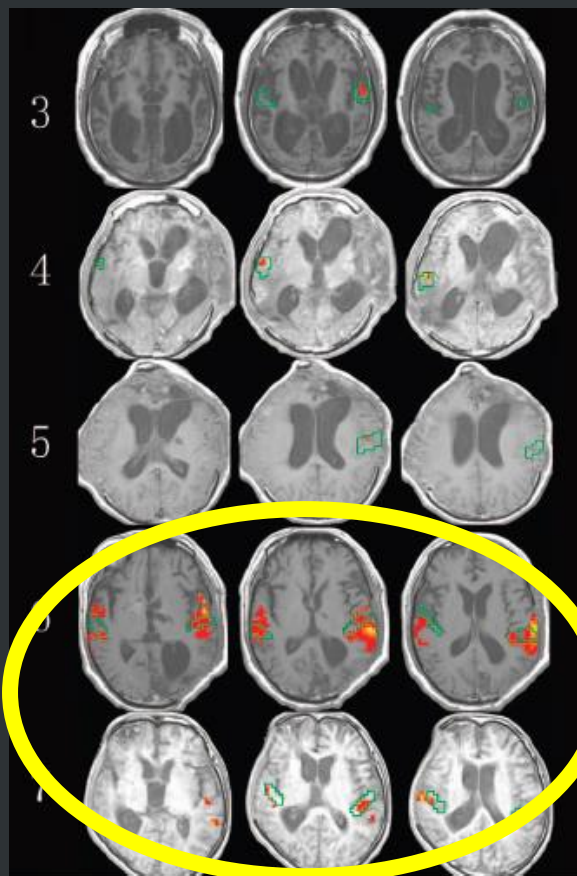
MCS (n=84)



Valeur pronostique de l'IRMf

VS/UWS

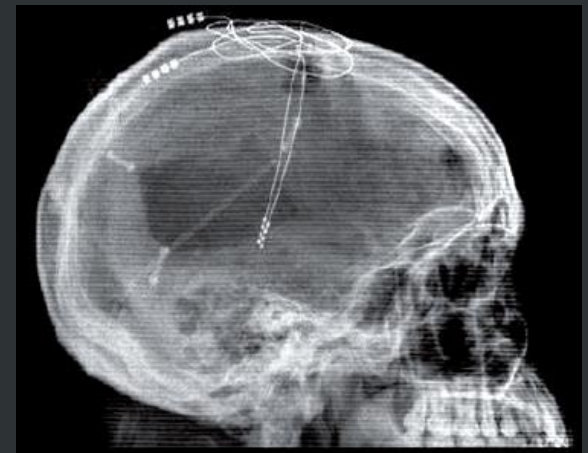
MCS



Activité
corticale
atypique
→ meilleur
pronostic

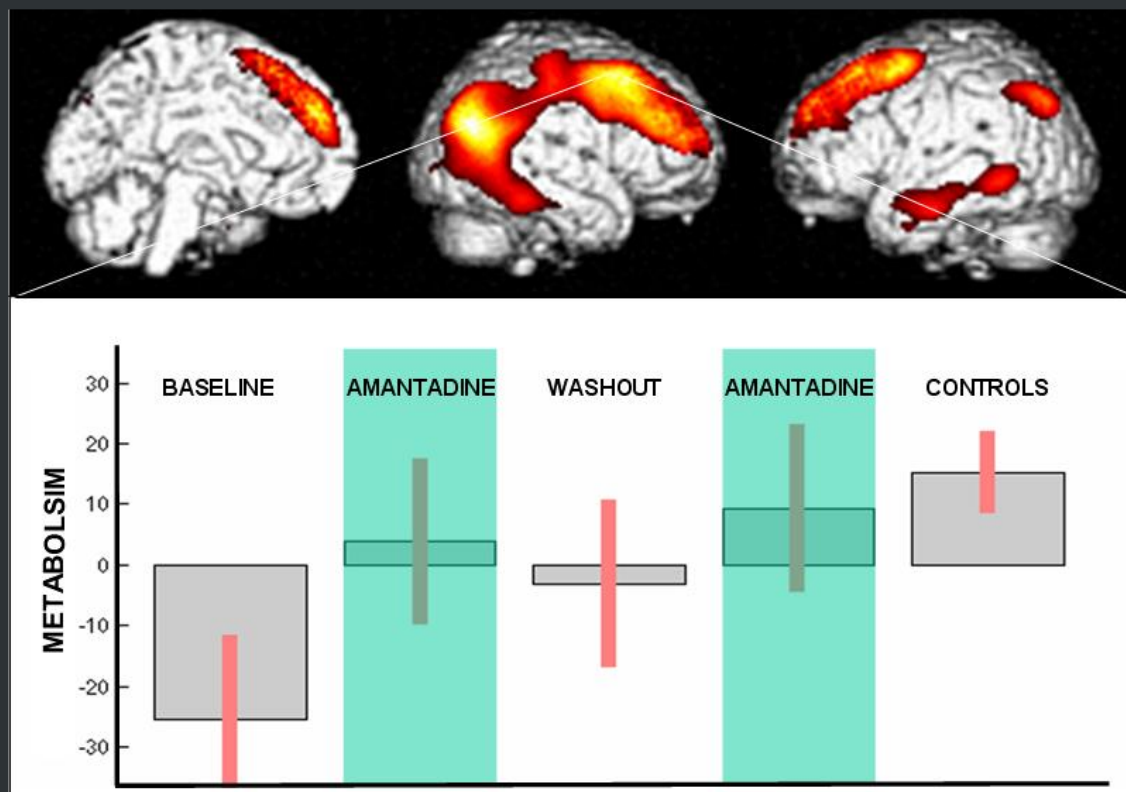


Traitements



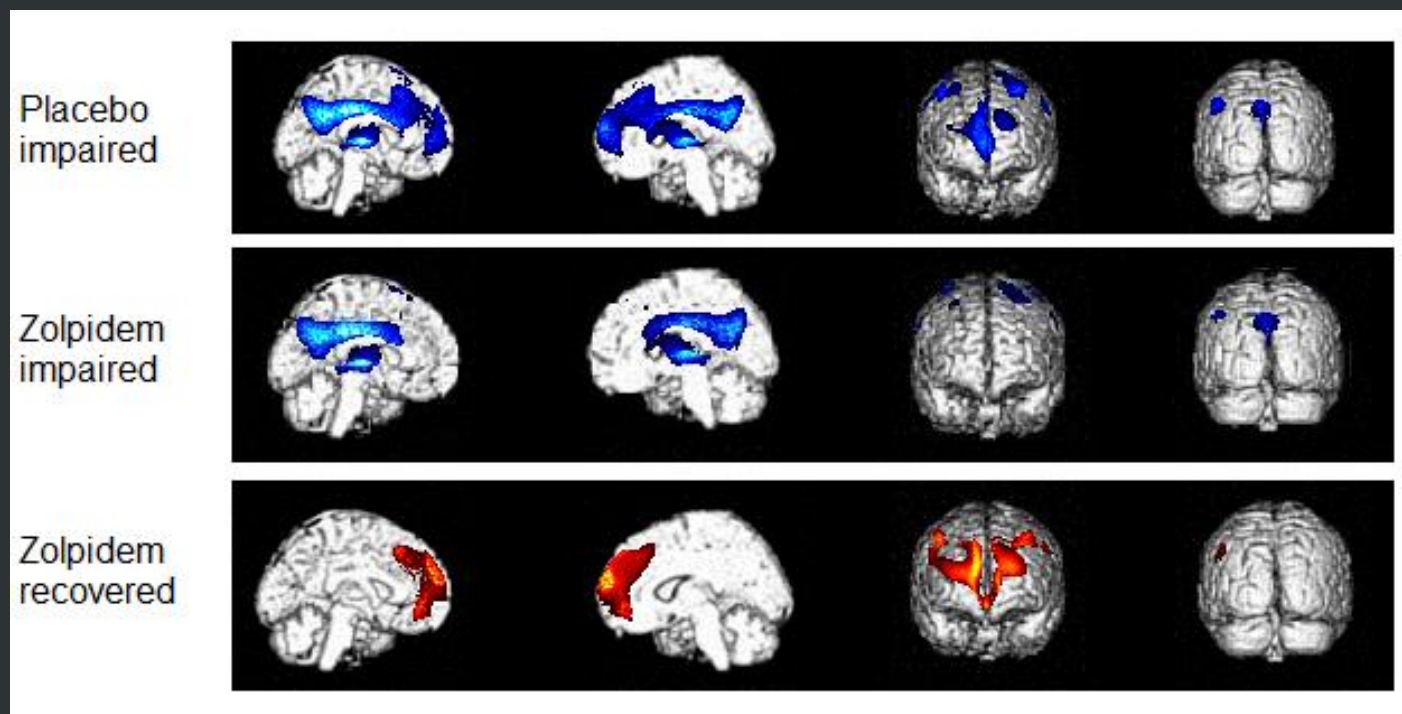
Amantadine

Agent dopaminergique (Parkinson)



Zolpidem

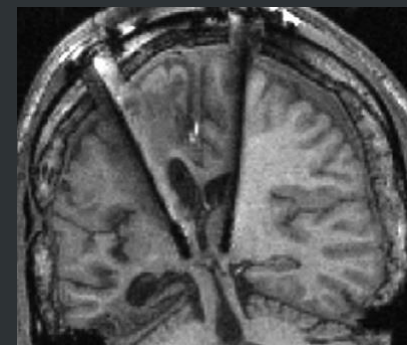
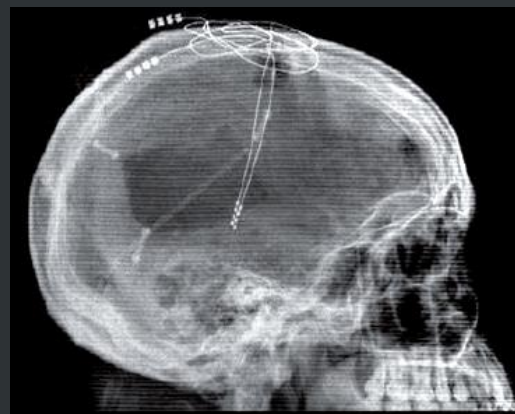
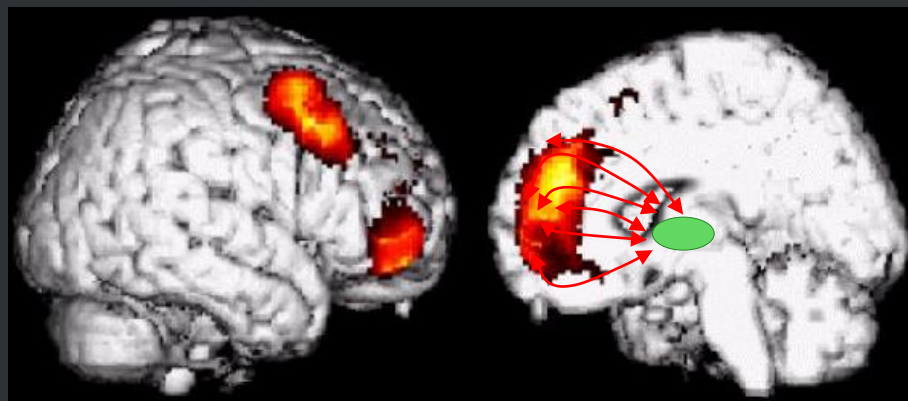
Agent sédatif (insomnie)



Stimulations cérébrales profondes

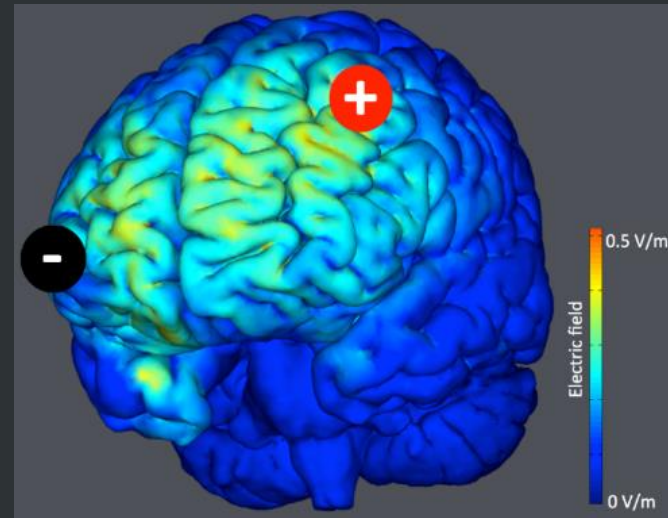
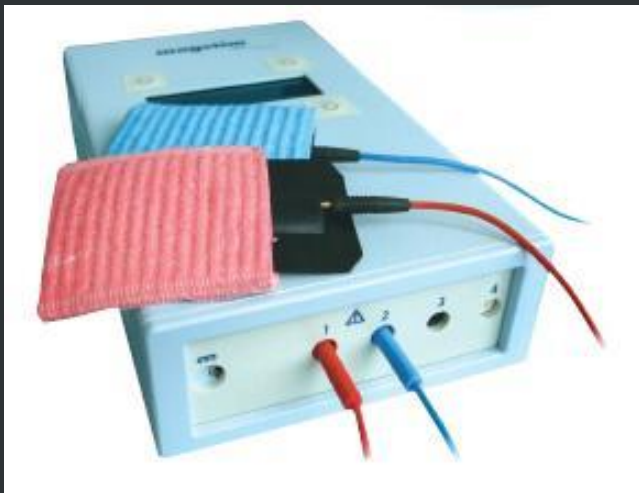
Récupération de la conscience =
recuperation de la connectivité
thalamo-corticale (préfrontal)

La stimulation des noyaux
intralaminaires induit la "récupération"
de l'état de conscience minimale



Stimulations non invasives

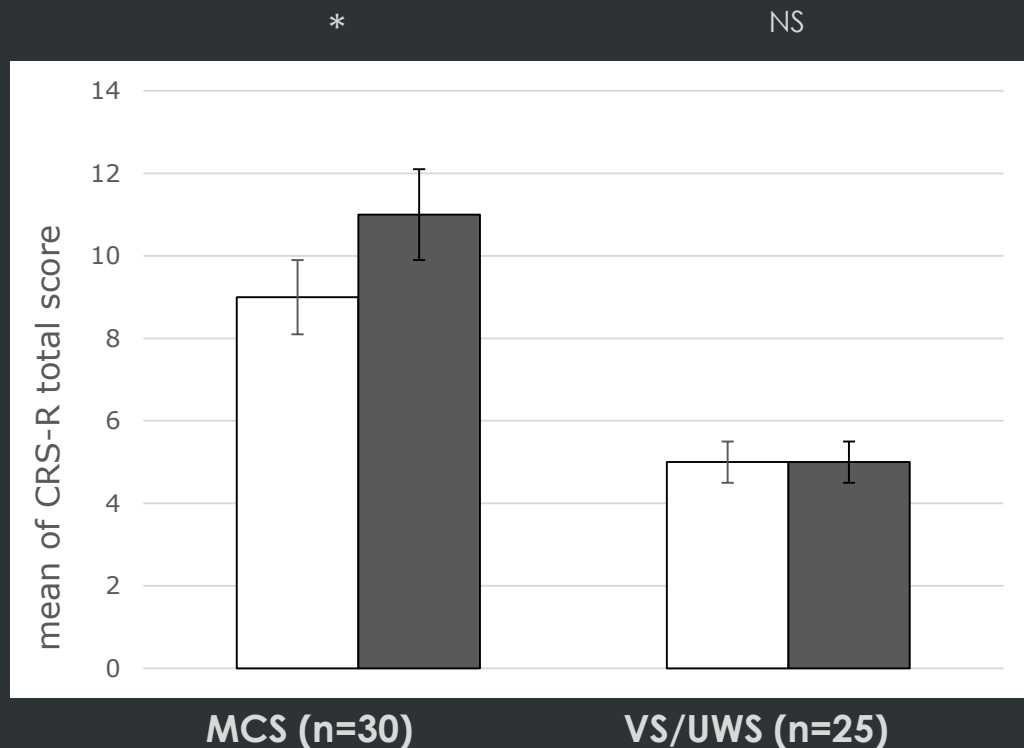
Stimulations transcrâniennes à courant continu



Courant continu de 2mA
20minutes sur le cortex préfrontal gauche

Stimulations non invasives

Stimulations transcrâniennes à courant continu



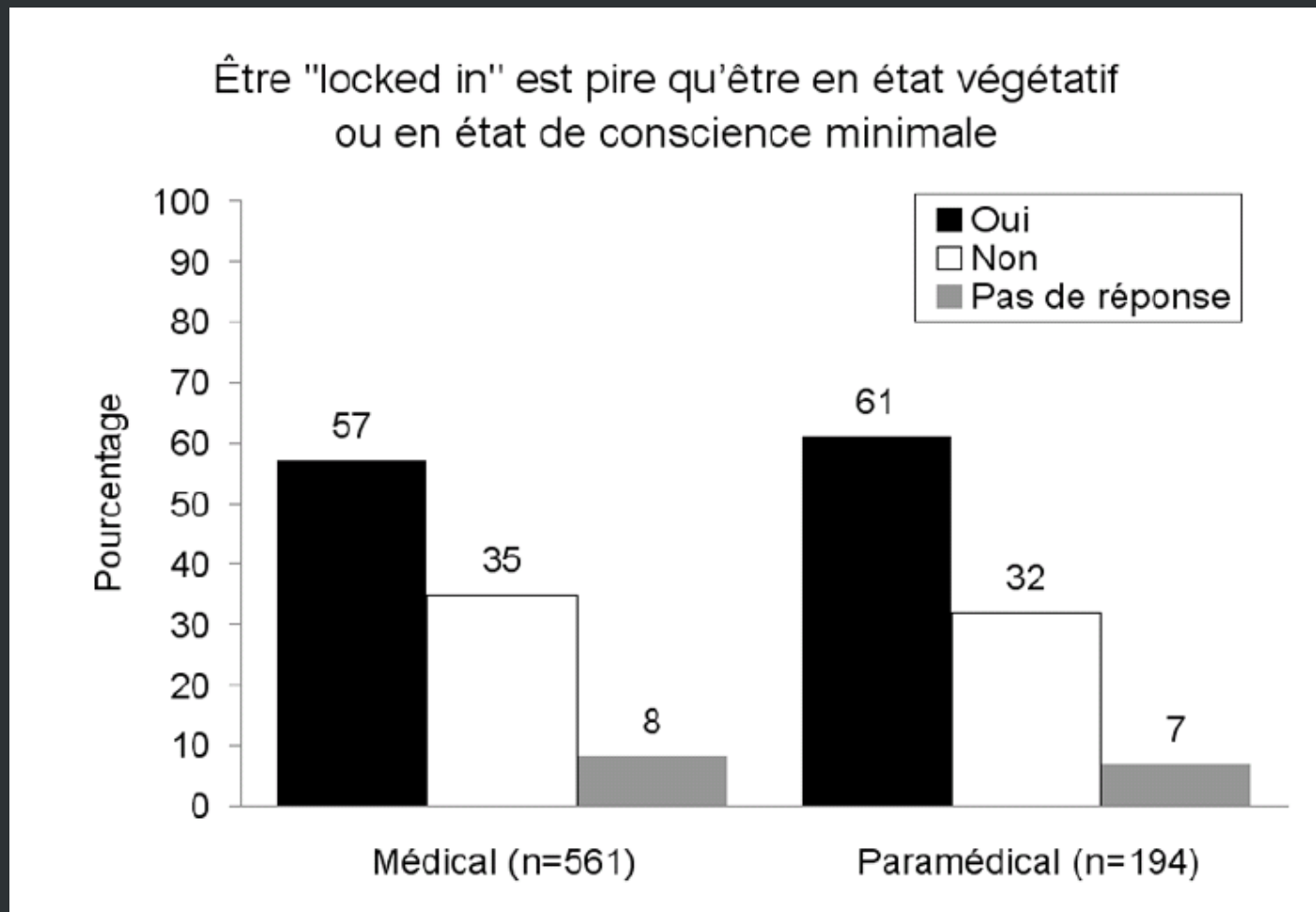
→ 15/55 répondants

- 2 UWS; acute
- 13 MCS
- 43% of MCS
- 5 > 1y post insult



Questions éthiques

Qualité de vie & LIS



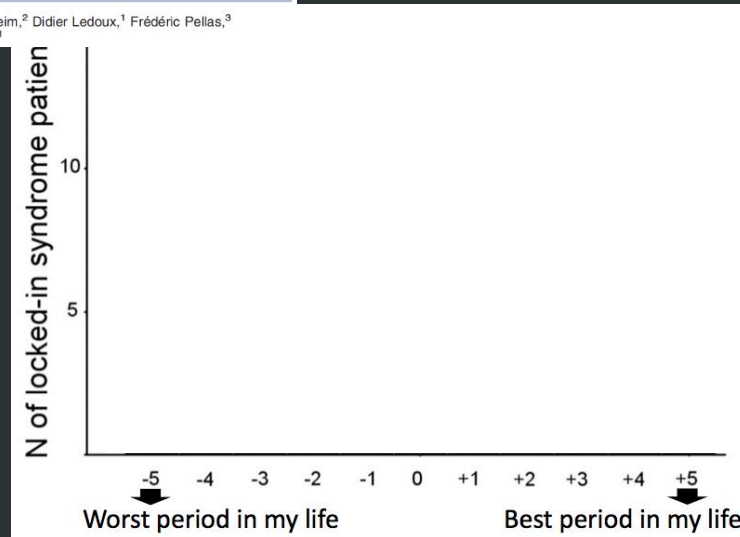
Qualité de vie & LIS

Open Access Research

BMJ open

A survey on self-assessed well-being in a cohort of chronic locked-in syndrome patients: happy majority, miserable minority

Marie-Aurélie Bruno,¹ Jan L Bernheim,² Didier Ledoux,¹ Frédéric Pellas,³ Athena Demertzi,¹ Steven Laureys¹

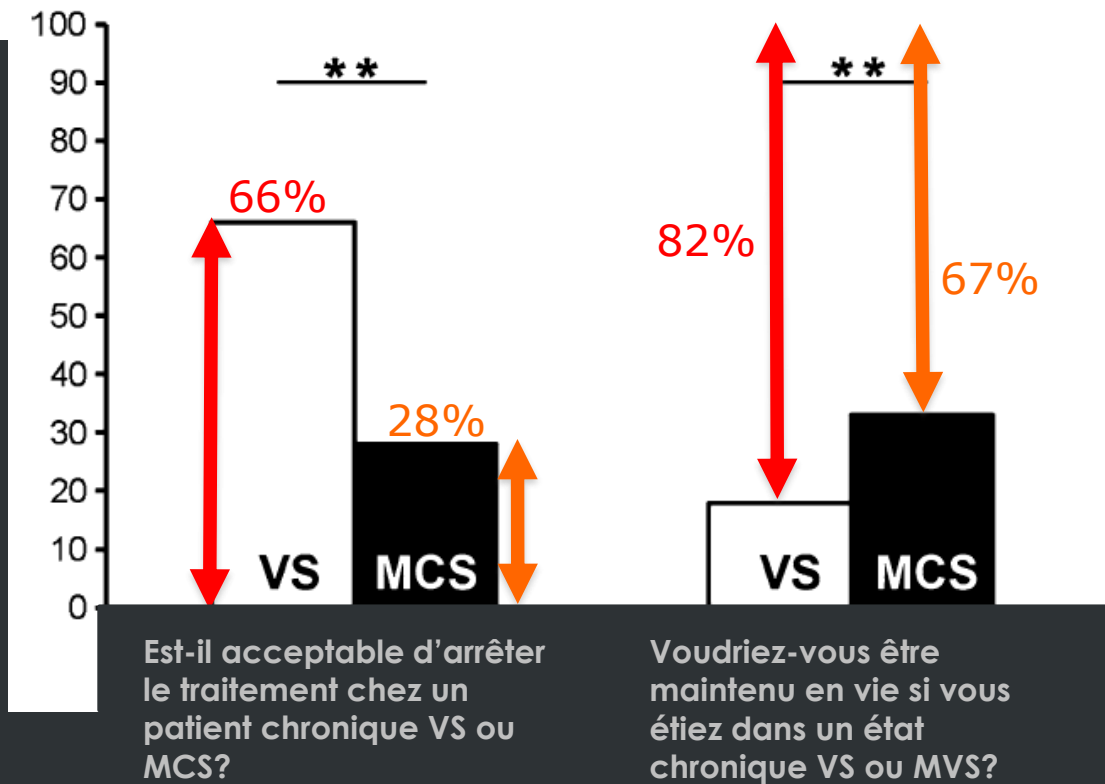


Décision de fin de vie

Attitudes towards end-of-life issues in disorders of consciousness: a European survey

A. Demertzi · D. Ledoux · M.-A. Bruno ·
 A. Vanhaudenhuyse · O. Gosseries · A. Soddu ·
 C. Schnakers · G. Moonen · S. Laureys

2475 professionnels
 médicaux

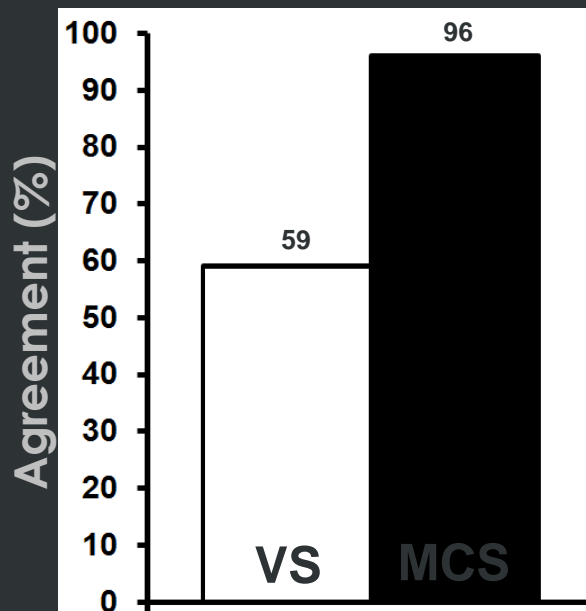


Est-il acceptable d'arrêter
 le traitement chez un
 patient chronique VS ou
 MCS?

Voudriez-vous être
 maintenu en vie si vous
 étiez dans un état
 chronique VS ou MCS?

Prise en charge de la douleur

Pensez vous que les patients en ...
ressentent la douleur?



Question Predictors	Odds Ratio	95% Confidence Interval		p value
Do you think VS patients feel pain?				
Age	1.01	1.00	1.02	.050
Women	1.25	.99	1.58	.060
Northern Europe	1.00			
Central Europe	.81	.58	1.14	.240
Southern Europe	1.10	.76	1.60	.600
Paramedical professionals	1.56	1.20	2.00	<.001
Religious respondents	1.37	1.10	1.70	.004
Do you think MCS patients feel pain?				
Women	2.38	1.33	4.26	.003
Religious respondents	1.83	1.05	3.18	.031

Predicted response: "agreement"



Conclusion

Conclusion

Coma ?

Diagnostic clinique (CRS-R)

Outils de neuroimagerie et d'électrophysiologie

Douleur & traitement

Questions éthiques



Merci !



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