

# Spécificité de la prise en charge de la spasticité chez le patient en état de conscience altérée

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Université de Liège

Symposium Prise en charge  
interdisciplinaire de la spasticité  
18 octobre 2014



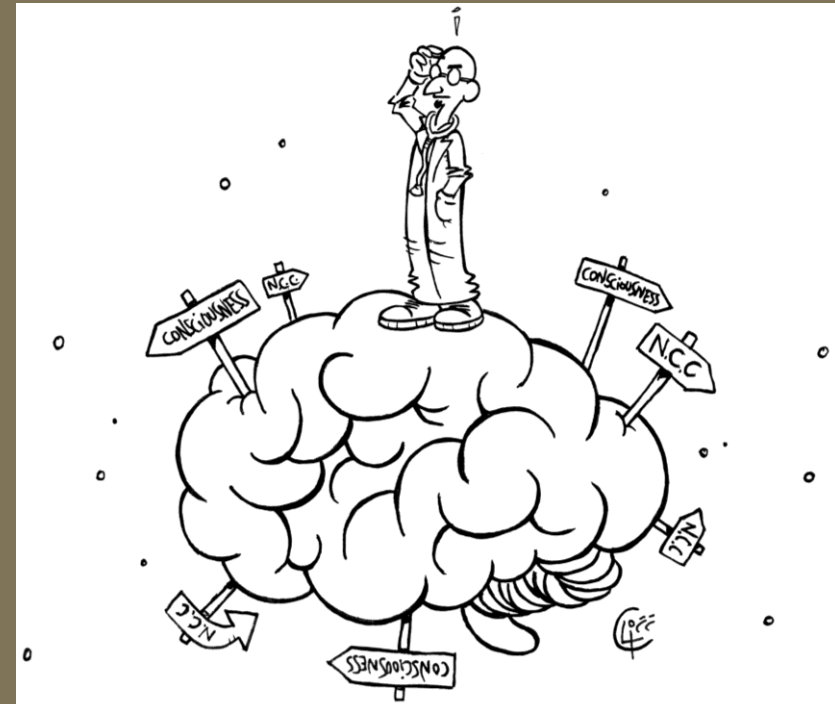
[www.comascience.org](http://www.comascience.org)



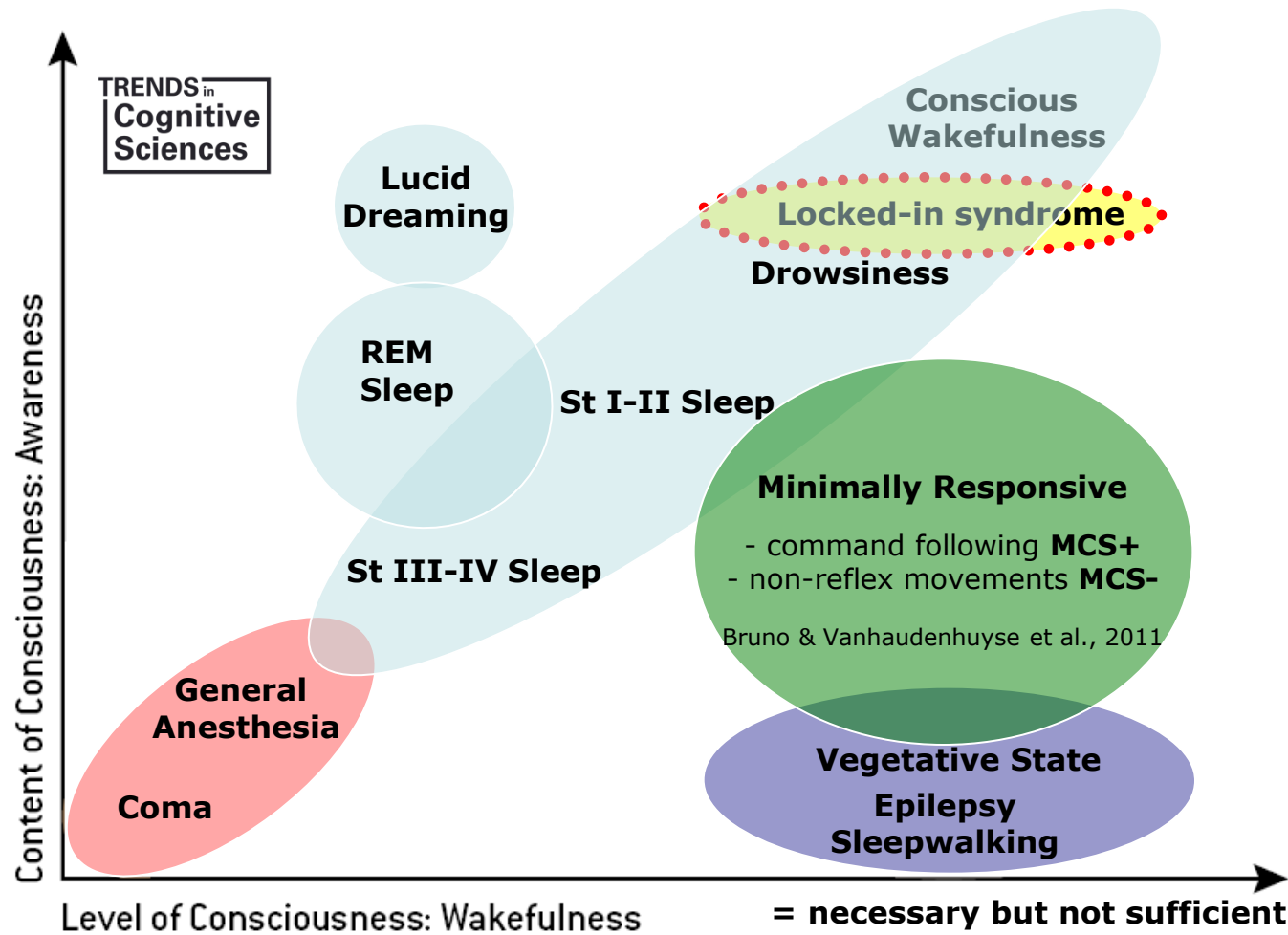
James S. McDonnell Foundation



# Consciousness

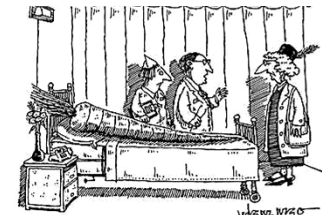


# Consciousness: 2 components



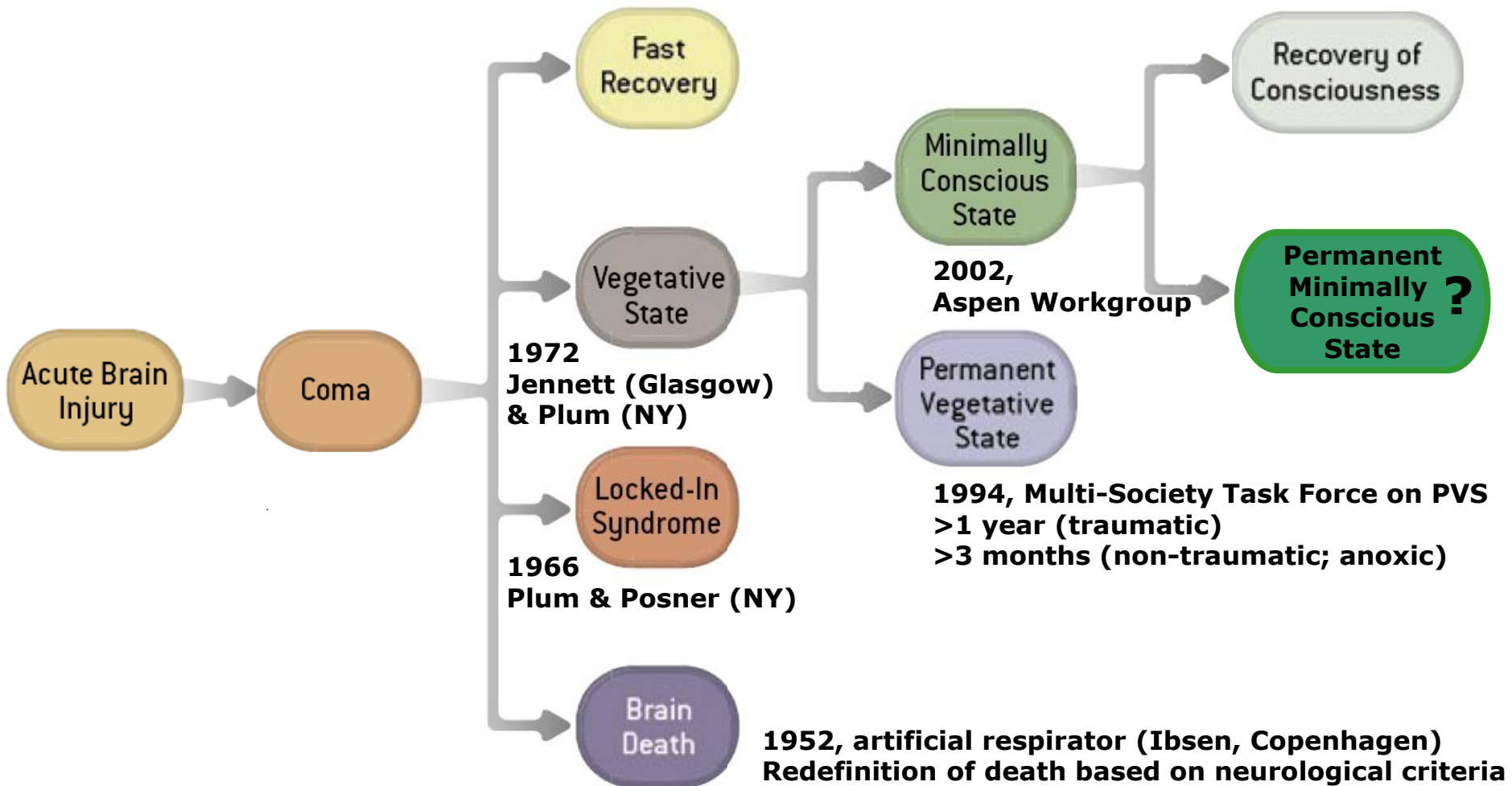
## Unresponsive Wakefulness Syndrome

Laureys et al., 2010



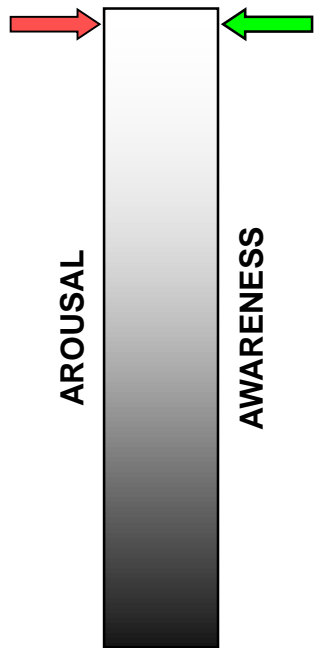
"There's nothing we can do... he'll always be a vegetable."

# Chronic disorders of consciousness

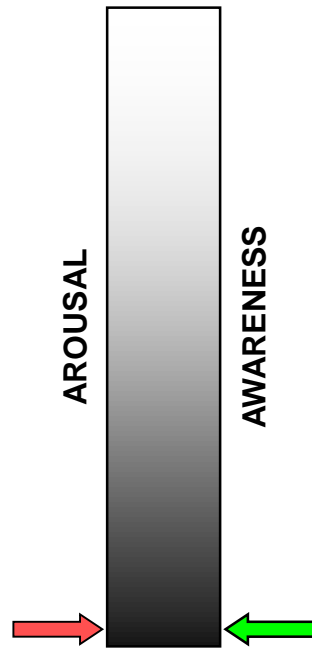


# Not all "coma"

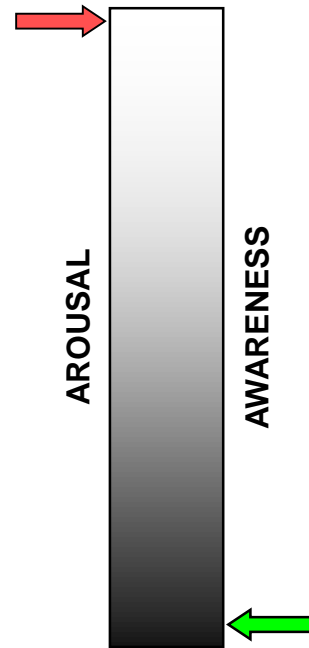
**NORMAL  
CONSCIOUSNESS**



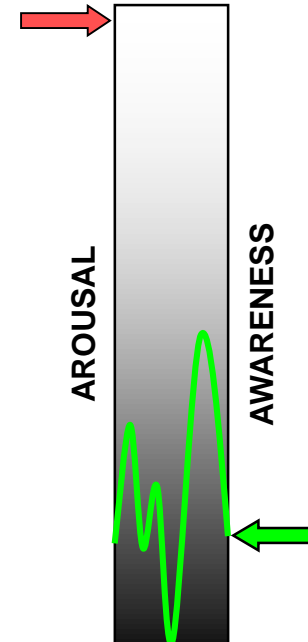
**COMA**



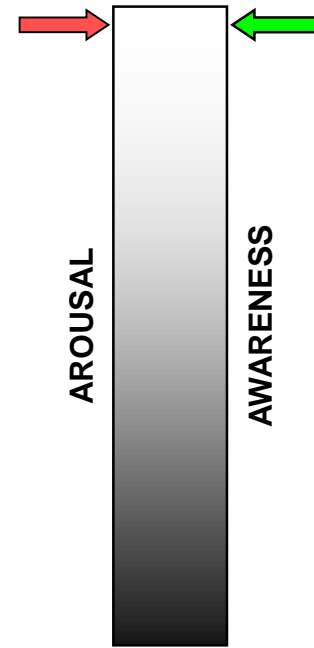
**VEGETATIVE STATE  
UNRESPONSIVE  
WAKEFULNESS  
SYNDROME**



**MINIMALLY  
CONSCIOUS  
STATE**

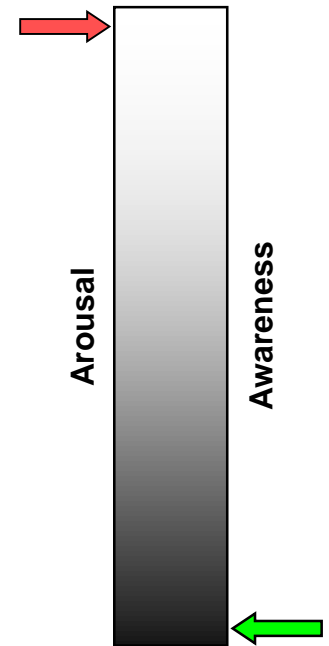


**LOCKED-IN  
SYNDROME**



# Vegetative state/Unresponsive

- No sign of consciousness
- No environment interaction
- No voluntary behavior in response to visual, auditive, tactile and painful stimuli
- No language comprehension – no language expression
- Wake-sleep cycle



# A new name for « vegetative »

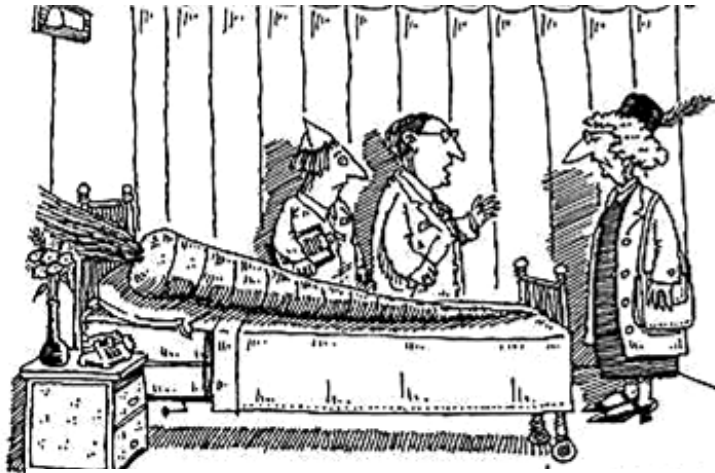


Highly accessed Open Access

## Unresponsive wakefulness syndrome: a new name for the vegetative state or apallic syndrome

Steven Laureys<sup>1</sup> ✉, Gastone G Celesia<sup>2</sup> ✉, Francois Cohadon<sup>3</sup> ✉, Jan Lavrijsen<sup>4</sup> ✉, José León-Carrión<sup>5</sup> ✉, Walter G Sannita<sup>6,7</sup> ✉, Leon Szabon<sup>8</sup> ✉, Erich Schmutzhard<sup>9</sup> ✉, Klaus R von Wild<sup>10,11</sup> ✉, Adam Zeman<sup>12</sup> ✉ and Giuliano Dolce<sup>13</sup> ✉ for the European Task Force on Disorders of Consciousness<sup>1</sup> ✉

<http://www.biomedcentral.com/1741-7015/8/68>



“There’s nothing we can do... he’ll always be a vegetable.”

## PERSISTENT VEGETATIVE STATE



## VEGETABLE MAN



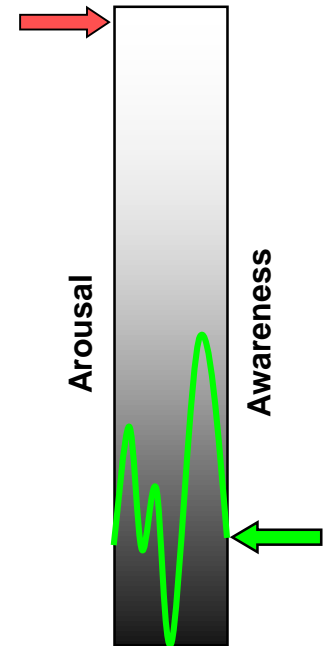
# Minimally conscious state

Limited but clearly discernible evidence of self or environmental awareness - one or more of the following behaviors:

- Following simple commands
- Intelligible verbalization.
- Purposeful behavior that occur in contingent relation to environmental stimuli:
  - appropriate smiling
  - appropriate vocalizations or gestures
  - reaching for objects
  - touching or holding objects
  - visual pursuit

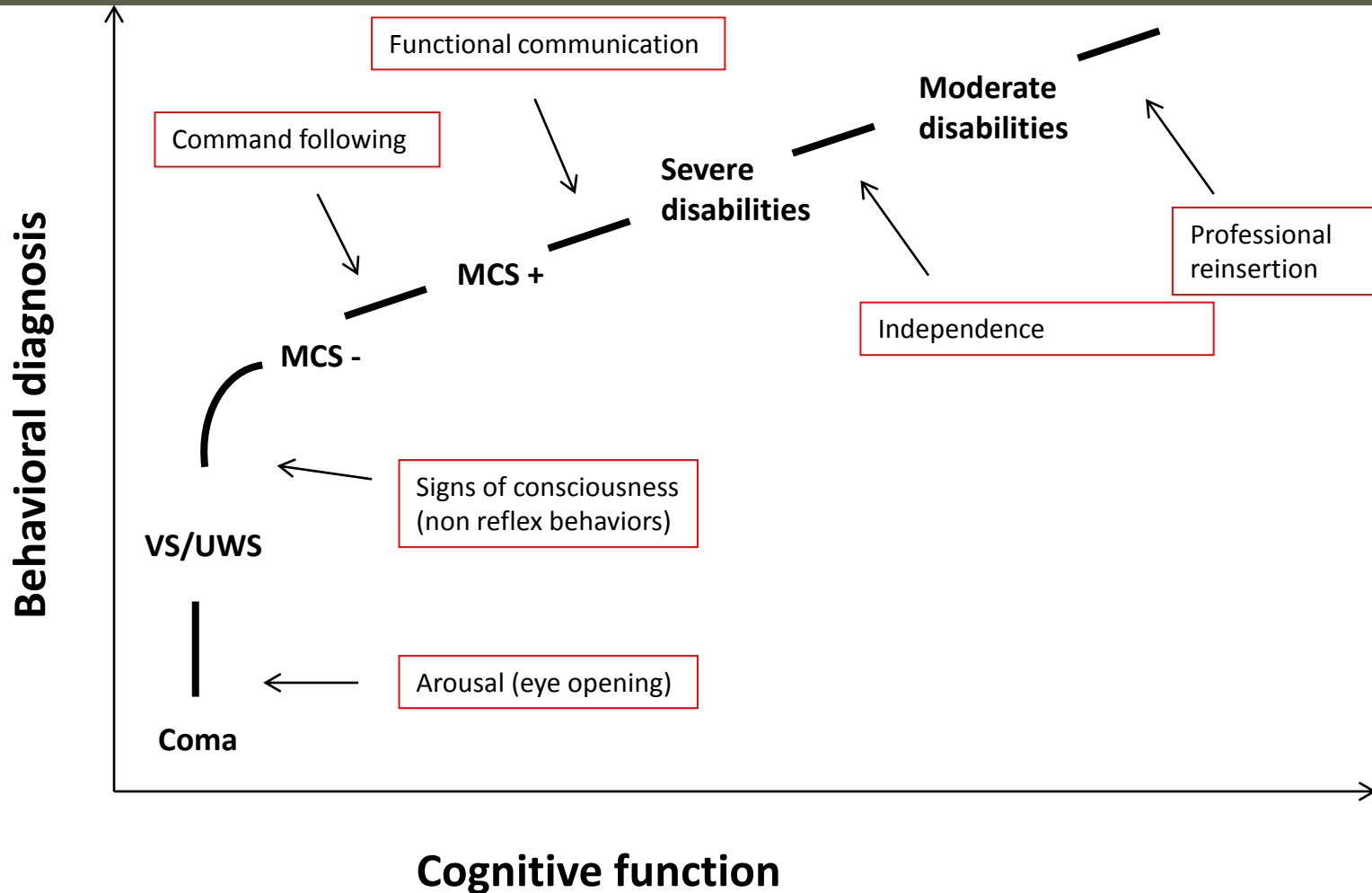
Emergence from MCS:

- Functional interactive communication
- Functional use of two different objects





# Recovery



# Diagnostic error

n=103 post-comatose patients

- 45 clinical consensus diagnosis 'vegetative state'
- 18 signs of awareness (Coma Recovery Scale-Revised)

 **41% potential misdiagnosis**

New studies → ± 30%

# Coma Recovery Scale

## JFK COMA RECOVERY SCALE - REVISED ©2004

Record Form

<b>Patient:</b>	<b>Date:</b>						
<b>AUDITORY FUNCTION SCALE</b>							
4 - Consistent Movement to Command *							
3 - Reproducible Movement to Command *							
2 - Localization to Sound							
1 - Auditory Startle							
0 - None							
<b>VISUAL FUNCTION SCALE</b>							
5 - Object Recognition *							
4 - Object Localization: Reaching *							
3 - Visual Pursuit *							
2 - Fixation *							
1 - Visual Startle							
0 - None							
<b>MOTOR FUNCTION SCALE</b>							
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

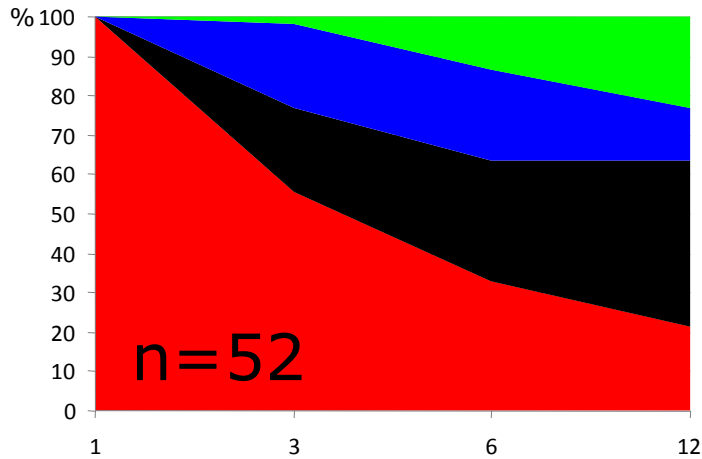
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coma@chu.ulg.ac.be

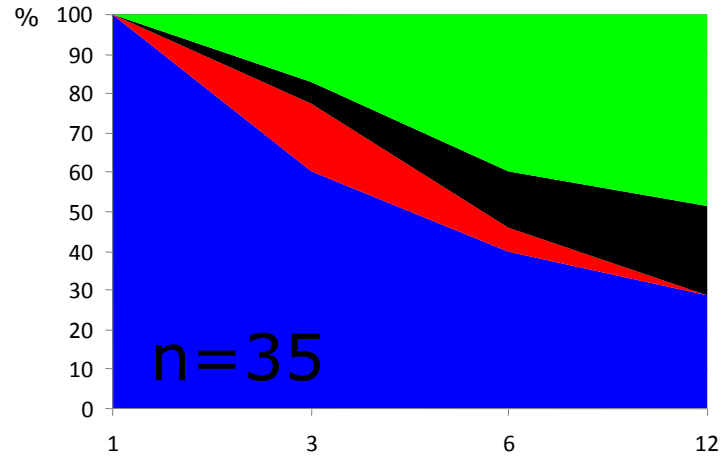


# Pronostic (Belgium Federal Project)

VS/UWS (n=116)

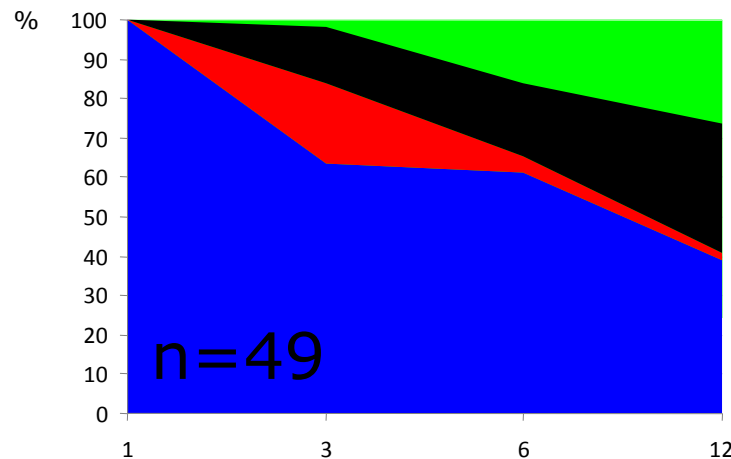
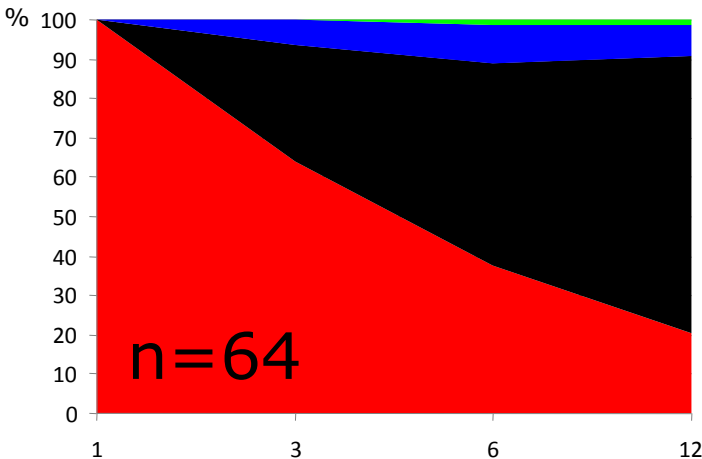


MCS (n=84)



TBI

NTBI



- EMERGENCE
- MCS
- Dead
- VS



# Pain in disorders of consciousness



**NO RESPONSE**



**AWAKENING**



**GRIMACING**

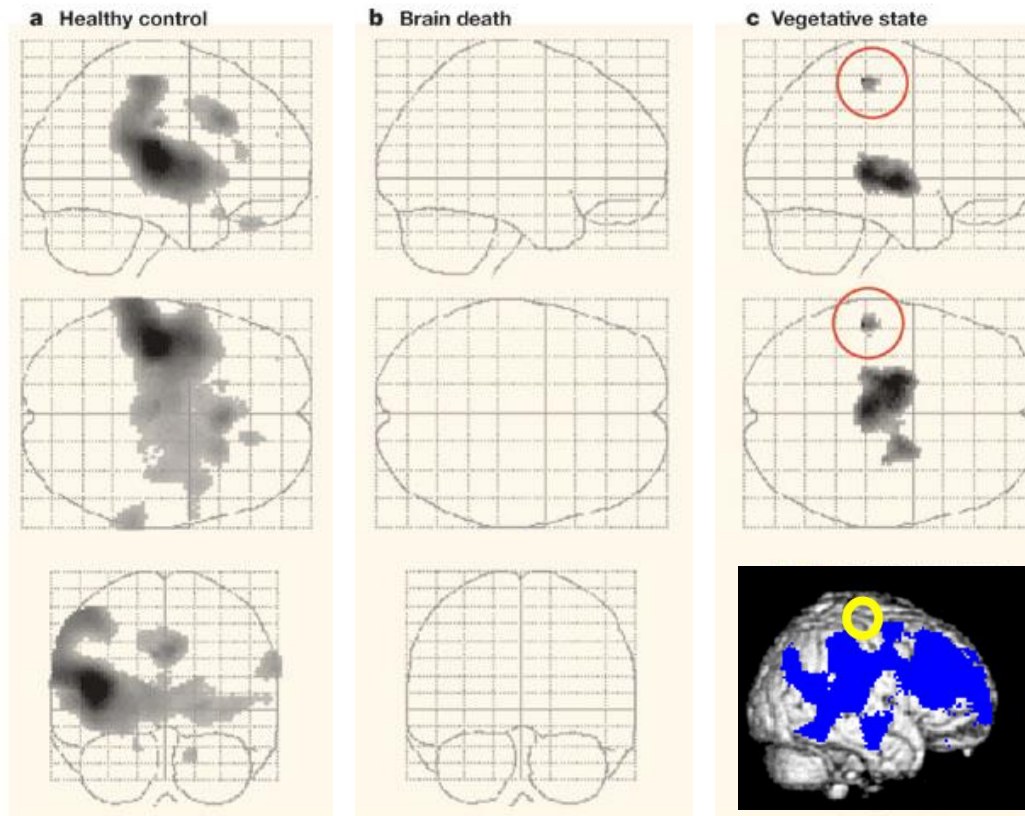
**COMA**

SCIENCE GROUP

[www.comascience.org](http://www.comascience.org)

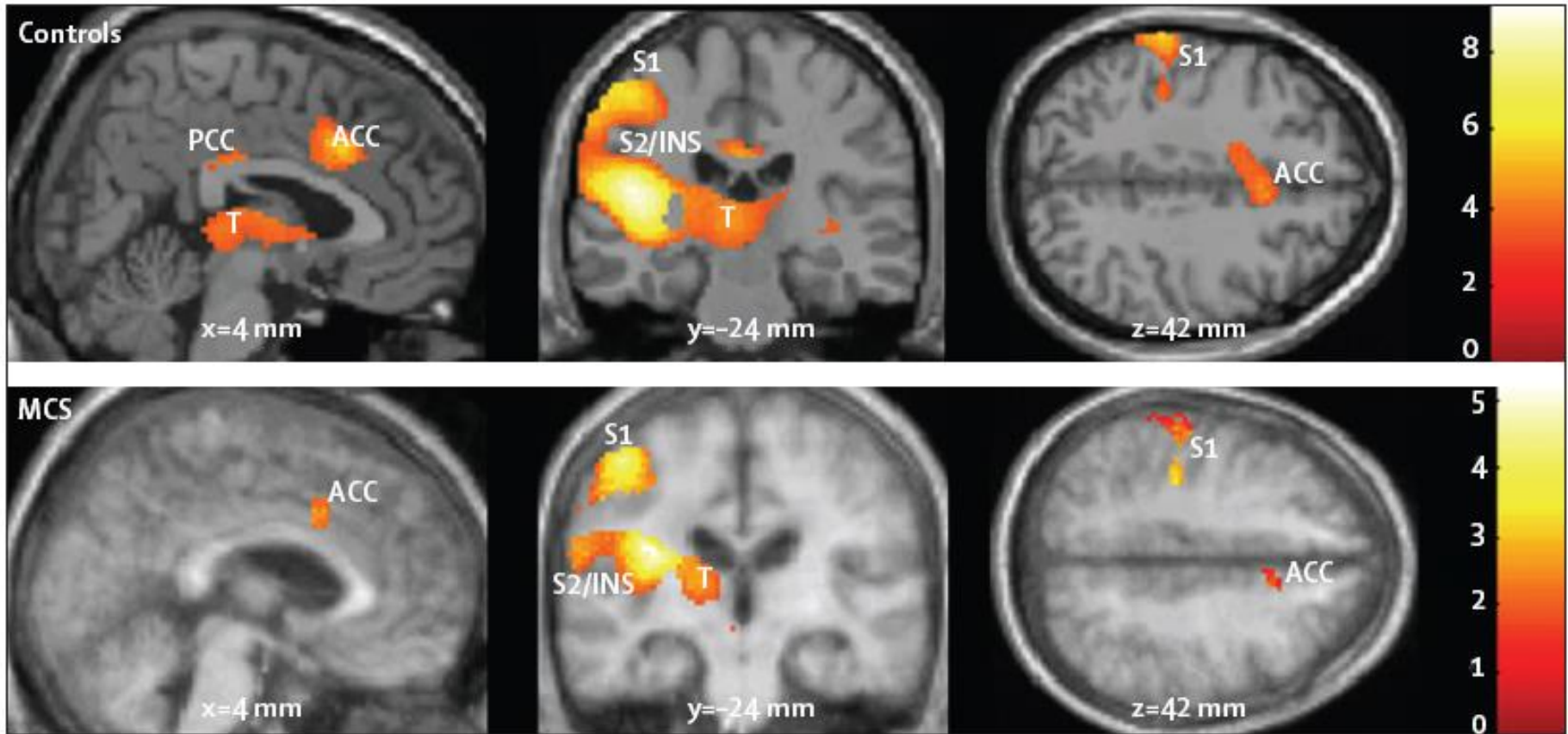
# Pain in brain death & VS/UWS

Noxious electrical stimulation



Low level  
disconnected  
cortical activation

# Pain in minimally conscious state



# BUT...

Subject number	Sex	Age	ACC	AI	S2	S1	Thalamus	PI	Cerebellum
1	F	52	-	-	+	+	-	-	+
2	F	29	-	+	+	+	+	+	+
3	M	46	-	-	+	-	+	-	+
4	M	29	+	+	+	+	+	+	+
5	F	31	+	+	+	+	+	+	+
6	F	35	+	+	+	-	-	+	-
7	M	32	+	+	+	+	+	+	-
8	M	62	-	-	+	-	-	+	-
9	F	47	-	-	-	+	-	+	-
10	M	52	-	+	+	+	-	+	-
11	F	58	-	-	+	+	-	-	-
12	M	48	+	+	+	+	-	-	-
13	F	28	+	+	+	+	+	+	+
14	M	33	-	+	+	+	-	+	+
15	M	54	-	-	+	-	-	-	-



# Nociception and pain

## Nociception Coma Scale - Revised



### *Motor response*

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

### *Verbal response*

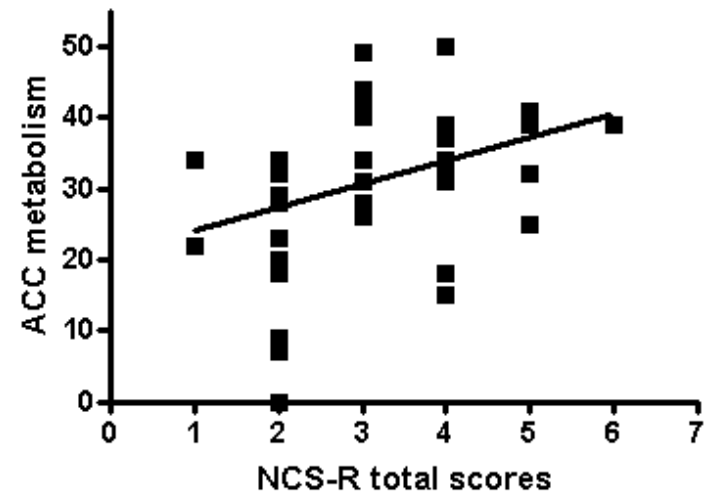
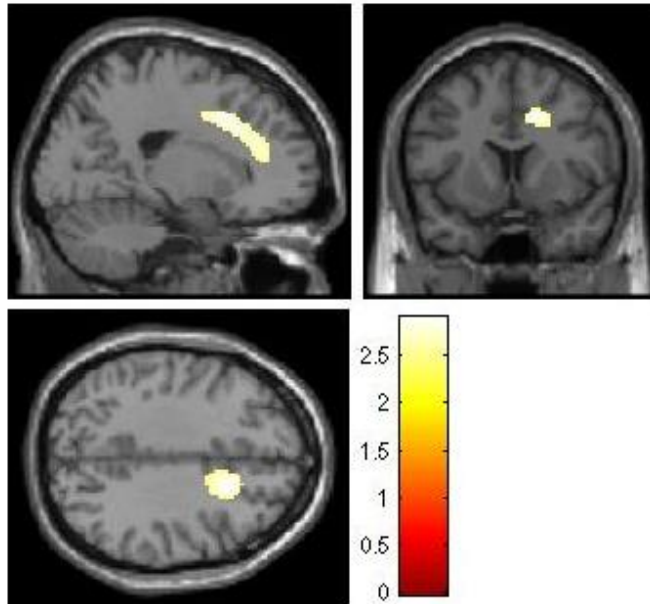
- 3 - Verbalisation (intelligible)
- 2 - Vocalisation
- 1 - Groaning
- 0 - None

### *Facial expression*

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

Score  $> 3/9$   
= analgesic  
treatment

# Nociception Coma Scale - Revised



Correlation between brain metabolism in anterior cingulate cortex (ACC-pain matrix) and Nociception Coma Scale Revised

# Spasticity in disorders of consciousness



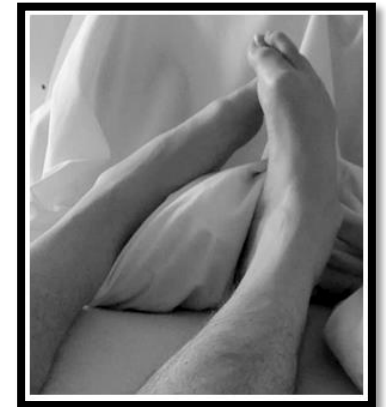
# Spasticity & upper motor neuron syndrome

➔ Exaggeration of myotatic reflex leading to an involuntary muscle contraction after muscle stretching or a permanent muscle contraction due to an alteration of 1<sup>st</sup> motoneuron (CNS) in the spinal cord or in the brain

**Aggravating factors:** Velocity of stretching  
Fatigue & stress  
Infection & pain



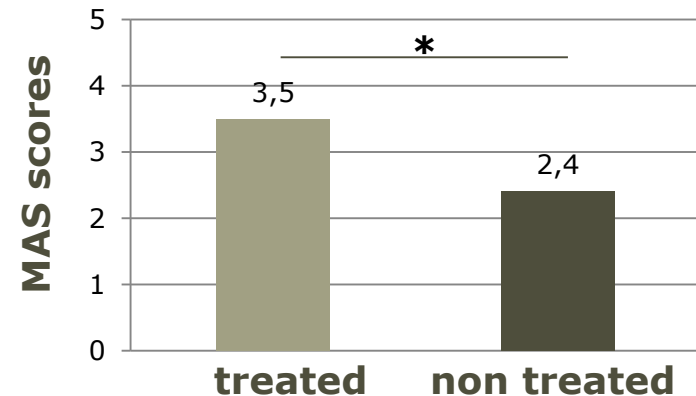
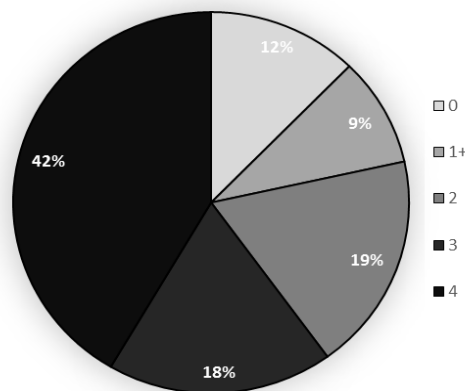
**Side effects:** Muscle retraction (↓ sarcomeres)  
Irreversible stiffness of joints  
Vicious positions and pain



# Spasticity in DOC

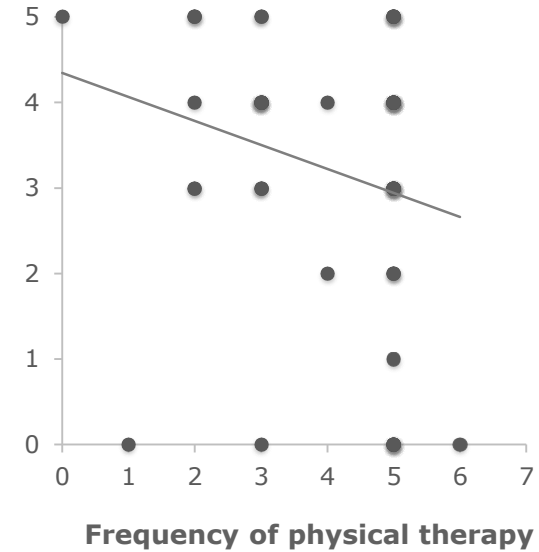
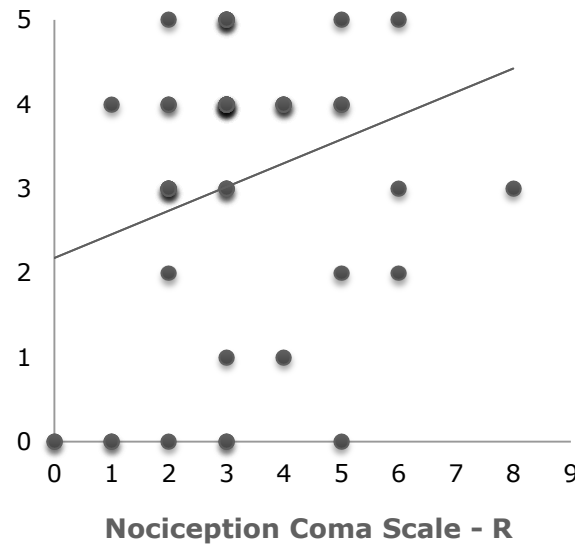
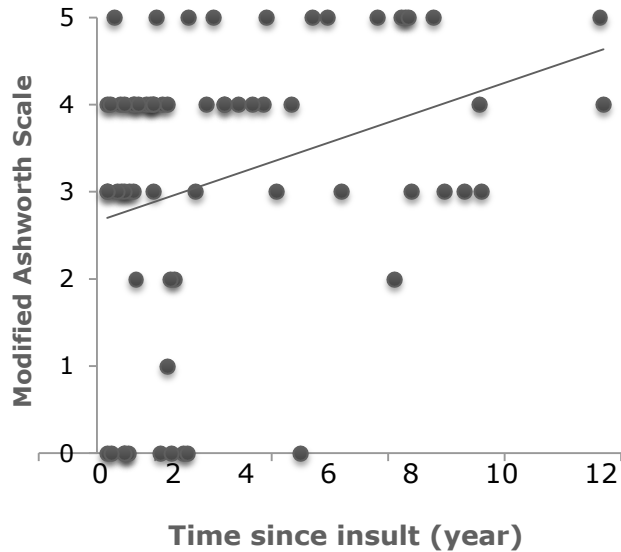
65 sub-acute & chronic VS/UWS and MCS patients

- **88%** (n=57) suffered from spasticity (MAS $\geq$ 1) and **60%** (n=39) suffered from severe spasticity (MAS $\geq$ 3)
- **Diagnosis** : no  $\neq$  ; VS/UWS = MCS
- **Treatment** : treated > non-treated (p=0.03)
- **Joint fixation** : MAS higher if tendon retraction (p<0.001) or equinovarus feet (p<0.001)



# Spasticity in DOC

- **Time since insult:** positively correlated with MAS scores ( $p=0.006$ )
- **Pain** (*Nociception Coma Scale Revised* - NCS-R) : positively correlated with MAS scores ( $p=0.01$ )
- **Physical therapy** (frequency per week): negative correlation with MAS scores ( $p=0.01$ )



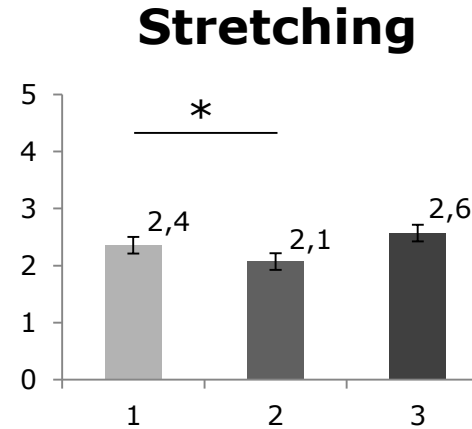
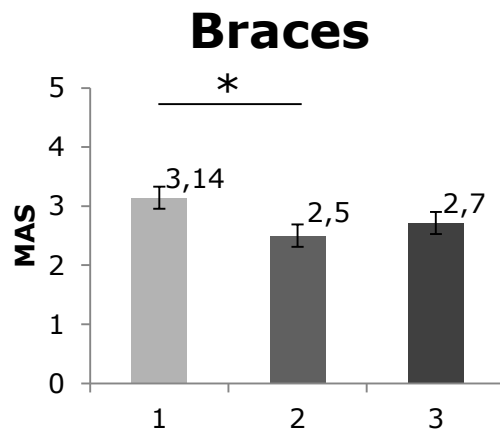
# Study: soft braces

- **AIM:** Test the efficacy of soft braces on spastic upper limb to reduce spasticity in chronics VS/UWS & MCS
- **Brace:** polyurethane roll in the palm of the hand
- **3 technics :**
  1. soft braces
  2. stretching
  3. no treatment
- **Assessments:** **Modified Ashworth Scale (MAS)**  
Tardieu scale  
Amplitudes (fingers/wrist/elbow)  
Length finger-palm

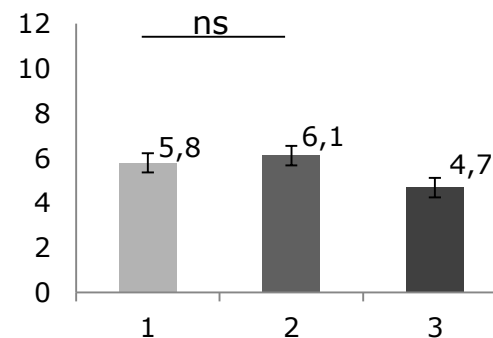
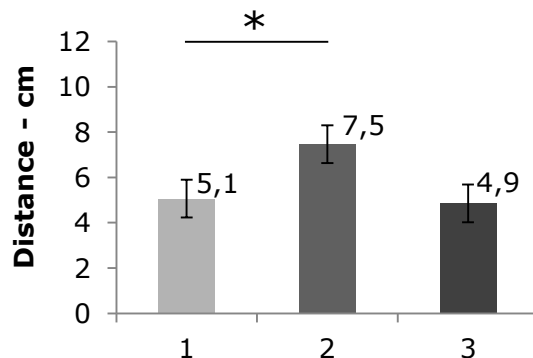


# Results

→ Spasticity decreases after both treatments (fingers flexors)



→ Braces increases hand opening (length finger-palm)



■ Pre-treatment  
 ■ Post-treatment  
 ■ 60min  
 I : SE



# Advantages

## Clinical benefits:

- Spasticity decrease on fingers flexors
- Increase of hand opening
- Better improvement for patients without tendon retraction

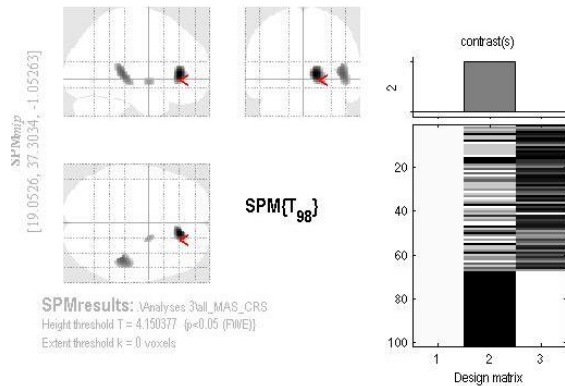
## Advantages:

- Easy to apply
- Patient can be alone
- Soft
- Comfortable
- Serveral hours per day

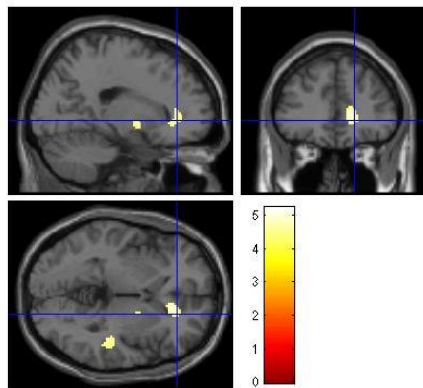
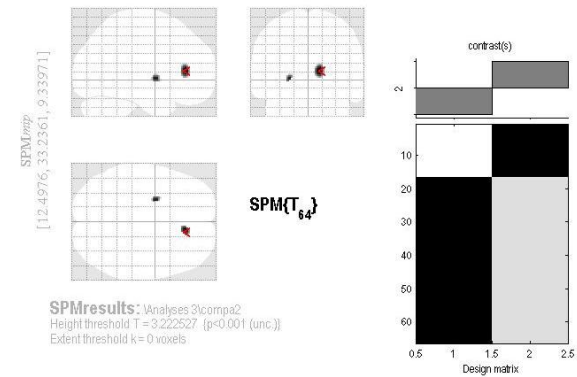


# Brain metabolism

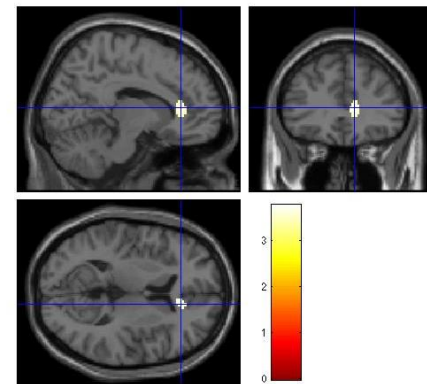
Positive correlation between MAS score and brain metabolism



Comparison between spastic and non-spastic patients



ACC  
→ pain?



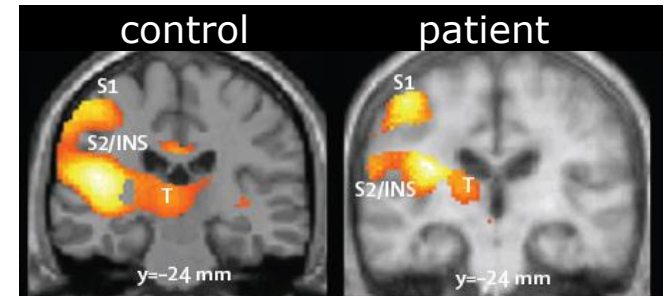
# Conclusion



# Conclusion

Patients in MCS perceive pain like us!

→ Use appropriate scales  
(CRS-R and NCS-R)



Spasticity is correlated with pain and ↗ over time

→ Treat it as soon as possible



Soft splints seem to ↘ spasticity  
and ↗ hand opening

