SUPPLEMENTARY MATERIAL

Appendix 1 : additional clinical data.

When MR returned home after the accident, he continued to suffer from amnesia for the previous ten year period. He did not remember anything about his daughters' childhood. He recognised his colleagues because he had been working for nearly 20 years in the same business, but did not recognise his professional activities between 1996 and 2006. He remembered Swiss politicians who were active until 1996, but not those who were in the Swiss parliament between 1996 and 2006. When the pictures of the terror attack of the 9/11 plane crash on the New York World Trade Centre were shown to him, he failed to identify the event. Instead, he suggested that these were taken from a movie. Similarly, when he was shown his own mobile phone, he could not identify it, as he had no memory of using that model of cell phone between 2000 and 2006. He remembered only those cell phones that he had used in 1996 for his work (GSM mobile phones) and was surprised to learn that such phones were no longer in use. He said that he had never heard of Tamagotchi games or DVD systems. He had no knowledge of I-pods, and was surprised to see very small electronic notebooks. Instead, he talked about videocassette recorders that were in standard use prior to 1996. His cardiovascular status was unremarkable during this period. He had no past or family history of psychiatric disorders and did not report any obvious secondary improvements.

Over the next three months his motor functions improved significantly, but the mutism and retrograde amnesia persisted. On one occasion, however, about six months after the accident, his wife did hear him utter two short but distinct sentences while awakening from a deep sleep, but the patient was too drowsy to have noticed it. He kept detailed records of all his written communications, from September 17th, 2006 onwards. He came to the clinics with his notebooks and would respond by writing or by nodding his head. After a few months he started to learn sign language and gradually

began to communicate by using his hands. However, he was independent to the extent that he did not require help in pursuing his daily routine activities. He had left his previous job as a sanitary installer, and had found new employment very rapidly as a machine driver in a recycling station, and had learnt sign language by attending a professional training school. He had asked for support from the disability insurance, which had been refused. He was able to help his children with their mathematics homework. After his initial injury, he learned about the events of previous decade with the help of his friends and relatives.

Regarding his behavior, his wife had noticed a change in his personality: he had become emotionally distant, was more forgetful and slower in decision making. These changes led to some difficulties in his interpersonal (e.g., with family) relationships.

Appendix 2 : Other experimental sessions

Diffusion Tensor Imaging (DTI): We performed a DTI tractography of the arcuate fasciculus bilaterally, using a streamline reconstruction of the fibre trajectories as supported by Trackvis software.[33] The seeding region of interest was placed on each side according to anatomical and radiological coordinates, and allowed to track the arcuate fascicles and to perform fractional anisotropy (Fa) and fibre density analysis on each side.[33, 34] The inter-hemispheric comparison, however, did not show any significant difference and Fa values were comparable to those obtained from healthy subjects' coordinates.[33, 34]

Transcranial Magnetic Stimulation:

Method: MR was seated in a comfortable reclining chair. A figure-of-eight shaped coil (7 cm inner diameter for each half) connected to a Bistim-module and two Magstim 200 magnetic stimulators (The Magstim Company, Dyfed, UK) was positioned on the scalp over the left M1. The hot spot for the right FPB muscle was defined as the lowest threshold site evoking a MEP response in FPB accompanied by a clear thumb flexion movement. The coil was positioned with the handle pointing backwards at an angle of 45° to the midline[35]. The hot spot was marked with a pen on the cap worn by the subject; this served as a visual reference against which the coil was positioned and kept in place by the experimenter. MEPs were recorded using surface EMG electrodes from the right flexor pollicis brevis (FPB) in bipolar belly-tendon arrangements (band-pass 10 Hz-2 kHz), using a Nicolet Viking electromyograph (Skovlunde, Denmark).

- **Resting motor threshold (rMT).** The resting motor threshold (rMT) was defined as the minimum TMS intensity (measured by altering the stimulator output intensity in one percent decrements) required to elicit at least five FPB MEPs > 50 μV in ten consecutive trials. TMS stimulus intensities were then expressed as percentages of the right or left FPB rMT[35-40].

- For MEP measurements, we averaged at least ten trials at 120% rMT for the FPB muscle of each side.

- **F – waves.** F-waves were evoked by a supramaximal stimulation of the median nerve at the wrist. The latencies of 18 F-waves were averaged for each side.

- **Central motor conduction time (CMCT).** Central motor conduction time was measured in the upper limbs, by calculating the difference between the latency of the MEPs to cortical stimulation and peripheral motor conduction time (PMCT) as assessed by using the F-wave latency: PCT (ms) = ½ (F + M -1), where F and M are respectively the onset latencies of F and M in milliseconds [35-40].

The findings from TMS included MEP latencies of 23.51 ms ± 0.6 ms at the right and 23.03 ms ±0.8 ms at the left FPB muscle. F-wave latency was 28.6 ms for the right median nerve, and 28.4 ms for the left median nerve, which is within the range of

normal values (26.6 ms ± 2.2ms). M-latency was 4.8 ms after stimulation of the right and 4.6 ms after stimulation of the left median nerve. CMCT was 7.25 ms at the right side and 7.00 ms at the left side, given the fact that F-wave latency was symmetric. These values are normal (6.13± 0.89)[32] and thus argue against any long-term consequences of the electrocution to the central motor system [35-40].

Complete Table of Neuropsychological data

Domains Tested	Findings (Scores)	
	Pre-Recovery (October 2007)	Post Recovery (January 2009) (Day 10-30)
Handedness	Lateralization Index of Oldfield Epworth: 66.67%	- Identical
Mood Behaviour	Hamilton's Anxiety Depression (HAD) Scale: **Marginal 10/21**	HAD: N **Anxiety:7/21, Depression:1/21**
	Emotional blunting	**Hyperactivity**
Fatigue	Fatigue Assessment Instrument : **Normal**	**Increased with increase in physical and cognitive activity**

Language	Montréal Toulouse Protocol of the linguistic examination of the aphasia [MT 86]	Montréal Toulouse Protocol of the linguistic examination of the aphasia [MT 86]
	• Interview: Good comprehension; mute, explained by writing, non-verbal gestures and signs	• Interview: slightly aprosodic 7 day after recovery; normal 2 months after
	• Words and non words repetition : impossible (0/15)	• Words and non words repetition : normal (15/15)
	• Oral words Comprehension: normal (9/9)	• Oral words Comprehension : normal (9/9)
	• Oral comprehension of sentences: within normal limits (35/38 with 2 auto corrections)	• Oral comprehension of sentences: 38/38
	• Comprehension of written words: normal (6/6)	• Comprehension of written words: normal (6/6)
	• Written text Comprehension : normal (6/6)	• Written text Comprehension : normal (6/6)
	• Oral reading : impossible (0/33 ; no articulatory movements possible)	• Oral reading :normal
	• Spontaneous writing : fluent and normal	• Spontaneous writing : fluent and normal
	• Writing of the letters: normal	• Writing of the letters: normal
	• Written naming: normal (30/31).	• Written Naming: normal (30/31).
	• Dictation : normal (13/13)	• Dictation : normal (13/13)
	• Reading and repetition of numbers: impossible.	• Reading and repetition of numbers: normal.
	• Calculation: normal.	• Calculation: normal.
	• Rhythm: 1 error in 5 trials (4/5).	• Normal melody
	• Whistling a common French song "Au clair de la lune": difficulty with the melody	

Praxis	• Bucco-linguo-facial praxis: normal on verbal commands and imitation if no linguistic sound was asked but with hesitations whilst whistling • Naming the parts of the body: normal • Manipulation of the objects on verbal suggestions: normal • Rey's Complex Figure: normal (32/36)	• Normal even for linguistic sound, despite some hesitations • Gestural and constructive (cubes, watch) praxis: normal
Spatio-temporal orientation	• Normal	• Normal
Memory	• Digit span : impossible (mute) 4 if written • RAVLT: normal (written response) in learning, recognition (57 /75) • RAVLT : Delayed recall: lower limits (12) • Immediate recall of Rey's complex figure. normal (30/36) • Delayed recall : normal (29/36)	• Digit Span: 5 • RAVLT learning : impaired (46/75) • RAVLT Delayed recall (14) and recognition: normal
	Autobiographical Memory: • AMI, Childhood, 21/21 + 9/9 • AMI, Early Adult life 21/21+ 9/9 • AMI, Recent life 1996/2006: 0/21+ 0/9 • AMI, Recent life 2006/2007:21/21+9/9	**Autobiographical Memory:** • AMI, Childhood, 21/21 + 9/9 • AMI, Early Adult life 21/21+ 9/9 • AMI, Recent life 1996/2006: 9/21+ 4/9 • AMI, Recent life 2006/2009:21/21+9/9

Executive Functions	• Luria Test: 3 perseverations; autocorrected. • Verbal fluency • Phonological fluency (12 in 1') : normal • Categorical fluency: normal.	• Luria gestural sequences: normal • Phonological fluency (10 in 1') : marginal • Stroop test : normal • Trail Making test : normal
	• Trail Making Test B: 53 seconds, normal.	• Trail Making Test B: normal
	• Pegboard Test: Left hand: 15 and 18, Right hand:14 and 13 (marginal for right hand)	• Pegboard Test: Both hands: 15 in 30 ''
Gnosis	• Detection of body parts : 8/8	• Not repeated
Gnosis	• Columbia Test Score: 10/12 (normal) • Test of super imposed images: normal	• Test of super imposed images: normal
	• Dichotic Hearing - Laterality Index: -0.156 *(not suggestive of atypical language representation)*	• Dichotic Hearing not repeated
Attention	• Trail Making Test A: 34 seconds, normal.	• Trail Making Test A: 15th centile