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Self-observation reinstates motor awareness in anosognosia for hemiplegia

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ABSTRACT

We report a patient with severe anosognosia for hemiplegia, who recovered instantly and permanently when viewing herself in a video replay. We believe the observed dramatic reinstatement of the patient's awareness related to her self-observation 'from the outside' (3rd person perspective) and 'off-line' (at a time later than the actual attempt to execute a movement); her anosognosia had been unaltered when she observed her plegic arm in her ipsilateral visual field (self-observation from a 1st-person perspective and 'on-line'). To our knowledge, the role of self-observation in videos or mirrors has not being assessed in AHP to date. Our study provides preliminary evidence that, when right hemisphere damage impairs the ability to update one's body representation, judgements relying on 3rd-person and off-line self-observation may be spared in some patients and may facilitate 1st person awareness.

1. Introduction

In humans, central neurological damage may lead to contralateral hemiplegia. This may sometimes be accompanied by a higher-order impairment of body awareness which, similarly to the hemiplegia, concerns the contralateral side of the body. Patients may falsely believe that they can move their paralysed limbs despite blatant evidence to the contrary, and they may even claim that they have moved to an examiner, when no such movement has taken place. This symptom, termed anosognosia for hemiplegia (Babinski, 1914) (AHP; apparent unawareness of paralysis) is often a transient phenomenon, with patients spontaneously recovering within days, weeks or months from onset. Nevertheless, the occurrence of AHP at the critical acute state following stroke may impede motor rehabilitation (Gialanella, Monguzzi, Santoro, & Rocchi, 2005) and limit accessibility to thrombolysis (Di Legge, Fang, Saposnik, & Hachinski, 2005). In addition, recent reviews suggest that approximately 30% of reported anosognosic patients remain unaware of their deficits beyond the acute phase of their illness (Orfei et al., 2007; Pia, Neppi-Modona, Ricci, & Berti, 2004). AHP occurs more frequently following right brain damage, usually in the frontoparietal cortex, but it has also been reported following subcortical and left-hemisphere lesions (Orfei et al., 2007; Pia et al., 2004). No available treatment exists for AHP, although temporary remission has been reported following vestibular stimulation (Rubens, 1985).

Patients with AHP typically remain anosognosic when their plegic arm is brought into the ipsilateral visual field. However, to our knowledge, self-observation from a 3rd person perspective has not being used in the treatment of AHP to date. We report a patient with anosognosia, who recovered instantly and permanently from her anosognosia after viewing herself in a video replay. We believe this dramatic reinstatement of awareness related to the observation of herself 'from the outside' (3rd person perspective), and potentially also to the observation of oneself at a time later than the actual attempt to execute a movement ('off-line').

2. Case report and methods

LM was a 67-year-old right-handed woman, a retired publisher, with 15 years of education (premorbid IQ 114, as estimated by the Wechsler Test of Adult Reading (Wechsler, 2001). She was previously mobile and independent without any relevant medical history, other than untreated hypertension. She was found collapsed with a marked left-sided hemiplegia. Radiological examination confirmed a large right distal MCA infarct. Six days post-admission her GCS was 15. On neurological examination she was found to be hypotonic, with absent reflexes, no tactile sensation, no pain, and 0/5 power in her left limbs. She showed some mild dysarthria, left lower facial weakness, left hemispatial neglect, left homonymous hemianopia and right gaze deviation. Her neuropsychological profile 6 days post-onset and at follow-up examinations is presented in Table 1. Fig. 1 shows LM's CT and MRI scans 1 day and 1 year post-onset. The study was approved by the local NHS ethical committee and LM gave written informed consent.

A formal awareness interview, including general questions (e.g. Can you move your left arm?) and confrontation ("Please, touch my hand with your left hand. Have you done it?"), was used to assess LM's anosognosia (Berti, Ladavas, & Della

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Table 1
LM's neurological and neuropsychological profile in repeated assessments.

Test	Days from onset					
	6	15	22 pre-video	22 post-video	36	180
Berti awareness[a] LUL	2	2	2	0	0	0
Berti awareness[a] LLL	1	1	1	0	0	0
AHP questionnaire[b]	6.5	6	6	0	0	0
Bi-manual[c] (scale min 0–10 max)	6 (S.D. 1.3)	–	5.8 (S.D. 0.9)	2.4 (S.D. 0.8)		1.8 (S.D. 0.4)
Bi-petal[c] (scale min 0–10 max)	1.6 (S.D. 1.3)	-	1.3 (S.D. 0.5)	1 (S.D. 0)		1 (S.D. 0)
Uni-manual-control questions[c]	7.4 (S.D. 1.1)	–	6.2 (S.D. 0.8)	6.2 (S.D. 0.8)		7.4 (S.D. 0.6)
WAIS–III[a] vocabulary SS	16	–	–	–	14	16
WAIS–III similarities SS	10	–	–	–		
WAIS–III digit span SS	12	–	–	–	12	12
WAIS–III matrix reasoning SS	4		5	–	4	5
WAIS–III arithmetic SS	9	–	–	–		
WAIS–III block design SS	2	–	1	–	2	2
WAIS–III picture completion SS	8	–	–	–	10	–
Visual fields[d] R max 10	9	7	–	–	8	–
Visual fields L max 10	2	2	–	–	3	–
Visual fields both max 10	0	2	–	–	2	–
RASP[d] surface touch L - max 30	5	–	4	–	5	–
RASP extinction - max 12	0	–	1	–	2	–
RASP proprioception - max 30 movement detection L	9	–	7	–	9	–
RASP proprioception - max 30 direction detection L	8	–	7	–	8	–
Comb/Razor test[d] R	24	–	28	–	20	–
Comb/Razor test L	4	–	2	–	4	–
Comb/Razor test ambiguous	5	–	4	–	0	–
Bisiach test[d]	1	–	1	–	1	1
BIT[d] total score	68	–	72	–	73	86
Hayling test[d] SS	3	–	–	–	4	–
Hayling test errors SS	3	–	–	–	3	–
Proverbs[d]	12	–	–	–	10	–
Cognitive estimates[d]	6	–	5	–	4	–
HADS[d] depression	6	–	6	–	10	6
HADS anxiety	12	–	12	–	8	8

[a] Awareness interview (Berti et al., 1996).

[b] AHP questionnaire (Feinberg et al., 2000).

[c] Actions awareness questions (Marcel et al., 2004): Scale 0–10. Ten bi-manual; five bi-pedal and five uni-manual questions. Scores > 5 represent overestimation in each bi-manual and bi-pedal task. Uni-manual tasks are control questions, testing for patients' comprehension of the task.

[d] WAIS–III = Wechsler adult intelligence scale–3rd edition (Wechsler, 1998a, 1998b); Visual-fields = The customary 'confrontation' technique (Bisiach, Vallar, & Perani, 1986); BIT total score = sum of scores of the conventional sub-tests of the behavioural inattention test; 'One Item Test' and 'Comb/Razor Test' = tests of personal neglect. Bias on the latter is calculated according to McIntosh, Brodie, and Beschin, (2000); RASP = The Rivermead Assessment of Somatosensory Performance (Winward, Halligan & Wade, 2002); Hayling test (Burgess & Shallice, 1997); Proverb test = Delis–Kaplan – executive functions system – proverbs subtest (Delis, Kaplan & Kramer, 2001); Cognitive estimates = cognitive estimates test (Shallice & Evans, 1978); HADS = hospital anxiety and depression scale.

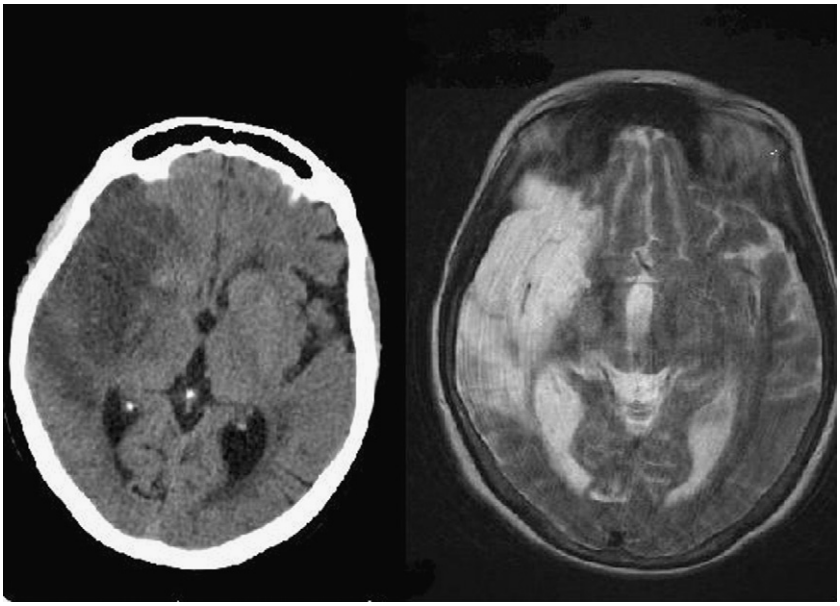

Fig. 1. *Left image*: CT, 1 day post-onset. Neuroradiological report: R MCA hyperdense area, R frontoparietal MCA region, effacement of R lateral ventricle. *Right image*: MRI, 1 year post-onset. Neuroradiological report: extensive area of mature damage, involving predominately the right frontotemporal region, with some involvement of the adjacent parietal lobe to a lesser degree. There is extensive volume loss of the deep grey matter structures also on this side. Appearances are consistent with a complete right MCA infarct, involving frontal, parietal and temporal lobes, both cortical and deep structures such as basal ganglia, internal capsule and insula.