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Chronic somatoparaphrenia: A follow-up study on two clinical cases

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ABSTRACT

Somatoparaphrenia consists in abnormal or bizarre verbal reports about some parts of the body. Such a pathological condition usually lasts for days or weeks and is variably associated with other cognitive defects. In the present paper we describe exceptionally long-lasting somatoparaphrenia in two focal brain-damaged patients: GA who had a right hemorrhagic fronto-parieto-temporal stroke and AC who developed a left ischemic parieto-occipital lesion. The presence and severity of somatoparaphrenia did not change in either patient during a 2-year follow-up, whereas the two patients showed different evolution of anosognosia for motor disorders, severity of extrapersonal neglect and cognitive impairments. Moreover, impairment of position sense was associated with somatoparaphrenia in one patient only; neither patient showed personal neglect. The reported clinical observations suggest that somatoparaphrenia can be observed as a body-related chronic disorder and can outlast other cognitive defects, even if it arose in conjunction with them.

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1. Introduction

Some brain-damaged patients produce abnormal or bizarre statements about parts of their body. Gerstmann (1942) was the first to use the term somatoparaphrenia (SP) to define “illusions or distortions concerning the perception of and confabulations or delusions referring to the affected limbs or side” (p. 895). SP encompasses several kinds of pathological verbal reports, including feeling of duplication, detachment of the involved body parts (Halligan et al., 1995) or disownership (asomatognosia; Gerstmann, 1942; Feinberg et al., 2010; see

Vallar and Ronchi, 2009, for a review). In most patients SP lasts for days or weeks and only rarely has it been reported to persist for months. Two-year persistence of somatoparaphrenic symptoms has been described in only one patient (Nightingale, 1982), who however developed SP 4 years after a cerebral lesion within the context of a florid psychotic illness, not restricted to the contralesional limbs.

SP symptoms are usually triggered by conversations about patients' affected body parts, are isolated (patients' discourse on other topics is unaffected), and often fluctuate over time (see Vallar and Ronchi, 2009). Patients can be resistant to

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counter-evidence, even though they may admit the incongruence between what they perceive (by sight, touch, proprioception) and what they declare. On other occasions, patients acknowledge at least for a short time that their statements are implausible and possibly wrong. From such a variable pattern, it is difficult to infer whether SP symptoms represent a close-to-reality description of what patients are experiencing about their affected limbs or whether their claims represent just an elaboration, i.e., a personal interpretation of what they are feeling. On this basis SP symptoms should plausibly not be considered as “delusions” or “beliefs” in a strict sense, notwithstanding the long-lasting neuropsychological tradition (see Gerstmann, 1942, quoted above).

SP is variably found in association with proprioceptive and somatosensory deficits (Vallar and Ronchi, 2009; Paysant et al., 2004), anosognosia for motor disorders (AMD; Cutting, 1978), and personal and extrapersonal unilateral neglect (Fotopoulou et al., 2008; Meador et al., 2000). Here we describe a follow-up study of two patients who presented SP for at least 2 years after the stroke. Thanks to the exceptional long-lasting course of SP in these patients, we were able to investigate the relationships of SP with the evolution of AMD, neglect, general cognitive defects, and proprioception impairments.

2. Methods

2.1. Patient GA

GA, a 59-year-old right-handed male teacher, developed a right haemorrhagic stroke. When admitted to our rehabilitation unit, 9 months after stroke, he still showed left hemiplegia, severe left spatial neglect, dense AMD, disownership of his left limbs, and somatoparaphrenic symptoms. He was bedridden, and was not autonomous in feeding, washing or taking care of himself (Barthel Index: 0/100; Mahoney and Barthel, 1965). Tactile perception was assessed by applying a fine wisp of cotton and by pinprick, in different testing sessions: GA detected light touch stimuli delivered on the left limbs, and also distinguished between “sharp” and “dull”, but transposed about 30% stimuli from left to right (tactile allochiria). Sense of position (proprioception) was assessed in four separate sessions by asking the patient (blindfolded) to tell whether different segments of his left limbs had been passively flexed or extended (10 trials per session); this procedure was complemented on two different occasions by a “mirroring” test in which the patient was required to judge whether his arms and hands had been placed in the same posture (10 trials per session). GA did not show relevant defects of position sense (mean correct responses on the dynamic test: 9/10; mean correct responses on the static test: 8/10). GA did not show personal neglect at bedside examination (he could touch his own left body parts on verbal request) or visual field defect on Goldmann perimetry. Repeated CT scans showed a right haemorrhagic fronto-parieto-temporal stroke, involving the basal ganglia and internal capsule (Fig. 1).

The patient underwent a rehabilitation programme for motor functions and neglect, and was followed up for 2 years after stroke. At the end of the follow-up, GA showed a very poor recovery of motor functions: he could only perform

extremely limited proximal voluntary movements with his left arm, and could not stand without aid; personal autonomy in common daily living activities was still strongly limited (Barthel Index: 10/100). GA lived at home, but required continuous care and support, e.g., in dressing or eating.

2.2. Patient AC

AC, a 74-year-old right-handed male retired employee, with 8 years of formal education, presented a left ischemic stroke. On admission to our rehabilitation unit, 1 month after stroke, AC showed right inferior quadrantanopia, right spatial neglect and optic ataxia (without paresis): when required to reach for objects under visual guidance, he was off-target with his right arm and showed severe difficulties in directing his gaze toward specific targets on command, but he could visually perceive and describe the left part of complex scenes (no simultanagnosia). AC presented SP and anosognosia for his motor difficulties. His personal autonomy was strongly impaired (Barthel Index: 5/100). On assessment of tactile perception, as in GA, AC missed most (but not all) light touch stimuli and could not distinguish between “sharp” and “dull” stimuli delivered to his right limbs (right tactile hypoesthesia). Sense of position (assessed as in GA) for the right limbs was impaired (mean correct responses on the dynamic test: 4/10; mean correct responses on the static test: 4/10). At bedside evaluation AC did not show personal neglect. Auditory comprehension, speech output, reading and writing (as far as it could be assessed) were spared. At that time CT scan showed a left ischemic parieto-occipital lesion (Fig. 1).

The patient underwent a comprehensive rehabilitation program for motor functions and neglect, and was followed up until 2 years after stroke. In this period AC had recovered assisted gait, but still showed grossly uncoordinated movements of his right arm. He had partially regained his personal autonomy (Barthel Index: 65/100), and was sufficiently able to live at home under the supervision of his wife.

2.3. Longitudinal neuropsychological assessment

Before starting neuropsychological assessment, both patients gave their informed consent to the study, which had been approved by the local ethics committee.

2.3.1. SP and anosognosia

The patients’ somatoparaphrenic symptoms, and awareness of their own deficits and of possible causes were assessed by means of a questionnaire focused on their current conditions (e.g., sensory, motor and cognitive deficits, the reason for their hospitalization), complemented by open questions addressing the patients’ specific thoughts on their own body (see Appendix 1).

After Marcel et al. (2004), to assess AMD the patients were required to rate their own ability to perform bimanual (e.g., “how well can you tie a knot in your present condition?”) and bipedal actions in their current conditions, on a 0 (bad performance, i.e., “not at all able to do it”) to 10 (good performance, i.e., “as good as normal”) scale and to assess the same performance of a person who was supposedly impaired in the same way as the patient (e.g., “how well could I row a boat if I

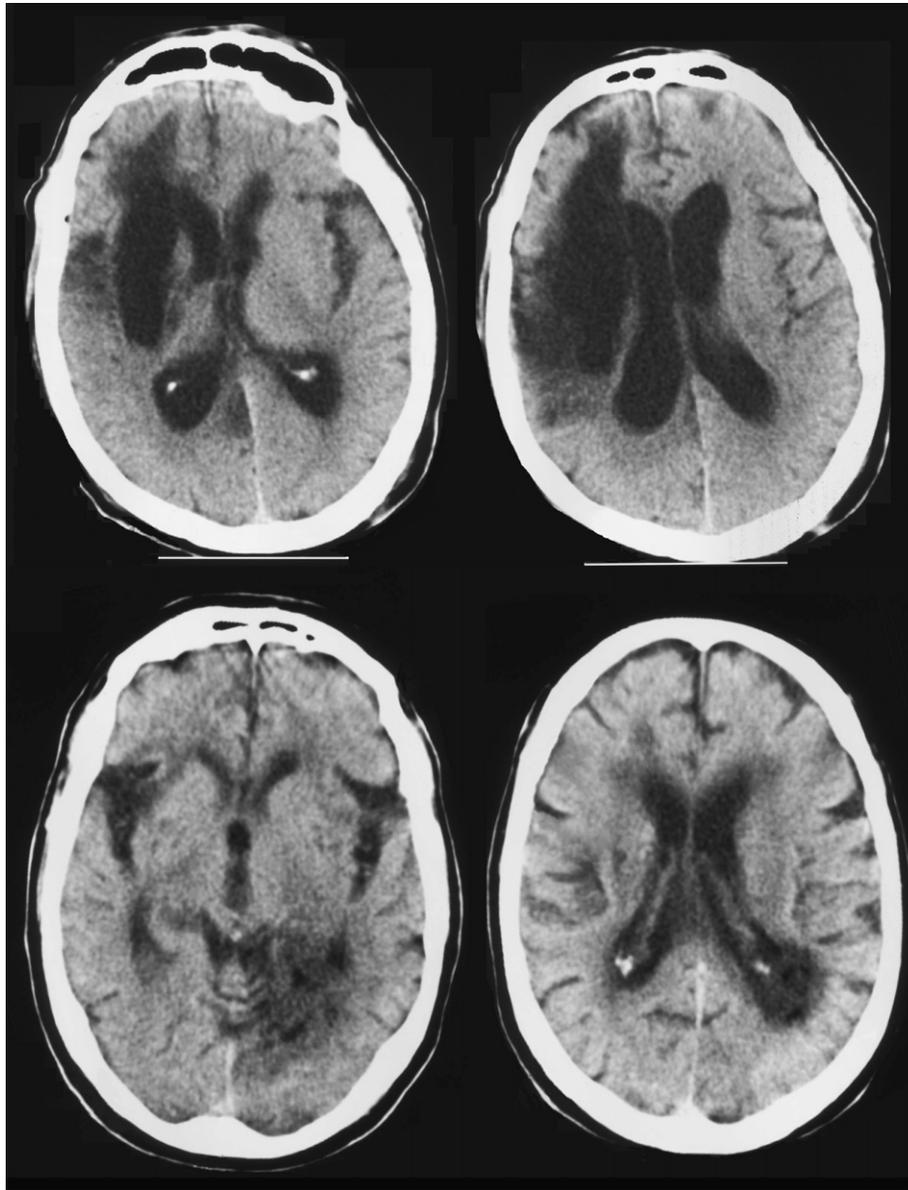


Fig. 1 – Axial CT scans of patient GA (upper row), showing a right cortical and subcortical fronto-parietal lesion, and of patient AC (lower row), showing a left parieto-occipital lesion.

were in the same condition as you are now?”). Scores ranging from 0 to 5 are considered accurate, whereas numeric estimations from 6 to 10 are considered as a sign of unawareness. Notably, Marcel *et al.* (2004) found a dissociation between answers relative to first- and third-person perspective: some patients tended to overestimate their own motor abilities in first-person perspective, but not in the third-person perspective. This questionnaire was devised to assess anosognosia for hemiplegia, but we were able to use it with our patients without changing any items because both GA and AC showed motor defects that profoundly impaired their ability to carry out the target actions (as in Conson *et al.*, 2008). Both patients were assessed four times (GA at 10, 14, 19 and 24 months from onset; AC at 2, 7, 19 and 24 months post-onset).

In the two last examinations we also administered a third version of the questionnaire (not included in the original procedure) in which the patients were required to rate the ability of a third-person (not the examiner) on the same actions, imagining that the person was affected by the clinical condition verbally described by the examiner. In this version (*new condition, nc*) the examiner described a clinical picture resembling the one affecting the patient, but without ever mentioning the patient himself and without any explicit reference to him. For instance, whereas in Marcel’s third person condition the examiner asked: “how well could I clap my hands if I were in the same condition as you are?”, in the *nc* the examiner asked: “how well could a person with a paralyzed arm clap his/her hands?” for GA, and “how well could

a person with grossly uncoordinated movements at his arm clap his/her hands?” for AC.

2.3.2. Neglect

Line and star cancellation tests (Albert, 1973; Halligan et al., 1989) were employed to assess patients' abilities to explore near extrapersonal space. The line cancellation test was also adapted to assess exploration of far extrapersonal space: the patients were required to cross targets using a 120-cm stick (Longo and Lourenco, 2006).

To identify the spatial frame of reference (subject- or object-based) of neglect disturbances we assessed copying of pairs of objects, copying of a daisy in different orientations (Marshall and Halligan, 1993) and copying of multi-component scenes (Na et al., 1999; Ogden, 1985).

In the imagery domain, neglect was assessed by requiring patients to describe familiar places (Bisiach and Luzzatti, 1978), and to mentally reconstruct a visual scene (object repositioning test; Lepore et al., 2004), and by the mental clock test (Grossi et al., 1989).

Personal neglect was formally assessed by the razor and comb test (Beschin and Robertson, 1997).

Extinction was evaluated by means of double simultaneous stimulations in tactile (on hands and legs), visual and auditory modalities (20 double stimuli interspersed in a series also comprising 10 right and 10 left unilateral stimuli).

2.3.3. General cognitive functions

The neuropsychological assessment comprised: Mini Mental State Examination (MMSE; Folstein et al., 1975; Italian version: Measso et al., 1993); auditory-oral span for bisyllabic words (short-term memory); learning of a short story (anterograde episodic long-term memory; Spinnler and Tognoni, 1987); semantic (Spinnler and Tognoni, 1987) and phonemic (Carlesimo et al., 1996) verbal fluency tests, to assess aspects of executive functions; a verbal reasoning test, to estimate logical-abstract thinking abilities (Spinnler and Tognoni, 1987).

Finally, patients' abilities in representing and localizing body parts were assessed by Semenza and Goodglass' (1985) battery.

3. Results

3.1. SP and anosognosia

Throughout the follow-up both patients produced incoherent and bizarre statements about their affected limbs. The content of SP fluctuated across sessions and also within a session, but a main idea was recognizable: GA often stated that his left hand was “fake”, “dead”, and that a third hand replaced or was added to the damaged one; AC expressed persistent feelings of strangeness and sometimes reported that some animals had entered his arm.

Notwithstanding persistence of SP in both patients, GA and AC showed different evolution of their awareness disorders. GA became aware of the reason for the hospitalization but not of his motor disorders, whereas AC showed the opposite pattern. Some examples of GA's and AC's self-reports about their own conditions and the reason for the hospitalization

throughout the follow-up period are reported in Appendix 2. It is worth mentioning that, although we did not formally evaluate awareness of cognitive disorders, both patients appeared to be able to criticize their errors on neuropsychological tests (e.g., on memory or on drawing tasks).

3.2. Awareness questionnaires

GA's answers to the questionnaire for awareness remained pathological for both first- and third-person perspectives, but he was able to estimate consequences of motor disorders when no explicit reference was made to himself (*nc*; Fig. 2). The difference between his scores on *nc* and scores on first- or third-person perspective was statistically significant on both sessions (non-parametric Wilcoxon signed rank test of significance for paired measures; third session: *first person vs nc* $Z = 2.66$, $p = .008$, *third person vs nc*: $Z = 2.72$, $p = .006$; fourth session: *first person vs nc* $Z = 2.89$, $p = .004$, *third person vs nc*: $Z = 2.85$, $p = .004$).

In contrast, AC's awareness scores returned to normal after the second evaluation. AC's scores on *nc* showed appropriate evaluation of other's motor deficit, as well as of his own deficit; accordingly, no significant difference was observed among the three conditions (third session: *first person vs nc* $Z = 1.34$, $p = .18$, *third person vs nc*: $Z = 1.49$, $p = .13$; fourth session: *first person vs nc* $Z = 1.10$, $p = .27$, *third person vs nc*: $Z = .53$, $p = .59$).

3.3. Neglect

On the first examination (10 months after stroke), patient GA presented preferential deviation of his gaze and head toward the right side and showed severe left neglect on cancellation tests in both near and far space (Table 1). GA showed egocentric neglect in drawing tasks, but did not show asymmetries on any imagery task. Personal neglect was absent. Left-sided extinction was observed in all the three modalities assessed; GA also transposed 3/10 unilateral left tactile stimuli to the right, upon both hand and leg stimulation (tactile allesthesia).

At the second examination (24 months after stroke) left neglect had partially reduced: the patient could move head and gaze in all directions, and performed the Albert test flawlessly in near space, but he still omitted the left-sided stimuli in the star cancellation test. The remaining features of the clinical picture did not change (egocentric bias in drawing tasks; no neglect on imagery tasks; no personal neglect; tactile, visual and auditory extinction), but tactile allesthesia was not evident.

Patient AC showed severe right neglect on the first examination, 2 months post-onset, in both near and far space (Table 1). In drawing tasks, AC performed poorly and his graphic productions showed egocentric neglect. In describing familiar places and in relocating objects he omitted right-sided elements or transposed them to the left (allochiria), but could not be tested on the mental clock test because he failed to comply with test instructions.

AC did not show personal neglect or extinction to simultaneous double stimulation in the auditory modality (in the

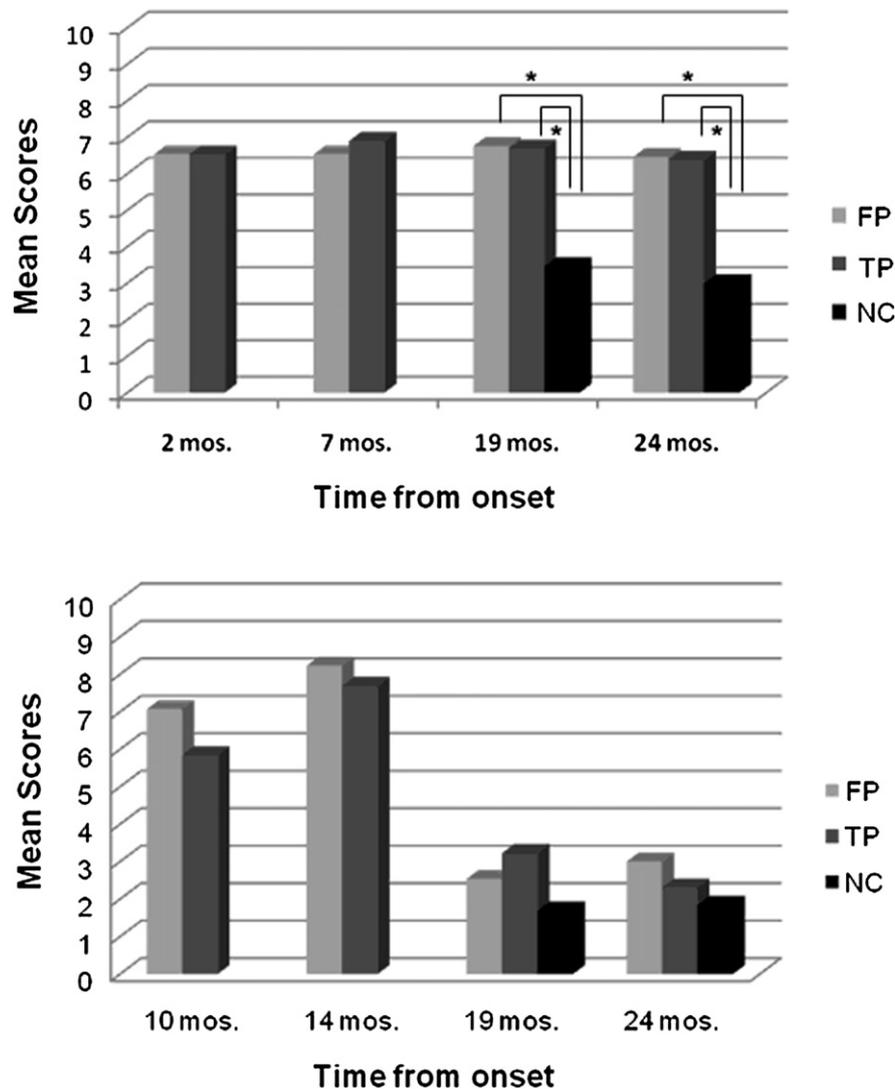


Fig. 2 – Mean scores on the Anosognosia Interview (Marcel et al., 2004) in patient GA (upper panel) and patient AC (lower panel). Scores on first-person perspective (FP), third-person perspective (TP), and on the new condition (NC, administered on the two last examinations only) are represented; the asterisk means that NC scores were significantly lower than both FP and TP scores in patient GA on the two last examinations (non-parametric Wilcoxon test for paired measures; $p < .01$).

visual and tactile modalities he missed most unilateral right-sided stimuli).

No relevant change was observed on the second examination of neglect, 24 months after the stroke.

3.4. General neuropsychological assessment

On the first examination GA was not well oriented in time and was impaired on verbal learning and verbal fluency tests, whereas abstract reasoning abilities were spared. The patient did not show relevant defects on Semenza and Goodglass' battery (5% errors). On the second examination GA proved to be well oriented in time and space, and achieved normal scores on verbal memory tests; his verbal fluency had improved but was still below normal range.

AC showed a diffuse impairment on all neuropsychological tests, but on verbal span and on Semenza and Goodglass' battery (9% errors); his performance did not change over time.

4. Discussion

The two patients described here were affected by chronic and stable SP until at least 2 years after stroke, although they showed very different brain lesions and divergent clinical characteristics.

At onset, both patients showed anosognosic disturbances for motor disorders. During the follow-up, awareness about motor deficits and their consequences for daily activities remained impaired in GA, but the patient gradually became aware of reasons for his hospitalization. AC showed an opposite pattern with respect to GA: awareness about cause of impairments remained defective, but the patient became aware of his own motor deficits.

Contralesional neglect was present in both patients, and in AC it persisted without appreciable variations. Moreover, general cognitive abilities were impaired in AC throughout

Table 1 – Assessment of extrapersonal neglect and of general cognitive abilities in the two patients.

Test	Max score	Patient GA		Patient AC	
		Month 10	Month 24	Month 2	Month 24
Line cancellation test					
Left omissions	11	10	0	3	0
Right omissions	10	2	0	6	6
Star cancellation test					
Left omissions	27	27	27	8	6
Right omissions	27	22	15	25	21
Line cancellation test (far space)					
Left omissions	11	11	4	4	2
Right omissions	10	6	0	7	6
Object relocation test					
Left omissions	8	1	0	2	3
Right omissions	8	0	0	7	7
Mental clock test					
Errors on the left half dial	15	3	0	–	–
Errors on the right half dial	15	2	0	–	–
Razor and comb Test					
Neglect index	1	.4	.5	.5	.5
Mini Mental State Examination ^a	30	17.2*	23.2	12.4*	13.4*
Verbal span for words ^b	–	4	4	3	3
Memory for a short passage ^b	16	7.5*	8.5	–	4*
15-word test ^c					
Immediate recall	75	26*	38	–	18*
Delayed recall	15	2*	7	–	2*
Phonemic fluency ^c	–	9*	18*	–	4*
Semantic fluency ^b	–	7*	9.75*	–	5.25*
Abstract verbal reasoning ^b	60	49	57	21*	19*

Note: *Raw scores below age- and education-adjusted normal range, according to Italian normative data (^aMeasso et al., 1993; ^bSpinnler and Tognoni, 1987; ^cCarlesimo et al., 1996).

the follow-up, whereas they returned to normal range in GA. It is worth to note that in GA sense of disownership persisted in spite of clinical evidence of spared position sense; this dissociation is very unusual and is not in line with hypotheses about the main role played by proprioception in the sense of ownership (and in SP; for a discussion, see Vallar and Ronchi, 2009).

From a theoretical perspective, our clinical descriptions mainly demonstrated that the evolution of disorders of spatial exploration, awareness for motor defects, proprioception or general cognitive abilities might not directly affect SP. In other terms, SP appeared to outlast other cognitive defects, even if it arose in conjunction with them. On this basis, it could be possible to speculate that the genesis of “chronic” SP might be different from the genesis of transient SP usually observed in the acute phase after a stroke. For instance, in a recent retrospective case series, all patients affected by SP within 1 week after stroke also showed left-sided somatosensory and proprioceptive impairments, extrapersonal unilateral neglect and left-sided asomatognosia (Feinberg et al., 2010).

The patients described here kept producing somatoparaphrenic claims for a long time after the stroke. Noncoherence and bizarreness of patients’ assertions, together with their unconcern about implausibility of discourse, might be compatible with the existence of a disorder affecting patients’ mental attitude and rationality (executive functions). We cannot exclude this possibility, but the selectivity (limited to the affected body parts) and the long-lasting course of SP symptoms in our patients could suggest that chronic SP might

be induced or underlain by a disorder in construing and/or updating a coherent representation of one’s own body.

Another interesting observation regarded GA’s performance on the questionnaire for AMD. GA overrated his abilities to perform several actions, and did not change his rating even after he had failed in doing the same actions (for instance, to clap his hands), but could correctly evaluate motor impairments resulting from hemiplegia when he was required to think about a third person affected by the same motor disabling condition (*nc*). This would suggest that GA’s pathological scores were not due to a general impairment in judging consequences of motor disorders, but rather to a selective defect involving body representation processes. This finding, together with Marcel et al.’s (2004) observations on dissociation between first- and third-person perspective, would suggest that judgments about others’ body do not imply *egocentric* body-related awareness. Moreover, it is also relevant that the evolution of awareness about one’s own condition in the two patients described here is consistent with Marcel et al.’s (2004) data about the independence between awareness of having a deficit and awareness of its consequences. Taken together, our data support the existence of distinct types of body-related awareness, plausibly based on different kinds of information (Marcel et al., 2004), and implying several body-related representations (Fotopoulou et al., 2010; see also Vocat et al., 2010).

In conclusion, the present follow-up study demonstrated that SP can persist for years, regardless of evolution of neuropsychological disorders usually associated with acute,

transient SP. As it has been recently demonstrated for anosognosia (Vocat et al., 2010), it is possible to suggest that different clinical, cognitive and even anatomical factors may be crucial for the genesis of SP at different times. Further systematic, longitudinal studies on SP might clarify the issues raised by the present clinical observations.

Acknowledgments

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Appendix 1

Questionnaire for anosognosia¹

- (1) What is the date today?
- (2) Do you know this place?
- (3) Why are you here?
- (4) Which diseases have you had in the last days?
- (5) What is wrong with you?
- (6) Have you got any sight defects? (Then, ask the patient about each side of visual field separately).
- (7) Have you got any hearing defects? (Then, ask the patient about each side separately).
- (8) Have you got any problems remembering what has happened in the last days?
- (9) Can you remember who called on you in the last days?
- (10) How well do your arms and legs work? (Then ask the patient about each limb separately).
- (11) Can you move your arms and legs normally? (Then ask the patient about each limb separately).
- (12) Have you got any problems to feel touch on your arms and legs? (Then ask the patient about each limb separately).
- (13) Can you do everything in the same way as you did before?
- (14) Have you got any problems with your daily activities now? (Eating, washing, dressing, getting about).
- (15) Do you need any help from your relatives in your daily activities?

Specific questions for the affected limb (SP)

- (1) Did anything happen to your limb?
- (2) Can you feel your limb well?
- (3) Do you feel any strange sensations in your limb?
- (4) Do you feel your limb is in an unusual position?
- (5) Do you have any problems knowing where either of your arms or legs are?
- (6) Do you feel your limb as yours?
- (7) Do you feel this limb belongs to someone else (Do you have any sense that this limb belongs to somebody else)?
- (8) Are you able to do all movements you want with your limb?
- (9) Can you control your limb movements?
- (10) Do you think your limb did anything by its own?

It is advisable to ask these questions to the caregivers too, if available.

¹ Note: Several questions have been derived from Marcel et al.'s questionnaire, part A (2004).

Appendix 2

Instances of patients' self-reports about their own conditions and the reason for the hospitalization.

Patient GA (first interview, 10th month)

Examiner: Why are you here in this hospital?

Patient: I would like to know too!

E: How are you getting on? What's the problem?

P: I'm not fine, I have glycemia.

E: What about your arms and legs? Do they work properly?

P: 50%, the left ones a little less.

E: Are you able to control the movements of your arms and legs?

P: Yes, I do, of course.

E: Can you clap your hands, please?...*(He does not do it)*.

E: And what now?

P: I have just done it.

E: So, why didn't your clapping make noise?

P: Because I did it very softly.

E: Please, touch your right hand with the left one...*(He does not do it)*.

E: So, did you do it?

P: Yes, I did.

E: Are you touching it now?

P: Yes, I am, sure.

E: *(While the examiner is touching patient's left hand)* Did you move this one?

P: No, that one is not mine.

E: Are you sure about that? Look at the hand I'm touching, whose hand is it?

P: I don't know but it's not mine, it looks sick, I think someone forgot it here.

Patient GA (second interview, 14th month)

E: So, how is it going?

P: Fine.

E: Why are you staying here?

P: I had a motorbike accident and then I had a stroke.

E: Did that have any consequences for you? Do your arms and legs work well?

P: Yes, they do; 50% the right limbs, 30% the left ones.

E: Can you move your arms and legs normally?

P: Yes, I can move both of them 50%. *(To his wife)* Take away this heavy stuff from my stomach.

E: What are you referring to?

P: To this hand *(the left one)*.

E: Whose hand is that? Whose is the hand lying on your stomach?

P: I don't know, it is not mine.

E: So, it is not yours, is it?

P: No, it isn't. It is a fake hand.

E: Can you show me your left hand? Can you point at it, please?

P: Here it is! *(He pointed at the empty space on the left of his left hand and mimed a grasping gesture)*.

E: Are you touching it?

P: Yes, I'm doing it right now *(He keeps imitating the grasping gesture)*.

Patient GA (third interview, 19th month)

E: How are you?
 P: Fine, thanks.
 E: Can you touch your left hand with the right one, please?
 P: Done. I'm touching it (*He pointed at the space contiguous to his left elbow, miming a grasping gesture*).
 E: Now, please, touch your left shoulder with your right hand and then move it along your arm downwards till you catch your left hand.
 P: Yes, I have reached it, but this is not my hand, it is not mine, my hand is close to it.
 E: So, whose hand is that?
 P: I don't know, but it is a dead hand.
 E: Can you name all your left fingers as you touch them, please? (*He performs the task well*).
 P: But they are not mine.
 E: Well, whose fingers can they possibly be?
 P: I don't really know.
 E: Look at this hand (*patient's left hand*), very carefully: whose hand could it be?
 P: I don't know...may be it is mine. But no, I'm sure, it isn't mine, I don't feel it as my hand.
 E: (*The examiner put her left hand under the patient's one*) Try to touch your left hand with your right one, please.
 P: Here it is! (*He caught the examiner's hand*).
 E: Whose hand are you touching?
 P: It is mine.
 E: And whose is this? (*while E is touching the patient's left hand*).
 P: This is yours.
 ...
 E: Like you did previously, starting from your left shoulder and moving your right hand along the arm, try to touch your left hand with the right one.
 P: (*When he reached his left hand*) This is not a hand, it is an armrest.
 E: Now, try to go back to your left shoulder moving your right hand along the arm.
 P: But this arm is not mine.
 E: So, whose arm is it?
 P: I don't know. It is a live arm, it should belong to someone but I don't know whose arm it is.
 E: Therefore, is it a living limb?
 P: No, no...this arm and hand are dead.
 E: So, don't they belong to anyone?
 P: I don't know but they are not mine.
 ...
 E: (*GA is set in front of a mirror*) Move your right hand along your left arm and try to reach the end of your limb, and, please, do it while looking at yourself in the mirror.
 P: Done.
 E: What are you touching?
 P: (*Looking at himself in the mirror*) A hand, but it is not mine.
 E: So, whose is it?
 P: I don't know, but it is warm, so I think it is a live hand.
 E: Look at this hand very carefully in the mirror. Starting from it, move your right hand along your left arm to verify where this hand 'that-is-not-yours' is attached.
 P: (*After reaching his left shoulder, he looked puzzled and was not really persuaded*) May be it is mine.

Patient GA (fourth interview, 24th month)

E: How are you?
 P: Fine, thanks.
 E: How do your limbs work?
 P: Well.
 E: Can you clap your hands, please?
 P: Yes, of course. (*He does not do it*).
 E: Did you do it?
 P: No, I didn't.
 E: How come?
 P: Because it makes me feel pain in my hands.
 E: Do your limbs work well?
 P: Yes, they do but I have this hand weighing on my stomach.
 E: And whose hand is it?
 P: I don't know.
 E: Is it yours?
 P: No it isn't. It is a third hand that my son put on me. He took it at church because the other one does not work very well.
 E: Which one are you referring to?
 P: The left one. But taking this other hand was a mistake.
 E: Why?
 P: It is only a trouble, it never listens to me.
 E: But where is this third hand?
 P: Usually, it is on me, on my belly, close to the second hand (*he refers to his palsy hand*).
 E: (*E is touching patient's left hand*) Whose hand is this?
 P: It is mine.
 E: And does it work well?
 P: Yes, it does. But it is a bitch.
 E: Why did you say that?
 P: Because it does not listen to me.
 E: So it does not do what you ask for. Do you think that it has a will of its own?
 P: No, this bitch has only the will to not listen to me.
 E: Why does this happen in your opinion?
 P: Because I had a hemorrhagic stroke.

Patient AC (first interview, 2nd month)

E: Why are you here in this hospital? What's the problem?
 P: I've got cataract.
 E: Is this the only reason? Do your arms and legs work well?
 P: No, they don't, not so well.
 E: What do you mean? Can you control the movements of your arms and legs?
 P: I can control the legs a little but not the arms.
 E: Do you feel anything odd in your arm or in your leg? Do you feel any unusual sensation?
 P: Yes, I feel pulling.
 E: Where do you feel pulling?
 P: In my right arm.
 E: Are you able to clap your hands?
 P: Yes, I am, of course.
 E: So, can you show me that, please?
 P: There we are. (*Patient was slapping his face with his right hand and, at the same time, he was clapping in vain with the left one*).
 E: How did you perform this task in your opinion?
 P: Well.
 E: Do you feel anything strange only in your right hand?

P: Yes, that one is really strange, it does just what it wants and doesn't listen to me.

E: So, can you control that hand?

P: No, I can't because it isn't mine; it is just a pain.

E: If it isn't yours, whose hand is it?

P: I don't really know.

Patient AC (second interview, 7th month)

E: Do you know the reason for your hospitalization?

P: Yes, I do. Indeed, I came to accompany my son. Here I met a doctor who decided to examine me. Then he said to me that I needed to be admitted into the hospital for a check-up.

E: And what were the results?

P: They found that my heart vein was blocked.

E: Were there any consequences for your arms and legs?

P: Actually, they don't work so well.

E: Can you control their movements?

P: I didn't pay much attention to it but I think I can control my legs and sometimes my arms as well.

...

E: What now? How are your limbs behaving today?

P: By now, they haven't worked for 2 months.

E: To what extent don't they work? Don't they move at all?

P: No, it is strange... sometimes this one falls asleep.

P: (To his wife) Whose this hand is it? It is really a pain! Whose hand is it? (He referred to his right hand).

E: What are you referring to?

P: I referred to this right hand.

E: Is it yours?

P: No, it isn't.

E: And whose hand do you think it is?

P: I don't know.

E: So, try to catch this object with your right hand.

P: Done. (He used the left one to do it).

E: Actually, you used your left hand. Why didn't you utilize the right one?

P: Because my right hand is placed there, on the armchair. (The armchair is placed quite far from him, at his right).

E: Does this right hand make you feel any odd sensation? I'm referring to that hand that 'is-not-yours'.

P: Yes, it does. It bothers me...it isn't normal.

E: Why do you think that?

P: Because it does as it likes...it is sick. I would very much like to throw it away.

Patient AC (third interview, 19th month)

E: Why were you hospitalized?

P: The reason was a toothache, which led me to be operated on my gums.

E: And now what is the problem?

P: My sight; I couldn't see so well and I wasn't able to stand up, so I fell.

E: And now how is your sight?

P: Good, but the right eye sees less than the left.

E: Were there any other consequences due to your fall?

P: Yes, there were. Now the left side of my body keeps working well but the right one doesn't work at all.

E: What is the most bothersome for you: your arm or your leg?

P: No, it is this damned hand. (Referring to his right hand).

E: What's wrong with it?

P: I can't control it. It doesn't listen to me.

E: Why does this happen in your opinion?

P: Because it is still sick, it doesn't get well yet...it is still shocked.

E: So, how does it behave?

P: It doesn't want to do anything, it doesn't help me. It betrays me.

E: Why does it behave so in your opinion?

P: Because there is an animal in my arm; it got into my arm from this wound on my hand, can you see that? (He was pointing to a little scab on his right forefinger).

E: So, is there an animal in your arm?

P: Yes, there is. It is walking in here, can you see it? (He was showing his right forearm internal face).

Patient AC (fourth interview, 24th month; patient's right arm was in plaster because of an accidental fall)

E: What's happened to your arm?

P: They put a by-pass in my arm because some cats bit me. ... (Few days later, without plaster).

E: Let me check the condition of your arms, put your hands on the table, please. (He does it).

P: But this one is a fake hand. (He was referring to his right hand).

E: Why did you say that? Why do you think it is fake?

P: Because sometimes at night it goes away; but then it leaps up and comes back, it climbs on my thigh and on the sheet.

E: And does it usually behave in this way?

P: No, it doesn't. Sometimes it is quiet, some other times it starts bothering me.

E: In which way?

P: (while he was trying to catch something, his right hand hit his face; at this point he said to his wife). Do you see what it is doing? It is going to torture me for the daily half an hour.

E: Why does it do this?

P: It is because of the animals that have got into from here (pointing to his right forefinger).

E: What kind of animals?

P: They are like ants.

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