The Evaluation of Anosognosia in Stroke Patients

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Key Words

Anosognosia, assessment · Stroke rehabilitation

Abstract

Background: Anosognosia in stroke patients showed a relevant detrimental effect on the rehabilitation course and patients' quality of life, especially in those with brain injury. Although a number of reliable scales for the assessment of anosognosia in stroke and traumatic brain injury have been developed, at present no single measure fully explores the multifaceted nature of the phenomenon. **Method:** A PubMed search with appropriate terms was carried out in order to critically review the issue. **Results:** The main dimensions to consider in the investigation of anosognosia in brain-injured patients are (a) awareness of deficit and related functional implications, (b) modality specificity, (c) causal attribution, (d) expectations of recovery, (e) implicit knowledge and (f) differential diagnosis with psychological denial. Time elapsed from stroke, aetiology, laterality, aphasia and clinical complications may influence all these characteristics and must be taken into consideration. Finally, an adequate association of the anosognosia evaluation with other neuropsychological and behavioural aspects is relevant for a modern holistic approach to the patient. **Conclusions:** This review is meant to stimulate the development of a new comprehensive assessment procedure for anosognosia in brain injury and particularly in stroke, in order to catch the multidimensionality of the phenomenon and to shape rehabilitation programmes suitable to the specific clinical features of every single patient.

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Introduction

Anosognosia is a self-awareness disorder which prevents brain-damaged patients from recognizing the presence or appreciate the severity of deficits in sensory, perceptual, motor, behavioural or cognitive functioning, which are evident to clinicians and caregivers [1, 2]. In particular, anosognosia following stroke [3] has gained importance for its striking phenomenology, its incidence in the stroke population and because it is detrimental to the recovery and rehabilitation course [4–6]. Thus, the assessment of anosognosia is fundamental. In fact, modern conceptualizations of awareness deficits in brain-damaged patients highlight the complex and multilevel nature of these clinical phenomena [3]. For instance, the pyramidal model proposed by Crosson et al. [7] hypothesizes 3 possible levels of awareness deficits, with specific clinical and rehabilitative implications for each. In the last 30 years, a number of high-quality measures have been proposed, but most of them focus on specific aspects, leaving other dimensions of anosognosia unexplored. Thus, at present no single scale is able to fully explore all the components of poor awareness of deficit. This is a relevant issue from a clinical perspective, because a lack of exhaustive diagnostic procedures may potentially affect the development of specific and efficient rehabilitation programmes. In addition, heterogeneous selection criteria and assessment modalities contribute to gather highly variable epidemiological data [3] and prevent a deeper knowledge of awareness processes and impairments.

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Table 1. Studies on anosognosia in relationship to different aetiopathogeneses

Stroke	Traumatic brain injury	Combined aetiologies (stroke, traumatic brain injury and others)
Starkstein et al. [8], 1992	Prigatano and Altman [27], 1990	Bisiach et al. [43], 1986
Stone et al. [9], 1993	Sherer et al. [28], 1998	Teasdale et al. [44], 1997
Ramachandran [10], 1995	Leathem et al. [29], 1998	Borgaro and Prigatano [45], 2003
Pedersen et al. [6], 1996	Fleming et al. [30], 1998	Kortte et al. [46], 2003
Maeshima et al. [11], 1997	Ranseen et al. [31], 1990	Fisher et al. [47], 2004
Jehkonen et al. [12], 2000	Sherer et al. [32], 2003	Fisher et al. [48], 2004
Hartman-Maeir et al. [13], 2001	Bogod et al. [33], 2003	Noé et al. [49], 2005
Appelros et al. [14], 2002	Hart et al. [34], 2004	
Appelros et al. [15], 2003	Evans et al. [35], 2005	
Hartman-Maeir et al. [16], 2003	Murrey et al. [36], 2005	
Farnè et al. [17], 2004	Sawchyn et al. [37], 2005	
Marcel et al. [18], 2004	Sherer et al. [38], 2005	
Baier et al. [19], 2005	Kurtz et al. [39], 2006	
Berti et al. [20], 2005	Schmitz et al. [40], 2006	
Karnath et al. [21], 2005	Pagulayan et al. [41], 2007	
Nimmo-Smith et al. [22], 2005	Dirette and Plaisier [42], 2007	
Barskova et al. [23], 2006		
Santos et al. [24], 2006		
Appelros et al. [25], 2007		
Spalletta et al. [26], 2007		

This paper aims to draw attention to a number of issues to be considered in the assessment of anosognosia and to encourage the development of new and more efficient diagnostic procedures able to fit modern knowledge on awareness phenomena. Thus, on the basis of the recent studies in this area, the most remarkable methodological issues and specific clinical factors are listed and debated.

For our purposes, the database was selected using Pubmed Services utilizing the key words ‘stroke’, ‘traumatic brain injury’ and ‘anosognosia’. The bibliographies of all related articles were searched. All the pertinent literature considered to be of relevant scientific interest by MDO and GS concerning the assessment of diagnosis and severity of anosognosia was selected. We chose a sample of studies, spanning from 1986 to 2007, to examine some salient methodological issues (table 1).

Classical versus More Recent Approach to the Assessment of Anosognosia in Stroke

The modern concept of anosognosia concerns a multidimensional phenomenon which includes a wider range of related factors. This is quite evident in research on impaired self-awareness in other medical conditions. For

instance, causal attribution of the deficit, evaluation of functional implications in activities of daily living, expectations of recovery, changes in various ability domains (sensorimotor, but also cognitive, behavioural and interpersonal) and adherence to the treatment are part and parcel of the definition of poor awareness of illness in traumatic brain injury (TBI), dementia and schizophrenia, and as such they are commonly investigated [50]. In contrast, these dimensions are mostly disregarded in stroke, where the best-known questionnaires for anosognosia in stroke, such as Cutting’s questionnaire [51], Bisiach’s Scale [43], the Anosognosia Questionnaire [8], the Anosognosia for Hemiplegia Questionnaire [52] and the Structured Awareness Interview [18], are polarized on the awareness of sensorimotor deficit per se, consistently with the original definition of anosognosia [53]. In addition, the complexity of an awareness deficit is supported by neuro-anatomic studies, which suggest that anosognosia is due to the impairment of a wide neural net including a number of cerebral circuits [54–57].

Thus, the development of a wider diagnostic perspective on anosognosia in stroke, consistent with the recent evolution of the concept of anosognosia, is required. To date, the measures for anosognosia in stroke, although quite reliable, are not very diversified, as they are all based on the clinician’s judgement, provide very similar items

and focus on nearly the same few themes. In contrast, in other medical conditions, such as TBI and dementia, more flexible anosognosia trials allow clinicians to monitor the evolution of the phenomenon under a number of aspects and also in daily living after discharge. Of course, given proper operational adjustments, the structure of these measures and the general issues they investigate can provide fruitful suggestions to improve the assessment of anosognosia in stroke.

Specific Methodological Issues

What to Assess?

In a multifaceted perspective, the main dimensions of anosognosia to investigate are as follows.

Modality Specificity. It refers to the unawareness of specific aspects of the illness but not of others [58]. For instance, the patient can be aware of a cognitive deficit but not of a more evident sensorimotor deficit. This is why, unlike present questionnaires for anosognosia in stroke, we suggest the inclusion of a number of specific items to assess the awareness of various deficits, specifically sensorimotor, cognitive, affective and behavioural deficits.

Causal Attribution. The patient can be aware of the deficit but disregard the real causes, attributing the impairment to other factors (e.g. a flu or laziness) or judging the pathological event as less severe than its real nature.

Awareness of Functional Implications, Expectations of Recovery and Need for Treatment. In fact, the patient can admit verbally to suffer from a deficit but not realize its pragmatic consequences, asserting that he/she is capable of doing everything he/she could do before the injury. Also, anosognosic patients can ask insistently to be discharged because they are sane [59] or can refuse to attend the rehabilitative programmes and clinicians' prescriptions.

Implicit Knowledge. This implies an inconsistency between the patient's verbal answers and behaviours [4, 18]. A frequent contradiction in anosognosic hemiplegic patients is the verbal assertion that they are able to walk but at the same time refuse to leave the wheelchair. Thus, the inclusion of both verbal and non-verbal items is essential to reveal a possible dissociation between explicit and implicit knowledge [18, 10, 60]. For instance, with regard to motor deficits, the request to perform some actions, such as to lift the paralysed arm/leg and to compare it with the sound one, to choose between unimanual and bimanual/bipedal tasks, can be very informative. In fact, an anosog-

nosic patient is expected to choose a bimanual task, while an underlying implicit knowledge of the deficit would compel him/her to privilege unimanual tasks [10]. Table 2 points out that 70% of studies on anosognosia in stroke adopted a combined (i.e. verbal and non-verbal) strategy of assessment, although only 29% of them actually required more articulated motor procedures. In order to let the implicit knowledge emerge, the alternate use of first/third-person questions about the deficit can also be used. In fact, some anosognosic patients tend to answer more correctly when asked to evaluate the deficit as referred to another person than when referred to him/herself. In the present study, only one study adopting this approach was found [18]. With specific regard to cognitive deficits, the patient's discrepancy between predicted and actual performance in a cognitive task can be very informative, since it does not require any significant intervention of others [61, 62].

Concurrent Awareness Phenomena. These include neglect, confabulations, bodily delusions, misoplegia or anosodiaphoria. Some classical anosognosia scales include items about these issues, but they are generally not sufficiently thorough or discriminating. In particular, the diagnosis of neglect requires attention, given the high co-occurrence with anosognosia and the partial overlap of brain areas involved [20]. Also, it is important to evaluate the various forms of neglect (e.g. visual, tactile, personal, spatial, extinction) [63], in order to clarify whether some of them are related to specific dimensions of anosognosia and to better define the still debated matter of the co-occurrence of these two phenomena.

Differential Diagnosis between Anosognosia and Denial. This issue should not be undervalued, especially in case of a mild to moderate deficit. At first glance, anosognosia and denial produce the same effect, that is the disavowal or the minimization of the deficit, but at a deeper analysis some salient behavioural differences emerge [46, 64].

Who to Assess?

The present review stresses a fair variability in the characteristics of the populations considered in different studies. This can account for the high variability in findings and makes data hard to compare. In particular, when selecting a sample, the following aspects have to be considered.

Mixed Brain Injury Aetiology. Of the total sample of studies on anosognosia that we considered, 47% recruited only stroke patients, 37% only TBI subjects and 16% combined various medical conditions, such as stroke, TBI or

Table 2. Characteristics of studies on anosognosia in stroke

Authors	Sample	Time of assessment	Side of lesion	Verbal/non-verbal trials	Follow-up	Language disorders
Starkstein et al. [8], 1992	80 subjects	mean 6 days	R + L	V + simple NV	no	not included
Stone et al. [9], 1993	171 subjects	2–3 days	R + L	u.s.	no	u.s.
Ramachandran [10], 1995	4 subjects	<8 days	R	V + NV	no	u.s.
Pedersen et al. [6], 1996	566 subjects	1–7 days	R + L	V + simple NV	no	not included
Maeshima et al. [11], 1997	50 subjects	<30 days	R	V	yes	u.s.
Jehkonen et al. [12], 2000	57 subjects	<10 days	R	V + simple NV	yes	not included
Hartman-Maeir et al. [13], 2001	46 subjects	4–8 weeks	R + L	V + NV	yes	included
Appelros et al. [14], 2002	282 subjects	1–4 days	R + L	V + simple NV	no	not included
Appelros et al. [15], 2003	282 subjects	1–4 days	R + L	V + simple NV	no	not included
Hartman-Maeir et al. [16], 2003	60 subjects	4–8 weeks	R + L	V	yes	not included
Farnè et al. [17], 2004	33 subjects	<6 weeks	R	V	yes	u.s.
Marcel et al. [18], 2004	64 subjects	mean 67 days	R + L	V + NV	no	not included
Baier et al. [19], 2005	128 subjects	<15 days	R + L	V + simple NV	no	not included
Berti et al. [20], 2005	30 subjects	<60 days	R	V + simple NV	no	u.s.
Karnath et al. [21], 2005	14 subjects	<14 days	R	V + simple NV	no	u.s.
Nimmo-Smith et al. [22], 2005	64 subjects	mean 67 days	R + L	V + NV	no	not included
Barskova et al. [23], 2006	151 subjects	mean 2.6 months	u.s.	V	yes	u.s.
Santos et al. [24], 2006	180 subjects	<4 days	R + L	V	no	not included
Appelros et al. [25], 2007	272 subjects	1–4 days	R + L	V + simple NV	no	not included
Spalletta et al. [26], 2007	50 subjects	<90 days	R	V + simple NV	no	u.s.

R = Right; L = left; V = verbal; NV = non-verbal; u.s. = unspecified.

neoplastic pathologies (table 1). Indeed, data from different aetiologies, if analysed separately, can be very informative to highlight possible similarities and differences in awareness impairments. In contrast, the study of a heterogeneous sample can blur data, since in spite of phenomenological similarities, unawareness deficits can imply very different processes in different patient populations [50].

Time Elapsed from the Acute Event. Anosognosia can evolve rapidly, within a few days or months and more rarely can last for several years after injury [29, 33, 36, 65]. Since anosognosia is more frequent in the acute than in the chronic phase [51, 66], the high variability in incidence rates [3] could be partially due to heterogeneous times of testing in different studies. Thus, it is necessary to stress target temporal terms and to discriminate between acute and chronic patients. In addition, these require differential assessment trials, and findings from the two subgroups should be analysed separately. In their meta-analysis, Pia et al. [66] defined as acute the patients tested within 29 days after stroke and as chronic those tested after the 30th postinjury day, and found 48% of studies focusing on acute patients, 30% on chronic pa-

tients, 9% on both acute and chronic patients, and in 13% of studies data about time of testing were not available. Given the high and rapid fluctuations of anosognosia in stroke, very acute cases, ranging from 1 to 7 days from injury, should be further discriminated from acute and subacute ones, ranging from 8 to 29 days after stroke. Consistently, in the sample of studies on stroke selected in the present paper, 35% of studies recruited very acute patients only, 25% chronic subjects only, while 40% combined subjects with variable time of testing.

Laterality of Lesion. In the present review, most of the studies considered (60%) included patients with both right and left strokes, 35% right only and no study recruited exclusively subjects with injury on the left. One study did not report information about laterality of lesion. Indeed, patients injured on the left can be more difficult to assess because of possible aphasic deficits, so they tend not to be included [4, 6, 66, 67]. However, the exclusion may cause some confusion due to the underestimation of rates of anosognosia in the total brain injury population.

Aphasia. Patients with global or severe comprehension aphasia cannot be tested on their awareness of lan-

guage disorders, but mere behavioural observation can provide information about awareness of sensorimotor deficits. In contrast, productive aphasia can be handled with some specific administration devices. For instance, the clinician can read the answer alternatives aloud and ask the patient to indicate his/her own choice with gestures or make him/her fill in the questionnaires on his/her own. In the present review, 55% of selected studies excluded stroke patients with language disorders, often generally mentioning inadequate linguistic abilities or severe language impairment, while 40% of studies did not mention the issue at all, with a definite loss of information for the reader.

How to Assess?

Some methodological aspects play a relevant role in the assessment of anosognosia. In particular, different clinical conditions require different assessment approaches.

Patient Estimation. Obviously, patient estimations of their deficits have to be compared to an objective standard. Clinical judgement is the most frequently adopted criterion in classical anosognosia scales, while awareness questionnaires for TBI and dementia mostly rely upon the direct comparison between patient answers and informant/staff reports. In fact, the total difference score, obtained by subtracting patient from caregiver evaluations, is supposed to reflect the degree of awareness of the patient. Self/significant other comparisons can be quite informative, due to a daily and long-lasting knowledge of the patient [4]. However, in the acute stage following stroke, this methodology is not fully reliable, since relatives and significant others can still have little information; as well, stress, anxiety [68] and denial coping strategy can alter their judgement [4, 33, 69]. In TBI, some measures which specifically examine these aspects have been developed, such as the Revised Patient Competency Rating Scale [68], a subsequent 3-item addition to the original Patient Competency Rating Scale and the Head Injury Behaviour Scale [69]. Both of them ask the caregiver how stressful the patient's problematic behaviours are. While recently a trial to test the differential efficacy of various methodologies in anosognosia assessment in dementia has been carried out [70], to our knowledge an analogous study to determine which approach is more efficient in stroke has not been performed.

Course of Anosognosia. Longitudinal studies can be very informative to follow the course of anosognosia that usually evolves as time goes by. In addition, the frequency of assessment has to be rather high, especially in the

acute phase. In spite of this, 30% of studies on stroke included in our review provided a follow-up and, similarly, Jehkonen et al. [71] reported that in 70% of studies no follow-up was carried out. However, some pragmatic factors preventing a frequent assessment approach have to be stressed. Firstly, clinical practice and ward routine hardly deal with frequent questionnaire administrations, especially in the very acute stage. Analogously, fatigability, patient's pain and reduced concentration can be salient problems. Thus, in the first days after stroke, assessment should focus strictly on only a few definite issues, not to outwear the subject, and should always explore implicit knowledge of sensorimotor deficits, since the patient may have difficulty in expressing verbally his/her condition. Secondly, early after stroke the patient often has not yet had the chance to put his/her abilities to the test. Analogously, questions about functional implications of the deficit can be misleading, and therefore they should be limited. Finally, at this stage, questions about prognosis can be avoided because of the objective lack of information. In summary, in the acute stage the assessment of awareness deficits has to concern only evident impairments, while it can be too early for a reliable self-evaluation of cognitive abilities, which can be less salient to the patient than a physical deficit.

Scale Type. Dichotomous scales, such as yes/no or aware/unaware, are not very fruitful, since anosognosia is not an all-or-nothing phenomenon. In contrast, Likert scales seem to be the most appropriate to measure depth of awareness and are adopted in most tools. In addition, separate domain scores should be provided to better highlight possible modality specificities.

A Holistic Approach to Anosognosia

A number of studies showed that awareness of deficits cannot be conceived as an isolated disorder, it must rather be integrated in a holistic view of the patient [3, 50]. Thus, in association with the assessment procedure specific to anosognosia, we suggest investigating other concurrent dimensions (table 3): (a) general level of cognitive impairment; indeed, the relationship between anosognosia and global cognitive level, as measured for instance by the Mini-Mental State Examination [81] or Wechsler scales [82] is still controversial, since some authors assert that cognitive impairment is not a causal factor of anosognosia, rather a worsening condition [8, 18, 33, 83, 84]; (b) mnemonic functions; because anosognosia has been interpreted in some studies as the result of a mnemonic failure,

Table 3. Fundamental issues of assessment of anosognosia in stroke

Dimensions to investigate	How to investigate	Existing scales investigating the dimension
Anosognosia		
Awareness of sensorimotor deficits	Structured questions addressed to the patient to compare with clinical evidence	Bisiach's scale, SAI, SADI, PCRS, Anosognosia Questionnaire [8], Anosognosia for Hemiplegia Questionnaire [52]
Awareness of cognitive deficits	Structured questions to compare with neuropsychological performances	PCRS, AQ, SADI, Impaired Self-Awareness Scale [64]
Awareness of emotional and interpersonal deficits	Structured questions to compare with psychopathological and behavioural scales and with caregiver's reports	PCRS, AQ, HIBS, SADI
Implicit knowledge	Clinical trials and requests to perform actions, in order to compare verbal and procedural knowledge	SAI, Anosognosia Questionnaire
Possible modality specificity of anosognosia	Separate items for different deficits (e.g. paresis of the arm and/or leg, aphasia, cognitive abilities)	Bisiach's scale, SAI, PCRS
Neighbouring delusional phenomena (anosodiaphoria, somatoparaphrenias, misoplegia, confabulation)	Semi-structured questions addressed to the patient to let emerge possible strange sensations and feelings about the deficit	SAI, Anosognosia Questionnaire, Anosognosia for Hemiplegia Questionnaire
Correct evaluation of functional implications of sensorimotor/cognitive/behavioural deficits in activities of daily living	Structured questions addressed to the patient to compare with clinical evidence	SADI, PCRS, AQ, HIBS
Degree of unawareness	Likert scales	SADI, PCRS, AQ, SAI, Anosognosia Questionnaire, Anosognosia for Hemiplegia Questionnaire
Correct causal attribution	Structured questions addressed to the patient	SADI, SAI
Correct evaluation of prognosis	Structured questions addressed to the patient to compare with clinical evidence	SADI, LDIS
Compliance to rehabilitation	Structured questions addressed to the patient and to compare with staff's and caregiver's reports	LDIS
Detection of differential signs of anosognosia and/or psychological denial	Structured questions to let emerge possible peculiar behavioural aspects of psychological denial	Clinician's Rating Scale for Evaluating Impaired Self-Awareness and Denial of Disability [64], LDIS
Neglect	Specific tests to assess possible association with neglect phenomena	Line crossing, letter cancellation, figure and shape copying, and line bisection tests, trials to assess non-visual neglect forms [72]
Behaviour		
Alexithymia	Scale to assess unawareness of emotions	TAS-20
Mood, anxiety and apathy symptoms	Semi-structured scales to assess severity of depression, anxiety states and apathy	HAM-D, HAM-A, Apathy Evaluation Scale [73]
Aggressiveness	Structured scale to assess state and trait aggressiveness	STAXI
Cognition		
Global cognitive level and IQ	Tests to assess general cognitive impairment	MMSE, Raven's Coloured Progressive Matrices Test, WAIS-R
Mnestic functions	Tests to assess possible mnestic impairment	Digit Span, Corsi Block Test, Rey Auditory Verbal Learning Test
Language functions	Tests to assess possible associated language disorders	Phonological and semantic verbal fluency tests
Executive functions and attention	Tests to assess possible attention impairment	WCST, Stroop Test

SAI = Structured Awareness Interview [18]; PCRS = Patient Competency Rating Scale [74]; SADI = Self-Awareness of Deficit Interview [4]; TAS-20 = Toronto Alexithymia Scale [75]; AQ = Awareness Questionnaire [28]; LDIS = Levine Denial of Illness Scale [76]; HIBS = Head Injury Behaviour Scale [69]; HAM-D = Hamilton Depression Scale [77]; HAM-A = Hamilton Anxiety Scale [78]; STAI = State Trait Anxiety Inventory [79]; STAXI = State Trait Anger Expression Inventory [80]; WAIS-R = Wechsler Adult Intelligence Scale, Revised; MMSE = Mini-Mental State Examination; WCST = Wisconsin Card Sorting Test.

specifically of the inability to integrate new episodic experiences into long-term memory or the image of oneself [18, 49]; (c) language functions. In some studies, phonemic and semantic abilities in verbal fluency were related to anosognosia [8, 18, 33, 49], although the nature of this relationship is still unclear; (d) executive functions. The relationship between anosognosia deficits and attentional control and inhibition function [85] on the one hand, and set-shifting or cognitive flexibility [86] on the other hand, are to be investigated, given their relevance in other self-awareness disorders [33, 49, 87–90]; (e) psychopathology; as it is necessary to ascertain the relationship between anosognosia and neuropsychiatric symptoms. For instance, in anosognosic patients depression and/or anxiety [8, 30, 91], apathy [92, 93], anger and hostility [94, 95] and alexithymia [26, 96] require further investigation, given their frequency in stroke patients and their controversial role in awareness of illness and patient outcome [24, 30, 46, 49, 64].

The administration of these neuropsychological and psychopathological instruments is thought to be necessary on the one hand as a diagnostic procedure to describe the complete clinical picture of the patient, and on the other hand to make possible correlations between anosognosia and neuropsychiatric features in stroke patients. In table 3, some examples of neuropsychiatric scales validated in stroke patients are given.

Finally, neuro-imaging studies should be part of the diagnostic trial. In fact, a combination of data from conventional or, more interestingly, non-conventional magnetic resonance imaging measures, such as diffusion tensor imaging or tractography, with behavioural data, could provide relevant information about brain circuits involved in specific dimensions of self-awareness and their deficits, analogously to the investigations carried out in other pathological conditions [97–99]. Currently, these methods are still not completely automated and require the supervision of technical experts. However, despite the time they require, the information they provide may help clinicians to optimize individual rehabilitation programmes in the near future. Also, advanced methods for studying structural indices in the cortex, such as thickness, in association with methods for studying functional activation, permit to follow the process of cerebral plasticity following the recovery from awareness deficits [100]. This might explain, if appropriately validated, reasons why patients may fully recover within a few hours or may become chronic cases.

Conclusions

Anosognosia represents a stimulating challenge for clinicians, due to its remarkable incidence in stroke populations [3], phenomenological variability and effect on the rehabilitation course and the patient's quality of life. Given the complexity of this phenomenon, similar to other multidimensional fields such as neuropsychology or psychopathology, a reliable assessment procedure for anosognosia is necessary. In spite of their good reliability, present diagnostic questionnaires are not fully exhaustive in catching the multifaceted anosognosic phenomena. In fact, as the model of Crosson et al. [7] illustrates, awareness is not a unitary function, and the deficit can regard different components which can determine important features for the development of a specific rehabilitation treatment. In addition, anosognosia is no longer conceived merely as the unawareness of a deficit per se but implies a number of related factors, such as attribution, expectations of recovery, psychological denial, need for rehabilitation and estimation of functional limitations. Such a wide perspective on anosognosia requires an articulated assessment in order to gain a more definite diagnosis, to develop specific rehabilitation programmes and to understand more deeply awareness and related superior neuropsychological processes. Thus, we have outlined the main dimensions to include them in a flexible and comprehensive assessment procedure for anosognosia. Our approach aims to take into consideration the patient in his/her wholeness, in accordance with modern holistic perspectives in medicine, and therefore also involves cognitive, neuropsychiatric and behavioural factors.

Another remarkable issue is the specificity of various clinical situations which require partially different assessment modalities. For instance, for acute-phase subjects and in general for patients showing vigilance deficits, severe cognitive impairment, non-compliance, severe language disturbances or behavioural disorders, a more basic set of measures is suitable. Thus, a few instruments focusing on awareness of sensorimotor impairments, possible implicit knowledge, somatoparaphrenias, global cognitive assessment, language functions and neglect could be administered. On the other hand, patients showing persistent anosognosia have to be monitored regularly and as frequently as possible to detect any evolution of anosognosia, which in brain-injured subjects can be very sudden. For instance, a very acute-stage administration, such as within 3 days from stroke, has to be followed by regular consecutive administrations.

Another frequent problem is represented by aphasia. In our opinion, aphasia should not necessarily be an exclusion criterion for the assessment of anosognosia, since in productive and moderate language disorders specific non-verbal assessment methods can be adopted.

In conclusion, this paper is intended to be a first step towards a more definite, reliable and valid diagnostic methodology, which should be structured *ex novo* considering the multifaceted expression of anosognosia and the complexity of its interaction with behaviour, cognition and with general clinical aspects.

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