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To Be or Not to Be at Home? A Neuropsychological Approach to Delusion for Place*

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ABSTRACT

A woman, LB, while in recovery from a viral encephalitis, exhibited a delusion for place, which led her to insist that she was at home, in spite of compelling evidence to the contrary. Later, she developed a Capgras syndrome, that is, another misidentification syndrome. The patient was given a detailed neuropsychological evaluation to shed some light on the mechanisms underlying her delusional misbelief. Two main deficits were in evidence: (1) a severe visual-spatial impairment, giving the patient a distorted perception of her surroundings; and (2) frontal lobe dysfunction, which played a critical role in her impulsive responses and lack of self-awareness. The pathogenesis of delusion for place and persons is discussed in light of these observations.

Delusion for place is a condition in which a subject is disoriented for place and persists in his or her beliefs despite compelling evidence to the contrary. This disorder is frequently observed in neurological practice when associated with dementia, confusion, or Korsakoff syndrome. However, it has rarely been described in patients who did not suffer global cognitive dysfunction, were alert, and had no or slight memory impairment (Fisher, 1982; Ruff & Volpe, 1981; Vighetto, Aimard, Confavreux, & Devic, 1980; Vighetto, Henry, Garde, & Aimard, 1985).

Several themes of disorientation for place have been described and these have led to a number of eponyms. One of them is referred to as reduplicative paramnesia, a term coined by Pick (Pick, 1903). His patient, who probably suffered from an Alzheimer-type dementia, claimed that she had been moved from Pick's Prague clinic to a closely identical one, but one which was located in a Prague suburb. The patient believed that Pick and all of the medical staff worked in both clinics.

The terms "disorientation for place" or "spatial delirium" have been described in inpatients who did not develop a reduplication phenomenon but had the delusional conviction that they were in a generally familiar place, such as their home or a town in which they had formerly lived (Fisher, 1982; Staton, Brumback, & Wilson, 1982; Vighetto et al., 1985). This place could change from day to day and, occasionally, patients believed that they were in a wild and unknown place, such as Timbuktu or another very exotic setting (Fisher, 1982; Vighetto et al., 1985). Disorientation in these patients could easily be missed on superficial examination, because in some cases they were able to correct-

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ly name the hospital but, on further questioning, mislocated it in any city or country in the world (e.g., Croix-Rousse Hospital in Lambaréné, Congo, instead of in Lyon, France; Vighetto et al., 1985). Finally, in a few reports patients stated that they lived in a "chimeric" place, describing their hospital room as their home bedroom into which the hospital had been moved (Benson, Gardner, & Meadows, 1976; Overlacq et al., 1988; Vighetto et al., 1985).

According to Joseph (1986), the classification of delusional themes of disorientation for place into separate entities may have obscured a common psychopathological origin. An argument suggesting that these delusions may share common mechanisms and that their precise theme may be of lesser importance is that delusional identification of place and person (e.g., Capgras syndrome, in which there is a misidentification and reduplication of a familiar face with the belief that one of the two persons is an impostor; Capgras & Reboul-Lachaux, 1923) may coexist (Overlacq et al., 1988; Staton et al., 1982). Because all of these delusional syndromes resulting from neurological disorders have in common a misidentification and, occasionally, a reduplication, it has been proposed that they be grouped together under the heading of misidentification syndromes (Cutting, 1990; Joseph, 1986). In the present report we have chosen the term "delusion for place".

The neuropsychological mechanisms underlying this syndrome remain controversial. In this respect, two aspects of delusion for place may be dissociated: (1) the apparent limitation of delusion to the field of geographical localization; and (2) the patient's inability to question his or her statements. Over the last few decades, a great number of cognitive disorders has been proposed to explain the disorder of disorientation for place.

The earliest investigators stressed the importance of psychogenic factors in delusion for place. They believed that it was not linked to any neurological syndrome and that its rarity could be accounted for by the major role of some premorbid personality features. They attributed the disorientation for place to a denial of illness, and claimed to find it in patients who had always regarded illness as "imperfection, or weakness or disgrace" (Weinstein & Kahn, 1955; p.73). Fisher (1982), although he described this syndrome in patients who suffered a stroke, suggested that his first patient possessed a certain "degree of sophistication" that played a role in the nature of the fanciful places in which he imagined himself. However, such personality factors are not very convincing, since they are only described in a few patients and explain neither the specific theme of the delusion nor the delusional belief itself.

Other investigators (Paterson & Zangwill, 1944; Ruff & Volpe 1981) believed that the desire to be at home may lead patients to claim that they were at home. Paterson and Zangwill (1944) proposed that prolonged disorientation for place was "an hysterical reaction" inhibiting a strong desire to go home. However, in several reports, delusion for place persisted when the patient was no longer in the hospital (Staton et al., 1982). Occasionally, delusions appeared several months after the patient's discharge (Filley & Jarvis, 1987). Moreover, some patients relocated themselves in unseemly places but never at home or in a familiar place (Fisher, 1982; Vighetto et al., 1985).

The psychodynamic approach of delusion for place has been tempered by pathological and radiological data. Right hemispheric damage, wherever its precise localization, has been shown to be a common basis in all cases of delusion for place that have been reported in the literature (Feinberg & Shapiro, 1989). Furthermore, the "organic" nature of this delusion is suggested by its association to consistent neuropsychological deficits.

The first descriptions of delusion for place were mentioned in the progressive recovery phase from confusional states after severe closed-head injury (Benson et al., 1976; Paterson & Zangwill, 1944; Staton et al., 1982), or as an early manifestation in the course of dementia (Fisher, 1982; Pick, 1903). As a result, the importance of widespread cognitive disorders has been proposed by several authors. However, most of the recent cases have been reported in patients who suffered a focal vascular disease (Fisher, 1982; Kapur, 1988; Patterson & Mack,

1985; Vighetto et al., 1985) or a tumour (Ruff & Volpe, 1981; Vighetto et al., 1985) and who were neither confused nor demented.

In a study of the anatomical basis of delusions after right cerebral infarction, Levine and Grek (1984) noted the existence of a pre-existing diffusely atrophied brain (and, therefore, a probable widespread cognitive impairment) as a major cause of delusion for place, time, or familiar individuals. Cortical atrophy is, however, an inconsistent finding (Kapur, 1988; Ruff & Volpe, 1981; Vighetto et al., 1985). Moreover, impressive neuropsychological studies have shown that patients with delusion for place have no general cognitive impairment, since verbal intelligence, language ability, and, at least verbal memory are normal (Benson et al., 1976; Patterson & Mack, 1985; Ruff & Volpe, 1981).

As proposed by Pick (1903), another source of geographical mislocalization is disorientation for time and difficulty gauging elapsed time. Pick observed that his patient's delusion for place occurred after an incidental temporary interruption in the course of events, such as a short sleep. Thus, the delusion for place may stem from an unawareness of the continuity of events, underlying a misinterpretation of the spatial context of events and the belief in a duplication of places (Pick, 1903). However, disorientation for time is mentioned inconsistently in reports of delusion for place (Fisher, 1982, cases 1 and 2; Ruff & Volpe, 1981, cases 3 and 4; Staton et al., 1982). In most cases, disorientation for place was in sharp contrast with a rather preserved orientation for time (e.g., Fisher, 1982, cases 3 to 7; Vighetto et al., 1985).

Visual perceptual impairment, as a consequence of damage involving the right hemisphere, is almost constantly associated with delusion for place. Hence, the disorientation for place observed in this syndrome has been interpreted by several investigators as a consequence of distorted visual-spatial perceptions (Benson et al., 1976; Patterson & Mack, 1985).

Memory impairment is a common source of place disorientation and is frequently exhibited by patients who display delusion for place. Moreover, such patients commonly display a dramatic difference between verbal memory, which is relatively preserved, and nonverbal memory, which is generally impaired (Levine & Grek, 1984; Overlacq et al., 1988; Ruff & Volpe, 1981; Vighetto et al., 1985). These observations may suggest that disorientation for place is a direct consequence of deficient visual-spatial memory. However, the rare existence of some patients without nonverbal memory impairment argues against this hypothesis (Benson et al., 1976, patient 1). An alternative explanation has been proposed by Staton et al. (1982) whose patient, it was suggested, had difficulty integrating new visual information into a store of previously acquired visual-spatial information. Such an interpretation would not attribute the disorientation for place to faulty visual memory per se, but to a *disconnection* of new memory registration from past memory stores.

A last issue concerns the cognitive disorders that may explain the patients' adamant credence in their incorrect statements. Anosognosia is a syndrome defined as an ignorance and a denial of an obvious physical disturbance, most often left hemiplegia or hemianopia (Babinski, 1918; Stuss & Benson, 1986, p.110). It has been widely described in patients exhibiting delusions for place, generally in the recovery course of these physical deficits (Cambier, Elghozi, & Strube, 1980; Fisher, 1982; Nighoghossian, Trouillas, Vighetto, & Philippon, 1992; Vighetto et al., 1985). The condition of anosognosia has been stressed by the same authors to define the patients' unawareness of their disorientation to place. However, in most reports, patients had insight into the conflicting implications of their statements. In fact, they often confessed that their statements sounded somewhat bizarre or were puzzling, but they nevertheless failed to reject them (Benson et al., 1976; Fisher, 1982; Ruff & Volpe, 1981; Weinstein et al., 1952).

To explain this failure, Benson et al. (1976) emphasized the patients' inability to resolve a conflict between the inferences they drew from their visual-spatial perception and what seemed to be a more plausible statement. Since their patients displayed evidence of frontal damage or dysfunction, these authors proposed the delusional belief to be a feature of frontal lobe disturbance. Indeed, EEG, CT scans, angiograms,

SPECT, and pathological data provide overwhelming evidence of frontal damage in patients exhibiting delusion for place (e.g., Nighoghossian et al., 1992; Vighetto et al., 1980; Weinstein, 1955). Furthermore, neuropsychological examinations show pervasive deficits suggesting frontal dysfunction (Kapur, Turner, & King, 1988; Patterson & Mack, 1985; Staton et al., 1982).

Several authors have suggested that the deficit underlying a delusional belief is an impairment in integration, causing poorly perceived information to be improperly associated with other information (Kapur et al., 1988; Patterson & Mack, 1985). They attributed such a disturbance to frontal dysfunction, but the precise dysfunction remains unclear. Indeed, a case has been described in which the delusion for place was progressively relieved but the patient's performance on tests assessing frontal lobe functioning remained impaired (Kapur et al., 1988).

The relation between delusion for place and confabulation is vague. Some investigators have indiscriminately used the terms delusion and confabulation to define their patient's belief (Kapur et al., 1988; Staton et al., 1982; Vighetto et al., 1980). It could be argued that delusions for place belong to a confabulatory behavior, and share the same neuropsychological mechanisms. However, according to Cummings (1992), confabulations are associated with a severe amnestic syndrome and do not reflect stable misbeliefs because they are variable over time and are rarely maintained against counter-arguments. As a consequence, the absence of severe amnesia has led some investigators to distinguish delusion for place from confabulation (Benson et al., 1976). Nevertheless, the presence of a confabulatory behavior, at least in patients displaying memory impairment, cannot be definitively excluded, because it remains to be extensively investigated.

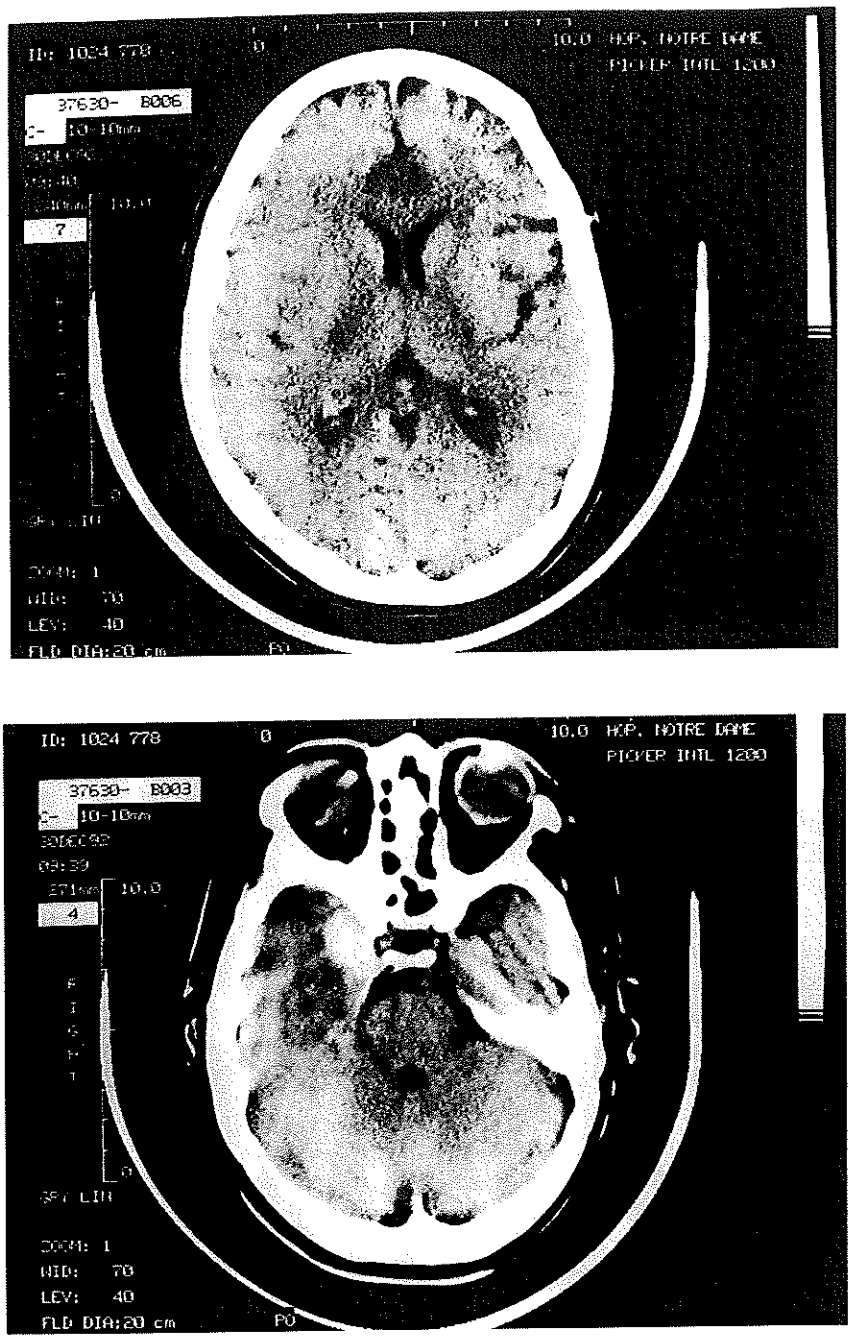
It has been suggested recently that delusional beliefs are the consequence of an interhemispheric disconnection. Delusions would be based on the intact functioning of the left-hemisphere speech areas receiving distorted visual-spatial information from the right hemisphere and trying to make sense of this information (Joseph, 1986; Overlacq et al., 1988; Vighetto et al., 1985). However, such a proposal is subject to some restrictions. First, delusions for place have been attributed to brain insults involving a great number of sites within the right hemisphere (Levine & Grek, 1984). Were the delusion to be secondary to a disconnection between visual-spatial areas and speech areas, the lesion should consistently involve a narrow area crossed by connecting fibers. Second, an imbalance that benefits the left hemisphere remains hypothetical, and cannot explain per se the patients' inability to accept evidence of their errors.

The present report concerns the case of a woman who, while in the recovery phase from viral encephalitis, exhibited a delusion for place without reduplicative paramnesia. She was given a detailed neuropsychological evaluation to shed some light on the mechanisms that might explain her disorientation for place and the strength of her misbelief.

CASE HISTORY

LB is a 64-year-old French-speaking right-handed woman who has 12 years of formal education. She was referred to Notre-Dame Hospital in Montréal with a 4-day history of fever, nausea, and vomiting. On admission there were clear signs of intracranial hypertension and clonic movements of the right limbs. A herpes simplex encephalitis was diagnosed and treatment by Acyclovir was initiated. A CT scan examination showed a heterogeneous hypodensity of the right temporal lobe. Seven days later, hypodensities bilaterally involved the cingulate, orbital and rectus gyri, the insula and, on the right side, the septal nuclei, the hippocampus and the parahippocampal gyrus, with a hemorrhagic lesion at the anterior pole of the right temporal lobe (Fig. 1, 2). A few weeks later, the patient displayed numerous "frontal signs", such as grasping reflex, perseverations, utilization behavior, confabulations and apathy; with the exception of the latter, these progressively disappeared.

Because her condition improved considerably, she was referred to a rehabilitation service at the Hospital Côte-des Neiges in Montréal 7 weeks after initial admission. Neuropsychological examination was conducted during her 2-month hospitalisation period at this facility. On examination she was alert, answered questions, and obeyed requests. She was generally able to describe her cognitive problems or behavioral



Figs. 1, 2. CT scan slides showing the bilateral mesio-frontal lesions (fig. 1) and, on the right side, the temporal necrosis with polar hemorrhage (fig. 2).

changes but expressed very little concern about their severity.

Behavior Related to Delusion for Place

While the patient occasionally acknowledged that she stayed at the Côte-des-Neiges Hospital, she had a

stronger impression of being at home. This discrepancy is illustrated by the statement: "I know I am at the hospital but it is nevertheless my home room". Each morning she declared spontaneously to the nurses that she was in Sainte-Agathe (the town where she lived). Once, she was surprised not to see a swimming pool through her room window, as she was used to at home. One evening, while hospitalized, she wanted to find her dog downstairs in the cellar of her "home". She opened the door to an emergency exit, set off the alarm, but did was indifferent to the cues of her error. The next day, her husband tried to convince her that she could not have found her dog since she was hospitalized, yet she maintained that she was at home and that he was wrong. To cut short the attempts to disabuse her of these positions, she stated: "My ideas are stronger than reality". Another day, she explained to one of the authors that her husband (who had to drive 100 km to see his wife each day) slept with her each night; this was not so.

From the second month, LB was discharged each week-end. During the first week-end at home, she knew that she was in Sainte-Agathe, and that this town was located almost 100 km from Montréal. She had no problem recognizing the different rooms and walking within her well known surroundings. However, several times she seemed to act as if she were still at the hospital: looking through the window, she was looking for a spruce tree that she could only be seen from her hospital window; on Saturday evening she wanted to go downstairs to the church and later to the café (as at the hospital); she was surprised not to find the bathroom (of the hospital) close to her bedroom, and so on.

Whereas LB had no problem recognizing her family, physicians, psychologists, and nurses, once she was discharged home, LB had some trouble recognizing actors or TV presenters. For several weeks, she believed that the TV presenter of a daily broadcast, Mrs X, had been replaced by a well-known actress, Mrs Y, in spite of her husband's denial and the fact that at the end of the programme the name of Mrs X appeared on credit titles. Hence, she suspected that the broadcast director wanted to deceive the public, and she held her false judgement with such a conviction that she wanted to call the TV staff to prove to her husband that she was correct. Interestingly, the misidentification of Mrs X was not purely irrelevant, since Mrs X and Y shared some common physical features.

NEUROPSYCHOLOGICAL ASSESSMENT

The *Ottawa-Wechsler Intelligence Scale*, a French-Canadian adaptation of the WAIS (Chagnon, 1953), yielded a global IQ score of 86 ($M = 114.6$, $SD = 9.9$), with a clear asymmetry between the verbal IQ (102) and the nonverbal IQ (70) scores. LB's poor performance was equally distributed within the different nonverbal tests.

Spontaneous speech was fluent and informative. Picture naming remained within normal limits, but verbal fluency was low (see Table 4). Comprehension and reading were good. She made a few perseverative errors and letter substitutions or omissions to dictation (e.g., byclyctette for *bicyclette*). She correctly wrote numbers to dictation and exhibited a few careless mistakes on written calculations. She only successfully calculated the most simple arithmetic reasoning problems.

Visual Perceptual Analysis

The patient's visual acuity was satisfactory with correction. She had no visual field limitations. The *Bells Cancellation test* (Gauthier, Dehaut, & Joanette, 1989) did not demonstrate any hemineglect. The results obtained in visual perceptual tests are summarized in Table 1. LB's low performance on the famous face recognition task contrasted with her ability to recognize faces of the medical staff at the hospital.

Visuoconstructive Abilities

Spontaneous drawings were recognizable, although a little messy. She was able to draw from memory a plan of her bedroom at home and at the hospital with all of the main elements (windows, door, furniture), but the representation was slightly distorted. She did not tend to mix subparts of the former room with subparts of the latter. Tridimensional representation was impossible.

Visual Spatial Orientation

LB displayed no difficulty in right-left discrimination for her own body, the examiner's body, or in the manipulation of objects. The *Standardized Road Map Test of Direction Sense* (Money, 1976) was administered according to two different procedures. In the first condition, LB had to follow the pathway on a fixed map. In the second condition, she could take the map in her hands and turn it to avoid mental spatial rota-

Table 1. Performances on Visual Spatial Tests.

Tests	Scores (number correct)	
	LB	norms
Bells cancellation test	32/35	cut-off: 32
Benton's Line Orientation Test	15/30	cut-off: 19
Benton's Visual Form Discrimination Test	24/32	borderline 24-25
Benton's Face Discrimination Test	37/54	cut-off: 40
Famous Faces		
recognition	32/46	
identification	23/46	
Hooper Visual Organization Test	15.5	cut off: 22.0
Rey's Complex Figure	14.5/36	< 10th percentile
Money's Road-Map Test		
with mental rotation	15/32	24.8 ± 6.2
without mental rotation	32/32	–

tions. The responses were almost at random in the first condition, while they were flawless when mental rotation was not required.

Wayfinding abilities were studied in real conditions: LB was asked to determine and follow an unknown route to reach a predetermined destination. The experimental task consisted of LB reaching the dental clinic in her hospital, from the closest bus stop in front of the hospital. Once the destination was reached, she was required to return to the bus stop by the same route. The patient was asked to verbally express everything that went through her mind while reaching the destination. When LB did not verbalize, the accompanying observer inquired as to what she was doing or why she was taking a given action.

The whole conversation was taped and then analyzed according to coding rules (Rainville et al., 1993). In the original trip, from the bus stop to the dental clinic, LB was able to make relevant decisions (e.g., to decide to take the elevator) or inferences (e.g., to use the ascending room numbers to determine which direction to follow in the corridor). However, exploratory behavior to find specific information was clearly impaired. For instance, while looking for the elevator, she walked by it and on to the end of the corridor. On the return trip, LB seemed to walk aimlessly. She did not try to recognize landmarks observed during the original trip, and she insisted on going to all the emergency exits and then to the photographer's office. To succeed at her task she required four interventions from the observer.

In her daily life, LB showed the same difficulty finding her way around the hospital. However, she was able to *describe* new routes in the hospital, such as those leading to the occupational therapist's or to the psychologist's offices. At home she had no difficulty following old, overlearned routes.

Orientation abilities were also studied in an experimental room with removable partitions. In this task, LB was explicitly asked to explore the room and to remember the layout of the partitions. Later, she was asked to recognize the explored room among five models in wood, only one of which corresponded to the correct layout (1st stage). She was then required to explain her choice by stating why the four other models had to be excluded (Fig. 3). Subsequently, she was asked to check the partition arrangement in the room and, if necessary, to correct her choice (2nd stage). In a last step, she had to take the model and go into the room, to check for a second time the accuracy of her response (3rd stage). This last procedure was intended to avoid a memory bias which could have impaired her performances.

Eight trials of increasing difficulty were undertaken. LB's first choice was the correct response in only 2 of the 8 trials (3 normal subjects, paired for sex, age, and education level never obtained a score lower than 6/8). Furthermore, while normal subjects always corrected their mistakes at the second stage, LB's score was still 2/8 at the second stage and only 3/8 at the third stage. Hence, LB's performances were clearly deficient as compared to the 3 normal controls. Figure 3 provides a good illustration of the problems that she encountered. The room was explored too quickly and too superficially; hence, at the recognition phase, LB only based her choice on fragmentary visual-spatial information extracted from the surroundings. She failed to correctly explain her choice and, later, to perceive the discrepancy between the chosen model and the actual arrangement in the room.

Memory

LB's short-term verbal memory was within normal limits but her short-term nonverbal memory was impaired on the Corsi Block-Tapping test and Wilson's spatial memory test (Wilson et al., 1989). On verbal long-term memory tasks, LB performed within or slightly below the normal range. Recognition of line drawings of nameable objects (Signoret, 1991) was almost flawless in the immediate condition as well as in the delayed condition. By contrast, memory deficits were severe for nonverbal material (see Table 2).

Orientation to Time and Memory for Temporal Order

The patient was severely disoriented with respect to time, even though she was sometimes able to give the correct date. She generally made gross errors when asked to specify the season or the year. Moreover, she had difficulty gauging elapsed time; occasionally, she was afraid of being late for meetings, though she had plenty of time. On other occasions, when she should have hurried, she wasted her time. In the first weeks at home after her discharge, LB always thought it was Sunday because of her inactivity. Each evening, she wanted to pack her luggage, as if she were on a week-end discharge and had to go back to the hospital. However, her belief that it was Sunday did not elicit a particular disorientation for place (e.g., claiming to be in a church or in another place which she would frequent on Sundays).

LB had severe difficulties organizing her autobiographical memory, as assessed by a translation of the Kopelman's questionnaire (Kopelman, Wilson, & Baddeley, 1989). LB often had

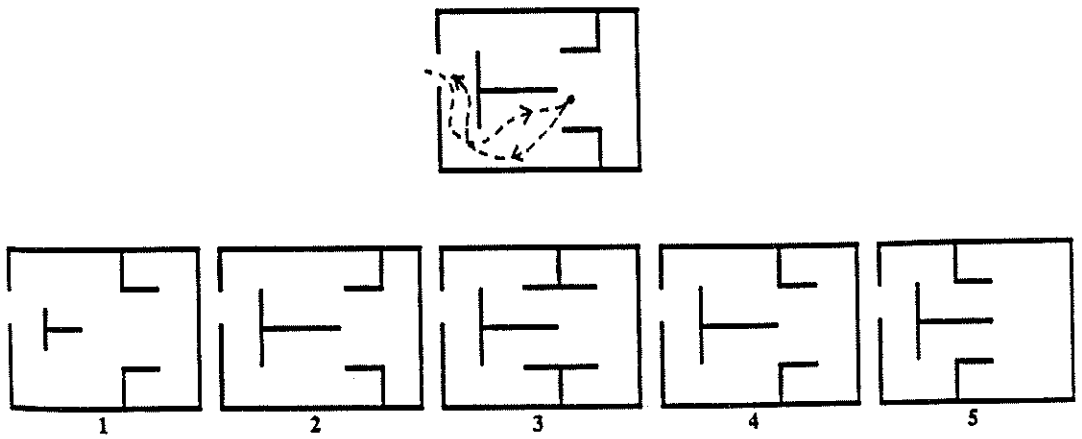


Fig. 3. Exploration of an experimental room. At the top: ground plan of the to-be-explored room, and LB's exploratory course. At the bottom: ground plans of the models used in the recognition task. Exploration duration: 29 s. First stage: LB chose the model # 4; second stage (after checking the partitions layout) she chose model # 4; third stage (within the room, with the models in her hands) she chose model # 3.

Table 2. Performances on Memory Tests.

Memory Tests	LB	norms
Auditory-verbal digit span	5	5
Corsi block tapping span	3	> 4
Wilson's Spatial Memory Test	6	8.9 ± 1.1
Buschke Selective Reminding Test		
free recall (1st trial)	6	9.3 ± 2.6
recognition	15	15.3 ± 0.7
delayed recall	12	12.4 ± 2.6
Wechsler Memory Scale histories		
immediate recall	9.5	12.5 ± 2.4
delayed recall	6.5	12.0 ± 2.9
BEM 144 line drawings recognition		
immediate condition	12,0	8,6 ± 1,2
delayed condition	11,5	9,6 ± 1,2
Warrington Facial Recognition Test	25/50	< 5th percentile
Rey-Osterrieth figure recall	5	< 5th percentile
Wechsler Memory figures	8	11.3 ± 2.2

to be prompted by the examiner to provide autobiographical events. While the events that she recalled were accurate, they were misplaced on a time scale, sometimes with gaps of 20 years. LB was able to chronologically order the major feasts of the year, but she produced some gross errors (e.g., placing Advent just before Easter, or Christmas after the New Year's). She also made a few (but glaring) errors on classification of 10 public events of the last 45 years (e.g., placing the end of World War II between the murder of President Kennedy and an important Canadian political event held in 1990).

Memory for the temporal order of events was assessed according to an adaptation of a word sequencing test devised by Shimamura, Janowski, and Squire (1990). In this test, LB was presented a series of 15 common words, with instructions to read them aloud and to try to remember the order in which they appeared. Immediately after the study phase, LB was asked to recall the temporal order of the words, randomly arranged in a two-dimensional array. The ability to remember this sequential order was assessed by calculating a Spearman rank order correlation between the actual study order and the judged order (perfect score: +1.0). In this task, LB's corelation was 0.54, while a control subject, matched for sex, age, and educational level reached a correlation of 0.77. By contrast, LB performed quite well in a word recall and a recognition test that did not require the retrieval of temporal order. Using a different list of 15 common words, her scores, 8/15 in free-recall (control: 6/15) and 15/15 in recognition (control: 13/15), were normal.

Examination of Confabulatory Behavior

LB did not exhibit any obvious confabulatory behavior, except for orientation to place and, to a lesser extent, to faces. However, confabulations were most evident when provoked by direct questioning. Therefore, confabulatory assessment was conducted following the procedure designed by Dalla Barba (1993). A battery of five types of questions was constructed. Four types probed personal semantic memory, episodic memory, orientation for time and place, and general semantic memory, respectively. The final type of questions was "impossible" questions, to which the expected response was "I don't know" (e.g., "What kind of job did Marilyn Monroe's father have?").

Of a total of 72 questions, LB gave confabulatory responses to only five questions. Two of them concerned orientation for time (the precise day of the week and the season). The last three confabulatory responses concerned orien-

tation for place. When asked in which town she was at the moment, she claimed she was at home; when asked twice about her activities of the previous day, she accurately recalled the examinations she had undergone, but claimed that, afterwards, she went back home. There were no confabulatory responses to the "impossible" questions.

Tests Sensitive to Frontal Dysfunction

On "frontal" tests, LB demonstrated slowness and poor flexibility. On the Wisconsin Card Sorting Test (Milner, 1964), although she could deduce the sorting principles, she could not apply them. During many tests, she was impulsive, did not take into account the feedback from the examiner, broke the rules, and made numerous perseverative errors (see Table 3).

Reality Monitoring

LB's delusions may have been related to an inability to discriminate real from imagined events (e.g., recent journeys or stays). Hence, a test was designed to assess LB's reality monitoring of recent events. The general procedure was similar to the one recently employed by Dick, Keane, and Sands (1989). The patient was presented 16 cards on which a to-be-performed action was written (e.g., brush your teeth). For half of the cards, the object required was provided to the patient and she was asked to carry out the action. For the remainder of the cards, the patient was asked to imagine but not to actually perform the action. Following a 10-min interferential task, LB was able to spontaneously recall six to-be-performed actions and five to-be-imagined actions (total recall 11/16). When she was presented with 24 cards (the 16 cards presented in the first phase and 8 foil cards), she recognized 16/16 actions and could perfectly dissociate the to-be-performed actions from the to-be-imagined ones.

DISCUSSION

In summary, LB suffered an encephalitis involving the mesio-frontal and orbito-frontal regions bilaterally and, on the right side, the anterior part of the mesio-temporal lobe. At the cognitive level, a thorough neuropsychological examination showed abnormalities suggesting frontal dysfunctions, visual perceptual impairment, and moderate nonverbal memory deficiencies. Verbal intelligence and language were preserved. Furthermore, the patient was disoriented with

Table 3. Performances on Frontal Tests.

Frontal Tests	LB	norms
Wisconsin Card Sorting Test		
number of applied categories	0	
perseverative errors	51	
Trail Making Test		
Part A	1 min 54 s	10th percentile
Part B	2 min 58 s numerous errors	25th percentile
Stroop Test		
word reading	58 s	50 ± 9 s
color naming	1 min 33 s	1 min 09 s ± 12 s
interferential condition: time	4 min 07 s	2 min 08 s ± 21 s
errors	3	1.5
Word fluency (90 s)		
animals	7	
words starting with P	10	
Porteus Maze Test	7-year level	
London Tower Test	incomplete data (LB broke the rules)	

respect to place, time, and, to a lesser extent, faces. At the behavioral level, LB displayed a delusion for place, consisting of the false belief of being in a familiar place, most often, at home. Following her discharge, such a delusional belief also interfered with recognition of some familiar faces. There was no confabulation in other areas. This case allows us to address two questions that appear central to a better understanding of the mechanisms underlying delusion for place: (1) Why is there a disorientation for place? (2) Why is there a delusional belief? Each will be discussed in turn using as arguments the results of the cognitive investigation.

Why a Disorientation for Place?

Several pathogenetic hypotheses proposed to explain this feature of delusion for place may be ruled out (e.g., psychogenic factors, widespread cognitive disorders, confusion or disorder of time perception). These are, indeed, inconstant disorders and may instead play the role of aggravating factors. By contrast, LB's nonverbal memory and visual perceptual impairments deserve more attention, since such disorders have been described in almost all previous cases of delusion for place.

On LB's laboratory tests there was a sharp contrast between fairly preserved verbal memory and severely impaired nonverbal short-term and long-term memories. These results may suggest that LB's inability to find the correct place is the consequence of her deficient nonverbal memory. As a result, LB may be unable to recall a given place and, consequently, may be unable to provide an accurate orientation for place. However, this does not seem to be the correct explanation. First, LB showed preserved recall of familiar places, drawn from her premorbid knowledge. Her verbal or drawn description of her home was accurate and detailed. Moreover, in everyday life, LB was able to acquire a significant number of new visual-spatial markers. When asked to recall visual information, she could discriminate between old (e.g., the layout of her home bedroom) and new familiar settings (e.g., the layout of her hospital bedroom). A last counter-argument is that, while nonverbal memory impairment is a very common disorder in brain-damaged patients, consistent misidentification of familiar places is far less frequent. Nonverbal memory impairment alone, thus, cannot account for the disorientation for place.

In one report, a disconnection between new memory and past memory stores has been proposed as the critical disorder (Staton et al., 1982). The patient, RK, was unable to recognize nonverbal information belonging to his premorbid experience and, hence, experienced duplications of time, place, and persons. This pattern is obviously different from the one displayed by LB. Although the authors concluded a reduplicative paramnesia, RK's deficit was a rather pure misidentification syndrome, since RK did not develop any delusional belief, but a psychotic-like sensation of unreality. LB did not have the same surreal feeling when placed in surroundings that she knew from her premorbid experience. After her discharge, although she made some remarks and occasionally acted like she was still at the hospital, she had no trouble recognizing her home, its topographical organization, and the minor alterations that had occurred. Therefore, although the explanation proposed by the authors may be accurate to explain the pattern displayed by RK, it does not seem relevant in explaining LB's disorientation and most of her delusions for place.

Without exhibiting neglect or visual field constriction, LB performed poorly on all of the visual-perceptual and visual-spatial tests. When asked to learn the layout of the experimental room, she made a piecemeal analysis of her surroundings and usually failed to recognize the layout on a multiple-choice task because her responses were determined by small details. This visual analysis defect could at least partly account for her place disorientation. Indeed, she often justified her misidentification of a place by pointing out the presence of *one* detail shared with a known place. In one instance, when she opened the ward emergency door to go to the cellar, she believed that she was at home because "the corridor was the corridor of my home", and she made no attempt to comprehend the ward as a whole.

The details chosen to identify an object or a place may or may not be relevant. Indeed, when

asked to explain why she chose a given model of the experimental room rather than the others (see Fig. 3), LB would often rely on a feature that was not necessarily critical: namely, a feature that was not specific to the chosen model. This trend to identify a visual item from a single detail was probably the source of her misidentification of place and, though rarely, of faces. Indeed, she more recently displayed a Capgras syndrome, illustrated by her strong belief that a TV presenter had been replaced by a popular actress, thought to be an impostor. A piecemeal processing may explain most of the weak performances observed on visual-perceptual and visual-spatial tests.

As in most of the previous reports, LB's delusion for place typically involved familiar places (e.g., the conviction of being at home). This preferential misidentification of *familiar* places has puzzled many investigators (e.g., Benson et al., 1976), but no clear explanation has yet been found. Two proposals may be made. First, LB's fragmentary visual processing led her to scan only some clues of the surroundings; this could induce a *déjà-vu* experience because of their closeness to familiar clues. In this respect, it could be argued that familiar places are among the type of information (with familiar faces) that may produce the strongest experiences of *déjà-vu* and, thus, may be a preferential theme of delusion. Second, the preferential misidentification of familiar places may be caused by the patients' profound desire to go back home, which has been documented in numerous reports (Paterson & Zangwill, 1944; Ruff & Volpe, 1981), and was also expressed by LB. The expectancy of being at home may indeed facilitate, at a preconscious level, perceptions that reinforce this hope (Fleminger, 1992). In other words, a top-down processing may guide perceptions.

Furthermore, LB's misidentifications yield insight into the question of whether delusion for place is strictly specific for place. In other words, should a distinction be held between delusion for place and other delusional misidentifications, such as delusion for faces? In LB's case, there was an overlap between the two delusional themes because, in addition to her major delusion for place, she asserted that a TV presenter had been replaced. Careful examination of previously reported cases provides overwhelming evidence of an overlap between these misidentification syndromes, which can involve the identification of place, face, or body parts (Cutting, 1990; Joseph, 1986).

Capgras syndrome, a delusion for faces, was first thought to be a functional disturbance and was interpreted in psychodynamic terms (Capgras & Reboul-Lachaux, 1923). Later reports of brain insults on CT scans and the observation of neuropsychological deficits in Capgras or related syndromes prompted their classification as delusions for place (Alexander, Stuss, & Benson, 1979; Young, Reid, Wright, & Hellawell, 1993). Thus, misidentification syndromes are unlikely to be specific to one type of visual spatial information (i.e., place, or face) but rather prevail on one visual theme.

Why is there a Delusional Belief?

The frequent association of delusion for place and memory impairment and the unseemly nature of the patients statements may suggest a behavioral phenomenon known as confabulation. Within confabulatory responses, a distinction has been proposed between provoked confabulations and spontaneous or fantastic confabulations. Provoked confabulations would tend to embellish true memories elicited by questions, and thus would be plausible. By contrast, spontaneous confabulation would reflect the production of an extremely incoherent, bizarre, and context-free retrieval of memories and associations (Kopelman, 1987).

The verbal manifestations of LB's disorientation do not fit well within this framework, because they shared characteristic features of both provoked and spontaneous confabulations. They were predominantly produced in response to questions, but were rather bizarre. A confabulatory behavior questionnaire was, nevertheless, administered to determine whether confabulatory responses could be evoked only by place-related questions or by wide range questioning. LB displayed confabulatory responses to questions probing orientation for place or time, and never confabulated to questions probing other aspects of her episodic and semantic

memories. Moreover, LB had a good metamemory in that she always answered "I don't know" to impossible questions.

These results are in agreement with those cited by Berthier, Posadas, Puentes, and Kulisevsky (1993) in connection with a similar misidentification syndrome. They lend support to a distinction of delusion for place from a broad confabulatory behavior. According to Cummings (1992), two other characteristics of LB's statements distinguished them from confabulations – that is, the consistency of her responses (e.g., the claim to be at home) and the strength of her wrong belief.

We have pointed out that LB's expectancy of being at home may have guided her already distorted visual perceptions, according to a top-down processing model. A vicious circle may then be engaged, in which the belief of being in a familiar setting is confirmed by misperceptions driven by this belief. However, the maintenance of a delusional belief needs at least another weak process, specifically poor judgement, which facilitates acceptance of misperceptions. LB's statements precisely confirm such a deficit. When her statements were questioned, she occasionally had some hesitations about her actual orientation for place, felt angry, and wanted to close the discussion. In such circumstances she once concluded that, in any case, she was more confident with "her idea" than with external clues from reality. As a result, she persisted in her wrong interpretations, even when they led to obvious discrepancies. Another striking evidence of LB's weak judgement is illustrated by the episode in which she went downstairs in the hospital and set off the fire-alarm. She had full *knowledge* that the alarm was ringing, but no *awareness* of its implications. Thus, she persisted to believe that she was at home.

LB's behavior and assertions give evidence to a lack of "self-awareness" (Stuss & Benson, 1986). Indeed, they indicate that LB is unable to make a judgement of appropriateness and select a correct interpretation or behavior, even though she received feedback from the environment. Although descriptions of patients' self-awareness are lacking in most reports of delusions for place, ancillary and neuropsychological examinations provide compelling evidence that all of these patients suffered frontal damage (Benson et al., 1976; Weinstein, 1955). These data are in agreement with the notion that prefrontal cortex is a critical brain area for self-awareness (Stuss, 1991). In LB's case, a CT scan showed tremendous lesioning of the prefrontal cortex. Furthermore, behavioral and neuropsychological data provide overwhelming evidence of prefrontal dysfunction. For example, she was apathetic and seemed unconcerned about her cognitive problems. Her difficulty ordering events, gauging time, and orientating for time probably stemmed from deficient evaluation abilities and poor judgement of appropriateness, which have been described in frontal-damaged patients (Stuss, 1991). On testing, she displayed a lack of anticipation and planning, and experienced difficulties in dealing with conflicting information.

Nevertheless, the role of frontal dysfunction in delusion for place has been questioned by some investigators, because in one case relief of the delusion did not correspond to a concomitant improvement on performances of "frontal tests" (Kapur et al., 1988). The tests were a verbal fluency task and a Modified Card Sorting Test, on which their patient, RS, continued to show perseverations. However, these data do not call into question our assertion that a lack of self-awareness was one of the critical deficits in LB's case. Indeed, the tests mentioned above do not tap so-called self-awareness but other prefrontal functions which are not necessarily relevant to explain the delusion.

Finally, it could be questioned whether LB's delusion for place relied necessarily upon a disrupted visual-spatial experience. Indeed, Whitty and Lewin (1957) have described some confabulating cingulectomy patients who complained of having difficulties discriminating facts that were real from facts that they just imagined. Because LB's brain injury involved the cingulate gyri bilaterally, her delusion for place might have rested also on a failure to discriminate real visual events (e.g., her stay at the hospital) from internally generated visual events (e.g., her hope to return home). In the latter case, a plausible explanation of the delusions may have been a deficiency in the processes which normally mo-

nitor remembering. A reality monitoring task was, therefore, administered to LB to check if to-be-performed and to-be-imagined actions were blurred or clearly discriminated. The results showed that she was perfectly able to judge the reality of to-be-recalled gestures, and hence provided some support to the essential role of a disrupted visual spatial input.

In summary, cognitive disorders involved in LB's delusion for place may need the conjunction of two main deficits. First, she had distorted visual-spatial input, which is a well-known consequence of brain damage involving the right hemisphere (Paterson & Zangwill, 1944). In LB's case, visual-perceptual impairment seemed to rely particularly on a scanty exploration of the environment, and a trend to give impulsive responses, which suggest a critical role of frontal dysfunction. Second, the patient displayed a lack of self-awareness, which may explain the strength of the misbeliefs induced by misidentifications. A similar two-factor pathogenesis of delusion for place has already been proposed, in which emphasis was placed on the patients' inability to resolve conflict (Benson et al., 1976). Others have proposed that a three-factor process may account for this syndrome; these encompass a visual-perceptual deficit, a nonverbal memory deficit, and an impaired ability to "integrate information" (Kapur et al., 1988; Patterson & Mack, 1985). In LB's case, as in most cases reported in the literature, nonverbal memory impairment was concluded from neuropsychological testing. Indeed, as shown above, she was able to acquire and recall a considerable amount of accurate information relevant to her new visual-spatial environment, although she experienced difficulties using this information. Hence, nonverbal memory impairment seems to be a less relevant disorder in the pathogenesis of delusion for place.

In conclusion, LB's disorder belongs to the so-called misidentification syndromes, whose common feature has been proposed to be a failure to recognize the *uniqueness* of a person, a place, or an event (Cutting, 1990). All patients have been reported to display some degree of visual-spatial impairment. The delusion appears to lie in an attempt to rationalize their strange experiences, and leads to the belief that the perceived thing (or person) is something (or someone) else within the same category. A lack of self-awareness, linked to lesions of the prefrontal cortex, gives a particular strength to the patients' belief, so that they are unable to shift their statements. They may even become suspicious and develop persecutory ideas when confronted with counter-arguments. Of particular theoretical interest is the comparison with persecutory delusions displayed by schizophrenic patients. The present report suggests that a neuropsychological approach may help to understand a neuropsychiatric picture that seems very bizarre and points to the existence of fascinating bridges between neurology and psychiatry.

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