NOTE

UNILATERAL NEGLECT OF REPRESENTATIONAL SPACE

Edoardo Bisiach and Claudio Luzzatti

(Centro di Neuropsicologia dell'Università di Milano)

Discussions of unilateral neglect following brain injuries have generally disregarded the question of whether the phenomenon is only manifest in the egocentrical perspective of the physical environment (including one's own body) or evident in representational space as well. An answer to this question would somehow contribute to the understanding of the nature of unilateral neglect. A simple procedure, recently applied to two patients who exhibited left unilateral neglect, provided some insight into the question. The patients were asked to describe a familiar place, the Piazza del Duomo in Milan (Figure 1), according to definite perspectives. First (*a*), they were requested to imagine themselves looking at the front of the cathedral from the opposite side of the square; then the reverse perspective (*b*) had to be described, i.e. the perspective seen from the front doors of the cathedral. In one patient, the same procedure was followed in relation to the studio where he had spent most of his life (Figure 2).

CASE REPORTS

Case 1

I.G., a retired manager of 86, had a stroke without loss of consciousness on July 24th, 1977. Neurological examination revealed a left hemiplegia with left hemianopia and severe global left hemihypesthesia. Tested a few days later, she was found to be minimally anosognosic concerning her motor disorder, while she denied any defect of visual field. She was requested to touch all 13 dots composing a symmetrical pattern, 23 cm in width, starting from the center. After having scanned the whole right side, she said: "I think I have touched all of them." After a few seconds hesitation, however, she went on spontaneously, correctly completing the task.

Description of the square (see Figure 1 for references). Perspective *a*. "The cathedral with its steps in front of me; the Royal Palace (1); the stairs (2); ... the Arengario (3); the Royal Palace; further on, the Archiepiscopal Palace (4); then Via delle Ore (5)." Perspective *b*. "The arcades with the shops" (she is probably referring to the northern arcades (6) rather than to the southern, as it is customary for Milanese people to allude to the former when no further specifications are added, due to their much greater significance and extension);

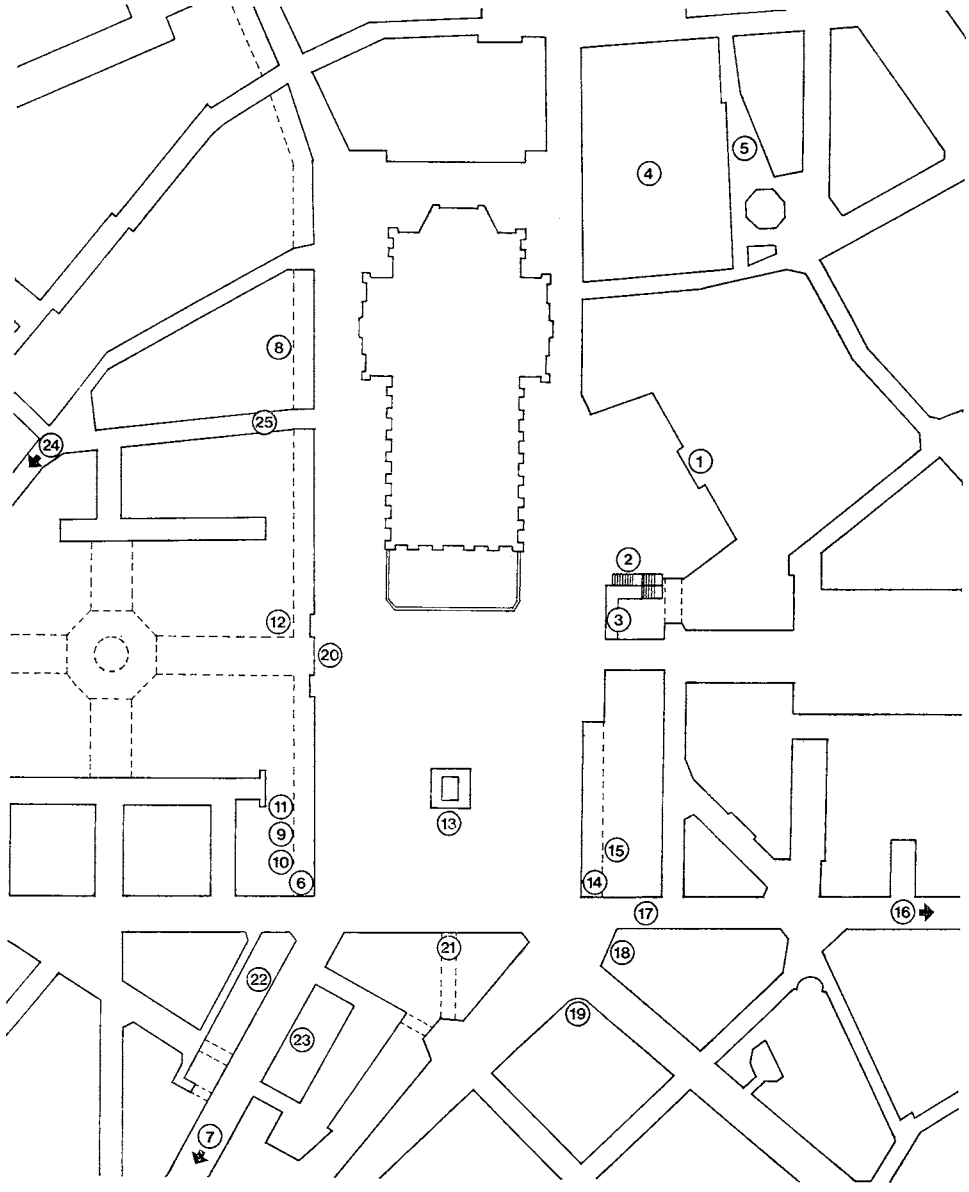

Fig. 1

"Via Dante (7); Rinascente (8); the jewellers' shops (9)(10); a shirt shop (11); Motta (12)."

Computerized tomography. Two areas of abnormal attenuation with mixed changes and ill defined margins are seen in the right hemisphere. In the frontal lobe the lesion is mainly decreased in density, involving the white matter lateral to the frontal horn, with some increased density dots at the level of the head of the caudate nucleus. In the temporoparietal region, lateral to the trigone there

is a small cortical increased density area with decreased density in the underlying white matter. These findings are compatible with hemorragic infarction in the vascular supply area of the lenticulostriate arteries and of the angular branch of the sylvian artery.

Case 2

N.V., a lawyer of 72, had a stroke on December 2nd, 1977. Neurological examination revealed a very slight left hemiparesis with left hemianopia and severe left hemihypesthesia. He was completely anosognosic for the above-mentioned deficits. The tests were begun on the same evening. The scanning task elicited complete neglect of the left half of the pattern, which could not be overcome in spite of the examiner's remarks.

Description of the square. Perspective *a*. "The cathedral; the corner of the Royal Palace (1); the Arengario (3); the Vittorio Emanuele II monument (13); the northern (6) and southern (14) arcades; the lamps; Galtrucco (15); Piazza Missori (16) at the end of Via Mazzini (17); Al Duomo stores (18), ... but they are no longer there; Alemagna (19)." After the examiner's invitation to continue his description, he added: "The front of the Galleria (20) with the terraces and Motta (12)." Perspective *b*. "The palace with the arcade to Via Orefici (21); the Palazzo dei Giureconsulti (22); the Loggia dei Mercanti (23); Motta (12); Rinascente (8); Piazza San Fedele (24); Via San Raffaele (25)." The last 4 items were provided after the examiner's incitement to go on.

Description of the studio (see Figure 2 for references). Perspective *a* (Sitting at the desk). "Behind me there is a book-case (1); I am sitting in a Savonarola chair (2), behind a carved Renaissance table (3); in front of me there is an unknown master's painting representing Jesus Christ's flagellation (4); I have many books, some armchairs, a chandelier with false candles (5); on the right, the window on *** street (6); on the left, the door to the passageway (7)." Prompted to go on, he added "An enclosed book-case (8)," and, after several seconds, "an upright piano (9)." It must be pointed out that the patient was very fond of music and used to spend a couple of hours at his piano every afternoon after working. Perspective *b* (Facing the desk; this part of the test was carried out on the following day). "In front of me, the book-case (1) and the carved table (3); on the right, the upright piano (9), some chairs, paintings on the walls, the door to the passageway (7); beyond the piano, a large room (10) hung with old tapestries, with old chests of drawers and some paintings... a Madonna and Child; ... in the studio there are no paintings besides the Flagellation... there are some water-colours (11) hung over the piano; then a copy from Titian... no, from Giorgione, a beautiful Lady, may be it is by Palma il Vecchio, her name is Violante (12)." After being asked for further details, he added: "A French pendulum-clock (13); the flowered velvet armchair (14); Dante's bust on the book-case (15)."

Computerized tomography. Right intracerebral hematoma, approximately 4 cm in diameter, involving the grey and white matter of the postero temporal and inferior parietal areas (carrefour).

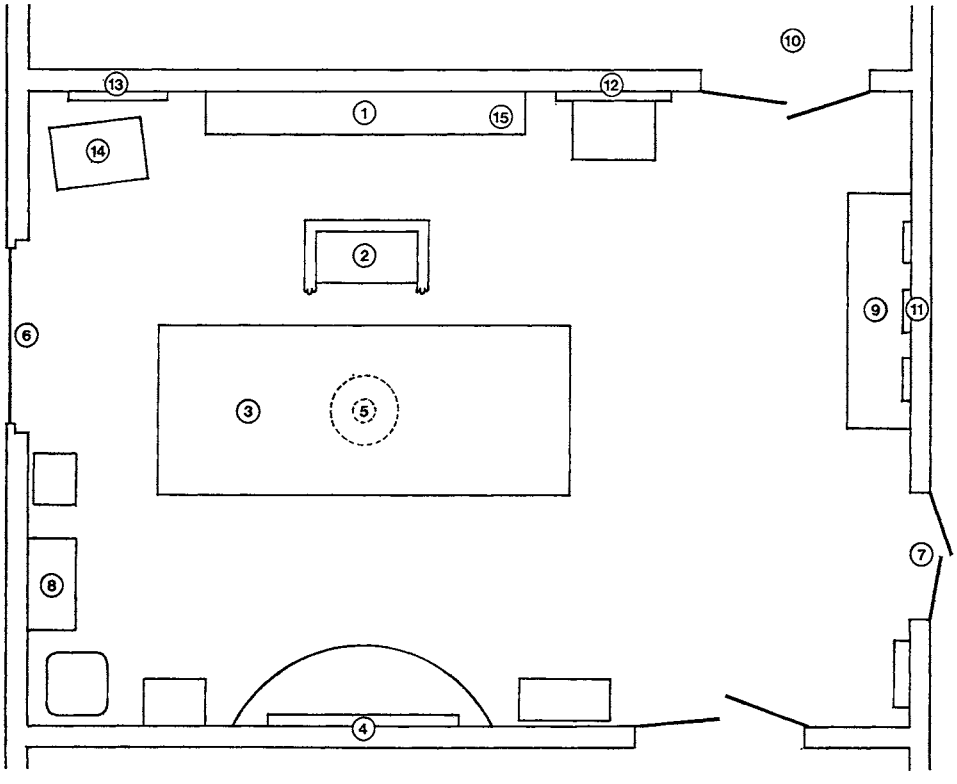

Fig. 2

Discussion

Though the more or less complete neglect of left-sided details in the descriptions of the imagined surroundings by our two patients is per se sufficiently eloquent, something may be added about patient N.V.'s exposition of the parts of remembered scenes: while central and right-sided items were enumerated in a rather lively manner and sometimes dwelt upon, the few left-sided items were mentioned in a kind of absent-minded, almost annoyed tone.

A full discussion of the findings would exceed the scope of this note. For the present purpose it is enough to consider briefly some of their theoretical implications. There is reason to suggest that unilateral neglect cannot be reduced to a disorder confined to the input-output machinery of the organism interacting with its physical environment, once it seems to affect mental events whose occurence is not contingent upon actual stimulation from the outside or actions of the organism on his environment; at least, not upon their spatial attributes. Moreover, our findings support the view that the mechanisms underlying the mental representation of the environment are topologically structured in the sense that the processes by which a visual image is conjured up by the mind may split between the two cerebral hemispheres, like the projection of a real scene onto the visual areas of the two sides of the brain. It might therefore be

argued that even stimulus-unbounded properties of the mind such as those at issue here do have *extension* and are built in a substrate which scarcely conforms to the holographic model suggested by Pribram (1971, p. 140).

Summary

Two patients showing left unilateral neglect were asked to describe imagined perspectives of familiar surroundings. Left-sided details were largely omitted in the descriptions. Some theoretical implications of the occurrence of unilateral neglect in representational space are briefly considered.

Reference

Pribram, K. H. (1971) *Languages of the Brain*, Prentice-Hall, Englewood Cliffs, New Jersey.

Edoardo Bisiach, Claudio Luzzatti, Centro di Neuropsicologia dell'Università di Milano, via Francesco Sforza 35, 20122 Milano, Italy.