



### AJ Larner

Cognitive Function Clinic, Walton Centre for Neurology and Neurosurgery, Liverpool, L9 7LJ, UK.

#### Correspondence to:

Email: a.larner@thewaltoncentre.nhs.uk

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# Neurological Signs: Mirror Phenomena

*"I've had the experience of finding myself unexpectedly before a mirror and not recognising myself..."*

André Malraux *La Condition Humaine* (published in English as *Man's Fate*)<sup>1</sup>

The speaker of these lines is an ageing Chinese academic, Old Gisors, who habitually smokes opium, a habit which might possibly be relevant to his strange sensory experiences. A number of mirror phenomena are described in the neurological literature,<sup>2</sup> of which those with a cognitive flavour are briefly considered here (i.e. neither mirror movements nor the "mirror dystonia" sometimes encountered in writer's cramp are discussed).

### Mirror Sign and Mirrored Self-Misidentification

The experience reported by Old Gisors, a failure to recognise ones' own reflection in a mirror, may be described as the "mirror sign". In addition to this failure, patients may sometimes develop a delusional belief that their reflection is in fact that of a stranger, which has been termed "mirrored self-misidentification",<sup>3</sup> a response which might contribute to the "phantom boarder sign" (the belief that there is someone else living in the house).

Rather little seems to have been published on these signs, but the articles which have appeared generally indicate that it is a reflection (no pun intended!) of cognitive decline,<sup>3</sup> for example in Alzheimer's disease (AD)<sup>4,5</sup> or dementia with Lewy bodies.<sup>6</sup> Mirror sign may perhaps be a consequence of visual agnosia, and has been noted in a patient with the posterior cortical atrophy variant of AD who also had visual hallucinations.<sup>7</sup> Unusually mirror sign may occur as a focal deficit at the onset of a progressive dementing illness, indicative of non-dominant hemisphere dysfunction. In addition to perceptual (face processing) impairments, affective and reasoning deficits may also contribute to the pathogenesis of mirror sign.<sup>8</sup> Dementia is not, however, a *sine qua non*: mirrored self-misidentification has also been noted in an elderly patient with a right dorsolateral frontal infarct, bilateral frontal encephalomalacia consistent with previous head trauma, and posterior periventricular ischaemic lesions but without dementia. Based on these observations, the authors suggested that the right dorsolateral prefrontal cortex may be important for self-recognition.<sup>9</sup>

### Mirror Agnosia, Mirror Apraxia, Mirror Ataxia

Mirror agnosia and mirror apraxia are related phenomena, as may be mirror ataxia.

Mirror agnosia is a deficit in which patients are unable to use mirror knowledge when interacting with mirrors (a definition which might also encompass mirror sign and mirrored self-misidentification). Also sometimes known as the "looking glass syndrome", or "Ramachandran's sign" after the first description,<sup>10</sup> patients are unable to point to the real object when it is seen in a mirror. They may attempt to reach "into" the mirror even when the actual location of the target has been shown, suggesting an inability to distinguish between the real and virtual images. This reaching for the virtual object has been termed mirror apraxia.<sup>11</sup> Reaching for the real object but with increased errors of direction has been termed mirror ataxia.<sup>12</sup> Parietal lobe lesions with associated hemispatial neglect may underlie these signs, with dissociation of retinotopic (allocentric) space and body schema (egocentric space). A lesion study suggested different areas of parietal lobe might underpin mirror ataxia (postcentral sulcus) and mirror agnosia (posterior angular gyrus and superior temporal gyrus).<sup>12</sup>

### Mirror Hallucination

The visual hallucination of seeing ones' own face, autoscopia, has been termed mirror hallucination since there is left-right reversal as in a mirror image. This has been described in association with epilepsy, migraine, and parieto-occipital space-occupying lesions.<sup>13</sup>

### Mirror Writing

Mirror writing is a mirror image of normal writing, hence in English it runs from right to left with characters back to front. In double mirror writing (*écriture en double miroir*) script is also inverted top to bottom (script goes up the page) as well as being mirror reversed. Mirror writing may occur spontaneously, more often in left-handers, as well as in a variety of pathological situations, mostly associated with left hemisphere damage. Leonardo da Vinci is perhaps the most celebrated historical mirror writer.<sup>14</sup>

Mirror writing should perhaps not be included here since it is most probably a motor phenomenon, akin to mirror movements, rather than a cognitive phenomenon, although it is reported to occur on occasion in the context of cognitive impairment or dementia. That said, in my experience of asking people with cognitive complaints to write sentences (e.g. when administering the Mini-Mental State Examination or the Addenbrooke's Cognitive Examination and its subsequent iterations, ACE-R and ACE-III) I do not recall ever having seen a mirror sentence produced.