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I and Me: Self-Portraiture in Brain Damage

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Abstract

Human bodily experience is characterized by the immediate feeling that our body is localized at a certain position in space and that the self is localized within these body borders (embodiment). Recent research from cognitive neuroscience and neurology suggests that embodiment is of major importance for neuroscientific models of self and self-consciousness. This is suggested by illusory own body perceptions (such as autoscopic hallucinations, heautoscopy, and out-of-body experiences) during which the self may be experienced as being localized outside one's body borders. I have previously argued that self-portraiture may rely on similar brain mechanisms and have proposed a classification of self-portraiture based on neurological classifications of illusory own body perceptions. Here I extend this model focussing on three types of self-portraits: visual self-portraits, disembodied self-portraits, and corporeal self-portraits. This is followed by a discussion of visuospatial, linguistic, and mnestic mechanisms in self-portraiture that are examined in selected painters.

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For my part, when I enter most intimately into what I call myself, I always tumble, on some particular perception or other, of heat or cold, light or shade, love or hatred, pain or pleasure. I can never catch myself at any time without a perception, and never can observe anything but the perception.

David Hume

Self in Philosophy, Neurology, and Neuroscience

In the above statement Hume claimed that when he introspected, he was unable to catch his self without a perception and was unable to observe 'anything but the perception' itself. He concluded that the self (or the observing introspective

subject) is nothing but a bundle or collection of different perceptions. The struggle of Western philosophy with the body was also exemplified in Descartes' effort to separate mind and body. Today there is a renewal of scientific interest in how bodies think, how conscious thought is embodied in the body as subject. Most discussions of embodiment draw on Maurice Merleau-Ponty's philosophy in *Phenomenology of Perception*, who was fascinated by our 'being-in-the-world' and the way our consciousness is incarnated in the world. For Merleau-Ponty and later Gibson and Neisser [1988] cognition is embodied and functions as part of the unity between subjects and objects that is the direct result of having a body. Recent years have seen increasing research in philosophy and cognitive science on embodiment and how the human mind and consciousness is ultimately linked to own body perception in the brain [Bermudez et al., 1995].

This has led to the development of neurocognitive theories on embodiment and own body perception and its relevance for the self and self-consciousness. This research investigated own body recognition of body parts (arm, face) or own action recognition [for review see Blanke and Mohr, 2005]. These studies focussed on how certain body parts and actions of humans are embodied or recognized as belonging to the self and how they are distinguished from those of other humans. A different line of research has investigated mechanisms of embodiment for the entire body and these seem especially relevant for self processing, self consciousness, and self-portraiture [Blanke, 2005]. For this a well-defined group of own body illusions in neurological patients that are characterized by different levels of embodiment have been investigated [Brugger, 2002; Blanke et al., 2004; Blanke and Mohr, 2005]. I have previously suggested that phenomenological and neurocognitive characteristics of these own body illusions can also be found in the pictorial phenomenology of self-portraits [Blanke, 2005].

Own body illusions are reduplicative experiences during which the subject has the impression of seeing a double in extrapersonal space either from an embodied or disembodied visuospatial perspective. They include out-of-body experience, autoscopic hallucination, and heautoscopy. In an out-of-body experience, subjects feel that their 'self' is located outside the physical body and somewhat elevated. It is from this elevated extrapersonal location that subjects experience seeing their body and the world. An autoscopic hallucination is defined as the experience of seeing a double of oneself in extrapersonal space without leaving one's body (no disembodiment). As compared to out-of-body experiences, individuals with autoscopic hallucination experience seeing the world from their habitual visuospatial perspective and experience their 'self' as embodied. During heautoscopy subjects also have the experience of seeing a double in extrapersonal space (as in autoscopic hallucination). However, it is difficult for the subject to decide whether he is disembodied or not and whether the self is localized within the physical body or in the double.

I have previously suggested that some of the phenomenological and neurocognitive characteristics of these own body illusions can be found in the pictorial phenomenology of self-portraits [Blanke, 2005]. I proposed to describe self-portraits as reduplicative phenomena since self-portraits contain the painter twice: as the painting painter and the painted painter [Bonafoux, 2004; Pächt, 1991]. This comparative analysis revealed that some of the neurocognitive mechanisms of own body illusions might also be employed by artists of self-portraits and beholders of such paintings. Based on this analysis a division of the genre of self-portraiture in three major types of self-portraits was proposed that reflects the characteristics of autoscopic hallucination (*visual self-portraits*), out-of-body experience (*disembodied self-portraits*), and heautoscopy (*corporeal self-portraits*). This is reviewed below and followed by neurological and neuropsychological findings in self-portraits of painters with neglect, aphasia and dementia.

Embodiment and Disembodiment Self-Portraiture

Jung [1974] remarked that '[a]n influence of brain damage... can especially be seen in... self-portraits'. This seems to be the case because of the more constant situation between painter and painted object in self-portraiture as compared to other genres and the possibility to analyze chronic effects [Blanke, 2005; Crutch et al., 2001]. The cognitive neurologist and neuroscientist – interested in painting – prefers to analyze painting situations as in self-portraiture that are rather stable with respect to its thematic and spatial content, thus relying on a specific subset of visuospatial and perceptual mechanisms. Other differences need to be mentioned. Whereas artists generally paint portraits of other people (objects and scenes) by direct inspection, the painter of a self-portrait cannot inspect himself (or can at least not inspect his entire body and his face) directly only with his eyes (but see the work of the American artist Tim Hawkinson). To paint their self-portraits painters throughout time have often relied on mirrors as well as mental imagery pointing to the possibility of functional differences between portraits of other people and portraits of oneself. To reiterate, self-portraits contain the body and self that interest the cognitive neuroscientist twice: as the painted painter and as the painting painter.

From Embodiment in the Self-Portraits of Rembrandt to Disembodiment in Velazquez and Schiele

Albrecht Dürer (1471–1528) is generally thought of as the first artist to have drawn a series of self-portraits for himself as well as the public: Bell [2000]



Fig. 1. Visual, disembodied and corporeal self-portraits. A visual self-portrait by Rembrandt focusing on the visual aspects of his face depicted from a short distance (**a**) and a disembodied self-portrait by Velazquez focusing on the spatial scene and the painter's entire body that is several meters away (**b**). A corporeal double self-portrait by Egon Schiele (**c**) reduces explicitly the painter's painted body (**c** courtesy Wolfgang Werner KG, Bremen).

speaks of 'Dürer's pictorial discovery of the modern self'. Dürer's self-portraits may be called visual self-portraits as they reflect visual mechanisms that can also be found in autoscopic hallucinations [Blanke, 2005]. They are the most frequent self-portraits and the painter draws himself as if he were seeing himself in the mirror (as if he were somebody else). Nothing in Rembrandt's *Self-Portrait* from Glasgow (1632; fig. 1a) could tell the beholder that the artist has drawn a picture of himself. Frequent instances of right-left reversals in visual self-portraits reveal not only the painter's concentration on his mirror reflection, but also highlight that the reflected person is seen as another person, as an image, disconnected from the painter. These visual characteristics appear in most of Rembrandt's self-portraits [Blanke, 2005] and in the majority of self-portraits shown in Bell [2000].

There is group of 'nonvisual' self-portraits that are less frequent and characterized by a distanced (third person) visuospatial perspective and disembodiment and might reflect mechanisms of out-of-body experiences (disembodied self-portraits). A famous example is *Las Meninas* (1656, Madrid; fig. 1b) by Velazquez (1599–1660). Many other examples are 'the artist in his studio' paintings and the great number of disembodied self-portraits of Caspar David Friedrich [Blanke, 2005]. In *Las Meninas* Velazquez paints himself as painting and as standing in front of a large canvas. By inverting the classical visuospatial perspective and thus imagining seeing the entire scene from the

position and visuospatial perspective of the King and Queen, Velazquez turns the portrait of the emperors and their daughter into a portrait of himself.¹ The disembodied painter imagines or looks at his own body and person from a third-person perspective, notably of the King and Queen [see Blanke, 2005].

Next to visual and disembodied self-portraits, corporeal self-portraits (reflecting mechanisms of heautoscopy) directly depict the reduplicated body of the artist and may in explicit instances depict the painter twice or even more often. Any self-portrait may arouse the question in the beholder whether the location of the painter's self is on the canvas (and thus painted) or in front of the canvas (and thus painting) [Blanke, 2005]. Nevertheless, this is most explicitly expressed in corporeal self-portraits. Egon Schiele frequently drew doubles of himself or the painter on the same canvas, in similar body postures, and often as staring at the beholder [Schröder, 1999]. In a particularly striking example (*The Truth Unveiled*; 1913, private collection; fig. 1c), Schiele drew his double (in orange) that is shown as coming out of (or is entering) his own body's back (brown) stressing the physical connection between both bodies. It is impossible to say which body belongs to Egon Schiele and where the painter's (embodied) self is localized. This can be seen in other double self-portraits by Schiele and those of other painters [Blanke, 2005].

These observations suggest one way of linking self-portraiture with the field of cognitive neuroscience. I argued that neurocognitive mechanisms of three own body illusions [Brugger, 2002; Blanke and Mohr, 2005] may be relevant for analyzing and understanding the cognitive mechanisms involved in self-portraiture. While painting a self-portrait the artist is in a similar mental situation as neurological patients experiencing autoscopic hallucination, out-of-body experience, or heautoscopy.² Whereas the painter may voluntarily depict himself using visual, disembodiment-related, or corporeal brain mechanisms,

¹I should also briefly mention Velazquez' masterly play with the mirror at the back of the painting where a reflection of the King and Queen of Spain can be seen who he should actually be in the process of portraying [Blanke, 2005]. The result is a portrait of the young princess Margarita who is shown in the center of the painting. Velazquez masterly plays and inverts a theme that had been introduced into portraiture by Jan van Eyck in his *Portrait of the Arnolfini Marriage*. In this latter painting Van Eyck had included his miniature self-portrait in a mirror at the back of the painting. By inverting the visuospatial perspective Velazquez draws and imagines himself, the Princess Margarita, and the rest of the visuospatial scene from the position and visuospatial perspective of the Spanish King and Queen. Both royals are 'only' depicted as small reflections in the mirror at the back of the room (corresponding to the position of Van Eyck 200 years earlier), whereas he paints himself large and in the foreground of the painting!

²When looking at a self-portrait the beholder of such art works is in a very similar situation.

these brain mechanisms related to visual, disembodiment-related, or corporeal processing are also activated in the brains of neurological patients leading to hallucinated self-portraits.

Neuropsychological Mechanisms in Self-Portraiture

How can findings from neurology and neuropsychology further be helpful to understand art and self-portraiture? The preceding considerations are speculative and based on the analysis of verbal and pictorial phenomena. In the remaining part of this article I will review empirical data on the influence of brain damage on self-portraiture. Importantly, the dramatic effects on artistry after brain damage differ after acute damage to the right (leading to neglect) or left brain (leading to aphasia) and during progressive damage to both hemispheres (leading to dementia). There is now an increasing body of clinical studies on the effects of brain damage on the works of internationally and locally known painters [Alajounaine, 1948; Jung, 1974; Chatterjee, 2004; Bänzner and Hennerici, 2006; Zaidel, 2006; Blanke, 2006; Blanke and Lenggenhager, in press]. As Jung [1974] and more recently Zaidel [2006] argue, these observations are probably the most direct empirical data that allow the examination of brain mechanisms in visual arts. It is hoped that these neuropsychological analyses will evolve into rich study material for art historians and philosophers of art.

The Effects of Neglect on Self-Portraiture

Neglect is a common neurological condition following right posterior brain damage. It may be defined as an attentional disorder characterized by disregard of sensory information in the part of space to the left of the midline [Robertson and Halligan, 2001; Blanke and Lenggenhager, in press]. The drawings of patients with visuospatial neglect classically show left-sided omissions and spatial deformities whereas the right side of the picture is more completely done [graphic neglect; Halligan and Marshall, 2001; Robertson and Halligan, 2001]. In addition, graphic neglect may be characterized by loss of spatial contours, difficulties in appreciating depth and three-dimensional objects, and enhancement of the right side of the picture. Left-sided neglect is in the large majority of cases due to right temporoparietal brain damage. The influence of neglect on painting has been analyzed in Otto Dix, Lovis Corinth, Anton Räderscheidt [Jung, 1974], and other painters [Vigouroux et al., 1990; Heller, 1994; Halligan and Marshall, 1997; Cantagallo and Della Sala, 1998; Blanke et al., 2003]. These analyses showed that independently of the premorbid style of



Fig. 2. Self-portraits by Lovis Corinth. **a–c** Graphic left-sided neglect with left-sided omission and deformities in drawn self-portraits of Lovis Corinth. **d–i** Positional change in the painted self-portraits of Lovis Corinth after and before 1912. Three self-portraits that were created before 1912 are shown: 1887 (*Selbstbildnis*, Museum Georg Schäfer, Schweinfurt, Germany) (**d**), 1901 (*Selbstporträt mit Modell*, Kunstmuseum Winterthur, Switzerland) (**e**), and 1911 (*Selbstbildnis mit schwarzem Hut und Stock*, Kunstmuseum, St. Gallen, Switzerland) (**f**). Compare with Corinth's stance in self-portraits carried out after

the affected painter, neglect-related signs or style elements can be found in the works of these painters [Chatterjee, 2004; Bätzner and Hennerici, 2006; Blanke and Lenggenhager, in press].

Several neglect signs are present in self-portraits of Lovis Corinth (1858–1925). Corinth is one of the great individualists in the history of painting who transcended both his own time and conventional classifications [Kuhn, 1925; Schröder, 1992]. Corinth's productive years spanned nearly half a century and he studied at the academies in Königsberg, Munich, and Paris. By 1901 he had emerged as one of the most eminent German painters. Art historical labels, however, are not easily applied to Corinth's works [Kuhn, 1925; Schröder, 1992]. He painted naturalistic portraits, slaughterhouse scenes as well as interiors, still lifes and landscapes that link him to Impressionism. At the same time he produced history paintings illustrating biblical and mythological scenes upon which his reputation in the last decade of the 19th century was based. Although he rejected Expressionism, some of Corinth's later works place him among the Expressionists [Schröder, 1992]. His work thus defies easy categorization and most people have failed to categorize this artist and his oeuvre. Two major periods have preoccupied art historians: Corinth's mature, 'impressionistic' period or style (1900–1911) and his late 'expressionistic' style (1912–1925) coinciding with a right hemispheric stroke in December 1911.

As described by Jung [1974] (fig. 2a) Corinth's postmorbid self-portraits reveal left-sided omissions: the central portrait depicts his wife Charlotte to which Corinth has added two portraits – probably of himself [Jung, 1974] – on each side of Charlotte's portrait. Many examples of left-sided omissions can be seen in Charlotte's face, her forehead and her hair. Her left shoulder was replaced by a small self-portrait. Although her left hand and arm are drawn both show signs of spatial deformities and are less precisely drawn than the corresponding right body parts. Her left hemiface is less wide and drawn with less spatial detail and nuances. Corinth's self-portrait on the right side also shows left-sided neglect suggesting the presence of object-centered graphic neglect [Halligan and Marshall, 2001]: despite placing this self-portrait in his preserved right spatial field, Corinth omitted left facial features (eye, hair, left facial contour). The left self-portrait also shows left-sided graphic neglect (left eye and other left facial features are missing). In a later self-portrait from 1912 further left-sided omissions can be found (fig. 2b). Here, the outer contour of the left arm is missing. The left arm is smaller than the right arm. In addition, the diagonal hatching of

1912: 1913 (*Selbstbildnis mit Tirolerhut*, Museum Folkwang, Essen, Germany) (**g**), 1918 (*Selbstbildnis im weissen Kittel*, Wallraf-Richartz-Museum, Cologne, Germany) (**h**), and 1924 (*Grosses Selbstportrait vor dem Walchensee*; Bayrische Staatsgemäldesammlungen, Munich, Germany) (**i**).

the left arm is missing whereas it is more complete for the right arm. Finally, the left hand is only roughly rendered without the depiction of individual fingers. This is not the case for the right hand, which is well modeled and completely drawn. Although Corinth's painted self-portraits do not reveal clear signs of left-sided spatial neglect, I have argued previously that Corinth changed his body position in front of the mirror when painting self-portraits. He thus deviated from his customary stance and that of his much admired Dutch masters Frans Hals and Rembrandt [Blanke, 2005]. In his self-portraits before 1912 Corinth depicts his body as turned rightwards (or facing straight ahead; fig. 2c–e), yet after 1912 Corinth depicts himself mostly as turned leftwards (or facing straight ahead; fig. 2f–h). The same analysis of 20 painted self-portraits of Rembrandt (who was right-handed as Corinth) revealed that Rembrandt positioned himself in front of the mirror as did Corinth before his stroke. I have argued that this change in stance was necessary in order to look at his mirror reflection in his preserved right visual field and not his left neglected visual field. Many of these changes have also been described in the painter Anton Räderscheidt [Jung, 1974] who carried out many self-portraits in the first year after his right-sided brain damage in 1967. Analysis of Räderscheidt's self-portraits reveals that he also changed his postmorbidity stance in front of these paintings: analysis of postmorbidity self-portraits [illustrated in Herzog, 1991] shows that he painted himself with his head and body turned to the left,³ whereas this was not or less frequently the case in his premorbidity self-portraits.

The Effects of Aphasia on Self-Portraiture

Aphasia is generally associated with damage to the left cerebral hemisphere and changes that have been observed in professional painters with aphasia are more variable and opinions diverge whether any postmorbidity style changes can be observed or not. Aphasia due to acute left hemisphere brain damage and its influences on the work of several painters has been summarized previously [Chatterjee, 2004; Bänzner and Hennerici, 2006; Blanke and Lenggenhager, in press]. Bonvicini [1926] describes the consequences of left hemisphere stroke and aphasia in the works of Daniel Urrabieta y Vierge (1851–1904) and could not find any changes in style. Yet, Chatterjee [2004] and Bänzner and Hennerici [2006] suggested that painters with aphasia seem to use more vivid colors and seem to change their preferred genre or the content of

³This was found in 28 of 35 self-portraits in Herzog [1991].

their paintings. Often painters with aphasia – due to associated right-sided hemiparesis or hemiplegia – have to change the hand they use for drawing (from the right hand that is paretic or plegic to the unaffected left hand) [Zaimov et al., 1969]. Thus the paintings and drawings of those still painting with their paretic right hand may show signs of tremor [Kirk and Kertesz, 1989]. Interestingly, most painters rapidly acquired the same manual and drawing skills with their non-dominant hand in only a few months' time [Zaimov et al., 1969].

Few self-portraits of the Polish painter R.L. [Kaczmarek, 1991] have been published in the medical literature. In addition, Kaczmarek [1991] argued that R.L.'s paintings revealed a profound change in style following damage to the left hemisphere. R.L. was Professor of Art at Lublin University. His art was strongly inspired by war themes and included frequently verbal material in the form of letters, names or numbers that he integrated into his paintings (i.e. *Quo Vadis*) (fig. 3a). For his paintings *Requiem* and *Exhumed* (fig. 3b) he received major national prizes. At the age of 51 years he suffered a stroke leading to Broca aphasia and right-sided hemiparesis. He was unable to reproduce a sequence of events of a story. In addition, difficulties in action planning and control, emotional lability, and confabulations were noted. He did postmorbid drawings with his right hand and started 6 months after the stroke. Two postmorbid self-portraits reveal remarkable skill with his paretic hand 5 months after his stroke (fig. 3c, d). Although verbal and symbolic material was one of the key elements of his pre-morbid art, he did not include these elements in his postmorbid art [Kaczmarek, 1991]. Over the first year, he continued to paint portraits and landscapes and only started to paint more symbolically after the first year. It is important for the considerations of self-portraiture that left hemisphere damage associated with aphasia in this artist seems to leave the artist's capacity to draw and paint self-portraits relatively unaffected although his art shows major changes.

The Effects of Dementia on Self-Portraiture

The most famous painter who suffered from Alzheimer's disease is probably the abstract expressionist William de Kooning (1904–1997), who was diagnosed as suffering from Alzheimer's disease in 1989. Since the beginning of the 1980s several art critics noted major changes in his style and some suggested that these might have been due to neuropsychological changes related to Alzheimer's disease [Espinel, 1996]. Yet, there is disagreement on whether de Kooning's style change was due to neurological mechanisms, other causes, or a natural evolution of his art [Crutch et al., 2001]. There is much debate over the relevance and significance of his later paintings, which have been described as clean, sparse, and almost graphic compared to his dynamic and rich earlier

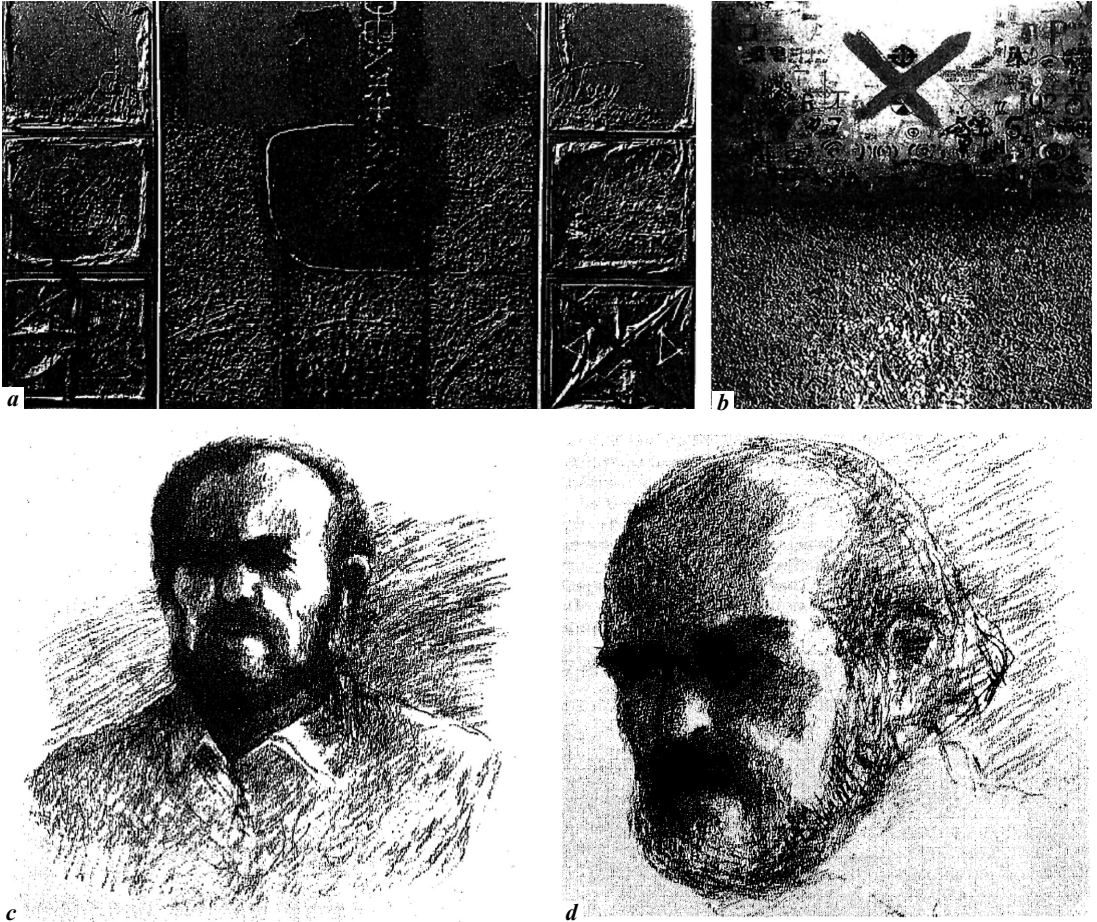


Fig. 3. Self-portraits by a Polish painter (Richard L.). Two premorbid paintings with verbal and symbolic elements of the Polish painter R.L. who suffered from aphasia are shown: *Quo Vadis* (a) and *Exhumed* (b). c, d Two postmorbid self-portraits are shown [Kaczmarek, 1991] (with kind permission of Psychology Press, www.psypress.co.uk/journals.asp, 2007).

works. Some say his mental condition and/or attempts to recover from a life of alcoholism had rendered him unable to carry out the mastery of his early works, while others see these late works as prophesizing the clean, surface-oriented painters of the 1990s. Still others who knew de Kooning personally claim that his late paintings were being taken away and sold before he was able to finish them. Detailed medical data on de Kooning are sparse and MRI, neurological, or neuropsychological data are not available.



Fig. 4. Self portrait of Danae Chambers (1999) who suffered from Alzheimer's disease [Fornazzari, 2005] (with kind permission of Blackwell Publishing).

In another painter who suffered from Alzheimer's disease, Danae Chambers (born 1941), neurological and neuropsychological data as well as a self-portrait have been analyzed. In 1996 (3 years after diagnosis), Chambers' art is undergoing minor changes in the depiction of form and space, but still has a well-conserved overall structure [Fornazzari, 2005]. Self-portraits do not seem to have been affected at this point. In 1999, Chambers' self-portraits started showing more irregularities and overlapping structures characterized by frequent reworking and overpainting of certain image parts. These changes were especially prominent in faces and were analyzed by Fornazzari [2005] in a self-portrait (fig. 4). An MRI revealed a cyst in the left temporal lobe and moderate brain atrophy. The neurological examination was normal [for neuropsychological data, see Fornazzari, 2005].

Similar changes in many of his self-portraits have also been observed in William Utermohlen (born 1933) [Crutch et al., 2001]. Alzheimer's disease was diagnosed at the age of 61 years and his self-portraits were followed for a period of 6 years, from the age of 60 to 66 years (fig. 5) and were in addition also frequent objects of his art prior to symptomatic disease onset [Crutch et al., 2001]. MRI revealed general brain atrophy and the neurological examination was normal [for neuropsychological data, see Crutch et al., 2001]. Crutch et al. [2001] describe less accurate brush strokes, overlapping lines, frequent

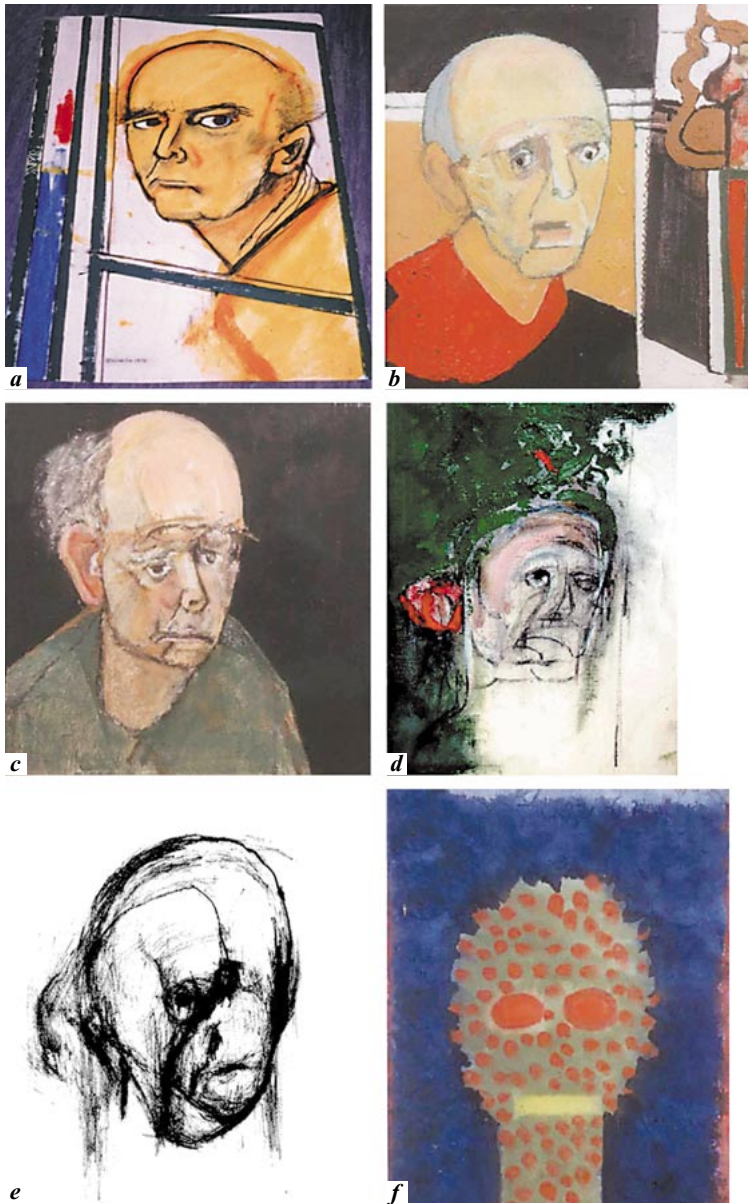


Fig. 5. Several self-portraits of William Utermohlen who suffered from Alzheimer's disease [Crutch et al., 2001]. *a* Premorbid self-portrait that was done at the age of 60 years. *b–e* Carried out at the age of 62–66 years. *d, e* Increasing difficulties to capture his own face become prominent. *e, f* Change from oil painting to crayon and aquarelle can be seen (with kind permission from Elsevier).

overpainting and reworking of lines, as well as rougher planes that increased progressively. They also pointed out his progressively increasing difficulties in depicting the human face, especially his own face.⁴

Conclusion

Postmorbidity self-portraits in painters who suffer from neglect, aphasia and dementia differ in several aspects that are relatively independent of the painter's premorbid style, epoch and country. Self-portraits of painters with neglect reveal the acute signs of left-sided omissions, deformities, loss of color, and shifting of the overall scene to the right of the picture. Moreover, the painter seems to change his preferred position in front of the drawing mirror (Corinth; Räderscheidt), the preferred direction of light (Corinth) and tends to use more verbal material in his art than in premorbid paintings (Corinth; Alder, Swiss painter from Geneva).

This is different in painters with aphasia who – due to their left-sided brain damage – often have to switch the hand they use for drawing from their paralyzed right hand to the normal left hand. It is remarkable that left-handed postmorbidity skill returns to premorbid levels within several months in most painters. Latter self-portraits have no or very minor right-sided minor omissions and are characterized by more harmonious or vivid colors, are less stylized, more imaginative, and more symmetrical. In a Polish painter a loss of verbal material and symbols has been observed. Although these signs may occur in the acute phase after brain damage, due to aphasia and right paralysis, the painter with aphasia generally starts to paint later than painters with neglect.⁵

Analysis of self-portraits painted by artists suffering from dementia reveal the progressive appearance of style changes over many years. These are initially more subtle than those in painters suffering from neglect or aphasia, but may – over the years – lead to an incapacity to paint which is never the case in painters with neglect or aphasia. These self-portraits are characterized by less accurate brush strokes, overlapping lines, frequent overpainting and reworking of lines, as well as rougher planes that can be found on both sides of the painting. These changes are especially prominent in the depiction of the painter's own face (Utermohlen; Chambers) leading in later stages of the disease to unrecognizability (Utermohlen).

To summarize, self-portraits of artists with neglect are characterized by *new spatial elements* affecting the global structure of the canvas, but can mainly

⁴Unfortunately no portraits of family members were shown or analyzed in comparison.

⁵Unfortunately, there are only few published self-portraits of artists suffering from aphasia.

be found on the left side of the picture and painted person. In self-portraits of artists with dementia *new form elements* are found leading to changes of contours and lines over the entire canvas, but predominantly in the center of self-portraits. Self-portraits of artists with aphasia are carried out with the nondominant hand and are characterized by *new verbal/symbolic elements* affecting the content and use of verbal material. These findings in artists suffering from brain damage should be compared with neuropsychological data on drawing ability (1) in nonartist patients after unilateral brain damage [Kirk and Kertesz, 1989] and Alzheimer's disease [Kirk and Kertesz, 1991], (2) painters without neurological disease, and (3) other visual artists with neurological disease (sculptors, architects, choreographers, video and installation artists, etc.). Findings from painters with other neurological disease such as epilepsy [especially temporal lobe epilepsy: Vincent van Gogh; Gastaut, 1956] and migraine [Giorgio de Chirico; Podoll et al., 2001; but see Blanke and Landis, 2004] and their effects on self-portraiture should also be analyzed and integrated.

These comparisons – for self-portraiture and other genres – will be necessary for the development of neuropsychological art theories that are based on the empirical principles of neuropsychology and neurology. As mentioned earlier – and briefly elaborated with respect to the neurocognitive mechanisms of own body illusions and self-consciousness – findings from cognitive neuroscience may further be integrated into an interdisciplinary field trying to elucidate the intricate and manifold relations between brain and visual arts in painter and beholder. It is hoped that collaborations can be established between art historians, art critics, neurologists, and neuropsychologists in order to build a bridge between art history and neuroscience that already exists between philosophy and neuroscience.

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