

Links Between Painting and Neurology: The Example of Dementia

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Abstract

Art is a system of human communication arising from symbolic cognition, conveying ideas, experiences, and feelings. The goal of this review is to describe the link between painting and dementia. Individuals with neurodegenerative diseases inevitably experience cognitive dysfunction that has the potential to limit and impair the artist's ability to realize their creative and expressive intentions through painting. The strategy to advance our understanding of the neural bases for art is to map locations and nature of neural damage to changes onto artistic production.

Keywords

art, creativity, dementia, painting, visual art

Introduction

Creativity is a quintessential and uniquely human characteristic that allows one to generate ideas that are a positive advance for society that transcends the status quo knowledge. It is a complex and multifaceted concept not easily understood commonly defined as the introduction of something innovatively new and positive for society that goes beyond the familiar and accepted.¹ It permits to produce original material that responds to a motivational drive or need.² Humans display an inordinate capacity for it in a broad range of activities. Art is one example where humans demonstrate the capacity for creativity. It is a uniquely human activity practiced by almost all cultures being associated fundamentally with symbolic and abstract cognition. Production of art is a complex process involving a combination of technical skill and a unique talent. What artists create and display is their reactions to ongoing internal and external happenings, ideas, and emotions. Whereas artistic technique can be learned, talent is innate and reflects the unique structural-functional organization of the artist's brain. Theories suggest that the major lobes of the brain, in particular interactions between the frontal lobes and temporal lobes, are critical for maximizing the potential for creative endeavors. Diseases affecting the brain have been reported to influence the creativity in famous artists. The pictorial artistic production is a complex chore that involves sight, coordination, memory executive functions often deteriorated by dementia. We try to describe links between painting and neurology in the context of dementia.

Methods

Medline and Google Scholar searches were conducted for relevant articles, chapters, and books published before 2017.

Search terms used included creativity, dementia, painting, and visual art. Publications found through this indexed search were reviewed for further relevant references.

Art and Neuroscience

Our culture characterizes art as imaginative, subjective, narrative, and often controversial, but very rarely scientific. A fundamental assumption of modern brain research is that each action in mental/cognitive/emotional realms is correlated with a corresponding specific brain activity pattern. Artistic production itself is a complex cognitive behaviour involving at least vision, praxis, memory, and executive functions: this list does not even consider the kind of emotional processing and inspirations that might give birth to such art.³ The ability to produce something "beautiful" does not appear to be linked to emotional stability, as emphasized earlier, or to higher ethical standards, or superior intelligence. Although a minimal intelligence quotient is often required for dealing with the mental processes associated with creativity, this is not invariable.² Profound difficulties arise when biological science methods are applied to

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complex phenomena such as artistic expression. The neuroanatomical correlates of talent and the ability to produce a work of art are not easily definable. There is little research on the brain regions involved with the artistic process, but beyond the parietal lobes and the visual streams, artists use a multitude of cortical and subcortical brain regions in the organization of a visually appealing painting, drawing, or piece of sculpture.⁴ Visual art production, particularly painting, involves multiple processes including basic motor skills, such as coordination of movements, visuospatial processing, emotional valences of stimuli, and sociocultural context. Functions localized in the occipital and temporal cortices preserve visual scenes absorbed over a lifetime and represent the creative soil for many artists, being reproduced in the form of paintings, drawings, and sculptures, while those in the parietal lobes provide visual-constructive precision essential for the craft of the artist.⁵ Organization and motivation are mediated via dorsolateral and medial frontal areas.⁶ The nondominant posterior right parietal and temporal cortices appear to be critical for accurate copying or for drawing of images that are imagined internally.⁷ Furthermore, the nondominant hemisphere seems to be responsible for understanding the essence of a visual form, whereas the dominant side appears engaged with details.^{8,9} In contrast, patients with spared left-sided function produce drawings that favor detail over the gestalt, such that the subject is often unrecognizable.^{8,9} Lesions limited to the limbic and paralimbic regions involved in the regulation of mood and emotional states should also affect an artist's work.¹⁰ Functional neuroimaging and experimental patient studies also suggest that the prefrontal cortex (PFC), in particular the anterior PFC, may also play a critical role in originality aspects of creativity: damage to the PFC may alter the intentional appropriateness and originality of patient productions by altering planning, fluency, mental flexibility, rule-based thinking, or abstraction.¹¹ In establishing a link between painting ability and a variety of neurological conditions, the most fundamental issue is whether or not a change has occurred in some aspect of the work produced by the affected individual. In those artists who do appear to exhibit some reliable alteration in their paintings, the much more controversial question that follows is whether this change is directly attributable to alterations in neurological state or whether it represents a stylistic change made deliberately to reflect symptoms, experiences, or feelings connected to the event.¹²

Visual Art and Aging

It is difficult to determine unequivocally the extent to which physiological aging influences artistic creativity. Too many variables must be considered in physiological age: vision decay (ie, in consequence of presbyopia or poor accommodation), motor slowness and clumsiness, decrease in vital dynamism and motivation, decline of inspiration, and inventiveness.¹³ Many painters such as Sandro Botticelli (1445-1510), Tiziano Vecellio (Titian, 1488-1576), Auguste Renoir (1841-1919), and others continued their artistic activity in old age and

apparently did not decline in creativity, but, in some cases, aging is accompanied by a decline in creativity, which in turn is due to the cognitive decline related to senescence processes.

Visual Art and Dementia

In neuropsychology and neurology, the relationship between brain structures and their functions is traditionally inferred from behavioral effects of damage in regional brain areas. In this regard, much of what we know about the consequences of brain damage in artists is based on visual artists. There is an evolving literature on artistic creativity in the setting of dementia. The effects of neurodegenerative diseases on artistic production will vary depending on the extent of the cognitive, behavioral, and motor dysfunction. Medical literature reports on artists who continued to paint while suffering from dementia. Research involving patients with dementia and other forms of brain injury has enriched our understanding of regional contributions to art-making and the nature of visual creativity itself: Drawings made by patients with dementia provide a unique opportunity to study the consequences of brain damage to artistic abilities.

Typically, during the progression of Alzheimer's disease (AD), various stylistic changes leading to frank deterioration and eventual cessation of painting have been reported, particularly evident in professional artists; however, surprisingly, preservation of artistic skills in the face of severe dementia has also been described.¹⁴ In many patients with AD, artistic skills dissipate rapidly associated with diminished function in posterior parietal and temporal regions, brain areas that contribute to visuoconstructive, linguistic, and musical skills.⁶ According to Gretton et al,¹⁵ the art of AD is characterized in early stages of the disease by prominent changes in spatial constructional quality and, to a lesser degree, visual perceptual attributes such as color and contrast, and a simplification due to reduced planning ability. Case reports of artists with AD reveal a declining ability to represent subject matter in a representational manner.^{16,17} The AD results in an abandonment of previous artistic productions in favor of copying previous efforts.^{16,18} An apparent reversion to more abstract representations most likely reflects the distortion of the global visuospatial aspects of the image from right parietal involvement.¹⁹

Frontotemporal dementia. Frontotemporal dementia (FTD) is a progressive neurodegenerative disease primarily affecting the frontal and anterior temporal lobes. It causes a group of brain disorders that share many clinical features. Variants include behavioral variant FTD (bvFTD), semantic dementia, and progressive nonfluent aphasia. Semantic dementia is heralded by difficulties in naming, single word comprehension, and verbal fluency and loss of common knowledge about the identity or function of common objects; progressive nonfluent aphasia is characterized by nonfluent speech with lexical, phonological, and syntactic deficits, while bvFTD usually presents itself with behavior and psychopathological changes.²⁰ Collectively, the FTDs share in common spared visual perceptual abilities so

that aspects of art such as spatial relations, contrast, and color are unaffected until later stages of the disease.¹⁵ Drawings produced by patients with FTD tended to display a simpler composition, and both copy and collage were poorly and rapidly executed. Patients with FTD altered the proportion in relation to the model with use of more muted and cold colors and fewer details.²¹ Because of executive dysfunction, patients display deficits in the domains of attention, abstraction, planning, and problem-solving, with relative sparing of language, memory, and visuospatial ability. Simplification of drawing and attention to detail both have been described in some patients with frontal dementia.²² Painters with FTD and predominant left hemisphere dysfunction generally lose their capacities of abstraction and symbolic representation, but their paintings may appear more emotional and creative.^{6,7} This is particularly evident in semantic variant of FTD, which is characterized by illness-triggered spontaneous bursts of visual creativity. In patients with semantic dementia and predominant left hemisphere atrophy, facilitation of creativity has been attributed to a mechanism called “paradoxical functional facilitation,”²³ corresponding to a shift from a left to a right hemisphere mode of functioning.¹⁰ These surprising outbursts of creativity correspond well to a progressive decline in frontal performances associated with the evolving dementia. Researchers hypothesized that enhanced artistic skills in the patients with anterior temporal and orbital frontal degeneration might be related to a loss of inhibitory activity over the posterior temporal and parietal regions involved in visuospatial and visuoconstructive processes.⁶ Patients who developed artistic skills were intensely preoccupied with their art and they produced realistic rather symbolic or abstract paintings, the images were so highly detailed to consider obsessive in quality: Patients often repeat the same picture over and over again, slowly perfecting their product.³

Dementia with Lewy bodies. Dementia with Lewy bodies (DLB) is a progressive, degenerative disease of unknown etiology characterized by fluctuating cognitive symptoms with pronounced variation in attention and alertness, visual hallucinations, and parkinsonism. Affected patients generally present with cognitive impairment preceding motor signs. Deficits of frontal-executive skills as well as visuospatial and constructional abilities might be especially prominent signs,²⁴ and these cognitive disorders might even be greater than that associated with AD. Single-photon emission computed tomography studies show that perfusion in patients with DLB is seriously impaired in the parietooccipital regions.²⁵ The art of DLB differs from AD in that motor ability, visual perception, and attention are affected earlier in the disease, with the likely consequence of simpler and less well-executed art.¹⁵ With DLB, copying even a simple figure is often associated with loss of figure ground, diminution of the size of the copy, and tremulousness. Visual and auditory hallucinations might influence the art of DLB being a potential source of artistic output.²⁶ Drago et al²⁷ found that aesthetic value, closure, and evocative impact are diminished in an artist suffering from DLB.

Painters Suffering From Dementia

From published reports of painters with dementia, we can draw some conclusions about the relationships between brain disorders and painting.

Willem de Kooning, born in Rotterdam in the Netherlands in 1904, is widely considered as one of the great painters of the postwar era, one of most influential artists of the 20th century, a major exponent of abstract expressionism which, emphasizing emotional content, spontaneous gestures, and monumental size, would change art forever. In 4 decades, de Kooning's art had travelled from concreteness to the abstract.²⁸ *Woman I* is perhaps his most famous painting. Following his *Women* series, de Kooning pursued nonobjective abstraction until his death in 1997. The late paintings have an airy lightness and a lyricism for which there is no precedent in a half century of the artist's work.²⁹ Willem de Kooning's dementia was diagnosed in his late 80s. Friends and colleagues noticed forgetfulness in the late 1970s, which is when his disease probably began. During the following years, he painted more than 300 abstract paintings, which art critics assess as among the finest and most sensitive artistic achievements in contemporary painting. Then he stopped painting for a period, and when he started again, his work had changed. It became exuberant, carefree, and full of life, and paintings were finished in weeks instead of months.²⁸ While de Kooning's early abstractions lie at a pivotal point within the vicissitudes of art history, his later works form indexical reference points to an artist clinging to his fading mental faculties.³⁰ His paintings became more spare and haiku-like, allusive rather than expository. As the disease advanced, his art became progressively more abstract and difficult to understand yet continued to attract the attention of critics. Although it is difficult to quantify the effect that de Kooning's illness had on his art, later paintings made during the advanced stages of his AD were composed of formless sheets of color and lines.³¹ The primary colors were used (red, yellow, and blue), with occasional touches of complementary orange, green, and violet. Toward the end of the 1980s, he sustained energy to paint only short periods and he could not concentrate.³ There is much debate over the significance of his 1980s paintings, which became clean, sparse, and almost graphic, while alluding to the biomorphic lines of his early works. The progression of the artist's AD throughout the 1980s accompanied abrupt changes in style, raising questions on the extent to which the new works should be considered “authentic” de Koonings: His paintings from the 1980s represent a distinguishable period because this substantial body of work departed radically from anything he had done before.^{29,32} Because of his advancing dementia, when asked a factual question, de Kooning was helpless, ignorant of the date, of where he lived. Succumbing to the effects of old age and dementia, de Kooning worked on his last painting in 1991 and passed away in 1997 at the age of 92, after an extraordinarily long, rich, and successful career. The work he created in his last years has since prompted considerable debate about the nature of creativity: As de Kooning's prices continued to rise at auctions,

there was disagreement over whether his late works were compromised by his mental incapacity. Many disagreed, arguing that—certainly, as far as the abstract expressionists were concerned—creativity sprung more from intuition than intellect.

William Utermohlen was diagnosed as suffering from AD in 1995, at the age of 61 after a long, successful painting career. He was born in Philadelphia and moved to England in 1957 where he enrolled at the Ruskin School of Art in Oxford before settling in London. The earliest symptoms of the condition, 4 years before diagnosis, involved difficulties with tying a necktie, calculating household finances, and memory for day-to-day events. In *Blue Skies* (1995), his last large painting, William paints his reaction to his diagnosis: a devastated figure holding on to a table as on to a raft in the blue bleakness of an empty studio. For the next 5 years, as his dementia worsened, he used his art to track the disintegration of his mind. Encouraged by his nurse, who loved his work, Utermohlen never gave up his life-long passion and painted as much as he could until his memory failed him completely creating a number of self-portraits over the past few years.³³ These demonstrate very clearly the changes in his self-perception. The artist's self-portraits grimly illustrate the merciless progression of the disease, which he had been exploring through visual self-reflection with paint and brushes during the past 5 years of his artistically active life. Many of the stylistic changes in the depictions are likely the result of the quick decline of Utermohlen's visuospatial and motor skills over the course of a few short years.³⁴ As the artist struggled to keep in touch with the world around him, his works became flatter, more abstract, with a new loss of details and spatial sense. Crutch et al³³ describe less accurate brush strokes, overlapping lines, frequent 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. Yet the portraits are also heartbreaking in that they expose a mind trying against hope to understand itself despite deterioration.

Carolus Horn (1921-1992), was a well-known German graphic artist who produced many iconic brands for Opel, Esso, and Coca Cola. He was diagnosed with AD at the age of 58. In Horn's paintings, from the time he was diagnosed, there is evidence of distortion in perspective, "primitive" style, lack of individual characteristics in depicting his subjects, more schematic drawing, and a preference for using red and yellow.³⁵ Venice's famous *Rialto Bridge* was a favorite subject throughout his lifetime. There is a series of 4 performances from *Rialto Bridge* conducted, respectively, at the age of 57 (ie, when the disease was not reported), 64, 65, and 67 years. By comparing the same subject matter, it is apparent that very detailed and intricately worked pieces were gradually reduced to flat images without proper spatial relationships, suggesting the spatial disorientation that is always characteristically present in the disease itself.³⁶ The most prominent change is the loss of 3-dimensionality, followed by a continuous simplification and finally a decay of all objects and structures.³⁷ The growing use of dark colors at the first stages of the disease

reflects depression feelings. With the progression of the disease, the dominating colors are brighter and brighter, which would corroborate the idea that the patients suffer an inability to discriminate the colors blue and green but keep the possibility to discriminate the bright ones, like yellow and red.³⁸

Leo Schnug, born in 1878, near Strasbourg in Alsace, was a painter and illustrator who also decorated the hall of the Haut-Kœnigsbourg castle during its restoration under Emperor Wilhelm II. Alcohol abuse marked his life and, from 1918 to 1919, he voluntarily entered "Stephansfeld" the Psychiatric Hospital beside Brumath because of alcohol dependence. He was diagnosed as suffering from alcoholic dementia. He remained in hospital until his death in 1933. On admission, he was described as having a cerebellar tremor, limb dysmetria, and "muscle weakness"; he was also disoriented in time and space, anxious, had frequent visual and auditory hallucinations, and developed delusional persecutive beliefs.³⁹ The appearance of a cerebellar syndrome forced him to change his style. To mask his tremor he had only 2 solutions, either drawing with short and rapid strokes or painting with repetitive, undulating, and less precise paintbrush strokes. Thematically, the patient produces tables where historical scenes give way to stormy and gloomy scenes, in which one or isolated characters reveal themselves crushed by a hostile nature, represented by trees of monstrous and serpiginous roots in which one believes to recognize demonic faces.⁴⁰

Mervyn Peake (1911-1968), born in the town of Kuling, China, where his parents were missionaries, was a brilliant English artist and writer. Best known for his Gormenghast trilogy of novels, one of the most sustained flights of imaginative writing ever attempted, Peake was also an author of children's books and nonsense verse, a painter, war artist, and poet. From 1946 until 1949 produced a nonending stream of illustrations to many of the classics. These included *Treasure Island*, *Grimm's Household Tales*, *Alice's Adventures in Wonderland*, and *Through the Looking Glass*. He suffered from a chronic neurodegenerative disease, developing signs of parkinsonism and symptoms of cognitive decline in his fifth decade.⁴¹ His illness began in his 40s and he was confined to hospital for the past 4 years of his life. His wife reported that he experienced recurrent visual hallucinations and paranoid delusions.⁴² Though he was investigated at various centers, including the National Hospital, Queen Square, London, his tragic deterioration remained undiagnosed at the time, but in retrospect, his progressive dementia with parkinsonism, psychotic symptoms, and marked cognitive fluctuations likely represents one of the earliest recognized historical cases of DLB.⁴¹ He died in 1968 after years in hospitals and mental asylums. Compared with his premorbid works, later works show dramatic loss of detail, caricature-like representations, and simplification.¹⁶ Peake's illustrations reflected his distillation of experiences during the hallucination and psychotic state: Distorted emotions were captured in his sketches which came and went with his DLB fluctuations.⁴³

Midorikawa et al⁴⁴ reported cases of patients with semantic dementia who developed new artistic skills in the setting of the

illness. One case involved a 53-year-old right-handed woman who was a part-time supermarket employee and owner of a snack bar. At the age of 49, she showed verbal deficits and abnormal behavioral. Her memory was well preserved. Magnetic resonance imaging put in evidence marked atrophy in the left temporal lobe. Progressively, her speech was restricted to a few words. The patient began to draw in response to a suggestion by her caregiver. The characteristics of the drawings were natural, and she could draw object details such as the veins or jagged edges of a leaf. The pictures drawn were realistic as opposed to abstract in character.

Conclusions

Artists are distinguished by the ability to think in new ways, developing new patterns of and connections between ideas to imagine and create artifacts and processes that have never existed previously. The sources of this creativity are among the least understood and most mythologized aspects of art production. The neuroanatomical correlates of talent and the ability to produce a work of art are not easily definable. The degenerative dementias all have their own distinctive anatomy, devastating specific brain areas while leaving other regions unaffected. Dementing diseases usually result in a deterioration of artistic productions. Studies of artists with degenerative diseases might provide an opportunity to investigate the progressive degradation of the systems important in artistic production as well as providing investigators an opportunity to study the neurological basis of artistic expression and creativity. The effects of neurodegenerative diseases on artistic production will vary depending on the extent of the cognitive, behavioral, and motor dysfunction. Because of the progressive nature of dementia, the neurologist has an opportunity to study how the disease affects an artist's work over time and to correlate such changes with the results of neuroimaging.

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