Dementia and Art

Shunichiro Shinagawa, Bruce L. Miller

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Some subjects with primary progressive aphasia (PPA), which is defined by a progressive loss of language ability, develop new artistic behaviors in the course of their disease. We had reported increased creativity in visual art, music and mechanical design in patients with PPA as they lose verbal language abilities. We believe that it reflects their underlying brain mechanism; left-sided and frontal activities would inhibit right-sided and posterior functions, and new artistic ability was most notable in patients who had left-frontal disease with intact right-posterior and dorsolateral-medial frontal cortex. Our models of neurodegenerative disease may reflect premorbid developmental differences possibly predisposing subjects towards different ways of expression. Subjects showing relative strengths in some network reveal a relative vulnerability to unique neurodegenerative disease.

1) Introduction

The source of creativity and art had been attracted the interest of philosophers and scientists for many years. As neuroscientists, we believe that specific neural networks and circuitry are responsible for our thoughts and expressions, including our artistic abilities. In support of this theory, we experienced subjects with neurodegenerative disease who developed artistic abilities, despite a progressive loss of cognitive functions. We specifically focus on subjects with primary progressive aphasia (PPA), which is defined by progressive loss of language ability. Some of these subjects developed new visual artistic behaviors in the course of their disease; their disease enabled new forms of expression. Although the majority of our series and literature on creativity highlights the accomplishments of visual artists, we believe that understanding the phenomenon of creativity in one modality will have implications for all aspects of creativities.

2) Frontotemporal dementia and Primary Progressive Aphasia

Alzheimer’s disease (AD) is the most common causes of dementia in adults over 65 years old; problems in memory and visuospatial abilities are the predominant symptoms. In contrast, frontotemporal dementia (FTD) is one of the most common forms of dementia in adults younger than 65 years, with predominant frontal and anterior temporal lobe neurodegeneration due to several pathologies.

Patients with FTD present unique behavioral and language manifestations, while their ability in memory and visuospatial function are relatively preserved.

PPA is a clinical syndrome presenting progressive loss of language ability which recently have divided into three subtypes: (i) nonfluent variant PPA (nfvPPA); (ii) semantic variant PPA (svPPA); and (iii) the logopenic variant of PPA (lvPPA). These...
three subtypes are associated with different localizations of cortical atrophy and different pathological background. svPPA is characterized progressive loss of word meaning with preserved fluency, associated with atrophy in temporal lobes, especially anterior temporal poles. The process is asymmetric typically affecting leftside more than the right. Right-sided svPPA patients often show rigidity and compulsive behavior. nfvPPA presents with agrammatic and progressive halting of speech, caused by atrophy of the left frontal, insular, and parietal regions. Patients with nfvPPA tend to have less severe behavioral presentations. lvPPA is characterized by word retrieval in spontaneous speech and sentence repetition deficits, caused by atrophy of the temporoparietal junction and angular gyrus. To date, the subjects who develop new artistic ability are mostly found in the svPPA and occasionally in the nfvPPA.

3) Art in the patients with neurodegenerative diseases

Based on the knowledge of brain–behavioral anatomy, we assume that left–sided and frontal activities would normally inhibit right–sided and posterior functions. In left–frontal disease, these right–posterior functions would be released. New artistic ability was most notable in patients who had left–frontal disease with intact right–posterior anatomy. Combined with spared dorsolateral and medial frontal cortices, they had the necessary functions to integrate and create. Comparison of atrophy patterns between subjects displaying artistic ability versus those that didn’t showed that the artistic subjects had relative sparing of the dorsolateral and anterior cingulate cortex while sharing a pattern of temporal atrophy with non–artistic subjects. In general, sparing of particular frontal lobe structures was important for creative abilities.

3-1) Art in Alzheimer’s Disease and Frontotemporal Dementia.

Patients with AD and FTD provide contrasting examples of how focal brain damage influences artistic creativity. In AD subjects, visuospatial abilities are lost in the early stages and overtime there is a diminution of color and style, typically. The prominent and early parietal involvement in AD results in the loss of artistic ability. Cummings et al. reported the stylistic evolution of a renowned painter as he progressed with AD noting reduced complexity of composition and color. Rankin et al. showed that subjects with AD produced art works with a simpler composition and more muted palate. On the other hand, FTD subjects retain the ability to copy as they have relatively spared posterior cortex. Patients with behavioral variant FTD generally show a decrease of creativity, especially when frontal disease is predominant. However, we observed that these new abilities occurred in a subset of FTD patients; those with predominant left temporal lobe atrophy, clinical syndromes of svPPA.

3-2) Art in Semantic Variant Primary Progressive Aphasia

We reported on fifty–eight FTD subjects, twelve of them either maintained previous talents in musical and visual arts or even developed new abilities compared to forty–six subjects those abilities were not observed. Eight of these twelve artistic patients had in common temporal atrophy (seven left–sided and one bilateral atrophy). While the majority of these FTD patients did not show increased interest the arts, a significant subset patients group, mainly left–sided temporal disease (overlapping svPPA group) showed.

The artwork of people with these svPPA subjects tends to be literal versus abstract and the use of color is striking. Pictures of animals and people are common.
As the illness proceed to the right anterior temporal lobe, faces often become distorted and bizarre, reflecting their specific deficits in recognizing faces, emotions and their meaning. As patients lose the meaning of words, the images become more vague and eccentric. The elements often show no contextual meaning or relationships to other elements and are reduced to reflecting the pure perception of the visual properties. While the composition may not represent a planned, coherent creative expression of an idea, the arrangement and representation of the fundamental pieces can be highly original. Generally, the paintings are realistic or surrealistic without a significant symbolic or abstract component.

Some subjects would obsessively rework their compositions over and over again or create dozens of similar creations. Compulsive behavior may have been beneficial in their creative process. This idea is supported by the observation of savant phenomenon, where seemingly impossible artistic or mental abilities are performed by subjects who have a profound singular interest \(^9,10\).

Additionally, recent work showed that svPPA patients view the world differently \(^11\). Using eye-tracking systems, we showed that svPPA patients looked at complex pictures without spending extra time on semantically meaningful items, different from healthy subjects and other dementia groups. This tracking distinction may allow these subjects to capture an image of the world that is more unique than what they might see with an ordinary visual tracking strategy.

3-3) Art in Non-fluent Primary Progressive Aphasia

We also characterized several nfvPPA patients who developed new onset creativity \(^12,13\). These subjects were previously engage in the visual arts, and in contrast to the photorealistic properties of the visual productions, these subjects displayed a change in their prior style that appeared more abstract and expressive that their baseline style.

In one subject, neuroimaging analyses revealed that despite severe degeneration of left inferior frontal-insular, temporal and striatal regions, this patient showed increased grey matter volume and hyperperfusion in right posterior neocortical areas implicated in heteromodal and polysensory integration \(^13\). The findings suggest that structural and functional enhancements in non-dominant posterior cortex may give rise to specific forms of visual creativity that can be liberated by dominant inferior frontal cortex injury.

4) Conclusions

We described subjects who with PPA developed new abilities in visual and verbal arts during the course of disease; disease appears to release their creativity. However, these subjects may have possessed inherent structural and developmental differences predisposing them to their disease and possibly towards their artistic abilities as well. This does not suggest that artistic abilities represent vulnerability towards disease, rather that some subjects may have networks, which cause strengths in the posterior right parietal function. Our models of neurodegenerative disease may actually reflect in part premorbid developmental differences possibly predisposing subjects towards different ways of expression. Access to this artistic creativity is developmentally encoded in us all, subjects showing relative strengths in some network reveal a relative vulnerability to unique neurodegenerative disease.

References

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