



On the Impacts of Loss of Brain-Neural Functions on Creativity in Graphic Design

Man Zhu

ABSTRACT

Semil-zeki believes that any aesthetics theory must be based on neurobiology, and the neural mechanism of the brain plays an important role in aesthetic activities. Normally, the predominant hemisphere of the brain always suppresses the contralateral side, allowing him to "play his part" to play a role in maintaining a state of balance with each other, suppressing the contralateral side if a particular area receives damage, The opposite side of the function will be out of control in the state, have extraordinary play. Creativity is the core part of the graphic advertising design talent intelligence structure, creative is the soul of advertising design. No innovation, how to creative, innovative ability, refers to the advertising design talent in the advertising design activities with new ideas, new mood, come up with a new image, new methods, ideas and ability. The basic purpose of modern advertising is to create customers, create images, create benefits and create the future. Therefore, the creative ability occupies an important position in the intelligent structure of the entire advertising planning and designing talents. This article focuses on the effects of brain function on the creative aspects of graphic design.

Key Words: Brain-Neural Functions, Creativity, Brain injuries, Graphic Design

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Introduction

Graphic design is a purposeful planning activity and a social activity that rarely works either alone or in private. In addition to increasing social experience, designers have also created their own subculture. This global language makes us connected across time and space. There are mainly kinds of brain function losses and brain damages, including the cognitive impairment in visual disturbance and cognitive impairment. The brain nerves are distributed on the left and right sides, which rely and constrain each other so as to maintain balance. If one side is less than the other, the balance will naturally incline toward the other side. In the visual system, the visual cortex that processes the visual information in the cerebral cortex is also distributed in both hemispheres of the brain. The visual cortex in the left hemisphere receives information from the right view field, and that in the right hemisphere receives information from the left view field. If

the information received by one side changes, the other side will inevitably be more sensitive to the information it receives and finally changes the visual information at the conscious level, which generates a different feeling from what normal people, feels.

Creativity is a high-level psychological activity. The psychological product of the brain is a mental carrier of the brain, so the brain is naturally a creative carrier. From the philosophical point of view, psychology is the activity of consciousness, and consciousness is the reflection of objective things and also the act of objective things. In other words, a subject cannot have consciousness without any material base and consciousness is reflected in objective practices or things. Therefore, creativity is not a purely "intangible" consciousness; instead, it is supported by "visible" material base and is a reflection of objective existence.

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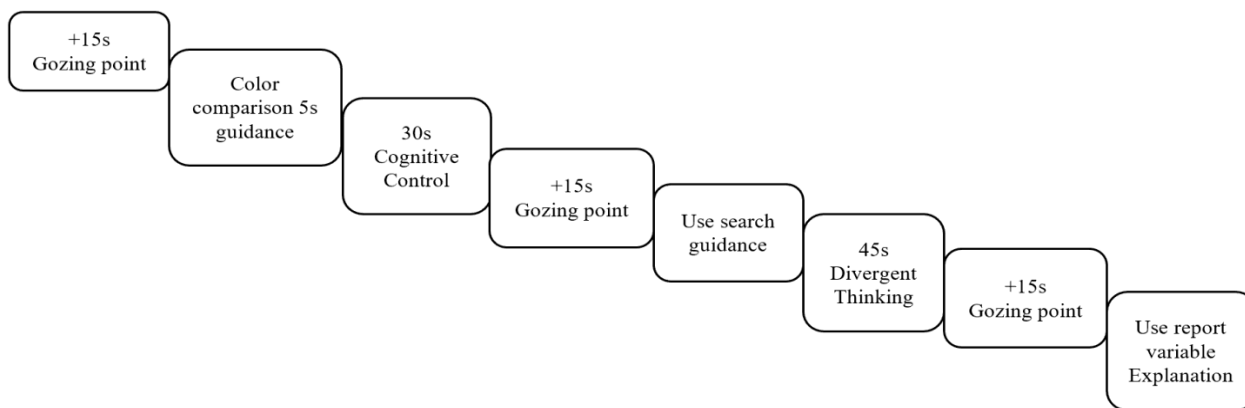


Figure 1. The general paradigm and stimulus presentation of brain imaging research on creative arts

For high-level consciousness or thinking activity, the objective material basis is separated from many objective materials. Emerging cognitive neuroscience and technologies, including high-precision electroencephalography and high-spatial-precision neuroimaging, can reveal the “visible” objective material basis for creativity - the fundamental physiologic anatomy of the brain or neural related substances. The flow chart for the brain imaging research on creativity is presented in figure 1.

Study on the influence of deletion of cerebral nerve function on the creativity of graphic design

Research on brain injuries

Early studies of the brain’s art creativity focused on the neuropsychological brain injuries. By comparing the behavioural changes of the patients before and after diseases or traumatic brain injuries, researchers indirectly obtained the relationship between the affected area and the patients’ performance. They believed that if one brain damage area can lead to the dysfunction of A in an individual while others cannot, then the brain may be closely related to the A function, and the area may even be regarded as the neurophysiological basis for the functional activity of A (Liu Chang, 2002; Zaidel, 2010). In other words, the brain injury studies primarily infer the neural basis of behaviours based on neuropsychological tests on the relationships between brain regions and impairment behaviours (Zaidel, 2010; Morriss-Kay, 2010). Relevant evidence shows that this research direction is very important to revealing the neurophysiological basis of brain cognition or thinking.

Alajouanine was among the earliest researchers to study the impacts of brain damages on creativity. He studied three aphasic artists who had excellent painting, music, and writing skills and found that there existed some relationship between artistic creativity and brain damages.

Unfortunately, he did not analyse the specific relationship between artistic creation and a particular brain area. Goel and Grafman later conducted a systematic analysis of this. They studied a 57-year-old patient with right brain injury (hereinafter referred to as the code name PF). PF was a graduate of Yale University with normal intelligence. The survey results show that artistic creativity is closely related to the right prefrontal cortex. First, through MRI scanning, he found the regions F07, F08, F09 and F10 in the right frontal lobe of PF impaired. Second, he compared PF’s performance of experimental tasks (including problem solving and task design) with those of the normal control group. PF was found unable to successfully complete the design task – PF’s design was abstract and fragmented without meaning. This shows that the right frontal lobe has an important role in artistic creation. The result was also supported by other studies on brain injury. According to a study by Miller and his colleagues on some patients with primary progressive aphasia (PPA), despite the severe damages in their left frontal, inferior insula and temporal lobes, they still possessed artistic skills. The neocortex in the right posterior cortex also demonstrates unique advantages in sensory processing and multichannel information integration, suggesting that the degradation of an individual’s speech function in the left inferior frontal lobes may lead to an increase in the brain function in the right cerebral cortex, thereby

improving the visual creativity. This further means that an individual's right cerebral cortex is closely related to the artistic creativity, especially the visual artistic creativity.

The studies on Alzheimer's disease (AD) and frontotemporal dementia (FTD) provide further evidence for the hypothesis proposed by Miller and Hou (2004). In general, Alzheimer's disease is more associated with the frontal lobes of the brain, often leading to a gradual decline in speech, spatial abilities and cognitive abilities. Studies have shown that semantic dementia is mainly associated with bilateral temporal lobe, anterior hippocampus, bilateral temporal lobes, left amygdala, parahippocampal gyrus, fusiform gyrus, inferior temporal gyrus and temporal gyrus. In combination with Katherine *et al.*'s research, this implies that brain regions such as bilateral temporal lobes, pre-hippocampus, bilateral temporal lobes, inferior temporal gyrus, middle temporal gyrus, and left amygdala are associated with artistic creativity. Injuries in these regions are likely to result in an individual's loss of artistic creativity.

Brain injuries make artists

A 68-year-old right-handed man used to be a successful businessman. But now, he is a skilled painter. Twelve years ago, he became unusually sensitive to light and colour and began to describe "open" and "closed" periods. When "open", lights and sounds produced euphoria. When "closed", he was dysphoric, and experienced lights and sounds as exquisitely intense. With the sensitivity to light and sound, his interest in painting was growing. He had no interest in art until he was five or six years old, but from that year on, he began to paint, with constant pursuit of the precision of strokes and the perfection of detail. In the 1960s, his works won awards at several art exhibitions.

What happened to Allen's brain? One theory thinks that Allen's brain will be forced to think and act in a more creative and liberal manner once the language system responsible for managing the data is damaged. However, some neuroscientists claimed that Allen's involvement in art might just be his personal response to a brain trauma. There are other similar cases, but his situation is indeed unusual. His story provides an example for this theory: the brain is so complex that it cannot be simply divided into two separate hemispheres.

Vincent Van Gogh, the famous painter, also had similar experience. His visual acuity was lightly deficient in red, and he had temporal lobe epilepsy and often showed manic depression, but it was also these problems that gave him the artistic talents. His artistic language was unrestrained, manic, full of tension and excitement, mixed with loneliness and depression, trying to reveal his disappointment in and desire for life. There are many other examples.

Research on brain imaging

Although brain injury research can reveal the general basis of mental activities, the results are not accurate, because brain injury research, in the strict sense, is not true experimental design, but rather quasi-experimental design. Researchers cannot control the many disturbing factors (such as the equivalence of lesion degree for different brain damages, the time of brain injury, the degree of natural recovery and compensation of brain function after brain injury, etc.) in the brain injury research. Moreover, the study of brain injury itself is a study of a small defective population sample, the results of which are difficult to be directly applied to the normal population. Therefore, it is necessary to study the artistic creativity of normal subjects.

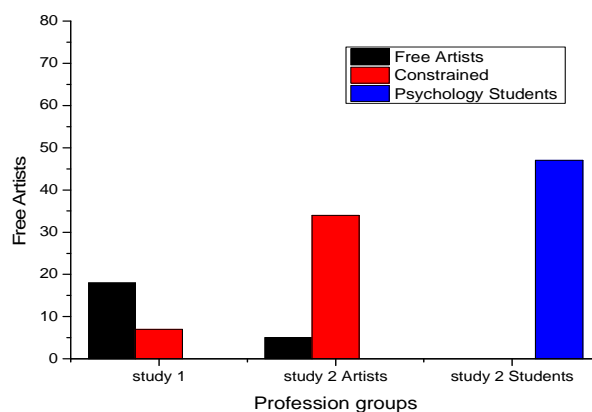


Figure 2. Distribution of Participants From Studies 1 and 2 Over the Three Profession Groups

To study living bodies (especially human), we must first consider non-invasive research - trying not to bring any damage to the subjects, and the newly emerging non-invasive electrophysiological and brain-imaging technology just meets this requirement. It not only brings no trauma to the subjects, but also accurately records the electrophysiological indexes and blood oxygen changes generated in



the mental activities of normal subjects, which provides “visual” metrics with high time or spatial accuracy to help researchers reveal the “black box” of human psychology activities. The subjects and the number of people are shown in figure 2.

By further comparison of the study phrase and the operation phase, it was found that the study phase contributes more to the activation of the right dorsolateral prefrontal cortex (PFC), and this advantage is more prominent in the design task. The operational phase contributes more to the activation of the right thalamus. This advantage is more prominent in the design tasks. Subsequent analysis reveals in more detail that design tasks significantly activate the right dorsolateral PFC while the routine problem solving tasks significantly activate the ventromedial PFC and intraparietal sulcus and this activation manifests a task specific trend, that is, the activation of right dorsolateral PFC appears only in design tasks and the activation of ventromedial PFC and intraparietal sulcus significant appear only in routine problem solving tasks. This shows that artistic creativity is more related to the function of the right dorsolateral PFC.

According to the “Interactions of the Two Cerebral Hemispheres” theory proposed by Jung-Beeman (2005) and/or “Theory of Neural Efficiency” proposed by (Fink and Neubauer, 2006; Jung *et al.*, 2009; Shen Wangbing *et al.*, 2010), artistic creativity activates one brain region without activating other regions probably because it is determined by the connectivity and neural efficiency of the hemispheric semantic network. “Interactions of the Two Cerebral Hemispheres” believes that artistic creativity shows more advantages in the right hemisphere probably thanks to the large-scale semantic network in the right brain and only scattered semantic networks in the left brain. It also points out that the greater variability in the relationship between the right hemisphere and creativity can be attributed to higher connectivity in the right hemisphere. The “Theory of Neural Efficiency” argues that neural efficacy plays an important role in the creation process, mainly because the brain can allocate the subcortical resources in the generation of creative ideas by controlling the top-bottom transmission in the information processing, and as a result, there are some differences in the brain regions of the subjects activated by artistic creativity in different tasks.

Future research can further explore such differences. In addition, the researchers also studied the relationships between creativity and gender and age, as shown in figure 3.

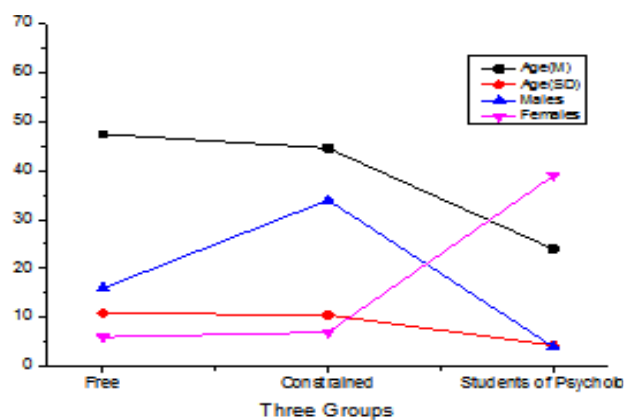


Figure 3. Age Means, Standard Deviations, and Gender Distributions for the Three Groups

Relationship between cerebral nerve and creativity

Scientific activities follow stricter logic rules and involve a great deal of abstract reasoning. Current studies on reasoning and decision-making (Hare *et al.*, 2009; Kiani and Shadlen, 2009; Hayden *et al.*, 2009) consistently show that cingulate gyrus has something to do with individuals’ calculation and trading off by logical reasoning, which means that the activation of cingulate gyrus is related to the rigorous reasoning involved in scientific creativity. Figure 4 shows the relationship between creativity and cerebral nerves. Of course, this is only one of the reasons why scientific creativity has something to do with cingulate gyrus. Another important reason is that limbic structures and frontal lobes (especially the prefrontal lobes) like cingulate gyrus are related to the motivation in scientific creativity. As pointed out by the three-factor brain anatomy model, the limbic system is responsible for seeking and providing driving force for the novelty of creative activities. Artistic creativity also involves a lot of emotional factors, but the activation of cingulate gyrus is not obvious. We think that both the cingulate gyrus and the frontal lobes have been involved in the processing of emotional factors (Limb and Braun, 2008; Flaherty, 2005), except that the frontal lobes play a more prominent role and shows more obvious activation and that the cingulate gyrus is not as important as the frontal lobes, and that its activation is not that obvious. In addition, it is probably because compared with scientific creativity, artistic creativity does not involve



extremely sophisticated logic operations and trade-offs; instead, it is more ambiguous and involves less logical reasoning (Zeki, 2001). Thus, the cingulate gyrus, which is responsible for precise logical reasoning, is not significantly activated. The factors of the product of the creativity and Brain nerve as shown in figure 4.

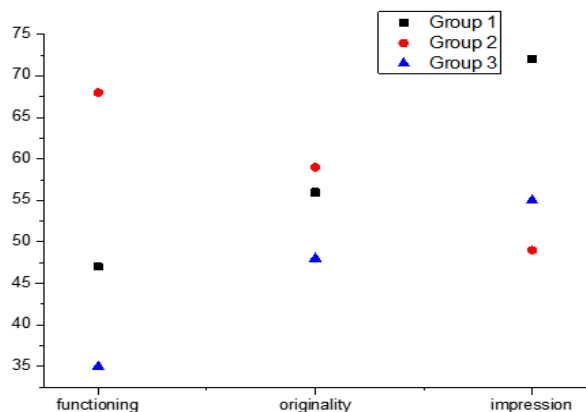


Figure 4. The three factors of the product of the creativity and Brain nerve

The brain structure imaging can help obtain the relationship between creativity and brain structure and even reveal the relationship between creativity and brain functions to some extent. However, there is no simple correspondence between structure and function, and the brain structure is only the basis for brain functions (Liu Chang, 2003). Creativity is a mental processing activity. Compared with its relation with the brain structure, psychologists are more interested in the brain function areas that may be involved in creative activity. A large number of studies have been conducted to investigate this subject at present (Seger *et al.*, 2000; Gibson *et al.*, 2009; Fink *et al.*, 2009; Chávez-Eakle *et al.*, 2007), as shown in figure 5. However, after careful analysis of these studies, it is found that they are mainly two orientations - one is task mode oriented, that is, exploring the differences in brain functions between creative tasks and non-creative tasks; and the other is individual difference mode oriented, that is, exploring the differences in brain functions between individuals with high and low creativity. Relatively speaking, the former is mostly based on the view of creative cognition, while the latter is mainly based on the view of creative personality. However, a few studies began to apply the crossover mode to explore the

differences between subjects in creative thinking tasks and routine tasks.

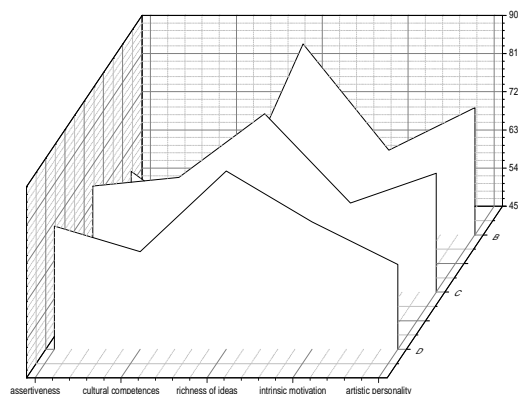


Figure 5. The five factors of the brain and the creativity

Previous studies (Liu, 2009; Silvia *et al.*, 2009; Reiter-Palmon *et al.*, 2009) show that studying creativity from the task mode and the individual difference mode helps clarify the essence of creativity. This is related to the controversy over the particularity/specificity and the universality of the creativity field. Some scholars at present think that creativity is field-specific, while others think it is field-universal. However, with further research conducted, many researchers recognize that creativity has both of these two characteristics, except that different characteristics are revealed by different evaluation methods. Specifically, they believe that the task mode follows the field-universal point of view while the individual difference mode follows the field-specific mode. So if we discuss these two modes separately, we can avoid the errors caused by the comparison between the two modes and get a better understanding of the essence of creativity and its neural basis. Also because of this, we will discuss these two modes separately in the paragraphs below.

Conclusions

However, after the artist suffered a brain injury, studies have shown that left temporal lobe damage often changes the artistic habit of long-term development or the creative impulses that have previously been exposed. Miller *et al.* Hypothesized that, in patients with frontotemporal dementia, it may be due to damage to the anterior temporal lobe of the left lesion that inhibits brain vision or music-related brain regions, thereby enhancing the art's interest and creativity. In recent years, neuroscientists have observed some peculiar



cases of artists suffering from brain damage or stroke sequelae. In one case, the researchers assessed the artist's entire painting career, including the whole process before and after she suffered a brain injury. Researchers have determined that the artist's paintings show more artistic skills later in the illness process, but also show unfinished or lack of emotional impact. The study by scientists finally concluded that the woman's temporal lobe damage made her more free to become an artist, which might help her increase her perception of art but at the same time prevent her from completing her coherently works. A study published by Swiss neuroscientists showed that they observed two visual artists and found that their post-stroke work was significantly different from pre-stroke work. One of the artists, after suffering damage to his brain that is connected to the mental image, began to paint in a more abstract style. In contrast to this case, other studies show that left brain injury may prevent one from painting in an abstract or figurative way. For example, another artist, whose brain damage occurred in those areas where he was working, began to paint in a more realistic way and with brighter colors. At the same time he will use more left-handed, and very smart. In fact, the most important finding is that neither of the two artists can find any difference in their post-genre work. To them, this looks like the same thing as their earlier work. What these cases have in common is that brain damage is usually accompanied by a tendency to produce apparently different and more liberal forms of art. With the above conclusion, we can make a bold assumption that due to the impairment of brain function, the majority of acquired artists suffer from damage to the left hemisphere. The function of the left hemisphere of the brain inhibits the artistic ability of the right hemisphere of the brain. When the left hemisphere Impaired the ability to visualize the right hemisphere of the brain, which was originally embodied in visual spatial abilities and

the visualization of the arts. However, after the brain damage, the artist changed his artistic style mostly because the right hemisphere of the brain was damaged, thus enhancing the semantic analysis function of the left hemisphere. However, due to the diminished visual perception, the ability of the artist to understand art changed, Too much to expand some of the details, so as to create alternative works of art.

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