

The Research on Split-Brain and Philosophical Thinking by Sperry

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Abstract. Among the advances in brain research at the frontiers of contemporary science, the most notable achievement was the work of Roger W. Sperry, a professor of psychobiology at the California Institute of Technology, who was awarded the 1981 Nobel Prize in Physiology or Medicine for his work on the "split-brain man". This paper is intended to analyze the philosophy behind the split-brain. Describe Sperry's main findings about the split brain.

Keywords: Split Brain; Corpus Callosum; Consciousness Agents; Sperry.

1. Introduction

Roger Wolcott Sperry was born in 1913, as an American neuropsychologist. Roger Sperry, through clinical observation, animal experiments, and psychological tests, came to a new conclusion on the functions of the nervous system and the two hemispheres of the brain. [1] Sperry began to study the consciousness function of the right hemisphere of the human brain in the early 1960s. On October 8, 1981, Sperry won the Nobel Prize in physiology and medicine for discovering that the right hemisphere of the brain has a higher level of consciousness. Sperry proposed an important scientific hypothesis from his research called "The interaction theory of monism" which is relative to philosophical thinking and necessary for people to consider. The important findings by Sperry on the split brain and the philosophy behind the relationship between brain and consciousness all should induce people's attention and continue to consider them.

2. Discovery of Consciousness Function in the Right Hemisphere of the Brain

The term "split-brain" has its origin in epilepsy treatment. The brain of humans has two different parts: the left hemisphere and the right hemisphere. The part that connects these two hemispheres is called the corpus callosum which includes 200 to 250 million nerve fibers. In addition, the corpus callosum is the way the left and right hemispheres communicate. When the situation of epilepsy seizure is severe, the brain will discharge. At that time, cutting down the corpus callosum of the patient can avoid the electricity current diffusion between the left and the right hemispheres, reduce the frequency of epilepsy seizures and alleviate the symptoms of epilepsy seizures. Therefore, those patients whose left hemisphere and right hemisphere are separated are called human split brains. After the doctor cut the corpus callosum into two different parts, the patient's left hemisphere and right hemisphere are independent of each other. Therefore, it is found that the right side of the body is mainly controlled by the left hemisphere alone, while the left side of the body is controlled by the right hemisphere alone. After more than 20 years of research on animals and schizophrenic patients, Sperry came to the following conclusion.

2.1 Specialization of the Functions

Sperry's work initially revealed the specialization of the functions of the two hemispheres of the brain and revealed that the two hemispheres reflect the objective world in different ways. Through the research on schizophrenic people in 1967, Sperry and others put forward a conclusion: each separated cerebral hemisphere has its own higher cognitive function, and each hemisphere shows its perception, imagination, and association functions when tested. Each hemisphere has its learning process and memory chain and has nothing to do with the conscious experience of the other hemisphere. In 1972, Jerry Levy and Sperry conducted an experimental study on the cognitive characteristics of the right hemisphere and found that the intelligence of spatial transformation within

the model from three-dimensional space expansion to two-dimensional space morphology developed better in the right hemisphere. In 1977, Franco and Sperry further proved that the geometric discrimination of topology is completed by the right hemisphere at a high level, while it is extremely difficult or impossible for the left hemisphere to complete this geometric discrimination. Based on the above experiments and the findings by predecessors, the left hemisphere is usually good at processing "digital" information, such as language function, logical thinking, and analytical ability. The right hemisphere is good at identifying the space and perception of images, music, and art. Meantime, the right hemisphere also has higher functions than the left hemisphere in certain aspects. In the traditional perspective, the right hemisphere is the inferior hemisphere compared with the left hemisphere. However, Sperry through numerous experiments shown that the truth is not like that, the right hemisphere is superior to the left hemisphere in many aspects, especially in the specific thinking ability, the ability to recognize space, and the ability to understand complex relationships.

2.2 Language Function

Sperry's experiments also revealed that the right hemisphere has a language function. At the beginning of the research, affected by the traditional idea, Sperry and his team also thought that the right hemisphere without language functions. Sperry found a way: he placed a screen in front of a person with a split brain and asked the person to focus on the center of the screen. At the same time, people with split brains will have their hands tied to their backs, so they cannot see their hands. At this time, people with split brains are in a state of independent hands and eyes. In this case, Sperry allows the left and right sides of the screen to display bright spots respectively. When the bright spot is displayed on the right side of the screen, the examinee said he saw a bright spot soon. However, when a bright spot appeared on the left side of the screen, the examinee showed a strange reaction: he said he saw nothing. However, Sperry was surprised by what happened: he asked the examinee to express their ideas orally, instead of asking the subjects to gesture. In this case, when the bright spot is displayed on the left side of the screen, the examinee conveys a fact through the gesture of his left hand: he does see the bright spot in his left eye. This shows that the left eye of a person with a split brain is not blind. He can see the bright spot on the left side of the screen and then send this signal to his right hemisphere. It's just that he has no language ability in the right hemisphere: he can't speak. Therefore, the right hemisphere cannot speak to indicate that the left eye sees a bright spot. However, if not through language, but limbs, the right hemisphere can still control the left hand. It clearly expresses the fact that it saw a bright spot with the help of its left hand. However, it was later found that the separated right hemisphere could read the text blinking in the left field of view because the left hand could select or point out the corresponding objects or pictures in a series of items according to various requirements. This kind of fact is tested by Sperry by using another experiment: he shows a picture with "HEART" on it. The right eye of the test taker see the letter "ART" and then said that they saw the letter "ART". However, when Sperry requires the test taker to use his left hand to find the corresponding letters, the test taker chooses "HE", not "ART".

2.3 Self Consciousness and Social Consciousness

The right hemisphere has self consciousness and social consciousness. Sperry conducted targeted experiments: he asked patients to look at different pictures and analyze the reactions given by patients. It was later found that the patients' reactions to the pictures were reasonable and logical. Such as, A 21-year-old schizophrenic patient whose left hemisphere was blocked by a half field blocker could only be tested with the right hemisphere. The patient needs to evaluate a series of photos within the specified time, including his friends, social and historical figures and his own photos. Patients need to use their thumbs up to indicate approval and thumbs down to indicate disapproval. For example, when he saw pictures of Churchill, beautiful girls and ballet, he made a thumbs up reaction. When the patient saw the war photos, he responded with his thumb down. When the patient saw Nixon's photo (the experimental date was before the Watergate incident), he showed his neutrality with his thumb. Finally, there is a picture of the patient himself, accompanied by the shy reaction of the thumb

down and the right hemisphere. It proves that the right hemisphere has self-consciousness and social consciousness.[2][3]

3. Philosophical Thinking

Based on the notion mentioned above, the right hemisphere has self-consciousness and social consciousness, Sperry subsequently proposed a hypothesis that whether Split-brain patients have two separate consciousness or spirit. In this case, there are four different perspectives proposed by several scientists and philosophers: 1. Professor Berov of the University of Edinburgh, UK: "the best hypothesis for people with split brains is the materialistic formula. There are two brains, so there are two spirits." 2. Sperry: "there are not only two spirits, but also two selves and two people." 3. Proseljin of Daruth University in Canada: he believes that normal people are not unity, and all normal people have two spirits. Normal people are actually a mixture of two people. 4. Eckles and Wilkes of St Hilda College, Oxford, UK, etc.: Schizophrenic people still have only one spirit, so they are only one person. [4] However, Sperry proposed an emerging theory of psychological and physiological interaction. The main ideas of the emerging theory of psychological and physiological interaction are that: 1. Conscious experience, as an emergent property of brain activity, is closely related to the brain. He made it clear that "whether conscious experience can be separated from the brain and exist dualism gives a positive answer to the independent existence of the spiritual and material world, thus opening the door for post-mortem consciousness, all kinds of supernatural and super sensory beliefs in the afterlife. Monism limits its answer to a world scope, thus giving a negative answer to the conscious spirit that is separated from the functional activity of the brain and exists independently." [5] 2. Consciousness is independent of other physiological elements in the brain. Although consciousness is composed of neural events and other physiological elements in the brain, the psycho-physiological equivalence theory is wrong. [6] 3. Consciousness plays an active role in the brain. Consciousness interacts with the brain to promote the control system of the brain. From the perspective of the highest order at the highest level of the hierarchical system of brain organization, consciousness plays an effective role as a cause. In fact, it is the highest level of consciousness function of the brain that controls the biological, chemical, and physical activities at the lower level of the brain. The higher conscious nature of brain activity determines the process of neural events in the lower-level brain. [6] In a word, Sperry, as an outstanding scientist, not only stands out in the scientific cause but also his theoretical hypothesis involving the frontier of contemporary science has rich content and many reasonable and profound insights, which deserve our attention. Of course, the analysis and research of this theoretical hypothesis about the brain consciousness relationship are by no means a simple philosophical judgment or philosophical veto, that is, we cannot simply criticize or discard his theoretical hypothesis, because we have seen him publicly claim that it is idealism, without paying attention to analyzing and absorbing its reasonable scientific content. At the same time, we believe that it is absolutely necessary to adhere to correct philosophical analysis to assess whether such a theoretical assumption is reasonable, what is reasonable and unreasonable in its content, and to what extent it is reasonable or unreasonable. We should not only pay attention to the reasonable components of its assumptions, but also not see the wrong tendencies, contradictions, and limitations contained therein, and give too high a rating, because it does not conform to the true nature of things, and of course, it is not conducive to promoting the research of brain consciousness in the right direction. This is the starting point of our philosophical thinking on Sperry's theoretical hypothesis. [7]

4. Summary

Sperry's research results have significant contributions to both medicine and philosophy. The discovery of the schizophrenic brain also solved many medical problems. But as time goes by, this technology has been gradually not studied. Because the epilepsy problem solved by splitting the brain still has many side effects and sequela. Through a wide range of different experiments on "split-

brain”, Sperry concludes that both the left and right hemispheres of the human brain have high-level cognitive functions. When the left and right hemispheres are been tested, they all show their sensation, imagination, abstract thinking ability, and the way they learn and restore memory. The key point is that all of that consciousness and experiences are independent of another hemisphere.

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