Split brains – Hemispheric disconnection and unity in conscious awareness.

American Psychologist, 23, 723-33.

Sperry, R.W. (1968)

Introduction / Background

This famous study by Sperry explores the connection between brain structure and experience. Our brain has a right and left hemisphere. The right hemisphere controls most of the activity on the *left* side of the body and the left hemisphere controls the *right* side. Motor and sensory control is *bilateral*, which means motor and sensory behaviours are equally controlled by both sides of the brain, though one side tends to be dominant. If you are right-handed the left hemisphere is the dominant hemisphere, but for language, the *left* hemisphere is dominant, while spatial awareness and emotion tend to be processed in the *right* hemisphere.

Vision has a complicated system. **Both eyes have a left and right visual field** and inputs from the left visual field from both eyes are processed in the *right* hemisphere, and inputs from the right visual field from both eyes are processed in the *left* hemisphere.

Sperry used split-brain patients to find out what happens when the two hemispheres can't communicate with each other. The split-brain procedure involves cutting the corpus callosum, the largest bundle of nerves which connects the two hemispheres. The operation is called a commisurotomy. The operation was **not** done for the purpose of the Sperry experiment, which would have been unethical. It was performed on a number of people who suffered severe epilepsy. An epileptic seizure is caused when there is a storm of electrical activity in the brain. In most epileptics this can be controlled by drugs, but in cases where this isn't possible, a surgical solution is to cut the connections between the right and left hemispheres to limit the damage caused by the epileptic seizure.

The laboratory experiment

Participants

11 people who suffered from severe epileptic seizures that could not be controlled by drugs. A commisurotomy was performed to help their epilepsy. This provided an opportunity to study the effects of hemispheric deconnection (split-brain) on behaviour.

Three research questions:

(1) What happens when the two halves of the brain are disconnected?

(2) Do the hemispheres perform different functions?

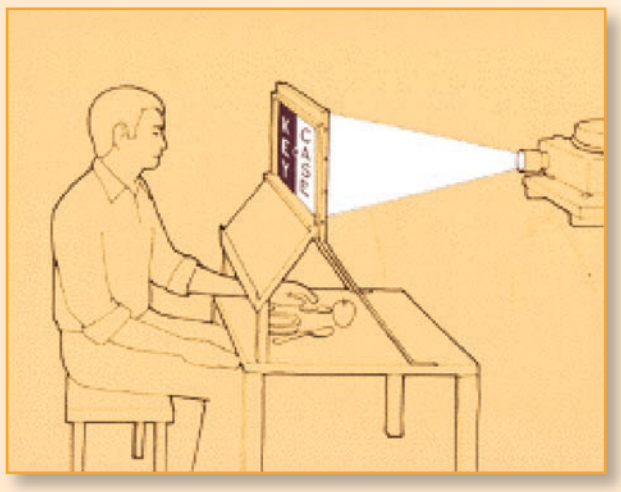
(3) Does each hemisphere have its own memories, perceptions and concepts?

Procedure

The participant covered one eye and was instructed to look at a fixed point in the centre of a projection screen.

Pictures were presented to the left or right visual field by projecting slides onto the right or left of the screen at a very high speed, one picture every 0.1 second or faster.

Below the screen there was a gap so that the participant could reach objects but not see his or her hands.



Summary of results

If a picture was first shown to the left visual field, the participant did not recognise it when the same picture appeared in the right visual field.

If visual material appeared in the right visual field, the patient could describe it in speech and writing.

If visual material appeared to the left visual field the patient could identify the same object with their left hand but not their right hand.

If visual material was presented to the left visual field the patient consistently *reported* seeing nothing or just a flash of light to their left. However, the participant could point to a matching picture or object with their left hand.

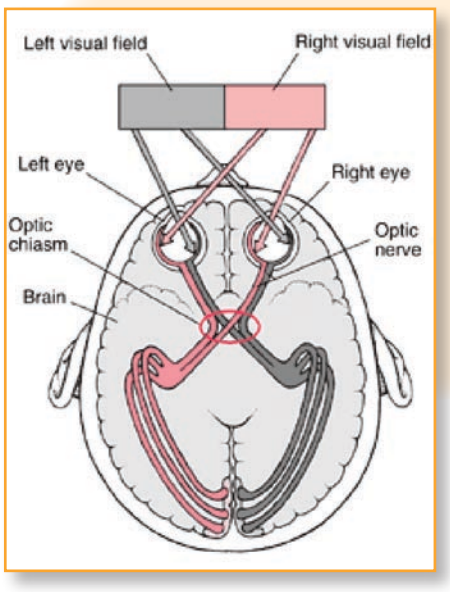
When TWO different objects were displayed, e.g. CASE and KEY and participants were asked to draw what they see with their left hand they drew what was on the LEFT half of the screen (CASE) BUT said they had drawn what was on the RIGHT half of the screen (KEY)

Key and case: Sperry flashed composite words across the midline of the screen, such as 'key case', so that 'key' was in the left visual field, and 'case' in the right. If the participant was then given a group of objects to search through with his left hand, he would identify a key (because the left visual field goes to the right hemisphere which controls the left hand). With his right hand the participant would spell out the word case (right visual field to left hemisphere which controls speech and the right hand).

When objects were placed in the RIGHT hand for identification by touch, participants could describe the object in speech and writing BUT when objects were placed in the LEFT hand for identification by touch participants made wild guesses and seemed unaware of the object in their hand.

Conclusion

It seems that when the hemispheres are disconnected one half of the brain does not know what the other half is doing



The LEFT hemisphere (in right handed people) is specialised for speech and writing and for the organisation of language. It can communicate the visual experiences of the right visual field and about the experiences of the right half of the body

The RIGHT hemisphere is mute and cannot speak or write (aphasic and agraphic) but can show non-verbally that mental processes, in the left visual field, and the left half of the body, are present

Sperry concluded… *"When the brain is disconnected we see two separate selves, each with its own memory and will"*