

Probing Question: If a blind person gained sight, could they recognize objects previously touched?

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Most people conceptualize the world largely based on sight, and would find it difficult to function using touch alone. Think about finding the keyhole on your car door at night, or locating that light switch in a dark room. Even if it's too dark to see, a seeing person uses his or her visual memory, along with the tactile sense, to navigate the physical world and accomplish the task at hand.

However, the interconnectedness of sight and touch is not a given for the blind.

Cathleen Moore, associate professor of psychology, explains that the areas processing visual and tactile information are located on the wrinkly, outermost shell of the brain, called the neurocortex. "Sight is located on the back of the brain, and touch along the sides, near the top."

A connection was verified between the two senses in sighted people, Moore says, through a test using functional Magnetic Resonance Imaging (fMRI) to analyze brain activity. Without looking, the subjects described objects they could only examine with their hands. "Despite being blindfolded, their visual areas were very active. It's as if they translated tactile sensations into visual terms," states Moore. "Obviously, these are integrated."

But although sighted people can picture tactile information in their head, the neurocortex is configured slightly differently for those who can't see.

"It's not like the visual area just atrophies for blind people," explains Moore. Instead, the visual area gets taken over by the tactile. This concept is called neuroplasticity, the ability of the neurosystem to reconfigure itself.

Because of this different brain configuration, blind

people who regain their sight may find themselves in a world they don't immediately comprehend. "It would be more like a sighted person trying to rely on tactile information," Moore says.

Learning to see is a developmental process, just like learning language, she continues. "As far as vision goes, a three-and-a-half year old child is already a well-calibrated system."

As an example of the process, she referenced two case studies where blind men regained their sight later in life. Their experiences illustrate some of the difficulties in making the transition from blindness to the world of visual imagery, as well as the surprising importance of one's age at the onset of blindness to one's successful adaptation to sight.

One man known as S.B., in a study conducted by British neuropsychologist Richard Gregory and reported in the journal *Nature*, lost his sight at 10 months old, only to regain it 50 years later through cornea transplants. He could recognize several objects despite never having seen them, but other aspects of vision left him bewildered, Moore says.

S.B. could tell time from the hands of a clock from previously feeling an open-faced watch, and identify cars and trucks from having repeatedly washed his relative's car.

"I would infer that he just formed a generally applicable spatial representation of these, so conceptualizing the position of hands on a clock or the shape of a car didn't matter if it came through visual or tactile sources," Moore says. "When he gained vision, it was easier for him to interpret them."

"What he wasn't good at was drawings. He basically couldn't extract depth from them," she

adds. For S.B., a painting of a countryside landscape was simply a collage of colors and a drawing of a cube simply a series of lines on a page. Gregory's study tentatively attributed this problem to a part of the brain inappropriately scaling objects, causing S.B. to misjudge their size.

The other man, American Michael May, whose case was reported by CBS News in 2003, went blind at 3 1/2 and regained sight at 43. Surprisingly, although losing sight much later in his childhood, he had a harder time adjusting to vision than S.B. "He can't recognize the faces of his wife and children," Moore says. "One possible explanation for this is that while May was blind, he was essentially trying to compare tactile sensations to visual images he obtained as a child, instead of forming a general spatial representation like S.B., who could only recall the colors red, black, and white.

So while we might think giving sight to the blind would be akin to taking off a blindfold, it is not that simple. The acquisition of sight for S.B. and May brought hardship along with opportunity. "After surgery, some people who regain their sight can become very depressed," Moore states. "For S.B., he expected the visual world to hold all of this promise, but it didn't. It was dull, and bland." S.B. never learned to read, and sometimes wouldn't bother flipping on the light at night.

Although S.B. died two years after his surgery, May has since gotten better at understanding his vision, confirms Moore. "He is learning to see like an adult learns a second language, slowly and through a lot of hard conscious work. It's very unlike the way a child learns a language -- quickly and seemingly effortlessly. The intriguing difference between S.B.'s and May's cases implies that there are critical periods for learning to see, just as there are heightened periods for language learning."

Source: Research/Penn State, By Joe Anuta

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