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2441 Old Stringtown Road • Grove City, Ohio 43123
Phone: 614-317-9990 • Facsimile: 614-317-9905
www.CapitolSleepMedicine.com

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Timothy J. Walter, M.D. Uma Marar, M.D.

Dreams in the Sighted and in the Blind

Dreams are typically quite visual. How is vision represented in the dreams of normally sighted subjects? A question frequently heard by sleep medicine patients is "Does every normally sighted subject dream in color?" Estimations of the percentage of dreaming in color in scientifically reported dreams varies from 68%[1] to 83%[2]. Thus, most but not all of scientifically reported dreams of normally sighted subjects in these studies are in color. One study progressed beyond the inquiry of color and concluded that about 80% of dream reports allowed the ability to discern the identity of objects based on their shape and size and about the same percentage had depth perception.[3] For those of us with sight, dreams are visual but what about the other senses? In one study, visual components were present in 100% of the dream reports. Roughly 40% of the surface area of our brains is devoted to vision, and so it stands to reason that our perception, thoughts, and memories are largely visual. Sounds and language were present in 69%, the sensation of motion was present in 12%, and touch in 10% of the reports. Taste and smell were the least frequently experienced senses, each being about 1% of the dream reports.[4]

Are dreams visual for everyone? What about for those who are blind? One study examined subjects who were born blind, and compared them to those who became blind at some point later in life. Dream diaries demonstrated that although some of the blind subjects reported highly visual dreams, not surprisingly, many of the blind subjects revealed less visual symbolism in dreams than did the normally sighted subjects. Interestingly, there was also a tendency for individuals who became blind after the age of seven to have more visual symbolism in dreams than subjects blinded before the age five. In other words, if the incident or disease that led to the blindness occurred before the age of five, it was unlikely that remembered visual details would be recalled in the dream.[5] This cutoff of an age of five isn't really very surprising. How many visual memories can you now remember that occurred before you were five years old?[6]

Some blind patients seen in clinical practice may say that they "see" in their dreams what they "see" as they are awake on any given day. Of course, they don't really see but they may imagine what an outline of a person, building, or object is. The sensations of sound and touch become much more important in constructing the experience than they would for a sighted person. From the descriptions of their dreams, it seems that their dream world is a reflection of how they "see" their waking world. Studying blind patients with neuro-imaging modalities provides insight as to how both the waking and dream world is different for blind patients. The primary visual cortex receives visual input from the eyes but it does not normally receive input from other sensory modalities. A study using positron emission tomography (PET) scans to measure activation during tactile discrimination tasks in normal subjects and in blind Braille readers demonstrated that blind subjects showed activation of primary and secondary visual cortical areas during tactile tasks, whereas normally sighted individuals showed the normally seen occipital lobe deactivation. Thus in blind subjects, touching Braille letters may activate cortical areas normally reserved for vision.[7] How does this somatosensory enhancement by the normally visually processing occipital cortex occur? A similar study was performed measuring regional cerebral blood flow with PET scans during tactile tasks performed both by Braille readers blinded early in life and by sighted subjects. Braille-letter strings were used, and subjects were asked to discriminate between words and nonwords. Braille reading by the blind subjects activated several brain areas, including areas normally involved in touch such as the superior parietal lobule and primary somatosensory areas bilaterally, but it also activated areas normally reserved for the processing of vision such as the primary visual cortex, superior occipital gyri, fusiform gyri, and the right middle occipital gyrus. These findings suggest that the tactile processing pathways usually linked in the secondary somatosensory area are rerouted in blind subjects to the ventral occipital cortical regions originally reserved for visual shape discrimination.[8]

Is there a cut-off in the age of when the blindness occurred that may determine if this somatosensory enhancement by the normally visually processing occipital cortex may occur? Functional MRI studies during a tactile discrimination task have shown an increase in activity in the primary visual cortex for blind subjects who had lost their sight before 16 years of age, whereas it was more suppressed in blind subjects who lost their sight after 16 years of age. This suggests that there may be a critical period for the ability of the occipital cortex to assume the functioning of touch sensation that would normally be reserved for the somatosensory cortex.[9] Blindness after the age of 16 may not result in the same heightened arousal for sensations other than vision. We all dream, each in our own way.

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2441 Old Stringtown Road
Grove City, Ohio 43123

1-800-SNORING
1-800-766-7464

11925 Lithopolis Road N.W.
Canal Winchester, Ohio 43110