Annotated Bibliography for Braille SC


The authors of this article explore verbal memory capabilities in congenitally blind study participants using a series of tests and functional magnetic resonance imagery. The study shows that increased occipital lobe activation took place in the blind participants when compared to sighted participants. Furthermore, the blind participants scored higher in the verbal tests than the sighted participants, suggesting that the increased occipital activation may serve a function in lexical tasks and actually serve as an increase in memory capabilities for the blind. This study began because of other recent studies and a desire to test the cultural belief that the blind make the best oral history keepers, as they never forget anything.


Using a test that included lists of nouns the authors of this study applied fMRI technology to normally-sighted, early blind, and late blind individuals to track brain activity. The tests included a semantic based test in which participants were given sixteen nouns in an auditory fashion and then had to produce an encompassing verb. There was also a phonological component in which the participants created a rhyming word to correlate to the sounds of the words in those lists. These tests concluded that the blind participants, whether early blind or late blind, used the visual cortex region of their brains in order to accomplish their tasks. A
reorganization of the brain takes place, allowing the blind to use the visual oriented parts of the brain to process linguistic functions. The authors claim that the study shows a greater use of this region for the semantic association portions of the test as opposed to the phonological aspects of the test. Early blind showed a greater amount of use, implying that the restructuring takes place steadily over time.


The authors of this report performed experiments to see if default brain activity was altered in any way by blindness in people. The test included verb generation for a list of nouns. Lists of related nouns were provided to participants and they generated a verb that connected each word in the list. The researchers excluded homonyms for the auditory portion of the tests. Braille testing was also performed on the Braille literate participants. Early blind participants resulted in more activity in non-normative sections of the brain for the applicable tests. Late blind participants showed some activity in these areas while the normally sighted showed standard activity in the expected regions. The tests did not show major changes in default brain function, however.


This study attempts to answer whether Braille literacy plays a part in the restructuring of the brain’s visual cortex into linguistics based functionality. The study performs the same tests used
in the previous studies as control, but focuses on variance between Braille literate and Braille naïve individuals with normal sighted participants as a control group. For the most part there is no difference between the two groups of blind participants except with the phonological task. Interestingly, the rhyming caused a response in different sections of the brain for the Braille literate as opposed to the Braille naïve individuals. The authors hypothesize that practice with non-visual stimulation drives the reorganization of the brain to allow the visual cortex areas to handle linguistics. The early blind Braille literate participants have organized the brain in a slightly different way. The effect of this difference is unknown.


Dehaene’s work is a very academic and scientific approach to the science behind reading. The terminology is not as prohibitive as the journal articles that fueled the primary research of the brain and braille reading’s effects on it, but it is more technical than Wolf’s work. Dehaene examines the neurological pathways of the brain along with the regions used for reading and writing. Reading is broken down to a symbolic construct no matter the language or writing system. Experiments on apes and monkeys are included in his research and prove that there are similarities and differences that occur between the species that argue this symbolic nature of reading. The areas of the brain that deal with reading are very closely associated between all languages, although greatly diverse languages such as English and Chinese also use different parts as well. Dehaene says that there is a central location for the act of reading, but that the neurological translation that occurs happens in different spots. This would allow for acknowledgement of written language as such but the inability to comprehend that occurs with alexia. The book also covers dyslexia through its history from a psychological disorder to one of neurological significance. Research on the monkeys showed a similar problem when lesions
were applied to the brain in specific locations. The monkeys lost the ability to connect objects with purpose. Training never connected so the monkeys did not learn that the food was always under a red box instead of a striped dome. The monkeys also sought to define everything they encountered with either food or procreation. The conclusion reached is that humanity did not reconfigure the brain to match up with reading and writing, but matched reading and writing to pre-existing neurological nets to make the necessary changes easier.


The authors of this article study the physical changes that take place in the brain because of blind individuals learning to read braille. The article proposes that the greater focus given to tactile sensitivity in the fingers increases matter in that part of the brain. Hamilton also mentions some of the early studies into the occipital, or visual, cortex reworking itself for use in lexical and tactile purposes as well. The authors discuss the steps the body takes to unmake and re-establish connections within the brain to enhance the brain’s new input and processing capabilities. This article is one of the earlier studies discussing neuroplasticity in reference to overcoming blindness.


The authors discuss in this article a case of a blind man who suffers visual hallucinations due to his blindness. These hallucinations appear as a “sandstorm” to the patient who then suffers from a disorder called alexia. Alexia is “word blindness”. According to the authors, the hallucination
originates in the occipital lobe, a place generally used for vision, but pulling its weight in other areas in the visually impaired. Maeda believes that the connection between the “sandstorm” and the patient’s alexia is a direct result of its appearance in the occipital lobe and the lobe’s function as a lexical center for the visually impaired.


The authors of this report performed a study using diffusion tensor imaging and diffusion tensor tractography (methods of physical brain mapping) to study the changes in white and gray brain matter as it differs between blind and normally-sighted individuals. The imaging results showed a difference in a few key areas of difference, primarily in the visual cortex of the blind. In the blind participants, all of whom were early blind, atrophy had occurred in the geniculocortical tracts, but connections remained to the other sections of the brain. The authors feel it important to mention that no new tracts were found in the blind participants. The brain restructures itself with a change in the white matter and runs different information across the channels but does not add any new tracts or connections that are not present in normally-sighted individuals.


The authors claim that certain reading difficulties experienced by braille readers is not due to the difficulty of learning to read. Dyslexia is potentially a cause for the reading problems. Sighted readers learn to read with both visual images of words and the associated sounds and a visual
definition of the word all presented together. For instance, when a child reads the word “ball” in an early reader book it is pictured on the page and an adult reads the word aloud at the same time. This allows an orthographic and phonological connection to be made at the same time. Dyslexia, however, is not strictly a visual problem. It stems from abnormalities within the brain that process information into the occipital cortex, usually used for sight. The visual connection to the word’s sound, and thus its meaning, becomes impaired by small alterations in the neural pathways that allow these connections. While dyslexia is a common enough reading problem for sighted individuals, it is not generally associated with the blind. As other articles here have pointed out, however, the occipital part of the brain is very active in the blind for braille functions, so dyslexia could still have an impact.


“We were never born to read.” Wolf begins her work with this sentence and proceeds to explain that the very act of learning to read imposes physical changes on the brain. Wolf discusses these changes in ways both historical and scientific. While she does not mention visual impairment in the book, the author does approach the very difficult nature of neuroscience in an easy, user-friendly sort of way. If all of the scientific articles included in our research are appealing but feel too difficult to conquer try *Proust and the Squid* first, then go back to those articles. The work includes a detailed history of writing in all its styles from the Greco-Roman alphabet to Asian character style writing systems. Different portions of the brain adapt itself in different ways to the writing styles. Alphabet based systems are orthographic, or spelling oriented, while the character systems are logographic, or memory based. The different systems activate different parts of the brain as demonstrated by the example of a bilingual man who suffered a stroke that led to alexia for Chinese, but not English. Wolf also details dyslexia using personal examples
and famous examples of very creative individuals who were dyslexic. Understanding dyslexia is a critical part of understanding how it is we reconfigure our brains in order to read, because we were never born to read.