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Scientific Resources: Left and Right Hemisphere Brain Functions and the Corpus Callosum

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Right and Left Hemisphere Brain Functions

Roger Sperry's (1968) split-brain research involved patients whose seizures were uncontrollable via medication. Sperry severed the bundle of nerve fibers, known as the corpus callosum, which connects the two cerebral hemispheres. This surgery effectively controlled seizures, and as a byproduct, created a group of split-brain persons, thus providing Sperry and his colleagues the opportunity to study the brain functioning of this group. Although the split-brain patients appeared quite normal in everyday activities, in the laboratory, the absence of the corpus callosum allowed the separate stimulation of the left and right hemispheres, and the study of their independent functioning. These research findings won Sperry the Nobel Prize in 1981.

Sperry's graduate student, Michael Gazzaniga (1997) claimed his work with Sperry on split brain theory made it entirely clear that a particular neurological structure can greatly vary in what it transfers and in its functional role; brain structures are responsible for this huge variety in style of brain diversity

Gazzaniga (1977). He contends that the ordering or assigning of duties of differing circuits may be affected by experiences, brain damage, or a variety of other influences to which the developing organism is subjected (Gazzaniga, 1977).

Bellis and Wilber (2001) found that left-right differences in dichotic tasks (or similar tasks in any modality) may be explained by the manner in which the brain scans the information presented. Bellis and Wilber (2001) contend that the brain has a tendency to scan information serially, which leads to one ear or visual hemifield having "superiority" over the other; they caution that this directional bias should not be taken as evidence of the existence of the hemispheric dominance for these tasks but, rather, evidence for serial processing in the brain. Males may begin to experience binaural processing difficulties earlier than do females; visuomotor interhemispheric transfer is affected by aging in the same manner as is auditory interhemispheric transfer (Bellis & Wilber 2001).

Gazzaniga (1977) found that the right hemisphere comprehends some simple nouns but cannot process verbs nor grasp adjectives; it is also syntactically weak, could recognize negative, could not make plurals, comprehend tense, failed of many syntactic tests, could not rhyme, and did poorly with tasks requiring phonemic analysis. Gazzaniga's series of tests strongly suggest that the right hemisphere in the normal brain carries out little or no language processing; a three - word

segment sent to the right hemisphere suggests that it was first assembled in the left hemisphere and scanned from left to right (Gazzaniga, 1977). Furthermore, this suggests that the right hemisphere does no processing of information, but rather sends it over to the left for the assembly of language analysis (Gazzaniga, 1977).

Carreiras et al. (2009) found white matter in the brain evidencing interhemispheric transference of left and right hemispheres. The study was conducted on 10 adults showing linkage between the right angular gyrus and left angular gyrus (Carreiras et al., 2009). Similarly, Gazzaniga (1977) found the linguistic functions occupy the left hemisphere while manipulative skill occupies the right hemisphere. The left hemisphere fills up, synaptically speaking, as a result of little remaining neural space; executing skills involved in manipulating items in external space matures later (Gazzaniga, 1977). Language matures in the left hemisphere, leaving the right principally responsible for acquiring these manipulative spatial skills in later life (Gazzaniga, 1977).

The Role of the Corpus Callosum

Bellis and Wilber (2001) found the corpus callosum appeared to play a role in many higher-level cognitive tasks, including selective and sustained attention, phonological (speech-sound) processing, auditory verbal learning and memory, and

syntactic pragmatic and semantic language functions. The ability of the two hemispheres of the brain to communicate with one another via the corpus callosum is important for a wide variety of sensory, motor and cognitive functions, many of them communication related (Bellis and Wilber, 2001). Age affects auditory behavioral and temporal measures of interhemispheric integrity which appears to remain relatively stable from young adulthood through approximately the age of 40 years (Bellis & Wilber, 2001). Bellis and Wilber (2001) found that because the language-dominant (usually left) hemisphere is required for the perception and verbal labeling of auditory linguistic stimuli, information presented to the left ear requires a transfer from the right hemisphere to the left via the corpus callosum for the subject to make a verbal report, whereas input to the right ear does not.

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