

ABSTRACT

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Essay title: Brain Plasticity in the Light of the Critical Period

The plasticity of the human brain determines the degree to which we are capable of acquiring new knowledge. In terms of brain capacity, language functioning is the most demanding activity which requires most co-ordination from most brain areas. Regarding brain plasticity which is the change of neural structuring of the brain at the effect of learning, is the best indicator of that unique feature of our brain.

According to nativists, the brain is most capable of learning new skills in early childhood and this ability gradually fades by age. Experimental language tests show that although some aspects of language functions are vulnerable to the critical period such as syntax processing and grammar acquisition, comprehension and vocabulary learning do not fall victim to aging. Further evidence for brain plasticity lies in the brain's ability to handle two languages in the same neural bound which is left hemisphere dominant with early bilinguals but calls additional brain regions into service beside the Perisylvian language pathways to aid language production and comprehension. The Convergence hypothesis claims that neural activation resembles to that of a native speaker in proportion with proficiency in the foreign language. The right hemisphere associates semantic relationship with words along with word learning and retrieval in case of every language speaker. Memory plays a crucial role in language production and comprehension in all languages. Both the hippocampus and the neocortical regions show synaptic plasticity while learning new words. The hippocampus holds newly learned words until the information walk their routes to the neocortical regions from where they are retrieved after familiarization. Newly acquired knowledge does not cause the loss of already existing ones because the surface familiarization in the hippocampus and the deep familiarization in the neocortical regions work in two separate pathways. Although our brain is synaptically flexible, some actions can consolidate newly learned information in the brain. One such action is sleep, which helps the segregation of new information from knowledge stored in the episodic memory. Besides that, sleep also helps consolidating memories and skills through processes in both the REM phase including the error driven learning which is the constant replaying of the newly acquired knowledge or skill and its improvement and correction of errors in recollection with every replay. The deep sleep phase brings short bursts of neural firing of the brain regions holding the memory systems. This one activity can only be revealed by EEG analysis which shows neural activity. The other relevant action enhancing brain plasticity and memory consolidation is a constant practice of familiarization of the newly acquired knowledge through frequent exercising. The reason to this is the decaying of unused synaptic connections. In early childhood it is clearly noticeable in the phenomenon describing both monolingual and bilingual babies' ability to distinguish between two languages on the basis of word boundary recognition and phonemic distinction but monolinguals lose their innate ability of language separation when they do not use it. Bilinguals by contrast, maintain this skill and thus they are able to perform in their mother tongues without an effort.