

Language learning and brain plasticity

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Abstract

This paper is a status report from the recently initiated Human Frontiers project, "Language Learning and Brain Plasticity", involving teams from the US, Japan, Finland and Sweden. One of the project's goals is to study how language exposure induces developmental changes in the young infant's perception of native and non-native speech sounds. Another goal is to examine how the behavioral changes in early speech perception are reflected by corresponding changes in brain activity, as measured by the Mismatch Negativity (MMN) technique. At this stage we are in the process of selecting suitable phonological contrasts that may be used to equate the early changes in perception of native and non-native speech sound contrasts across the native languages involved in the project. The results from this selection process will be reported at the conference.

Background

Previous infant speech perception research has suggest that young infants develop from a "language-general phonetic perception", as evidenced by their sensitivity to phonetic contrasts in both native and non-native languages, toward a "language-specific phonetic perception" by about 10-12 months of age (Werker and Tees 1984; Best, McRoberts, and Sithole 1988). Although this developmental path is well established, the processes and functions underlying it are still at issue.

The current project attempts to address this question by adding measures of brain activity to the traditional set of behavioral techniques that have been used to establish infants' early speech perception development.

In this international project parallel empirical studies will be conducted in the four countries to gather data on 1) developmental changes in infant speech perception, 2) the nature of the language input to the infants and 3) the infant's brain plasticity in the course of the early language acquisition process.

One of the project's critical issues concerns the selection of adequate native and non-native contrasts. This selection process must meet a number of constraints. Because we wish to study how perception of native and non-native contrasts diverges as a consequence of the infant's language exposure, it is obviously necessary to select a contrast that is not used in the infant's ambient language. In addition, it is necessary to provide differential evidence for the selective perception of native contrasts during the first year of life. In other words, the loss of ability to perceive the foreign contrast by the end of the first year of life must be strictly related to the linguistic status of that contrast and to do this it is necessary to rule out the possibility of a general loss of perceptual acuity toward the end of the first year of life. Thus, to demonstrate the linguistic basis of this loss of acuity for the foreign contrast, it is necessary to study a control group of infants for whom the contrast is instead native. In our case, this requires a group of infants living in Sweden but with a foreign ambient language.

On the basis of language typologies and subject availability we have chosen Croatian as the foreign language to be tested in Sweden. The Croatian phonological system includes a number of consonant contrasts that also occur in Swedish along with an additional post-alveolar/palatal consonant contrast between voiceless affricates that is foreign to Swedish speakers. We have also chosen a bilabial/dento-alveolar consonant contrast between voiceless stops as the common cross-language contrast.

At this stage we are in the process of preparing listening tests and the results will be reported at the conference.

References

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