Potential relevance of general-purpose mechanisms at the onset of language: Audio-visual integration of ambient language - a pathological perspective

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Goals & Results
According to the Ecological Theory of Language Acquisition (Lacerda et al), early language acquisition is an emergent consequence of multi-sensory embodiment of the information available in ecological adult-infant interaction settings. If there are deficits in biological conditions or a lack of adequate interaction with the environment, the child’s linguistic development may be delayed or deviate from typical language/communication development.

This study aims at examining the parent-child interaction when the child has some perception and production disabilities, and whether the parent modulates her behaviour to enhance interaction and the child’s linguistic development.

Preliminary analysis suggests increased overall parental interactive activities. The mother seems to enhance her manner of communication in order to keep the interaction active. Mother-child eye contact is frequent and expanded and the mother strongly encourages turn-taking. The mother tends to verbalize repeatedly every representation of target word present under joint attention.

SECDI forms indicate a continuously growing development of lexical production in words and gestures. Signed Supported Swedish (SST) is used to facilitate communication and language development.

The child’s verbal production is limited because he lacks supporting facial bone structure. The left side of the tongue slips down into the cavity of the missing mandible bone structure, and there is a general weakness in the mobility of the affected side of the face. Consonant sounds are hard to control, as a consequence of a soft palate cleft and a split uvula. Furthermore, articulation has been impaired by a short ligament of the tongue, that has recently been surgically corrected.

Eye-tracking tests did not produce sufficient data for analysis. The child has had problems with ear infections in his only ear, affecting his interest and performance in the eye-tracking tests.

Further collection and analysis of data is currently in progress. Results will be compared with similar data from children with typical linguistic development.

Method

Subject
A male child, born with Hemifacial Microsomia is investigated during the ages 8 to 24 months. No left outer or mitten ear.
No left side zygomatic or mandible bone structure.
Slightly cleft soft palate, split uvula. Fed by subglottal probe first two months, then by nasal probe until eight months of age.

Recording sessions
Recording sessions take place at the phonetic laboratory at SU. Mother and child receives a selection of toys. Mother-child interaction is captured by audio and video recordings. Sessions last about 30 min.

Eye-tracking
Audio-visual perception is studied by an eye-tracking system that measures the child’s eye movements when presented with different auditory representations, in order to evaluate the child’s integration of audio-visual linguistic information.

SECDI
SECDI (Eriksson & Berglund), a Swedish version of CDI (McArthur Communicative Development Inventory) is administered every month to observe the development of the child’s lexical production in words and gestures.

This study is part of the Bank of Sweden Tercentenary Foundation project "MILLE" (Modelling Interactive Language Learning), an interdisciplinary collaboration between Stockholm University, Royal Institute of Technology (Sweden), and Carnegie Mellon University (USA). The goal of the project is to investigate infants/gerbils fundamental processes involved in language acquisition, and develop computational models to simulate these processes.

This experiment is part of potential further interest for implementation of cognitive development in the humanoid-robotic system "Babybot". The on-going research within the European Commission project "CONTACT" (Learning and Development of Contextual Action) is a co-work between Uppsala University, Stockholm University (Sweden), Università di Genova, University of Ferrara (Italy), and Inst. Superior Técnico de Lisbon (Portugal).