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CRC 9/3/15

Socioeconomic Status, Bilingualism & Language Environment

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1) Study purpose and Rationale:

Infant acquisition of language is a complex process that has been shown though studies to be influenced by the home environment (Khul 2004). An example of two home environment characteristics are socioeconomic status (SES) and the linguistic environment of the home. Specifically, multiple studies have shown that children from a higher SES, frequently measured in terms of parental education, occupation, and income, perform better on cognitive tests than children from a lower SES (Brito & Barr, 2012;2013; Kovacs & Mehler, 2009ab). Conversely, children from lower SES backgrounds perform more poorly on tests of receptive and expressive language skills.

In turn, the linguistic environment can be characterized by the number of languages the infant is exposed to, as well as the number of words heard, and the ways in which the caregiver uses language to interact with the child. Similarly to children from an upper SES, children from a "richer" linguistic environment—one that contains more vocabulary—also excel at cognitive tests.

Exposure to multiple languages is associated with specific advantages for non-linguistic components of executive functioning, such as inhibition, working memory and cognitive flexibility, even as young as 18 months of age. (Feng, Bialystok, & Diamond, 2009; Carlson & Meltzoff, 2008; Kovacs & Mehler, 2009b; Brito & Barr, 2012). Our study aims to look specifically at bilinguism and its effect on infant's cognitive development, and analyze if socioeconomic status mediates this affect.

Characterizing the natural home linguistic environment is important in understanding infant development because qualitative differences on how language is spoken can conceivably influence early infant brain development in unique ways. For instance, will an infant who is exposed to two languages in approximately the same proportion gain more of a cognitive advantage than an infant exposed to primarily one language with an adult and less frequently a second language with another adult? Do infants who hear constant switching between both languages develop differently than one who hears one language at a time? These environmental linguistic various could impact the degree to which a bilingual cognitive advantage is present.

Understanding how these factors may influence brain development will aid our understanding of how infants reach the crucial milestone of language and speech. Furthermore, as we gain more understanding on how language exposure affects their development we may be better able to counsel families on how to best use language to interact with their infants.

This study has three aims:

1. Measure the home linguistic environment, specifically adult speech, infant-directed speech, conversational turns, and audio environment.
2. Assess the infant's performance on cognitive tests at 18 months of age.
3. Analyze if characteristics of the home environment are correlated with infant performance on cognitive tests.

Study Hypothesis:

We hypothesize that accounting for the home linguistic environment will reduce the socioeconomic disparities seen in language development.

2) Study Design:

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This study is an observational epidemiologic study. Participants will be recruited from an existing sample (PI: William Fifer, Columbia University Department of Psychiatry) of linguistically and socioeconomically diverse infants. We will also recruit 40 monolingual and 40 bilingual 18 month infant-parent dyads. Exclusion criteria are infants from born before 35 weeks, infants born to mothers under the age of 18, or infants with any neurodevelopmental disorder or complications at birth.

Infants will be tested on several neurocognitive measures. 18 month visits will take place in the lab of the New York State Psychiatric Institute. Recording will take place in the natural environment of the family.

SES and demographic data of the parents will be collected. Parents will be invited to have the LENA device. All protocols have been approved by the CUMC and NYSPI IRB.

The Language Environment Analysis (LENA) digital language processor is a 2.5 ounce device that fits inside specifically designed recording and continuously records the child's language environment. The LENA device uses speech-identification algorithms to calculate the number of word and vocalizations. It is able to distinguish between words and crying and vegetative sounds. When compared with trained human transcribers it has been shown to have high fidelity.

After obtaining consent from the care giver, the family will be given the LENA device and a child size t-shirt to hold the device. Caregivers will be provided with verbal and written instructions on how to use and care for the device. The care giver will be instructed to have their child wear it for 10 hours on two different "typical" days. After recordings are competed the care giver will notify the study coordinator and set up a time to return the device. They will also be provided with a return envelope to return the device. The data will be uploaded and automatically analyzed by the ENA program software. Daily word production, estimated mean length of utterance, age based standard score and development age are calculated. These measures are reliably and highly correlated with standardized assessments.

3) Statistical Procedures:

To compare the home linguistic environment of our four groups (Upper SES/monolingual; lower SES/monolingual; Upper SES/bilingual; lower SES/monolingual), an ANOVA analysis on number of words heard, and conversational turns, will be performed. A pairwise t-test will be used to determine if the amount of adult speech, infant-directed speech, and conversational turns varies significantly among the four groups.

To assess the relationship between bilingualism, SES and home linguistic environment, multiple mediator models (Preacher & Hayes, 2008) will be calculated for both language and cognitive skills. Using a multiple mediator models will allow us to test the indirect effect of bilingualism on cognitive advantage, and the extent to which it factors such as SES and the home linguistic environment mediates the relationship.

4) Study Questionnaire:

None.

5) Recruitment:

Recruitment flyers are attached. Flyers will be placed in NYP-Columbia Ambulatory Care Network clinics.

6) Confidentially of Study Data:

The recordings obtained by the LENA device will be accessed only by only key personnel of the research team. Names or other identifying information will be not be included in the analysis. The output of the recordings will be stored on a password-protected computer under the supervision of the principle investigator, and the original recordings will be deleted once the output has been reviewed.

Any information obtained will remain confidential. The study has obtained a Certificate of Confidentiality issued by the National Institutes of Child Health and Human Development. The certificate does not prohibit the research team from reporting suspected or known neglect or sexual or physical abuse of a child, or threatened violence to self or others.

7) Potential Risks:

Potential risks include emotional distress associated with having the home environment recorded. This can be alleviated by study participants voluntarily discontinuing the recording at any time.

There are no known risks for the 18 month old infant by participating in this study.

8) Potential Benefits:

Study participants are unlikely to directly benefit from the study. However, information from the study may aid in monitoring the development of infants in the future.

9) Alternative:

Study Compensation:

Families will receive $30.00 in cash and a pagane of diapers, and up to $0 reimbursement for travel.

References:

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Seeking 12- to 18-month-old infants to participant in a learning and memory study

Purpose: We are conducting a research study to understand how family conditions and language environment affect children's development.

Parts of the Study:
1. We will play learning games with your child.
2. A special recorder will tape words your child hears and says at home.

Compensation: Your family will receive $30 (study part 1) or $60 (study parts 1 and 2) plus paid transportation to the lab.

If interested or have questions, please contact us:
Email **nhb2111@columbia.edu** OR call **323-943-2229**
Website: www.columbia.edu/cu/needlab