Visual attention and language production in bilingual children

Background & Purpose

Language sampling analysis (LSA)
- Narrative LSA of Spanish-speaking English language learners (ELLs) predicts bilingual reading achievement (Miller et al., 2006).
- ELLs exhibit distinct growth trajectories for English and Spanish (Rojas & Iglesias, 2013).

Attention and language
- Unclear relation between attention and language.
- Visual attention and language may be closely linked (Griffin & Oppenheimer, 2006).
- Sustained attention of children with language impairment (LI) may be restricted relative to typically developing (TD) peers (Ebert & Kohnert, 2011).

Purpose
- Is attention in bilingual children (indexed by visual fixation) differentially related to narrative skills in each language?

Potential impact
- Validate an integrated bilingual LSA-eye tracking approach.
- Further informing the attention-language relation.
- Seek extramural funding to investigate finer-grained LSA and eye tracking.
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Method

Participants
- 81 TD bilingual (Spanish-English) children (43 girls; 38 boys).
- 162 total language samples (81 English; 81 Spanish).

Materials
- Systematic Analysis of Language Transcripts (SALT) 2012.
- Tobii T60XL eye tracker and Tobii Studio 3.2.

Procedure
1. Books scanned into Tobii Studio; shown on T60XL eye tracker.
2. Areas of interest (AOIs) for each book created in Tobii Studio.
3. Mean AOI: per page = 4.2; pixels = 1,443 W x 1,002 H.
4. Participants seated at 65 cm from screen.
5. Pre-recorded audio samples (SALT website) synced with each book.

Results & Discussion

Table 2

Results

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LSA & Eye Tracking Integration

Language sampling analysis (LSA)
- Narrative retell language samples orthographically transcribed in SALT 2012 (Miller & Iglesias, 2012).
- Calculated specific language measures in English and Spanish:
  - %-Ungrammatical utterances (%U): Overall indicator of grammaticality and language development.
  - %-Mazed words (%MzWds): Indicator of word and utterance formulation difficulties.
  - Mean length of utterance in words (MLUw): Gross index of morphosyntactic productivity.
  - Number of different words (NDW): Index of lexical diversity.
  - Words per minute (WPM): Indicator of overall verbal fluency.

Eye tracking integration
- Eye tracking precisely measures attention.
- Total duration (sec) of successive visual fixations on specific areas of interest (AOIs) per book in each language.
- Visual fixation: Temporary pause of eye movement on a specific area of the visual field.

Analytic approach
- Multiple linear regression models for English and Spanish:
  - Degree of AOI fixation variance accounted for by gender, chronological age (mos.), and grade.
  - Degree of AOI fixation variance accounted for by LSA measures (%U; %MzWds; MLUw; NDW; WPM).

Note
- Table 2: Readers are referred to 
- Significant predictors: % mazed words, NDW, and WPM.

Results

- For both languages (Model A: English; Model C: Spanish), neither gender, age, nor grade predicted AOI fixation.
- LSA measures differentially predicted AOI fixation in each language.
- For English, Model B accounted for 22% of variance on AOI fixations.
  - Significant predictors: % mazed words, NDW, and WPM.
- For Spanish, Model D accounted for 32% of variance on AOI fixations.
  - Significant predictors: NDW and WPM (% mazed words and MLUw approached significance).

Discussion and future steps
- Successfully validated an integrated bilingual LSA-eye tracking approach, providing insight into the attention-language relation in TD bilingual children.
- Visual attention was differentially accounted for by each language.
- In English and Spanish, increased lexical diversity predicted an increase in visual attention, while decreased verbal fluency predicted a decrease.
- In English, increased word and utterance formulation difficulties predicted an increase in visual attention.
- Future steps: Relation between attention and LSA database profile in TD bilinguals and those with LI.

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