



LENA versus LEQ: Measuring bilingual infants' language exposure

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Introduction

Determining the linguistic background of participants is a very important step in language research. Developed by Bosch & Sebastián-Gallés (2001), the Language Exposure Questionnaire (LEQ) determines the percentage of input a child is exposed to per language. This interview-style questionnaire indirectly measures the language exposure of infants through parental estimates and is frequently used in bilingualism research (Byers-Heinlein, 2015).

However, these parental reports can be biased and can inaccurately depict language use in bilingual households. New technology now allows for a more direct measure of a child's language environment.

The Language Environment Analysis (LENA) system is a digital language processor that records and analyzes the child's audio environment. The LENA system has been used in research to measure the speech style of input but has yet to be used as a measure of language exposure (Weisleder & Fernald, 2013; Ramírez-Esparza et al., 2014).

This study aims to compare the estimated percentages of exposure obtained using the LEQ and using the LENA system. The estimates are hypothesized to differ and such a result may lead us to question the validity of using indirect measures to evaluate language exposure.

Methods

Two French-English bilingual infants were tested and for each participant, four estimates of global exposure were determined. Parents filled out the LEQ and gave a global estimate of the percentage of French and English that their infant is exposed to. Another estimate from the LEQ was calculated using the weekly exposure estimates.

Parents were then given the LENA system and recorded 8 hours on two typical days at home. The total adult word count (AWC) and meaningful speech time (MST) were automatically calculated by the LENA analysis software. The recordings were coded per 5-minute block as English input, French input, or a mix of both. The coding was used to determine the percentage of adult words and meaningful speech heard in each language.

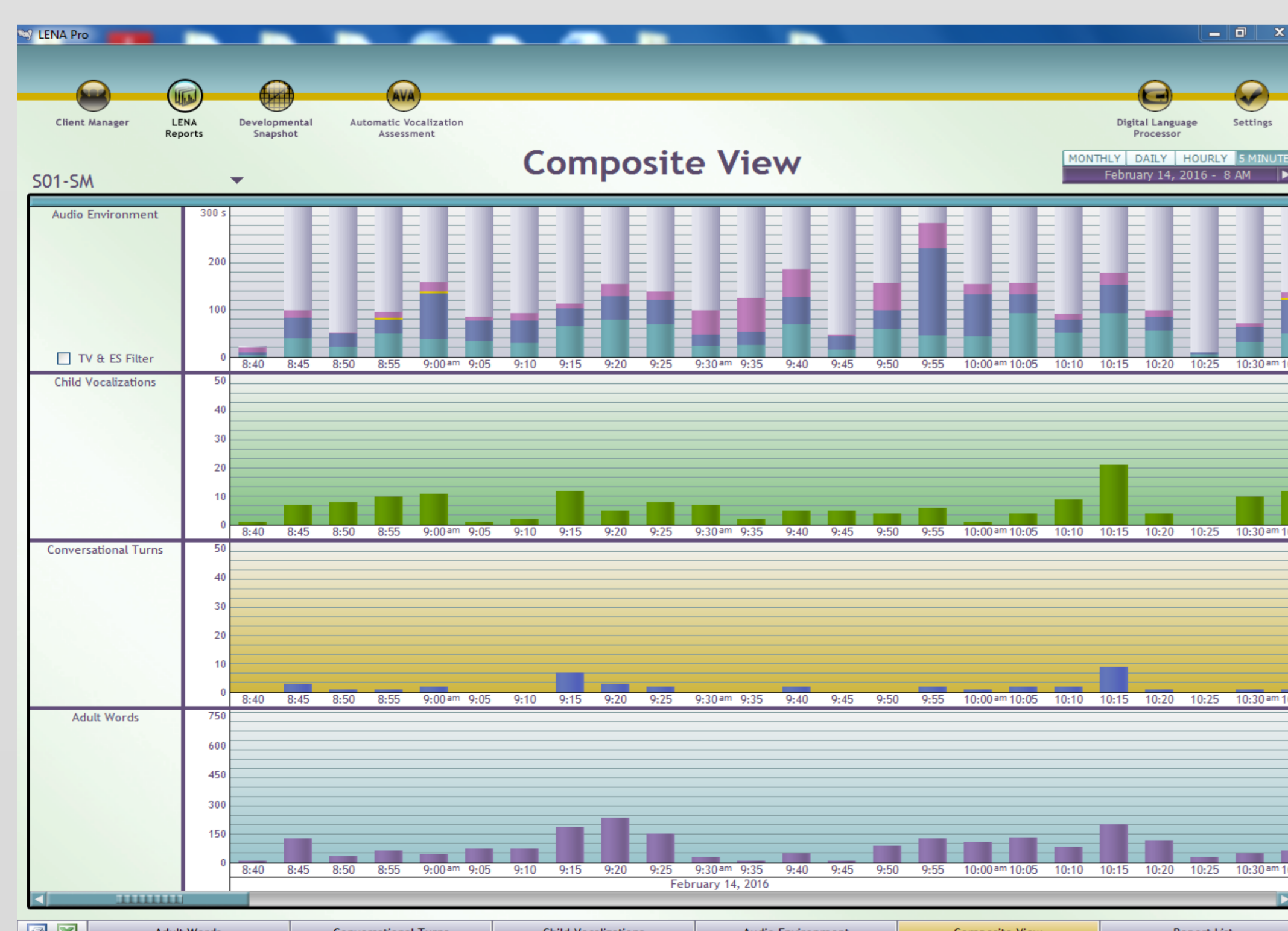


Figure 1. Composite report of audio analysis in LENA software.

Results

The LENA software estimated that in total, Participant 1 heard 15,542 adult words and 1 hour 46 minutes of meaningful speech per day (1 day = 8 hours). The coding of the 5-minute blocks showed that out of all meaningful speech and words heard by Participant 1, 16% of the speech was French. This compares to a parental estimate of 40% French in the LEQ.

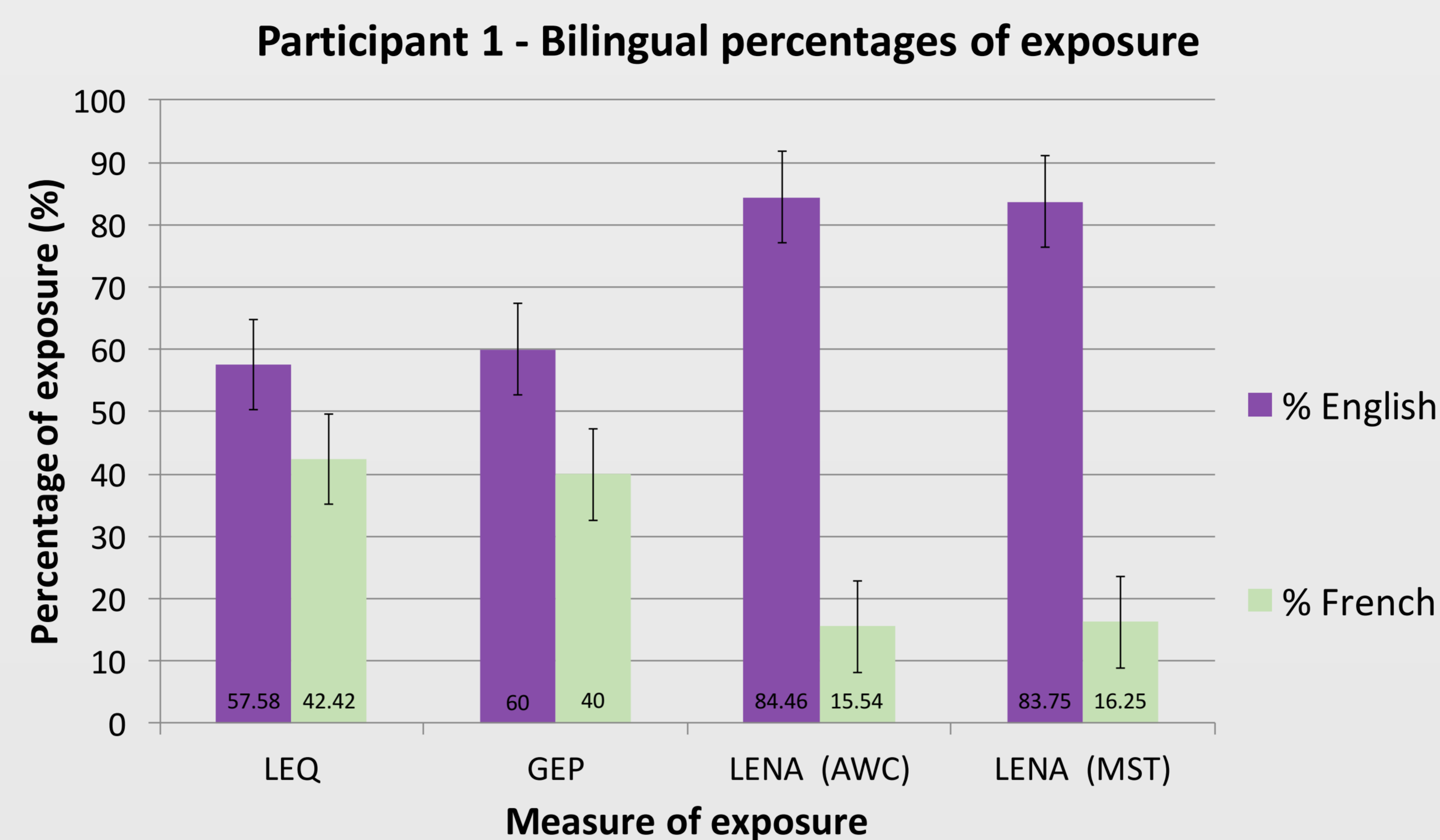


Figure 2. Global percentages of exposure for participant 1.

Participant 2 heard a total of 8172 adult words and 1 hour 21 minutes of meaningful speech per day. Out of all meaningful speech and words heard by Participant 2, 17% of the speech was French. This compares to a parental estimate of 30% French in the LEQ.

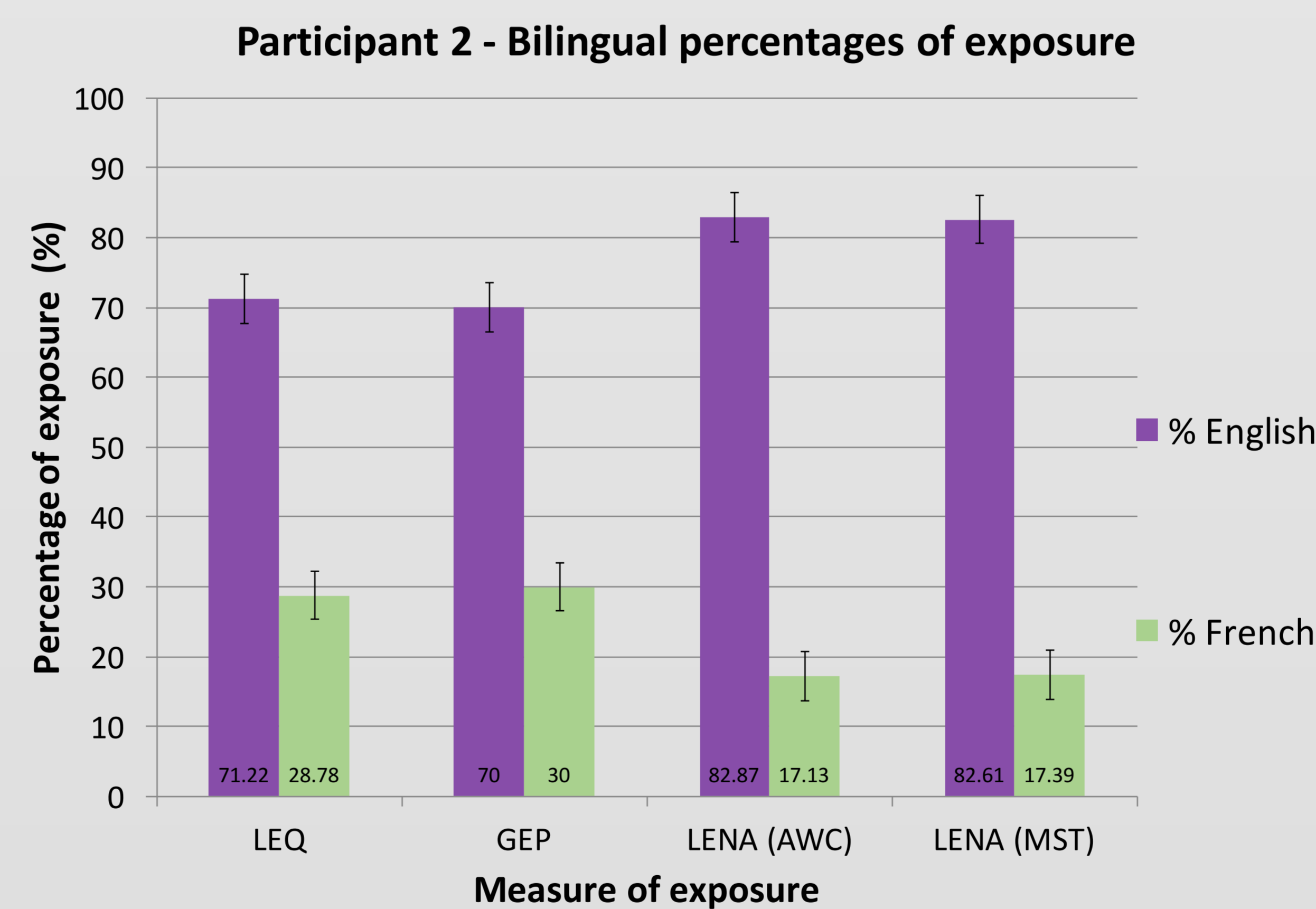


Figure 3. Global percentages of exposure for participant 2.

No statistical analyses to correlate the LEQ and LENA estimates could be conducted due to the low number of participants. The correlation between AWCs and MSTs, however, was analyzed per participant, per language, and globally. Overall, strong positive correlations between the two variables were found, indicating that as total adult word count increases, total meaningful speech increases and vice versa.

	Globally	Participant 1	Participant 2	English	French
r	.878	.917	.756	.876	.868

Table 1. Correlations between AWCs and MSTs ($p \leq .001$).

Conclusion

These preliminary findings were obtained from only two participants so definitive conclusions on the efficacy of the LEQ as a measure of language exposure cannot be made. Also, both participants were English-dominant so further research must include balanced and French-dominant bilingual infants in the analysis.

The results found do seem to indicate that a discrepancy does exist between parental estimates and estimates derived from the LENA recordings, especially for Participant 1. The parental estimate of 40% French was calculated by the LENA system to be 16% French. Also, in the 5-minute audio blocks coded as mixed, there often was a greater percentage of English spoken than French, which may mean an even smaller amount of French exposure. The overestimation found in the parental reports may only be applicable to the minority language but more research is necessary to determine this.

Another interesting finding is how the amount of adult words heard relates to the amount of meaningful speech heard. Participant 1 heard almost twice as many words as Participant 2 heard. However, the amount of meaningful speech heard by each infant was similar. As shown in Ramírez-Esparza et al., the quality of speech children hear is more important than the sheer quantity (2014).

As this research further develops, the LEQ estimates may be found to be an inaccurate measure of exposure for bilingual infants. This may lead researchers to question the validity of past studies that used indirect measures to correlate language exposure with other variables, such as vocabulary size and lexical processing efficiency.

References

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