

## Statistics Supplemental Material

For each vocalization and interaction variable, statistical tests for differences across groups used a linear mixed effects model with participant ID as a random effect and ASD, age, mother's level of education, gender, interaction between age and ASD, and interaction between age and maternal education as fixed effects. Analyses were run in R (R Core Team, 2012) using the lme4 (Bates, Maechler, & Bolker, 2012) and languageR (Baayen, 2011) packages. Markov chain Monte Carlo was used to determine the betas and  $p$ -values. All variables were standardized prior to inclusion in the linear mixed effects models.

In testing the two directions of influence in our social feedback loop hypothesis, significance of the predictions was based on bootstrapped null distributions. To obtain the  $p$ -value for the effect of child speech-related material on adult response, all recordings for the group in question had the adult response variable shuffled relative to the child speech-related utterance duration. Shuffling was done at the level of the recording. This was repeated 1000 times. The proportion of speech-related child vocalizations receiving adult responses minus the proportion of non-speech-related child vocalizations receiving adult responses for the original (not reshuffled) data was then compared to the difference between the two proportions for the 1000 shuffled datasets. The  $p$ -value was calculated as the proportion of reshuffled proportion differences that were greater than or equal to the real proportion differences. The same method was used to test the significance of the hypothesis that speech-related material in a child vocalization would be predicted by

whether the previous child segment containing some speech-related vocalization had received an adult response.

### References

- Baayen, R. H. (2011). *Data sets and functions with “Analyzing linguistic data: A practical introduction to statistics.”* Available from <http://cran.r-project.org/web/packages/languageR/index.html>
- Bates, D., Maechler, M., & Bolker, B. (2012). *Linear mixed-effects models using S4 classes.* Available from <http://lme4.r-forge.r-project.org/>
- R Core Team (2012). *R: A language and environment for statistical computing.* Vienna, Austria: R Foundation for Statistical Computing. Available from <http://www.R-project.org>