**Appendix A**

Null models for all groups include only fixed effects (e.g. type). The second model includes fixed effects with a random intercept for child. The third model is a full model with fixed effects and random effects of both intercepts (child) and slopes (vocabulary). Each model with random effects was compared to a null model. The models with random effects were significantly different from the null model. For our data sets, the deviance scores, AIC, were smallest for the third model including random intercept (vocabulary) and slope (child). Thus, the third model, the full model with a random slope of ‘vocabulary’ and an intercept of ‘child’ was considered to better fit the data than the other models without random effects.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  model  | AIC  | Log likelihood  | Chisq  | df  | Pr(>Chi)  |
| Initial Place  |   |   |  |   |  |   |  |   |
|  null  | 7637.20  |  | -3809.60  |  |   |   |  |   |
|  null+σ (intercept)  | 7598.24  |  | -3789.12  |  | 40.96  |  | 1  | < .001  |
|  null+σ (slope+intercept)  | 7460.86  |  | -3719.43  |  | 180.34  |  | 2  | < .001  |
| Initial Manner  |   |   |  |   |  |   |  |   |
|  null  | 4977.42  |  | -2481.71  |  |   |   |  |   |
|  null+σ (intercept)  | 4961.88  |  | -2472.94  |  | 17.54  |  | 1  | < .001  |
|  null+σ (slope+intercept)  | 4881.60  |  | -2431.80  |  | 99.82  |  | 2  | < .001  |
| Final Place  |   |   |  |   |  |   |  |   |
|  null  | 6094.10  |  | -3038.05  |  |   |   |  |   |
|  null+σ (intercept)  | 6066.62  |  | -3023.31  |  | 29.48  |  | 1  | < .001  |
|  null+σ (slope+intercept)  | 5947.44  |  | -2962.72  |  | 150.66  |  | 2  | < .001  |
| Final Manner  |   |   |  |   |  |   |  |   |
|  null  | 4384.90  |  | -2185.45  |  |   |   |  |   |
|  null+σ (intercept)  | 4353.60  |  | -2168.80  |  | 33.3  |  | 1  | < .001  |
|  null+σ (slope+intercept)  | 4280.28  |  | -2131.14  |  | 108.62  |  | 2  | < .001  |

Model comparisons with/without random effects