

Supplemental Materials: Bayesian Analysis Overview

Here we look at one of the regressions from Experiment 1 in detail in order to explain and illustrate the rationale of the Bayesian analysis, in particular the *probability of direction* (pd) and the 89% CI (credible interval). For this example we take the exploratory regression from Experiment 1 predicting parents' rate of word types with fixed effects of condition (*No Video* or *Activity Video*), each subscale of the EPAQ (EL: Early Learning, AA: Affection and Attachment, and RR: Rules & Respect), parent education (parent_ed), the child's age (centered) and gender. The model also included interactions for condition and each subscale of the EPAQ, as well as a random intercept for each video. The model syntax was: $\text{types} \sim \text{condition} * \text{EL} + \text{condition} * \text{AA} + \text{condition} * \text{RR} + \text{age} + \text{gender} + \text{parent_ed} + (1|\text{video})$. Table 1 reports the mean of each coefficient's posterior distribution, along with the lower and upper bounds for the 89% credible interval, and the probability of direction (pd).

Parameter	pd	Mean	89% CI Lower	89% CI Upper
conditionexp	0.83	-2.01	-5.41	1.39
EL	0.83	-3.33	-9.27	2.44
AA	0.80	-2.43	-7.09	2.34
RR	0.51	0.04	-2.50	2.45
age	0.77	-1.91	-6.03	2.38
genderM	0.79	-1.71	-5.06	1.52
parent_ed	0.86	1.22	-0.56	3.00
conditionexp:EL	0.56	0.60	-6.41	7.68
conditionexp:AA	0.97	6.92	0.95	12.74
conditionexp:RR	0.71	1.23	-2.38	4.79

What do these values mean? Let's take a closer look at the posterior distribution of the parent education (parent_ed) coefficient. Shown below in Figure 1, the 87% of this distribution that is greater than 0 is shaded orange, which corresponds to the probability of direction $pd = 0.87$, which has the straightforward interpretation of being the probability that an effect has the same sign as the median value of the posterior. Thus, pd has a range of 0.5 (if the distribution is equally-distributed around 0: a likely true null effect) to 1.0 (if the posterior is entirely positive or negative). Since $pd < 0.95$ in this case (corresponding to a $p < .05$ threshold in the null hypothesis significance-testing framework), we do not consider parent education to have a notable effect on the rate of types used during play, but the posterior distribution is interpretable. Also shown are the mean estimated coefficient value (red line) and 89% credible intervals (blue lines), within which 89% of the posterior distribution falls.

Figure 2 shows the posteriors for all of the coefficients in this regression. Only the interaction between condition and the Affection and Attachment subscale of the EPAQ was notable (by pd in Table 1), but as indicated by their pd values, much of the mass some other parameters' posteriors are skewed negative (e.g., conditionexp: the Activity Video condition; EL: the Early Learning subscale of the EPAQ), while others are more evenly-distributed (e.g., RR, $pd = 0.51$).

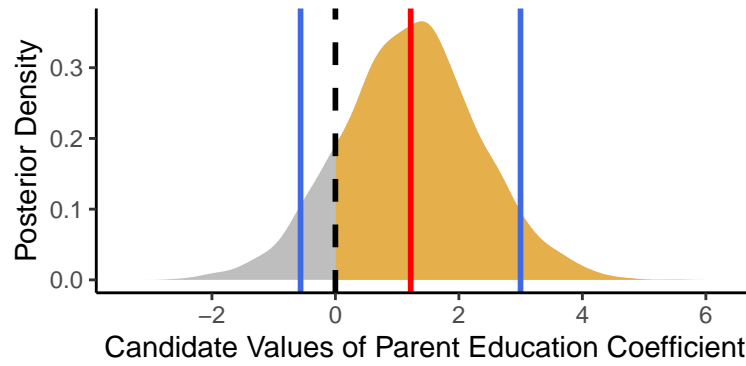


Figure 1: Posterior distribution of parent education coefficient with mean (red), 89% CIs (blue), and pd (orange portion) shown.

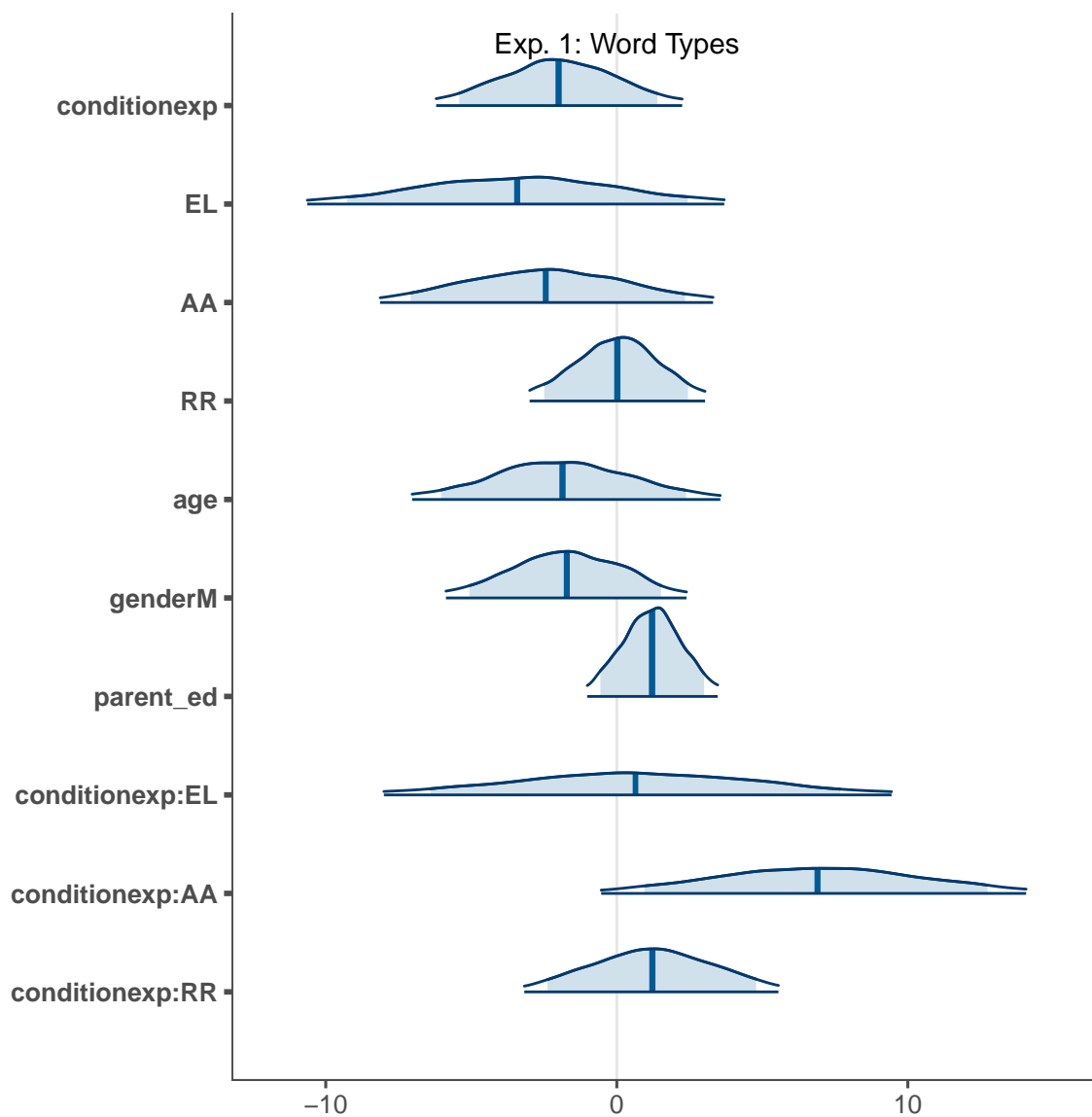


Figure 2: Posterior distributions with means and 89% credible intervals. The outermost 5% of each posterior distribution is clipped and not shown.