Appendix: 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 intecept for each video. The model syntax was: types ~ condition*EL + condition*AA + condition*RR + age + gender + parent_ed + (1|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, $pd = 0.51$).

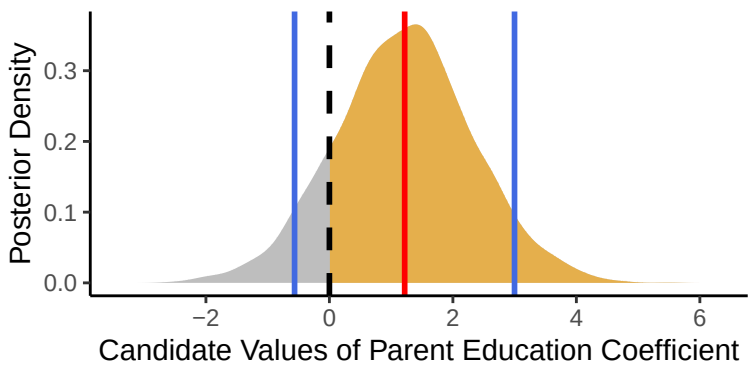

Figure 1: Posterior distribution of parent education coefficient with mean (red), 89% CIs (blue), and *pd* (orange portion) shown.

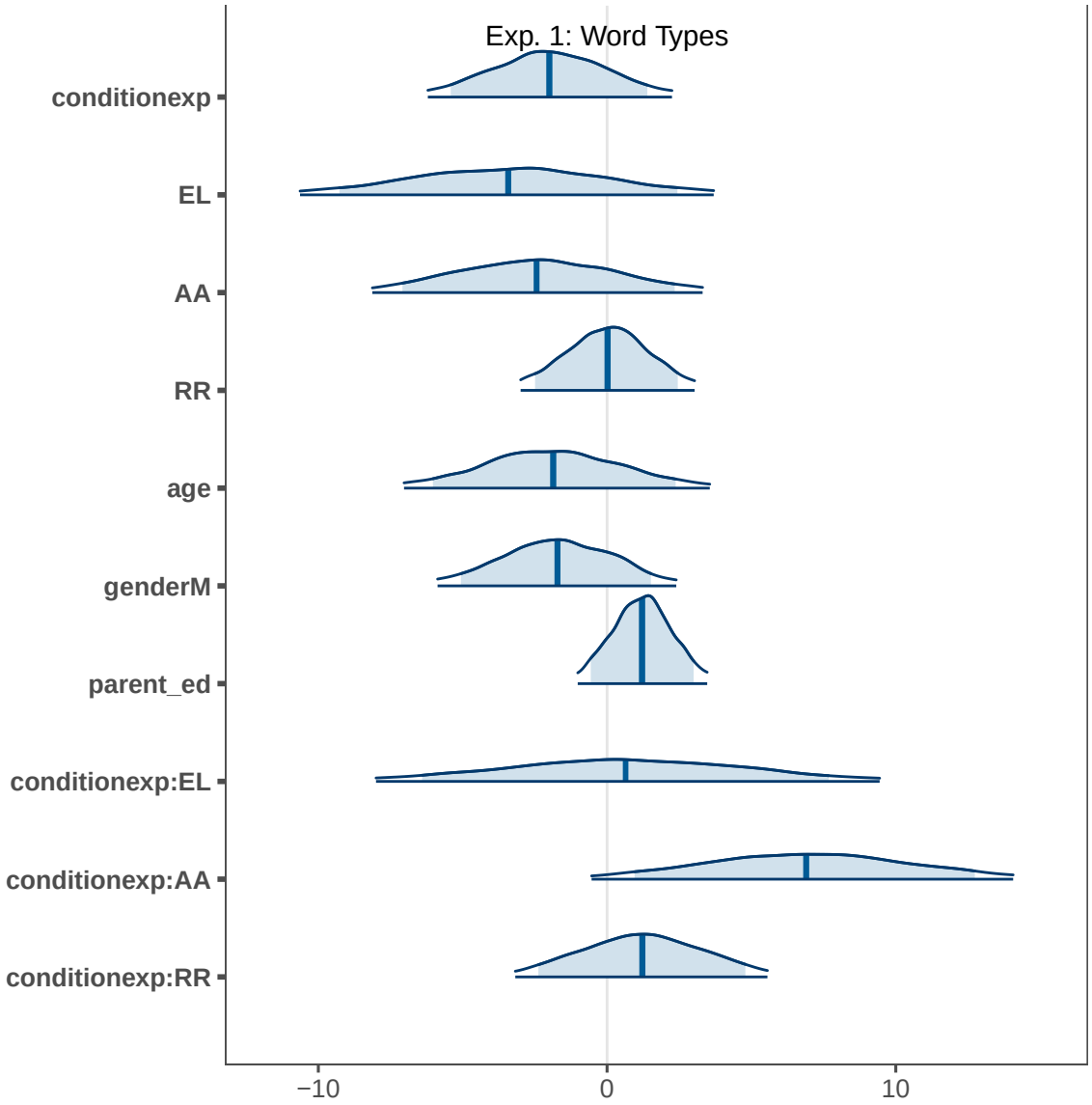

Figure 2: Posterior distributions with means and 89% credible intervals. The outermost 5% of each posterior distribution is clipped and not shown.

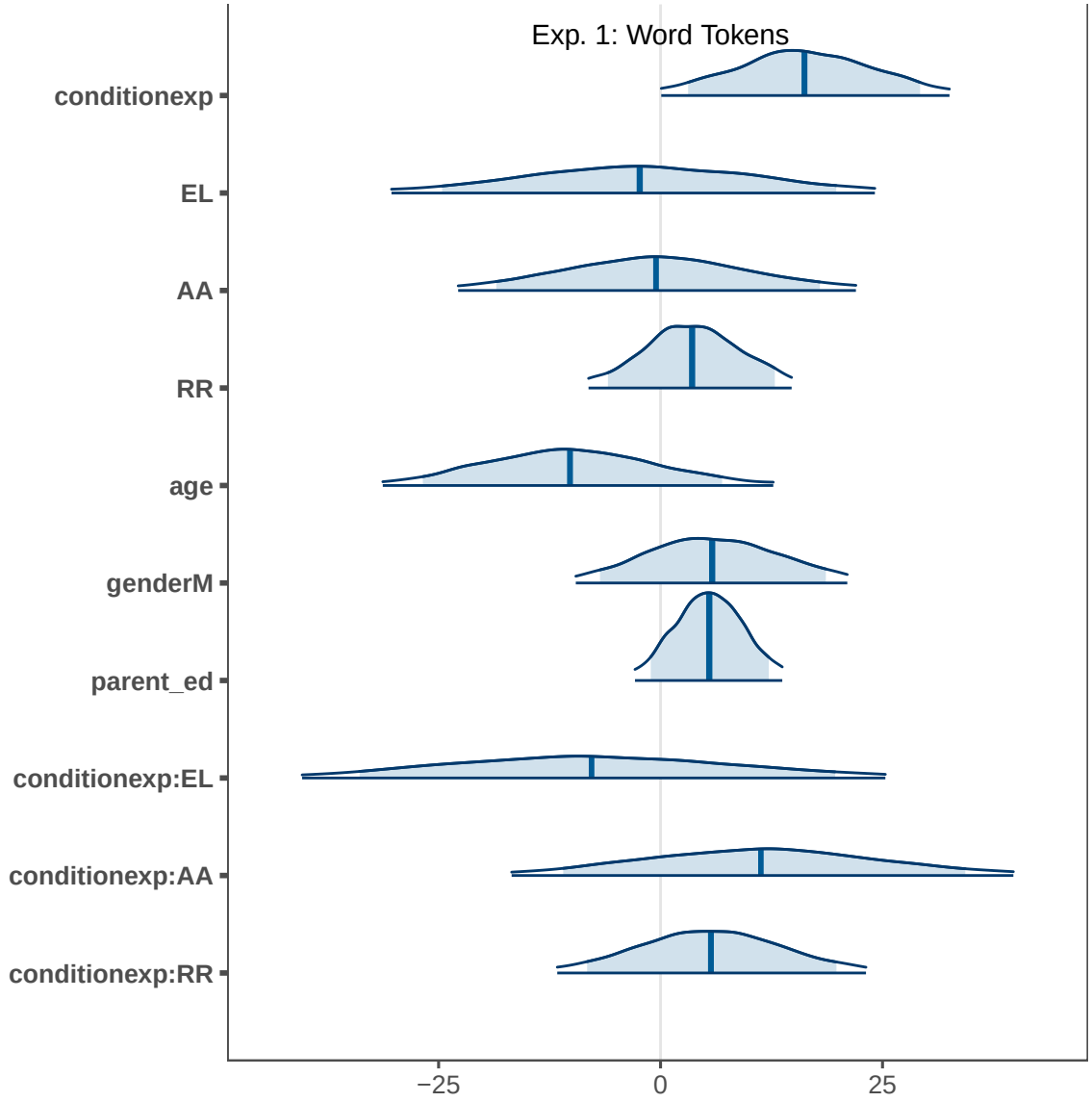

Figure 3: Posterior distributions with means and 89% credible intervals. The outermost 5% of each posterior distribution is clipped and not shown.

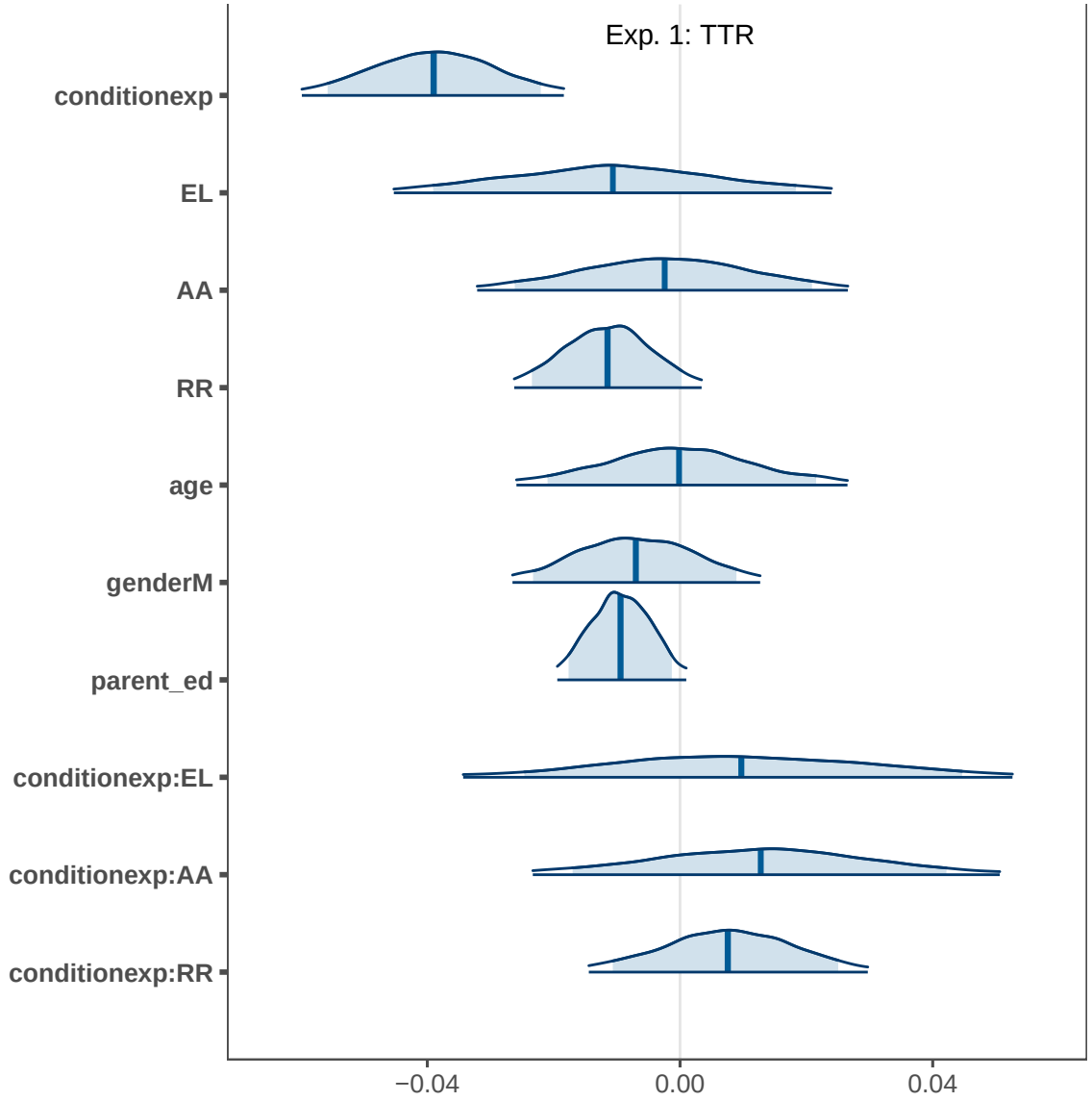

Figure 4: Posterior distributions for regression predicting TTR, with means and 89% credible intervals. The outermost 5% of each posterior distribution is clipped and not shown.

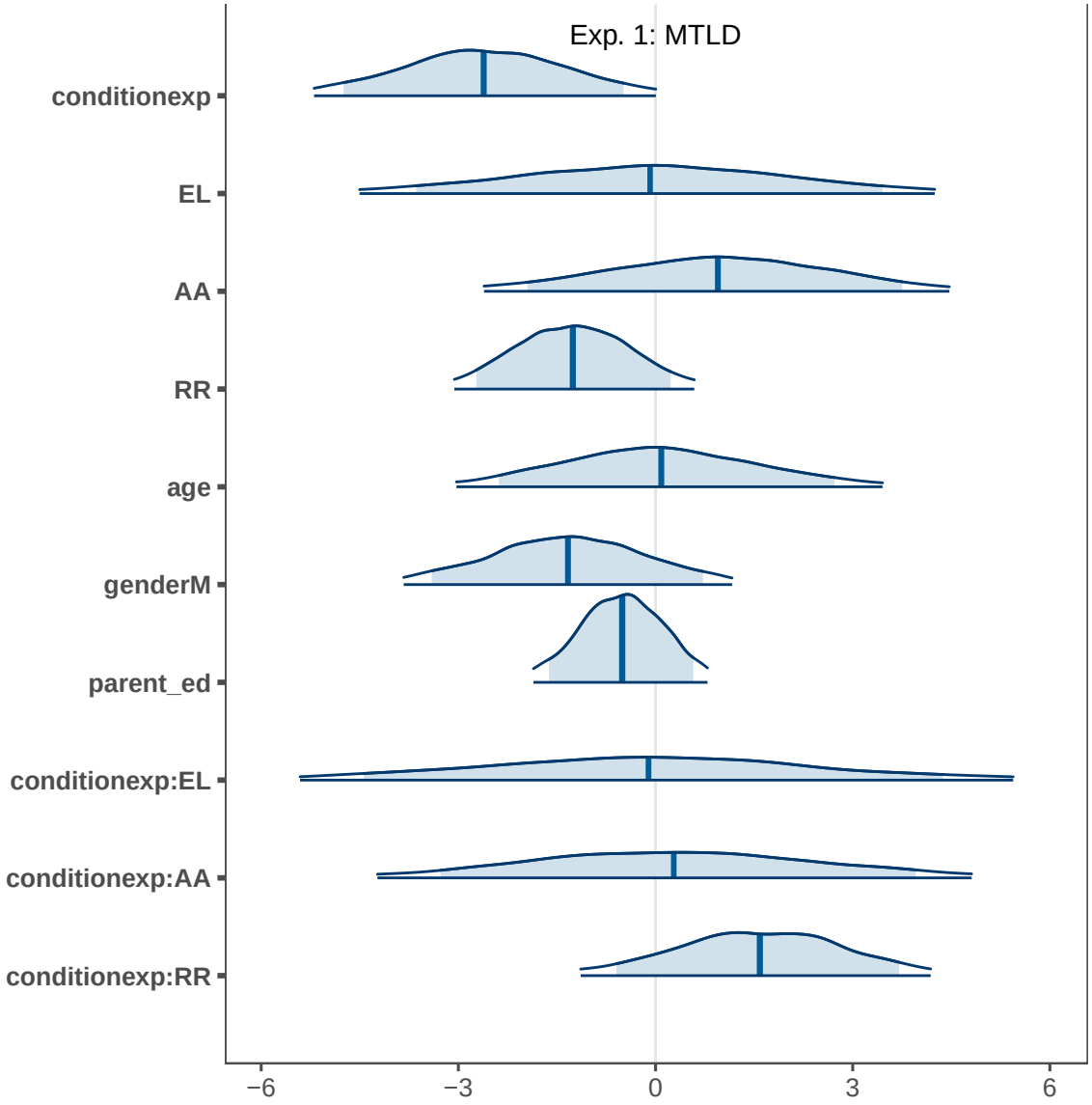

Figure 5: Posterior distributions for regression predicting MTLD, with means and 89% credible intervals. The outermost 5% of each posterior distribution is clipped and not shown.