

Group-Specific Latent Functions with Trial-Level Modulation

$$y_i(t)|_{z_i=k} = \sum_{j=1}^K \mathbf{1}[z_i = k] \{ \beta_{ik} f_k(t - \tau_{ik}) + \varepsilon_{ik}(t) \}$$

(Each experimental group has its own underlying latent signal. For each trial within a group, this signal is modulated by a group-specific distribution over amplitude and temporal shift, allowing both amplitude and phase to vary across groups). Here z_i denotes experimental group (e.g. high, low, neutral).

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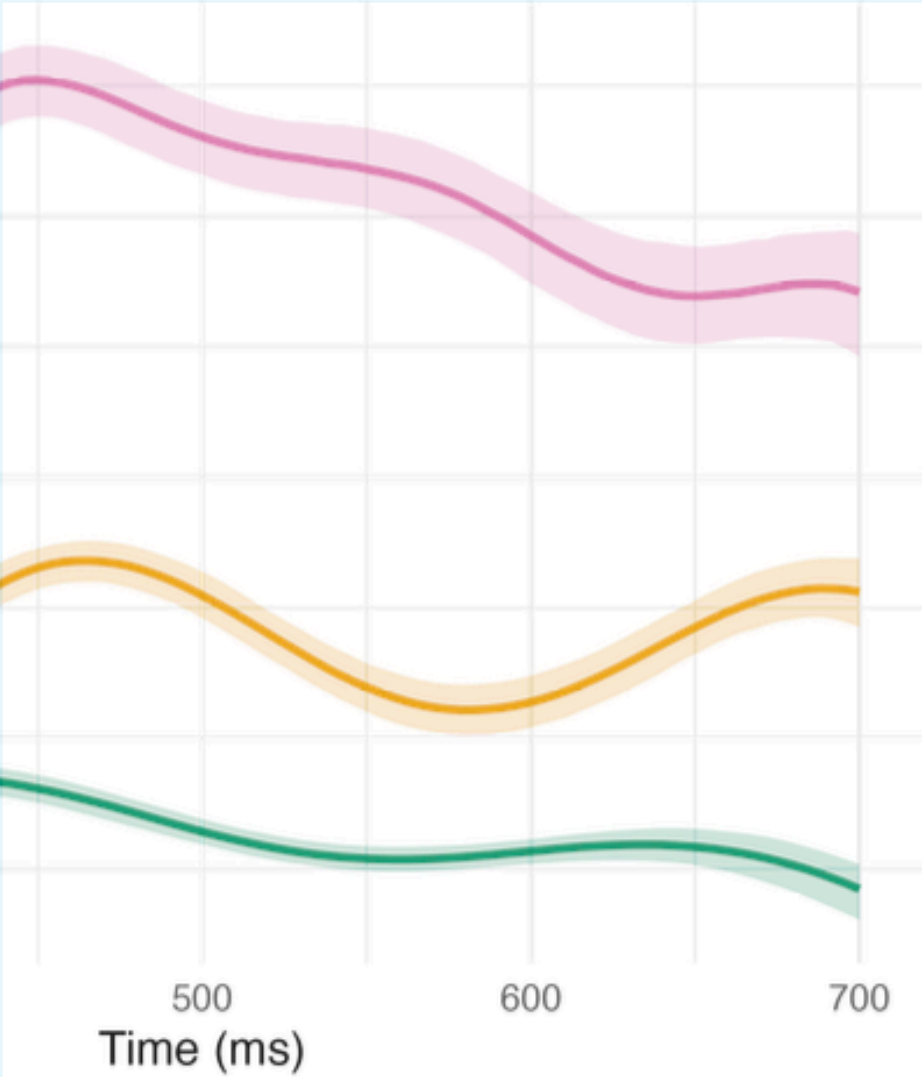
$$f_k \sim GP(0, K_k), \quad K_k(t, t') = \exp\left\{ -\frac{\rho_k^2}{2}(t - t')^2 \right\}$$

(Each group-level latent signal is modeled as a smooth function drawn from a Gaussian Process, with group-specific smoothness controlled by the kernel lengthscale)

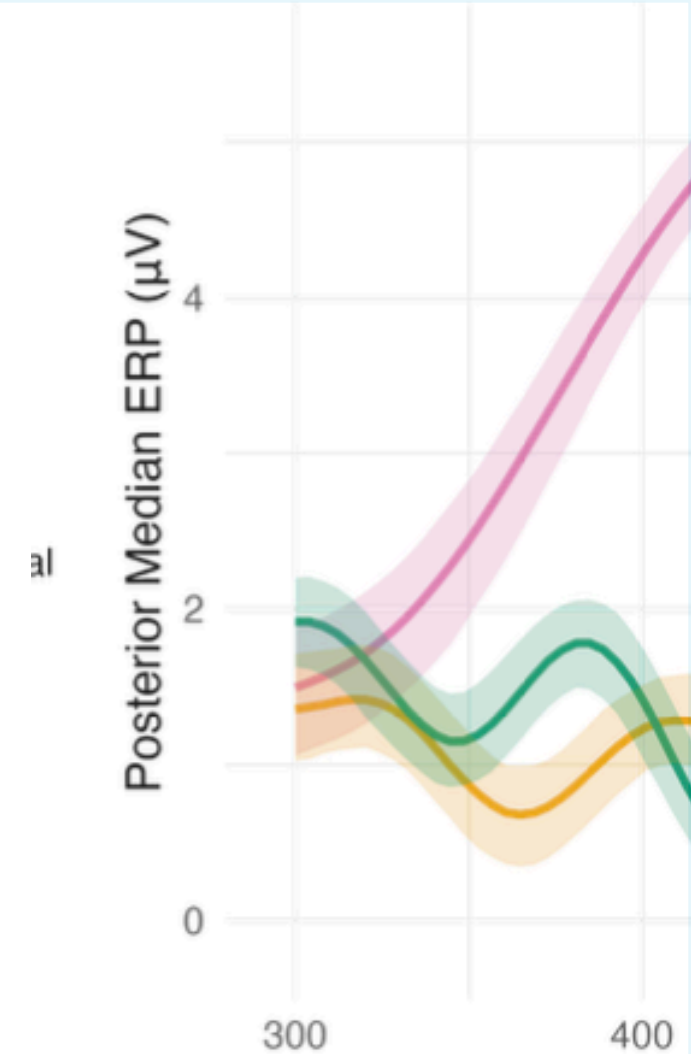
Group-Specific Observation Noise

$$\varepsilon_{ik}(t) \sim \mathcal{N}(0, \sigma_k^2)$$

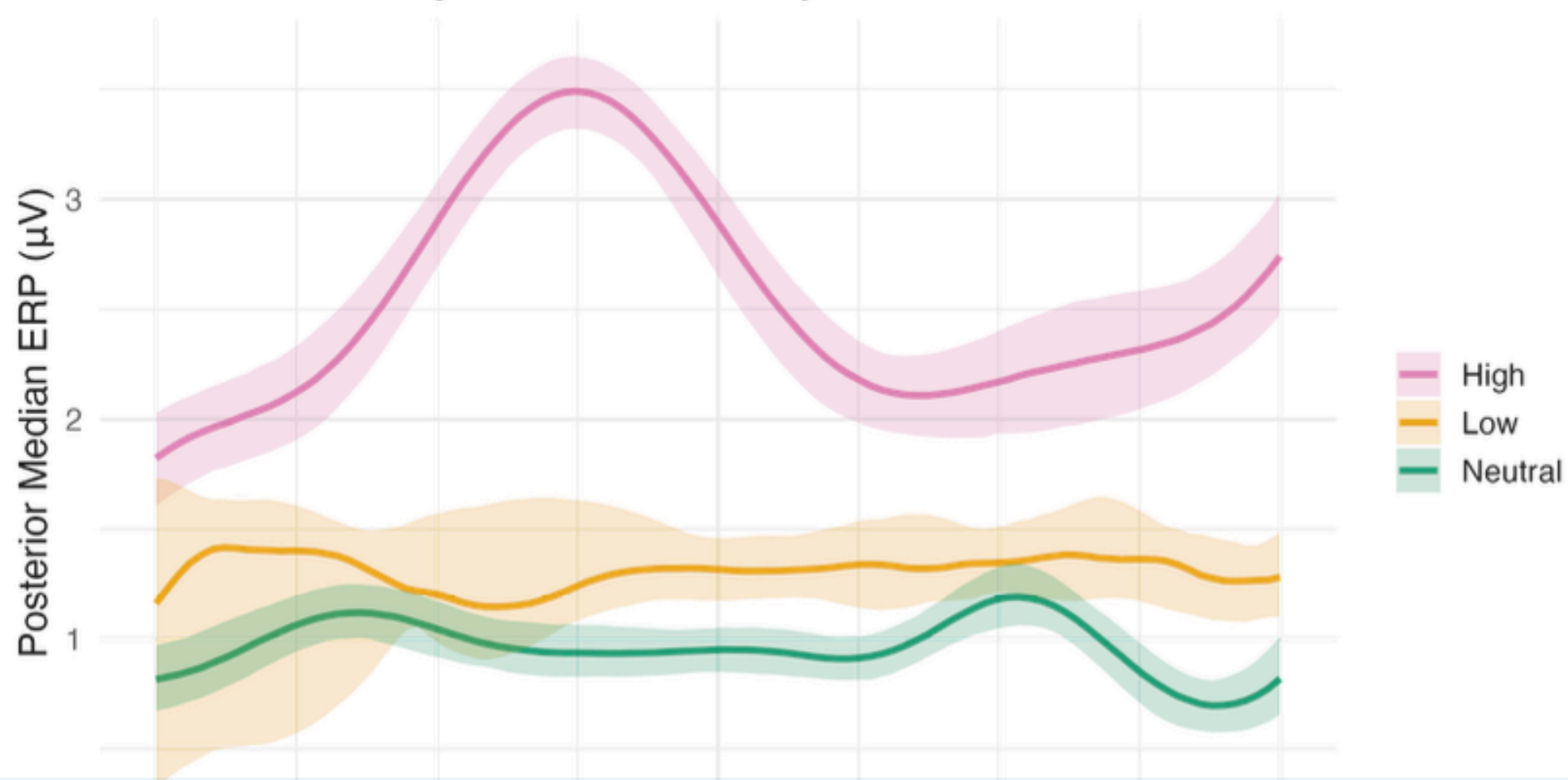
(Each group has its own level of observation noise, allowing for heterogeneous residual variance across experimental conditions)



High
Low
Neutral



Posterior ERP by Condition – Subject 20293



	Contrast	Proportion
1	High > Neutral	0.873
2	High > Low	0.863
3	Low > Neutral	0.580
4	All 3 Contrasts	0.481

	Contr
1	High > Neut
2	High >
3	Low > Neut
4	All 3 Contra

