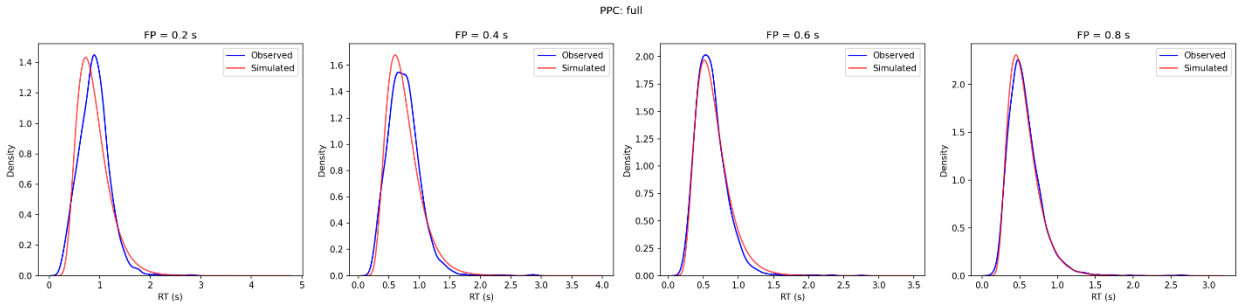
Supplementary Material for:
Temporal preparation in rats: Evidence from a variable foreperiod paradigm and shifted Wald modeling

Model	FP effect on	Formula (log-link)	elpd_loo	elpd_diff	se	dse
full	α, γ, θ	$\alpha = \exp(\alpha 0 + \beta\alpha \cdot FP)$ $\gamma = \exp(\gamma 0 + \beta\gamma \cdot FP)$ $\theta = \exp(\theta 0 + \beta\theta \cdot FP)$	543.25	0	100.54	0
α-γ	α, γ	$\alpha = \exp(\alpha 0 + \beta\alpha \cdot FP)$ $\gamma = \exp(\gamma 0 + \beta\gamma \cdot FP)$ $\theta = \exp(\theta 0)$	531.56	11.69	100.69	5.09
α-θ	α, θ	$\alpha = \exp(\alpha 0 + \beta\alpha \cdot FP)$ $\gamma = \exp(\gamma 0)$ $\theta = \exp(\theta 0 + \beta\theta \cdot FP)$	489.12	54.12	100.38	12.81
γ-θ	γ, θ	$\alpha = \exp(\alpha 0)$ $\gamma = \exp(\gamma 0 + \beta\gamma \cdot FP)$ $\theta = \exp(\theta 0 + \beta\theta \cdot FP)$	447.10	96.15	102.01	11.75
α-only	α	$\alpha = \exp(\alpha 0 + \beta\alpha \cdot FP)$ $\gamma = \exp(\gamma 0)$ $\theta = \exp(\theta 0)$	426.73	116.51	100.50	16.35
γ-only	γ	$\alpha = \exp(\alpha 0)$ $\gamma = \exp(\gamma 0 + \beta\gamma \cdot FP)$ $\theta = \exp(\theta 0)$	418.24	125.01	102.70	19.42
θ-only	θ	$\alpha = \exp(\alpha 0)$ $\gamma = \exp(\gamma 0)$ $\theta = \exp(\theta 0 + \beta\theta \cdot FP)$	–397.97	941.21	104.52	45.07

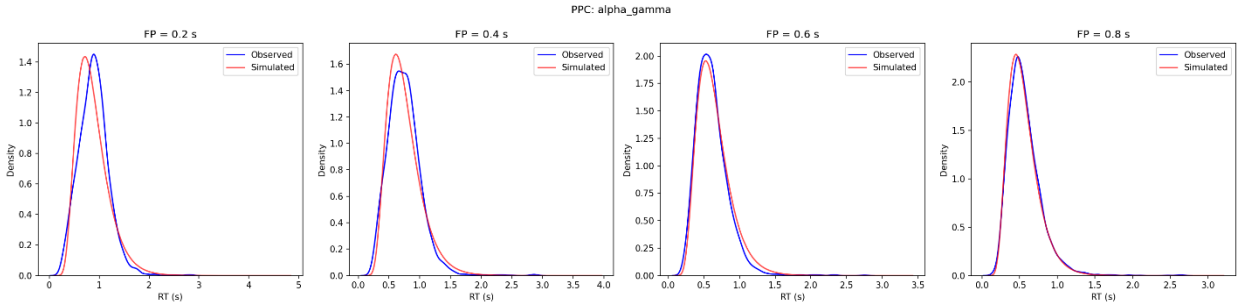
Supplementary table S1. Candidate models of foreperiod (FP) effects on Shifted Wald parameters and their relative predictive performance evaluated by leave-one-out cross-validation (LOO-CV). All models are parameterised on the log scale to ensure positivity; α (decision threshold), γ (drift rate), and θ (non-decision time) are exponentiated from linear combinations of intercepts and slopes. FP denotes the foreperiod centred at its mean (i.e., FP = FP_original − mean(FP)), such that the intercepts (α_0, γ_0, θ_0) represent the parameter values at the average foreperiod. The columns under "FP effect on" indicate which parameters are allowed to vary linearly with FP; parameters not listed are held constant. The model comparison metrics are: elpd_loo (expected log pointwise predictive density, higher is better), elpd_diff (difference in elpd_loo relative to the best-performing model), se (standard error of elpd_loo), and dse (standard error of the difference). The full model has the highest elpd_loo, but the alpha-gamma model is a close competitor (Δelpd = 11.69, SE = 5.09). Models that omit FP effects on either α or γ perform substantially worse (Δelpd $\geq$ 54.12), while the θ-only model is clearly the worst (Δelpd = 941.21).

Model	Parameter	True mean	Recovered mean	r	Bias	RMSE	Coverage
Full	α0	0.773	0.753	0.595	–0.021	0.026	0.813
	γ0	1.163	1.155	0.653	–0.008	0.012	0.889
	θ0	–4.729	–3.954	0.406	0.775	0.822	0.434
	βα-FP	–0.526	–0.512	0.646	0.013	0.060	0.909
	βγ-FP	0.334	0.337	0.668	0.003	0.034	0.965
	βθ-FP	4.129	1.546	0.535	–2.583	2.677	0.020
α-γ	α0	0.808	0.784	0.456	–0.024	0.026	0.655
	γ0	1.177	1.168	0.620	–0.009	0.012	0.865
	θ0	–6.143	–4.576	0.083	1.568	1.651	0.215
	βα-FP	–0.378	–0.401	0.668	–0.023	0.034	0.840
	βγ-FP	0.392	0.380	0.684	–0.012	0.029	0.940

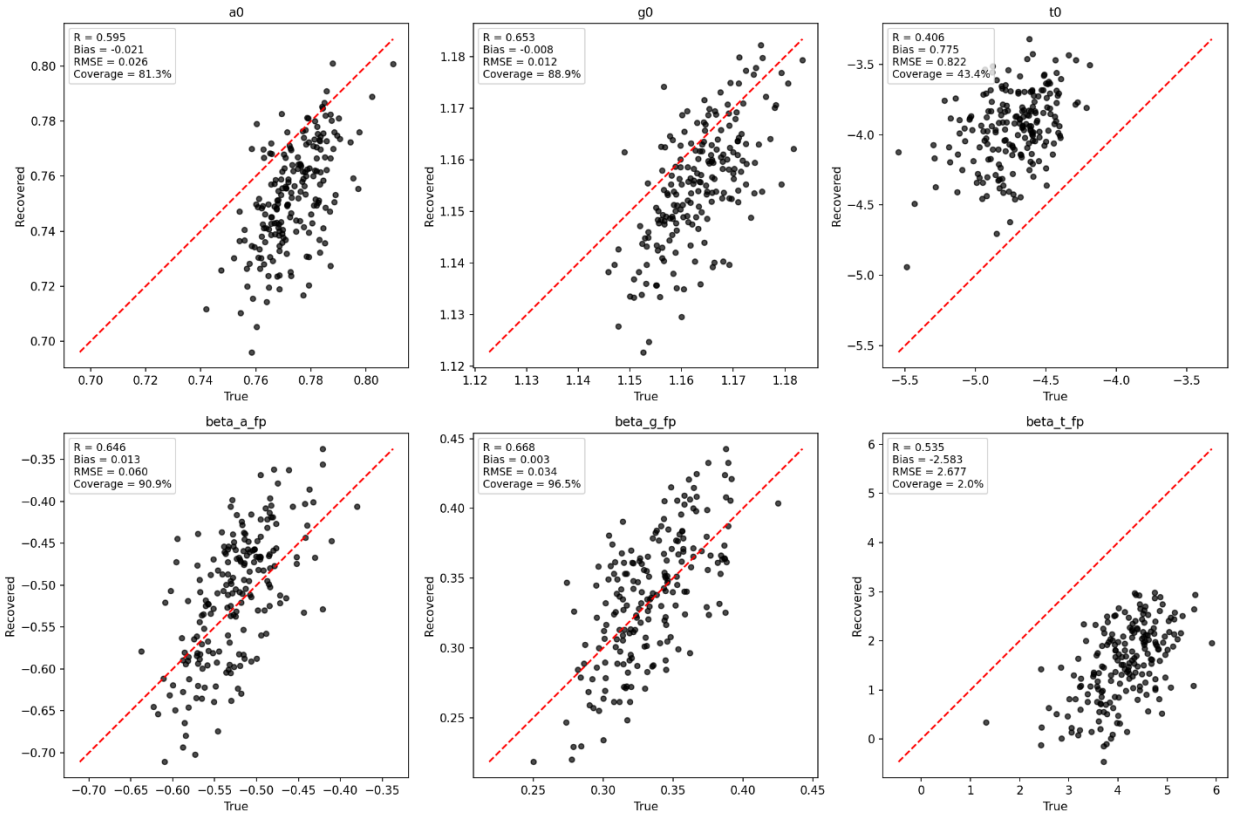
Supplementary Table S2. Parameter recovery results for the full and alpha-gamma Shifted Wald models. All parameters are estimated on the log scale. α0, γ0, and θ0 denote the intercepts (at mean foreperiod) of the decision threshold, drift rate, and non-decision time, respectively; βα-FP, βγ-FP, and βθ-FP denote the corresponding log-linear slopes of foreperiod (FP). The alpha-gamma model excludes βθ-FP (i.e., θ is constant across FP). For each parameter, the table shows the mean of true values across iterations, the mean of recovered posterior means, the Pearson correlation between true and recovered values (r), bias (recovered minus true), root-mean-squared error (RMSE), and the proportion of iterations where the true value fell within the 95% highest density interval (Coverage).



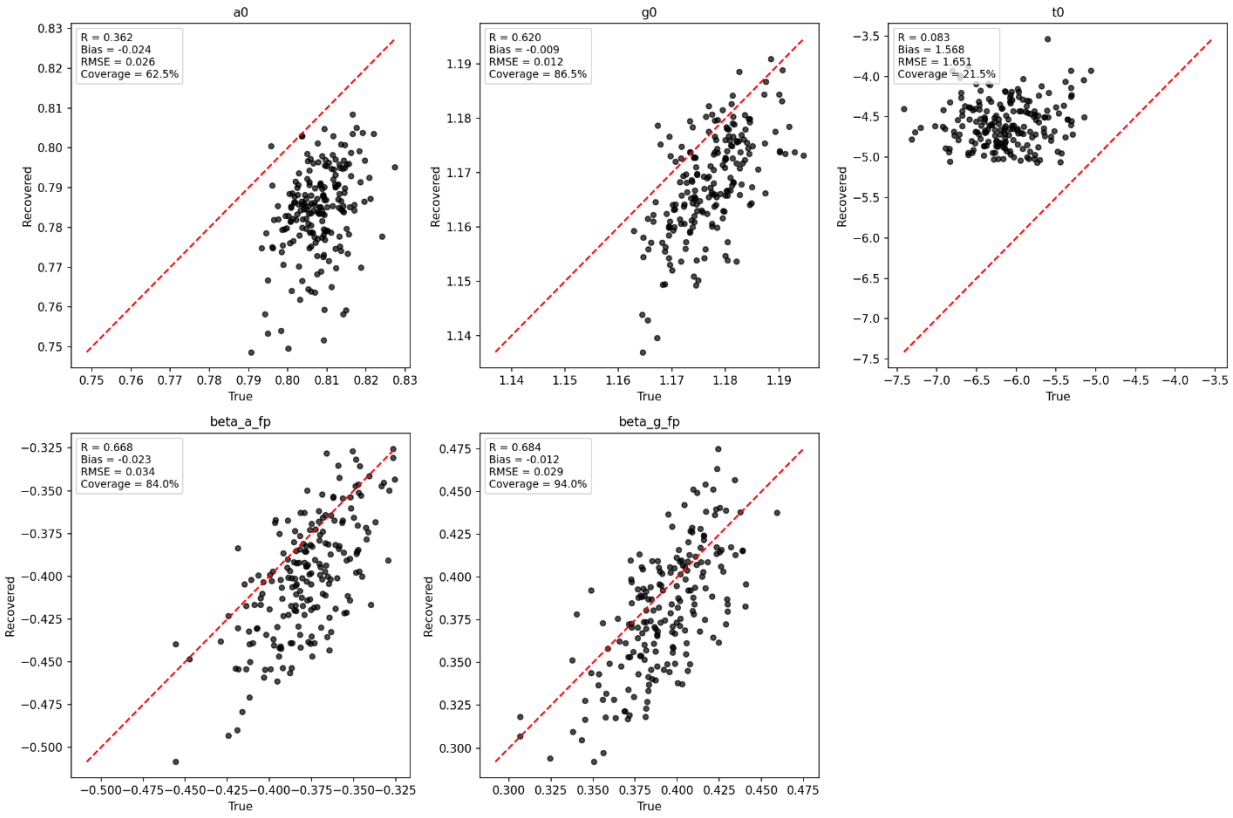
Supplementary Fig. S1. Posterior predictive checks for the full model.
Each panel shows the distribution of observed reaction times (blue) and posterior predictive simulations (red) for one foreperiod level. Simulated distributions were generated by drawing 200 samples from the posterior predictive distribution of the model, pooling across chains and draws, and overlaying them on the observed RTs using kernel density estimates. Close overlap between the two curves indicates that the model reproduces the shape and location of the empirical RT distributions at each foreperiod. RTs were filtered to 0.05–3 s prior to fitting. Panels correspond to foreperiods of 0.2, 0.4, 0.6, and 0.8 s.



Supplementary Fig. S2. Posterior predictive checks for the alpha-gamma model.
Each panel shows the distribution of observed reaction times (blue) and posterior predictive simulations (red) for one foreperiod level. Simulated distributions were generated by drawing 200 samples from the posterior predictive distribution of the model, pooling across chains and draws, and overlaying them on the observed RTs using kernel density estimates. Close overlap between the two curves indicates that the model reproduces the shape and location of the empirical RT distributions at each foreperiod. RTs were filtered to 0.05–3 s prior to fitting. Panels correspond to foreperiods of 0.2, 0.4, 0.6, and 0.8 s.



Supplementary Fig. S3. Parameter recovery for the full model across 200 simulated datasets. Each panel plots the recovered posterior mean against the true generating value for one parameter. Points show individual iterations that passed the convergence filter ($\hat{R} \leq 1.01$, ESS ≥ 400); the red dashed line is the identity line ($y = x$). The legend in each panel reports the Pearson correlation (R), bias (mean recovered − true), root mean square error (RMSE), and 95% credible-interval coverage. Parameters: a0, intercept for threshold (α); g0, intercept for drift rate (γ); t0, intercept for non-decision time (θ); beta_a_fp, regression coefficient for the effect of foreperiod on threshold; beta_g_fp, regression coefficient for the effect of foreperiod on drift rate; beta_t_fp, regression coefficient for the effect of foreperiod on non-decision time. All parameters were sampled on the log scale and drawn from the posterior of the full model fitted to the real data.



Supplementary Fig. S3. Parameter recovery for the alpha-gamma model across 200 simulated datasets.

Each panel plots the recovered posterior mean against the true generating value for one parameter. Points show individual iterations that passed the convergence filter ($\hat{R} \leq 1.01$, ESS ≥ 400); the red dashed line is the identity line (y = x). The legend in each panel reports the Pearson correlation (R), bias (mean recovered − true), root mean square error (RMSE), and 95% credible-interval coverage. Parameters: a0, intercept for threshold (α); g0, intercept for drift rate (γ); t0, intercept for non-decision time (θ); beta_a_fp, regression coefficient for the effect of foreperiod on threshold; beta_g_fp, regression coefficient for the effect of foreperiod on drift rate; All parameters were sampled on the log scale and drawn from the posterior of the full model fitted to the real data.