

Supplementary Material

for

Trial-by-Trial Behavioral Adaptation in a Restless
Bandit Task: A Mixed-Effects Modeling Approach

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This document provides supplementary tables and figures supporting the analyses reported in the main manuscript. These materials include additional descriptive statistics, model-comparison results, robustness analyses, and diagnostic plots that complement the primary findings. All supplementary materials were generated using the same reproducible analysis pipeline described in the main manuscript.

Supplementary Tables

Table S1: Full model comparison across outcomes.

Outcome	Model	AIC	BIC	logLik	ΔAIC
<i>Payoff-maximizing choice</i>					
	Null	178,147.8	178,167.5	−89,071.9	8942.28
	Fixed effects	177,329.7	177,378.9	−88,659.9	8124.14
	Random slope	172,854.6	172,913.7	−86,421.3	3649.07
	Linear interaction	172,736.5	172,815.3	−86,360.2	3530.92
	Quadratic, uncorrelated	169,511.1	169,629.3	−84,743.6	305.55
	Quadratic, correlated	169,205.6	169,353.3	−84,587.8	0.00
<i>Obtained reward</i>					
	Null	1,199,306	1,199,336	−599,650	12,484.4
	Fixed effects	1,194,237	1,194,296	−597,112	7415.16
	Random slope	1,187,442	1,187,511	−593,714	620.49
	Linear interaction	1,186,822	1,186,910	−593,402	0.00
<i>Log reaction time</i>					
	Null	2250.66	2280.20	−1122.33	5945.36
	Fixed effects	646.80	705.89	−317.40	4341.50
	Random slope	−3694.70	−3625.76	1854.35	0.00
	Linear interaction	−3691.18	−3602.55	1854.59	3.51
<i>Choice switching</i>					
	Null	155,369.0	155,388.6	−77,682.5	8904.26
	Fixed effects	149,313.7	149,362.8	−74,651.8	2848.97
	Random slope	146,489.4	146,548.3	−73,238.7	24.72
	Linear interaction	146,464.7	146,543.3	−73,224.4	0.00

Table S2: Random-effects variance and correlation estimates for the final models.

Outcome	Random effect 1	Random effect 2	Parameter	Variance	SD/Correlation
<i>Payoff-maximizing choice</i>					
	Intercept	–	Variance	0.340,90	0.584
	Trial	–	Variance	0.357,52	0.598
	Trial ²	–	Variance	0.142,37	0.377
	Intercept	Trial	Correlation	0.066,81	0.191
	Intercept	Trial ²	Correlation	–0.005,32	–0.024
	Trial	Trial ²	Correlation	0.145,73	0.646
<i>Obtained reward</i>					
	Intercept	–	Variance	20.4071	4.517
	Trial	–	Variance	8.923,10	2.987
	Residual	–	Variance	276.3194	16.623
<i>Log reaction time</i>					
	Intercept	–	Variance	0.093,46	0.306
	Trial	–	Variance	0.002,55	0.051
	Residual	–	Variance	0.054,11	0.233
<i>Choice switching</i>					
	Intercept	–	Variance	1.745,02	1.321
	Trial	–	Variance	0.245,44	0.495

Table S3: Robustness checks for the primary payoff-maximizing-choice model.

Model	AIC	BIC	logLik	ΔAIC
<i>Random-effects specification</i>				
Quadratic, uncorrelated	169,511.1	169,629.3	–84,743.6	305.55
Quadratic, correlated	169,205.6	169,353.3	–84,587.8	0.00
<i>Trial functional form</i>				
Linear interaction	172,736.5	172,815.3	–86,360.2	3225.37
Quadratic, uncorrelated	169,511.1	169,629.3	–84,743.6	0.00

Supplementary Figures

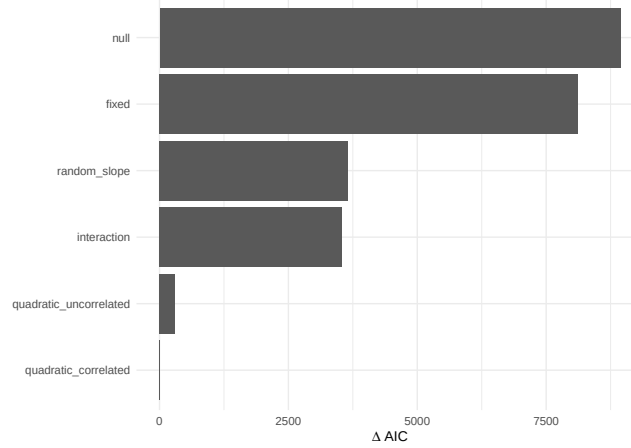


Figure S1: Comparative fit of candidate mixed-effects models across outcomes. Lower AIC indicates better relative fit.

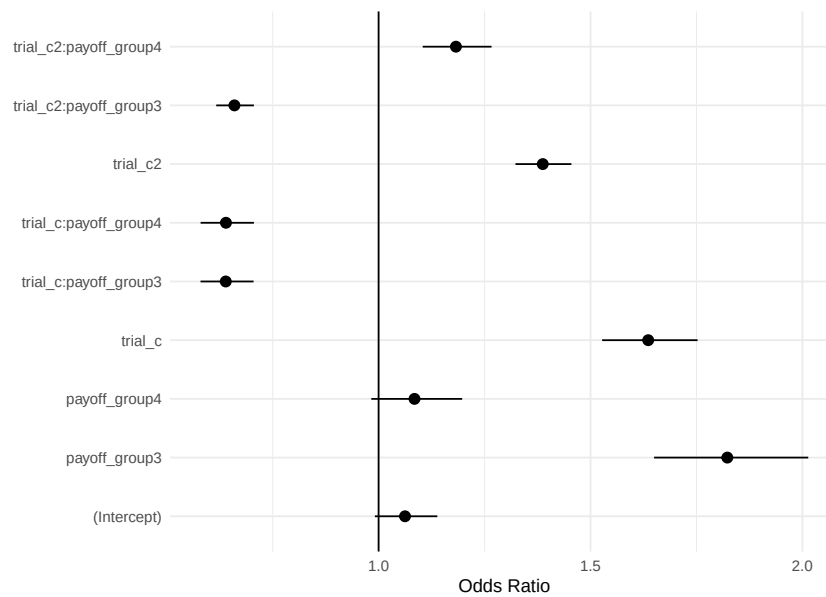


Figure S2: Odds ratios and 95% confidence intervals for fixed effects in the final payoff-maximizing-choice model.

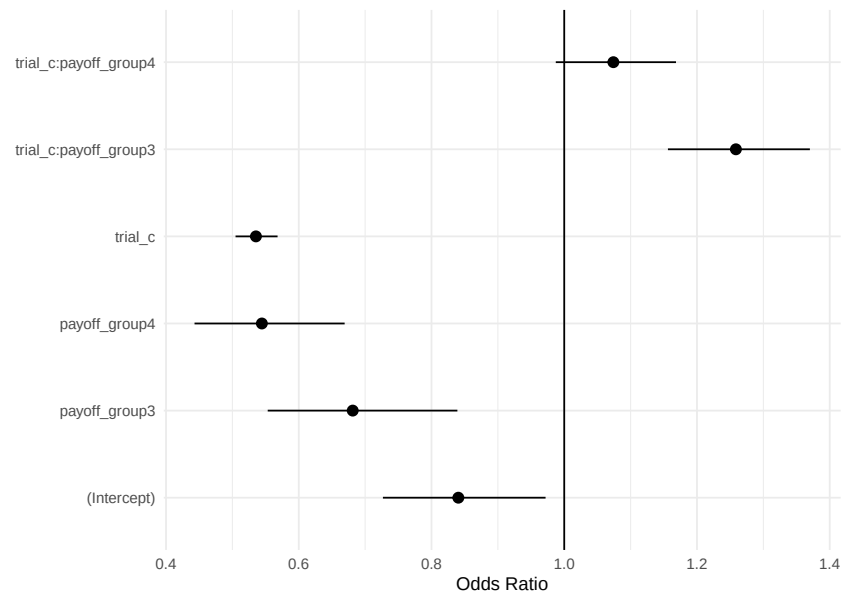


Figure S3: Odds ratios and 95% confidence intervals for fixed effects in the choice-switching model.

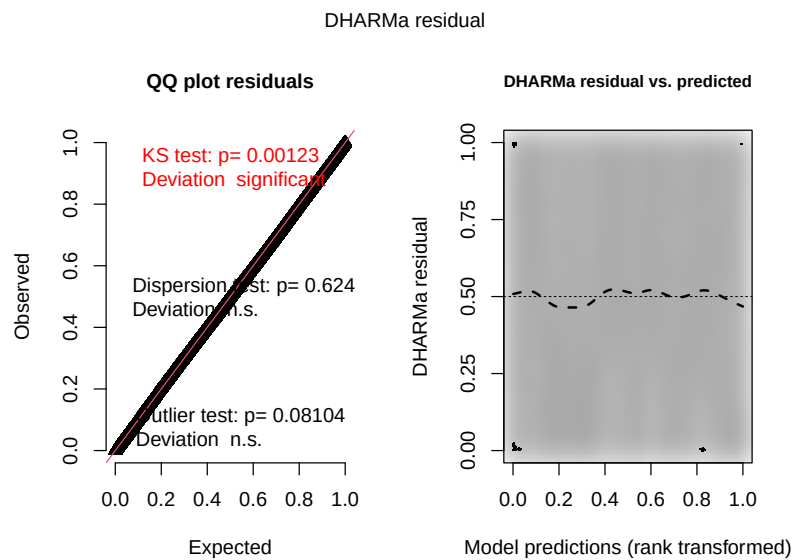


Figure S4: DHARMA residual diagnostics for the final payoff-maximizing-choice model.

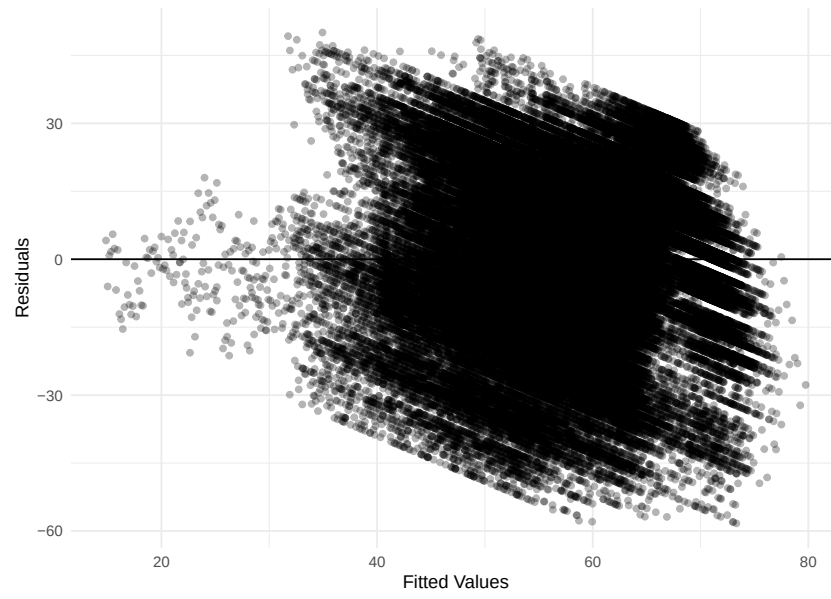


Figure S5: Residual diagnostics for the final obtained-reward model.