Individual differences in habituation rate and behavioral volatility predict dishabituation in adults, preschoolers and infants

Supplementary Information

Anonymous CogSci submission

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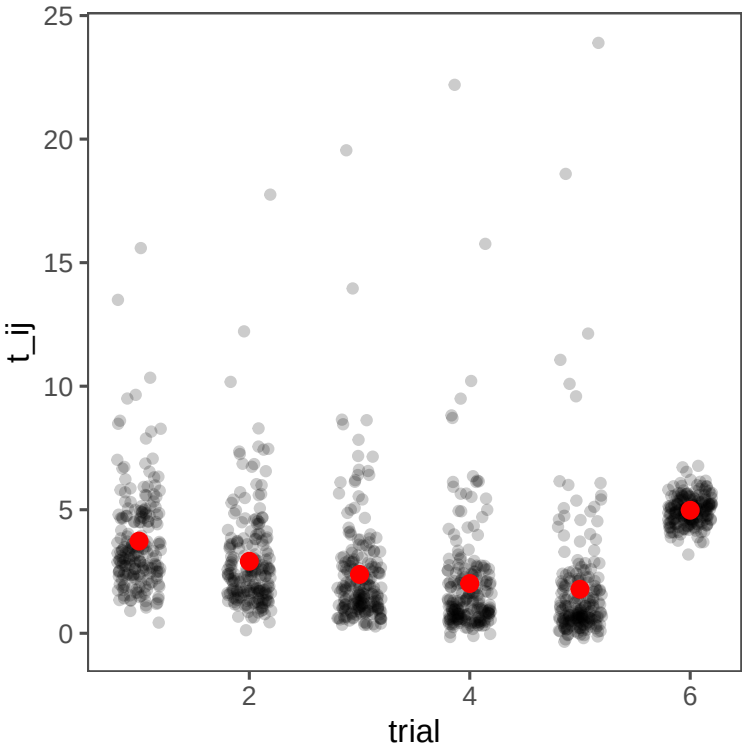
Contents

Simulations

Generating dataset

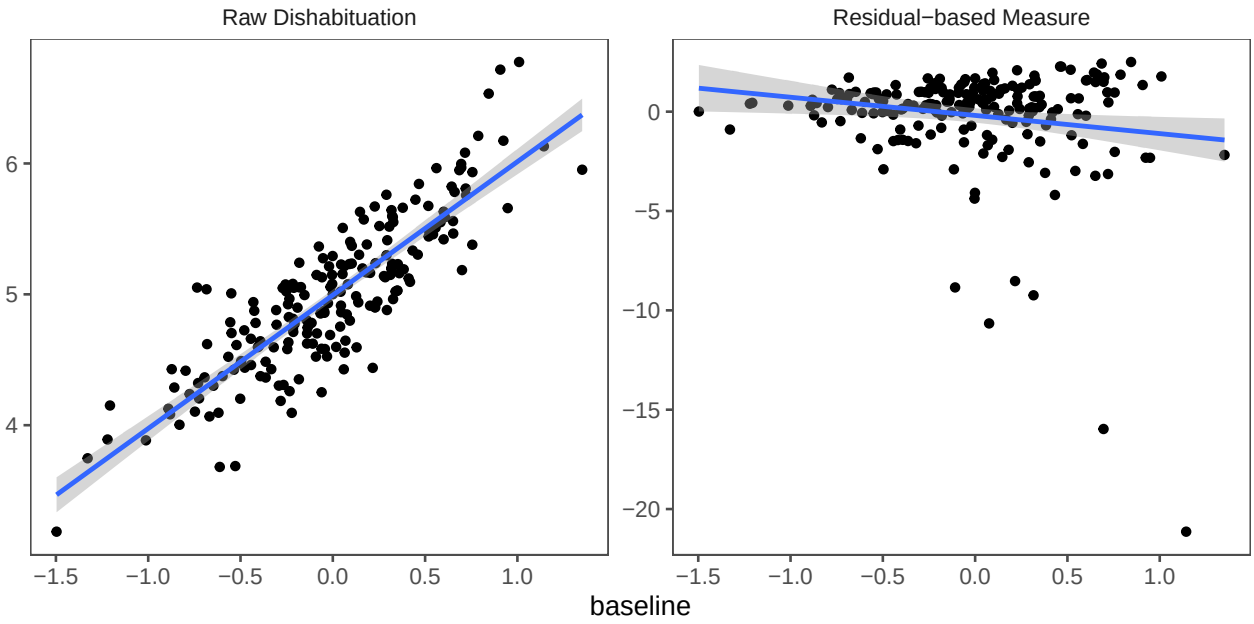
Here we simulated a dataset to model habituation and dishabituation effects in a looking time paradigm. Each of the 200 participants undergoes five habituation trials followed by one dishabituation trial. The habituation process is modeled using an exponential decay function, where looking time decreases across trials according to a population-level intercept and slope, with individual variability introduced through random intercepts and slopes. Observation noise is added to simulate natural variability in responses. The dishabituation trial, representing a response to a novel stimulus, is generated using a separate intercept with an additional dishabituation effect and individual-level noise. This setup captures both the within-subject decline in looking time during habituation and the rebound effect when a novel stimulus is introduced.



Comparison with baseline

Comparison of raw dishabituation and residual-based measures against baseline looking time. The left panel displays the relationship between raw dishabituation looking time (i.e., looking time on the first post-habituation trial) and baseline looking time ($r = 0.86$), while the right panel shows the relationship between the residual-based measure (V_i; r = -0.17), which accounts for individual differences in habituation trends, and baseline looking time. Both measures exhibit variability in their associations with baseline looking, highlighting the impact of measurement choice on capturing dishabituation effects. Shaded areas represent 95% confidence intervals from linear model fits.

The plot shows that residual-based approach significantly reduced the correlation between dishabituation and the baseline looking time.



Model comparisons

Residual-based models

Table 1: Adults

Model	AIC	BIC
a + b	10414.85	10436.28
a only	10412.99	10430.14
b only	10394.62	10411.76

Table 2: Preschoolers

Model	AIC	BIC
a + b	1725.340	1737.949
a only	1723.331	1733.419
b only	1705.097	1715.184

Table 3: Infants

Model	AIC	BIC
a + b	268066.8	268103.9
a only	268910.3	268940.0
b only	270980.5	271010.2

Robustness check models

Table 4: Adults

Model	AIC	BIC
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Table 5: Preschoolers

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Table 6: Infants

Model	AIC	BIC
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Correlations between measures and predictors

Below are the correlation matrices for all predictors and the two operationalizations of dishabituation. Specifically, `resid_diff` represents the residual-based dishabituation, and `log_diff` is the difference score between the log-transformed looking time at the dishabituation trial and the last habituation trial. The numbers in the matrices are Pearson's correlation coefficients, and blank cells indicate nonsignificant correlations.

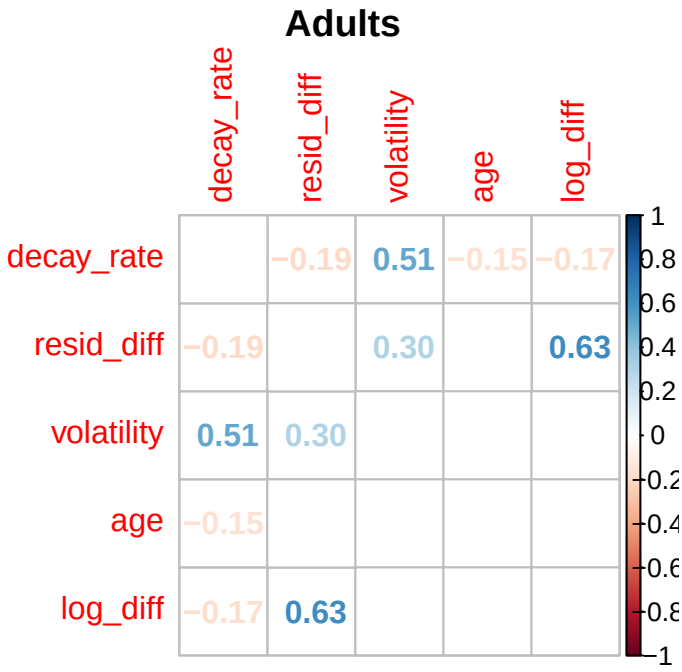

Figure 1: Correlational matrix for adults.

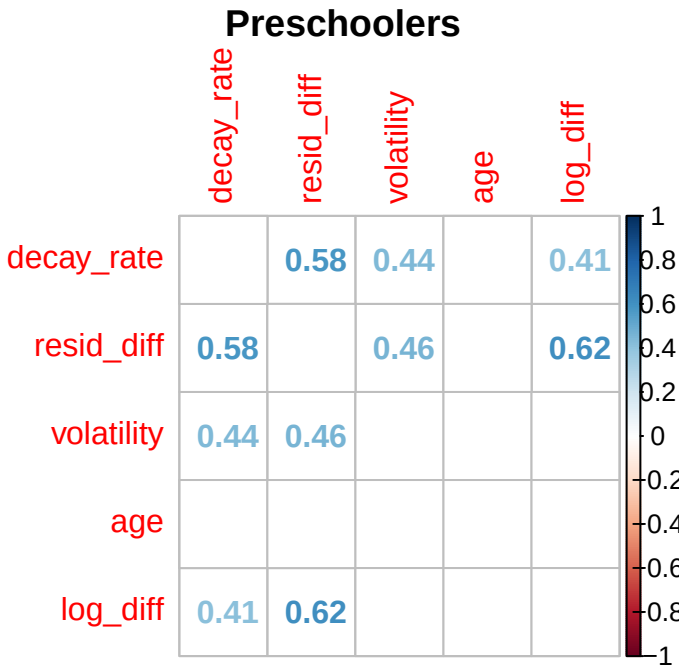

Figure 2: Correlational matrix for preschoolers.

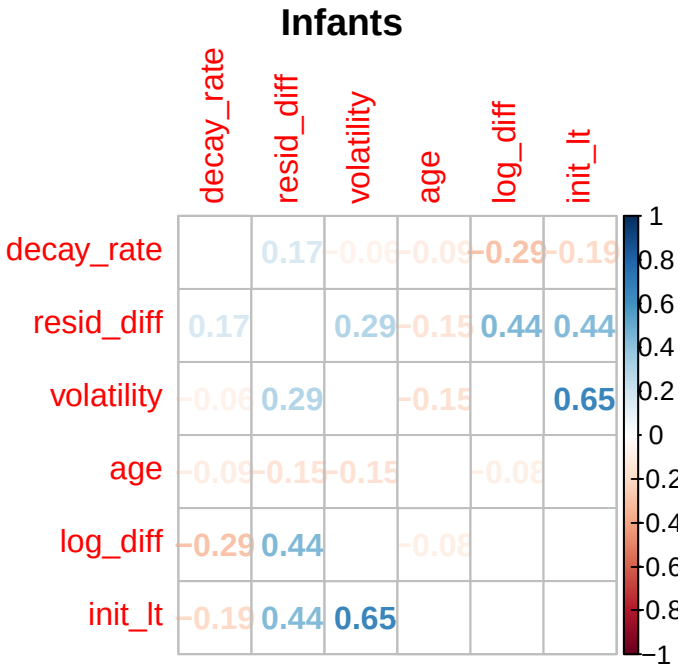

Figure 3: Correlational matrix for infants.