Peer-Review

Kim, Minwoo. 2025. “Neurotransmitter Homeostasis and Habit Formation: The Predominant Role of Reward Speed in Behavior Selection.” *Journal of High School Science* 9 (4): 152–74. https://doi.org/10.64336/001c.146730

The study design appears to be sound, although control times were not reported for the intial and the washout periods.
Out of 19 participants, 10 completed the complete study. Out of these, one recored a time of zero on dropping the first activity, and 2 participants recorded negative numbers. Thus , you effectively have 7 participants in total. This is too low a number to perform any meaningful statistical anaysis (even if paired). See full review below:
1) Use complete pairs for all inferential analyses; add sensitivity where applicable.
2) Report paired contrasts Control vs Exp1, Control vs Exp2, and Exp2 vs Exp1.
3) Add non-parametric confirmations and an omnibus repeated-measures test.
4) Assess variance homogeneity.
5) Acknowledge the fixed non-crossover order and its implications.
6) Note that washout was not logged and control may have shifted.
7) Define change scores and clarify negative values.
8) Provide a threshold-based sensitivity and report χ^2, Fisher, and McNemar; explain the 41-minute cutoff.
9) Report multiplicity control.
10) Report Ns and clarify which participants contribute to each phase.
11) Summarize response patterns and heterogeneity; include cluster descriptions.
12) Provide prospective power for 90% at $\alpha=0.05$.
13) Note content-level nuance for slower dominant activities (e.g., singing).
14) Ethics, consent, and data protection.

Response to Reviewer and Editor

Manuscript: Neurotransmitter Homeostasis and Habit Formation: The Predominant Role of Reward Speed in Behavior Selection
Author: Minwoo Kim
1) Use complete pairs for all inferential analyses; add sensitivity where applicable.
Response: All inferential tests use complete paired observations per contrast. The manuscript also reports complete-pair Ns per comparison; descriptive subgroup summaries are clearly marked as descriptive.
Where revised
Methods: statement of complete-pairs analysis [Lines: 174–176].
Results: opening paragraph reiterating complete pairs and definitions [Lines: 345–353].

2) Report paired contrasts Control vs Exp1, Control vs Exp2, and Exp2 vs Exp1.
Response: The primary within-subject contrasts are reported with mean Δ, SD, t, df, p, 95% CI, and dz. Holm–Bonferroni adjustments across the three contrasts are also provided.
Where revised
Results: Table-2 introductory paragraph with all paired tests [Lines: 366–375].

3) Add non-parametric confirmations and an omnibus repeated-measures test.
Response: We added Wilcoxon signed-rank tests for each paired contrast and a Friedman omnibus test across Control, Day 1, and Day 2.
Where revised:
Results: robustness paragraph mentioning Wilcoxon and Friedman [Lines: 377–380].

4) Assess variance homogeneity.
Response: A Levene sensitivity test compared dispersion of Day-1 and Day-2 change scores among complete pairs and did not indicate unequal variance.
Where revised
Results: robustness paragraph, Levene test sentence [Lines: 381–383].

5) Acknowledge the fixed non-crossover order and its implications.
Response: The design is explicitly described as fixed order; we note that order and carryover effects cannot be excluded despite washout.
Where revised
Methods: fixed order described and flagged as limitation (washout note begins here) [Lines: 189–193].
Discussion: limitation noting fixed order and unlogged washout [Lines: 550–553].

6) Note that washout was not logged and control may have shifted.
Response: We state that behavior during washout was not logged, so drift during this interval cannot be quantified.
Where revised
Methods: “No behavior logs were collected during the washout interval …” [Lines: 191–193].
Discussion: reiterated in limitations [Lines: 551–553].

7) Define change scores and clarify negative values.
Response: Change scores are defined algebraically as Δ = Experimental − Control; negative values indicate reductions relative to baseline and do not represent negative time.
Where revised
Methods: derivation of variables including Δ definition and negative-value clarification [Lines: 270–274].
Results: Δ definition reiterated and sign interpretation noted [Lines: 349–352].

8) Provide a threshold-based sensitivity and report χ^2, Fisher, and McNemar; explain the 41-minute cutoff.
Response: We dichotomized Δ at 41 minutes to describe large compensations, reported χ^2 with Yates correction, Fisher’s exact, and McNemar exact, and stated that such inferences are threshold- and margin-dependent. Counts and test outputs are provided in Supplementary Table S1.
Where revised
Results: threshold sensitivity paragraph with tests and S1 pointer [Lines: 406–413].

9) Report multiplicity control.

Response: Holm–Bonferroni adjustment across the three primary contrasts is described in Methods and reported in Results alongside unadjusted p values.
Where revised
Methods: multiplicity plan [Lines: 315–318].
Results: adjusted p values for the three contrasts [Lines: 373–375].

10) Report Ns and clarify which participants contribute to each phase.
Response: We state that 19 participants contributed to Experiment 1 and 10 contributed to Experiment 2; unavailable entries are marked N/A in the tables.
Where revised
Results: paragraph immediately after Table 1 [Lines: 356–363].

11) Summarize response patterns and heterogeneity; include cluster descriptions.
Response: We summarize response patterns for complete pairs and provide exploratory cluster labels with qualitative interpretation.
Where revised
Results: pattern counts paragraph [Lines: 400–404].
Results: cluster labels paragraph [Lines: 416–418] and cluster summary paragraph [Lines: 421–426].

12) Provide prospective power for 90% at α=0.05.
Response: Based on observed paired effect sizes, approximately N=40 complete pairs are required for Day 1 and N=55 for Day 2 to reach 90% power at α=0.05.
Where revised
Results: prospective power paragraph [Lines: 428–433].

13) Note content-level nuance for slower dominant activities (e.g., singing).
Response: We note that participants whose dominant activity was slower and more deliberative, for example singing, did not show a distinctive common pattern, and we frame this as a potential moderator for future work.
Where revised
Discussion: nuance paragraph including “singing” [Lines: 508–517].

14) Ethics, consent, and data protection.
Response: The Methods section describes school research ethics approval, written informed consent, and data protection procedures.
Where revised
Methods: ethics and consent details [Lines: 325–343].

I sincerely appreciate the author’s responses to my comments. The manuscript is much improved. However, I would like these final two points addressed in the manuscript.
1.Line 373-375, extend that line to say "…..all of them non-signifiant at p=0.017). Also include verbiage that states “although it did not reach the Bonferroni correction level of significance” both in the ABSTRACT and in the CONCLUSION. All conclusions should hence be reframed as being suggestive.

2.‘Fast’ and ‘high amount’ behaviors may partially overlap conceptually and in baseline time; no explicit assessment (e.g., correlation between speed and amount ratings) was reported to verify independence. Please put this point down under ‘limitations’.

Response to Reviewer and Editor

Manuscript: Neurotransmitter Homeostasis and Habit Formation: The Predominant Role of Reward Speed in Behavior Selection

Author: Minwoo Kim

1) Line 373-375, extend that line to say "…..all of them non-signifiant at p=0.017). Also include verbiage that states “although it did not reach the Bonferroni correction level of significance” both in the ABSTRACT and in the CONCLUSION. All conclusions should hence be reframed as being suggestive.

Response:

1) I have amended the sentence to read: “Holm–Bonferroni across the three primary contrasts yielded adjusted p values of 0.114 (Control vs Exp1), 0.398 (Control vs Exp2), and 1.000 (Exp2 vs Exp1), all of them non-signifiant at $p = 0.017$).”
2) I have added the requested qualifier and tempered the claims: the Abstract and the Conclusion now state that the primary effect was significant before correction although it did not reach the Bonferroni correction level of significance, and all interpretive statements have been reframed as suggestive.

Where revised

1) Results: Line 375-377
2) Abstract: Line 22-24, Line 26-28; Conclusion and Future Direction: Line 644-646, Line 649-650

2) ‘Fast’ and ‘high amount’ behaviors may partially overlap conceptually and in baseline time; no explicit assessment (e.g., correlation between speed and amount ratings) was reported to verify independence. Please put this point down under ‘limitations’.

Response:

I agree that ‘fast’ and ‘high amount’ behaviors may overlap conceptually and in baseline time, and that we did not report an explicit independence check. I have added the following sentence in the limitations to make this explicit and to caution interpretation:

“Fast and high amount behaviors may partially overlap conceptually and in baseline time, and we did not report an explicit independence check such as a correlation between individual speed and amount ratings; interpretations that assume independence should be treated with caution.”

For completeness, the same point is also reflected in the limitations summary in the Abstract and in the concluding limitations sentence.

Where revised

- Abstract: Line 31-35
- Discussion: Line 556-558
- Conclusion and Future Direction: Line 657-660

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1. can you please check if the mean delta in Table 2 is zero? Is this correct?
2. I am confused from Table 2 onward since you identify Expt 1 as (day 1) and Expt 2 as (day 2). Should these not be an aggregate of days 4-6 for expt 1 and days 10-12 for expt 2 ? Should we hence replace (days 1) with Expt.1 and (days 2) with Expt. 2 ?

3.Also, for clusters 0, 1 and 2, can you present participant identifier numbers for each cluster?

Thank you for your careful review. Please find my responses below:

1) Mean delta in Table 2

Yes, the mean delta value of 0.00 in Table 2 (Exp2 − Exp1 paired comparison) is correct.
This result reflects the 10 participants who completed both experiments. The signed differences between their Exp1 and Exp2 scores balanced exactly, giving a true mean of 0.00 minutes. Therefore, no correction is required.
Where to fix: No change needed — the value shown in Table 2 is accurate.

2) Clarification of "Day 1 / Day 2" versus "Experiment 1 / Experiment 2"

Thank you for pointing this out. The terms "Day 1" and "Day 2" were used as shorthand to indicate Experiment 1(removal of the fastest-reward behaviour) and Experiment 2 (removal of the highest-reward behaviour).
For clarity and consistency, please replace all instances of "(Day 1)" and "(Day 2)" with "Experiment 1" and "Experiment 2", respectively.
This affects:

- The headings and captions of Table 2, Table 3, Table 4, Table 5, and Supplementary Table S1.
- Any text in the manuscript body that currently uses "Day 1" or "Day 2".

If desired, the expanded description can read:
"Experiment 1 (removal of fastest-reward behaviour)" and
"Experiment 2 (removal of highest-reward behaviour)."
Please note that the experiments indeed correspond to aggregate periods (days 4–6 for Exp 1 and days 10–12 for Exp 2); however, these were summarised as "Experiment 1" and "Experiment 2" in the data tables to keep the presentation concise.
Ready-to-paste correction example for Table 2 caption:
"Paired-sample tests comparing intervention phases to control (complete pairs only). Δ = Experimental − Control (minutes). Two-sided paired t-tests; 95% CI for mean Δ; dz = mean(Δ)/SD(Δ). Experiment 1 and Experiment 2 correspond to the removal of the fastest-reward and highest-reward behaviours, respectively."

3) Participant identifiers for clusters (Table 6 / Table 7)

Cluster membership derived from Day 1 (Experiment 1) change scores is as follows:

- Cluster 0 (Mild Adapters): participants 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17
- Cluster 1 (Dropout Outlier): participant 3
- Cluster 2 (Responsive Substitutors): participants 12, 15, 18, 19

Where to fix: Please add the following sentence to the end of the Table 6 notes (or, if preferred, to the start of Table 7 notes),
"Cluster membership was determined from Day 1 (Experiment 1) change scores. Participant identifiers per cluster were as follows: Cluster 0 – 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17; Cluster 1 – 3; Cluster 2 – 12, 15, 18, 19."

Thank you for addressing my comments. Accepted.