Full Report 2023-06-18

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Initial data checks

One participant had fewer than 630 total trials (total of 455 trials remained in file) and was missing columns for the final 3 MCQ questions (4-6). However, this participant was still included in analysis.

Descriptive statistics

Table S1 - % correct replies across participants for MCQ, pre-task quiz, post-game quiz, total - Optimal, cravers, total

Table S2 - Participant strategy of play: no clue, yes but not sure, confident

Table S3 - % cravers in test, control, total - Bet in yellow once vs twice

Table S4 - Betting rate in blue background sessions for control, test, total - N, mean, median, SD, min, max, skew - Across participants, not split by cravers/others

Table S5 - Betting rate in yellow background sessions for control, test, total - N, mean, median, SD, min, max, skew - Across participants, not split by cravers/others

This section goes through the tests specified in the pre-registration report and specifies observed effect sizes in the sample so far.

There was a total of 199 participants after excluding participants. The mean age of participants was 21.6 (range 18-30) years old. The gender distribution was Female = 78, Male = 120, Other = 1. The distribution of majors for participants was STEM = 67, Business = 128, Humanities = 2, Other = 2.

Table 1: Participant understanding of basic aspects of the task. "MCQ": The table reports the percentage of correct replies to the 6 MCQ questions. "Pre-/Post-task quiz": MCQ about the probability of a winning bet in a yellow/blue background session. The question is asked twice: just before the beginning of the task ("Pre"), and immediately after the task is completed ("Post"). "Optimal": Participants who play optimally, i.e., they pass in all trials of all yellow background sessions. "Cravers": Participants who bet at least twice across yellow background sessions during the experimental task (this is the definition used in Test 4; see also Table S3).

participant_type	MCQ	post_game_quiz	Total
Optimal	100%	-	100%
Cravers	100%	99%	100%
Total	100%	99%	100%

Table 2: Participant report on whether they have a strategy of play just before they start performing the task.

	No strategy	Not quite sure	Quite confident	Think it is right
n	1	29	120	49

Table 3: Fraction of cravers in the experiment. "At least twice in yellow": percentage of participants who bet at least twice across yellow background sessions during the experimental task (this is the definition of "craver" used in Test 4). "Bet in yellow": percentage of participants who bet once or more in the yellow background sessions during the experimental task (reported here for reference).

craving_definition	Test	Control	Total
Bet in yellow	53/99 = 54%	36/100 = 36%	89/199 = 45%
At least twice in yellow	44/99 = 44%	33/100 = 33%	77/199 = 39%

Table 4: Betting rate of all participants, in blue and yellow background sessions.

	Blue	Yellow
n	199.000	199.000
mean	0.966	0.076
median	1.000	0.000
sd	0.091	0.142
min	0.500	0.000
max	1.000	0.742
skew	-3.537	2.369

Test 1

Paired t-test to compare participant betting rate in the high-reward vs. low-reward sessions in the yellow background sessions, one-sided; H0: Betting rate is higher or equal in the low-reward sessions. We expect to be able to reject H0 at a 5% significance level (Prediction 1).

Participant-level test (N = 199).

Data was skewed at 1.611 (ideal values within [-1, 1]) and a Shapiro-Wilks test showed non-normality. Data were Box-Cox transformed with lambda = -18. This reduced skew to 0.816 (acceptable value), but SW test still showed non-normality.

Paired t-test using Box-Cox transformed data showed higher betting rate in high reward sessions (t(198) = -7.201, p < .001). Non-parametric paired Wilcoxon test using non-transformed data showed qualitatively same results (V = 242.5 p < .001).

Test 2

Logistic mixed effects model predicting betting, with independent variables: potential reward value in the session, uncertainty level in the session, a dummy for treatment (reference: treatment C), a dummy for session colour (reference: yellow), the interaction of treatment and session colour, and several control variables (which include the previous decision, to control for choice inertia/stickiness). The main variables of interest are:

- the reward variable; we expect a positive coefficient on that variable (Prediction 1).
- the interaction of treatment and session colour. We predict a negative coefficient on this variable (Predictions 2 & 3).
- the uncertainty variable; a positive coefficient would be consistent with Prediction 4.

Test 3

Logistic mixed effects model predicting betting, with independent variables: potential reward value in the session, uncertainty level in the session, a dummy for treatment (reference: treatment C), a dummy for session colour (reference: yellow), the previous decision, and reward exposure, which is the discounted sum of prior rewards as defined in our computational model (more below). The main variable of interest is the reward exposure variable. We expect it to be significantly positive (Prediction 2).

Test 4

Linear regression using as dependent variable participant betting rate in yellow (proxy for craving). We will also run a logistic regression using as dependent variable participant type (0: non craver; 1: craver). A craver is defined as a participant who chooses to bet at least twice across the yellow background sessions during the task.†† The independent variables will include a dummy code for treatment (reference: treatment C) and several control variables which include participant accuracy at the post-yellow-sessions lotteries (to control for the aforementioned miswanting aspect of behaviour). Our main variable of interest is the treatment variable: we expect a significantly positive coefficient on that variable (Prediction 3).

Test 5

Logistic mixed effects model predicting betting in a yellow background session; the independent variables include potential reward value in the session, uncertainty level in the session, a dummy for treatment (reference: treatment C), and the previous decision (to control for choice inertia/stickiness). The main variables of interest are: - the reward variable; we expect a positive coefficient on that variable (Prediction 1). - the treatment variable; we expect a positive coefficient on this variable (Prediction 3). - the uncertainty variable; a positive coefficient would be consistent with Prediction 4.

Test 6

Paired t-test to compare participant betting rate in the high-uncertainty vs. low uncertainty sessions in the yellow background sessions, one-sided; H0: Betting rate is higher or equal in the low-uncertainty sessions. We expect to be able to reject H0 at a significance level of 5% (Prediction 4).

[graph for uncertainty, BC corrected]

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n_7 = 100
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Test 7

T-test checking if betting rate in yellow session in the test treatment is different from 0. Participant-level test (N = 100).

- Betting rate in yellow C vs T

[graph C vs T in yellow, fig3]

Figures

S2 from OSF but with color as well - only for pooled

S4 but theta 1.0