Supplementary material for:

# Chasing emotional losses: negative subjective affect is linked to increased risk seeking both within and between individuals

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## Section S1: Composition of choice pairs

Each participant was presented with two repetitions of each of 101 choice pairs (one free-choice repetition, one forced-choice repetition) in a randomised order and with randomised left/right mapping on the display screen. The 101 specific choice pairs presented to participants were all non-stochastically-dominated (first order) combinations of the five possible outcomes (-200, -100, +0, +100, +200) and two outcome probabilities (25/75, 50/50), as detailed in Table S1.

*Supplmentary Table S1*. Composition of choice pairs in risky choice task

| Choice pair # | Card 1 outcomes | Card 1 probs | Card 2 outcomes | Card 2 probs |
|---|---|---|---|---|
| 1 | [-200, -100] | [0.25, 0.75] | [-200, 0] | [0.50, 0.50] |
| 2 | [-200, -100] | [0.25, 0.75] | [-200, 100] | [0.50, 0.50] |
| 3 | [-200, -100] | [0.25, 0.75] | [-200, 200] | [0.50, 0.50] |
| 4 | [-200, -100] | [0.25, 0.75] | [-200, 0] | [0.75, 0.25] |
| 5 | [-200, -100] | [0.25, 0.75] | [-200, 100] | [0.75, 0.25] |
| 6 | [-200, -100] | [0.25, 0.75] | [-200, 200] | [0.75, 0.25] |
| 7 | [-200, -100] | [0.50, 0.50] | [-200, 0] | [0.75, 0.25] |
| 8 | [-200, -100] | [0.50, 0.50] | [-200, 100] | [0.75, 0.25] |
| 9 | [-200, 0] | [0.50, 0.50] | [-200, 100] | [0.75, 0.25] |
| 10 | [-200, 0] | [0.50, 0.50] | [-200, 200] | [0.75, 0.25] |
| 11 | [-200, 0] | [0.50, 0.50] | [-100, 0] | [0.75, 0.25] |
| 12 | [-200, 0] | [0.50, 0.50] | [-100, 100] | [0.75, 0.25] |
| 13 | [-200, 0] | [0.50, 0.50] | [-100, 200] | [0.75, 0.25] |
| 14 | [-200, 100] | [0.75, 0.25] | [-100, 0] | [0.75, 0.25] |
| 15 | [-200, 100] | [0.75, 0.25] | [-100, 0] | [0.25, 0.75] |
| 16 | [-200, 100] | [0.75, 0.25] | [-100, 0] | [0.50, 0.50] |
| 17 | [-200, 100] | [0.25, 0.75] | [-200, 200] | [0.50, 0.50] |
| 18 | [-200, 100] | [0.25, 0.75] | [-100, 0] | [0.25, 0.75] |
| 19 | [-200, 100] | [0.25, 0.75] | [-100, 0] | [0.50, 0.50] |
| 20 | [-200, 100] | [0.25, 0.75] | [-100, 0] | [0.75, 0.25] |
| 21 | [-200, 100] | [0.25, 0.75] | [-100, 100] | [0.50, 0.50] |
| 22 | [-200, 100] | [0.25, 0.75] | [-100, 200] | [0.50, 0.50] |
| 23 | [-200, 100] | [0.25, 0.75] | [0, 100] | [0.50, 0.50] |
| 24 | [-200, 100] | [0.25, 0.75] | [0, 200] | [0.50, 0.50] |
| 25 | [-200, 100] | [0.50, 0.50] | [-100, 0] | [0.25, 0.75] |
| 26 | [-200, 100] | [0.25, 0.75] | [-100, 100] | [0.75, 0.25] |
| 27 | [-200, 100] | [0.25, 0.75] | [-100, 200] | [0.75, 0.25] |
| 28 | [-200, 100] | [0.25, 0.75] | [0, 100] | [0.75, 0.25] |
| 29 | [-200, 100] | [0.25, 0.75] | [0, 200] | [0.75, 0.25] |
| 30 | [-200, 100] | [0.50, 0.50] | [-100, 100] | [0.75, 0.25] |
| 31 | [-200, 100] | [0.50, 0.50] | [-100, 200] | [0.75, 0.25] |

| | | | | |
|---|---|---|---|---|
| 32 | [-200, 100] | [0.50, 0.50] | [0, 100] | [0.75, 0.25] |
| 33 | [-200, 100] | [0.50, 0.50] | [0, 200] | [0.75, 0.25] |
| 34 | [-200, 100] | [0.50, 0.50] | [-100, 0] | [0.50, 0.50] |
| 35 | [-200, 100] | [0.50, 0.50] | [-100, 0] | [0.75, 0.25] |
| 36 | [-200, 200] | [0.75, 0.25] | [-100, 0] | [0.75, 0.25] |
| 37 | [-200, 200] | [0.75, 0.25] | [-100, 100] | [0.75, 0.25] |
| 38 | [-200, 200] | [0.75, 0.25] | [-100, 0] | [0.25, 0.75] |
| 39 | [-200, 200] | [0.75, 0.25] | [0, 100] | [0.75, 0.25] |
| 40 | [-200, 200] | [0.75, 0.25] | [-200, 100] | [0.25, 0.75] |
| 41 | [-200, 200] | [0.75, 0.25] | [0, 100] | [0.25, 0.75] |
| 42 | [-200, 200] | [0.75, 0.25] | [-200, 100] | [0.50, 0.50] |
| 43 | [-200, 200] | [0.75, 0.25] | [-200, 100] | [0.50, 0.50] |
| 44 | [-200, 200] | [0.75, 0.25] | [-100, 0] | [0.50, 0.50] |
| 45 | [-200, 200] | [0.75, 0.25] | [-100, 100] | [0.50, 0.50] |
| 46 | [-200, 200] | [0.75, 0.25] | [0, 100] | [0.50, 0.50] |
| 47 | [-200, 200] | [0.25, 0.75] | [-100, 0] | [0.50, 0.50] |
| 48 | [-200, 200] | [0.25, 0.75] | [-100, 0] | [0.75, 0.25] |
| 49 | [-200, 200] | [0.25, 0.75] | [-100, 0] | [0.25, 0.75] |
| 50 | [-200, 200] | [0.25, 0.75] | [-100, 100] | [0.50, 0.50] |
| 51 | [-200, 200] | [0.25, 0.75] | [-100, 100] | [0.75, 0.25] |
| 52 | [-200, 200] | [0.25, 0.75] | [-100, 200] | [0.50, 0.50] |
| 53 | [-200, 200] | [0.25, 0.75] | [-100, 200] | [0.75, 0.25] |
| 54 | [-200, 200] | [0.25, 0.75] | [0, 100] | [0.25, 0.75] |
| 55 | [-200, 200] | [0.25, 0.75] | [0, 100] | [0.50, 0.50] |
| 56 | [-200, 200] | [0.25, 0.75] | [0, 100] | [0.75, 0.25] |
| 57 | [-200, 200] | [0.25, 0.75] | [0, 200] | [0.50, 0.50] |
| 58 | [-200, 200] | [0.25, 0.75] | [0, 200] | [0.75, 0.25] |
| 59 | [-200, 200] | [0.25, 0.75] | [100, 200] | [0.50, 0.50] |
| 60 | [-200, 200] | [0.25, 0.75] | [100, 200] | [0.75, 0.25] |
| 61 | [-200, 200] | [0.50, 0.50] | [-100, 0] | [0.25, 0.75] |
| 62 | [-200, 200] | [0.50, 0.50] | [-100, 0] | [0.50, 0.50] |
| 63 | [-200, 200] | [0.50, 0.50] | [-100, 0] | [0.75, 0.25] |
| 64 | [-200, 200] | [0.50, 0.50] | [-100, 100] | [0.50, 0.50] |
| 65 | [-200, 200] | [0.50, 0.50] | [-100, 100] | [0.75, 0.25] |
| 66 | [-200, 200] | [0.50, 0.50] | [-100, 200] | [0.75, 0.25] |
| 67 | [-200, 200] | [0.50, 0.50] | [0, 100] | [0.25, 0.75] |
| 68 | [-200, 200] | [0.50, 0.50] | [0, 100] | [0.50, 0.50] |
| 69 | [-200, 200] | [0.50, 0.50] | [0, 100] | [0.75, 0.25] |
| 70 | [-200, 200] | [0.50, 0.50] | [0, 200] | [0.75, 0.25] |
| 71 | [-200, 200] | [0.50, 0.50] | [100, 200] | [0.75, 0.25] |
| 72 | [-100, 0] | [0.25, 0.75] | [-100, 100] | [0.50, 0.50] |
| 73 | [-100, 0] | [0.25, 0.75] | [-100, 200] | [0.50, 0.50] |
| 74 | [-100, 0] | [0.25, 0.75] | [-100, 200] | [0.75, 0.25] |

| | | | | |
|---|---|---|---|---|
| 75 | [-100, 0] | [0.50, 0.50] | [-100, 100] | [0.75, 0.25] |
| 76 | [-100, 0] | [0.50, 0.50] | [-100, 200] | [0.75, 0.25] |
| 77 | [-100, 100] | [0.50, 0.50] | [-100, 200] | [0.75, 0.25] |
| 78 | [-100, 100] | [0.50, 0.50] | [0, 100] | [0.75, 0.25] |
| 79 | [-100, 100] | [0.50, 0.50] | [0, 200] | [0.75, 0.25] |
| 80 | [-100, 100] | [0.75, 0.25] | [-100, 0] | [0.25, 0.75] |
| 81 | [-100, 200] | [0.25, 0.75] | [0, 100] | [0.25, 0.75] |
| 82 | [-100, 200] | [0.25, 0.75] | [0, 100] | [0.50, 0.50] |
| 83 | [-100, 200] | [0.25, 0.75] | [0, 100] | [0.75, 0.25] |
| 84 | [-100, 200] | [0.25, 0.75] | [0, 200] | [0.50, 0.50] |
| 85 | [-100, 200] | [0.25, 0.75] | [0, 200] | [0.75, 0.25] |
| 86 | [-100, 200] | [0.25, 0.75] | [100, 200] | [0.50, 0.50] |
| 87 | [-100, 200] | [0.25, 0.75] | [100, 200] | [0.75, 0.25] |
| 88 | [-100, 200] | [0.50, 0.50] | [0, 100] | [0.25, 0.75] |
| 89 | [-100, 200] | [0.50, 0.50] | [0, 100] | [0.50, 0.50] |
| 90 | [-100, 200] | [0.50, 0.50] | [0, 100] | [0.75, 0.25] |
| 91 | [-100, 200] | [0.50, 0.50] | [0, 200] | [0.75, 0.25] |
| 92 | [-100, 200] | [0.50, 0.50] | [100, 200] | [0.75, 0.25] |
| 93 | [-100, 200] | [0.75, 0.25] | [0, 100] | [0.25, 0.75] |
| 94 | [-100, 200] | [0.75, 0.25] | [0, 100] | [0.50, 0.50] |
| 95 | [-100, 200] | [0.75, 0.25] | [0, 100] | [0.75, 0.25] |
| 96 | [0, 100] | [0.25, 0.75] | [0, 200] | [0.50, 0.50] |
| 97 | [0, 100] | [0.25, 0.75] | [0, 200] | [0.75, 0.25] |
| 98 | [0, 100] | [0.50, 0.50] | [0, 200] | [0.75, 0.25] |
| 99 | [0, 200] | [0.25, 0.75] | [100, 200] | [0.50, 0.50] |
| 100 | [0, 200] | [0.25, 0.75] | [100, 200] | [0.75, 0.25] |
| 101 | [0, 200] | [0.50, 0.50] | [100, 200] | [0.75, 0.25] |

## Section S2: Details of logistic regression analyses

The dependent variable for both logistic regression analyses was whether the participant chose right-most card (1 = chose right card, 0 = chose left card). All predictors (both fixed and random effects) were as detailed in Table S2. Results are detailed in Table S3a and Table S3b.

*Supplementary Table S2.* Overview, mixed-effects logistic regressions of choice behaviour

| **Fixed effects** | **Participant-wise random effects** |
|---|---|
| - Intercept<br>- Block number *(z-scored)*<br>- Expected value (EV) difference between cards *(z-scored; positive = higher EV for right card, negative = higher EV for left card)*<br>- Standard deviation (SD) difference between cards *(z-scored; positive = higher SD for right card, negative = higher SD for left card)*<br>- $Z_{within}$ *(within-person emotional valence as defined in the main text)*<br>- $Z_{between}$ *(between-person emotional valence as defined in the main text)*<br>- Outcome of previous trial (*z-scored*)<br>- EV difference × $Z_{within}$<br>- EV difference × $Z_{between}$<br>- EV difference × outcome of previous trial<br>- SD difference × $Z_{within}$<br>- SD difference × $Z_{between}$<br>- SD difference × outcome of previous trial | - Random intercept<br>- Random slopes for:<br>  - Block number<br>  - EV difference<br>  - SD difference<br>  - $Z_{within}$<br>  - EV difference × $Z_{within}$<br>  - EV difference × outcome of previous trial<br>  - SD difference × $Z_{within}$<br>  - SD difference × outcome of previous trial |

*Supplementary Table S3a.* Logistic regression analysis results, Exp. 1

| **Coefficient** | ***β* (SE)** | **95% Bayesian HDI** | |
|---|---|---|---|
| Intercept | 0.11 (0.02) | [0.07, 0.14] | * |
| Block number | 0.03 (0.02) | [-0.002, 0.06] | |
| EV difference | 1.71 (0.04) | [1.63, 1.80] | * |
| SD difference | 0.41 (0.05) | [0.32, 0.50] | * |
| $Z_{within}$ | 0.01 (0.01) | [-0.02, 0.04] | |
| $Z_{between}$ | -0.03 (0.02) | [-0.07, -0.003] | * |
| Outcome of previous trial | 0.01 (0.01) | [-0.02, 0.04] | |
| EV difference × $Z_{within}$ | -0.01 (0.02) | [-0.04, 0.03] | |
| EV difference × $Z_{between}$ | -0.02 (0.04) | [-0.10, 0.06] | |
| EV difference × outcome of previous trial | 0.04 (0.02) | [-0.004, 0.07] | |
| SD difference × $Z_{within}$ | -0.06 (0.02) | [-0.09, -0.03] | * |
| SD difference × $Z_{between}$ | -0.07 (0.05) | [-0.17, 0.02] | |
| SD difference × outcome of previous trial | -0.06 (0.02) | [-0.09, -0.03] | * |

Note: * denotes coefficients for which the Bayesian 95% HDI excludes zero

*Supplementary Table S3b.* Logistic regression analysis results, Exp. 2

| Coefficient | **$\beta$ (SE)** | **95% Bayesian HDI** | |
|---|---|---|---|
| Intercept | 0.11 (0.01) | [0.08, 0.18] | * |
| Block number | 0.01 (0.01) | [-0.01, 0.04] | |
| EV difference | 1.81 (0.04) | [1.74, 1.89] | * |
| SD difference | 0.48 (0.04) | [0.41, 0.55] | * |
| $Z_{within}$ | 0.01 (0.01) | [-0.02, 0.03] | |
| $Z_{between}$ | 0.01 (0.01) | [-0.02, -0.04] | |
| Outcome of previous trial | -0.01 (0.01) | [-0.03, 0.02] | |
| EV difference × $Z_{within}$ | 0.01 (0.02) | [-0.02, 0.04] | |
| EV difference × $Z_{between}$ | -0.05 (0.03) | [-0.12, 0.01] | |
| EV difference × outcome of previous trial | -0.01 (0.02) | [-0.04, 0.03] | |
| SD difference × $Z_{within}$ | -0.04 (0.01) | [-0.06, -0.01] | * |
| SD difference × $Z_{between}$ | -0.04 (0.04) | [-0.12, 0.04] | |
| SD difference × outcome of previous trial | -0.09 (0.01) | [-0.11, -0.06] | * |

Note: * denotes coefficients for which the Bayesian 95% HDI excludes zero

The majority of these coefficients are discussed in the main text; of those that are not, the finding that the intercept coefficient was significantly different from zero in both experiments indicates that participants showed a slight overall preference for choosing the choice option displayed on the right side of the screen. The significant main effect of $Z_{between}$ in Experiment 1 indicates that the tendency for choosing the rightmost choice option was weaker in strength among participants who reported more positive affect on average; however, this main effect of $Z_{between}$ was not replicated in Experiment 2.

**Section S3: brms syntax for logistic regression analyses**

```
choice ~
      ## FIXED EFFECTS
      1 + scale(block) + scale(gamble_mean_diff) + scale(gamble_stdev_diff)
      + z_within + z_between + scale(prev_outcome) +
      z_within:scale(gamble_mean_diff) + z_between:scale(gamble_mean_diff)
      + scale(prev_outcome):scale(gamble_mean_diff) +
      z_within:scale(gamble_stdev_diff) +
      z_between:scale(gamble_stdev_diff) +
      scale(prev_outcome):scale(gamble_stdev_diff) +
      ## RANDOM EFFECTS
      (1 + scale(block) + scale(gamble_mean_diff) +
      scale(gamble_stdev_diff) + scale(prev_outcome) +
      z_within | id)
```

The choice variable was a Bernoulli variable denoting whether the participant chose the left card (choice = 0) or the right card (choice = 1). Other variables were as defined in Section S2 above. All analyses used default priors as implemented in brms (version 2.16.3).

## Section S4: Model recovery analysis

To assess model recovery, we simulated 50 datasets of 200 participants each from each of the four models in Table 1. Group-level parameter distributions for simulated data were given by the estimated posterior distributions for each parameter in our actual data, and emotion self-reports were generated by bootstrapped resampling of emotion self-reports.

We then fit all four models to each dataset and identified the best-fitting model according to the model selection procedure described in the main text. That is, models were compared on the basis of the WAIC statistic, with models with a ΔWAIC score within one standard error of the numerically best-fitting model treated as statistically equivalent and ties broken according to model complexity. We then computed the proportion of datasets in which the generative model was also identified as the best-fitting model (higher numbers denote better model recovery). The results of this analysis (Figure R1) indicated that models showed excellent model recovery overall (model recovery scores over 0.8 for all models and over 0.9 for three of the four).

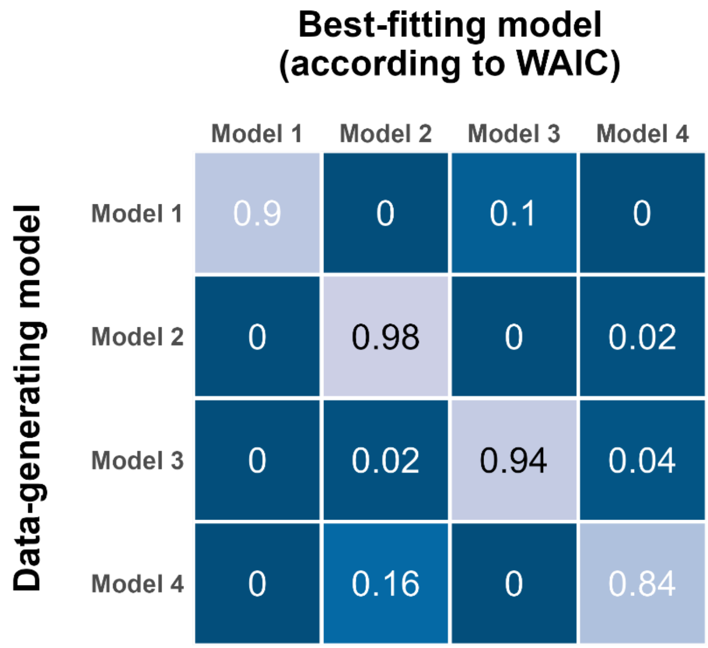


*Figure R1*. Results of model recovery analysis for simulated data. Rows indicate the model that was used to generate the data, and columns the best-fitting model as a proportion of 50 simulated datasets. Good model recovery performance is indicated by a high proportion of best-fitting models on the diagonal of the matrix. Model numbers are as per Table 1 in the main text.

## Section S5: Parameter recovery analysis

To assess the recoverability of parameters from the best-fitting model (Model 4), we simulated an additional dataset of 200 participants according to the method described in Section S4 above. We then assessed the recoverability of model parameters, both for group-level parameters (Table S4) and for participant-level parameters (Figure R2).

*Table S4.* Parameter recovery results for group-level parameters

| Parameter | Generative group-level mean | Estimated group-level mean [95% HDI] |
|---|---|---|
| $\lambda$ | 2 | 1.99 [1.86, 2.14] |
| $\rho$ | 0.7 | 0.71 [0.66, 0.76] |
| $\beta$ | 0.04 | 0.04 [0.03, 0.05] |
| $\Delta\lambda(within)$ | 0.2 | 0.11 [0.02, 0.19] |
| $\Delta\rho(within)$ | -0.04 | -0.03 [-0.05, -0.02] |

Table S4 demonstrates that all group-level parameters were well-recovered in the parameter recovery analysis, with the slight exception of $\Delta\lambda(within)$, which was slightly underestimated (though still identified as statistically significant). This is crucial, since these group-level parameter estimates were the primary focus of our main research questions.

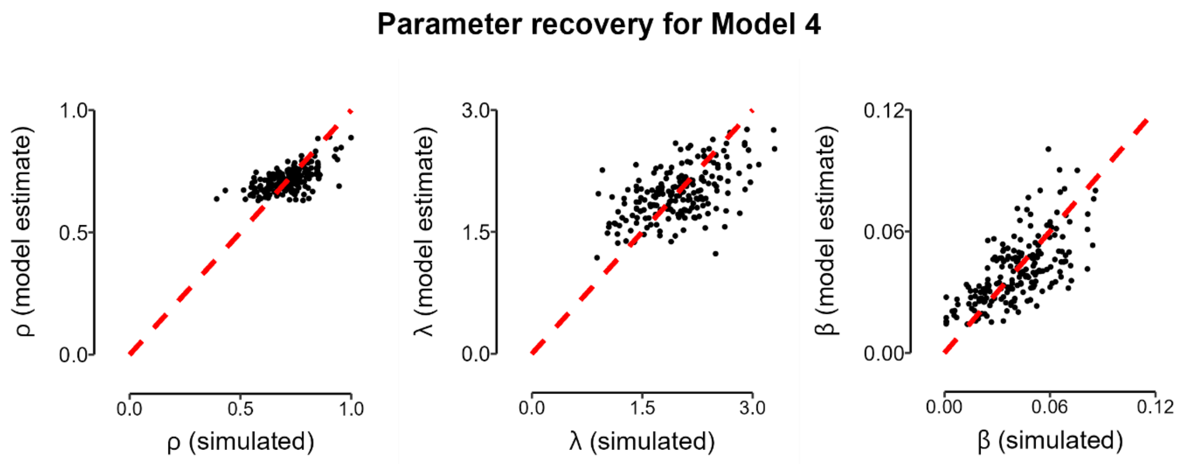


*Figure R2.* Parameter recovery results for participant-level parameters from Model 4. In perfect parameter recovery, all points would fall on the dashed diagonal line.

Figure R2 illustrates that participant-level parameters showed reasonable levels of recoveryability, as measured by the strength of correlation between simulated and recovered parameters (for $\rho$: $r = 0.62$, $p < .001$; for $\lambda$: $r = 0.65$, $p < .001$; for $\beta$: $r = 0.62$, $p < .001$).