**Behavior analysis of VNI data**

**Updated 11/11/20 HRB – but most of this has not been updated (everything in red needs to be updated).**

Some basics:

N=48

4 participants excluded (subs 13, 16, 42, 43; see QA document for details)

Gender (still need to update this – create a file with participant information instead of getting it from google drive)

* 27 females
* 11 males
* 1 non-binary

Age

* Mean (sd) = 24(4.5), median = 23
* Range = 18-31 years

Missed trials:

* 84 missed trials across 24 participants
* Mean = 1.75 trials; range = 0-11; median = .5
* None of the trials were consecutive missed trials

After removing 84 trials, we have 10,428 trials across 48 participants and participants have 208-219 trials.

P(gamble)

* Mean = .44; range = .13-.71

**INDIVIDUAL-LEVEL ANALYSES (Have not updated this on 11/11)**

Individual-level analyses of past outcome effect:

1. Run a trial-level model for each participant (choicet ~ gain, safe, ground EVt)
2. Regress residuals from step 1 on to past outcome
3. Result summary
   1. After accounting for trial-level effects (gain, safe, EV), there are 4 participants showing significant effects of past outcome (3 with positive betas, 1 with negative beta). There are 4 additional participants with trending effects of past outcome (3 with positive betas, 1 with negative beta). I also ran a trial-level model with just gain and safe (because ground EV was causing some weird patterns for some participants in those individual-level trial-level glms) and the results are similar but now there are 4 participants showing significant effects of past outcome (3 positive, 1 negative) and 6 participants with trending effect of past outcome (4 positive, 2 negative).
   2. Figure of each participants’ past outcome estimate on drive in VNI folder (VNI/analysis/mriBehaviorAnalysis/figures/indivPOCestimates.pdf) where blue dots are trending, green are significant and black is neither.

**GROUP-LEVEL ANALYSES**

1. Trial-level model (glmer)
   1. Choicet ~ 0 + risky gaint + safet + ground EVt + (0 + risky gaint + safet |subID)

AIC = 6349.5

gainSC 17.367 2.184 7.954 1.81e-15 \*\*\*

altSC -42.253 4.297 -9.834 < 2e-16 \*\*\*

grndEVscaled 5.210 5.911 0.881 0.378

* 1. Residuals: mean = -.002, range= -.999251 to +.999882
  2. Risky gain and safe significant in expected directions and model unsurprisingly performs well where mean residuals are near 0, but this varies trial-by-trial as range of residuals is -1 to +1.

1. Does past outcome amount account for residual risk-taking? (lmer)
   1. Residualst ~ 0 + outcomet-1 + (1|subID)

AIC = 5259.2

Outcomet-1 beta = 9.916e-03(1.115e-02), p = 0.375

* 1. No effect of past outcome. This is surprising given what we’ve seen in other datasets. Perhaps a result of our design (e.g. we have a mixture of “easy” vs. “hard” choices, is the outcome effect only useful for “hard” choices?).

1. What about past outcome type? (safe = 0; win = 1; loss = -1; lmer)
   1. AIC = 5257.4
   2. Outcomet-1 type = beta = .009(.005), p=.11
   3. No effect of past outcome type
2. Does shift account for residual risk-taking? (lmer)
   1. In previous datasets, we’ve seen a short-lasting, asymmetric effect of positive shift amount where the first trial following a shift we see more risk-taking following a positive shift (but not a negative shift).
   2. Ran several models looking at signed shift, absolute shift, positive and negative shift, and whether a positive and negative shift occurred and found no effect.
3. Does run size preceding a shift interact with shift to account for residual risk-taking? (lmer)
   1. Ran several models, we interacted run size preceding a signed shift, absolute shift, positive and negative shift.
   2. Not seeing any interactions.
   3. Only seeing an effect of run size preceding a negative shift and the effect of run size is strongest when in a model with negative shift with no interaction:

AIC = 5334.4

shiftDiffscNEG 3.775e-01 1.704e-01 8.473e+03 2.216 0.0267 \*

runSizeNEG 7.031e-03 2.854e-03 8.490e+03 2.464 0.0138 \*

* + - No interaction between negative shift and run size following negative shift
  1. Looks like run size preceding a shift is doing something, but what? What is the run size preceding a negative shift accounting for if it is not related to negative shift but is strongest in a model with negative shift? why is the interaction not significant then? and why is run size preceding negative shift not significant on its own in a model.

1. Do earnings account for residual risk-taking (accounting for trial)? (lmer)
   1. Max earnings range from $3270 to $3938; mean = $3550; median = $3508
   2. Model 1: earnings and trial only

AIC = 5322.1

earningsSC 0.005734 0.001439 122.296776 3.985 0.000115 \*\*\*

trialSC -0.317238 0.082960 118.700237 -3.824 0.000211 \*\*\*

* 1. Model 2: add negative shift amount and run size preceding negative shift since these were significant above:

AIC = 5320.3

earningsSC 5.753e-03 1.440e-03 1.211e+02 3.994 0.000112 \*\*\*

trialSC -3.187e-01 8.301e-02 1.175e+02 -3.840 0.000200 \*\*\*

shiftDiffscNEG 3.957e-01 1.702e-01 8.461e+03 2.325 0.020113 \*

runSizeNEG 6.610e-03 2.857e-03 8.457e+03 2.314 0.020713 \*

* 1. Model 3: we’ve seen an interaction between past outcome and earnings in the past, do we see this here (even though poc was n.s. in model alone)?

AIC = 5221.2

earningsSC 4.428e-03 1.442e-03 1.292e+02 3.071 0.002605 \*\*

poc1scaled -8.315e-02 2.166e-02 1.060e+03 -3.839 0.000131 \*\*\*

trialSC -2.674e-01 8.240e-02 1.273e+02 -3.245 0.001500 \*\*

shiftDiffscNEG 3.888e-01 1.697e-01 8.424e+03 2.292 0.021950 \*

runSizeNEG 6.783e-03 2.845e-03 8.421e+03 2.384 0.017134 \*

earningsSC:poc1scaled 3.486e-03 7.113e-04 2.291e+03 4.901 1.02e-06 \*\*\*

* 1. Model 4: add an interaction between trial and poc

AIC = 5219.5

Interaction between trial and past outcome is trending and now neither earnings or trial have main effect

* 1. Earnings and trial are both significant but have opposing effects that hold up in a model with negative shift amount and run size preceding a negative shift. Interestingly, adding past outcome to the model and interacting it with earnings shows effects we’ve seen before where the past outcome effect is negative and interacts with cumulative earnings.
  2. Figures for outcome x earnings effects in figures folder