## Extending material

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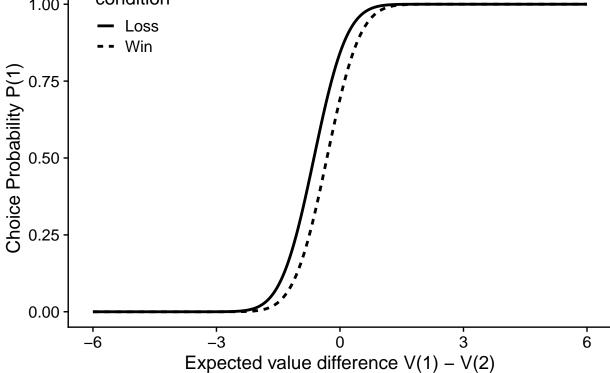
### Expected results

#### Conditions

I supposed that losing condition will lead to more direct exploration. That will yield a result that higher w2 in losing condition than in wining condition.

However, I am not really sure about whether we should suppose it, especially, when we control the risk aversion. It has a fair chance that the framing effect (wining/losing condition) have nothing to do with exploration.

# Hypothetical result of winning and losing condition 1.00 condition



As previous study found that the relative risk in RR condition will be close to 0, I supposed there will be a different intercept between SR and RR condition. The TU is set to the real value of variance in the population. Based on the definition of TU:  $TU = \sqrt{(\sigma_1^2 + \sigma_2^2)}$ , in our experiment, the TU in RR is actually smaller than in SR condition. The TU is SR is

```
rr <- c(-1,-1,-1,0,0,0,0,0,1,1,1) 
 sr <- c(1,2,3,3,4,4,4,4,5,5,6,7) 
 V_rr <- var(rr) * 12/11 # using the variance of the population instead of the unbiased estimator 
 <math>V_sr <- var(sr) * 12/11 
 sqrt(V_sr + 0)
```

## [1] 1.724879

Whereas the TU in RR is

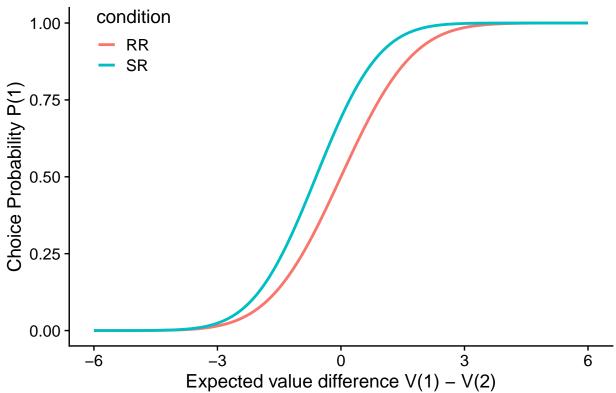
```
sqrt(2 * V_rr)
```

## [1] 1.090909

Those are not real TU, as the TU should be estimated during subjects' decision making. However, it is a little bit tricky to explain the setting. We may need to discuss it later. For now, I will use the real value of variance in the population in the following simulation.

I setted same w3 for RR and SR. However, the slop is different due to the different TU.



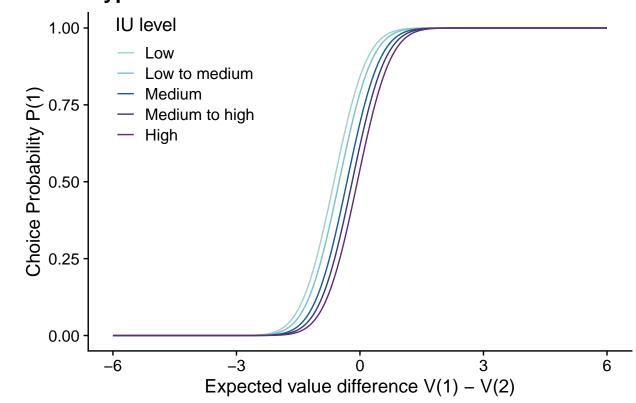


### Individual difference

#### Intolerance of Uncertaint (IU)

H1: High IU lead to less direct exploration

## Hypothetical result of IU level



#### Impulsiveness (IM)

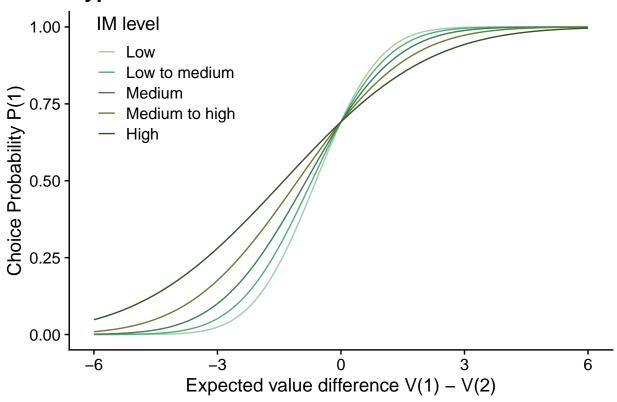
H2: High IM will lead to more random exploration

Notice: the sign of w3 is changed to negative.

The hybride model is a function with 3 variables, the w3 is actually a slop of the total uncertainty (TU). By fixed the TU, the comparison of w3 will be anti-intuitive. A higher w3 will lead to a steep slop of value. Therefore, for convenience, I changed the sign of w3.

Please let me know if you have any suggestions.

## Hypothetical result of IM level



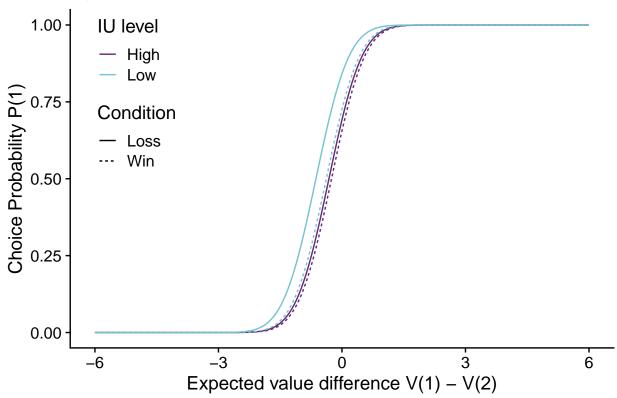
## Interactions

#### IU x Win/Loss

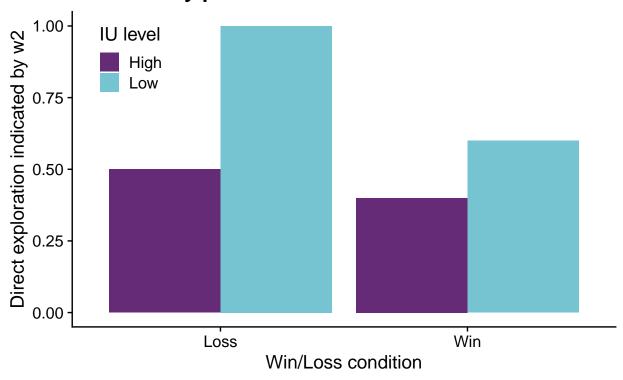
H3: In loss condition, participates with lower IU will show a similar level of direct exploration compared to participates with higher IU. In win condition, participates with lower IU will show a greater increase in direct exploration compared to participates with higher IU.

Although I lake of the evidence to support the hypothesis of framing effect, there are some evidence support the interaction between IU and win/loss condition. As the IU is supposed to show overestimation of the probability of negative events, the losing condition will lead to more direct exploration.

## Hypothetical result of IU level and win/loss interaction



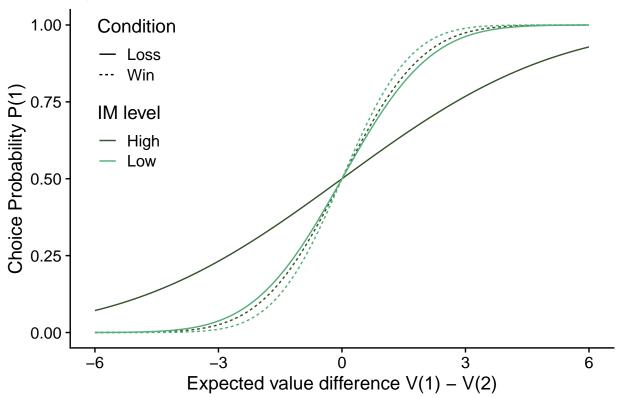
## Hypothetical result of IU level and win/loss interaction indicated by parameter



### IM x Win/Loss

H4: In win condition, participates with higher IM will show a small higher random exploration compared to participates with lower IM In loss condition, participates with higher IM will show a greater increase in random exploration compared to participates with lower IM.

## Hypothetical result of IM level and win/loss interaction



## Hypothetical result of IM level and win/loss interaction indicated by parameter

