

# Extending material

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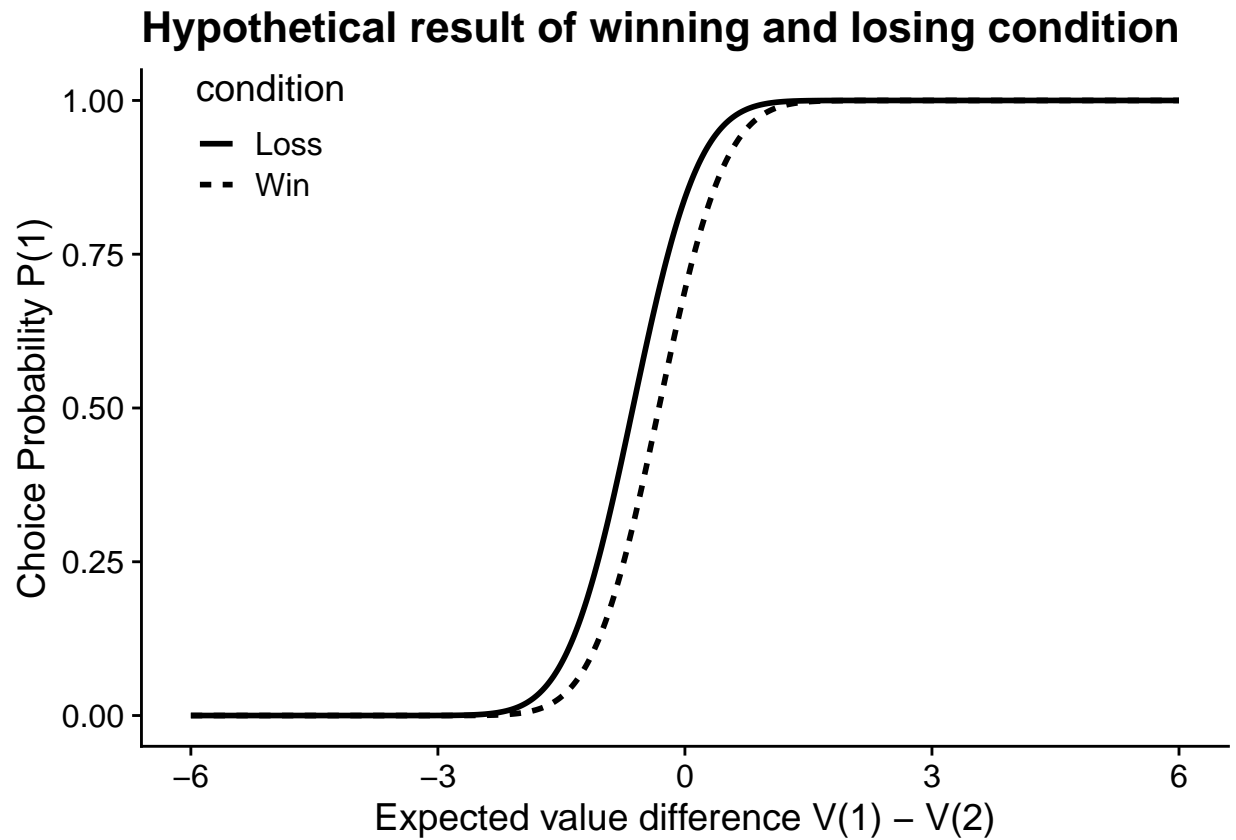
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## Expected results

### Conditions

I supposed that losing condition will lead to more direct exploration. That will yield a result that higher  $w_2$  in losing condition than in winning 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 (winning/losing condition) have nothing to do with exploration.



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,-1,0,0,0,0,0,0,1,1,1)
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
V_sr <- var(sr) * 12/11
sqrt(V_sr + 0)
```

```
## [1] 1.724879
```

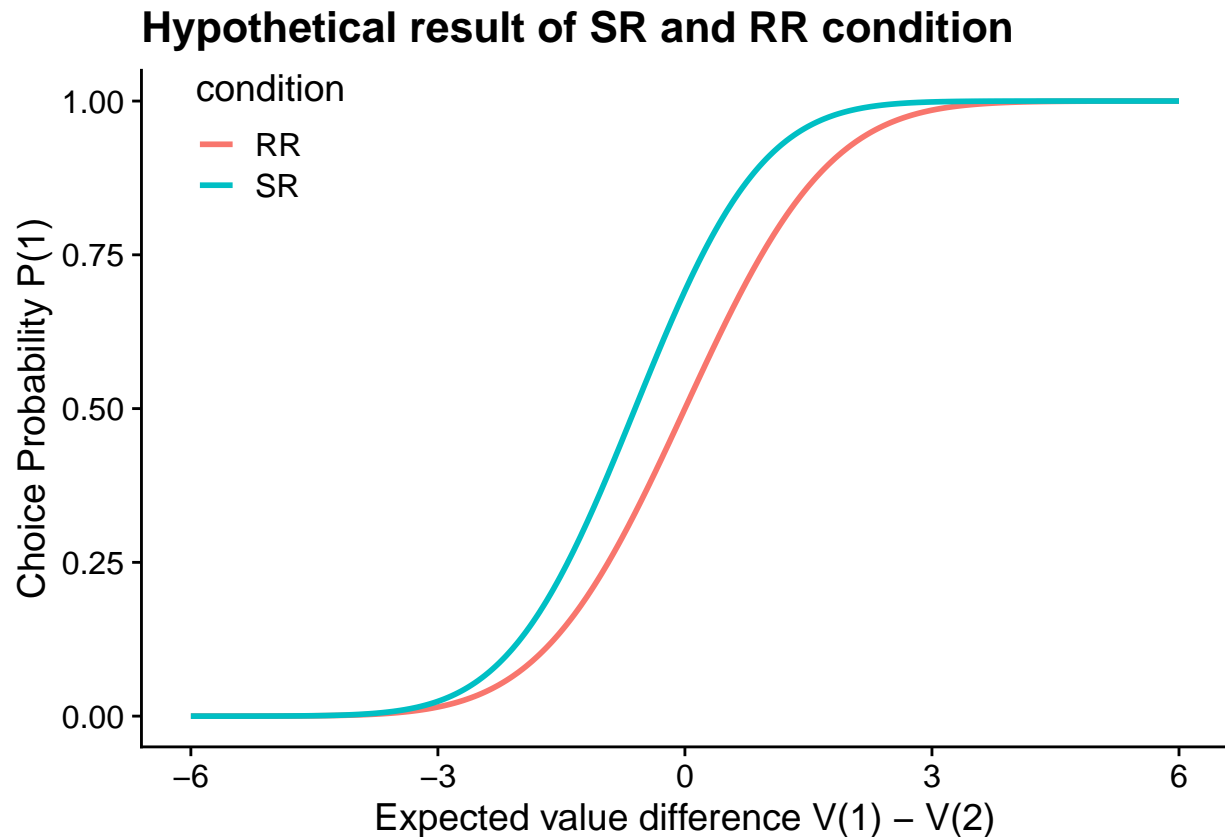
Whereas the TU in RR is

```
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.

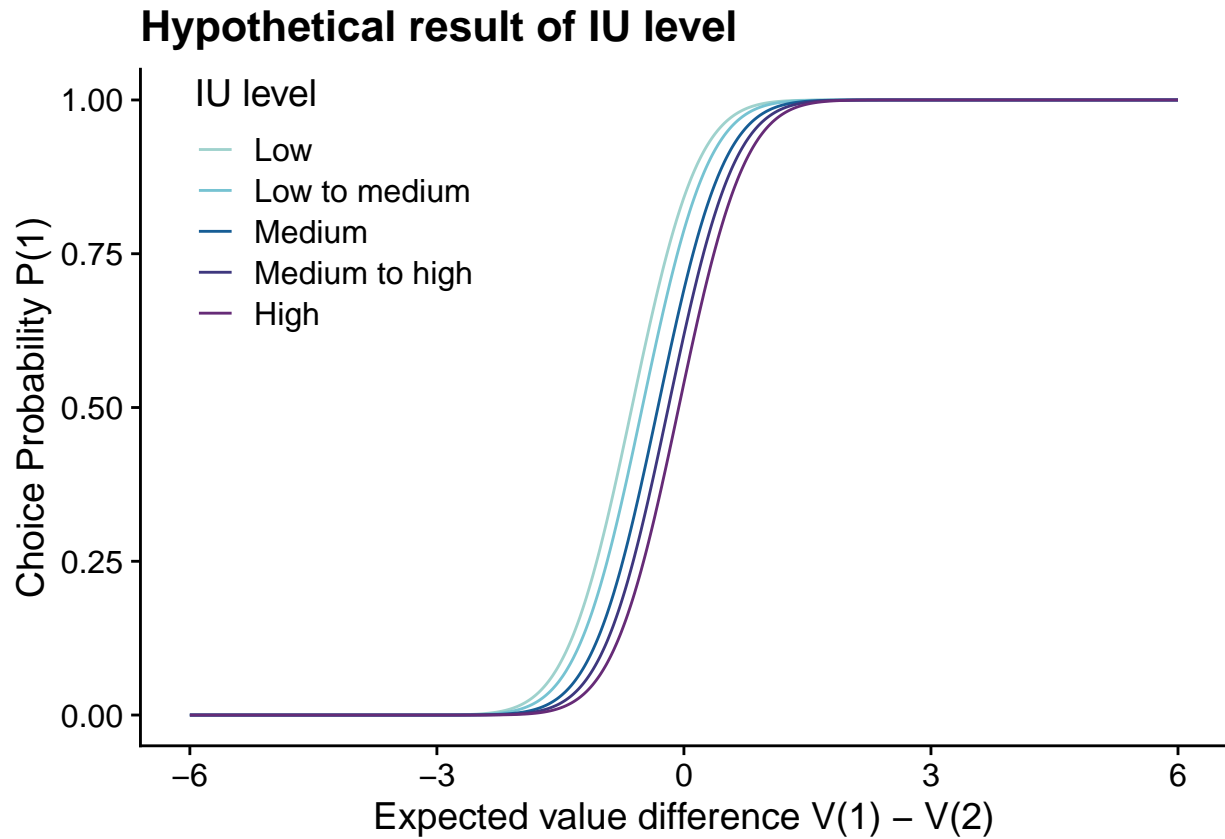
I setted same  $w_3$  for RR and SR. However, the slop is different due to the different TU.



## Individual difference

### Intolerance of Uncertainty (IU)

H1: High IU lead to less direct exploration



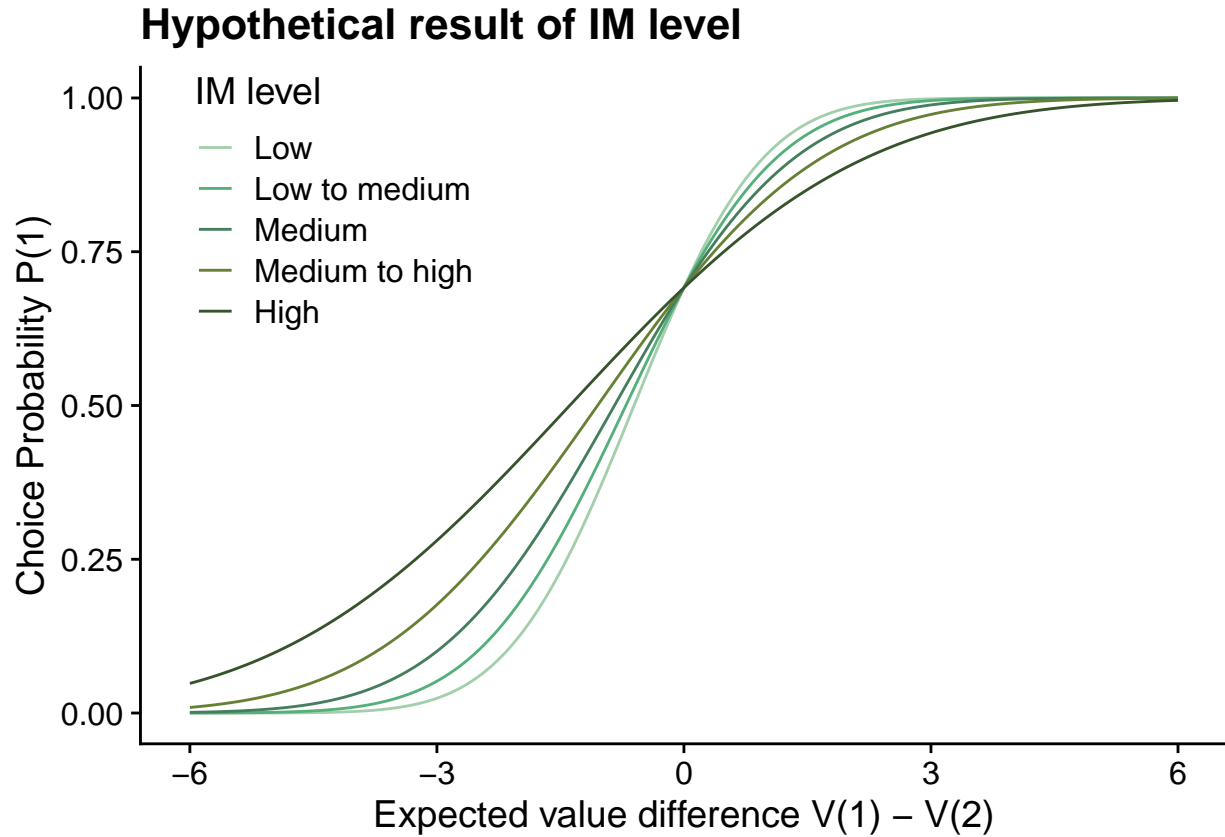
### Impulsiveness (IM)

H2: High IM will lead to more random exploration

Notice: the sign of  $w_3$  is changed to negative.

The hybride model is a function with 3 variables, the  $w_3$  is actually a slop of the totel uncertainty (TU). By fixed the TU, the comparison of  $w_3$  will be anti-intuitive. A higher  $w_3$  will lead to a steep slop of value. Therefore, for convenience, I changed the sign of  $w_3$ .

Please let me know if you have any suggestions.

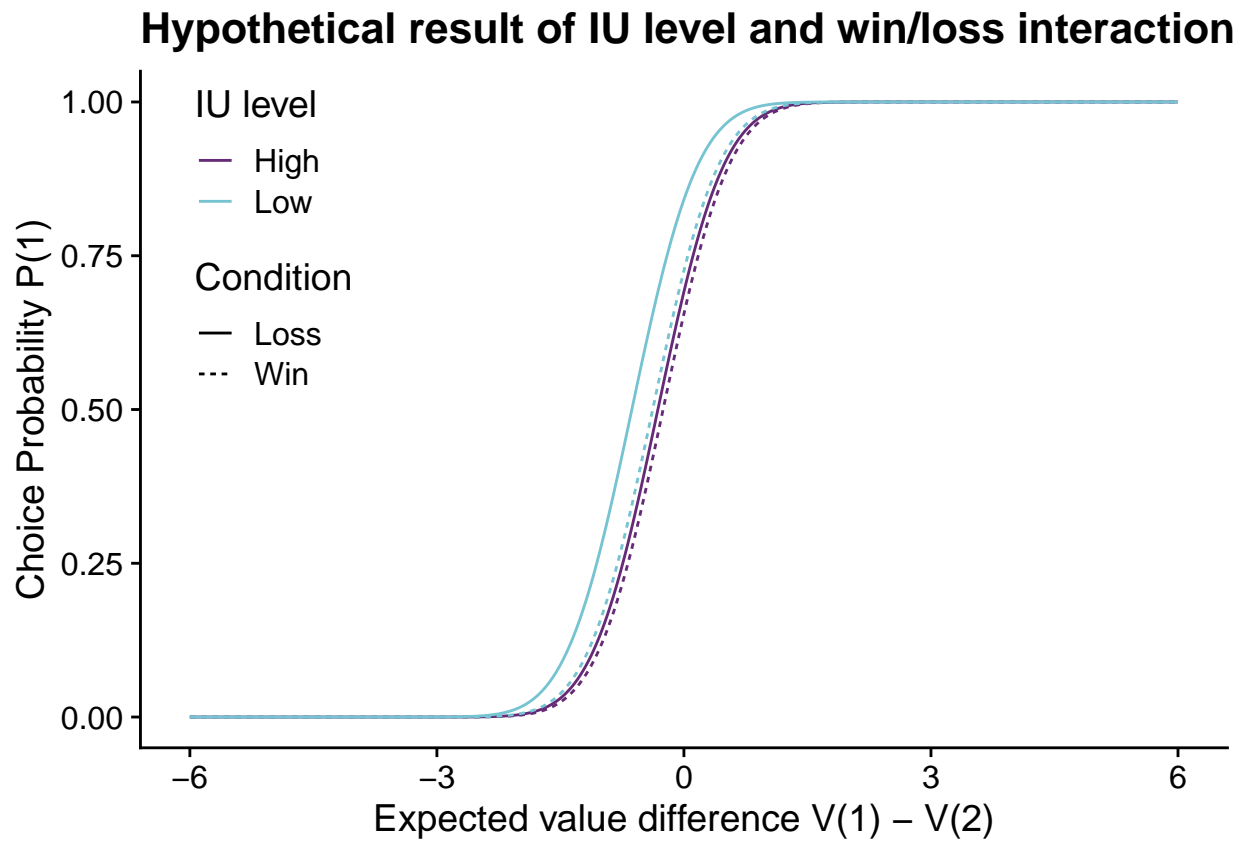


## Interactions

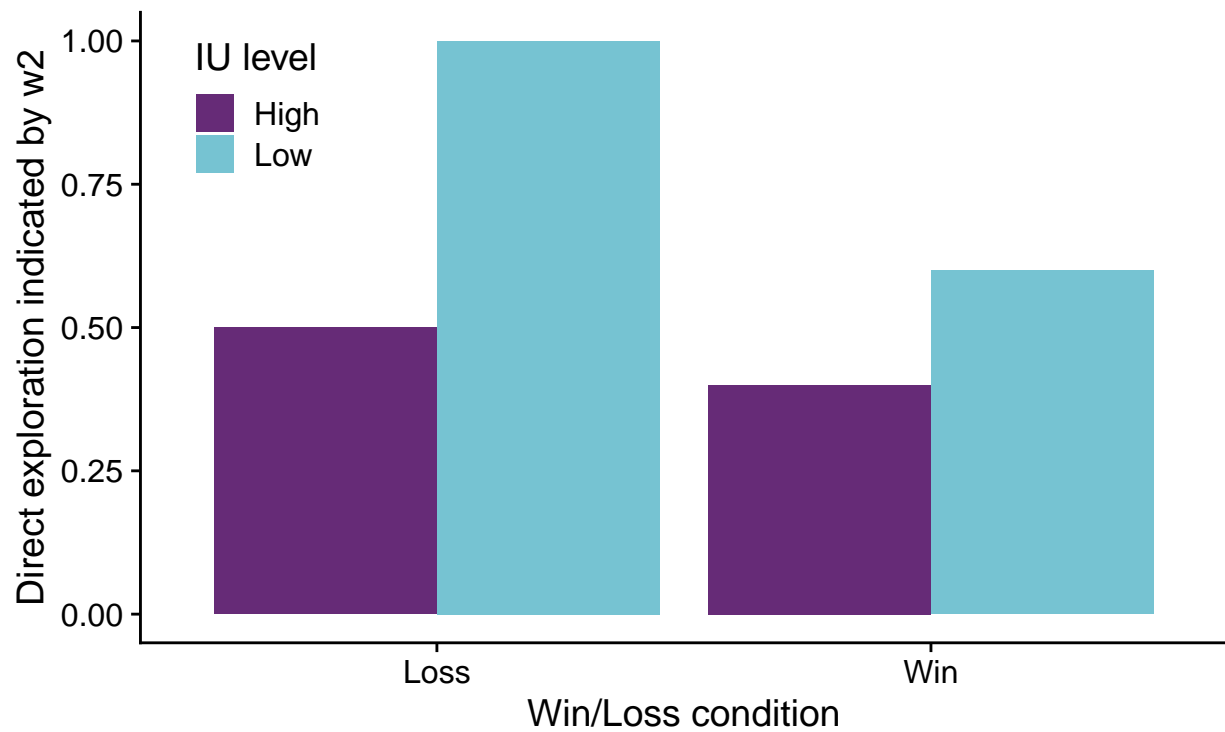
### IU x Win/Loss

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

Although I lack 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.

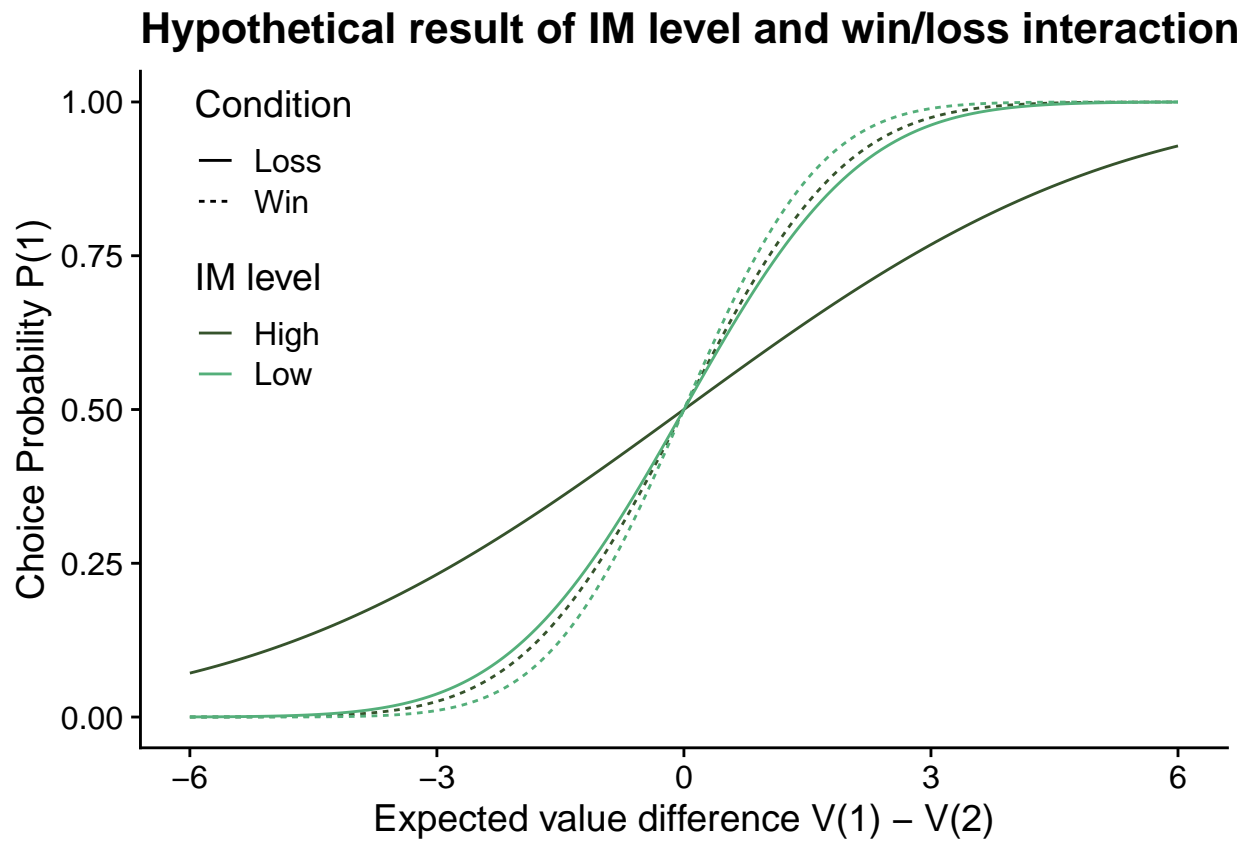


### Hypothetical result of IU level and win/loss interaction indicated by parameter



#### IM x Win/Loss

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



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

