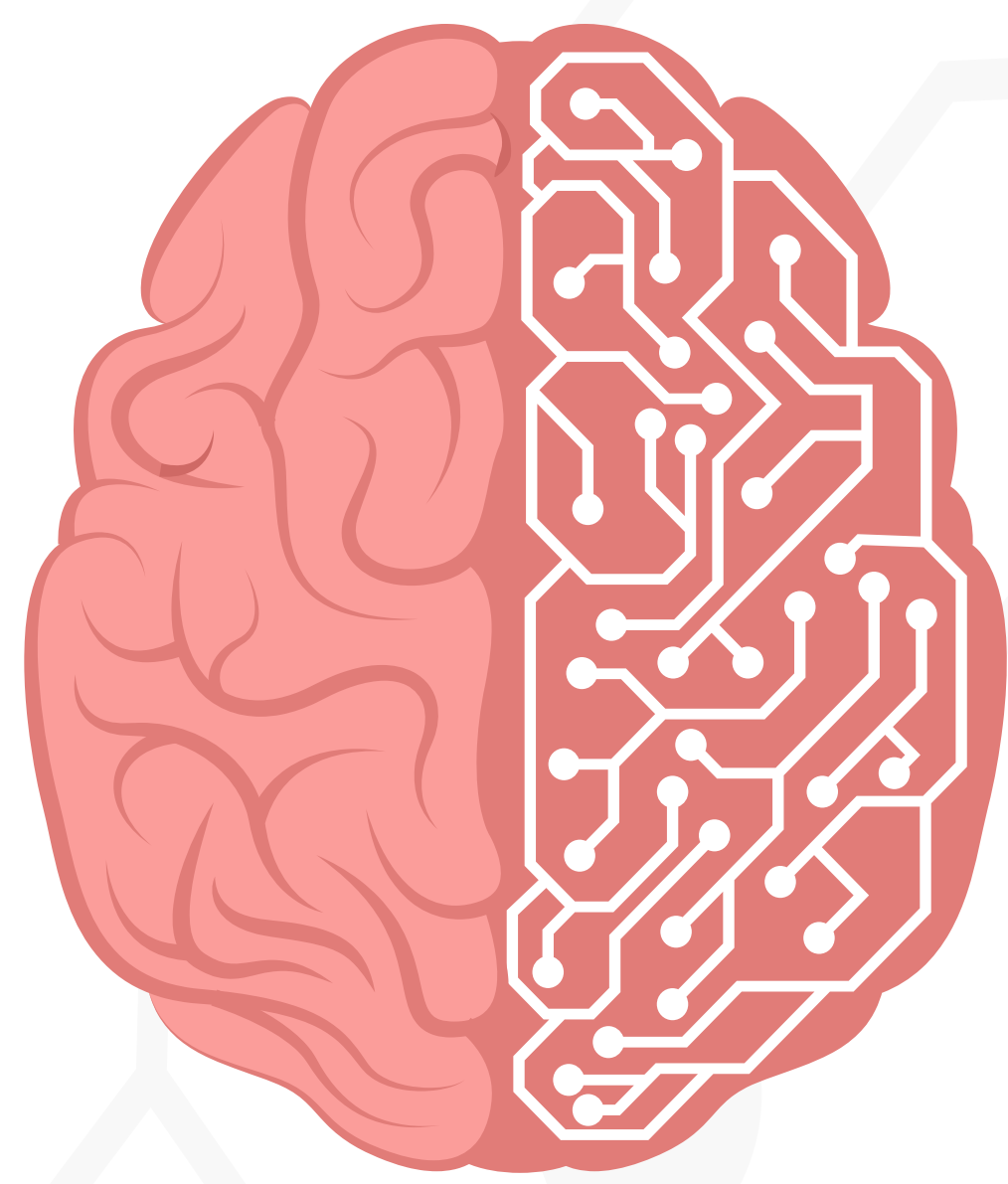


# The functional roles of right DLPFC and VMPFC in risk-taking behavior

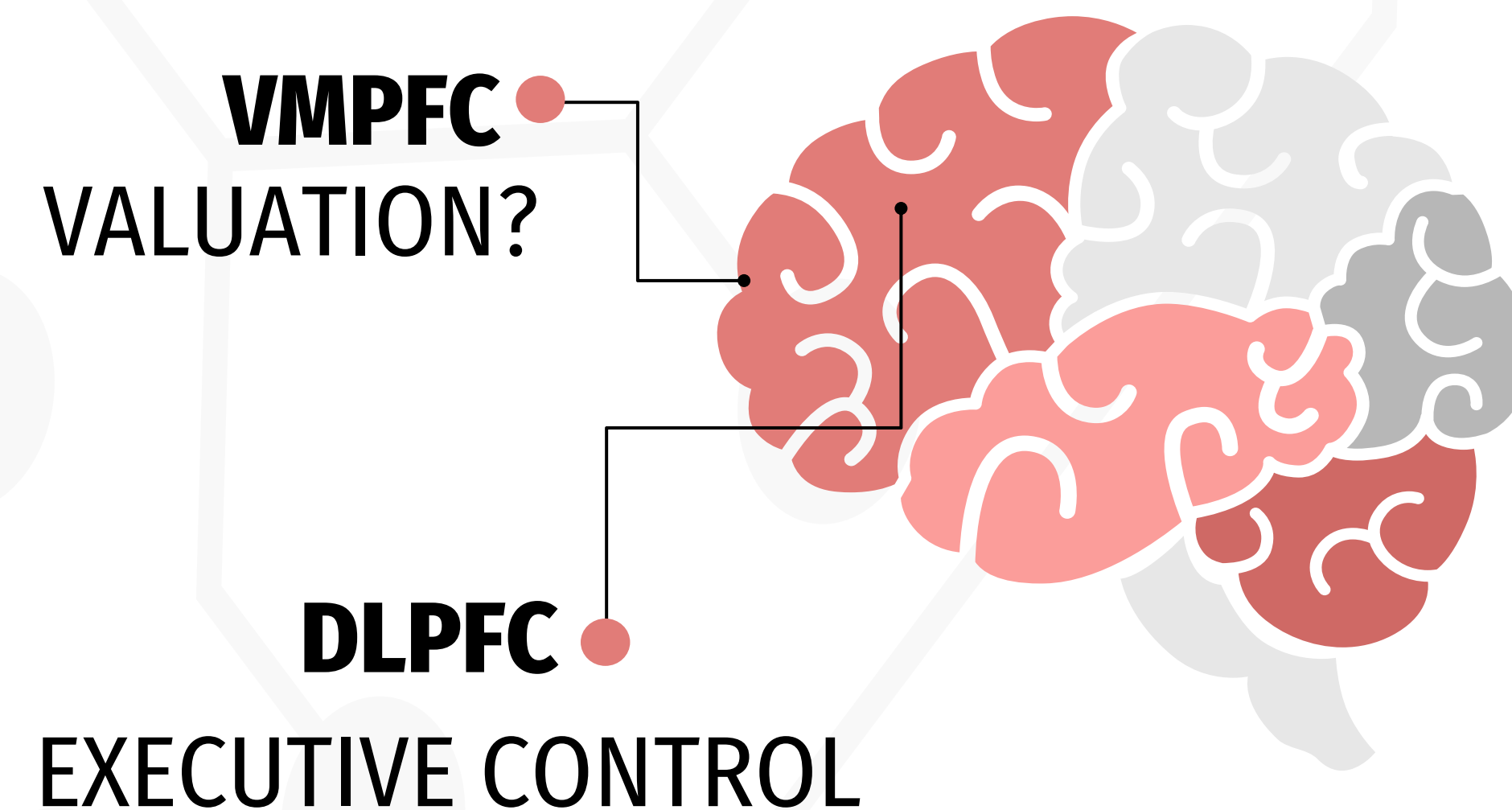
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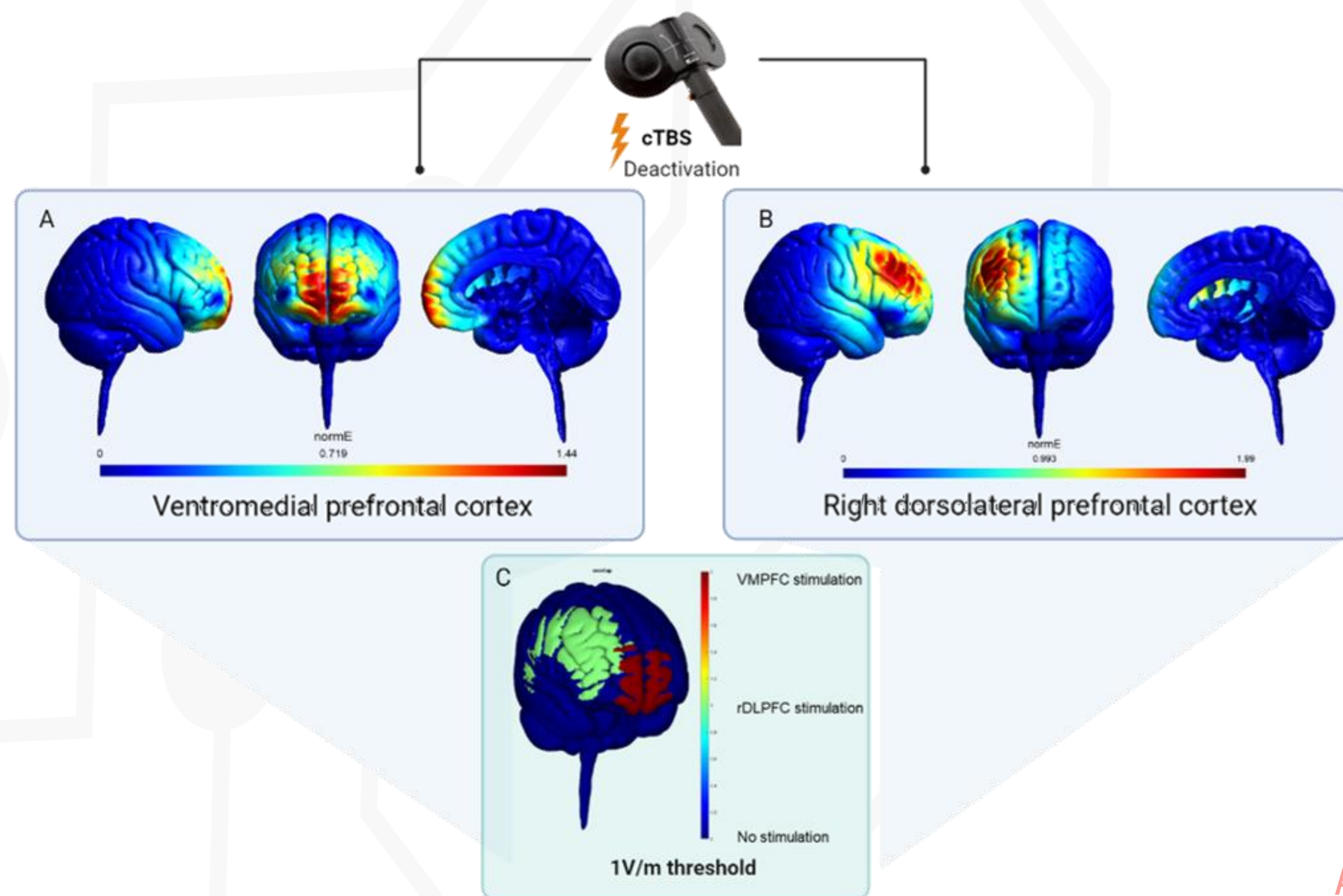


## 01. Introduction

Risk-taking behavior is part of a decision process that has been associated with activity changes in specific prefrontal regions of the brain, including the ventromedial prefrontal (VMPFC) and the dorsolateral prefrontal cortex (DLPFC) [1-3]. Two important aspects of the risk-taking behavior modulation are valuation and executive control. While the role of the DLPFC in executive control is well-established, the role of the VMPFC in valuation is yet to be confirmed [4].



## 02. Methods



### Stimulation:

Continuous theta burst stimulation (cTBS) using a MagVenture x100 stimulator, and COOL DB80 coil.

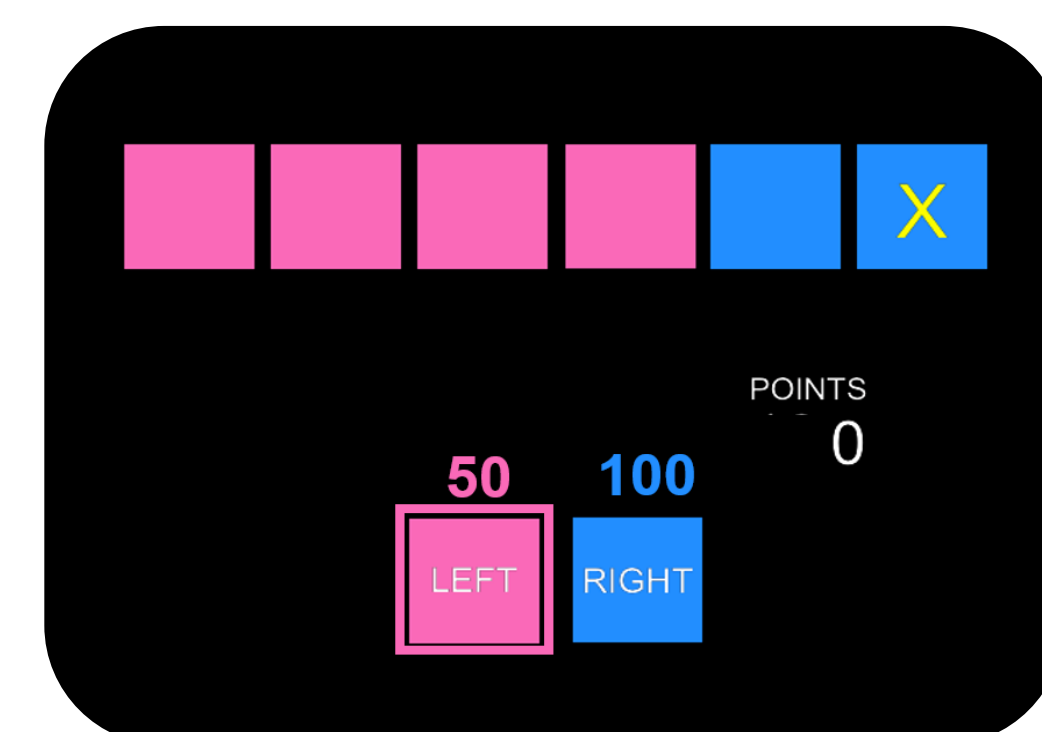
### Location:

- Right DLPFC (F4)
- VMPFC (Fpz)
- Sham

### Intensity:

100% of resting motor threshold.

**Maastricht Gambling Task (MGT)**  
Adapted from the original version of the Risk task (Rogers et al., 1999), the MGT controls for loss aversion and memory effects with independent trials [5].



### DESIGN

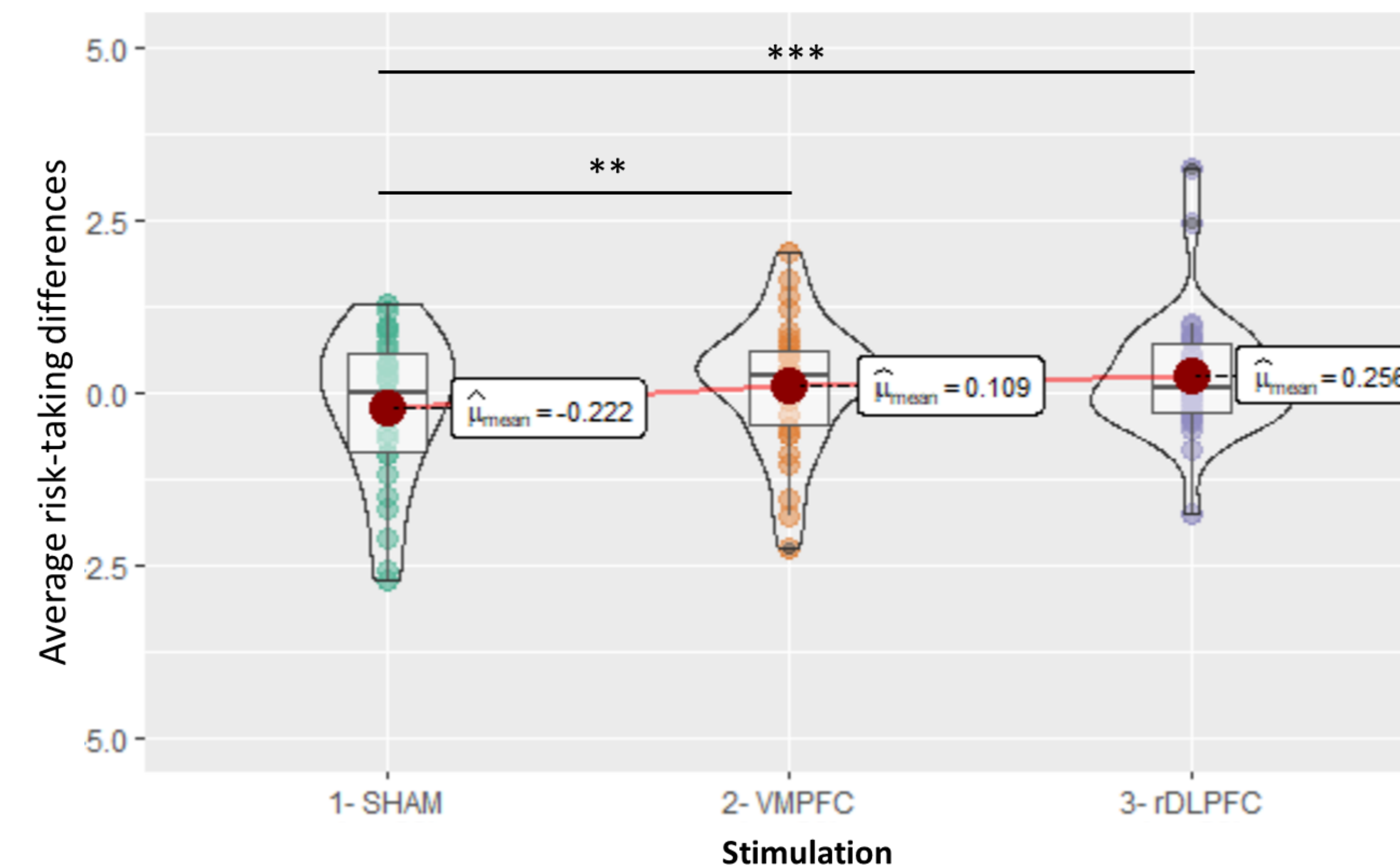
Session 1	Session 2	Session 3
VMPFC cTBS + MGT	DLPFC cTBS + MGT	Sham + MGT
Participants		Gender
30		18 female

### References.

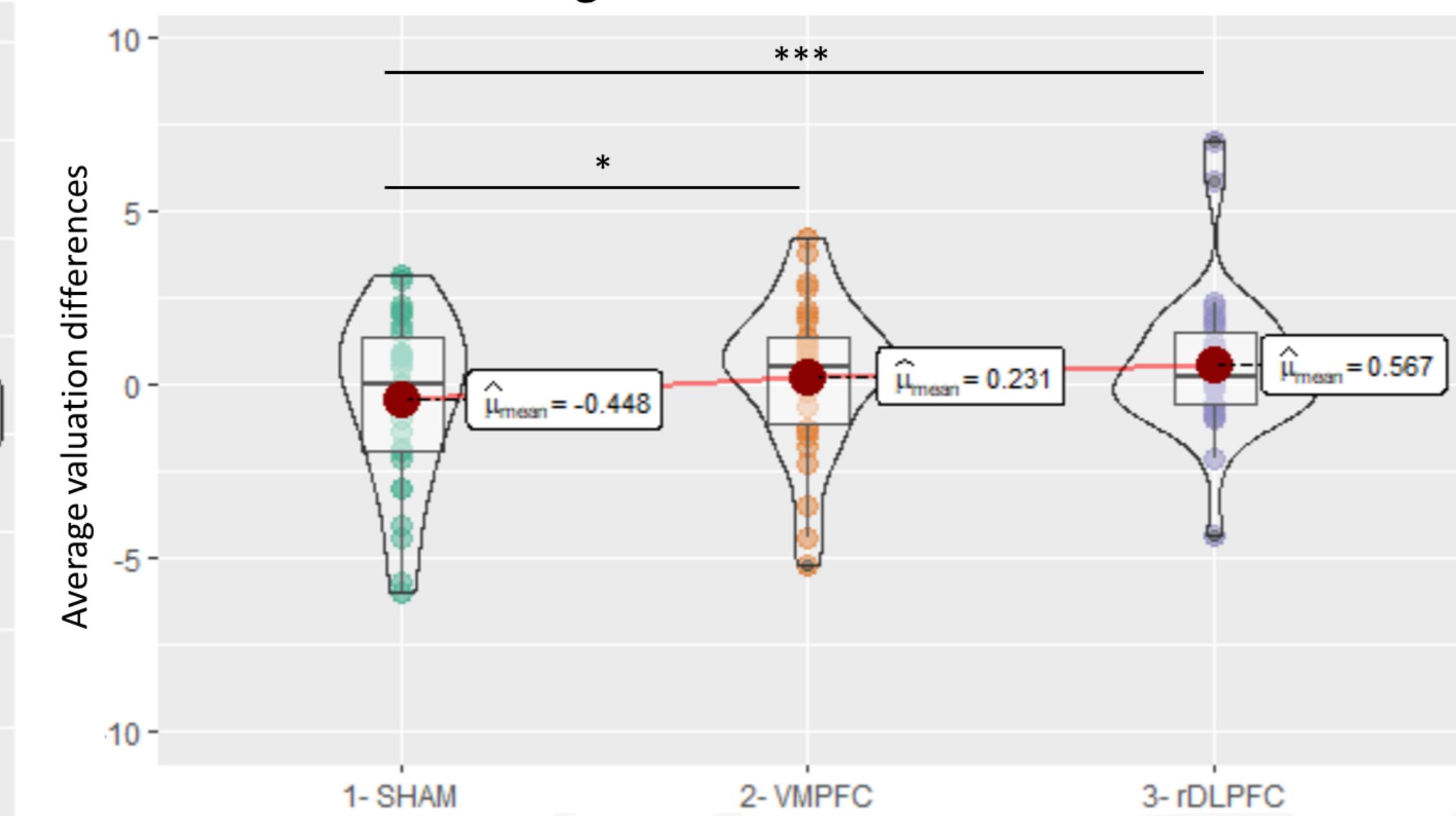
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## 03. Results

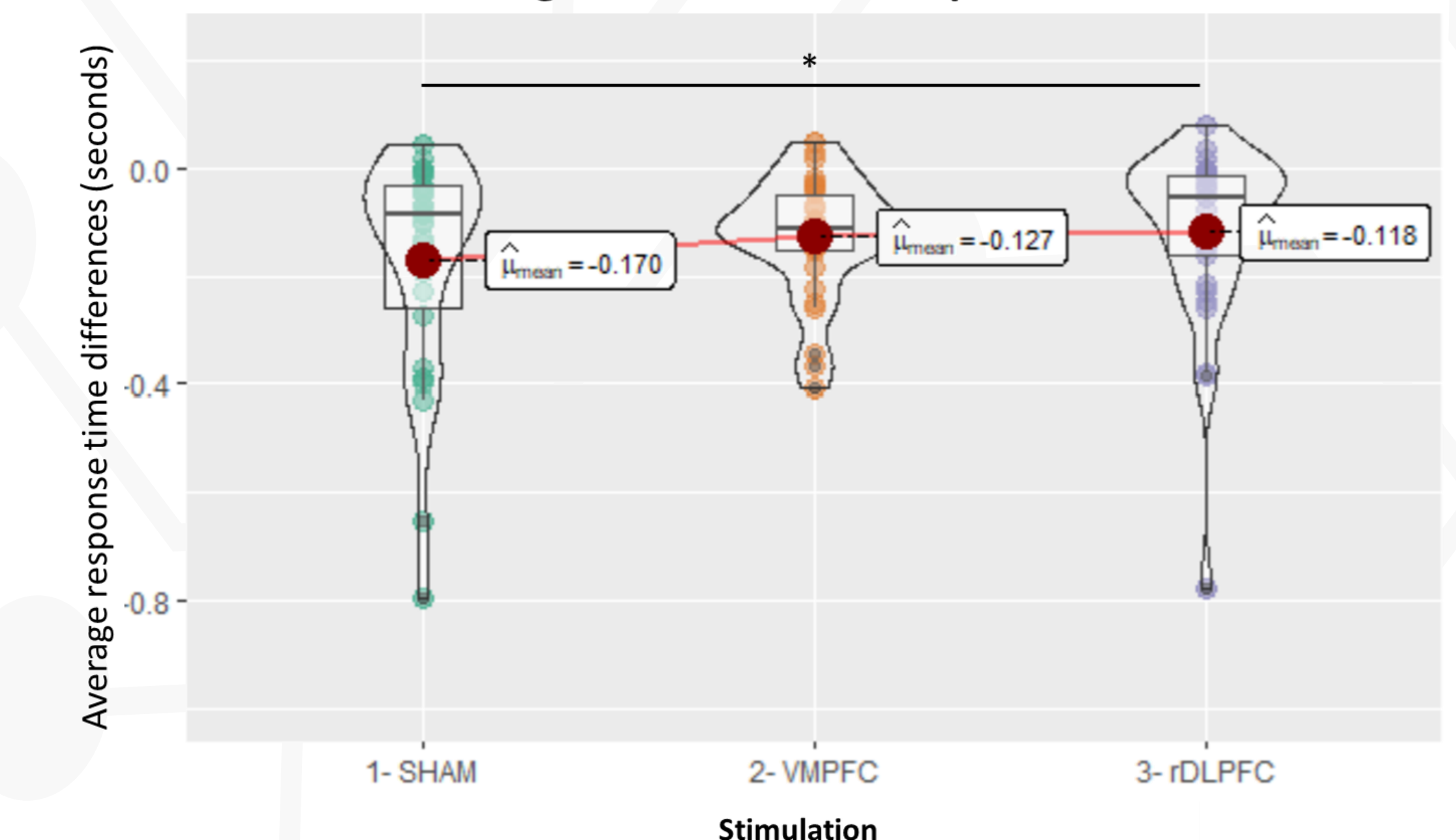
### Average differences in risk-taking behavior



### Average differences in valuation



### Average differences in response time



- **Risk-taking:** The deactivation of both VMPFC and rDLPFC led to a significant increase in risk-taking. Stronger effect observed after rDLPFC stimulation.
- **Value:** The deactivation of both VMPFC and rDLPFC also significantly increased the average value chosen.
- **Probabilities:** No significant differences were observed on the probability scores.
- **Response time:** rDLPFC stimulation led to a significant increase in response time.

## 04. Discussion

Considering the options standard deviation as an indication of risk-taking behavior in a gambling task such as the MGT, there is a strong correlation between risk-taking and expected value. Therefore, we expected that the deactivation of the VMPFC would lead to a lower values chosen and therefore lower attractiveness of high-risk options, and consequently lower risk-taking. However, our results show:

- **Risk-taking:**
  - Increases in risk-taking behavior after both rDLPFC and VMPFC deactivation.
  - In line with studies that show increased risk-taking behavior in patients with VMPFC lesions [3].
- **Valuation:**
  - Increases in average value choices after both rDLPFC and VMPFC deactivation.
  - Contradicting the theory that the activation of the VMPFC codes for the utility concept in economics [6].
  - In accordance with the assumption that the stimulation of the DLPFC would affect the VMPFC and vice-versa, leading to similar results, since these areas are densely interconnected [7,8].