

Another's Pain vs. my Gain

Evidence of absence for a causal role of the dorso-lateral prefrontal cortex in costly decision-making

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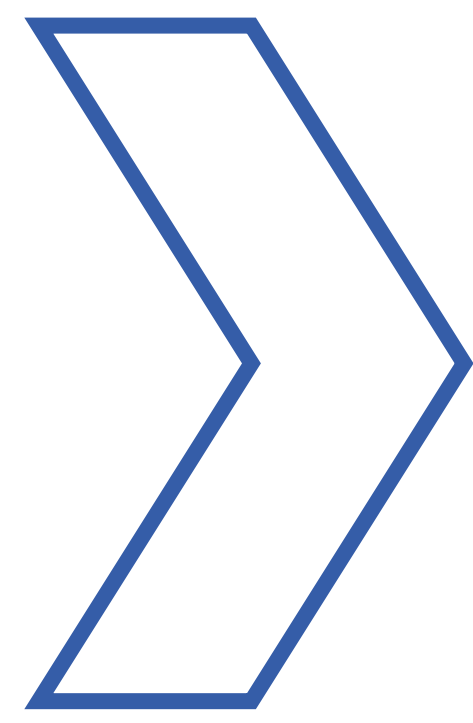
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Introduction

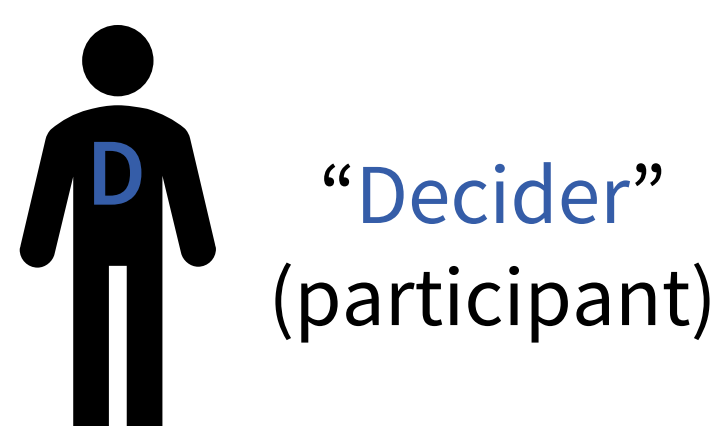
- Empathy and harm avoidance for conspecifics are significant factors in moral decision-making
- How the brain implements these functions and how they flow into decisions remains incompletely understood



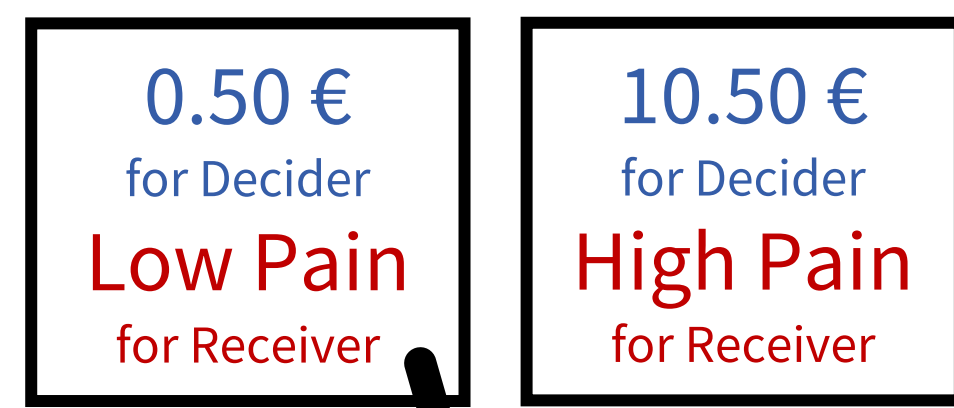
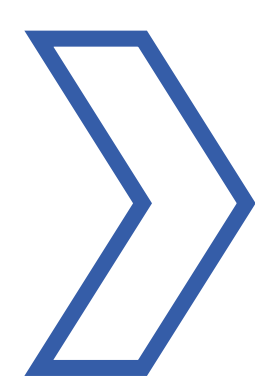
- The **dorsolateral prefrontal cortex (dlPFC)** has been implicated in such decisions, specifically in cognitive control and costs vs. benefits weighing
- With previous studies finding the dlPFC to either promote or suppress prosociality, **causal evidence on its specific contribution is needed**

What is the specific role of the dorsolateral prefrontal cortex in conflictual decisions?

Methods



"Decider" (participant)



Cover story: "10% of all choices will be selected and executed at the end"

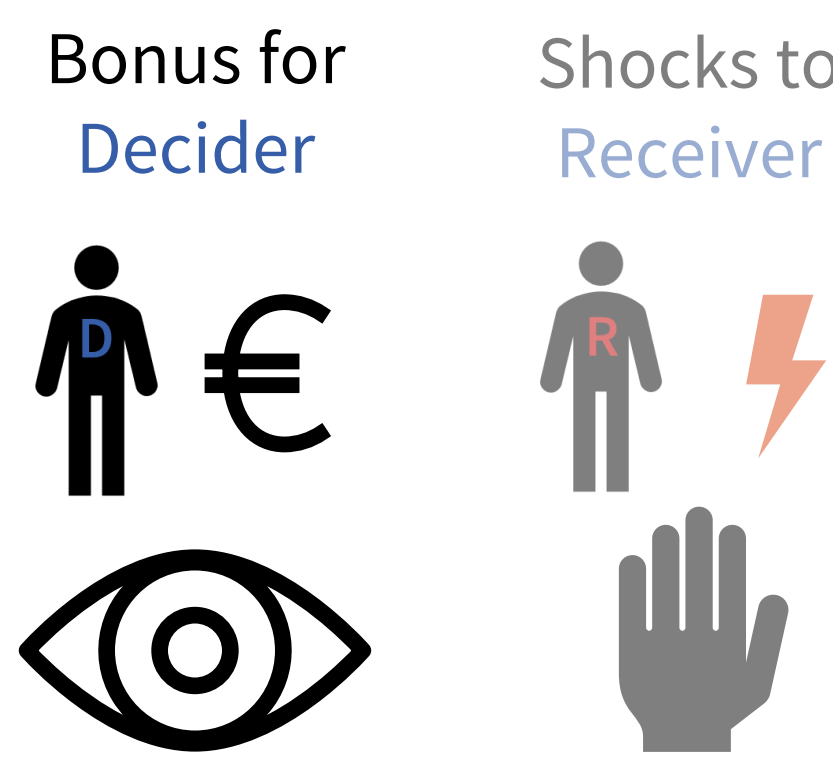


"Receiver" (confederate)

Choice Task during online rTMS

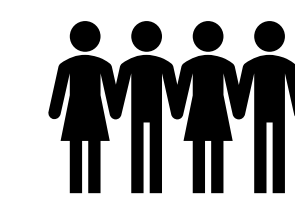
- Active stimulation over dlPFC**
- MNI coordinates = [-44, 34, 20]
 - 18 pulses x 60 trials 6Hz rTMS
 - Intensity ($M \pm SD$) = 50.84% \pm 0.07% of stimulator output
 - 90% of rMT = 56.51% \pm 0.08%

Sham stimulation over vertex



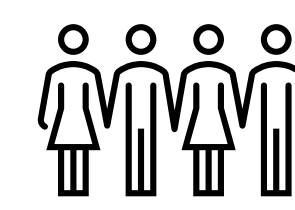
In reality, the confederate never received any shocks.

Samples



Validation Study

- $n = 22$
- Right-handed and English-speaking



TMS Study

- $n = 36$ (42 tested, 6 did not tolerate rTMS)
- High exclusion/dropout rate due to screening
- Right-handed and English-speaking
- Age: $M = 23.33 \pm SD = 3.76$
- Gender: 19 female, 14 male, 3 non-binary

Outcomes

- Indifference point (IDP)** = the amount of money for which people chose both options equally
- Slope** = how sharply variations in money alter the decision; how deterministic people choose

Main Findings

Validation study showed high correlation/test-retest reliability when measuring the IDP and slope in two conditions (corr. coefficients from .69 to .99)

rTMS study showed moderate evidence of absence for a causal role of the dlPFC (active vs. sham: p 's > .324; evidence for the null vs. the alternative hypothesis (BF_{01}): IDPs = 3.44, slopes = 4.97)

Legend

- dlPFC = dorsolateral prefrontal cortex
- rTMS = repetitive transcranial magnetic stimulation
- MNI = Montreal Neurological Institute
- $M \pm SD$ = mean \pm standard deviation
- rMT = resting motor threshold

Conclusion

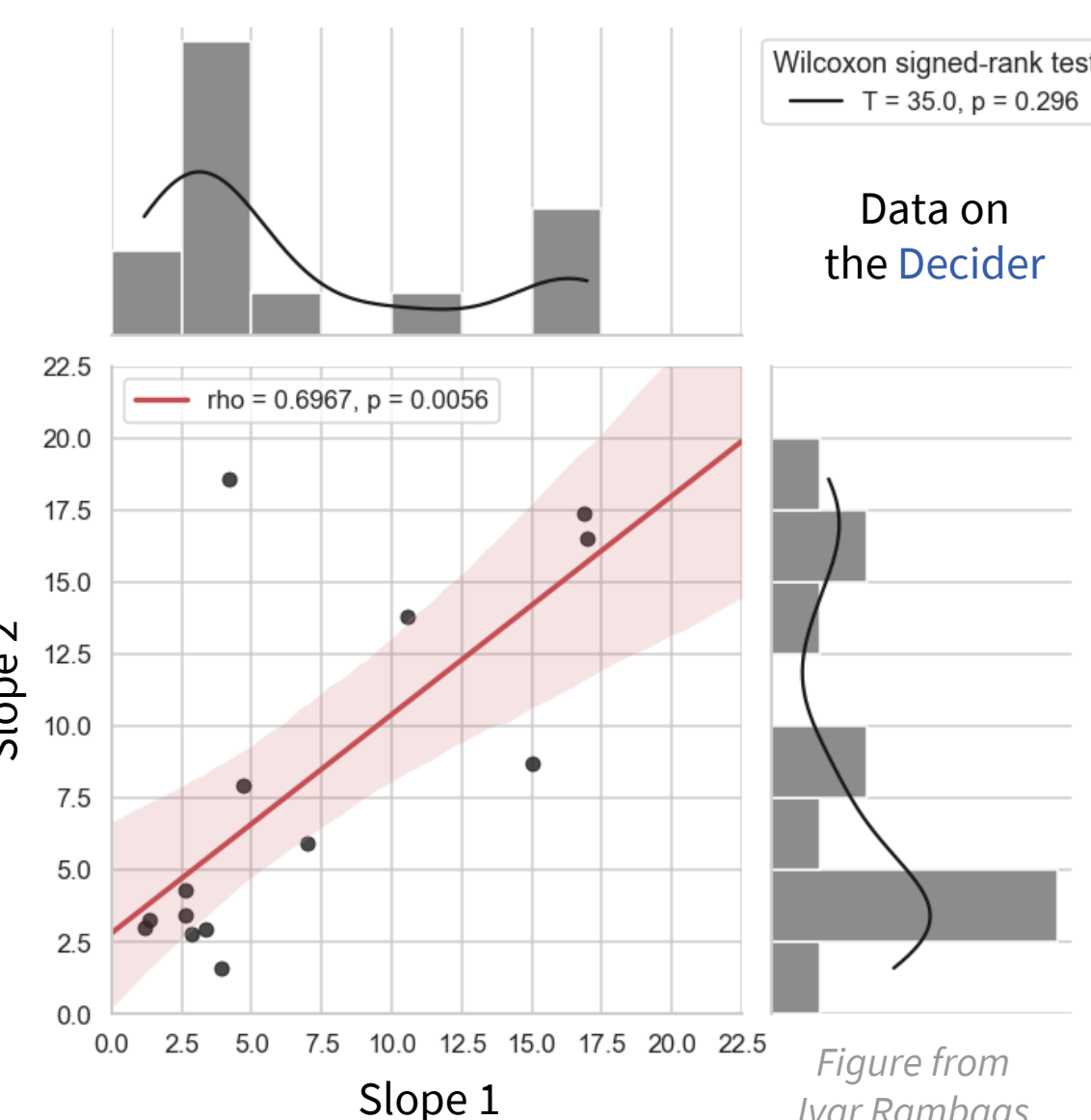
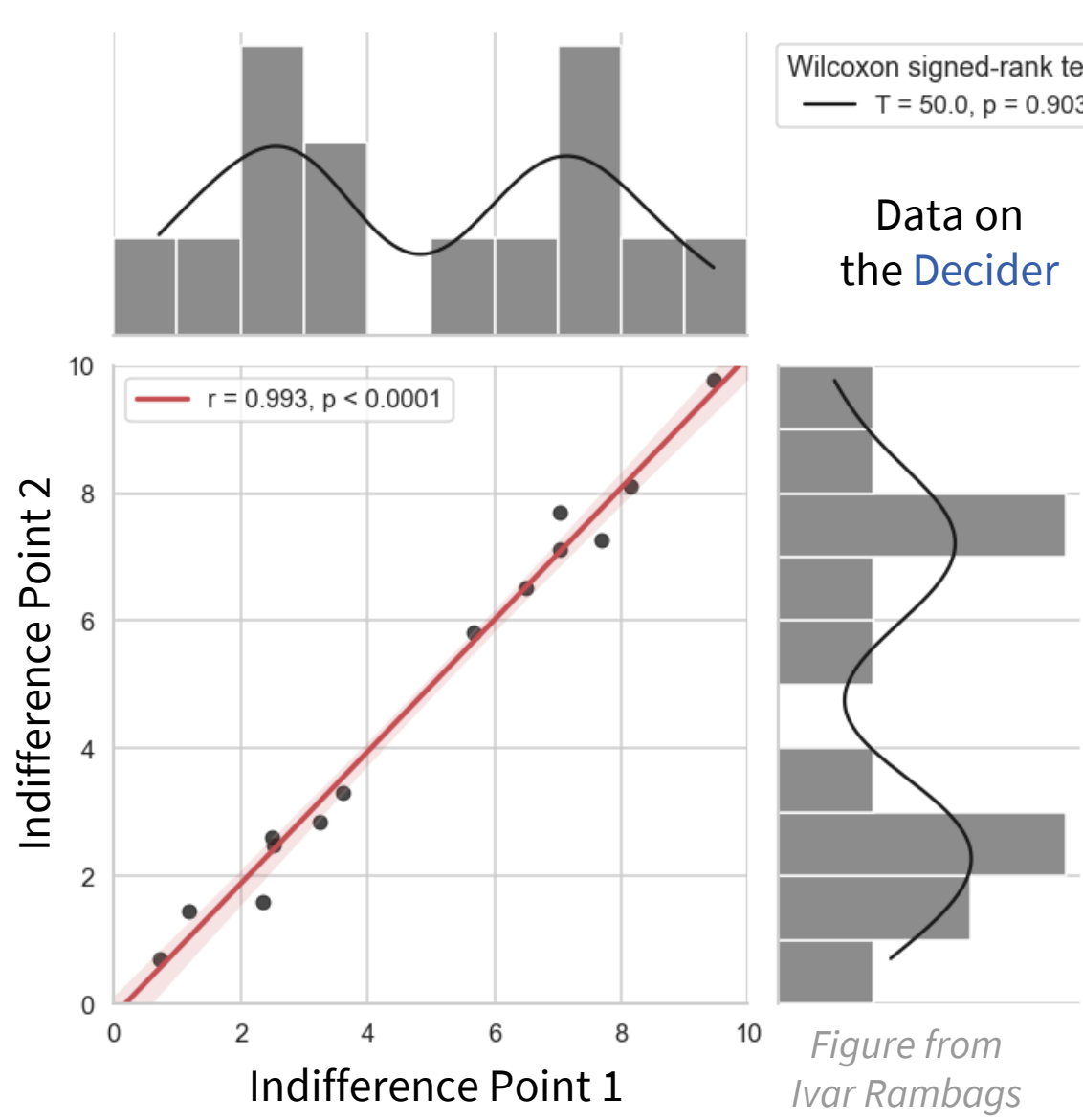


Perturbing the dlPFC with our particular protocol does not alter conflicting moral decisions involving money and pain.

Results

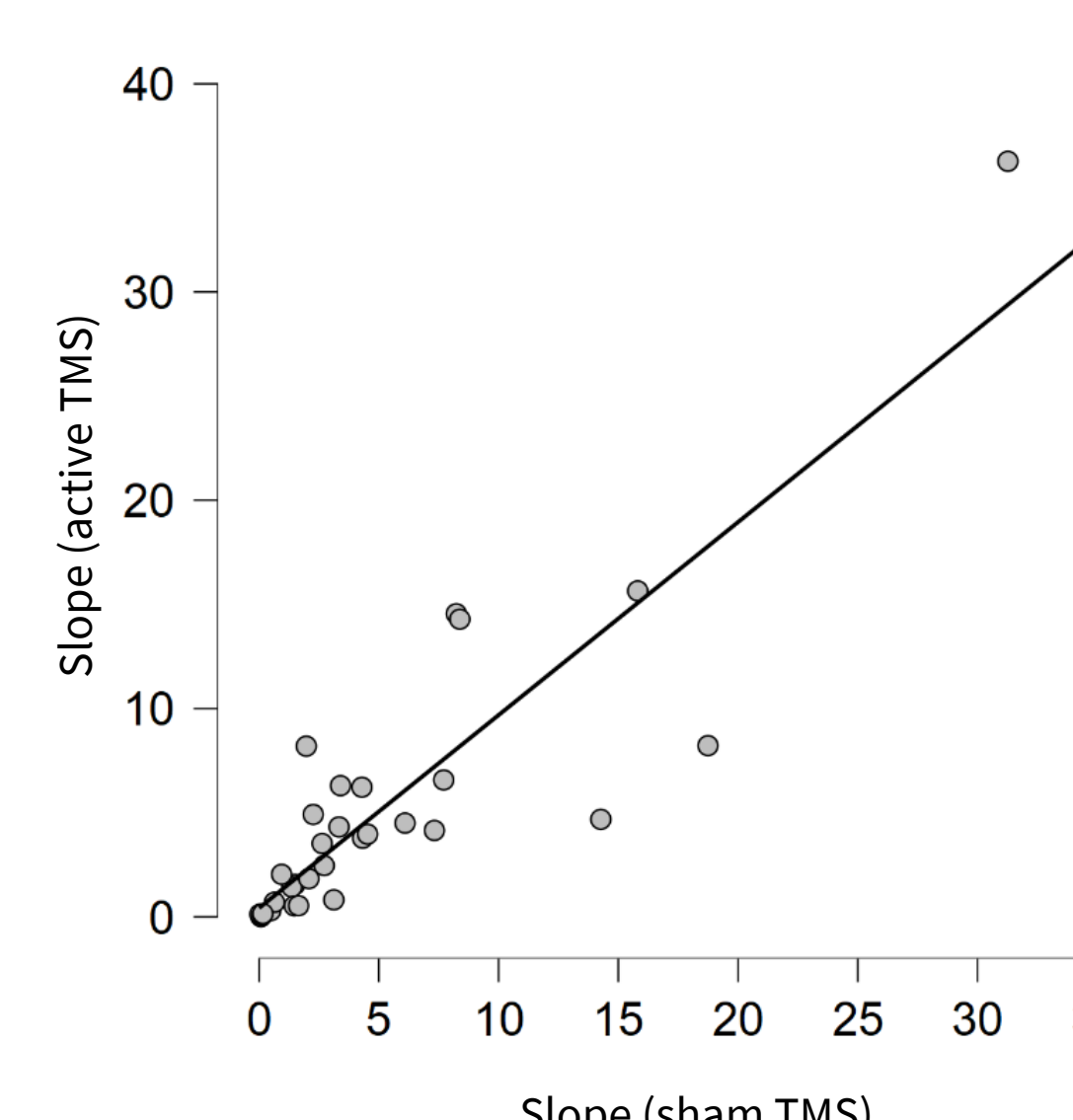
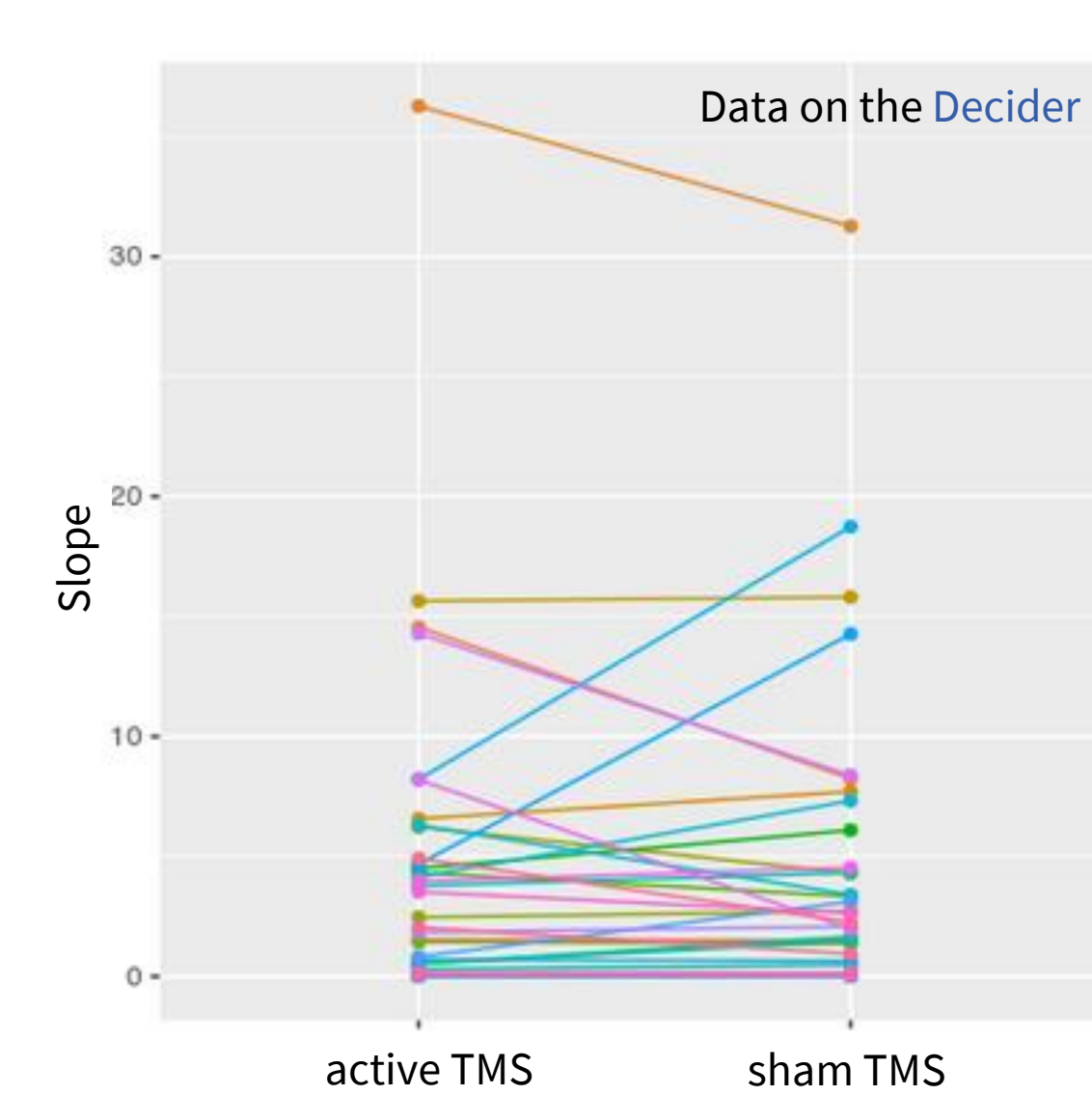
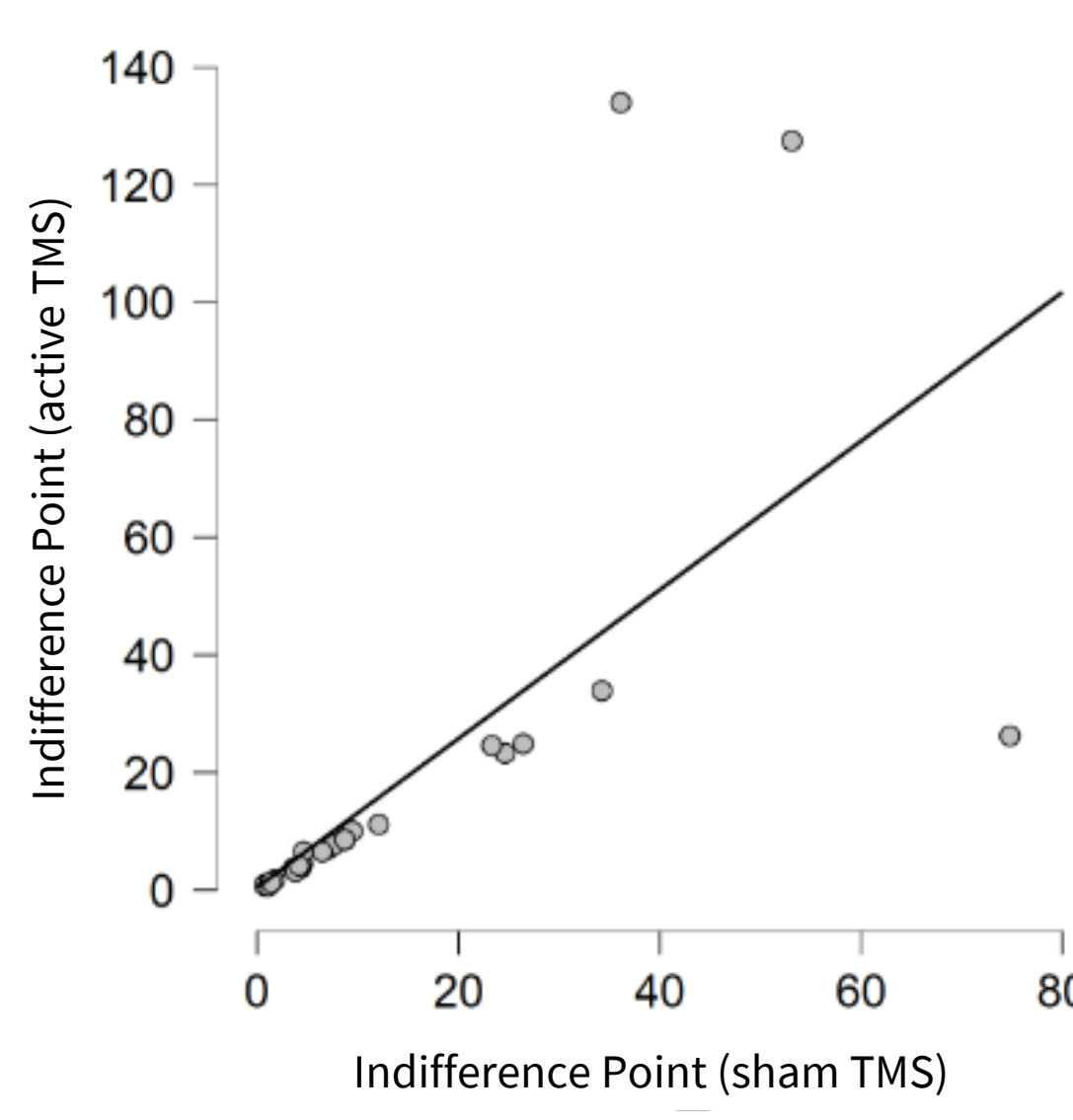
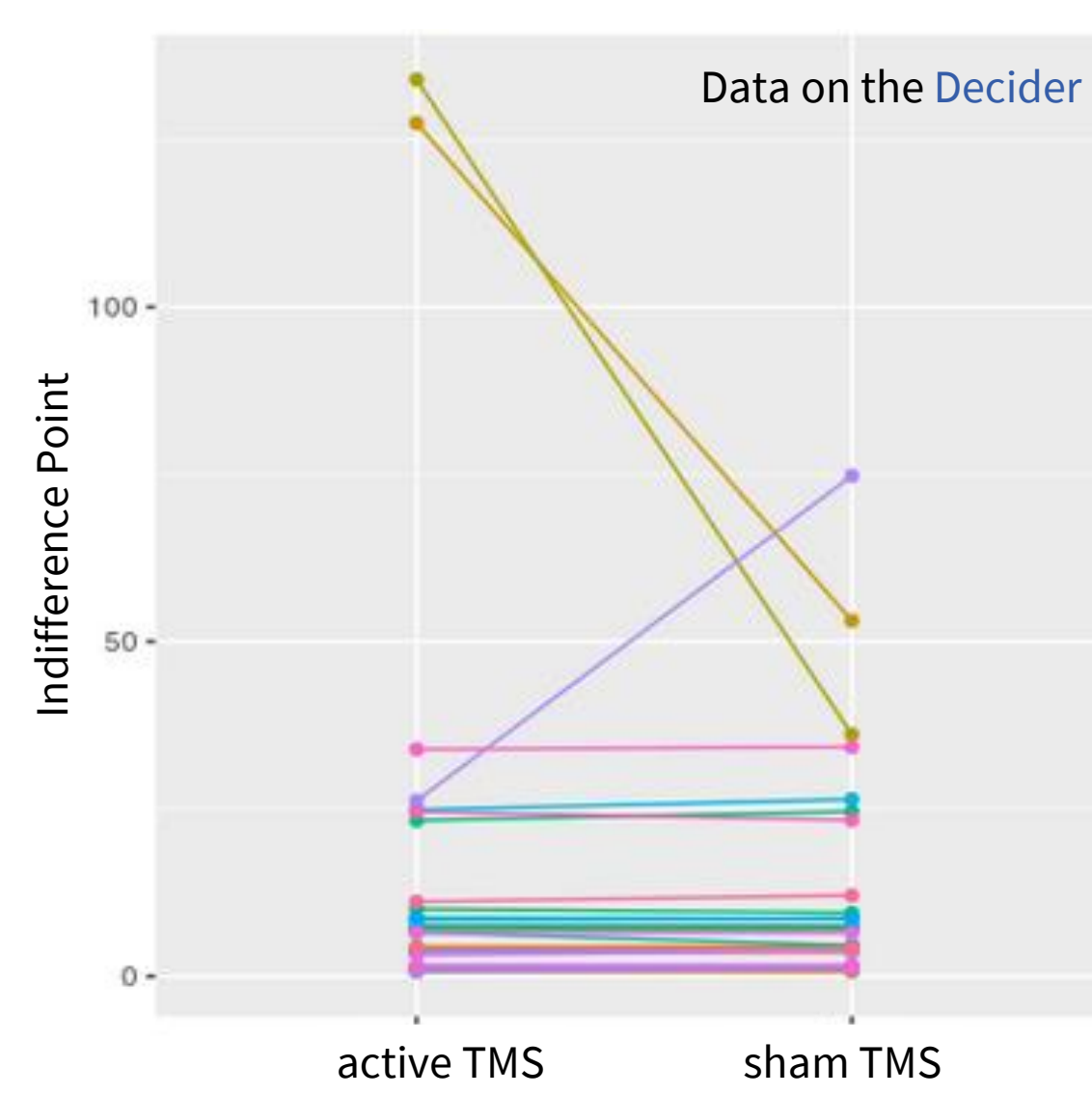
Validation Study

Validation of the adaptive choice task to measure the indifference point



rTMS Study

Role of the dorsolateral prefrontal cortex in costly decisions



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