Parsing the role of dopamine in reward discounting and subjective value

Jaime J. Castrellon[1], Gregory R. Samanez-Larkin[1,2]
[1]Department of Psychology, Duke University, [2]Center for Cognitive Neuroscience, Duke University

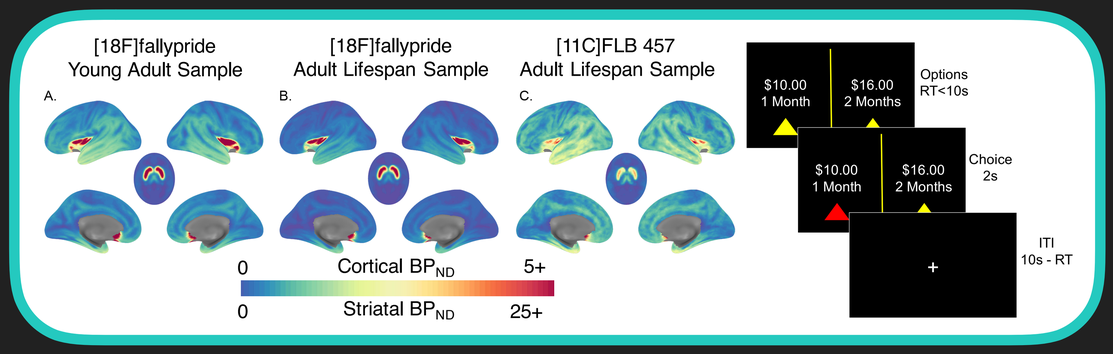
Introduction

Some people are more willing to make impulsive, risky, or costly choices than others, which is assumed to be strongly associated with individual differences in dopamine (DA) function. However, there are inconsistencies in findings relating DA to discounting. **Across three studies, we sought to better clarify the role of DA function in discounting behavior and subjective value neural representations.**

Methods

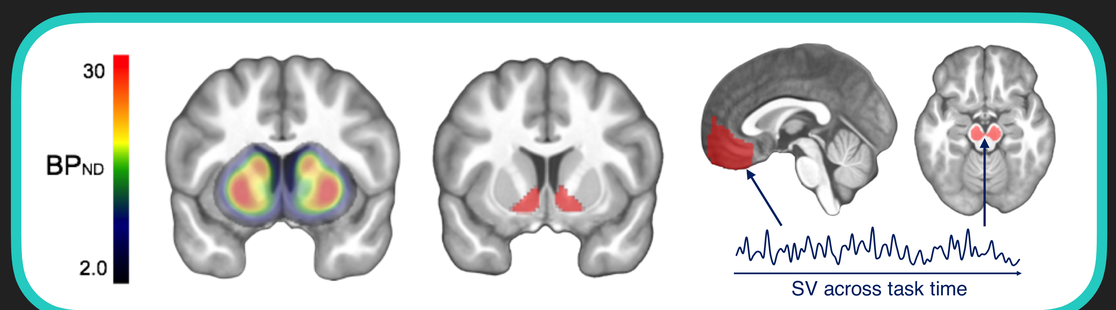
Study 1

Left: Average D2 BPND across 3 study samples and 2 radiotracers.
Right: Delay discounting task setup



Study 2

Left: Average D2 BPND in the striatum
Right: ROI from which BP was extracted in the ventral striatum; ROIs in the vmPFC and midbrain from which SV fMRI signal was extracted



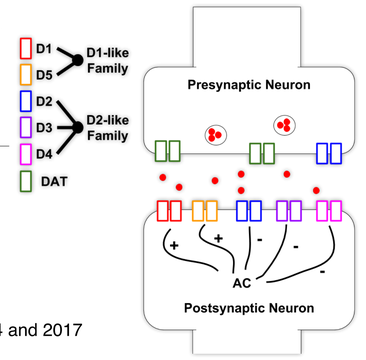
Study 3

Action	D1	D2	DAT
Agonist	4	9	22
Antagonist	12	32	

Time	Probability	Effort
34	28	18

Lister-Hooded	Long-Evans	Sprague-Dawley	Wistar
5	34	32	5

Papers included published between 1994 and 2017

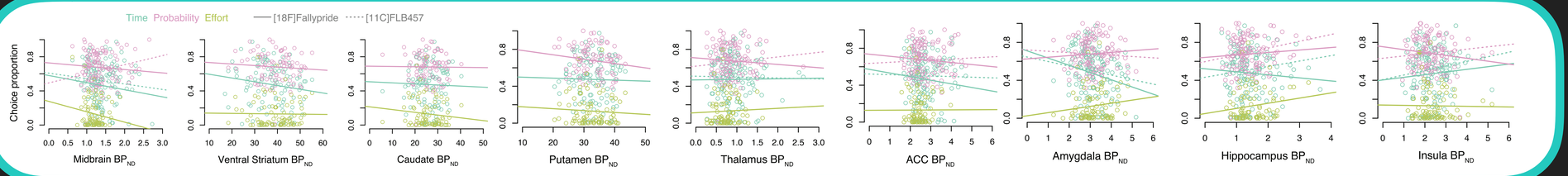


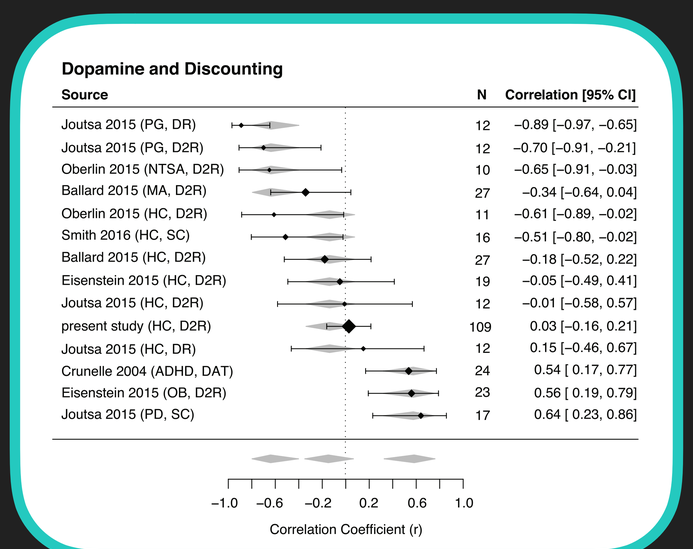
- **Inclusion criteria**
  - **Discounting task**
  - **Healthy mammals**
  - **DA drug that binds to D1, D2, or DAT**
  - **Placebo-controlled studies**
- Pre-registered meta-analysis
- Initial library of 34 studies
- PubMed search expanded to 1,309 papers

Results

Study 1

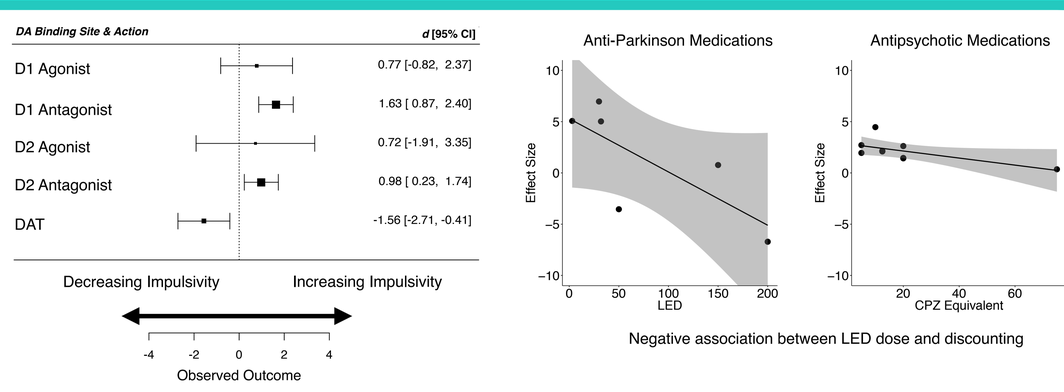
No correlation between DA D2 receptors and discounting in healthy adults.





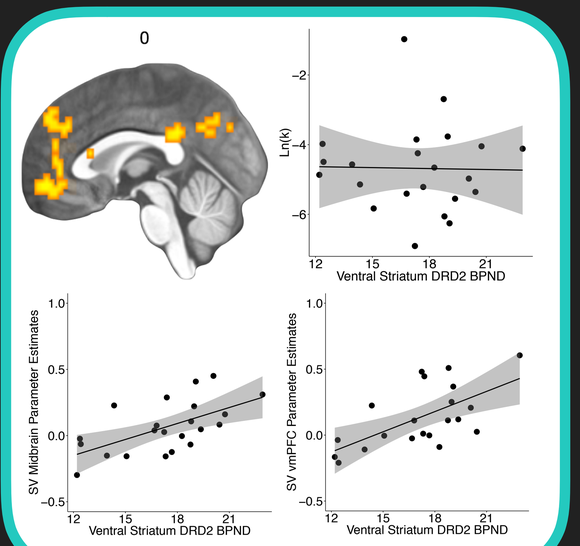
Study 3

Not all DA drugs impact discounting behavior. DAT blockers reduce impulsive choice.
No distinction between agonist and antagonist drugs that bind to D1R or D2R.



Study 2

VS D2 receptor availability correlates with SV but not discounting.



Conclusions

These findings suggest that some long-held assumptions about individual differences in dopamine function and reward discounting may be more nuanced than previously believed.

This work was supported by the following grants: NIDA R21-DA033611, NIA R00-AG042596, NIA R01-AG044838, and an NSF Graduate Research Fellowship
We thank all those who contributed to the OpenNeuro platform, which facilitated this analysis.