



## Background

- Attention deficit hyperactive disorder (ADHD) has a prevalence of approximately 5% in the United States, affecting a significant portion of the population in concentration & inhibition<sup>1</sup>
- ADHD and substance use disorder (SUD) share many features and both impact reward responsivity<sup>2</sup>
- However, familial history of SUD (FH) has not been found to impact ADHD reward response<sup>3</sup>
- Study eliminated participants with co-occurring autism spectrum disorder & behavioral disorders and may have been subject to response bias

### Hypotheses

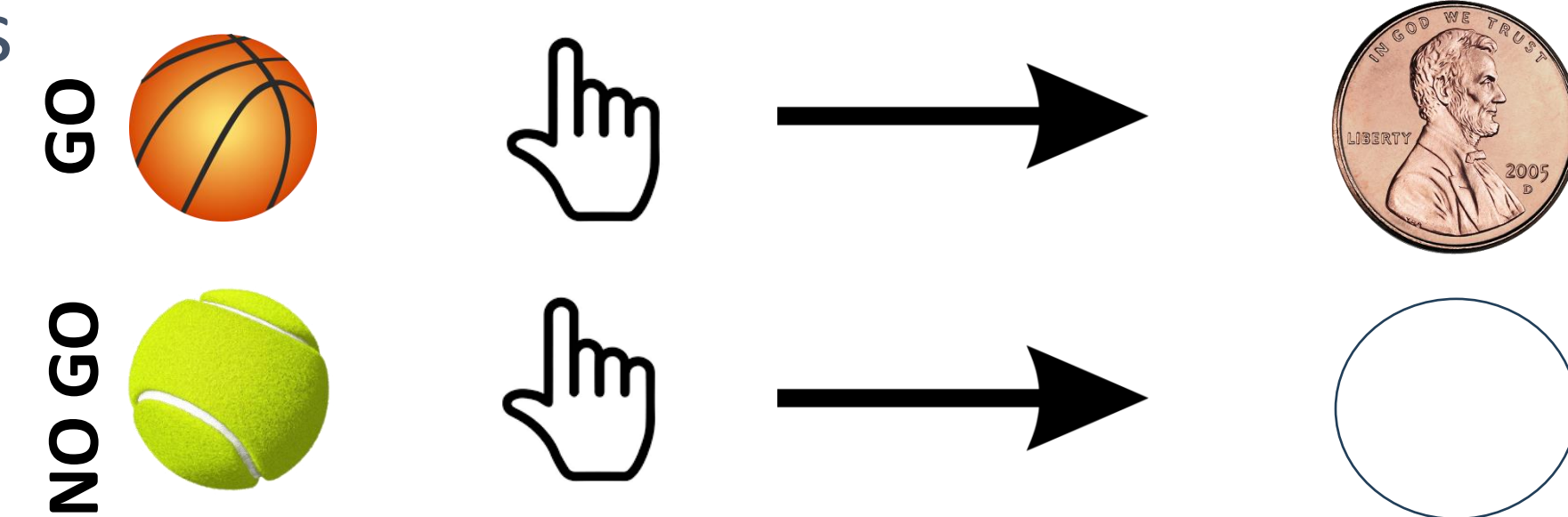
1. ADHD participants, regardless of familial SUD status, are expected to display greater increase in Go-No Go task performance between unrewarded and rewarded trials
2. Combined BIS/BAS scores are expected to increase with a diagnosis of ADHD

## Methods

- 124 participants from the BrainMAP study, ages 10-14

	ADHD/FH+ (n=22)	ADHD/FH- (n=58)	TD/FH+ (n=11)	TD/FH- (n=33)
Sex (M:F)	17:5	43:15	4:7	20:13

- FH determined by Family History Assessment Module (FHAM) self-reported measures for 1° and 2° family members
- Determined change in accuracy via D' data for rewarded Go-No Go and unrewarded Go-No Go round averages
- D' calculated based on accurate and inaccurate hits and stops



- Behavioral inhibition system and behavioral activation system (BIS/BAS) self-reported measures administered to participants

## Results

- One-way ANOVA compared groups
  - ADHD diagnosis with family history of SUD
  - ADHD diagnosis only
  - $\Delta$  GNG D', BIS, & BAS were insignificant across the ADHD/FH+, ADHD/FH-, TD/FH+, and TD/FH- groups ( $p=0.562$ ;  $0.989$ ;  $0.148$ )
  - When ADHD and TD groups were compared,  $\Delta$  GNG D' and BIS were still insignificant ( $p=0.689$ ;  $0.804$ )
  - BAS displayed trend with ADHD groups ( $p=.068$ )
    - Self-reported measure; not performance-based
    - BIS scores did not reflect BAS scores
  - ADHD GNG D' had significantly lower average on unrewarded trials
  - ADHD and TD GNG D' were comparable in the rewarded task trials
  - Family history of substance use disorder status showed no difference in task performance between rewarded and unrewarded trials

	ADHD/FH (n=22)	ADHD/FH- (n=58)	TD/FH+ (n=11)	TD/FH- (n=33)
Average $\Delta$ D'	.315	.134	.045	.171
Average BIS	20.3	20.5	20.9	20.6
Average BAS	40.1	38.1	36.8	36.6

Table 1. Change in GNG performance and BIS/BAS measures across the four studied groups

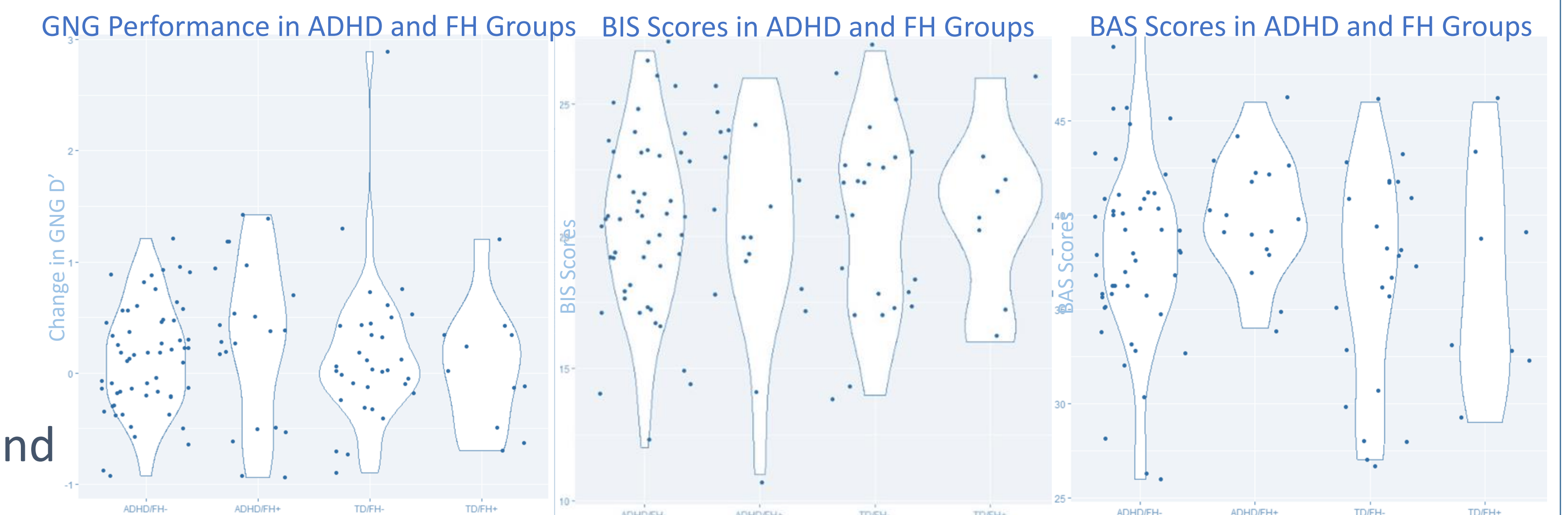


Figure 1. GNG performance change from unrewarded to rewarded tasks across ADHD/FH+, ADHD/FH-, TD/FH+, and TD/FH+ groups

Figure 2. BIS responses across ADHD/FH+, ADHD/FH-, TD/FH+, and TD/FH+ groups

Figure 3. BAS responses across ADHD/FH+, ADHD/FH-, TD/FH+, and TD/FH+ groups

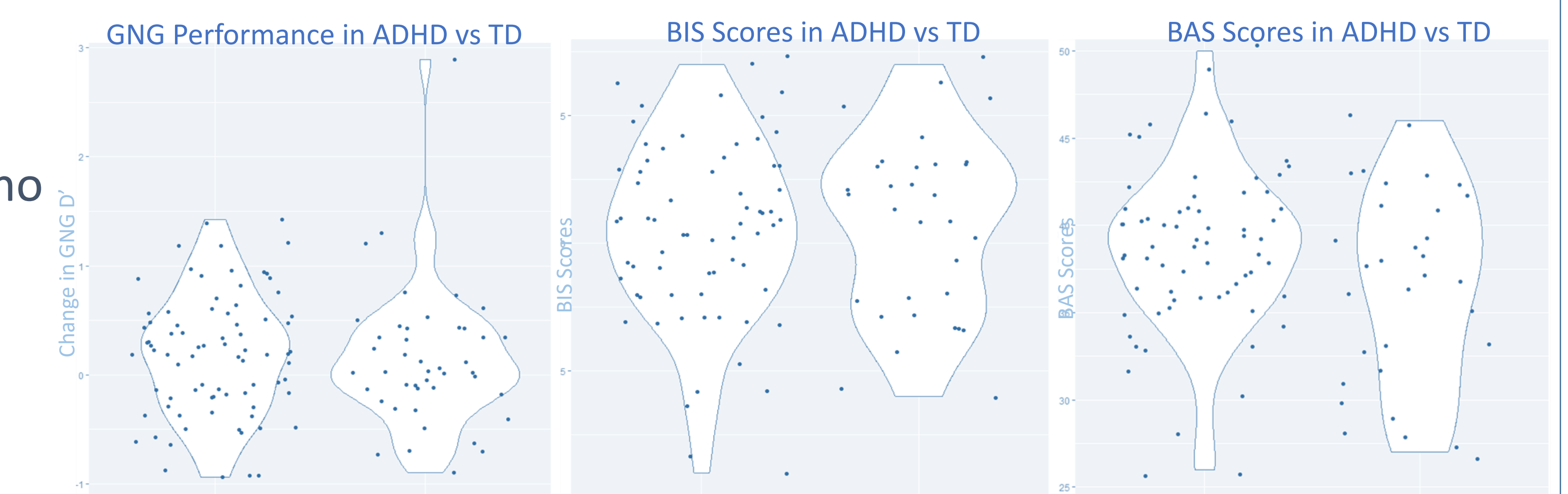


Figure 4. GNG performance change from unrewarded to rewarded tasks in ADHD and TD participants

Figure 5. BIS responses in ADHD vs. TD groups

Figure 6. BAS responses in ADHD vs. TD groups

## Conclusions

- Family history of SUD did not impact the change in GNG performance or responses on BIS/BAS questionnaire
- Self-reported activation measures may be higher in those with ADHD
- Unrewarded performance significantly lower for ADHD group but the presence of reward equalizes accuracy with TD groups
- Broadening of inclusion criteria could be responsible for insignificant findings
- Population limited to those in early puberty
  - Developmental changes a potential factor

### Future Analysis:

- Cortical analysis across rewarded and unrewarded processes
  - Dopamine (via brain iron quantification) availability in presence of reward
- Effects of medication on unrewarded task performance
- Broader age range without confounding factors of puberty

### References

1. Faraone, S. V., Asherson, P., Banaschewski, T., Biederman, J., Buitelaar, J. K., Ramos-Quiroga, J. A., Rohde, L. A., Sonuga-Barke, E. J. S., Tannock, R., & Franke, B. (2015). Attention-deficit/hyperactivity disorder. *Nature Reviews. Disease Primers*, 1, 15020. <https://doi.org/10.1038/nrdp.2015.20>
2. Paraskevopoulou, M., Link to external site, this link will open in a new tab, Daan, van R., Albert, B., Roselyne, C., Maartje, L., Schene, A. H., Buitelaar, J. K., S. A. F. (2021). Effects of substance misuse on reward-processing in patients with attention-deficit/hyperactivity disorder. *Neuropsychopharmacology*, 46(3), 622–631. <https://doi.org/10.1038/s41386-020-00896-1>
3. Paraskevopoulou, M., van Rooij, D., Schene, A. H., Batalla, A., Chauvin, R. J., Buitelaar, J. K., & Schellekens, A. F. A. (2022). Effects of family history of substance use disorder on reward processing in adolescents with and without attention-deficit/hyperactivity disorder. *Addiction Biology*, 27(2), e13137. <https://doi.org/10.1111/adb.13137>