

# CA-LEND Leadership Project Mid-Year Presentation

**Studying the Effects and Interaction of ADHD and Anxiety in  
relation to Trauma and Parent Mental Health in Academic-  
based Evaluations**

(Project Type: Research)

## Project Team

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## Project Plain Language Summary

ADHD (Attention deficit hyperactivity disorder) and anxiety can impact many parts of a person's life, including their school performance and overall academic achievement.

This is a research study that studies children and adolescents from ages 6 - 17 to better understand how ADHD, anxiety, or having both diagnoses affect a child's education and academic performance.

The study also looks at parent mental health and exposure to negative experiences and will compare if there are differences in what ADHD and anxiety look like based on sex

# ABSTRACT

**Background:** ADHD and anxiety impacts about ~6 million children each year with current research showing potential significant impacts on academic performance and inconsistent data regarding the interaction between

**Methods:** This study is a retrospective secondary analysis of the Healthy Brain Network (based on NY). Inclusion criteria includes children ages 6 - 17 years of age with diagnosis of ADHD, Anxiety, dual diagnosis, or control group who have data regarding demographic data, testing data (Woodcock Johnson and WISC), parental mental health data, and maternal education.

**Analysis:** Part one will be a descriptive analysis of each of the subgroups (ADHD and breakdown by sex or severity as available). Multiple regression or cumulative risk model will be used to compared the four groups on academic testing outcomes while correcting for factors such as BMI, sex (when not part of the group), age, handedness, SES status, etc. Additional subgroups will take into consideration sex differences, subtypes of ADHD/Anxiety, and breakdown by severity of symptoms.

## Purpose & Goals of Leadership Project

- Project Type: Research
- Domain: Developmental-Behavioral Pediatrics, Neuroimaging, Mental health
- Anticipated Leadership Project: Research abstract/Paper for MCHB conference and Journal
- Intended Audience: Pediatric providers who treat children for developmental and mental health needs
- Proposed Impact: The study aims to clarify and differentiate the interaction of anxiety and ADHD with focus on its impact on academic outcomes and examine this relationship in the larger context of environmental and life experience.

# Project Plan

Timeline: 2023-2026

Steps:

Phase 1: Research question development (July 2023 - Jan 2024)

**Phase 2: (Jan 2024 - June 2024) ← current step**

**-IRB submission; Introduction and methods**

**-MCHB presentation (works in progress): complete -feedback given**

Phase 3: Complete data analysis (excluding neuroimaging piece)

Phase 4: Add neuroimaging component

Phase 5: Data discussion/Conclusions

Phase 6: Publication preparation

## Background

- 6 million children in the US are diagnosed with ADHD or Anxiety according to CDC survey of parents.
- 3/10 children with ADHD also have anxiety.
- ADHD adversely affects long-term academic outcomes with interaction with anxiety not fully understood currently.

DSM-V criteria defines:

ADHD: 6+ months of symptoms in 2 settings with 6/9 criteria for each type (inattentive/hyperactive) for  $\leq$  17 years of age.

Anxiety: Excessive worry/anxiety more days than not for the last 6 months  
Definitions: (DSM-V) about a number of events. Difficult to control and are associated with at least 3 of the following (restlessness, fatigued, difficulty concentrating, irritability, muscle tension, sleep disturbance).

## Research Question

How are children (ages 6 - 17) with ADHD, Anxiety, and dual diagnosis of ADHD/Anxiety impacted in context of academic testing and are there differences degree of modifiers on these groups based on parental mental health and personal history of adverse childhood experiences?

Is there a presence of cumulative risk based on these and related factors related to which group the person belongs to?

Are there differences in impact or presentation based on sex differences?

How differentially impactful are parent mental health and personal history of adverse childhood events?

# HYPOTHESIS

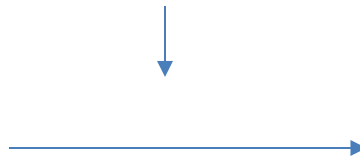
1. Children ages 6 – 17 with ADHD alone and Anxiety alone will **have reduced academic outcomes** compared to children without these diagnoses.
2. Children ages 6 – 17 with **ADHD + Anxiety will have worse outcomes** compared to ADHD alone and anxiety alone as well as healthy controls.
3. **ACEs and higher levels of parental mental stress will differentially strengthen** the relationship between diagnosis and worse academic outcomes.

## Predictors:

- Diagnosis of ADHD
- Diagnosis of Anxiety
- Diagnosis of Combined ADHD + Anxiety

## Effect Modifiers:

Parent mental stress  
Presence of ACES



## Outcomes:

Academic performance

- Reading
- Writing
- Math



# Methods

- My Study Design
  - Retrospective
  - Cross-sectional
  - Secondary analysis
  - Use of publicly available data set (HBN)

# Methods

## The Data

- Healthy Brain Network (HBN) - Child Mind Institute
  - Large scale open data-sharing that provides multimodal information about broad range of disorders
  - It includes multimodal brain imaging, genetics, biological samples, phenotyping of psychiatric, behavioral, cognitive, and lifestyle factors
  - Goal: 10,000 participants aged 6 - 21 years - current at ~ 4000
  - Data is collected at 3 centers in NYC and data is shared via download file after requesting access and signing agreement regarding data use.

# Methods

- **Inclusion criteria:**
  - Children ages 6 -17 within the HBN dataset who fall under group comparisons (below) who have demographic, diagnostic, educational and IQ testing, and screening data available to look at trauma history data and parental health data available
  - Exclude: additional diagnosis
- **Group comparisons:**
  - ADHD only, Anxiety only, ADHD and Anxiety, No Diagnosis
- **Primary outcome**
  - Performance on Woodcock-Johnson (reading/writing/math components and total)
  - Assessing the impact of parent mental stress and presence of ACEs
  - Secondary outcome: Looking at neurodevelopmental patterns on fMRI or other available imaging data as biomarkers

# Methods

## MEASURES OF INTEREST

Predictors → Diagnoses - ADHD, Anxiety, comorbid ADHD + Anxiety, Controls

Outcomes → Academic outcome measures (type)

- Woodcock-Johnson task: Reading, Writing, Math scores

## LISTED COVARIATES

Demographic factors: BMI, sex/gender, race/ethnicity, socioeconomic status (parent income or federal poverty line), maternal education level

Study factors: site where data was collected

Confounders: IQ (Wechsler Intelligence Scale for Children)

## Effect modifiers:

Parent Mental health (via parent survey)

Adverse childhood experiences

# Analysis

## Preliminary breakdown by groups

Overall plan: 4 cohorts (estimated numbers)

- ADHD (505 potential subjects)
- Anxiety (92 potential subjects)
- ADHD + Anxiety (91 – 106 subjects?)
- No Mental Health diagnosis (healthy controls)

## Proposed analysis:

- R or SPSS as available to complete analysis of de-identified data
- Descriptive data (demographic data)
- Comparative analysis with ANOVA and/or regression models (multiple regression?)
- Graded predictors /mediators
  - Type and severity of ADHD or anxiety?
  - Modulation by ACES or parent mental health report
  - Cumulative risk model?
  - Comparison of each group with subgroups to look for sex differences

# Analysis

- Statistics: will be completed via R or SPSS as available
- Imaging data: specific neuroimaging data software data (freesurfer, etc)
- Type: Multiple regression analysis?
- Analysis:
  - Differences on WISC Task between groups (ADHD only, anxiety only, both, no diagnosis)
  - Subgroup analysis options
    - ADHD by type?
    - Severity of symptoms of anxiety/ADHD?
    - Effect of personal trauma history (PTSD? Or general exposure to trauma/ACES?) on each of initial groups when performing on WISC task
    - Effect of parental mental health on performance on WISC task in the initial larger groups
  - Neuroimaging data -TBD - maybe fMRI?

## Alignment with LEND Values

- Plan for Family- and Person- Centered Perspective:
  - Family factors such as parent experience, social-financial pressures, cultural differences, This study looks at family factors and environmental exposures that give a comprehensive view of the family's experience, such as the impact of parent mental health
- Plan for Interdisciplinary Perspective:
  - Mentors and related topics for this study come from a variety of backgrounds including DBP, neuroscience, and mental health/psychology.
- Plan for Health Equity Perspective:
  - Many children with ADHD, anxiety, and trauma need additional support in academic and non-academic settings with differences that exist in rates of diagnosis and receiving treatment.

## Community (Title V) Agency Interface

- This research study will be included in work with the MCHB.



## Challenges & Next Steps

- Clarifying overall study design and depth of analysis that can take place for subgroup analysis
  - Determining total n for each group and subgroup analysis to determine what level of analysis can take place
  - Determining if matched samples makes sense to reduce effect of other confounding factors within the analysis groups
  - Establishing a cumulative risk model that is informed based on current understanding of bio-psycho-social model.
  - Interpretation of biomarkers (neuroimaging data) in relation to clinically relevant understanding of ADHD, anxiety, and trauma

## Questions for the Audience/ Invitation for Feedback

Any recommendations related to additional factors to be considered in the study?

How to address IQ scores - use as a confounder or create subgroups for analysis?

How should subgroup analysis be organized?

1. ADHD – severity and subtype?
2. Anxiety – separate by type if available?
3. Subgroups by sex in each group
4. Subgroup by age/stage of development?

## Citations

- <https://www.cdc.gov/ncbddd/adhd/data.html>
- <https://www.cdc.gov/childrensmentalhealth/features/anxiety-and-depression.html>
- [https://www.aafp.org/dam/AAFP/documents/patient\\_care/adhd\\_toolkit/adhd19-assessment-table1.pdf?ref=clarityxdna.com](https://www.aafp.org/dam/AAFP/documents/patient_care/adhd_toolkit/adhd19-assessment-table1.pdf?ref=clarityxdna.com)
- <https://pubmed.ncbi.nlm.nih.gov/25583985/>
- <https://data.healthybrainnetwork.org/main.php>

## Acknowledgments

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