Anxiety disorders, despite their acknowledged burden, remain among the most prevalent untreated psychiatric conditions(Bandelow & Michaelis, 2015). Nearly one in three adolescents suffer from anxiety disorders, making it the most common mental health issue in this age group (Merikangas et al., 2010). While less obvious than bipolar disorder, depression, and schizophrenia, anxiety disorders can be equally debilitating (Bystritsky et al., 2013). Reduced productivity, higher rates of sickness and death, and the rise in drug and alcohol abuse among a significant portion of the population can all be attributed to anxiety disorders (Bystritsky et al., 2013; Koen & Stein, 2011; Leon et al., 1995; Loeb et al., 2012).

The term "anxiety" encompasses a wide range of specific mental challenges, complicating its conceptualization and description. Anxiety disorders, such as separation anxiety disorder, generalized anxiety disorder (GAD), panic disorder, social anxiety disorder (SAD), specific phobias, and post-traumatic stress disorder (PTSD), exhibit different prevalence rates and symptom presentations (Kessler et al., 2010). Additionally, the comorbidity between anxiety disorders and other mental health conditions further adds to the phenotype’s intricacy (Kessler et al., 2010). With such diverse manifestations and overlapping features, effectively understanding, explaining, and treating anxiety becomes a difficult task for researchers, clinicians, and those affected by these conditions.

Evaluating anxiety symptomatology in adolescents presents numerous challenges. It is well-documented that a combination of biological, psychological, and sociocultural factors can influence the risk and resilience for developing maladaptive responses to social or environmental contexts (Luthar et al., 2000; Sanislow et al., 2010). Studies show that individuals with anxiety disorders exhibit specific structural brain differences compared to healthy controls. Notably, significant reductions in gray matter volume (GMV) have been consistently observed in the anterior cingulate cortex (ACC) and insular cortices (Bora et al., 2012; Bromis et al., 2018; Radua et al., 2010), which are considered general markers of psychopathology (Goodkind et al., 2015).

Anxiety disorders, as conceptualized in the DSM-5, also display GMV differences in fronto-parietal and ventral attention networks, including the ventrolateral prefrontal cortex (PFC) and temporo-parietal junction, areas implicated in attentional control and anxiety symptomatology (Sylvester et al., 2012). Comparing anxiety to major depressive disorder (MDD), studies highlight potential distinctions in frontotemporal regions. Using machine learning techniques, these regions have shown greater accuracy in differentiating between MDD and GAD than clinical questionnaires (Hilbert et al., 2017; Zhao et al., 2017). Other studies have found significant correlations between generalized anxiety severity and cortical thickness similarities in the left caudal ACC and pericalcarine cortex (Yoo & Kim, 2023).

Gathering information about a child’s functioning typically involves input from multiple informants, including the child and parents (Achenbach, 2006). Mental health issues can vary across different contexts (Bauducco et al., 2024; Beesdo et al., 2009). Children and adolescents may exhibit mental health concerns in certain environments, such as at home or school, but not in others, like during peer interactions. These contextual variations are evident across various domains, including conduct problems, attention, hyperactivity, and anxiety (Beesdo et al., 2009).

However, the reliability of parent reports for assessing children's experiences, especially for non-observable functions like emotions, has been questioned (Eiser & Morse, 2001). Parental assessments often differ from children’s self-perceptions, potentially due to biases, superficial observations, or the nature of the parent-child relationship. Conversely, children frequently lack objective self-perception (Barrett et al., 1991; Martin et al., 2004). Research indicates discrepancies and varying accuracy in symptom reporting, with no clear consensus on which group reports internalized symptoms more accurately, while parents tend to be more precise in identifying externalized (Silverman & Eisen, 1992).

Research question: To what extent does structural brain data explain the variation in anxiety symptoms as reported by youths versus their parents?

Hypothesis:  There will be a significant difference in the prediction accuracy of structural brain data between self-reported and parent-reported anxiety symptoms in adolescents with GAD, with an expectation of higher accuracy for self-reported symptoms.

**Methodology**

The Adolescent Brain and Cognitive Development (ABCD) Study is a decade-long investigation tracking children from ages 9-10 through late adolescence and early adulthood. This study conducts annual lab-based evaluations and biannual imaging scans to assess various mental and physical health metrics (Saragosa-Harris et al., 2022; Barch et al., 2018). The ABCD Study is designed to enhance our understanding of the behavioral, genetic, neurobiological, and environmental factors influencing health and risk factors for physical and mental health issues. It includes 12,000 children at baseline, recruited from 21 research sites across the United States (Karcher & Barch, 2021). The study contains neuroimaging, cognitive assessments, psychosocial surveys, and hormonal measurements. To ensure the cohort is diverse and representative, the ABCD Study employs a multi-stage probability sampling technique, along with weighting methods and stratified sampling within specific regions to minimize selection bias.

See below for timeline of measurements as well as a list of collected questionnaires:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Baseline** | **6 months** | **Year 1** | **18 months** | **Year 2** | **30 months** | **Year 3** | **42 months** | **Year 4** |
| Contact | In person | Phone/ online | In person | Phone/ online | In person | Phone/ online | In person | Phone/ online | In person |
| Participant Age | 9-10 years |  | 10-11 years |  | 11-12 years |  | 12-13 years |  | 13-14 years |
| **Mental health and related factors** | | | | | | | | | |
| Parent-report on youth | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |
| Youth self-report | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com | Check mark button - Free vector emoji on creazilla.com |
| Parent self-report | Check mark button - Free vector emoji on creazilla.com |  |  |  |  |  |  |  |  |
| Parent report on family | Check mark button - Free vector emoji on creazilla.com |  |  |  |  |  |  |  |  |
| Teacher-report on youth | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |
| **Brain Imaging** | | | | | | | | | |
| sMRI | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |  | Check mark button - Free vector emoji on creazilla.com |

|  |  |  |
| --- | --- | --- |
| **Mental Health Assessment** | | |
| Construct | Measure | Citations |
| ***Parent about Youth/Family*** | | |
| Categorical Psychopathology and Suicide/ Homicidally | Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) | (Kaufman & Birmaher, 2013; K. A. Kobak et al., 2013; K. Kobak & Kaufman, 2015) |
| Dimensional Psychopathology/Adaptive Function | Achenbach Child Behavior Check List | (Achenbach, 2009) |
| History of Mental Health and Substance Abuse Services | Introduction to Kiddie Schedule for Affective Disorder and Schizophrenia | (K. Kobak & Kaufman, 2015) |
| ***Youth about Self*** | | |
| Categorical Psychopathology and Suicide | Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) [Mood Disorders (minus sex questions), Separation Anxiety Disorder, Social Anxiety Disorder, Generalized Anxiety Disorder, Sleep Problems, Suicidality] | (Kaufman & Birmaher, 2013; K. A. Kobak et al., 2013; K. Kobak & Kaufman, 2015) |
| ***Parent about Self and Family*** | | |
| Dimensional Psychopathology/Adaptive Function | Achenbach Adult Self Report Questionnaire | (Achenbach, 2009) |
| Family History of Psychopathology | Modification of the Family History Assessment from NCANDA | (Brown et al., 2015) |
| ***Teacher About Youth*** | | |
| Dimensional Psychopathology/Adaptive Function | Achenbach Brief Problem Monitor | (Achenbach, 2009) |

|  |  |  |
| --- | --- | --- |
| **Demographic Assessment** | | |
| Construct | Measure | Citations |
| ***Parent about Youth/Self/Family*** | | |
| Parent/Guardian Age, Birth Sex, Gender Identity, Race, and Ethnicity | PhenX | (Stover et al., 2010) |
| Child Age, Birth Sex, Gender Identity, Race, and Ethnicity | PhenX | (Stover et al., 2010) |
| Country of Origin for Grandparents, Parent/Guardian and Child | PhenX | (Stover et al., 2010) |
| Parent/Guardian Education, Occupation and Current Income | PhenX | (Stover et al., 2010) |
| Family Income | PhenX | (Stover et al., 2010) |
| School performance, repeating a grade, detention/suspensions and a drop in grades, special services | Introduction to Kiddie Schedule for Affective Disorder and Schizophrenia | (K. A. Kobak et al., 2013) |
| Bullying and youth friendships | Introduction to Kiddie Schedule for Affective Disorder and Schizophrenia | (K. A. Kobak et al., 2013) |
| ***Youth about Self*** | | |
| Repeating a grade, detention/suspensions and a drop in grades | Introduction to Kiddie Schedule for Affective Disorder and Schizophrenia | (K. A. Kobak et al., 2013) |
| Friendships | # of same and different gender friends | NA |

**Sample**

The cohort had a mean age of 9.48 years with a standard deviation of 0.507 years. The gender distribution included 47.8% females, 52.1% males, and the racial composition was predominantly White (52.0%), followed by Hispanic (20.3%), Black (15.0%), and Asian (2.12%).A graph of different age groups

Description automatically generated with medium confidence

The sample had a mean age of 9.52 years with a standard deviation of 0.508 years. The gender distribution included 53.2% females and 46.8% males, with racial composition predominantly White (64.8%), followed by Hispanic (16.9%), Black (7.69%), and Asian (0.448%).A group of graphs with numbers

Description automatically generated with medium confidence

**Methods**

Image processing and analysis methods corresponding to ABCD Release 2.0.1 are described Hagler et al., 2019, NeuroImage. Image processing and analysis methods for the Adolescent Brain Cognitive Development Study (doi: [10.1016/j.neuroimage.2019.116091](https://doi.org/10.1016/j.neuroimage.2019.116091)). Changes to image processing and analysis methods in Release 3.0 and Release 4.0 are documented below. No significant changes were made to the processing pipeline for Release 5.0.

https://wiki.abcdstudy.org/release-notes/imaging/structural-mri.html

From caregiver and youth perspective, information is obtained about both current and lifetime mental health diagnoses of the youth using a validated and computerized Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS) for DSM-5 (KSADS-COMP), developed by Dr. Joan Kaufman and Dr. Ken Kobak with NIH Small Business Innovation Research support (Kobak et al., 2013; Kobak and Kaufman, 2015). This is a self-administered, computerized version that does not involve a clinician for either the caregiver or the youth, though the youth are supported in completing the KSADS-COMP by trained research assistants. In Section 3.2 below, we provide more information about changes in this measure over assessment waves and known issues or considerations in the use of data from the KSADS-COMP (Barch et al., 2021)

KSADS Questionnaire:

Components

1. Introductory interview
   1. Demographics
   2. Health history
   3. Prior psychiatric treatment
   4. Family history of psychiatric illness
   5. Adaptive functioning (e.g. school, peers, activities)
   6. Additional Questions (e.g. guns in home, gender identity, sexual orientation)

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