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Introduction

Evaluating Rating Scales for Psychiatric Conditions

Liam (12 years) had been struggling with severe Obsessive-Compulsive Disorder (OCD) for several years. After starting therapy, he was showing signs of improvement. According to Liam, he felt he was making excellent progress. He managed to reduce his handwashing rituals from every hour to three times a day and had started joining some family meals. He was also beginning to meet his friends for short walks around the neighborhood. However, his parents observed a different reality. While Liam had made some progress, he often became trapped in lengthy rituals that caused him significant distress. He had yet to return to school full time, attending only partial days if he went at all. Though he started venturing out with friends, it was only to familiar, controlled environments. The family had rearranged the house to facilitate his progress—stocking rooms with hand sanitizers and scheduling regular therapist calls to help him during challenging times. His parents continued to monitor his progress closely, supporting him in his journey while remaining aware of the continuous obstacles that his OCD presented.

The aforementioned vignette demonstrates how the child's perspective is distinct but equally valid, despite clinicians' assumption that parents can offer information regarding the effects of illness and treatment on the child. Results would vary based on whether Liam or his mother provided information, regardless of whether the objective is clinical assessment or research. From this perspective, we must make clear how parent and child assessments of mental health relate to one another.

Contextual differences

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, while appearing unaffected in others, like during peer interactions. These contextual variations are evident across various domains, including conduct problems, attention, hyperactivity, and anxiety (Jónsdóttir et al., 2022). Consequently, the source of information—whether from self, parents, other family members, healthcare professionals, or teachers—can lead to differing perceptions and understandings of the child's condition.

Regarding children, it's possible that the particular domains being taken into consideration affect how accurate proxy ratings are. Therefore, gathering information about a child’s functioning typically involves input from multiple informants (Achenbach, 2006).

Furthermore, studies in the 1970s indicated that girls tend to be more reliable informants than boys [14]. (Caqueo-Urízar et al., 2022)

Additionally, there are certain contextual factors that associate with higher agreement or discrepancy between reports. It has been observed that when there is a higher socioeconomic level, parents tend to underestimate the problems related to their children’s mental health, while in lower socioeconomic levels, the opposite happens [22]. Furthermore, family factors, such as parenting style, lack of communication, and conflict between parents and children, have been associated with higher levels of discrepancy in both reports [23–32], while family cohesion and parental acceptance have shown fewer discrepancies [9,25]. Traditionally, these observed differences have been interpreted as a function of measurement errors and informant bias [26]. However, such discrepancies may be significant to understand the nature and course of child and adolescent psychopathology, as they may reflect underlying family problems, which potentially contribute to the development of psychopathologies [27]. (Caqueo-Urízar et al., 2022)

Parent Rating

Although the use of multiple informants in mental health assessment in the infant population benefits the understanding of the psychological functioning of children, discrepancies have been observed between the self-reports and the data provided by parents [6], and also between parents and teachers [7,8], generating new challenges for clinical practice, research, and theory related to child psychiatry and psychopathology [9]. These discrepancies have been extensively studied [10,11], showing that children as young as 6 years old may report independently regarding their health, as compared to parental reporting [12,13]. (Caqueo-Urízar et al., 2022)

Moreover, when externalized problems are analyzed, it seems that parents tend to be more precise than their children; however, when internalized symptoms are analyzed, there seems to be less agreement about which group reports symptoms better [15]. This disagreement stems from the fact that children value their behavior more positively than parents do [10]; although, it becomes more complicated towards adolescence, where they seem to report poorer health than parents, especially in emotional health [16]. Various studies support that these discrepancies are based on an underestimation of anxious and depressive symptoms by the parents [17–20].

However, when externalizing symptoms such as defiant behavior or hyperactivity are under evaluation, some studies have found a higher level of agreement between both groups [9,21].

In that sense, a meta-analysis carried out by Los Reyes et al. [4] including 341 studies published between 1989 and 2014, observed low-to-moderate correspondence between children’s self-report and parents’ report (mean internalizing: r = 0.25; mean externalizing: r = 0.30; mean overall: r = 0.28).

Research indicates discrepancies and varying accuracy in symptom reporting, with no clear consensus. Child reports internalized symptoms more accurately, while parents tend to be more precise in identifying externalized (Silverman & Eisen, 1992).

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).

Agreement as a test of validity for multiple informant

It can be challenging for clinicians to make a diagnosis if data from different sources are conflicting. When assessing children’s behavioral and emotional problems, informants tend to disagree [30,31]. Achenbach et al. [31] conducted a meta-analysis to evaluate relations between different informants’ reports of children’s and adolescents’ behavioral and emotional symptoms and found considerably higher consistency between informants who play similar roles in children’s lives than between informants who play different roles. They also found low consistency between children and their parents. Since the Achenbach et al. [31] review, other researchers have studied cross-informant correlation and found similar results [30]. Agreement between children and their parents differs by diagnostic categories, but studies have shown low to moderate agreement for the diagnosis of anxiety and depressive disorders [26,32,33] as well as attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD) and conduct disorder [18,27,34]. Disagreement between children and their parents about target problems can be problematic when it comes to setting treatment goals, which can, ultimately, lead to poorer treatment outcomes [35]. Studying moderators of parent–youth agreement may facilitate diagnostic processes [36]. Research suggests that agreement between parents and children is related to factors such as a child’s age [31,35], gender [37,38] and type and severity of disorder – especially anxiety and depression [39] – and parental psychopathology [39–42]. Studying those moderators may guide clinicians in assessing which reports have greater veracity [35,42,43]. (Jónsdóttir et al., 2022)

Traditionally, in both clinical and research work, the assumption that adults can answer for children has gone unchallenged. Children have been seen to be unreliable respondents, who lack the linguistic and cognitive skills required to understand and respond to questionnaires. In many cases it may well be that children are too young or ill to complete questionnaires themselves. Ironically, it may be especially in these situations that information about the child's HRQoL is most pertinent. In some circumstances, there may be no alternative but to rely on proxy raters. These are usually parents, but other relatives, medical sta and teachers may also contribute valuable information. Advocates of measures which rely exclusively on adults as informants argue that these may better facilitate assessments of children across the age range, compared with multiple measures designed for child self-report at dierent age levels [1]. Against this, relying on an adult as informant may result in incomplete assessment to the extent that the child's subjective experience and perceptions of HRQoL may be overlooked.

(Eiser & Morse, 2001)

MRI

In recent years, magnetic resonance imaging (MRI) studies have provided numerous evidence of functional and structural abnormalities in various brain regions in OCD, mainly within the cortico-striato-thalamo-cortical (CSTC) circuit [8–12]. The success of neuroimaging in revealing the neural correlates of OCD has raised hopes of using MRI indices to discriminate OCD patients and the healthy.

volume of gray matter (VGM), cortical thickness and sulcal depth were extracted from T1-weighted images as the structural neuroimaging markers.

These MRI indices were used because previous studies have successfully revealed altered VGM [34–36] and cortical thickness [37–39] in various brain regions, including the traditional CSTC circuit and newly reported regions, such as the occipital, parietal, and temporal lobes and the cerebellum, in patients with OCD. sulcal depth may provide valuable information for classification since previous studies indicate the association of altered sulcus morphology and psychotic disease [40–42].

It is also important to explain the contribution of the MRI markers when constructing the OCD diagnosis models. However, due to the “black box” problem of machine learning models, such as SVM, previous studies seldom explored the contribution of the MRI markers used in the classification models. The Shapley value is a fair profit allocation among many stakeholders depending on their contribution and was derived from the name of the economist who introduced it. By using the idea of the Shapley value, approaches were proposed to interpret the predictions from any “black box” model [49, 50]. The key component of general explanations is the contributions (equivalent to the Shapley value) of individual input features. A prediction is explained by assigning to each feature a number which denote its influence. For each feature, such contributions can be aggregated to plot the feature’s average contribution against the feature’s value. This provides an overview of the model and explanation of the predictions.

Obsessive-Compulsive Disorder

OCD is recognized as a prevalent and persistent neuropsychiatric condition, impacting an estimated 2% to 3% of individuals worldwide (de Mathis et al., 2013). The disorder commonly arises in early life and is characterized by the presence of compulsions – ritualized behavioral or mental acts, and obsessions – intrusive and unwanted thoughts and worries (Karno et al., 1988). OCD is unique among mental illnesses in that it exhibits both externalizing and internalizing symptoms (Guzick et al., 2019). Externalizing features, like compulsivity and repetitive actions, are often outwardly disruptive and align with disorders such as attention-deficit/hyperactivity disorder (ADHD) and disruptive behavior disorders. In contrast, internalizing aspects, including anxiety, concerns, and obsessions, cause internal distress and align with conditions like depressive and anxiety disorders, often leading to avoidance or withdrawal (Achenbach, 2001). Understanding OCD within this dual framework enhances our grasp of its complexity and informs more effective therapeutic strategies. These frameworks are not only therapeutically beneficial but are also supported by empirical research (Kessler et al., 2011; Slade & Watson, 2006).

The present study

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

Use MRI to predict youth score vs. parent score on four dimensions.

Have difference in score as an independent variable.

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.

Methods

Sample

* OCD scores by race/ethnicity
* post distributions: internalizing children vs parents and externalizing children vs parents
  + age, sex, socio economic

Clinical characteristics:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Characteristic  N (%) | Full Sample  (10756) | OCD absent  (10068) | OCD present  (662) | Group difference | Effect size |
| **KSADs Lifetime diagnosis** | | | | | |
| Any depressive disorder | 44(0.41%) | 35(0.35%) | 9(1.36%) | =13.19 | OR= |
| Any anxiety disorder | 286(2.66%) | 191(1.90%) | 95(14.35%) | =366.34 | OR= |
| ADHD | 635(5.90%) | 516(5.13%) | 119 (17.98%) | =181.75 | OR= |
| ODD/CD | 630(5.86%) | 523(5.19%) | 107(16.16%) | =133.24 | OR= |
| Bipolar | 228(2.12%) | 148(1.47%) | 80 (12.08%) | =331.43 | OR= |
| Drug use disorder | 26(0.24%) | 19(0.19%) | 7 (1.06%) | =15.96 | OR= |
| Any suicidality | 345(3.21%) | 271(2.69%) | 74(11.18%) | =141.05 | OR= |
| Any eating disorder | 118(1.10%) | 89(0.88%) | 29(4.38%) | =66.61 | OR= |
| No diagnosis | 9105(84.65%) | 8748(86.88%) | 357(53.93%) | =3114.60?? | OR= |
| **CBCL T-score** | | | | | |
| Mean (SD) | (10773) | (10733) | (660) |  |  |
| DSM-5 Anxiety | 53.37(5.92) | 52.94(5.36) | 59.81(9.21) |  |  |
| DSM-5 Depression | 53.76(5.94) | 53.43(5.62) | 58.91(8.00) |  |  |
| DSM-5 Somatic | 54.79(6.26) | 54.58(6.07) | 58.03(7.96) |  |  |
| DSM-5 ADHD | 53.10(5.33) | 52.84(5.09) | 57.06(7.13) |  |  |
| DSM-5 Opposite | 53.04(5.03) | 52.85(4.83) | 55.96(6.91) |  |  |
| DSM-5  Conduct | 52.39(4.80) | 52.21(4.57) | 55.04(6.88) |  |  |
| OCD | 53.30(5.72) | 52.82(5.03) | 60.68(9.38) |  |  |
| Total problem score | 44.64(11.41) | 43.92(11.11) | 55.60(10.26) |  |  |

\*NA = adhd=6, depressive disorder = 4, anxiety = 4, eating disorder = 4, no diagnosis =4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comorbidities | OCD absent | OCD present | Group diff | Effect size |
| No (other) diagnosis | 8748 | 357 |  |  |
| 1 | 962 | 174 |  |  |
| 2 | 257 | 76 |  |  |
|  | 95 | 55 |  |  |

Demographic characteristics:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Characteristic | Full sample  (10711) | OCD absent  (10049) | OCD present  (662) | Group difference | Effect size |
| Age | 9.48(0.51) | 9.48(0.51) | 9.46(0.50) |  |  |
| Sex, Female | 5096(47.58%) | 4777(47.54%) | 319(48.19%) |  |  |
| Pubertal status, Female | 3.28(0.80) | 3.28(0.81) | 3.25(0.76) |  |  |
| Pubertal status, Male | 2.01(0.91) | 2.00(0.91) | 2.09(0.88) |  |  |
| Perinatal | 0.0029(0.91) |  |  |  |  |
| Race, white | 5746(53.65%) | 5415(53.89%) | 331(50.00%) |  |  |
| Race, hispanic | 2098(19.59%) | 1970(19.60%) | 128(19.34%) |  |  |
| Parental marital status, married | 7227(67.47%) | 6838(68.05%) | 389(58.76%) |  |  |
| Parental education |  |  |  |  |  |
| Parental income | 7.53(2.32) | 7.57(2.29) | 6.99(2.63) |  |  |
| General SES | 0.00(0.94) |  | -0.26 |  |  |
| Social functioning | 0.0027(0.85) |  |  |  |  |
| NIH toolbox – cognition total |  |  |  |  |  |
| Family conflict – child report |  |  |  |  |  |
| Family conflict – parent report |  |  |  |  |  |
| Usable structural data | 7969 | 7495 | 474 |  |  |

SES, social functioning, perinatal variables are zero-centered; pubertal status is a 5-point scale,

Itemwise CBCL OCS characterization:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CBCL OCS item | Score | Full sample  (10898) | | OCD absent (10048) | |  | OCD present (660) | |
| 9- cannot get his/her mind off certain thoughts; obsessions | 0 | 8264(75.83%) | 7890(78.52%) | | 239(36.21%) | | |
| 1 | 2198(20.17%) | 1854(18.45%) | | 304(46.06%) | | |
| 2 | 436(4.00%) | 304(3.03%) | | 117(17.73%) | | |
| 31- feels he/she might think or do something bad | 0 | 10177(93.38%) | 9492(94.47%) | | 516(78.18%) | | |
| 1 | 654(6.00%) | 514(5.12%) | | 121(18.34%) | | |
| 2 | 66(0.61%) | 42(0.42%) | | 23(3.48%) | | |
| 32- feels he/she has to be perfect | 0 | 7993(73.34%) | 7511(74.75%) | | 347(52.58%) | | |
|  | 1 | 2484(22.79%) | 2210(21.99%) | | 226(34.24%) | | |
|  | 2 | 420(3.85%) | 327(3.25%) | | 87(13.18%) | | |
| 52- feels too guilty | 0 | 10226(93.83%) | 9518(94.73%) | | 532(80.61%) | | |
|  | 1 | 609(5.59%) | 487(4.85%) | | 109(16.52%) | | |
|  | 2 | 62(0.57%) | 43(0.43%) | | 19(2.88%) | | |
| 66- Repeats certain acts over and over: compulsions | 0 | 10293(94.45%) | 9692(96.46%) | | 432(65.45%) | | |
| 1 | 508(4.66%) | 313(3.12%) | | 181(27.42%) | | |
| 2 | 96(0.88%) | 43(0.43%) | | 47(7.12%) | | |
| 84- Strange behavior | 0 | 10472(96.09%) | 9741(96.94%) | | 553(83.79%) | | |
| 1 | 391(3.59%) | 285(2.84%) | | 97(14.70%) | | |
| 2 | 34(0.32% | 22(0.22%) | | 10(1.16%) | | |
| 85- strange ideas | 0 | 10313(94.63% | 9593(95.47%) | | 545(82.58%) | | |
|  | 1 | 559(5.13%) | 440(4.38%) | | 106(16.06%) | | |
|  | 2 | 25(0.23%) | 15(0.15%) | | 9(1.36%) | | |
| 112- worries | 0 | 7434(68.21%) | 7060(70.26%) | | 244(36.97%) | | |
|  | 1 | 3009(27.61%) | 2666(26.53%) | | 293(44.39%) | | |
|  | 2 | 454(4.17%) | 322(3.20%) | | 123(18.64%) | | |
| OCS score >0 |  | 5764(52.89%) | 5085(50.62%) | | 574(86.97%) | | |
| OCS score >1 |  | 3330(30.56%) | 2781(27.68%) | | 476(72.12%) | | |
| OCS score 5 |  | 621(5.70%) | 401(3.99%) | | 206(31.21) | | |
| CBCL OCS sum |  | 1.25 | 1.10 | | 3.50 | | |
| CBCL OCS t-score |  | 51.87 | 51.64 | | 55.24 | | |

Comparison parent vs child reports (CBCL):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Parent | | | Child | | |
|  | Full Sample | OCD absent | OCD present | Full Sample | OCD absent | OCD Present |
| Attention | 53.52(5.65) | 53.23(5.34 | 57.92(7.95) | 56.20(6.95) | 56.06(6.89) | 58.26(7.50) |
| Internal | 47.66(10.52) | 47.01(10.19) | 57.62(10.44) | 53.41(5.31) | 53.27(5.30) | 55.48(6.63) |
| External | 44.38(9.83) | 43.92(9.578) | 51.29(10.91) | 52.10(4.27) | 52.03(4.19) | 53.05(5.29) |
| Total problem score | 44.64(11.41) | 43.92(11.11) | 55.60(10.26) | 53.70(5.64) | 53.57(5.53) | 55.87(6.83) |

Study Design

The Adolescent Brain and Cognitive Development (ABCD) Study is a decade-long investigation in the US, 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 list of used questionnaires:

|  |  |  |
| --- | --- | --- |
| **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) |

|  |  |  |
| --- | --- | --- |
| **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 | Achenbach, T. M. (2001). *Manual for the ASEBA school-age forms & profiles: Child behavior checklist for ages 6-18, teacher’s report form, youth self-report: An integrated system of multi-informant assessment*. ASEBA.  Achenbach, T. M. (2006). As Others See Us: Clinical and Research Implications of Cross-Informant Correlations for Psychopathology. *Curr Dir Psychol Sci*, *15*(2), 94–98. https://doi.org/10.1111/j.0963-7214.2006.00414.x  Achenbach, T. M. (2009). *The Achenbach system of empirically based assessment (ASEBA): Development, findings, theory, and applications*. University of Vermont, Research Center for Children, Youth, & Families.  Barrett, M. L., Berney, T. P., Bhate, S., Famuyiwa, O. O., Fundudis, T., Kolvin, I., & Tyrer, S. (1991). Diagnosing Childhood Depression. 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| 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 |

Data acquisition

Statistical analyses/Preliminary analyses(?)

Modelling approach(?)

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