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Journal

Journal of Mental Health Research in Intellectual Disabilities, 8(2)

ISSN

1931-5864

Authors

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Blacher, J

Publication Date

2015-04-03

DOI

10.1080/19315864.2015.1018395

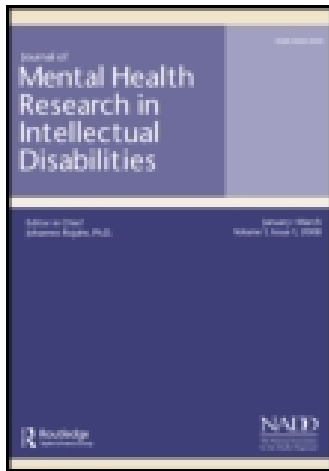
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Journal of Mental Health Research in Intellectual Disabilities

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/umid20>

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Published online: 15 Apr 2015.



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To cite this article: Bruce L. Baker & Jan Blacher (2015) Disruptive Behavior Disorders in Adolescents With ASD: Comparisons to Youth With Intellectual Disability or Typical Cognitive Development, *Journal of Mental Health Research in Intellectual Disabilities*, 8:2, 98-116, DOI: [10.1080/19315864.2015.1018395](https://doi.org/10.1080/19315864.2015.1018395)

To link to this article: <http://dx.doi.org/10.1080/19315864.2015.1018395>

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Disruptive Behavior Disorders in Adolescents With ASD: Comparisons to Youth With Intellectual Disability or Typical Cognitive Development

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Dual diagnosis of autism spectrum disorder (ASD) and behavior problems and/or mental disorders has become increasingly recognized and studied. Reported rates in samples of mixed-age youth with ASD are often above 70%, making this comorbidity more the rule than the exception. The present study compared rates of disruptive behavior disorder diagnosis in a sample of 13-year-old adolescents with ASD (n = 58), intellectual disability (ID; n = 40), or typical cognitive development (TD; n = 100). In youth without ASD, there was a high negative correlation between IQ and disruptive behavior disorders, assessed with the Child Behavior Checklist (CBCL) and the Diagnostic Interview Schedule for Children (DISC). In youth with ASD, however, the presence of a comorbid disruptive behavior disorder was unrelated to IQ, indicating that higher intelligence was not a protective factor for disruptive behavior disorders (DBDs) in ASD. On four CBCL scales and two DISC scales examined, youth with ASD had significantly higher rates than TD youth, though not generally higher than youth with ID. The most commonly diagnosed comorbid disorder in the early adolescents with ASD was attention-deficit/hyperactivity disorder. This has implications for planning school-based interventions, particularly for

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high-functioning children with ASD who are more likely to be fully included in general education.

KEYWORDS *autism spectrum disorder, disruptive behavior disorder, ADHD, ODD, IQ*

Comorbidity of intellectual/developmental disabilities and mental disorders has become increasingly recognized (Charlot & Beasley, 2013). Studies internationally that have focused on children and adolescents with intellectual disability (ID) have reported rates of behavior problems about 3 times as high as rates in cognitively typical youth (TD; Baker, Blacher, Crnic, & Edelbrock, 2002; Dekker, Koot, van der Ende, & Verhulst, 2002; Emerson, 2003; Emerson & Einfeld, 2010). Studies examining specific mental disorders in children with ID have found this same heightened risk (Christensen, Baker, & Blacher, 2013; Dekker & Koot, 2003). In one study focused on disruptive behavior disorders, 39% of 5-year-old children with ID met diagnostic criteria for attention-deficit/hyperactivity disorder (ADHD), compared with 12% of typically developing children. Oppositional defiant disorder (ODD) was also elevated (43% vs. 24%) even at this young age (Baker, Neece, Fenning, Crnic, & Blacher, 2010).

There has been a marked growth in research reports of comorbidity with autism spectrum disorder (ASD), especially since 2006 (Matson & Cervantes, 2014). A prominent focus has been on disruptive behavior disorders (DBDs), primarily ADHD, but also some including ODD or conduct disorder (CD; APA 2000, 2013).

The present study assessed the prevalence of ADHD and ODD in a sample of youth with typical development, intellectual disability, or autism spectrum disorder, using both a symptom checklist and a diagnostic interview. The sample was comprised of early adolescents, all age 13 years, to focus on this important developmental period. The youth with ASD were recruited from schools, rather than from psychiatric clinics, to be more representative of ASD youth. We examined whether the prevalence and severity of DBDs (ADHD and ODD) differed in youth with ASD compared with youth with TD or ID. We further examined whether DBDs in the ASD group differed according to whether the youth had typical cognitive development or ID.

Comorbidity of ASD with ADHD, and to a lesser extent ODD, has been found to be substantial, albeit highly variable. In these representative studies, the percentage of youth with ASD who met diagnostic criteria for ADHD was 18% (Mannion, Leader, & Healy, 2013), 28% (Simonoff et al., 2008), 31% (Gjevik, Eldevik, Flaeran-Granum, & Sponheim, 2011), 31% (Leyfer et al., 2006), 53% (Sinzig, Daniel, & Doepfner, 2009), 68% (Caamano, et al., 2013), and 83% (Joshi et al., 2010). This international sample of studies was from Ireland, England, Norway, United States, Germany, Spain, and the United States, respectively. Similarly, the percentage of comorbid ODD diagnoses in

these same studies ranged widely, from 4% to 73% (Mdn = 28%). In seeking to understand this wide variability, we noted that definitions of DBDs did not vary much, and nationality did not seem to account for the differences. However, several aspects of the study methods did vary in ways that appeared related to the diagnostic variability: sample source, assessment method (s), inclusion of youth with ASD and ID, and age ranges of youth.

Sample Source

The way in which youth with ASD enter the study appears to be highly related to the extent of DBD comorbidity reported. Understandably, the highest rates (53% to 83%) were found in samples drawn from psychiatric clinics (Caamano et al., 2013; Joshi et al., 2010) or psychiatric outpatients (Sinzig et al., 2009). The lower rates were found in samples recruited from schools for children with special needs (Gjevik et al., 2011), or samples drawn from the community for research (Mannion et al., 2013; Simonoff et al., 2008; Leyfer, 2006). The extent of comorbid DBDs in youth with ASD would seem to be most validly assessed in the more widely representative samples.

Assessment Methods

Studies of comorbid DBDs have used a wide range of questionnaire and interview measures. In the studies cited above drawn from the community, which found comparably lower rates of comorbidity, Simonoff et al. (2008) administered the strengths and difficulties questionnaire (Goodman, et al., 2001), Leyfer et al., (2006) and Gjevik et al. (2011) used modifications of the Semi-Structured Parent Interview Schedule for Affective Disorders and Schizophrenia (Kiddee SADS), and Mannion et al. (2013) administered the Autism Spectrum Disorder-Comorbid for Children (ASD-CC; Matson & Gonzales, 2007). Those authors finding the highest rates of comorbid ADHD used the same or similar measures. For example, Sinzig et al. (2009) used an ADHD rating scale derived from the ICD-10 and DSM-IV, while Caamano et al., (2013) and Joshi et al. (2010) used versions of the Kiddee SADS diagnostic interview. Researchers have been less likely to use questionnaire and interview methods together. The present study did this, in order to examine the classification agreement between these two approaches to diagnosis.

ASD With ID

One notable difference in the samples of the above-cited studies and others assessing comorbid DBDs with ASD is whether children with ID are included in the sample. Many researchers have limited the sample to high-functioning ASD, usually defined by IQs of ≥ 70 (e.g., Ames & White, 2011; Gadow, DeVincent, & Drabick, 2008; Guerts et al., 2008; Hurtig et al., 2009; Mayes,

Calhoun, Mayes, & Molitoris, 2012). In the representative studies cited initially, Caamano et al. (2013) and Sinzig et al. (2009) imposed this cutoff. The other studies cited above did not exclude youth with ASD and ID, with the reported proportion of children in the ID range varying from 32% to 60%. Simonoff et al. (2008) specifically examined the relationship between ADHD diagnosis and child IQ in ASD, finding no relationship. Similarly, a UK study of a large population-representative sample, found that youth with ASD, with or without ID, scored equally high (Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011). The rationale for an IQ cutoff in many studies may reflect assumptions that rates of disorders, or the disorders themselves would be different if the ASD sample included children with IQs in the ID range. In short, the question of whether DBDs are more or less likely in ASD youth with ID is far from resolved. The present ASD sample included youth with or without comorbid ID and examined whether lower intelligence is a further risk (or protective) factor for DBDs.

DBDs and Youth Age

While we might expect the extent and nature of psychopathology with ASD to vary with child age, all of the studies of DBDs in youth with ASD cited thus far in this report, enrolled children varying widely in age, most including children from early school age through high school. The median age span within these studies was 13 years. While both the incidence and the manifestation of DBDs would be expected to vary with the child's developmental stage, this issue has received little or no attention. The present research studied a sample of youth in a critical developmental stage, early adolescence (all age 13). This middle-school period is a time when ADHD and ODD diagnoses will have been established and when some interpersonal problems (e.g., bullying) are most in evidence.

The present study examined the extent of DBDs in young adolescents with or without ASD and across a wide range of IQ. Thus, we were able to compare rates in a control group of youth with typical cognitive development to clinical groups with ID and/or ASD. Diagnoses were derived from mother reports on both the child behavior checklist (Achenbach & Rescorla, 2001) and the structured and personally administered diagnostic interview schedule for children (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000).

We addressed two primary questions. First, does the difference in comorbid DBDs, previously found to vary negatively with IQ in youth without ASD (i.e., higher in youth with ID) also vary with IQ in youth with ASD? That is, does higher intelligence serve as a protective factor against DBDs for youth with ASD? Second, are adolescents with ASD at greater risk for clinical levels of ADHD and ODD, derived from parent questionnaires as well as structured diagnostic interviews, than youth without ASD who have intellectual disability or typical cognitive development? Thus, we examined

two possible risk factors for DBDs in youth: low IQ (ID) and ASD. We considered DBDs both as continuous variables and also as dichotomous scores (clinical range, nonclinical range).

METHODS

Participants

Participants were 198 early adolescents (all age 13 years) and their families. They were participating in the collaborative family study, a longitudinal study focused on behavior problems and/or mental disorders (BP/MD) from age 3 to 13 years (references blinded for review). Of these, $n = 100$ youth were TD and $n = 40$ met criteria for ID. Eighty percent of these youth had participated in the longitudinal study, and 20% joined at age 13. The $n = 58$ youth in the ASD group, primarily entered the study at age 13 (78%); the remaining 22% had entered the longitudinal study as children with TD or ID but later were professionally diagnosed with ASD.

Families of children with ID were recruited primarily through schools or agencies that provide and purchase diagnostic and intervention services for persons with developmental disabilities. Children in the ID group at intake were all in the moderate to borderline range of cognitive delay on the Bayley Scales of Infant Development (Bayley, 1993); original exclusion criteria at age 36 months were lack of ambulation, diagnosis of autism, or any neurodevelopmental disorder. Families of children with TD were recruited primarily through local preschools and daycare programs. Further selection criteria were that the child score in the range of typical cognitive development, not have been born prematurely, and not have any developmental disability.

The 45 youth with ASD who began the study at age 13 were referred through schools. Many ($n = 25$) were in a large private nonprofit organization of schools for children with autism or programs associated with this organization, where they had received comprehensive evaluation of autism. The remaining 20 were referred from school programs for youth with ASD and had been diagnosed professionally. In recruiting all study participants, school and agency personnel mailed brochures describing the study to families who met selection criteria, and interested parents contacted the research center.

At age 13, all participating mothers were administered the Vineland Adaptive Behavior Scales (Sparrow, Cicchetti, & Balla, 2005) and youth were administered subtests of the Wechsler Intelligence Scales for Children (Wechsler, 2003). Youth without ASD were classified as intellectually disabled (IQ <70, $n = 27$), borderline intellectual disability (IQ 70–84, $n = 13$), or typically developing (IQ 85+ $n = 100$). The intellectual disability and borderline intellectual disability groups (American Psychological Association, 2000) were combined in the present study and were designated as the ID group. Youth assigned to the ID group also had VABS scores at least one standard

deviation below the mean (≤ 85). The TD youth had IQ scores of 85 or higher, and were assigned to this condition regardless of VABS scores. Youth classification in the ASD group ($n = 58$) was based primarily on diagnostic history of autism, which included a full clinical evaluation. There was a wide range of IQ within the ASD group, from ID (< 70 , $n = 13$) and borderline ID (70–84, $n = 14$), to typical developing (85+, $n = 31$).

Table 1 shows demographic characteristics at child age 13 by group status. In the combined sample there were more boys (60.4%) than girls. Youth race/ethnicity was distributed as follows: 55.8% White, non-Hispanic, 17.3% Hispanic, 8.6% African American, 1.5% Asian American, and 16.8% classified by parents as “other.” Seventy percent of mothers were married or partnered (defined here as legally married or living together at least 6 months). The socioeconomic status was generally high; 67% of families had an annual income above \$50,000, and 53% of mothers were college graduates, with over half of these having had additional years of education. As shown in Table 1, there were no significant between-group differences in child race/ethnicity, mother’s age, marital status, and family income. Mother’s highest grade in school completed differed significantly across groups, and was covaried in analyses when it related to the dependent variable. Child sex differed by sample but could not be covaried in cross-group analyses given the high, and expected, percentage of males in the ASD group. However, the relationship of child sex to clinical scales was examined within each diagnostic group.

Procedures

The Institutional Review Boards of the participating universities approved all procedures. Mothers and their adolescents came to the center for an

TABLE 1 Child, Parent, and Family Demographics

| Demographics | TD $n = 100$ | ID $n = 40$ | ASD $n = 58$ | F or chi-square |
|--|---------------------------|--------------------------|--------------------------|---|
| Child sex: % male | 51 ^a | 54 ^a | 82 ^b | $F(2,196) = 8.64$ $p < .001$ |
| Child race/ethnicity: % White, non-Hispanic | 59 ^a | 45 ^a | 58 ^a | $X^2 = 2.41$, ns |
| Child IQ, mean (SD) | 108.2 ^a (12.6) | 62.1 ^b (12.9) | 90.3 ^c (24.0) | $F = 106.34$, $df = (2,187)$, $p < .001$ |
| Mother age: years (SD) | 45.6 ^a (6.3) | 42.9 ^a (7.4) | 45.3 ^a (9.8) | $F = 1.79$, $df = (2,194)$, ns |
| Mother education: years of school (SD) | 16.0 ^a (2.3) | 14.2 ^b (3.1) | 15.1 ^b (2.2) | $F = 8.22$, $df = (2,194)$, $p < .001$ |
| Mother marital status (% married) | 76.0 ^a | 65.0 ^a | 63.0 ^a | $X^2 = 3.47$, ns |
| Family income (% >\$50K) | 73.5 ^a | 57.5 ^a | 61.4 ^a | $X^2 = 4.26$, ns |

Note. Scores with different superscripts significant at $p < .05$.

assessment session lasting between 2 and 3 hours. The session began by reviewing what would be done and obtaining informed consent. During the center visit, measures of relevance to the present study included assessments of youth intelligence, youth adaptive behavior, youth mental health, and family demographics. Questionnaire measures of youth behavior problems were obtained in separate batteries from mothers and fathers, usually before the center visit. Families were paid \$75 for their participation in the assessment.

Measures

WECHSLER INTELLIGENCE SCALE FOR CHILDREN, 4TH EDITION (WISC-IV; WECHSLER, 2003)

Full Scale IQ (FSIQ) of a child at age 13 years was estimated using three subtests of the WISC-IV (Vocabulary, Matrix Reasoning, and Arithmetic). Sattler and Dumont (2004) reported that this prorated IQ correlated highly ($r = .91$) with the FSIQ from the full WISC-IV administration. While they did not specify whether this correlation was consistent across all levels of cognitive functioning, their normative sample included a substantial number of children with mild and moderate ID, learning disabilities, ADHD, and other childhood disorders.

VINELAND SCALES OF ADAPTIVE BEHAVIOR-II (VABS; SPARROW ET AL. 2005)

The VABS is a commonly used semi-structured interview that asks the caregiver to report on adaptive behaviors that the child usually does. The standardized adaptive behavior composite score was used, which has a mean of 100 and a SD of 15. This core was comprised of three subscales: communication, daily living skills, and socialization. The VABS has excellent validity and reliability, with $\alpha = .99$ (de Bildt, Kraijer, Sjoerd, & Minderaa, 2005).

NIMH DIAGNOSTIC INTERVIEW SCHEDULE FOR CHILDREN, VERSION IV (SHAFFER ET AL., 2000; SHAFFER, FISHER, LUCAS, & COMER, 2007)

The DISC, administered to mothers in the present study, is a highly structured diagnostic interview covering DSM-IV (American Psychological Association, 2000) criteria for child psychiatric disorders. Respondents are asked about the presence of symptoms that fall under the major diagnostic categories. Responses are simultaneously entered into a computerized scoring program that determines a positive diagnosis with an algorithm that considers three criteria: age of onset, symptom count, and impairment.

The DISC (all versions) has undergone extensive testing, refinement, and revision (Shaffer, Schwab-Stone, Fisher, & Cohen, 1993) and has shown good test-retest reliability (Shaffer et al., 1996) as well as concurrent and

predictive validity for ADHD and ODD diagnoses (Friman et al., 2000; McGrath, Handwerk, Armstrong, Lucas, & Friman, 2004). In the present study we administered only the ADHD and ODD modules to every parent. We also read a brief summary of the diagnostic criteria for conduct disorder and went on to administer that module to those parents ($n = 15$) who acknowledged it somewhat applied. Of these, only 4 youth met diagnostic criteria (0% TD, 2.5% ID, 5.2% ASD), too few for further analyses.

CHILD BEHAVIOR CHECKLIST FOR AGES 6–18 (CBCL; ACHENBACH & RESCORLA, 2001)

Child behavior problems were assessed with the widely used CBCL, completed by mothers. For each of the 113 problems listed, the respondent indicates whether it is “not true” (0), “somewhat or sometimes true” (1), or “very true or often true” (2). The CBCL yields a total score, two broadband scales (externalizing and internalizing), eight narrow-band scales, and six clinical scales that map onto specific diagnoses. In the present study, the total and externalizing broadband scores as well as the ADHD and ODD clinical scales were examined. The CBCL has good validity (Achenbach & Rescorla, 2001) and the internal reliability for the total behavior problems score in the present sample was $\alpha = .97$.

RESULTS

The first question asked whether intelligence is a protective factor against disruptive behavior disorders in adolescents with ASD. Figure 1 shows CBCL total behavior problem scores for youth with ASD versus those with no ASD across the IQ spectrum. Youth in each condition were divided into five standard deviation IQ categories, representing ID (<70), borderline ID (70–84), low to average IQ (85–99), average to higher IQ (100–114), and high IQ (115+). The graph for youth without ASD is what would be expected given the considerable literature on heightened behavior problems associated with ID. Youth in the typical IQ range (85+) scored just below the CBCL standardized mean of 50, but there was a steep increase in behavior problems when IQ dropped into the borderline or ID range. The graph for youth with ASD, however, had a very different slope. There was no relationship between youth IQ group and the extent of behavior problems.

Table 2 shows scores for youth with ASD versus no ASD across IQ groups for the CBCL total score shown in Figure 1, and also for three other CBCL scales: broadband externalizing T , and clinical scale T scores for ADHD and ODD. If graphed, these three other DBD domains would show the same pattern as shown for CBCL total problems. In the no-ASD group there were significant negative correlations with IQ group across the

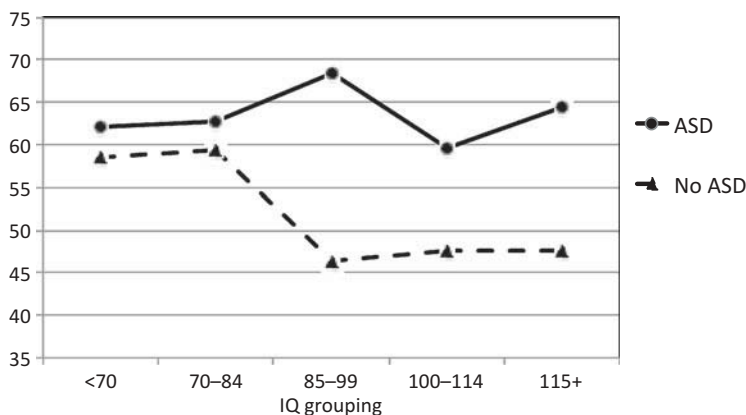


FIGURE 1 Total CBCL behavior problems by IQ standard group: Youth with No ASD vs. ASD. ASD = autism spectrum disorder.

three CBCL scores, ranging from $r = -.26$ ($p = .002$) to $r = -.41$ ($p < .001$). As seen in Table 2, the no-ASD group scores were highly similar when IQs were above 85; the correlation with IQ is accounted for by the heightened CBCL scores in the ID range (below 85). In the ASD group, however, there was not a relationship between CBCL score and IQ score for any scale.

Table 3 shows the results of ANOVAs with the CBCL scales as dependent variables and ASD (yes/no) and IQ category (1–5) as independent variables. For each scale, there is a highly significant effect of ASD, no significant effect of IQ, and a significant ASD \times IQ interaction. We should note that these CBCL scale results are not independent. The CBCL scales scores are highly intercorrelated, for both the no-ASD and the ASD groups, in part because there is item overlap between scales.

In a further set of analyses within the ASD group addressing whether DBDs differed between youth with ASD only versus ASD with comorbid ID, we first examined three ASD groups (with ID, $n = 13$; with borderline ID, $n = 14$; with typical cognitive development, $n = 31$) on four CBCL scales (total, externalizing, ADHD, ODD) and two DISC diagnoses (ADHD, ODD), each expressed as continuous variables and then as clinical level variables. None of the 12 overall F tests or pairwise comparisons approached significance (the highest $F = 0.80$). We then conducted two-group comparisons, combining youth with ASD who also had ID or borderline ID ($n = 27$) and contrasting this group with the ASD typical cognitive development group on the same 12 domains as above. No t test approached significance (the highest $t = 0.90$). Thus, from these other ways of examining the zero-order relationship in ASD between those youth with or without ID that is shown in Figure 1, we found no evidence that comorbid ID makes a difference in the likelihood or level of a DBD.

TABLE 2 CBCL Mean (*SD*) Scale Scores for Autism Spectrum Disorder (ASD) Versus No ASD by IQ Groups

| CBCL scale | DX | IQ <70 (<i>n</i> = 23) | IQ 70–84 (<i>n</i> = 17) | IQ 85–99 (<i>n</i> = 17) | IQ 100–114 (<i>n</i> = 46) | IQ 115+ (<i>n</i> = 30) | <i>r</i> score × IQ group |
|---------------|--------|----------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|------------------------------|
| Total | No ASD | 58.0 (11.0) | 59.4 (11.0) | 46.4 (12.2) | 47.2 (10.0) | 47.5 (10.8) | -.38*** |
| Externalizing | No ASD | 54.4 (9.6) | 54.8 (12.2) | 46.5 (9.3) | 46.7 (9.2) | 47.5 (9.9) | -.29** |
| ADHD | No ASD | 61.2 (7.6) | 59.5 (8.0) | 54.3 (6.8) | 52.9 (4.2) | 54.4 (6.1) | -.41*** |
| ODD | No ASD | 58.4 (7.7) | 58.5 (8.7) | 53.9 (4.6) | 54.1 (6.0) | 54.1 (6.9) | -.26** |
| Total | ASD | 61.6 (7.9) | 62.8 (11.3) | 68.4 (6.5) | 60.1 (8.2) | 64.3 (8.6) | -.07 |
| Externalizing | ASD | 57.2 (8.8) | 54.5 (10.3) | 63.6 (5.7) | 53.2 (9.0) | 53.2 (10.1) | -.12 |
| ADHD | ASD | 62.5 (8.7) | 61.8 (8.3) | 67.4 (8.3) | 61.0 (6.0) | 63.2 (9.4) | -.03 |
| ODD | ASD | 58.9 (6.4) | 57.9 (8.8) | 63.9 (6.9) | 59.4 (9.9) | 56.4 (7.8) | -.05 |

****p* < .01. ***p* < .001.

TABLE 3 ANOVAs Showing the Relationship Between CBCL Scale Scores and ASD Diagnosis (Yes, No), IQ Category (1–5), and the ASD by IQ Interaction

| CBCL scale | ASD versus no ASD | IQ category ¹ | ASD × IQ |
|---------------|-------------------|--------------------------|-----------------|
| Total | $F = 47.94^{***}$ | $F = 2.45$ | $F = 4.61^{**}$ |
| Externalizing | $F = 15.46^{***}$ | $F = 2.40$ | $F = 3.12^*$ |
| ADHD | $F = 34.59^{***}$ | $F = 2.32$ | $F = 3.65^{**}$ |
| ODD | $F = 9.47^{**}$ | $F = 1.46$ | $F = 2.61^*$ |

¹IQ category: 1. <70; 2. 70–84; 3. 85–99; 4. 100–114; 5. 115–145.

* $p < .05$. ** $p < .01$.

TABLE 4 CBCL DBD *T* Scores by Youth With Typical Development, Intellectual Disability, or ASD Status

| CBCL scale | TD no ASD $n = 98$ | ID no ASD $n = 37$ | ASD $n = 52$ | F $df = 2/184$ |
|---------------|--------------------------|--------------------------|-------------------------|----------------------|
| Total score | 47.8 ^a (11.0) | 58.5 ^b (10.3) | 63.5 ^c (8.7) | 43.08 ^{***} |
| Externalizing | 47.6 ^a (9.9) | 54.3 ^b (10.0) | 56.3 ^b (9.6) | 15.52 ^{***} |
| ADHD | 54.0 ^a (5.6) | 60.4 ^b (7.9) | 63.3 ^b (8.3) | 33.50 ^{***} |
| ODD | 54.5 ^a (6.2) | 58.2 ^b (7.6) | 59.0 ^b (7.8) | 8.52 ^{***} |

Note. Scores with different superscripts significant at $p < .05$.

*** $p < .001$.

The second question asked whether youth with ASD are at significantly greater risk for DBDs than those who do not have ASD. As shown in Table 2, on the four CBCL scales, each across five IQ levels, youth with ASD scored higher than youth without ASD on 18 of 20 comparisons. Table 4 examines scores on these four CBCL scales further, across the three youth groupings: TD, ID, and ASD. Given the lack of any relationship of DBD and IQ within the ASD group described above, we combined the ASD youth with and without ID into one ASD group for these and subsequent analyses. The three groups differed significantly at $p < .001$ on every scale. ASD youth scored significantly higher than TD youth on every scale, and significantly higher than youth with ID on total score. The ASD group mean score on the CBCL total was quite high, averaging 63.5, well within the borderline clinical range and just below the clinical range cutoff (of 64). Youth with ID scored significantly higher than TD youth on every DBD scale.

Table 5 shows an alternative way to look at DBDs—the percentage of youth on each CBCL scale whose problem score was high enough to be considered of clinical concern (in the borderline or clinical range). For CBCL broadband scores (total, externalizing), the criterion for borderline or clinical range is a score of 60 or above. For CBCL clinical scales (attention-deficit/hyperactivity disorder, oppositional defiant disorder) the criterion for borderline or clinical range is a score of 65 or above. The percentage of youth in the ID group meeting clinical criteria was significantly higher than for youth with TD on two scales (total score, ODD). The percentage for

TABLE 5 CBCL Scales and DISC Diagnoses by Youth ASD Status: Percentage in the Borderline or Clinical Range A

| CBCL scale | TD no ASD <i>n</i> = 98 | ID no ASD <i>n</i> = 37 | ASD <i>n</i> = 52 | Chi-square | Risk ratio ASD: TD |
|--------------------|----------------------------|----------------------------|----------------------|------------|-----------------------|
| CBCL total | 16.3 ^a | 45.9 ^b | 65.4 ^c | 37.62*** | 4.01:1 |
| CBCL externalizing | 14.3 ^a | 29.7 ^{ab} | 38.5 ^b | 21.38*** | 2.51:1 |
| CBCL ADHD | 12.2 ^a | 24.3 ^a | 46.2 ^b | 11.88*** | 3.79:1 |
| CBCL ODD | 12.2 ^a | 24.3 ^b | 21.2 ^b | 3.59 | 1.74:1 |
| DISC diagnosis | <i>n</i> = 100 | <i>n</i> = 39 | <i>n</i> = 58 | | |
| DISC ADHD | 14.0 ^a | 46.2 ^b | 56.9 ^b | 34.36*** | 4.06:1 |
| DISC ODD | 14.0 ^a | 25.6 ^{ab} | 33.9 ^b | 8.66* | 2.42:1 |

Note. Different superscript letters denote status categories whose proportions differ significantly from each other at $p < .05$.

* $p < .05$. *** $p < .001$.

youth with ASD was significantly higher than for youth with TD on every scale, and was significantly higher than for youth in the ID group on two scales (total score, and ADHD).

These findings of differences in DBD by youth diagnostic status were derived from the mother-completed CBCL, a questionnaire measure. Similar analyses were conducted with the DISC, which also had mothers as respondents, except that the diagnostic measure involved in-depth, structured interviewing. Table 5 also shows the percentage of youth meeting diagnostic criteria on the ADHD and ODD DISC modules. Overall, 33% and 22% of youth met DISC diagnostic criteria for ADHD and ODD respectively. The diagnostic groups differed significantly in the percentage of youth meeting diagnostic criteria, with the ASD group having over 4 times as many youth diagnosed with ADHD as in the TD group.

We examined the agreement in clinical classification between the CBCL and the DISC. The extent of agreement possible was curtailed somewhat, as more youth met diagnostic criteria on the DISC than on the CBCL. ADHD criteria were met by 23.7% of the sample on the CBCL and 31.7% on the DISC. ODD criteria were met by 16.8% on the CBCL and 22.3% on the DISC. Yet there was still high agreement between the two measures. For ADHD, 81% of youth received the same classification (meets or does not meet clinical cutoff) on the CBCL and DISC (Chi-square = 55.22, $p < .001$). With this stringent criterion, of meeting the cutoff on both measures, the percentage of youth meeting the two clinical cutoffs were ASD (50%), ID (26.1%) and TD (9.1%), Chi-square (2 df) = 26.58, $p < .001$. For ODD 86% of youth received the same classification on the CBCL and DISC (chi-square = 58.01, $p < .001$). The percentage of those meeting criteria on both measures by condition was ASD (23.8%), ID (20%) and TD (8.1%), chi-square (2 df) = 6.45, $p = .04$.

Overall, 40.6% of the present sample received a DBD diagnosis, of ADHD (18.5%), or ODD (7.7%) or both disorders (14.4%). The ASD group

was especially high in ADHD diagnoses, with 46% in the clinical range on the CBCL and 58% meeting DISC criteria. These were about 4 times as high as the percentage of youth meeting ADHD criteria in the TD group by these two measures: 11% and 14%.

Given the significant difference among groups in child sex, and the commonly reported rates of higher DBDs in boys (APA, 2013), it would be customary to co-vary child sex in analyses of disorder prevalence. However, this was not possible given the high overlap of male gender (81%) and ASD diagnosis in the present sample. To understand the possible role of child sex, we examined the four CBCL scales in Table 4 separately within each diagnostic group for child sex differences. In the TD group, where the percentage of boys and girls was almost identical, boys scored significantly higher than girls in total ($t = 2.07$, $df = 96$, $p = .04$) and ADHD scales ($t = 3.89$, $df = 96$, $p < .001$), and approached significance in externalizing scores ($t = 1.91$, $df = 97$, $p = .06$). In the ID group, where the percentage of boys and girls was similar, there were no significant sex differences, although girls scored *higher* than boys on every variable. In the ASD group girls also scored *higher* than boys on every variable; girls were significantly higher on externalizing scores ($t = 2.37$, $df = 51$, $p = .02$) and almost significantly higher on total scores ($t = 1.98$, $df = 51$, $p = .053$). Thus the higher rates of externalizing problems in youth with ASD were not an artifact of the high percentage of boys in this condition.

DISCUSSION

We examined the extent of DBDs in 13-year-old youth with ASD compared with same-aged youth who had TD or ID but no ASD. Our first question asked whether higher intelligence is a protective factor against DBDs in youth with ASD. In samples without ASD, considerably higher DBDs have been found in youth with ID in contrast to those with TD. Findings have replicated in children as young as age 3 years (Baker et al., 2002) and across childhood and adolescence (deRuiter, Dekker, Verhulst, & Koot, 2007; Emerson & Einfeld, 2010), on symptom checklists or diagnostic interviews. Consistent with this, in the present study there was a strong relationship between IQ and DBDs in the 140 youth without ASD. Among the 58 youth with ASD, however, there was no relationship between IQ and DBDs.

Most studies of comorbid psychological problems in children with ASD select samples with IQs <70, perhaps based on assumptions about the extent or causes of mental disorders in children with nonnormative intelligence. In any case, while there is increasing information about comorbid disorders in ASD youth without ID, there is little known about such disorders in ASD youth with ID. The present study, consistent with several others that have examined hyperactivity in ASD youth with or without ID (Sinzing et al.,

2009; Totsika et al., 2011) found no relationship between intelligence and the diagnosis of DBDs in youth with ASD.

Our second question asked whether youth with ASD were more likely to have DBDs than youth without ASD (with or without ID). In the present sample, the answer was affirmative, regardless of the type of measure used. On the mother-completed CBCLs, the ASD group scored significantly higher than the TD group on every scale. In order to provide more robust assessment of DBDs, we utilized a widely administered checklist measure (the CBCL), as well as scales from a structured clinical interview (DISC), the latter requiring specific interviewer training and considerable interview time. Thus, it was possible to examine both the DISC diagnoses of ADHD and ODD and the CBCL clinical designations of within or below the borderline/clinical range. On each of these measures, 4 times as many ASD youth as TD youth met diagnostic criteria for ADHD. Elevated scores for ADHD in the ASD group were found with both CBCL continuous and categorical scores and also with the DISC diagnoses.

This comorbidity is of particular interest, as the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychological Association, 2013) now permits diagnosing both disorders when criteria are met. Rao and Landa (2014) reported that 29% of their young ASD sample (mean age 5.6 years) also received an ADHD diagnosis by a parent report measure. They found that these comorbid children had lower cognitive functioning, more severe social impairment, and more delayed adaptive functioning than the children with ASD only. In the present study of 13-year-old youth, the comorbidity was even higher; 46% of those with ASD met criteria for ADHD by the CBCL, and 57% met DISC interview criteria. Thus, the comorbidity of ASD and ADHD should be the focus of more research, as it seems to be high, possibly increasing over time, and potentially even more impairing than each of the two serious disorders alone.

We examined differences in diagnoses by child sex, as 81% of the youth in the ASD group were boys, which, it seemed, might be one explanation for the heightened rate of DBDs found in our ASD sample. Studies of sex differences in disruptive behavior disorders, although almost always excluding children with ID or ASD, have reported greater incidence in boys. Drawing on this literature, the DSM-V description of ADHD reports a sex risk ratio of 2:1 boys over girls (APA, 2013, p. 63). Consistent with the research literature, in our TD group boys scored significantly higher than girls in CBCL total score and the ADHD clinical scale. However, this sex difference was not found in our ID and ASD groups; in both of these groups girls scored higher on every CBCL scale. Within the ASD group, the girls' higher scores were significant for the total score. While the higher scores for girls with ASD was surprising, this was based on a small sample. However, some other recent studies with ASD samples have also reported higher rates of DBDs in girls than boys (e.g., Holtmann, Bolte, & Poustka, 2007) or comparable rates

for girls and boys (Stacy, Zablotzky, Yarger, Zimmerman, Makia, Li-Ching, 2013). A review of gender effects on disruptive behaviors in youth with ID (Einfeld, Gray, Ellis, Taffe, Emerson et al., 2010) cites some studies showing higher rates in girls and others showing higher rates in boys, though the latter reported more modest sex differences than are usually found in studies of typically developing youth. There is a clear need for further examination of the extent of, and explanations for, sex differences in youth with ID and/or ASD.

This study of youth with autism spectrum disorder or intellectual disability had several notable strengths. First, the youth were all age 13, during the critical developmental period of early adolescence, in contrast to most such studies that sample from a wide age range. Second, measures of disruptive behavior disorders, while still obtained only from mothers, utilized two prominent diagnostic measures, a parent-report checklist and a diagnostic interview. Third, the study included youth with TD, ID, ASD with ID, and ASD with no ID, allowing us to examine the DBDs in ASD in a broader context. There are, of course, also limitations, among them these. First, the relatively small samples of youth with ASD and ID limited the statistical power, and also the types of analyses that could be performed. Second, we did not assess the youth in the ASD group with a standard autism diagnostic instrument. Due to the age of our sample, as compared with very young children, and our youths' lengthy histories of autism diagnoses and services, we relied on the fact that they had been screened and accepted into programs for youth with autism. Given this, however, we do not have a measure of the severity of symptoms. Future studies of DBDs in adolescents with ASD should obtain such measures, to determine whether symptom severity across diagnostic domains relate to the extent of comorbid disorders.

Three primary conclusions can be drawn from these results. First, comorbidity with ADHD occurred in about 50% and ODD in about 25% of youth with ASD at age 13. Second, youth with ASD scored higher than those with typical cognitive development on every questionnaire and interview indicator of these DBDs. Third, there was no indication that higher IQ was a protective factor for DBDs in for youth with ASD.

These findings have clear relevance for teachers and other service providers for early adolescents with ASD. Student–teacher relationships are known to be strongly predictive of current and future school success (Hamre & Pianta, 2004). Unfortunately, however, teachers of students with ASD have been found to report significantly poorer relationships with them than has been reported by teachers of students with ID or TD, indicating greater conflict and less closeness (Blacher, Howell, Lauderdale-Littin, DiGennaro Reed, & Laugeson, (2014). As student–teacher conflict is driven primarily by the presence of youth behavior problems (Blacher, Baker, & Eisenhower, 2009), enhanced in-service training for teachers of youth with ASD that is focused on recognizing and responding to disruptive behavior disorders may

have the added benefit of better student–teacher relationships, and more likelihood of more successful school outcomes.

ACKNOWLEDGMENTS

We appreciate the efforts of our doctoral students, staff, and participating families.

FUNDING

This article was based on the activities of the Collaborative Family Study, a two-site longitudinal study supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, Grant 34879-1459. This work was done in collaboration with The Help Group Alliance and Dr. Elizabeth Laugeson, and with partial support from the SEARCH Family Autism Center at UC Riverside and the UCR Vice Chancellor for Research.

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