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Examining the Clinical Correlates of Autism Spectrum Disorder in Youth by Ascertainment Source

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Abstract

Objective—To examine whether presentation of autism spectrum disorder (ASD) and associated patterns of psychiatric comorbidity and dysfunction vary by referral source.

Methods—ASD youth referred to a specialized ambulatory program for ASD (N=143) were compared to ASD youth referred to a general child psychiatry clinic (N=217).

Results—More ASD clinic youth met criteria for a more robust form of ASD (autistic disorder); more youth referred to the psychiatry clinic met criteria for broader spectrum ASD (PDD-NOS). General psychiatry clinic youth with ASD suffered from a greater burden of psychopathologies and higher levels of dysfunction.

Conclusion—The presentation of ASD in psychiatrically referred youth differs between general and ASD-specialized clinics, though both referral populations have high levels of comorbidity and dysfunction.

Keywords

autism spectrum disorder; psychiatric comorbidity; youth

Autism spectrum disorder (ASD) refers to a developmental disorder characterized by impairments in socialization and communication in the presence of restricted, repetitive behaviors and is estimated to affect up to 2% of children and adolescents in the general population (Blumberg et al. 2013). Psychiatric referrals of children with ASD are frequently driven by emotional and behavioral difficulties (RUPP 2002, 2005; Gadow et al. 2004; Vickerstaff S. et al. 2007; Sterling et al. 2008). Up to 14% of children referred to general

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psychiatric clinics have diagnoses of ASD, and a sizable number of ASD youth referred to specialized ASD programs are afflicted with comorbid psychiatric disorders (Kurita et al. 2004; M. Ghaziuddin et al. 1998; Muris et al. 1998). Questions remain as to whether the presentation of ASD and comorbid psychopathology in referred youth reliably varies by ascertainment source.

The existing literature on referred youth with ASD documents a high prevalence of various psychiatric disorders including attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, and mood disorders (Wozniak et al. 1997; Green et al. 2000; Frazier et al. 2001; Leyfer et al. 2006; de Bruin et al. 2007; Joshi et al. 2010; Van Steensel et al. 2013; Skokauskas and Gallagher 2012; Mazefsky et al. 2012; Levy et al. 2010). We previously reported that in one sample of psychiatrically referred youth, 88.5% of the children with autism spectrum disorder met criteria for a broader ASD phenotype, i.e., pervasive developmental disorder not otherwise specified (PDD-NOS; Joshi et al. 2010). We speculated that this could reflect a referral bias where youth with unrecognized forms of ASD come to clinical attention through initial referrals to general psychiatry clinics for management of their more salient comorbid psychiatric condition(s). It follows that this potential referral bias could inflate reported rates of psychiatric disorders in youth with ASD, raising concerns as to whether patterns of referral vary by the clinical presentation of both ASD and associated psychopathology. These considerations suggest that further research is necessary to study the relationship between ascertainment source and the clinical correlates of ASD and associated psychopathology.

A better understanding of this issue has important clinical implications. If a diagnosis of ASD predicts a set of psychiatric and functional correlates irrespective of ascertainment source, clinicians in child psychiatry settings should be encouraged to consider the diagnosis of ASD in children struggling with multiple psychiatric disorders. Similarly, clinicians evaluating children with ASD in specialized programs may need to increase efforts to identify and target comorbid psychiatric disorders. The presence of psychiatric comorbidity in youth with ASD not only complicates an already highly impaired course (Joshi et al. 2010; Wozniak et al. 2007), but also interferes with critical efforts at psychosocial rehabilitation. Reciprocally, failure to recognize ASD in the presence of psychiatric disorders will deny children with ASD appropriate therapeutic interventions aimed at ameliorating this developmental disorder. This latter issue may be of particular concern for children with a broader phenotype of ASD that may be less obvious in the context of significant psychopathology.

This study aimed to investigate whether phenotypes of ASD and associated psychopathology and dysfunction varied by referral source. To this end, youth with ASD attending a specialty clinic for ASD were compared to those attending a general psychiatry clinic. We hypothesized that the profiles of psychiatric comorbidity in youth with ASD would be similar between the two samples.

Methods

Subjects

ASD clinic participants were 143 children and adolescents (≤17 years) derived from youth consecutively referred to a specialized ambulatory autism spectrum disorder program at a major academic medical center. General psychiatry clinic participants (N=217) were children and adolescents (≤17 years) with ASD derived from consecutive referrals to a pediatric psychopharmacology program for psychiatric disorders at the same medical center. Investigators received institutional review board approval to review, analyze, and report anonymously on these subjects.

Assessment Measures

Assessment of Psychiatric Comorbidity—As part of standard clinical intake for both clinics, all study participants were assessed with the Schedule for Affective Disorders and Schizophrenia for School-Age Children—Epidemiological Version (K-SADS-E) administered to the parent/guardian, usually the mother (Orvaschel and Puig-Antich 1987; Orvaschel 1994). Depending on the time of interview, the K-SADS-E provided Axis-I psychiatric diagnoses based on DSM-III-R (prior to 1994) or DSM-IV criteria (1994 and thereafter; American Psychiatric Association 1987; American Psychiatric Association 1994).

Diagnostic interviews were administered by highly trained and closely supervised psychometricians with bachelor's or master's degrees in psychology or a related field. Rater reliability was established through the following process: board-certified child and adult psychiatrists and licensed clinical psychologists diagnosed subjects based on audiotaped interviews completed by raters, and these diagnoses were used to compute kappa coefficients of agreement. The median kappa coefficient was 0.98, calculated using 500 assessments from interviews of children and adults (J Biederman et al. 2006).

Interviewers were blind to any prior information, such as the participant's specific complaints, clinical diagnosis, or referral status. Diagnoses were considered positive by the interviewers if, on the basis of interview results, full DSM-III-R/IV criteria (including clinical impairment) were met unequivocally. In order to resolve diagnostic uncertainties, all interviews were reviewed by a committee of board-certified child and adult psychiatrists and experienced clinical psychologists who were blind to the subject's referral source, diagnostic status, and all other non-diagnostic data (e.g., socioeconomic status, family and social functioning). Diagnoses presented for review were considered positive only if diagnostic criteria were met to a degree that would be considered clinically meaningful based on the nature of the symptoms, the associated impairment, and the coherence of the clinical picture based on the interview. The reliability of the diagnostic review process was estimated by computing kappa coefficients of agreement for clinician reviewers. The median reliability between individual clinicians and the review committee-assigned diagnoses was 0.87 (J Biederman et al. 2006).

Although per DSM-IV criteria, certain disorders are exclusionary in the presence of pervasive developmental disorders (PDD; e.g., ADHD, separation anxiety disorder, social phobia, overanxious disorder/generalized anxiety disorder [GAD]), the present study

employed a non-hierarchical approach to diagnostic endorsements, which required meeting full DSM-IV symptom and impairment criteria for diagnosis. This approach allowed for empirical examination of all present disorders in an effort to fully characterize the clinical picture of each subject. Furthermore, since the anxiety disorders comprise many syndromes with a wide range of severity, two or more anxiety disorders were determined to indicate the presence of a clinically meaningful anxiety syndrome referred to as "multiple anxiety disorders." Psychoactive substance use disorder was defined as any alcohol or substance use or dependence.

Assessment of Autism Spectrum Disorder—As with the assessment of psychiatric comorbidity, all diagnostic assessments of ASD were conducted as part of standard clinical intake. Given that the K-SADS-E lacks a module to evaluate ASD, DSM-III-R PDD diagnostic criteria were adapted into interview format to assess for ASD in psychiatry clinic participants. ASD was defined as meeting DSM-III-R diagnostic criteria for autistic disorder or PDD-NOS: a diagnosis of autistic disorder required the full presence of eight out of sixteen symptoms with at least two symptoms from each of the three domains of ASD; in the absence of full autistic disorder, a diagnosis of PDD-NOS required the presence of more than two of the required symptoms with symptom(s) present from each of the three domains of ASD. Kappa coefficients of agreement for this PDD module were computed by comparing the initial rater diagnosis to diagnosis by an independent clinician with expertise in the diagnosis of ASD (the first author). Clinician diagnoses were made using audiotaped interviews of the original subject assessments. Based on 20 interviews, the median kappa coefficient of agreement between raters and clinician was 0.90. The kappa for reliability between independent raters and the final diagnostic decision made by a clinician-reviewer was 0.88. Additionally, concurrent and discriminant validity of the PDD module for diagnosing ASD has been established (Joshi et al. 2011). Excellent sensitivity for the PDD module is observed with the clinical diagnosis of ASD (94%) and with the Social Responsiveness Scale (t-score ≥60; 96%; Constantino et al. 2003).

In ASD clinic subjects, ASD was evaluated using DSM-IV PDD diagnostic criteria for autistic disorder, Asperger's disorder, or PDD-NOS. The diagnosis of ASD was established by a board-certified psychiatrist experienced in evaluating ASD and comorbid psychiatric disorders. The psychiatric diagnostic interview was conducted with the subject and parent/guardian(s), and information was incorporated from multiple sources when available (e.g., psychiatric records, schools, social services). Regardless of whether subjects were referred to the ASD clinic specifically for a diagnostic evaluation or arrived with a prior diagnosis, all ASD clinic subjects were evaluated by clinician psychiatric diagnostic interview at intake.

Assessment of Adaptive Functioning—The DSM Global Assessment of Functioning Scale (GAF) was used as a measure of overall adaptive functioning (Endicott et al. 1976). Although the GAF has been demonstrated to be an unreliable psychometric instrument in use for persons with cognitive impairments, the majority of subjects studied in this analysis had adequate intellectual capacity (Oliver et al. 2003; see Table I for further detail). To evaluate school functioning, three indices of school difficulties were used: placement in

special classes, extra tutoring, and repeated grades. Treatment histories included rates of disorder-specific counseling, pharmacotherapy, and hospitalization. Socioeconomic status was established by using categories delineated by Hollingshead (1975).

Assessment of Cognitive Ability—Full-scale IQ of the ASD clinic subjects was assessed with the Vocabulary and Matrix subsets of Wechsler Abbreviated Scale of Intelligence (D Wechsler 1999); that of the Psychiatry Clinic subjects was assessed with the Wechsler Intelligence Scale for Children (WISC-III; D. Wechsler 1991).

Statistical Analysis

Two-sample t-tests, Pearson's chi-squared tests, and Wilcoxon rank-sum tests compared the two groups of ASD subjects. Holm's (1979) sequential Bonferroni method was used for each set of analyses to correct for multiple testing.

Results

Socio-Demographics

From the pool of 177 children and adolescents referred to the ASD clinic during the index period (October 2007 to August 2009), 143 (81%) were found to have diagnoses of autistic disorder (89/143; 62%), Asperger's disorder (24/143; 17%), or PDD-NOS (30/143; 21%); the 34 individuals who did not meet for an ASD diagnosis were excluded from the sample. IQ assessment was available for 68 youth; of those, 91% (62/68) had an IQ greater than 70. Among the remaining 75 ASD youth without a formal IQ assessment, mental retardation was excluded in 53 subjects based on clinical information. Taken together, 80% (115/143) of the ASD youth in the ASD clinic sample had adequate intellectual capacity.

Of the 2323 children and adolescents referred to the general psychiatry clinic during the index period (1991 to 2008), 217 (9.3%) met diagnostic criteria for ASD. A majority of the psychiatry clinic ASD subjects were diagnosed with PDD-NOS (192/217; 88.5%), compared to 11.5 % diagnosed with autistic disorder. There were no significant differences between the groups on any demographic measures assessed, including age, race, or sex (Table 1).

Psychiatric Comorbidities

Although both groups had high rates of comorbidity, the psychiatry clinic ASD group had significantly more lifetime comorbidities compared to the ASD clinic group (Table 2). The psychiatry clinic ASD group had significantly higher rates of lifetime oppositional defiant disorder, major depressive disorder, and psychosis compared to the ASD clinic group. The average number of current (past month) comorbidities was also significantly higher in the psychiatry clinic ASD group compared to the ASD clinic group, and the psychiatry clinic ASD group endorsed a higher rate of current oppositional defiant disorder (Table 3).

Psychosocial Functioning & Treatment History

The psychiatry clinic ASD group had significantly more impaired lifetime and current GAF scores compared to the ASD clinic group (Table 4). The ASD clinic group was significantly

more likely to have repeated a grade compared to the psychiatry clinic ASD group. The psychiatry clinic ASD group was significantly more likely to have received combined counseling and pharmacotherapy compared to the ASD clinic group, and the ASD clinic group was significantly more likely to have received only counseling.

Discussion

This study compared the subtype of ASD, pattern of psychiatric comorbidity, and level of psychosocial functioning in youth who were referred to a specialty clinic for ASD to a sample of youth with ASD who were referred to a general psychiatry clinic at a university hospital. In the psychiatry clinic group, the majority of ASD youth suffered from a broader subtype of ASD, PDD-NOS. In contrast, autistic disorder was the most prevalent ASD diagnosis in the ASD clinic sample. While the two referred samples significantly differed by prevalence of ASD subtype, they shared substantially similar patterns of psychiatric comorbidity, irrespective of ascertainment status. Not only do these results confirm the extant literature regarding the presence of comorbidity in ASD, the pattern of specific comorbid diagnoses reported across both ASD groups in the current study is also highly consistent with those reported previously. Taken together, these findings emphasize the heavy burden of psychiatric comorbidity associated with ASD in clinically referred youth and contribute to the broader characterization of the clinical presentation of ASD in a referred pediatric population.

In this and prior studies of clinic-referred samples of youth with ASD, ADHD is the most frequent comorbid psychiatric condition identified (Frazier et al. 2001; Goldstein and Schwebach 2004; Yoshida and Uchiyama 2004; Lee and Ousley 2006; de Bruin et al. 2007; Lecavalier 2006; Skokauskas and Gallagher 2012). The present findings add to a growing body of literature demonstrating the substantial comorbid presence of ADHD and ASD that is associated with higher levels of impairment, supporting the DSM-V revision whereby diagnoses of ASD and ADHD are no longer mutually exclusive (Sikora et al. 2012). Clinical recognition of ADHD in youth with ASD is critical to providing affected children with appropriate treatments for both disorders.

Oppositional defiant disorder (ODD) was the second most prevalent comorbid diagnosis in both of the referred samples with ASD and was present at a higher rate in the general psychiatry clinic sample. Again, these results are consistent with previous literature demonstrating high rates of ODD and related disorders in clinical samples of ASD youth ranging from preschoolers to adolescents (Gadow et al. 2004; de Bruin et al. 2007; Lecavalier et al. 2011). Oppositional behaviors, in conjunction with the communication and social skills deficits central to ASD, have the potential to even further compound difficulties in interpersonal interactions experienced by ASD youth at school and in the home. Thus, identifying and treating both ASD and ODD is important in order to reduce social and functional impairment in a comorbid population. In light of previous research by Guttmann-Steinmetz and colleagues (2009) suggesting that the presence of ODD may be uniquely severe in youth with both ASD and ADHD, the high rates of both ODD and ADHD in the present ASD samples highlight the importance of evaluating for comorbidities in order to fully address disruptive behaviors in ASD youth.

Anxiety disorders were the third most prevalent comorbidity in both of the referred populations with ASD. An equally high prevalence of anxiety disorders (43–84%) has been previously documented in referred populations of youth with ASD (Muris et al. 1998; Leyfer et al. 2006; de Bruin et al. 2007; Sukhodolsky et al. 2008; Weisbrot et al. 2005; White et al. 2012; Gjevik et al. 2011). Also consistent with the extant literature are the findings that specific phobia was the most common anxiety disorder, followed by separation anxiety disorder and GAD (Muris et al. 1998; Leyfer et al. 2006; de Bruin et al. 2007; Russell and Sofronoff 2005). The rates of obsessive-compulsive disorder (OCD) were comparable in both of the study populations of ASD and were consistent with the literature, which documents equally high estimates of OCD in the range of 11–35% in other referred populations with ASD (Muris et al. 1998; Leyfer et al. 2006; Szatmari et al. 1989; Green et al. 2000). Presence of anxiety disorders, social phobia in particular, may further compromise social deficits in individuals with ASD and therefore the identification and treatment of these conditions in an ASD population is of high clinical importance. Conversely, ASD may interfere with standard treatment of anxiety disorders and is thus a vital treatment target in ASD youth with comorbid anxiety.

Mood disorders also emerged as prevalent comorbidities across general clinic and specialized clinic referred ASD youth in the present study. The substantial comorbidity with MDD found in both samples of referred youth in this study is consistent with the existing literature that estimates MDD to affect up to half of referred individuals with ASD (de Bruin et al. 2007; Wing 1981; Leyfer et al. 2006; Ryden and Bejerot 2008; M Ghaziuddin and Zafar 2008; Sverd et al. 2003; Vickerstaff S. et al. 2007; Sterling et al. 2008). Efforts aimed at the identification and treatment of MDD in youth with ASD are clearly indicated. In addition, the significant prevalence of bipolar I disorder observed in both of our referred samples of youth with ASD is consistent with a previous report that identified a bidirectional overlap between bipolar disorder (BPD) and ASD (Wozniak et al. 1997). Considering the well-documented morbidity of BPD, identifying and treating this disorder is of high clinical significance for affected individuals. Psychotic features of delusions and hallucinations were much more common in ASD youth referred to the psychiatry clinic than to the ASD clinic, which may reflect a bias in the referral of more severe BPD to a general psychiatry clinic. The literature documents a wide variation in the rate of psychosis (ranging from 0–50%) in referred populations of youth with ASD, likely due to differences in methodology between studies (Leyfer et al. 2006; Sverd et al. 1995). ASD in the context of BPD (or vice versa), especially when psychotic features emerge, may represent an especially complicated and impairing clinical picture (Weissman and Bates 2010; Joshi et al. 2013). Additional research to clarify the association between these disorders will be vital to providing clinicians with an evidence base for the interventions necessary to achieve improved rehabilitation.

Despite the demonstrated similarities in comorbid psychopathology, the current study identified differences in presentation of ASD between the two referred samples. A majority of the youth referred to the ASD clinic was suffering from autistic disorder, the most robust subtype of ASD. By comparison, PDD-NOS was the most frequent diagnosis in the psychiatrically referred youth. This distinction could reflect referral patterns based on the disorder of concern: individuals with a robust phenotype of ASD are more likely to be identified earlier and referred to specialized ASD clinics, whereas individuals with broader

spectrum ASD (i.e., PDD-NOS) may initially come to clinical attention through referral to general psychiatry clinics for the management of comorbid psychiatric conditions. In children with broader spectrum ASD, clinically prominent and impairing comorbid psychiatric symptoms may obscure ASD-related deficits in social communication or interaction. In an effort to fully characterize a subject's clinical picture, a non-hierarchical approach to the structured diagnostic interview was employed in this study to minimize clinical bias and allow for empirical examination of all present disorders. The greater numbers of comorbid conditions, including ODD, observed at ascertainment in the psychiatry clinic referred youth with ASD, along with significantly higher rates of PDD-NOS, support this hypothesis of a referral bias.

Our findings should be evaluated in the light of certain limitations. The diagnoses of ASD in the two referred samples were based on different versions of DSM, although both versions employ similar features to make a primary diagnosis of ASD and to sub-categorize ASD into subtypes. We have previously documented a concordance rate of 94% between our DSM-III-R-based diagnostic PDD module and a clinical diagnosis of ASD based on DSM-IV criteria, supporting diagnostic continuity between the two revisions of the DSM in the context of this specific methodology (Joshi et al. 2011). We have also previously demonstrated agreement between DSM-III-R and DSM-IV definitions of ADHD, although such tests of concordance between revisions were not conducted for other psychiatric disorders assessed in this study (J. Biederman et al. 1997). Another limitation of the study involves the diagnosis of ASD in the psychiatry clinic referred sample, which relied on an ad-hoc DSM-based module. While this module demonstrated high concordance with clinical assessment by an expert clinician, it has not been formally validated. The Autism Diagnostic Interview-Revised (ADI-R) and Autism Diagnostic Observation Schedule (ADOS) were not performed to confirm ASD diagnoses, although the feasibility of conducting the ADI-R/ADOS in clinical settings and large population-based studies is limited given the specialized training and significant time required for administration. Psychometric measures of intellectual capacity were not available for all the study participants. This analysis assessed clinically referred populations that were largely Caucasian, thus these findings may not generalize to community samples or to other ethnic groups.

Despite these considerations, the results of this study suggest that a diagnosis of ASD in a psychiatrically referred population of youth is associated with high levels of psychiatric comorbidity and dysfunction that are independent of referral status. The important distinction between general and specialty clinic referral samples lies in the particular ASD subtype: broader spectrum forms of ASD appear to garner referrals to general child psychiatry clinics and more symptomatically robust forms to specialized ASD clinics. Considering the bidirectional exacerbation of ASD and psychiatric comorbidities, these results stress the dual importance of identifying co-occurrence of ASD in psychiatrically referred youth and comorbid psychiatric disorders in youth attending specialized programs for ASD. To this end, additional training for clinicians in general psychiatry settings may be warranted to improve the detection and treatment of ASD. Reciprocally, clinicians with an expert focus in ASD may benefit from education in the diagnosis and treatment of commonly occurring comorbidities in order to more effectively manage the care of patients in ASD specialty clinics.

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Table 1

Demographics of Clinically Referred Populations of Youth with ASD

	ASD Clinic Referred ASD Youth	Psychiatry Clinic Referred ASD Youth	Test Statistic	p-value
Subjects	143	217		
Prevalence	143 (81)$^{(N=177)}$	217 (9.3)$^{(N=2323)}$		
Gender (Male)	125 (87)	188 (87)	$^{2}_{(1)}$=0.05	0.83
Race (Caucasian)	124 (88)	164 (93)	$^{2}_{(1)}$=3.76	0.052
Mean Age (years)	10.0 ±3.8	9.7 ±3.6	$t_{(358)}$=0.82	0.41
Age range	3–17	3–17		
Mean IQ	97.1 ±18.2$^{(N=68)}$	104.2 ±16.7$^{(N=35)}$	$t_{(101)}$=−1.93	0.06
IQ Range	53–140$^{(N=68)}$	68–135$^{(N=35)}$		
IQ > 70	62 (91)$^{(N=68)}$	34 (97)$^{(N=35)}$	$^{2}_{(1)}$=1.12	0.29
Average IQ (> 85)	53 (78)$^{(N=68)}$	29 (83)$^{(N=35)}$	$^{2}_{(1)}$=0.34	0.56
HF (clinically estimated)*	53 (71)$^{(N=75)}$	NA		
Socioeconomic status (HFFI)	1.7 ±0.9	1.7 ±0.9	z=0.59	0.56
ASD Subtypes based on:	DSM-IV	DSM-IIIR		
Autistic disorder	89 (62)	25 (11.5)	$^{2}_{(1)}$=102.5	<0.001
Asperger's disorder	24 (17)	NA		
PDD-NOS	30 (21)	192 (88.5)	$^{2}_{(1)}$=166.1	<0.001

HFFI=Hollingshead Four-Factor Index; HF=High-functioning; NA=Not Available; Values expressed as N (%) or Mean ±Standard Deviation;

* Subjects without IQ assessment

Table 2

Lifetime Psychiatric Comorbidities in Clinically Referred Populations of Youth with ASD

	ASD Clinic Referred ASD Youth (N=143)	Psychiatry Clinic Referred ASD Youth (N=217)	Test Statistic	p-value	Holm's Adjusted Alpha
	N (%)	N (%)			
# of psychiatric disorders	5.4 ±2.7	6.4 ±2.7	z=−3.31	**<0.001**	**0.002**
Language Disorder	89 (64)	105 (48)	$^2_{(1)}$=8.83	0.003	0.0026
Tic Disorders					
Tic disorder (Motor or Vocal)	21 (15)	50 (23)	$^2_{(1)}$=3.57	0.06	0.004
Tourette's disorder	15 (11)	40 (18)	$^2_{(1)}$=0.52	0.48	0.012
Disruptive Behavior Disorders					
Attention-deficit/hyperactivity disorder	106 (75)	181 (83)	$^2_{(1)}$=3.64	0.06	0.004
Oppositional defiant disorder	75 (54)	158 (73)	$^2_{(1)}$=13.90	**<0.001**	**0.002**
Conduct disorder	13 (9)	47 (22)	$^2_{(1)}$=9.59	0.002	0.003
Major Mood Disorders					
Major depressive disorder	53 (37)	121 (56)	$^2_{(1)}$=12.07	**0.001**	**0.002**
Bipolar I disorder	28 (20)	68 (31)	$^2_{(1)}$=6.09	0.01	0.003
Psychosis	10 (7)	42 (20)	$^2_{(1)}$=10.10	**0.001**	**0.002**
Anxiety Disorders					
Multiple anxiety disorders (≥2)	77 (54)	133 (61)	$^2_{(1)}$=1.58	0.21	0.006
Specific phobia	67 (48)	79 (37)	$^2_{(1)}$=4.47	0.03	0.004
Separation anxiety disorder	46 (33)	79 (37)	$^2_{(1)}$=0.58	0.44	0.01
Agoraphobia	35 (25)	77 (35)	$^2_{(1)}$=4.52	0.03	0.003
Generalized anxiety disorder	42 (31)	76 (35)	$^2_{(1)}$=1.48	0.22	0.006
Social phobia	40 (29)	60 (28)	$^2_{(1)}$=0.03	0.87	0.017
Obsessive-compulsive disorder	28 (20)	53 (25)	$^2_{(1)}$=0.84	0.36	0.008
Panic disorder	4 (3)	13 (6)	$^2_{(1)}$=1.77	0.18	0.005
Post traumatic stress disorder	5 (4)	4 (2)	$^2_{(1)}$=0.98	0.32	0.007

	ASD Clinic Referred ASD Youth (N=143)	Psychiatry Clinic Referred ASD Youth (N=217)	Test Statistic	p-value	Holm's Adjusted Alpha
Substance Use Disorders[*]					
Substance use disorders	1 (2)	1 (1)	$^{2}_{(1)}$=0.09	0.77	0.017
Cigarette Smoking	1 (2)	4 (5)	$^{2}_{(1)}$=1.43	0.23	0.006
Elimination Disorders					
Enuresis	51 (37)	79 (37)	$^{2}_{(1)}$=0.0005	0.98	0.05
Encopresis	45 (32)	48 (22)	$^{2}_{(1)}$=4.51	0.03	0.003

Versus ASD clinic referred youth *p<0.05, **p<0.01, ***p<0.001;

[*] Limited to children 10 years of age and older

Table 3

Current (last month) Psychiatric Comorbidities in Clinically Referred Populations of Youth with ASD

	ASD Clinic Referred ASD Youth (N=143)	Psychiatry Clinic Referred ASD Youth (N=217)	Test Statistic	p-value	Holm's Adjusted Alpha
	N (%)	N (%)			
# of Psychiatric disorders	4.0 ±2.3	4.9 ±2.4	z=−3.29	**0.001**	**0.002**
Language Disorder	61 (44)	83 (38)	$^{2}_{(1)}$=1.24	0.26	0.005
Tic Disorders					
Tic disorder (Motor or Vocal)	18 (13)	39 (18)	$^{2}_{(1)}$=1.73	0.19	0.005
Tourette's disorder	14 (10)	33 (15)	$^{2}_{(1)}$=2.09	0.15	0.004
Disruptive Behavior Disorders					
Attention-deficit/hyperactivity disorder	96 (68)	167 (77)	$^{2}_{(1)}$=3.45	0.06	0.003
Oppositional defiant disorder	68 (49)	150 (69)	$^{2}_{(1)}$=15.12	**<0.001**	**0.002**
Conduct disorder	7 (5)	27 (12)	$^{2}_{(1)}$=5.62	0.02	0.002
Major Mood Disorders					
Major depressive disorder	41 (29)	85 (39)	$^{2}_{(1)}$=4.31	0.04	0.003
Bipolar I disorder	21 (15)	54 (25)	$^{2}_{(1)}$=5.44	0.02	0.003
Psychosis	7 (5)	28 (13)	$^{2}_{(1)}$=6.01	0.01	0.002
Anxiety Disorders					
Multiple anxiety disorders (≥2)	58 (41)	89 (41)	$^{2}_{(1)}$=0.007	0.93	0.025
Specific phobia	47 (34)	56 (26)	$^{2}_{(1)}$=2.55	0.11	0.004
Separation anxiety disorder	25 (18)	40 (19)	$^{2}_{(1)}$=0.04	0.85	0.012
Agoraphobia	29 (21)	66 (30)	$^{2}_{(1)}$=4.25	0.04	0.003
Generalized anxiety disorder	36 (26)	46 (30)	$^{2}_{(1)}$=0.42	0.52	0.006
Social phobia	31 (22)	54 (25)	$^{2}_{(1)}$=0.34	0.56	0.007
Obsessive-compulsive disorder	24 (18)	45 (21)	$^{2}_{(1)}$=0.62	0.43	0.006
Panic disorder	2 (1)	9 (4)	$^{2}_{(1)}$=2.05	0.15	0.004
Post traumatic stress disorder	2 (1)	2 (1)	$^{2}_{(1)}$=0.18	0.67	0.01

	ASD Clinic Referred ASD Youth (N=143)	Psychiatry Clinic Referred ASD Youth (N=217)	Test Statistic	p-value	Holm's Adjusted Alpha
Substance Use Disorders[*]					
Substance use disorders	1 (2)	1 (1)	$^{2}_{(1)}$=0.09	0.77	0.012
Cigarette Smoking	0 (0)	3 (4)	$^{2}_{(1)}$=2.63	0.10	0.003
Elimination Disorders					
Enuresis	28 (20)	44 (20)	$^{2}_{(1)}$=0.003	0.96	0.05
Encopresis	14 (10)	26 (12)	$^{2}_{(1)}$=0.33	0.57	0.008

Versus ASD clinic referred youth *p<0.05, **p<0.01, ***p<0.001

[*] Limited to children 10 years of age and older

Table 4

Psychosocial Functioning & Treatment History of Clinically Referred Populations of Youth with ASD

	ASD Clinic Referred ASD Youth (N=143)	**Psychiatry Clinic Referred ASD Youth (N=217)**	**Test Statistic**	**p-value**	**Holm's Adjusted Alpha**
Psychosocial Functioning					
GAF					
Lifetime	45.6 ±5.5	42.6 ±6.7	$t_{(356)}$=4.37	**<0.001**	**0.012**
Current	49.8 ±5.5	46.5 ±6.7	$t_{(356)}$=4.89	**<0.001**	**0.01**
School Functioning					
Repeated grade	31 (22)	25 (12)	$^2_{(1)}$=7.12	**0.008**	**0.017**
Extra tutoring	95 (67)	145 (67)	$^2_{(1)}$=0.0003	0.99	0.05
Special class	84 (59)	124 (57)	$^2_{(1)}$=0.09	0.76	0.025
Treatment History					
Only Counseling	55 (38)	45 (21)	$^2_{(1)}$=13.49	**<0.001**	**0.012**
Only Pharmacotherapy	1 (1)	3 (1)	$^2_{(1)}$=0.37	0.54	0.05
Counseling + Pharmacotherapy	84 (59)	160 (74)	$^2_{(1)}$=8.87	**0.003**	**0.017**
Hospitalization	16 (11)	43 (20)	$^2_{(1)}$=4.68	0.03	0.025

Values expressed as N (%) or Mean ±Standard Deviation

Versus ASD clinic referred youth *p<0.05, **p<0.01, ***p<0.001