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ORIGINAL PAPER

The Heavy Burden of Psychiatric Comorbidity in Youth with Autism Spectrum Disorders: A Large Comparative Study of a Psychiatrically Referred Population

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Abstract The objective of the study was to systematically examine patterns of psychiatric comorbidity in referred youth with autism spectrum disorders (ASD) including autistic disorder and pervasive developmental disorder not otherwise specified. Consecutively referred children and adolescents to a pediatric psychopharmacology program were assessed with structured diagnostic interview and measures of psychosocial functioning. Comparisons were made between those youth satisfying diagnostic criteria for ASD and age and sex matched youth without ASD referred to the same clinical program. 9.3% (217/2323) of the referred youth (age range: 3–17 years) met DSM-III-R criteria for ASD. ASD youth suffered from significantly higher number of comorbid disorders than comparisons (6.4 ± 2.7 vs. 5.2 ± 2.9; $p < 0.001$). Ninety-five percent of the youth with ASD had three or more comorbid psychiatric disorders and 74% had five or more comorbid disorders. ASD youth were also more functionally impaired and required extra-assistance in school and therapeutic interventions at higher rates than age and sex matched non-ASD referred youth. Youth with ASD have high levels of psychiatric comorbidity and dysfunction comparable to the referred population of youth without ASD. These findings emphasize the heavy burden of psychiatric comorbidity afflicting youth with ASD and may be important targets for intervention.

Keywords Autism spectrum disorders · Psychiatric comorbidity · Children and adolescents

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Introduction

Autism spectrum disorders (ASD) refers to a group of developmental disorders distinguished by variable presentation of difficulties with socialization, communication, and behavior that are estimated to affect at least 7 in 1,000 children and adolescents in the general population (CDC 2006; Fombonne 2003). Much higher rates of ASD ranging from 2 to 14% have been reported in youth referred for psychiatric care, thereby comprising a substantial subgroup of patients referred for psychiatric treatment (Sverd et al. 1995; Sverd 2003; Wozniak et al. 1997a, b).

While the reason for psychiatric referrals of children with ASD are heterogeneous, they are frequently driven by emotional and behavioral symptoms including irritability and aggression (RUPP 2002), hyperactivity (RUPP 2005), anxiety (Gadow et al. 2004, 2005), and depression (Vickerstaff et al. 2007; Sterling et al. 2008). However, whether these co-occurring emotional and behavioral symptoms represent associated features in children with pervasive developmental disorders (PDD; American Psychiatric Association 2000), or bona fide comorbid psychiatric disorders remains unclear (Frazier et al. 2001).

Comorbid psychiatric symptoms have been reported in a number of questionnaires studies in both children (Herring

et al. 2006; Lecavalier et al. 2006; Steinhausen and Metzke 2004; Gadow et al. 2004, 2005) and adults (Blacher and McIntyre 2006; Kobayashi and Murata 1998). These studies suggest that as many as three-fourths of individuals with ASD may reach diagnostic threshold for a bona fide coexisting psychiatric disorder (Brereton et al. 2006), a finding later endorsed by a few studies using structured interviews that reported a high prevalence of various psychiatric disorders including attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, and affective disorders (Green et al. 2000; Wozniak et al. 1997a, b; Frazier et al. 2001; deBruin et al. 2007; Leyfer et al. 2006). Yet despite mounting evidence that psychiatric comorbidity is a serious clinical problem in youth with ASD, there continues to be under-recognition of comorbid psychiatric disorders in individuals with ASD that, in turn, hampers clinical care and treatment.

Equally important is to recognize ASD in children and adolescents referred for the treatment of psychiatric disorders. Several studies from various referred populations have noted the under-recognition of ASD in individuals who initially come to clinical attention for the management of other psychiatric conditions (Sverd 2003; Gillberg 1992; Wolff 1991a, b); Towbin 1997; Harpaz-Rotem and Rosenheck 2004; Fombonne et al. 2004). Thus, ASD youth presenting with emotional and behavioral disturbances may only be diagnosed with a variety of psychiatric disorders without adequate attention to the diagnosis of ASD.

Prevalence of psychiatric disorders in psychiatry clinic referred populations of youth with ASD have been examined in two psychiatry clinic based samples, one reporting high rates of various psychiatric comorbidities in children with milder form of ASD i.e., PDD not otherwise specified (PDD-NOS; deBruin et al. 2007, $n = 94$) and other documenting high rates of ADHD (83%) and bipolar disorder (21%) in youth with ASD (Wozniak et al. 1997a, b, $n = 66$; Frazier et al. 2001, $n = 60$).

A clearer picture of the frequency and characteristics of comorbid psychiatric disorders in individuals with ASD has important clinical implications. The presence of psychiatric comorbidity not only worsens the morbidity of the already compromised course of youth with ASD (Wozniak et al. 1997a, b) but is also likely to interfere with critical efforts at psychosocial rehabilitation. Moreover, while there is no established pharmacological approach to treat ASD, there are well known pharmacological interventions for the management of many of the psychiatric disorders that afflict pediatric populations and as literature suggests are often comorbid with ASDs. Second-generation antipsychotic risperidone and more recently aripiprazole are approved by the U.S. Food and Drug Administration for the treatment of target symptom(s) of irritability/aggression in youth with autistic disorder. Since diagnosis is paramount to develop a rational treatment plan, an improved diagnostic clarity will facilitate an appropriate pharmacological and non-pharmacological approach for the management of psychiatric disorders associated with ASD. Such an approach may additionally facilitate functional life and enhance efficacy of ASD related behavioral interventions (McDougle et al. 2003). Equally important is the identification of ASD in youth referred for psychiatric evaluation since the treatment of the comorbid psychiatric disorder is unlikely to address the developmental and interpersonal deficits associated with ASD.

Therefore the main aim of this study is to evaluate the prevalence of ASD and the scope of psychiatric comorbidity associated with this disorder in psychiatrically referred population of youth. To this end we examined the rate of ASD in a large population of youth consecutively referred to a pediatric psychopharmacology program and compared the rates of comorbid psychiatric disorders in this sample of youth based on the presence or absence of an ASD. Based on the literature, we hypothesized that rates of psychiatric comorbidity in youth with ASD will be higher than in clinically referred youth without ASD. To the best of our knowledge this is one of the largest and the only comparative study evaluating the spectrum of psychiatric disorders associated with psychiatrically referred population of youth with and without ASD.

Methods

Participants

Subjects were derived from consecutive referrals ($n = 2{,}323$) to a pediatric psychopharmacology program at a major academic center from 1991 to 2008. Subjects were compared based on whether they met DSM-III-R (American Psychiatric Association 1987) diagnostic criteria for an ASD (autistic disorder or PDD-NOS; $n = 217$) or for non-ASD diagnoses.

All children and adolescents were referred for psychiatric care. This clinic sample is "unselected" as children were referred for psychiatric evaluation and psychopharmacological intervention for behavioral and emotional difficulties and not for evaluation of any specific disorder. There was no selection bias based on social class or insurance restrictions. This study received institutional review board approval to review, analyze, and report anonymously on these subjects.

Assessment Measures

All children and adolescents in this study were evaluated by administering the Epidemiologic version of the Schedule for

Affective Disorders and Schizophrenia for School-Age Children (K-SADS-E; Orvaschel 1994; Orvaschel and Puig-Antich 1987) to the care-taker (parent/guardian), usually the mother. The K-SADS-E is a semi-structured interview that generates current and lifetime Axis-I diagnoses according to DSM-III-R/IV criteria (American Psychiatric Association 1987, 1994) in children and adolescents. It has been shown to possess acceptable test–retest and inter-rater reliabilities (Chambers et al. 1985). Although there are no published instruments normed for the assessment of psychiatric morbidity in individuals with ASDs, K-SADS-E has been previously utilized for the assessment of psychiatric morbidity in ASD populations (Ghaziuddin et al. 1998; Wozniak et al. 1997a, b; Frazier et al. 2001). There are two versions of K-SADS: the epidemiological version that is utilized in this study and the present state version (K-SADS-P). Both versions of K-SADS provide a current diagnostic assessment. In contrast to the K-SADS-P version that evaluates the worst past episode during the preceding year and measures each symptom severity, the K-SADS-E provides a lifetime diagnosis and is primarily a categorical diagnostic interview.

As the K-SADS-E and other structured interviews lack module to evaluate PDD, we adopted DSM-III-R diagnostic criterion into interview format to assess this disorder. Diagnostic assessment of PDD by this interview required a lifelong severe and pervasive deficit in development of reciprocal social interaction, communication, and restricted patterns of behavior. Autism spectrum disorder was defined as subjects meeting criteria for autistic disorder or PDD-NOS. To be given the diagnosis of autistic disorder, the participant had to meet DSM-III-R diagnostic criteria of eight out of sixteen symptoms with at least two symptoms from each of the aforementioned domains of PDD. A diagnosis of PDD-NOS was received if more than two of the required symptoms were met with symptom(s) present from each of the three domains of PDD. DSM-III-R criteria, rather than DSM-IV (American Psychiatric Association 1994) were applied because data collection preceded the advent of DSM-IV. As in relation to the other diagnostic categories there were substantial changes in the diagnostic criteria for PDD in DSM-IV from DSM-III, in order to maintain consistency, DSM-III diagnostic criterias for PDD were retained and not replaced with DSM-IV PDD criterias. The diagnoses of other psychiatric disorders were DSM-III-R based for youth assessed before 1994 and DSM-IV based thereafter. Although per DSM-IV criteria, certain disorders are exclusionary in the presence of PDD (e.g., ADHD, separation anxiety disorder, social phobia, generalized anxiety disorder/overanxious disorder), we opted for a nonhierarchical approach for diagnostic endorsements which required meeting full DSM-IV symptom and impairment criteria as the basis for diagnosis. The rationale for this was to allow empirical examination of all the disorders in an effort to fully characterize the clinical picture of the subjects.

All assessments were conducted by carefully selected, highly trained, and closely supervised psychometricians with bachelor's or master's degrees in psychology or a related field. The interviewers were blind to the a priori information as to the child's specific complaints or clinical diagnosis apart from their knowledge that they had been referred to a pediatric psychopharmacology clinic.

The interviewers underwent several weeks of classroom style training, during which they learned interview mechanics, diagnostic criteria, and coding algorithms. They then observed interviews by experienced raters and clinicians. They subsequently conducted at least six practice (non-study) interviews and at least three study interviews while being observed by senior interviewers. Trainees were not permitted to conduct interviews independently until they executed at least three interviews that achieved perfect diagnostic agreement with an observing senior interviewer. We computed kappa coefficients of agreement for diagnostic coding by having experienced, board certified child and adult psychiatrists and licensed clinical psychologists diagnose subjects from audio taped interviews. Based on 500 assessments from interviews of children and adults, the median kappa coefficient was 0.98.

The inter-rater reliability of the PDD module was established by having an independent rater with expertise in the diagnosis of PDD (the first author [GJ]) listen to audiotapes of 20 randomly selected modules with or without a diagnosis of PDD. Based on these audiotapes, the reliability with the rater was kappa = 0.90. The reliability between our independent rater and the final diagnostic rating made by a clinician-reviewer was kappa = 0.88. The psychometric validity of the PDD module is examined by comparing the PDD module interview-generated diagnoses with the clinical diagnoses of ASD and with the Social Responsiveness Scale (SRS) scores. Excellent sensitivity of the PDD module is observed for the clinical diagnosis of ASD (94%) and for the SRS positive screen (t-score $\geq$60; 96%). To resolve diagnostic uncertainties, all interviews were reviewed by a committee of board-certified child and adult psychiatrists who were blind to the subject's referral source, diagnostic status, and all other non-diagnostic data. Diagnoses presented for review were considered positive only when the committee determined that diagnostic criteria were met to a clinically meaningful degree. We estimated the reliability of the diagnostic review process by computing kappa coefficients of agreement for clinician reviewers. For these diagnoses, the median reliability between individual clinicians and the review committee assigned diagnoses was 0.87.

Functional Impairment

In addition to diagnostic information, interviewers gathered data on several measures of functioning in multiple domains and treatment intervention. Interviewers inquired as to individual disorder-specific impairment by asking the informant to rate impairment on an anchored ordinal scale (1 = minimal, 2 = moderate, 3 = severe), and asked the respondent to provide additional justification for their ratings of impairment, taking into account number of symptoms, frequency and intensity of symptoms and their impact on functional life. These data were then presented as part of the diagnostic review process. Interviewers also rated overall adaptive functioning using the DSM-III-R/IV Global Assessment of Functioning Scale (0 = worst to 90 = best; GAF; Endicott et al. 1976). 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).

Statistical Analysis

Each ASD subject ($N = 217$) was paired with an age and sex matched non-ASD subject from a pool of 2106 clinic subjects. In the event of multiple qualifying matches, a non-ASD subject whose interview was in close temporal proximity to the interview of the ASD subject was chosen as a match, as determined by the sequential identification numbers assigned in the consecutive referrals. Analyses were conducted using Stata Version 10.1 (Stata Corporation 2007). Comparisons were made using McNemar's chi-squared test, paired *t*-tests, and Wilcoxon's matched-pairs signed-ranks test, depending on the distribution of the outcome variable. We compared the ASD to the Non-ASD subjects using Holm's sequential Bonferroni method for each set of analyses (i.e., for each Table/Figure) to correct for multiple testing (Holm 1979).

Results

Demographics

From the pool of clinic-referred subjects ($N = 2{,}323$) 9.3% met the diagnostic criteria for ASD as operationalized above. The ASD group ($N = 217$) was comprised of subjects with autistic disorder ($N = 25$) and PDD-NOS ($N = 192$). The groups differed in mean age at evaluation and gender; ASD subjects were more males and significantly younger than non-ASD subjects. Subsequent analyses were therefore controlled for both age and gender by matching non-ASD comparisons ($N = 217$) on sex and age (Tables 1, 2).

Psychiatric Comorbidities

The ASD group had a significantly higher number of comorbidities compared to the non-ASD group (Figs. 1, 2). The ASD group had significantly higher rates of language disorders, multiple (≥ 2) anxiety disorders including agoraphobia and specific phobia, and encopresis (Figs. 3, 4). Conversely, the non-ASD group had significantly higher rates of psychoactive substance use disorder (alcohol/drug abuse/dependence) compared to the ASD group (Tables 3, 4).

Psychosocial Functioning and Treatment History

The ASD group had significantly more impaired lifetime and current GAF scores compared to the non-ASD group (Table 3). The ASD group was also significantly more likely to have been in a special class compared to the non-ASD group. The ASD group was significantly more likely to have received combined counseling and pharmacotherapy compared to the non-ASD group (Table 4).

Although ASD group had significantly higher rates of comorbidity with psychosis, social phobia, and obsessive–compulsive disorder and history of repeated grades at the $p < 0.05$ level, these comorbidities did not reach statistical

Table 1 Demographics of psychiatrically referred ASD and non-ASD youth

	ASD ($N = 217$) *N* (%)	Non-ASD ($N = 217$) *N* (%)	Test statistic	*p*-value
Gender (Male)	188 (87)	1,509 (72)[a]	$\chi^2_{(1)} = 22.44$	<0.001
	Mean ± SD	Mean ± SD		
Age (years; range 3–17 years)	9.7 ± 3.6	10.9 ± 3.5[a]	$t = 4.61$	<0.001
Socioeconomic status	1.7 ± 0.9	1.8 ± 1.0	$z = 0.76$	0.45

[a] Non-ASD $N = 2{,}106$

Table 2 Psychiatric Comorbidities in Psychiatrically Referred ASD and Non-ASD Youth

	ASD ($N = 217$) N (%)	Non-ASD ($N = 217$) N (%)	$\chi^2_{(1)}$	p-value	Holm's adjusted alpha
Language disorder	105 (48)	59 (27)	18.93	<0.001	0.002
Tic disorder					
Tic disorder (motor or vocal)	50 (23)	43 (20)	0.69	0.41	0.01
Tourette's disorder	40 (18)	34 (16)	0.49	0.48	0.012
Disruptive behavior disorder					
Attention-deficit/hyperactivity disorder	181 (83)	173 (80)	0.75	0.39	0.008
Oppositional defiant disorder	158 (73)	146 (68)	1.49	0.22	0.005
Conduct disorder	47 (22)	48 (22)	0.01	0.90	0.05
Mood disorder					
Major depressive disorder	121 (56)	102 (47)	3.44	0.06	0.004
Bipolar I disorder	68 (31)	65 (30)	0.11	0.74	0.017
Psychosis	42 (20)	27 (12)	4.09	0.04	0.003
Anxiety disorder					
Multiple anxiety disorders (≥2)	133 (61)	92 (42)	15.14	<0.001	0.002
Specific phobia	79 (37)	43 (20)	14.09	<0.001	0.003
Separation anxiety disorder	79 (37)	77 (35)	0.04	0.84	0.025
Agoraphobia	77 (35)	41 (19)	14.73	<0.001	0.003
Generalized anxiety disorder	76 (35)	65 (30)	1.46	0.23	0.006
Social phobia	60 (28)	35 (16)	8.56	0.0034	0.0031
Obsessive–compulsive disorder	53 (25)	37 (17)	3.88	0.049	0.004
Panic disorder	13 (6)	18 (8)	0.86	0.35	0.007
Post traumatic stress disorder	4 (2)	8 (4)	1.33	0.25	0.006
Substance use disorders[a]					
Substance use disorders	1 (1)	13 (13)	12.00	<0.001	0.003
Cigarette smoking	4 (5)	9 (12)	2.67	0.10	0.004
Elimination disorders					
Enuresis	79 (37)	64 (30)	2.09	0.15	0.005
Encopresis	48 (22)	17 (8)	15.52	<0.001	0.002

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

significance because the Holm's sequential Bonferroni method was applied to correct for multiple testing.

Discussion

In this systematic evaluation of data from a large psychiatry clinic-referred population, close to 10% of the referred youth met diagnostic criteria for ASD (autistic disorder or PDD-NOS). Youth with ASD suffered from high rates of psychiatric comorbidity at a frequency comparable to other psychiatrically referred youth without ASD. In addition, they had significantly increased risk for comorbidity with anxiety disorders, elimination, and language disorders. Additionally, youth with ASD also had more impaired overall functioning with a significant proportion requiring placement in special classes and mental health services, including pharmacotherapy and counseling. These results confirm and extend findings indicating that ASD represents a substantial minority of severely ill patients referred for psychiatric treatment (Sverd 2003; Lecavalier et al. 2009) and they are afflicted with a very high burden of psychiatric comorbidity.

The close to 10% rate of ASD in this sample of psychiatrically referred youth is consistent with the extant literature. Rates of ASD ranging from 2 to 14% have been reported in youth referred for psychiatric care (Sverd et al. 1995; Sverd 2003; Wozniak et al. 1997a, b). Taken together, these results stress the fact that youth with ASD comprise a substantial subgroup of populations of youth referred for psychiatric treatment.

Majority of the referred population of youth with ASD were diagnosed with PDD-NOS (88.5%). Higher prevalence of PDD-NOS in this clinic-referred population could

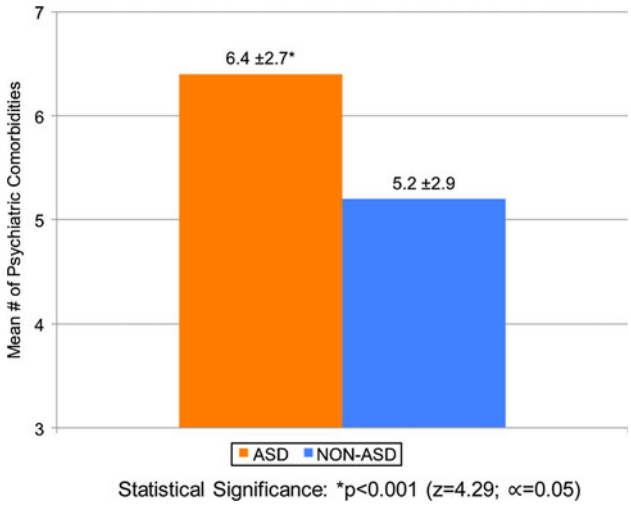

Fig. 1 Mean number of psychiatric comorbidities in psychiatrically referred youth stratified by the status of ASD

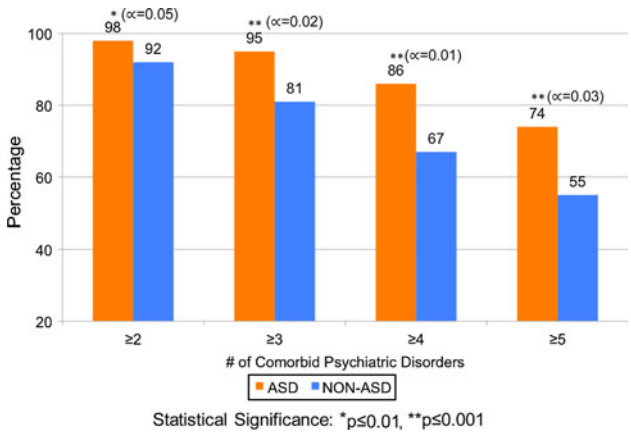

Fig. 2 Number of psychiatric comorbidities in psychiatrically referred youth stratified by the status of ASD

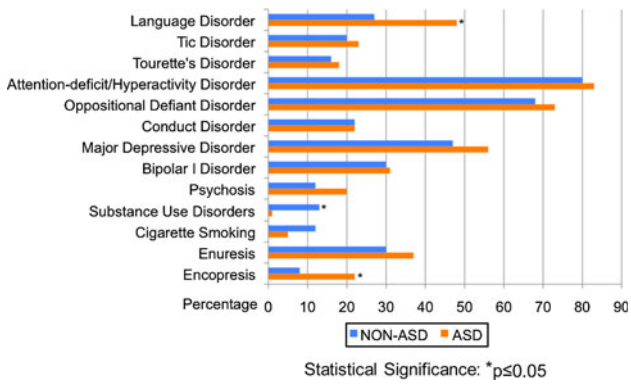

Fig. 3 Prevalence of psychiatric disorders in psychiatrically referred youth stratified by the status of ASD

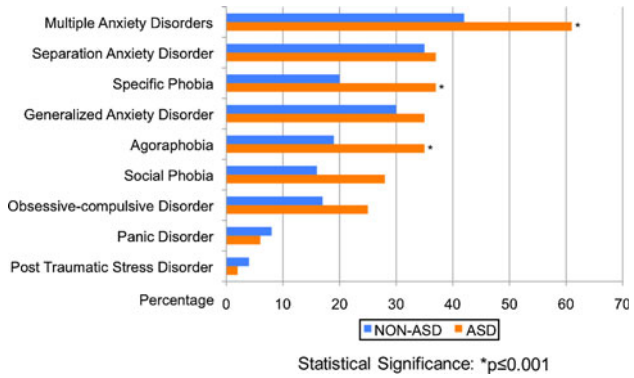

Fig. 4 Prevalence of anxiety disorders in psychiatrically referred youth stratified by the status of ASD

be reflective of the distribution of the ASD subtypes in the general population or suggestive of the referral patterns based on the disorder of concern for referral in this population. Latter is consistent with the notion that contrary to the youth with more severe form of ASD i.e., autistic disorder who are diagnosed early and referred to specialized ASD clinics, youth with milder forms of ASD often initially come to clinical attention through referral to psychiatry clinics for the management of the relatively more severe emergent comorbid psychiatric condition.

The high prevalence of various psychiatric disorders identified in this study are consistent with previous findings reported in smaller samples of psychiatry clinic referred populations of youth with ASD (deBruin et al. 2007; Wozniak et al. 1997a, b). In a younger sample of psychiatry clinic referred children (6–12 years) with PDD-NOS ($n = 94$) deBruin et al. (2007) reported high rates of comorbid psychiatric disorders with disruptive behavior disorders as the most prevalent comorbidity followed by anxiety and mood disorders; similar to the pattern of comorbidity reported in our sample of youth with ASD. Taken together, these findings stress the heavy burden of psychiatric comorbidity associated with ASD in psychiatrically referred youth.

The high rate of comorbidity with ADHD observed in this sample of psychiatrically referred youth with ASD is similar to the previously documented high rates of ADHD in psychiatry clinic referred populations of youth with ASD (Frazier et al. 2001; Goldstein and Schwebach 2004; Yoshida and Uchiyama 2004; Lee and Ousley 2006; deBruin et al. 2007). Considering that ADHD is known to respond to a variety of pharmacological and non-pharmacological interventions, identifying and treating ADHD in youth with ASD can greatly facilitate psychoeducational rehabilitation efforts unique to individuals with ASD.

The substantial comorbidity with major depressive disorder (MDD) in our youth with ASD noted in the present study is consistent with the extant literature that estimated

Table 3 Psychosocial functioning in psychiatrically referred ASD and non-ASD youth

	ASD ($N = 217$) Mean ± SD	Non-ASD ($N = 217$) Mean ± SD	Test statistic (t)	p-value	Holm's adjusted alpha
GAF					
Lifetime	42.6 ± 6.7	48.4 ± 7.6	8.51	<0.001	0.017
Current	46.5 ± 6.7	52.3 ± 6.9	8.68	<0.001	0.012
	N (%)	N (%)	$\chi^2_{(1)}$		
School functioning					
Repeated grade	25 (12)	39 (18)	4.26	0.04	0.025
Extra tutoring	145 (67)	131 (61)	2.28	0.13	0.05
Special class	124 (57)	63 (29)	32.36	<0.001	0.01

Table 4 Treatment history of psychiatrically referred ASD and non-ASD youth

	Non-ASD ($N = 217$) N (%)	ASD ($N = 217$) N (%)	Test statistic $\left(\chi^2_{(1)}\right)$	p-value	Holm's adjusted alpha
Only Counseling	48 (22)	45 (21)	0.13	0.71	0.05
Only Pharmacotherapy	10 (5)	3 (1)	3.77	0.052	0.017
Counseling+Pharmacotherapy	135 (62)	160 (74)	6.87	0.009	0.012
Hospitalization	32 (15)	43 (20)	2.12	0.15	0.025

MDD to affect between 11 and 30% of the referred individuals with ASD (deBruin et al. 2007; Wing 1981; Leyfer et al. 2006). Significant depressive symptoms have also been reported in more than half (68%) of the youth with ASD attending a psychiatry day treatment program (Sverd 2003). Despite referral and sample differences, the findings of our and other investigators' studies converge to show increased rates of MDD in youth with ASD.

The prevalence of bipolar disorder observed in this sample of youth with ASD is consistent with a previous study from our program that identified a bidirectional overlap between BPD and ASD in 21% of the ASD and 11% of the BPD youth (Wozniak et al. 1997a, b). Considering the well-documented morbidity of BPD, identifying and treating it can be of high clinical significance for affected individuals.

The high rate of comorbidity with anxiety disorders in our youth with ASD is also consistent with several previous uncontrolled studies that reported equally high prevalence (43–84%) of anxiety disorder(s) in referred populations of youth with ASD (Muris et al. 1998; Leyfer et al. 2006; Sukhodolsky et al. 2008; deBruin et al. 2007). Our findings also concur with previous studies reporting high prevalence of various specific anxiety disorders (Steinhausen and Metzke 2004; Green et al. 2000; Leyfer et al. 2006; Sukhodolsky et al. 2008; Esbensen et al. 2003) and higher level of anxiety symptom severity (Weisbrot et al. 2005; Gadow et al. 2005; Russell and Sofronoff 2005) in samples of referred populations with ASD. Analogous to our findings, studies in referred populations of youth report specific phobia as one of the most common (38–63%) and panic disorder as the least frequent (0–9%) of the anxiety disorders associated with ASD (Muris et al. 1998; Leyfer et al. 2006; deBruin et al. 2007). Anxiety-like phobic responses are so frequently exhibited in children with ASD that DSM-IV highlights them as a common, ''associated feature'' of autism stating that, ''there may be excessive fearfulness in response to harmless objects'' (American Psychiatric Association 2000). Anxiety conditions are known to be more common in ASD populations with higher intellectual and verbal capacity and with milder form of ASD i.e., PDD-NOS (Muris et al. 1998; Weisbrot et al. 2005; Lecavalier 2006; Sukhodolsky et al. 2008). Perhaps these high-functioning PDD-NOS ASD individuals with interest in social interactions and awareness of social deficits amplified by their legacy of repeated failure in social domain could be predisposed to social phobia compared to ASD individuals who inherently lack interest in the surroundings and thus do not exhibit anxiety or fear response in social situations. Present study with high rates of social phobia in predominantly PDD-NOS subtype of ASD population exemplifies this notion. Whether higher functioning or milder form of ASD are risk factors for social phobia need to be further explored.

Similar to the present study, equally high estimates of OCD, in the range of 11–35%, have been reported in other referred populations with ASD (Muris et al. 1998; Leyfer et al. 2006; Szatmari et al. 1989; Green et al. 2000). Both, ASD and OCD are characterized by repetitive behaviors that differ in their qualitative expression. Children with OCD commonly experience repetitive behaviors of checking, cleaning, and counting along with contamination and catastrophic/aggressive obsessions that are distressing and anxiety provoking (Geller et al. 2001). By contrast, repetitive behaviors in ASD characteristically present as hand flapping, spinning objects, ordering or arranging objects, repeating phrases, and preoccupations with specific topics. Repetitive behaviors of ASD are usually not bothersome and on the contrary children with ASD may self-soothe or derive pleasure or relief from their repetitive behaviors (McDougle et al. 2000). Additionally, there seems to be a significant overlap in the neural underpinnings of the repetitive behaviors associated with ASD and OCD; both sharing neuropathological abnormalities in the anterior cingulated cortex and caudate nucleus region of the brain (Langen et al. 2007; Sears et al. 1999; Scarone et al. 1992; Levitt et al. 2003; Rojas et al. 2006; Rosenberg et al. 2000) though differing in the neurochemical profile of the prefrontal region (Murphy et al. 2002; Ebert et al. 1997).

The findings that youth with ASD in the present study experienced psychosis at a high rate are consistent with the high rate of psychosis reported in a population of youth with ASD attending a psychiatry day treatment program (Sverd 2003) and in a adult psychiatric population with ASD (Ryden and Bejerot 2008). In the present study a significantly higher proportion of youth with ASD experienced language disorders. This finding is consistent with the ASD diagnosis, as language deficits are one of the diagnostic features of ASDs.

Lastly, nearly half of the referred population with ASD experienced encopresis at rates significantly higher than observed in clinic referred youth without ASD. Though the available literature lacks similar comparisons, prevalence of encopresis in psychiatrically referred populations of youth with ASD are noted to range between 4 and 27% (Sverd et al. 1995; Sverd 2003; Wozniak et al. 1997a, b). Higher risk for encopresis in the ASD population adds to the burden of developmental delays, and the social ramifications of comorbid encopresis may worsen the already compromised social interactions of these children and adolescents. Whether the etiological nature of encopresis in this population is predominantly physiological, developmental, or both remains understudied. The reported high prevalence of global developmental delays (Scahill 2005) and gastrointestinal problems, primarily diarrhea and constipation (Fombonne and Chakrabarti 2001; Taylor et al. 2002; Nikolov et al. 2009), in individuals with ASD may moderate the risk for encopresis. Further research in this direction may help in the understanding and management of encopresis in individuals with ASD.

Our findings should be evaluated in the light of certain limitations. As we examined youth referred to a pediatric psychopharmacology clinic, these findings may not generalize to community samples. Additionally, since youth with ASD in the present study were identified from a pool of psychiatrically referred population, we do not know if these results will generalize to samples of youth specifically referred for ASD. However, our findings will generalize to other psychiatrically referred youth. Though majority of the population attending the general psychiatry clinic is clinically determined to be not intellectually impaired, this study lacks psychometric measures on the intellectual capacity of the participants. Validity of the PDD diagnostic module relied only on sensitivity, but not other diagnostic accuracy statistics; this remains a limitation of this study. Additionally, because we do not have data on the reliability of our GAF scores, there could be variability in these ratings. While the diagnosis of ASD was not additionally established by administering Autism Diagnostic Interview-Revised (ADI-R), feasibility of administering ADI-R in studies with large sample of youth with ASD is challenging and questionable. Lastly, although K-SADS-E is not normed for diagnosing psychiatric disorders in ASD populations, based on the equally high levels of psychiatric comorbidity observed in this psychiatrically referred population of youth with and without ASD, we would argue that when structured diagnostic interview is administered to an unselected psychiatric clinic population unbiased by the status of the ASD diagnoses, we observe equally high prevalence of comorbid psychiatric disorders in ASD youth, similar to the age and sex matched non-ASD youth, suggesting that ASD youth suffer from high levels of severe psychiatric comorbidity, when using identical structured interview methodology.

Despite these limitations, results of this study highlight that a substantial minority of youth referred to a child psychiatry program satisfy diagnostic criteria for ASD and that those that do are affected with very high levels of psychiatric comorbidity. Our observations stress the dual importance of identifying ASD in children referred to child psychiatry programs and the identification and treatment of comorbid disorders in youth with ASD. Considering that many of these associated comorbidities can respond to both pharmacologic and non-pharmacologic interventions, this study underscores the critical importance of identifying and treating psychiatric comorbidity in youth with ASD.

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