

RELATIONSHIP OF PSYCHIATRIC DISORDERS TO MEASURES OF CHILD FUNCTION IN PARENTS OF CHILDREN WITH AUTISM

ERIN WINTERROWD, B.A.,¹ SUSAN L. HEPBURN, PH.D.,¹ LILA K. KIMEL, M.A.,²
MARTIN L. REITE, M.D.¹ & DONALD C. ROJAS, PH.D.¹

¹Department of Psychiatry, University of Colorado Health Sciences Center, Denver, CO

²Department of Psychology, University of Denver, Denver, CO

Genetic and environmental contributions from parental psychiatric disorders may partially explain the heterogeneity of autism in children. Few studies, however, have utilized structured interviews or examined parental psychiatric status with regard to child functioning. We completed structured psychiatric interviews on 23 parents of children with autism as well as symptom severity and cognitive measures on the children. Fifteen parents (65%) met lifetime criteria for a DSM-IV Axis I psychiatric disorder. Parental psychiatric history was associated with a parent report measure of symptom severity in children but not with measures derived from clinical observations.

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Autism is a disorder characterized by impairments in social interaction and communication and a restricted range of behaviors and interests.⁴ Twin studies have shown that autism is highly heritable. Monozygotic concordance rates range from 36% to 91% (versus dizygotic concordances of 0%-23%), and overall autism spectrum heritability rates are estimated to be as high as 90%.^{5,18,40,50}

Increased rates of social and communication deficits in first-degree relatives of persons with autism also suggest the heritability of the broader autism phenotype.^{5,8,18,19,50} In addition to the broader autism phenotype, family studies have also found increased rates of psychiatric disorders, particularly affective disorders, in relatives of persons with autism. High rates of major depressive disorder (MDD) in first degree relatives (ranging from 20%-37%) have been consistently identified, especially for recurrent and early onset MDD.^{9,34,35,47} There is some suggestion that rates of single episodes of major depression, dysthymia, and minor depressive disorder are also increased in families of persons with autism as compared to the general population, but are not higher than parents of children with other developmental disabilities.²⁵ DeLong and Dwyer¹⁴ found increased rates of bipolar disorder in first degree relatives of children with Asperger syndrome; however, subsequent research has not replicated that finding in relatives of children with autistic disorder in general.^{1,9,34,35,47}

Many studies have also reported increased rates of anxiety disorders, especially social phobia,

in first degree relatives of persons with autism.^{29,34,35,47} However, Bolton *et al.*⁹ did not find increased rates of any anxiety disorders in the relatives of children with autism compared to relatives of individuals with Down syndrome.

There are conflicting reports on the rates of other psychiatric disorders (e.g., alcohol abuse, drug abuse, eating disorders, and somatoform disorders) in the relatives of persons with autism. Smalley *et al.*⁴⁷ reported a significant increase in the rate of substance abuse in families of children with autism. Abramson *et al.*¹ did not report an increased rate of drug abuse but did find a significant increase in alcohol abuse. Other studies have not replicated this finding.^{9,29,35} The few studies that have examined rates of eating disorders in relatives have not found a significant difference between the groups.^{9,34,47} We are not aware of any published studies that have included somatoform disorders in investigations of psychiatric disorders in relatives of persons with autism.

Estimates of psychiatric disorders in the general population suggest that women have a higher risk for anxiety and mood disorders than men, but that men are at an increased risk for substance use disorders.²² However, in a literature review of psychiatric disorders in parents of children with autism, Yirmiya and Shaked⁵⁵ did not find significant gender differences in psychiatric disorders. Both mothers and fathers had increased rates of psychiatric disorders compared to parents of typically developing

children, children with Down syndrome, and children with severe intellectual disability of unknown etiology.⁵⁵ In the only epidemiologically ascertained sample published to date, however, Micali *et al.*²⁹ reported a significant increase in mood and anxiety disorders over a control sample in only the mothers of children with autism. Given the mixed findings to date on gender differences, it will be important to continue to explore possible gender differences in psychiatric diagnoses in parents of children with autism.

One of the methodological challenges of studying psychiatric disorders in parents of challenging children is to determine when the symptoms were first evident relative to important life events pertaining to the child. By investigating ages of onset of parent psychiatric disorders in relation to the birth and time of the autism diagnosis of their children, several studies have discovered that the increased rates of psychiatric disorders are not solely due to the stress of raising a child with autism.^{9,34} Eighty-three percent of the mothers with depression from the sample in Micali *et al.*²⁹ had symptom onset prior to the birth of their child with a pervasive developmental disorder. While this does not preclude the possibility, even likelihood, that an existing condition or underlying vulnerability could be exacerbated by the birth or diagnosis of a challenging child, the published data suggest that much of parental psychiatric history in autism antedates these important stressors. Given the high heritability of mood and anxiety disorders, these findings are likely to be relevant to issues of symptom expression and comorbidity in children with autism.

Examining psychiatric disorders and the broader autism phenotype in families of affected children may help to identify the specific genes that are implicated in autism, even if the modes of inheritance are different. The increased rates of mood and anxiety disorders suggest a genetic liability associated with autism. However, establishing a link between proband characteristics and psychiatric disorders in relatives would strengthen that suggestion. In their review, Yirmiya and Shaked⁵⁵ identified preliminary evidence that parents of low functioning children with autism (i.e., IQ < 70) had more psychiatric symptoms than parents of children with high functioning autism (i.e., IQ > 70). They were careful to note, however, that the effect sizes were small and child functioning information was fairly limited in most studies.

It is also important to study the relationship between parental psychiatric disorders and child functioning so as to better understand the effects of family conditions on child outcome. Psychiatric disorders such as depression and anxiety are highly heritable.^{3,31} In addition, studies have suggested that children of parents with psychiatric conditions are at an increased risk for child behavior problems and overall psychopathology through factors such as insecure parent-child attachments.^{13,37} Parental depression can also affect parent-child relations indirectly through family disruptions such as marital discord.^{13,15,43} This “double hit” of genetic and environmental contributions from parental psychiatric disorders may greatly affect the presentation of autism in children and may help to explain some of the heterogeneity within the disorder.

While many studies have used semi-structured interviews, checklists, and clinical diagnoses to examine the incidence of psychiatric disorders in parents of children with autism,^{9,34} few have used more rigorous structured interviews. In their review, Yirmiya and Shaked⁵⁵ found that the method of parental diagnosis significantly affected the amount of psychiatric difficulties reported. According to their results, studies that used clinical evaluations identified fewer symptoms than studies that used structured interviews. One of the possible reasons for this difference is that interviewers using a semi-structured interview can depart from the format of the interview at will (as with the clinical interview), such that if he/she believes there is no evidence for a particular disorder, then no questions are asked about that particular disorder, whereas interviewers using a fully structured interview must adhere to the rigid format of the interview. Clinical skill and interpretation are, therefore, not emphasized in structured interviews, and it may be argued that structured interviews are more sensitive and reliable at the expense of possibly over-diagnosing psychiatric disorders.

The primary aim of this descriptive study was to replicate previous findings of increased rates of mood disorders in parents of children with autism and to clarify contradictory findings of anxiety disorders using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID).¹⁷ An additional goal of the study was to examine the relationship between parental psychiatric

TABLE 1. PARENTS OF CHILDREN WITH AUTISM

MEASURE	RANGE	MEAN	SD
Family Socioeconomic Status ^a	34 - 62	49.2	8.1
Parent Age	35.6 - 41.6	38.9	6.2
Cognitive Testing ^b			
Verbal IQ	97 - 130	114.8	8.6
Performance IQ	81 - 136	113.5	11.5
Full Scale IQ	99 - 131	115.8	7.7

^aHollingshead 4-Factor Index of Social Status. This tool is commonly used in research to assess familial social status using both parents' education and occupation, if available. Familial 4-factor scores range from 8 to 66 with a score > 55 generally indicative of high status.

^bWechsler Abbreviated Scale of Intelligence (WASI)

conditions and symptom severity rating in their child with autism.

METHODS

Participants

Twenty-three parents of children with autism participated in structured interviews assessing their lifetime history of psychiatric symptoms. Parents qualified for the study if they had at least one biological child who met criteria (as described below) for autism. Twelve parents from ten families were recruited from a letter sent to 24 families by the Autism and Developmental Disorders Research Group at the University of Colorado at Denver and Health Sciences Center to those who had participated in one or more studies on autism. Only families of at least one child with autistic disorder, excluding pervasive developmental disorder-NOS and Asperger syndrome, were invited to participate. Seven parents from five families were recruited from additional researchers and therapists familiar with the study. Three parents from two families were recruited from advertisements in local autism and developmental disabilities newsletters. Two parents from one family found a recruitment description online and one parent was recruited through another family already enrolled in the study.

In total, 27 parents from 20 families contacted the study coordinator and 23 participants were enrolled. Data were collected on 23 parents of children with autism from 18 different families; 15 mothers and 8 fathers. Due to the small number of fathers who participated in the study, gender differences in psychiatric disorders were only

preliminarily investigated. Two parents from two families (9%) were African American and non-Hispanic. The remaining 21 parents (91%) were Caucasian and non-Hispanic. See Table 1 for a description of mean parent age and family socioeconomic status. As noted in Table 1, many of these families were from a high socioeconomic status as measured by the Hollingshead 4-Factor Index of Social Status.²⁰

An age and gender matched comparison group of typically developing adults was recruited for the larger neuroimaging study. However, this group could not be used as a comparison for the current project because participants were specifically excluded if they had personal or familial history of psychiatric symptoms. Epidemiological data from Kessler *et al.*²² were used to compare overall lifetime prevalence rates in parents of children with autism and data from Kessler *et al.*²³ were used to compare lifetime rates by gender. These studies used DSM-IV and DSM-III-R criteria, respectively, to estimate lifetime prevalence rates of psychiatric disorders in the general population.

Proband Diagnostic Assessment

All children and their families completed the Autism Diagnostic Observation Schedule (ADOS)²⁷ and the Autism Diagnostic Interview, Revised²⁸ or the Social Communication Questionnaire (SCQ).⁷ The ADOS, Autism Diagnostic Interview, and SCQ are established tools used to show that probands meet ICD-10⁵⁴ and DSM-IV diagnostic criteria for autism. The ADOS utilizes direct observation and interactions with the child to measure verbal and non-verbal communication, reciprocal social interaction, play (imagination and creativity),

restricted, repetitive behaviors and interests, and other abnormal behaviors such as overactivity, aggression, and anxiety.

The Autism Diagnostic Interview and SCQ are parent interviews that are designed to collect onset and early development information in addition to parents' observations of a child's behavior within several symptom domains associated with autism (communication, social interactions, play, and restricted, repetitive behaviors and interests). The SCQ is a brief screening questionnaire derived from the larger Autism Diagnostic Interview. Assessments and interviews were conducted in a standardized manner by experienced clinician-researchers who have demonstrated reliability on the measures. Inter-observer reliability is assessed on more than 20% of children in the autism and developmental disabilities research projects and is maintained at 85% or better across administrations.

All children in this study were diagnosed with autism by meeting criteria on the ADOS, SCQ and through current clinical judgment determined by the second author (SLH), who is a clinical psychologist. Reliability of clinical diagnosis was assessed on six participants, chosen randomly from the sample. A second clinical psychologist with extensive experience in autism provided an independent diagnosis based on direct observation and review of records. Diagnostic reliability for these six probands was 100 percent.

According to parental report, no probands had a medical condition that could have explained the autism. One family had two children who met criteria for autism, both boys. However, data were only collected on one of the two boys. The recruitment letters, advertisements, and website did not specifically state that the study would be examining familiarity of psychiatric disorders in parents of children with autism. Therefore, recruitment was not biased towards or targeted at multiply affected families. In total, parents of 15 boys (83%) and 3 girls (17%) with autism participated in the study. Children ranged in age from 3 to 20 years with a mean of 8 years of age. To examine the level of functioning of children with autism in relation to the presence of psychiatric conditions in parents, it was essential to have the same measures of autism symptomatology on each of the children. Despite the fact that ADOS scores were available on all of the children with autism, different modules had been used depending on the age and verbal ability

of the child. In order to compare ADOS scores across modules, a severity score for each child was calculated by summing the number of symptoms endorsed as clinically significant and dividing by the total symptom score possible, consistent with methods utilized by Bailey *et al.*⁶ In this paper, ADOS scores transformed in this way are referred to as ADOS severity. The majority of families recruited from Dr. Hepburn's studies had previously participated in an Autism Diagnostic Interview-Revised. However, most of the newly recruited families participated in an SCQ, rather than the Autism Diagnostic Interview, to save time. To resolve this issue, the research team filled out an SCQ for families with only an Autism Diagnostic Interview, utilizing the answers from that interview. This process allowed the presence of parental diagnoses to be examined in relation to SCQ symptom endorsement in addition to ADOS severity.

Standardized developmental testing on the children with autism was available for 15 of the 18 families. Eight of the 15 children participated in a Mullen Scales of Early Learning,³² five (33%) participated in one of three Wechsler scales of intelligence (WISC-III,⁵² WISC-IV,⁵³ WASI,³⁶) and one participated in a Stanford Binet Scale of Intelligence.⁴² Of the 15 children who had participated in cognitive testing, four (27%) were in the significantly delayed range (<50), four (27%) were in the moderately delayed range ($\geq 50 < 60$), four (27%) were in the mildly delayed range ($\geq 60 < 80$), one (7%) was in the low average range ($\geq 80 < 90$), one (7%) was in the average range ($\geq 90 < 110$), and one (7%) was in the above average range (≥ 110). Cognitive data were not available for three of the 18 families (17%).

All children were reported by their parents as having delays in their adaptive functioning. Twelve of the 18 families (67%) completed a Vineland⁴⁸ about their child's adaptive behavior. Nine of the 12 (75%) had adaptive behavior composites in the significantly delayed range (<60). The remaining three children (25%) had adaptive behavior composites in the moderately delayed range ($\geq 60 < 80$). In total, child functioning information included autism severity (ADOS, SCQ), cognitive functioning (Mullen, WASI/WISC, Stanford-Binet), and adaptive behavior functioning (Vineland). See Table 2 for a description of child age, autism severity, cognitive functioning, and adaptive behavior functioning.

TABLE 2. CHILDREN WITH AUTISM

MEASURE	RANGE	MEAN	SD
Child Age ^a	3.6 - 20.5	8	8.1
Autism Severity			
SCQ ^a	16 - 31	22.1	4.0
ADOS Severity ^a	29.2% - 91.7%	61.4%	22.1%
Cognitive Functioning			
Mullen ^b	49 - 70	53.4	7.1
WISC/WASI ^c	52 - 118	86.5	23.2
Stanford-Binet ^d	n/a	69	n/a
Adaptive Functioning			
Vineland ^e	44 - 80	56.5	9.6

^aN = 18 (SCQ cutoff for autism is 15); higher scores suggest greater symptom numbers and/or severity; ^bN = 9; ^cN = 6; ^dN = 1; ^eN = 12

Parental Diagnostic Assessment

At least one parent from each family was interviewed by a trained researcher using the Structured Clinical Interview for DSM-IV Axis I Disorders, Research Version (SCID)¹⁷ and/or the SCID Screen Patient Questionnaire Extended Computer Program (hereafter SCID computer screen or computer screen) to determine the lifetime prevalence rates of psychiatric disorders. The SCID is a reliable, structured interview designed to elicit the necessary information to make a diagnostic decision based on DSM-IV criteria.^{39,45,46,51,56,57} The progression of questions is intended to mimic the DSM-IV decision trees and allows for follow up and clarification. The SCID interviewer was trained using the training tapes designed by Spitzer and colleagues⁴⁹ and observing SCID interviews administered by an experienced researcher. The research team, which included a psychiatrist (MLR), met to discuss each interview and reach a consensus on symptom coding, overall diagnosis, and age of onset. Clinical and medical records were also consulted when available. Researchers were unable to interview parents without knowledge of family history and proband diagnosis.

Parents who reported during screening that they had never seen anyone professionally for psychiatric symptoms (e.g., depression or anxiety) were first administered the screening interview. If a parent's answers on the SCID computer screen indicated the possibility of a psychiatric disorder,

all of the questions in the appropriate SCID section (e.g., mood disorders) were administered. Those participants who reported psychiatric histories at screening were administered the full SCID without the computer screen. Seventeen of the 23 parents (74%) completed the full SCID interview.

The Structured Clinical Interview for DSM-IV Axis II Disorders (SCID II)¹⁷ and the SCID II Computer Screener were added at a later point in the study. Similar to the SCID, the SCID II is a reliable, structured interview designed to help researchers make a diagnostic decision based on DSM-IV criteria for Axis II personality disorders.^{17,45} The same follow up process for Axis I psychiatric disorders was used for Axis II personality disorders. Nine of the 21 parents who participated in the SCID II screener (39%) also completed the full SCID II Interview. There were no parents who enrolled in the study with a pre-existing Axis II diagnosis. See Table 3 for a list of Axis I and II disorders assessed using the SCID computer screen, SCID II Screen, and the full SCID I and II interviews.

Data Analysis and Statistical Methods

Data were statistically evaluated using Statistica 6.0 (Statsoft, Tulsa, OK). All null-hypothesis significance testing was conducted using a two-tailed alpha of .05. To examine possible differences in rates of disorders between parents of children with autism and estimates

TABLE 3. AXIS I DISORDERS AND AXIS II PERSONALITY DISORDERS ASSESSED

SCID I Disorders				
Mood Disorders	Anxiety Disorders	Eating Disorders	Somatoform Disorders	Substance Use Disorders
Bipolar I	Panic	Anorexia Nervosa	Somatization	Alcohol Abuse
Bipolar II	Agoraphobic	Bulimia Nervosa	Hypochondriasis	Alcohol Dependence
Minor Depressive	Social	Binge Eating		Substance Abuse
Dysthymic	Specific			Substance Dependence
Major Depressive	Obsessive-Compulsive			
	Post Traumatic Stress			
	Generalized Anxiety			

SCID II Personality Disorders			
Cluster A	Cluster B	Cluster C	Cluster D
Paranoid	Histrionic	Avoidant	Passive-Aggressive
Schizotypal	Narcissistic	Dependent	Depressive
Schizoid	Borderline	Obsessive-Compulsive	
	Antisocial		

from the general population,^{22,23} chi-square tests were generally employed. For specific comparisons where any of the expected values were calculated to be less than 5, a Fisher Exact Test (FET) was substituted for the chi-square analysis. For the evaluation of our hypotheses concerning child functioning in parents with and without psychiatric histories, we used independent Student's t-tests.

RESULTS

Lifetime Prevalence Rates of Psychiatric Disorders

To examine lifetime prevalence rates of psychiatric disorders in parents of children with autism, estimates from the general population were used.^{22,23} See Table 4 for a description of lifetime rates of psychiatric conditions in parents of children with autism in this sample compared to the general population estimates published elsewhere.

Of the 23 parents who participated, 15 (65%) had at least one Axis I psychiatric disorder based on DSM-IV criteria. Although the overall incidence of any disorder was not significantly different in our sample, the lifetime prevalence for any mood disorder in parents of children with autism (56.5%) was significantly higher than that of

adults in the general population ($X^2 = 5.81$; $df = 1$; $p=0.016$). The majority of parents with a mood disorder were diagnosed with MDD (39%). Of the 15 parents that met criteria for a psychiatric disorder, two were male (13%) and 13 were female (87%). There was a gender difference in that mothers of children with autism were significantly more likely to have a psychiatric disorder than fathers of children with autism (FET, $p=0.006$). See Table 5 for lifetime rates of psychiatric disorders in mothers and fathers of children with autism compared to estimates for men and women in the general population.

The lifetime prevalence rate of any psychiatric disorder in mothers of children with autism (87%) was significantly higher than for women in the general population ($X^2 = 5.40$; $df = 1$; $p=0.02$). Mood disorders contributed the most to this finding with 11 mothers (73% of all mothers) meeting criteria for any mood disorder, seven of which met criteria for MDD (47% of all mothers). The rate of mood disorders in mothers of children with autism was significantly higher than the corresponding rate for women in the general population (FET, $p=0.012$). However, the rate of MDD, specifically, was not significantly higher. Lifetime prevalence rates of mood disorders,

**TABLE 4. OVERALL RATES OF AXIS I PSYCHIATRIC DISORDERS
COMPARED TO THE GENERAL POPULATION**

Psychiatric Disorder	Autism Parents		General Population ^a	X ² (1=df)	p
	N	%	%		
Any Disorder	15	65.2%	46.4%	ns	ns
Any Mood Disorder	13	56.5%	20.8%	5.841	0.016
MDD	9	39.1%	16.60%	FET ^b	0.071
Dysthymic Disorder	1	4.3%	2.5%	FET	ns
Bipolar Disorder (I & II)	2	8.7%	3.9%	FET	ns
Any Anxiety Disorder	8	34.8%	28.8%	ns	ns
Panic Disorder	2	8.7%	4.7%	FET	ns
Agoraphobic Disorder	0	0.0%	1.4%	FET	ns
Social Phobia	0	0.0%	12.1%	ns	ns
Specific Phobia	2	8.7%	12.5%	FET	ns
OCD	2	8.7%	1.6%	FET	ns
Post-Traumatic Stress Disorder	3	13.0%	6.8%	FET	ns
Generalized Anxiety Disorder	0	0.0%	5.7%	FET	ns
Any Substance Use Disorder	4	17.4%	14.6%	FET	ns
Alcohol Abuse	1	4.3%	13.2%	FET	ns
Alcohol Dependence	1	4.3%	5.4%	FET	ns
Sub Abuse	2	8.7%	7.9%	FET	ns
Sub Dependence	1	4.3%	3.0%	FET	ns

^aKessler *et al.*²²
^bFisher Exact Test

anxiety disorders, substance abuse/dependence, and eating disorders in fathers of children with autism were not significantly higher than for men in the general population.

Lifetime Prevalence Rates of Comorbid Psychiatric Disorders

In order to investigate prevalence rates of secondary psychiatric diagnoses in the presence of primary psychiatric diagnoses, comorbidity rates were examined. See Table 6 for a description of lifetime comorbidity in parents of children with autism and Table 7 for a comparison between parent comorbidity and estimates from the general population.

The overall rates of comorbidity within parents of children with autism did not differ significantly from the general population. Of the 15 parents with one or more psychiatric disorder, 12 (80%) had a primary diagnosis of a mood disorder and three (20%) had a primary diagnosis of an anxiety disorder. Eight of those 15 parents (53%) also met

criteria for at least one comorbid Axis I psychiatric disorder (35% of all parents). Of the 12 parents who had a primary diagnosis of a mood disorder, 5 (42%) also met criteria for a comorbid anxiety disorder.

Two of the 21 parents who completed the SCID-II Screen (9.5%) met full criteria for a comorbid Axis II disorder. One father met criteria for schizoid personality disorder in addition to a primary diagnosis of MDD and comorbid diagnoses of PTSD and alcohol dependence. One mother met criteria for avoidant personality disorder in addition to a primary diagnosis of minor depressive disorder. The reliability of Axis II personality assessment in the presence of an Axis I psychiatric disorder must be taken into consideration when interpreting this data.⁵⁸

Ages of Onset of Psychiatric Disorders

To examine the possibility that raising a child with autism was solely responsible for a parent's psychiatric condition, information on the age of

TABLE 5. LIFETIME RATES OF AXIS I PSYCHIATRIC DISORDERS BY GENDER COMPARED TO THE GENERAL POPULATION

Psychiatric Disorder	Mothers					Fathers			
	Autism Parents		General Pop ^a	X ² (1=df)	p	Autism Parents		General Pop ^a	X ² (1=df)
	N	%	%			N	%	%	
Any Disorder	13	86.7%	47.3%	5.40	0.02	2	25.0%	48.7%	ns ^c
Any Mood Disorder	11	73.3%	23.9%	FET ^b	0.012	2	13.3%	14.7%	ns
MDD	7	46.7%	21.30%	FET	0.097	2	25.0%	12.70%	ns
Dysthymic Disorder	1	6.7%	8.0%	FET	ns	0	0.0%	4.8%	ns
Bipolar Disorder (I & II)	2	13.3%	1.7%	FET	ns	0	0.0%	1.6%	ns
Any Anxiety Disorder	6	40.0%	30.5%	FET	ns	2	13.3%	19.2%	ns
Specific Phobia	2	13.3%	15.7%	FET	ns	0	0.0%	6.7%	ns
Panic Disorder	2	13.3%	5.0%	FET	ns	0	0.0%	2.0%	ns
Any Substance Use Disorder	3	20.0%	17.0%	FET	ns	1	12.5%	35.4%	ns
Alcohol Abuse	1	6.7%	6.4%	FET	ns	0	0.0%	12.5%	ns
Alcohol Dependence	0	0.0%	8.2%	FET	ns	1	6.7%	20.1%	ns
Sub Abuse	2	13.3%	3.5%	FET	ns	0	0.0%	5.4%	ns
Sub Dependence	1	6.7%	5.9%	FET	ns	0	0.0%	9.2%	ns

^aKessler *et al.*²³

^bFisher Exact Test

^cLifetime rates of mental illness in fathers of children with autism were not significantly higher than males in the general population.

onset of parent psychiatric disorders in relation to a child's birth and diagnosis of autism was collected. See Table 8 for a timeline of the onset of parents' primary psychiatric diagnoses in relation to the birth and autism diagnosis of their children.

Eight of the 15 parents with psychiatric disorders (53%) had their first clinically significant episode before their child was born, including all of the fathers. However, of these eight, only three (37.5%) were being actively treated prior to their child's diagnosis of autism. Of the remaining parents with a disorder (all mothers), one mother had her first psychiatric episode between the birth of her child and her child's diagnosis of autism, five mothers' (33%) first episode coincided with the diagnosis of autism in their children, and one mother's first episode occurred after the diagnosis of her child. Three of the seven mothers with later onsets of disorders (43%) had clinically significant symptoms before their child's birth. Thus, the

majority of parents reported symptoms preceding their child's diagnosis of autism.

In order to further investigate the effects of raising a child with autism on parental psychiatric functioning, the association between child age and parental psychiatric status was examined. There was not a significant relationship between the presence of a parental diagnosis and child age at participation ($t(21) = 1.891$, ns).

Psychiatric Conditions and Child Functioning

We found some preliminary evidence for an association between parent psychiatric condition and parent report of child symptom severity. Clinician ratings of child severity, however, were not associated with parental psychiatric status. Children of parents with psychiatric diagnoses had significantly higher SCQ scores than children of parents without disorders ($t(21) = 2.943$, $p = 0.008$). Clinician administered measures, including ADOS derived severity ($t(21) = .586$, ns), measures of cognitive functioning (Mullen,

TABLE 6. COMORBID DISORDERS IN PARENTS OF CHILDREN WITH AUTISM

Comorbid Disorders	Primary Disorder	
	Mood (N = 12)	Anxiety (N = 3)
Mood Disorder	n/a*	33% (N = 1)
Anxiety Disorder	42% (N = 5)	33% (N = 1)
Substance Use Disorder	8% (N = 1)	33% (N = 1)
Eating Disorder	8% (N = 1)	33% (N = 1)
Axis II Disorder	17% (N = 2)	0.0%

*DSM-IV criteria do not allow one person to be diagnosed with multiple mood disorders.

TABLE 7. LIFETIME COMORBIDITY RATES COMPARED TO GENERAL POPULATION

Number of Comorbid Disorders	Autism Parents (N = 23)	General Population^a	X² (1=df)
One or more	65.2% (N = 15)	46.4%	ns ^b
Two or more	34.8% (N = 8)	27.7%	ns
Three or more	21.7% (N = 5)	17.3%	ns

^aKessler *et al.*²²

^bRates of comorbid disorders in autism parents were not significantly higher than adults in the general population.

TABLE 8. AGES OF ONSET OF PRIMARY AXIS I PSYCHIATRIC DISORDERS IN RELATION TO BIRTH AND DIAGNOSIS OF CHILD WITH AUTISM

First Clinically Significant Episode	Mothers (N = 13)	Fathers (N = 2)	All Parents (N = 15)
Before birth of child with autism	46.2% (N = 6)	100%* (N = 2)	53.3% (N = 8)
Between birth and diagnosis of autism	7.7% (N = 1)	0.0%	6.7% (N = 1)
Coinciding with autism diagnosis	38.5% (N = 5)	0.0%	33.3% (N = 5)
After autism diagnosis	7.7% (N = 1)	0.0%	6.7% (N = 1)

*All fathers with a psychiatric disorder had their first clinically significant episode and first clinically significant symptoms before their child was born.

WASI/WISC, Stanford-Binet; $t(21) = .700$, ns), and measures of adaptive functioning (Vineland; $t(12) = -1.181$, ns) were not significantly associated with parent diagnostic status. There was a significant relationship between SCQ scores and ADOS severity ratings ($r(21) = .418$, $p = .047$).

DISCUSSION

This study supports previous findings that a large percentage of parents of children with autism have suffered from diagnosable psychiatric conditions at some point in their lives. Rates of mood disorders, including MDD, were particularly high. Overall, this study found higher rates of mood disorders in parents of children with autism than previous studies have found. As discussed earlier, this increased rate may be in part due to the nature of the SCID, and rigorous structured interviews in general, compared to semi-structured or clinical interviews. The rates of psychiatric disorders may also be higher in mothers, consistent with Micali *et al.*,²⁹ but caution is warranted in these findings since fathers were underrepresented in this sample. Given the small number of multiplex families in this sample ($N=1$), and the similar rates of psychiatric disorders in parents of children with autism compared to those studies with multiplex-only samples, the high rates of psychiatric disorders reported in those prior studies may not relate directly to their presumably higher familial loading on autism.

The majority of parents with psychiatric disorders had their first clinically significant episode before their child with autism was born. However, few of the parents meeting lifetime criteria for a psychiatric condition received any treatment for their psychiatric symptoms prior to the birth or diagnosis of their child and prior to enrollment in this study. Although this finding supports previous reports that high rates of psychiatric disorders in parents are not due solely to the stress of raising a child with autism, it also suggests that parents of children with autism are not readily seeking psychiatric treatment for their symptoms despite their connection to the mental health community. For those parents whose psychiatric disorders had onsets after the birth of their child with autism, many had their first clinically significant symptoms before the birth. In these cases, the stress of raising a child with a serious developmental disorder may have precipitated the full expression of a prodromal illness.

There was a significant relationship between the presence of a parental psychiatric disorder and the SCQ score of his/her child. Parents with a psychiatric diagnosis reported more autism symptoms than parents without a diagnosis. However, there was not a significant relationship between parental psychiatric disorders and any measures that were not derived from parent report (ADOS severity, cognitive functioning, and adaptive functioning). Based on the lack of correlation between clinical child functioning measures and parental psychiatric conditions, these findings suggest that parents with a psychiatric disorder may be over reporting the amount of autism symptoms in their children. Further examination into the potential response bias of parents with psychiatric disorders and the validity of parent reports, including the SCQ and Autism Diagnostic Interview, is warranted. Child behavioral inventories such as Child Behavior Checklist² have been shown to be sensitive to the psychosocial function and diagnostic status of the parent rater.^{30,38,44} While this bears further examination, clinicians treating children with autism spectrum conditions should be aware of the impact of potential familial psychiatric conditions on parental recognition of their children's symptoms.

Limitations of the Study

The majority of the families of children with autism in this study were from a high socioeconomic group. Therefore, it could be argued that increased rates of psychiatric disorders in parents of children with autism might be a factor related to socioeconomic status itself. Klerman²⁴ suggested that the incidence of bipolar disorder (then, manic depression) may be increased in families of high socioeconomic status. However, since Klerman's research, there have been a number of studies that suggest that the rates of almost all psychiatric disorders increase as the socioeconomic status decreases.^{11,12,21,23,26,41} Given the more recent findings, the increased rates of psychiatric disorders in this sample of parents of children with autism is most likely not due to their higher socioeconomic status; future studies, however, should examine this potential relationship.

For those parents who did not have a pre-existing psychiatric diagnosis (via medical records), mental health history was derived completely from self report of psychiatric symptoms. Having a child with autism could

potentially affect the type of responses a parent might give to questions about psychiatric symptoms such as depression and anxiety. However, previous studies comparing parents of children with autism to parents of children with other illnesses, including Down syndrome, have also found increased rates of psychiatric disorders,^{9,16,33} suggesting that parents of children with autism may not be overly sensitive to their own mental health either due to their increased contact with the medical community and/or because of their own increased awareness of mental health issues surrounding pervasive developmental disorders.

This study, as with most of the earlier studies of psychiatric disorders in parents of children with autism, employed a clinic sample that could arguably be biased in favor of higher rates of single disorders and comorbidity. Epidemiological samples are far more useful for estimating prevalence. Micali *et al.*,²⁹ however, reported higher lifetime rates for any Axis I illness in their epidemiologically ascertained sample of parents of children with autism, compared to similarly ascertained control subjects. The rate of depression in first degree relatives from that study was reported to be 62%, higher than the rate we report in the current study.

It will be important for future research on parental psychiatric disorders to include a larger number of families in general with better representation of fathers. In addition to the increase in power for examining specific diagnostic associations, this will allow us to examine questions of gender differences and comorbidity more rigorously.

Future Questions

Given the continued findings of increased rates of psychiatric disorders in parents of children with autism, it is important to explore whether mood and anxiety problems in families are heritable factors in autism. Only a few studies^{35,47} have examined the relationship between psychiatric disorders in autism families and the broader autism phenotype. Further investigation into this relationship may reveal whether or not the mode of inheritance of psychiatric disorders is related to the mode of inheritance of the broader autism phenotype. It may also be worthwhile to explore whether mothers of children with autism genetically contribute something unique from fathers of children with autism. Furthermore, given that

affective disorders are associated with changes in brain anatomy and function,¹⁰ contradictory findings in the literature on brain structure and function in persons with autism may be partially attributable to the lack of control for the phenotypic background upon which autism is expressed. Continuing to examine the environmental and genetic contributions of parental psychiatric disorders to the comorbid presentation of autism in children will be essential to fully understanding the disorder.

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CORRESPONDENCE: Donald C. Rojas, Ph.D., Associate Professor of Psychiatry, Department of Psychiatry, University of Colorado Health Sciences Center, 4200 E. 9th Avenue, Box C268-68, Denver, CO 80262; tel.: 303-315-8624; fax: 303-315-5395; email: Don.Rojas@uchsc.edu.