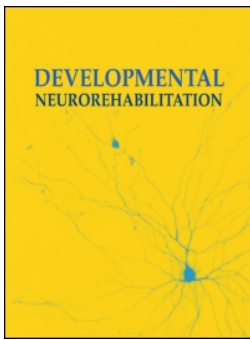




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Relationship between Comorbid Psychopathology in Children and Adolescents with Autism Spectrum Disorder and Parental Well-being

Julia Lanyi^a, Arlene Mannion^a, June L. Chen^b, and Geraldine Leader^a

^aIrish Centre for Autism and Neurodevelopmental Research, School of Psychology, National University of Ireland, Galway, Ireland; ^bDepartment of Special Education, Faculty of Education, East China Normal University, Shanghai, China

ABSTRACT

Aim: Frequency and relationship between child comorbid psychopathology and parental stress, quality of life (QoL), anxiety, depression, and social support were examined in parents of children and adolescents with autism spectrum disorder (ASD).

Method: Parents of 152 children and adolescents with ASD completed the Autism Spectrum Disorder-Comorbid for Children, Parenting Stress Index-Short Form, World Health Organization Quality of Life Abbreviated Version, Hospital Anxiety and Depression Scale, and the Multidimensional Scale of Perceived Social Support.

Results: A series of one-way multivariate analysis of variance was conducted to examine the relationship between child comorbid psychopathology and parental well-being. A relationship was found between parental QoL, depression and anxiety and child comorbid psychopathology. Results showed a relationship between parental stress and the severity of child conduct, and repetitive behaviors.

Conclusion: This study adds to existing literature by demonstrating the relationship between comorbid psychopathology in children and adolescents in ASD and parental well-being.

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Autism spectrum disorder; comorbidity; comorbid psychopathology; behavior problems; parental well-being; parental quality of life

Introduction

Comorbid Psychopathology in Autism Spectrum Disorder (ASD)

Comorbid psychopathology is characterized by the occurrence of two or more separate psychological disorders, such as depression or anxiety, in the same individual.¹ In a review of the topic, comorbid psychological disorders for ASD were divided under (i) mood disorders (major depression and bipolar disorder), (ii) phobias, obsessive compulsive disorder (OCD), and anxiety and (iii) psychosis and schizophrenia.¹ The authors highlighted the complexity of screening and diagnosing for co-occurring disorders for ASD, given the wide variety of symptoms associated with ASD and therefore the difficulty distinguishing between ASD core symptomology and symptoms related to a comorbid disorder.

Screening for co-occurring psychopathologies is crucially important, however, as treatment specific to comorbid diagnosis have been shown to be more effective, than nonspecific treatment and has been associated with greater improvement in adaptive functioning.² Furthermore, drug administration has been associated with challenging behavior and comorbid psychopathology rather than ASD core symptoms, which warrants accurate assessment of the co-occurring disorder.¹ Without screening for comorbid disorders, it has been argued, there is a danger of diagnostic overshadowing – a biased judgment affecting the accuracy of practitioner's judgments about co-occurring diagnoses.^{3,4}

Comorbid conditions in ASD and other developmental disorders include attention-deficit/hyperactivity disorder (AD/HD), epilepsy, behavior problems, gastrointestinal symptoms, sleep problems, toileting issues, and feeding problems.^{5–13} A previous study¹⁴ investigated the prevalence rates of comorbid psychopathology in 89 children with ASD, using the Autism Spectrum Disorder-Comorbid for Children (ASD-CC).^{15,16} The authors found that 46% of participants had an additional diagnosis, and this number was even higher when ID was included as a second-order diagnosis (78.8%). AD/HD, epilepsy and anxiety disorders were among the most common co-occurring challenges.¹⁴ A two-year follow-up of the study found that out of the 56 participants the percentage of participants with a comorbid diagnosis has increased by 15.63% (16.67% when ID included), with an increase in the occurrence of AD/HD, anxiety and epilepsy too.¹⁶ A recent meta-analysis has reported that the pooled prevalence of adult participants with ASD with one or more psychiatric diagnosis was 54.8%.¹⁷ A further study reported that 75% of the 109 children and adolescents with ASD met the cut off for clinically significant level of anxiety.¹⁸ A recently published umbrella review synthesizing the findings of 12 meta-analyses and 14 systematic reviews on comorbid psychopathology in ASD reported that prevalence rates ranged between 1.47–54% for anxiety, 2.5–47.1% for depression, 9–22% for OCD, 25.7–65% for AD/HD, and 6–21.4% for bipolar disorder.¹⁹

Relationship between Comorbid Psychopathology in ASD and Parental Well-being

Parental wellbeing is an umbrella term used to define subjective wellbeing, including, but not limited to, physical and emotional health of parents, coping skills, QoL, stress, and social support.²⁰ Parents of individuals with ASD are at increased risk of experiencing poorer quality of life²¹ and different mental health problems^{22,23} that are often associated with their child's comorbid psychopathology and additional behavioral and emotional challenges.^{24–26}

Parental Quality of Life and Child Characteristics

In a systematic review examining variables associated with parental quality of life (QoL) in parents of children with ASD, all five studies included in the review assessing child characteristics in relation to caregiver QoL found a relationship between child behavioral problems and parental QoL.²¹ Evidence from other research, investigating the relationship between health-related QoL and child characteristics in 304 primary caregivers of children with ASD, showed that greater caregiver burden, more behavioral problems and higher functional impairment in the child had a significant negative impact on physical QoL outcomes for the caregivers.²⁷ Similar results were found by another study where conduct problems and emotional problems of the child correlated to lower maternal QoL.²⁸

Parental Sleep Quality and Child Characteristics

Children with developmental disabilities and ASD often experience sleep disturbances that usually lead to the need for the caregivers to wake up as well and tend to their child.^{22,29,30} Parents of children with ASD are therefore more at risk of having poor sleep quality. A study comparing sleep quality in children with typical development (TD) and a diagnosis of ASD found that children with ASD have a different sleep pattern, with earlier wake times and less total hours of sleep.³¹ Research has also found that there is a significant difference in the sleep quality of parents of children with ASD and TD, with poorer outcomes for parents of those with ASD.³² Greater sleep disturbance in children with developmental disability indicated poorer sleep quality in their mothers in previous studies, which then predicted maternal mental health outcomes.^{33,34}

Parental Stress and Child Characteristics

Parents of children with ASD often face a number of challenges and endure more stressors than caregivers of TD children.^{35,36} Children with ASD are more likely to experience behavioral difficulties, sleep disturbances, language impairment, and other comorbid medical or psychological conditions that have a huge impact on their parent's daily routine and stress levels.^{22,24,28,33,37}

In a study comparing 50 families of children with ASD and 50 families of children with other developmental disabilities, results found that parental stress was significantly higher in the ASD group.²⁶ The level of parental stress was associated with

child irritability. Similarly, a study reported that for parents of a child with ASD, stress was associated with child disruptive behaviors.³⁸ Other research also reported that greater behavioral problems in children with ASD positively correlated to parental stress.³⁹ A recently published review concluded that parents of those with an ASD diagnosis experienced higher levels of stress than any other parent group.⁴⁰

Parental Anxiety and Depression and Child Characteristics

Parents of children with ASD are at increased risk of experiencing mental health problems.^{23,37} A study found that in mothers of children with ASD, one in two mothers reached the cutoff score for at least one psychological morbidity on the General Health Questionnaire 12⁴¹ and that this was related to higher levels of challenging behavior of the child.³⁷

A study examined 107 parents of children with ASD, where 90% of parents reported that they felt stretched beyond their limits regularly and were unable to effectively deal with their child's behavior at times.⁴² The same study found that nearly half of the parents experienced severe anxiety and two thirds of them reported clinical levels of depression. The authors argued that challenging behavior of the child may contribute to these figures. Further evidence from the literature supports the hypothesis that the severity of child behavioral problems may predict levels of mental health problems in parents. Research has examined the relationship between child symptom severity and parental depression in 149 parents of children with ASD and found a positive correlation between those variables.⁴³ Parental anxiety and depression have also been associated with poor sleep quality in children with ASD.^{22,32,33}

Social Support and Child Characteristics

Social support refers to a person's perception of how supportive a social interaction is.⁴⁴

It is a coping mechanism that is protective against stressors and is negatively associated with mental health problems, for those raising a child with ASD.³⁵ Previous research comparing parents of children with ASD and TD found that parents of children with ASD score significantly lower on social support.⁴⁵ Research has reported that the most significant child characteristic leading to parents to seek more social support is behavioral difficulties.⁴⁶ Research has found that mothers of a child with ASD reported significantly lower levels of stress with more perceived social support, concluding that social support has a stress-buffering effect for parents.⁴⁷ Recent research reported similar findings, with perceived social support protecting against parental stress, according to their results.⁴⁸

Current Study

The aim of the current study was to investigate the relationship between child comorbid psychopathology and parental wellbeing. This study explored whether parental characteristics, including quality of life, sleep problems, stress, anxiety, depression and perceived social support differ dependent on the severity of the comorbid psychopathology of their child.

Method

Participants

Participants included 152 parents of a child with a diagnosis of ASD. The majority, 94.7% ($n = 144$) of participants were female with an average age of 41.5 years ($SD = 7.0$). Most participants, 73% ($n = 111$) were educated to degree level and lived in a marriage (59.9%, $n = 91$) or were living like married (11.2%, $n = 12$). Most participants lived in the United Kingdom, with 36% ($n = 55$), and the rest of the participants were equally distributed between Ireland (22.4%, $n = 34$), the United States of America (20.4%, $n = 31$) and other countries (21.1%, $n = 32$), including Australia (7.2%, $n = 11$), Canada (3.9%, $n = 6$) and South Africa (3.3%, $n = 5$).

Procedure

Participants were recruited through online parent support groups, forums, and social media sites from all over the world. First, participants were provided with an information sheet and a consent form and once consent was obtained, they were invited to fill out a battery of questionnaires in their own time.

The study sample comprised of 152 parents of children with a diagnosis of ASD in accordance with DSM-IV-TR criteria.⁴⁹ Diagnoses were provided by a licensed psychologist or pediatrician independent of the study. The participants received their diagnosis as a result of the formal diagnostic protocol which employs multiple diagnostic measures. Caregiver information on professional diagnosis, diagnostic setting/organization, and professional(s) who made the diagnosis was obtained.

Measures

Demographic Information

A self-constructed questionnaire provided information on child characteristics. Questions included the child's age, gender, whether they had an independent diagnosis of ASD, whether they had co-occurring disorders such as intellectual disability, epilepsy, migraines, anxiety, attention deficit/hyperactivity disorder, gastrointestinal symptoms or any other medical or psychological disorders. Participants were asked to provide information on their child's medication and what educational intervention their child is receiving, and how often. Further, participants were asked to select their country of residence.

Autism Spectrum Disorder-Comorbid for Children (ASD-CC)

The ASD-CC is a parent-report questionnaire, specifically designed for individuals with ASD, widely used in previous publications,^{6,9,10,13,15,50} constructed to assess co-occurring psychopathology and emotional difficulties associated with ASD.¹⁵ The 39-item scale includes questions focusing on conditions such as depression, AD/HD, conduct disorder, eating disorders/difficulties, obsessive compulsive disorder, tic disorders, and specific phobias. Caregivers rate all items based on how severely each statement affects their child at present. Items are analyzed in seven subscales, (1) Tantrum Behavior, (2) Repetitive Behavior, (3) Worry/Depressed, (4) Avoidant

Behavior, (5) Under-Eating, (6) Conduct and (7) Over-Eating, which were generated by factor analysis. The psychometric properties of ASD-CC are satisfactory, with acceptable inter-rater reliability ($\kappa = 0.46$) and test-retest reliability ($\kappa = 0.51$), and excellent internal consistency ($\alpha = 0.91$).

Social Communication Questionnaire (SCQ)

The SCQ is a 40-item parent-report screening tool based on the Autism Diagnostic Interview (ADI).⁵¹ The scale is designed to assess key ASD characteristics at the age of 4–5 years and currently, questions focus on social interaction, communication and repetitive behavior. Scores range from 0 to 39, where the higher the total score, the more likely the risk of ASD. The questionnaire is not an official diagnostic tool; however, it is widely used in research and for screening at risk populations. A cutoff score of 15 have been recommended for an increased likelihood for ASD. The SCQ has established very good internal consistency ($\alpha = 0.80$), as well as high test-retest reliability ($\kappa = 0.92$).⁵¹

World Health Organization Quality of Life Abbreviated Version (WHOQOL-BREF)

The WHOQOL-BREF is a 26-item questionnaire that is the short version of the 100-item World Health Organization Quality of Life scale.⁵² The WHOQOL-BREF is a self-report tool, that assesses subjective quality of life in four main areas of functioning; physical, psychological, social and environmental.⁵³ The questionnaire is widely used in medical and psychological research and has demonstrated good content validity as well as internal consistency ($\alpha = >0.7$) and test-retest reliability.⁵⁴

Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a short self-rating questionnaire measuring sleep quality and sleep disturbances over a one-month period.⁵⁵ The scale consists of seven subscales; sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction and has a total score between 0 and 21. There is good evidence from the literature in support of the PSQI's psychometric properties, with high internal consistency between the items ($\alpha = 0.83$) and good construct validity as well as high test-retest reliability ($r = 0.87$).^{55–57}

Parenting Stress Index-Short Form (PSI-SF)

The PSI-SF is a 36-item parent-report questionnaire assessing the magnitude of parental stress.⁵⁸ The scale has been developed as a short version of the 120-item original PSI for quick clinical screenings and research. The PSI-SF is divided into three subscales: Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child. The subscales include 12 items that parents rate from one (strongly disagree) to five (strongly agree). The higher total scores indicate greater levels of stress in the parent. The Total Stress scale demonstrated excellent internal consistency ($\alpha = .91$) and as well as stability over time.^{59,60}

Hospital Anxiety and Depression Scale (HADS)

The HADS is a self-assessment scale constructed to assess anxiety and depression in medical practice.⁶¹ It is a 14-item questionnaire that can be completed in 2–5 minutes. It contains two subscales with 7 items each, one focusing questions on anxiety and the

other one on depression. The scores range from 0 to 21 for each subscale, where the higher score indicates greater level of risk for the presence of anxiety or depression. The questionnaire is widely used in research and practice and has been validated in many different groups and languages. Its construct validity is good for both subscales and has good internal consistency ($\alpha = 0.9$).^{62–64}

Multidimensional Scale of Perceived Social Support (MSPSS)

The MSPSS is constructed to assess subjective social support with a 12-item questionnaire.⁶⁵ The scale is divided into three subscales, addressing support from Family, Friends and Significant Other. Items are rated from one to seven, where one indicates “Very Strongly Disagree” and seven “Very Strongly Agree.” The validity of the inventory has been demonstrated, as well as the three distinct subscales, with the items also showing excellent internal consistency ($\alpha = 0.88$).^{65,66}

Results

Analysis

Data were analyzed using SPSS version 25. Descriptive statistics were calculated for the all the scales in the study. A series of one-way between group multivariate analysis of variance (MANOVA) assessed the significance between the severity of comorbid psychopathology for parental well-being. Comorbid psychopathology was measured with the ASD-CC subscales, with groups of no/minimal-, moderate-, and severe impairment, where groups were based on cutoffs established by a previous study.⁶⁶ Parental well-being included QoL (WHOQOL-BREF), sleep problems (PSQI), stress (PSI-SF), anxiety (HADS), depression (HADS), and perceived social support (MSPSS).

Demographic Information for Children

Most children were male (78.9%, $n = 120$), with only 21.1% being female ($n = 32$). Age was reported for 148 children, with four cases missing. Average age was 9.64 years ($SD = 4.16$), with the age ranging from two to 18 years. All children scored above the cutoff of 15 points on the SCQ ($M = 56.25$, $SD = 6.02$), indicating high likelihood for the presence of ASD.

Current Comorbid Diagnosis

A summary of child comorbid disorders, including ID, epilepsy, psychological disorders, and GI symptoms are detailed in Table 1. The number of parents reporting at least one comorbid diagnosis for their child, including epilepsy, ID, anxiety, AD/HD, and other comorbid diagnosis specified by parents, was 117 (77.1%). This was reduced to 56.6% ($n = 86$) when ID was excluded. Table 1 provides further details into frequency rates of comorbid conditions, psychological disorders, and gastrointestinal symptoms.

Comorbid Psychopathology

All seven subscales of the ASD-CC measure behaviors associated with psychopathology, with cutoffs established by

Table 1. Current comorbid diagnosis of children.

Characteristic	<i>n</i>	%
Comorbid diagnosis		
Intellectual Disability	60	39.5
Migraines	16	10.5
Epilepsy	13	8.6
Psychological Disorder		
Attention-deficit/hyperactivity disorder (AD/HD)	44	28.9
Generalized Anxiety Disorder	16	10.5
Social anxiety disorder	5	3.3
Other anxiety disorders ^a	15	9.9
Gastrointestinal Symptoms		
Constipation	56	36.8
Abdominal pain	36	23.7
Diarrhea	25	16.4
Bloating	24	15.8
Nausea	21	13.8
Other GI Symptom	9	5.9
Currently on Medication	69	45.4
Currently on Melatonin	43	28.3

^aIncludes selective mutism, OCD, separation anxiety, posttraumatic stress disorder, and panic disorder

previous research.⁶⁷ The means and standard deviations of the ASD-CC subscales including the frequency and percentage of level of impairment of each subscale are presented in Table 2.

Comorbid Psychopathology and Parental Well-being

A summary of means and standard deviations are presented on Table 3 for parental well-being measures.

When comparing results to established cutoffs,⁶¹ 36.2% ($n = 55$) of participants reached abnormal levels of depression and 60.5% ($n = 92$) experienced abnormal levels of anxiety. Clinically significant levels of stress were present for 19.7% ($n = 30$) of participants, based on cutoffs established by previous research.⁶⁸ Sleep problems were present for 91.4% ($n = 139$) of parents, where a score of 5 or greater on the PSQI was considered a sleep problem. More than half of the parents reported overall “good” (48.0%, $n = 73$) or “very good” (10.5%, $n = 16$) QoL, while a smaller number of participants

Table 2. ASD-CC subscale means, standard deviations, level of impairment, and frequencies.

Factor	<i>M</i>	<i>SD</i>	Level of impairment	% (<i>n</i>)
Tantrum behaviors	10.59	4.57	No/Minimal impairment	52.1% (79)
			Moderate impairment	26.3% (40)
			Severe impairment	21.7% (33)
Repetitive behaviors	7.59	4.24	No/Minimal impairment	63.8% (97)
			Moderate impairment	20.4% (31)
			Severe impairment	15.8% (24)
Worry/Depressed	6.61	3.11	No/Minimal impairment	28.9% (44)
			Moderate impairment	45.4% (69)
			Severe impairment	25.7% (39)
Avoidant behaviors	7.25	3.14	No/Minimal impairment	42.1% (64)
			Moderate impairment	24.3% (37)
			Severe impairment	33.6% (15)
Under-eating	1.70	2.15	No/Minimal impairment	53.9% (82)
			Moderate impairment	30.3% (46)
			Severe impairment	15.8% (24)
Conduct behaviors	4.01	3.63	No/Minimal impairment	41.4% (63)
			Moderate impairment	21.7% (33)
			Severe impairment	36.8% (56)
Over-eating	2.00	2.04	No/Minimal impairment	63.2% (96)
			Moderate impairment	23.0% (35)
			Severe Impairment	13.8% (21)

Table 3. Means and standard deviations of parental well-being measures.

Scale	<i>M</i>	<i>SD</i>
WHOQOL-BREF		
Physical Health	59.11	22.01
Psychological	49.10	20.49
Social Relationships Environment	48.35	24.85
PSQI Total Score	59.38	18.79
Subjective Sleep Quality	10.11	3.85
Sleep Latency	1.64	0.83
Sleep Duration	2.26	0.85
Sleep Efficiency	1.39	0.88
Sleep Disturbance	1.36	1.24
Use of Sleep Medication	1.49	0.64
Daytime Dysfunction	0.55	1.07
PSI-SF Total Score	1.45	0.80
Defensive Responding	94.36	23.09
Parental Distress	17.48	6.19
Parent-Child Dysfunctional Interaction	31.01	10.14
Difficult Child	34.26	8.71
HADS	29.10	7.88
Depression	9.05	4.48
Anxiety	11.67	4.60
MSPSS	50.83	17.66

experienced “poor” (17.8%, $n = 27$) and “very poor” (1.3%, $n = 2$) QoL.

A series of one-way between group MANOVAs was run to assess the difference in the level of impairment of comorbid psychopathology for parental well-being. Six dependent variables were used measuring parental well-being, including QoL, sleep, stress, anxiety, depression and perceived social support. Independent variables associated with comorbid psychopathology were the seven subscales from ASD-CC; tantrum behavior, repetitive behavior, avoidant behavior, under-eating, conduct behaviors, and over-eating. Each variable had three groups based on the severity of impairment, with groups of no/minimal, moderate, and severe impairment.

Assumptions of MANOVA were checked prior to analysis, where no violation was noted for linearity, univariate and multivariate outliers, multicollinearity and homogeneity of variance-covariance matrices. Normality was violated in three dependent variables (social support, stress and QoL), where sample size is above 20 in each cell, ensuring robustness.⁶⁹ Levene’s test of equality of error variance was violated in three cases (tantrum behavior and QoL and avoidant behavior with social support and sleep), where following the recommendation⁷⁰⁷¹⁷²⁷³ a more conservative alpha level was set ($\alpha < 0.025$) to compensate for the lack of the equality of variance. Due to the violation of the above assumptions, Pillai’s Trace was reported in each case to ensure robustness.

Tantrum Behavior and Parental Well-being

A statistically significant difference was observed between groups of tantrum behavior with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 4.40$, $p < .001$; Pillai’s Trace = .308, partial eta squared = .15. When the test results were examined for the dependent variables separately, it was found that after using a Bonferroni adjusted alpha of 0.008 all variables, except for sleep and social support, had reached a statistically significant difference. Table 4 summarizes the difference in the group means and the results for all dependent variables.

A post-hoc analysis using Scheffe’s test indicated that after adjusting the alpha to 0.008 the mean scores for no/minimal tantrum behavior were significantly different from both the moderate- and the severe impairment means scores, for parental depression, anxiety, stress and QoL. Depression and anxiety were significantly higher with higher child symptom severity, while QoL and stress means had a declining tendency with the growing severity of child impairment. There was no significant difference observed between moderate and severe group’s mean scores in any of the dependent variables.

Repetitive Behavior and Parental Well-being

A statistically significant difference was observed between groups of repetitive behavior with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 1.78$, $p = .048$; Pillai’s Trace = .138, partial eta squared = .069. When the test results were examined for the dependent variables separately, it was found that after using a Bonferroni adjusted alpha of 0.008, a statistically significant difference was only found for parental stress, $F(2, 149) = 8.45$, $p < .001$; Pillai’s Trace = .138, partial eta squared = .102. Table 5 presents the results for all dependent variables.

A post-hoc analysis using Scheffe’s test indicated that after adjusting the alpha to 0.008 the mean score for stress for parents of a child with no/minimal repetitive behavior ($M=99.54$, $SD=23.25$) was significantly higher than the mean score from parents of those with moderate repetitive behavior ($M=81.45$, $SD=18.406$). There was no significant difference observed between no/minimal and severe ($M=90.13$, $SD=21.14$) and moderate and severe group’s mean scores in relation to parental stress.

Table 4. Difference between tantrum behavior severity for dependent variables.

Dependent variable	Tantrum severity	<i>M</i>	<i>F</i>	<i>p</i>	Partial eta squared
QoL (WHO-BREF)	No/minimal impairment	56.00	10.64	.000**	.125
	Moderate impairment	42.63			
	Severe impairment	40.42			
Stress (PSI-SF Total)	No/minimal impairment	106.06	29.25	.000**	.282
	Moderate impairment	83.05			
	Severe impairment	80.06			
Anxiety (HADS)	No/minimal impairment	10.09	11.43	.000**	.133
	Moderate impairment	13.02			
	Severe impairment	13.82			
Depression (HADS)	No/minimal impairment	7.48	11.82	.000**	.137
	Moderate impairment	10.38			
	Severe impairment	11.18			
Social support (MSPSS)	No/minimal impairment	55.51	6.25	.002	.077
	Moderate impairment	46.50			
	Severe impairment	44.88			
Sleep (PSQI)	No/minimal impairment	9.28	4.635	.011	.059
	Moderate impairment	10.58			
	Severe impairment	11.55			

** $p < .001$

Table 5. Difference between repetitive behavior severity for dependent variables.

Dependent variable	Repetitive behavior severity	<i>M</i>	<i>F</i>	<i>p</i>	Partial eta squared
QoL (WHO-BREF)	Psychological	No/			minimal impairment
51.47	2.638	.075			
	Moderate impairment	41.87			
	Severe impairment	48.83			
Stress (PSI-SF Total)	No/minimal impairment	99.54	8.45	.000**	.102
	Moderate impairment	81.45			
	Severe impairment	90.13			
Anxiety (HADS)	No/minimal impairment	10.88	4.229	.016	.054
	Moderate impairment	13.23			
	Severe impairment	12.88			
Depression (HADS)	No/minimal impairment	8.27	4.318	.015	.055
	Moderate impairment	10.65			
	Severe impairment	10.13			
Social support (MSPSS)	No/minimal impairment	51.95	.539	.585	.007
	Moderate impairment	48.68			
	Severe impairment	49.08			
Sleep (PSQI)	No/minimal impairment	9.67	1.862	.159	.024
	Moderate impairment	10.71			
	Severe impairment	11.13			

***p* < .001

Worry/depressed and Parental Well-being

A statistically significant difference was observed between groups of worry/depressed with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 3.74$, $p < .001$; Pillai's Trace = .268, partial eta squared = .134. When the test results were examined for the dependent variables separately, it was found that after using a Bonferroni adjusted alpha of 0.008 all variables, except for parental sleep, had reached statistical significance. Table 6 presents group means and results for all dependent variables.

A post-hoc analysis using Scheffe's test indicated that after adjusting the alpha to 0.008 the mean scores for no/minimal worry/depressed behavior were significantly lower, than the mean scores of moderate impairment in the case of anxiety and depression. Furthermore, mean scores for parental QoL, stress and social support with a child with no/minimal worry/depressed behavior were significantly higher, than the mean score of moderate impairment. In addition, there was a significant difference between the mean scores of no/minimal and severe impairment in the case of QoL, stress, anxiety and depression, with higher levels of anxiety and depression, and lower levels of QoL and stress associated with more severe child symptoms. There was no significant difference observed between moderate and severe group's mean scores for any dependent variables.

Avoidant Behavior and Parental Well-being

A statistically significant difference was observed between groups of avoidant behavior with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 3.07$, $p < .001$; Pillai's Trace = .225, partial eta squared = .113. When the test results were examined for the dependent variables separately, it was found that after using a Bonferroni adjusted alpha of 0.008 all variables, except for

Table 6. Difference between worry/depressed severity for dependent variables.

Dependent variable	Worry/depressed severity	<i>M</i>	<i>F</i>	<i>p</i>	Partial eta squared
QoL (WHO-BREF)	Psychological	No/			minimal impairment
60.46	11.20	.000**			
	Moderate impairment	45.73			
	Severe impairment	42.26			
Stress (PSI-SF Total)	No/minimal impairment	110.11	18.38	.000**	.198
	Moderate impairment	86.23			
	Severe impairment	90.97			
Anxiety (HADS)	No/minimal impairment	9.48	7.95	.001**	.096
	Moderate impairment	12.35			
	Severe impairment	12.95			
Depression (HADS)	No/minimal impairment	6.70	9.45	.000**	.112
	Moderate impairment	9.96			
	Severe impairment	10.08			
Social support (MSPSS)	No/minimal impairment	57.32	6.109	.003*	.076
	Moderate impairment	45.94			
	Severe impairment	52.15			
Sleep (PSQI)	No/minimal impairment	9.09	2.251	.109	.029
	Moderate impairment	10.45			
	Severe impairment	10.67			

p* < .008, *p* < .001

perceived social support, had reached statistical significance. Table 7 presents group means and the results for all dependent variables.

A post-hoc analysis using Scheffe's test indicated that after adjusting the alpha to 0.008 the mean scores for no/minimal avoidant behavior were significantly lower from the mean

Table 7. Difference between avoidant behavior severity for dependent variables.

Dependent variable	Avoidant behavior severity	<i>M</i>	<i>F</i>	<i>p</i>	Partial eta squared
QoL (WHO-BREF)	Psychological	No/			minimal impairment
55.20	6.24	.002**			
	Moderate impairment	41.16			
	Severe impairment	47.20			
Stress (PSI-SF Total)	No/minimal impairment	104.42	12.63	.000**	.139
	Moderate impairment	86.41			
	Severe impairment	87.51			
Anxiety (HADS)	No/minimal impairment	10.34	5.24	.006**	.066
	Moderate impairment	12.16			
	Severe impairment	12.98			
Depression (HADS)	No/minimal impairment	7.50	7.15	.001**	.088
	Moderate impairment	10.30			
	Severe impairment	10.08			
Social support (MSPSS)	No/minimal impairment	52.47	.847	.431	.011
	Moderate impairment	47.73			
	Severe impairment	51.02			
Sleep (PSQI)	No/minimal impairment	9.11	5.07	.007**	.064
	Moderate impairment	10.14			
	Severe impairment	11.35			

***p* < .001

scores of moderate impairment in the case of depression, and significantly higher in the case of QoL and stress. There was a significant difference between the mean scores of no/minimal and severe impairment in the case of stress, anxiety, depression and sleep, where higher child symptom severity was associated with higher depression, anxiety and sleep problems, and lower stress. There was no significant difference observed between moderate and severe group's mean scores for any dependent variables.

Under-eating and Parental Well-being

There was no statistically significant difference observed between groups of under-eating with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 1.18$, $p = .298$; Pillai's Trace = .098, partial eta squared = .047.

Conduct Behavior and Parental Well-being

A statistically significant difference was observed between groups of conduct behavior with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = 3.34$, $p < .001$; Pillai's Trace = .243, partial eta squared = .121. When the test results were examined for the dependent variables separately, it was found that after using a Bonferroni adjusted alpha of 0.008, only parental stress $F(2, 149) = 11.31$, $p < .001$, partial eta squared = .132 had reached statistical significance. Table 8 presents group means and results for all the dependent variables.

A post-hoc analysis using Scheffe's test indicated that after adjusting the alpha to 0.008 the mean score for no/minimal conduct behavior ($M = 104.22$, $SD = 23.65$) was significantly higher, than the mean score of moderate impairment ($M = 89.06$, $SD = 19.71$) in the case of parental stress. There was also a significant difference between the mean scores of no/minimal and severe impairment ($M = 86.39$, $SD = 20.34$) for stress, where higher stress was associated with lower conduct severity. There was no significant difference observed between moderate and severe groups.

Over-eating and Parental Well-being

There was no statistically significant difference observed between groups of over-eating with no/minimal, moderate and severe impairment and variables of parental well-being, $F(12, 290) = .924$, $p = .523$; Pillai's Trace = .074, partial eta squared = .037.

Discussion

The current study was the first to explore the relationship between parental well-being and comorbid psychopathology in children with ASD using the ASD-CC. In summary, it was found that the parental well-being measures of anxiety, depression and QoL in particular were elevated with more severe comorbid psychopathology of their child. Parents reported high levels of sleep problems, with 91.4% of parents experiencing poor sleep and 60.5% reported abnormal levels of anxiety. Stress and depression were also frequently reported in this sample. Findings showed that the level of parental well-being was shown to be significantly lower based on the severity of

Table 8. Difference between conduct severity for dependent variables.

Dependent variable	Conduct severity	<i>M</i>	<i>F</i>	<i>p</i>	Partial eta squared
QoL (WHO-BREF Psychological)	No/minimal impairment	53.83	3.129	.047	.040
	Moderate impairment	47.46			
	Severe impairment	44.75			
Stress (PSI-SF Total)	No/minimal impairment	104.22	11.31	.000**	.132
	Moderate impairment	89.06			
	Severe impairment	86.39			
Anxiety (HADS)	No/minimal impairment	10.87	4.93	.008	.062
	Moderate impairment	10.67			
	Severe impairment	13.16			
Depression (HADS)	No/minimal impairment	8.33	1.777	.173	.023
	Moderate impairment	9.00			
	Severe impairment	9.88			
Social support (MSPSS)	No/minimal impairment	55.06	3.182	.044	.041
	Moderate impairment	47.79			
	Severe impairment	47.86			
Sleep (PSQI)	No/minimal impairment	10.25	.744	.477	.010
	Moderate impairment	9.39			
	Severe impairment	10.38			

** $p < .001$

child psychopathology, with poorer mental health outcomes related to higher impairment of the child in the majority of cases, with parental stress being an exception to this.

Results showed that the overall QoL of this study sample was good, but a small group of parents experienced "poor" and "very poor" QoL, according to their report. In relation to child comorbid psychopathology, QoL was significantly lower for parents of a child with moderate and severe impairment of both tantrum and worry/depressed behavior, compared to groups with no/minimal impairment. In both the case of tantrum and worry/depressed behavior a large effect size was observed, with tantrum behaviors explaining 12.5% and worry/depressed behaviors explaining 13.1% of the variance of parental QoL. In addition, parents of children with moderate avoidant behavior had significantly lower QoL than those with no/minimal impairment. These findings are important, as they show that child behavioral difficulties are associated to poorer parental QoL, similarly to what has been reported in the previous literature.^{21,27,28}

Sleep problems have been present in 91.4% of participants in the study sample. In relation to child variables, parental sleep problems have only been shown to be significantly higher for parents of a child with severe levels of avoidant behaviors, compared to no/minimal avoidant behavior, and no significant difference was found for other comorbid psychopathology. Although more severe avoidant behavior of the child was

associated with greater parental sleep problems, the difference may have little meaning from a clinical perspective, as the difference in actual raw score for the PSQI was 2 points, and parents met the cut off for sleep problems regardless of their child's psychopathology. This is in line with existing literature, where parents of children with ASD reported poor sleep quality.^{29,31} The findings of this study do support the evidence that parents of those with an ASD diagnosis experience sleep problems, but there was no difference of sleep problem observed, based on severity of comorbid psychopathology.

Nearly 1 in 5 or 19.7% of participants experienced clinically significant levels of stress. Results from the current study also showed that parental stress was significantly higher with lower levels of comorbid psychopathology of the child. This was evident in the case of tantrum, repetitive, and avoidant behaviors, worry/depressed, and conduct behaviors, measured by the ASD-CC. The effect sizes observed were large, where tantrum behavior, for instance, accounted for 28.2% of the variance of stress in this sample. This is the very contrary to what the abundance of evidence from the literature suggests, where higher levels of stress were associated with more problem behavior and worst symptom severity.^{26,38-40} There are several possible explanations for the results above. First, social support has a well-noted stress buffering effect,^{35,48} where evidence suggests that the higher the behavioral difficulty of the child, the more parents are triggered to seek social support.⁴⁶ It is possible that the difference between the levels of stress experience by parents in this study is mediated by social support. Most of the sample (71.1%) reported to being married, or living like married and only 9.2% divorced, which is similar to what previous research³⁸ have reported of their samples. It is unlikely therefore that social support from significant others may be mediating the results observed in this study. Social support derived from friends was found to be the most important protective factor against stress,⁴⁸ it may be therefore, that parents of children with higher levels of comorbid psychopathology sought more support, particularly from their friends, and were therefore less stressed, than those with children with lower levels of impairment.

Alternatively, it is also possible that parents experiencing chronically high levels of stress due to their child's behavioral difficulties did not have an interest or had no time to take part in the study, creating a sampling bias. Previous research³⁸ provided gift vouchers for their participants, incentivizing participation while other research²⁶ conducted face-to-face interviews with parents. It is possible that questionnaire-based research like the current study involved, is challenging for parents with high levels of stress to take part in, and incentives, such as a gift voucher or a face-to-face interview create more motivation for taking part. Further research of the underlying reason of these finding is necessary, with investigation needed for other potential confounding variables, including socioeconomic status and level of parental education.

Results showed that 60.5% of parents reached an abnormal level of anxiety and 36.2% experienced abnormal levels of depression. In relation to child comorbid psychopathology, parental anxiety and depression have been shown to be significantly higher with higher tantrum-, worry/depressed- and avoidant behaviors of the child. When no/minimal tantrum

behaviors were reported, the mean scores of parental anxiety and depression were in the normal range. Both depression and anxiety scores however met the established cutoff⁶⁵ for clinically abnormal levels when children experienced severe tantrum behavior. Similar findings were observed for avoidant behavior as well, establishing a tendency, where higher behavioral challenges are associated with poorer parental well-being. This tendency supports findings from previous research.^{42,43} However, the current study adds important details regarding the extent to which parental well-being is affected, with results showing that parents experience abnormal levels of mental health problems with severe behavioral difficulties of the child, while no impairment of the child is associated with normal levels of anxiety and depression. These findings are especially important as more than half of parents reported abnormal levels of anxiety and 48.0% of children experienced moderate or severe tantrum behaviors.

Findings of this study revealed similar scores for perceived social support for parents to that of previous research.⁴⁵ In relation to child characteristics, parent's levels of perceived social support was only significantly different based on the severity of worry/depressed behavior of their children. In particular, the difference was observed only between parents of a child with no/minimal impairment and moderate impairment, with higher support perceived with lower impairment of the child. Parents in the current study didn't perceive significantly higher levels of social support, with more severe impairment of the child, in contrary to what previous research findings suggest.^{46,48} Previous research reported that actual social support received by parents is negatively correlated with perceived levels of stress,⁴⁶ whereas the current study has measured perceived social support. A recent study has concluded the opposite, that while received social support does not have a stress-buffering effect, according to their findings perceived social support does.⁴⁷ It is possible, that in the current study parents experiencing higher levels of behavioral difficulties with their child did reach out more to seek more support, which did protect them against higher levels of stress. But it may be that although they did receive higher level of support, their perception of the level of support received did not change significantly enough to show it in the findings. More research is needed in the future to understand the relationship between received and perceived social support and their protective properties against stress and other aspects of parental well-being. Further research is needed to understand what factors influence whether parents reach out for support and how it is related to their mental health issues.

The current study has several limitations that are important to acknowledge. First, convenience sampling may have led to sampling bias, affecting the participation of parents experiencing high levels of stress due to their child's challenging behavior. Second, the findings may be stronger if the self-report measures would have been accompanied by objective measure, such as biomarkers for stress or assessment of psychopathologies by clinicians. Third, the cross-sectional nature of the study limited the extent to which causal relationships can be deduced. It can only be hypothesized that higher levels of behavioral challenges of the child caused higher parental depression and anxiety, rather than the

other way around, but the current study does not provide evidence for the direction of this relationship. Further, participants may have come from a higher income level, as they had access to the internet, which may have impacted upon the level of support they had access to. In addition to the limitations mentioned above, it is important to highlight that repetitive behavior (measured as a comorbidity by the ASD-CC in this study) is a defining characteristic when diagnosing ASD. Due to this, it may be more accurate to refer to the results related to the repetitive subscale of the ASD-CC not as comorbidity but rather as an ASD trait, the severity of which may have an association with parental well-being. Another limitation of the current study is that results are not reported for different age groups of children separately as the sample size was insufficiently large for stratification by grouping. This study could also be further improved by collecting data on children's sleep problems and investigating its relationship to their parent's sleep problem.

Future research could replicate the study using a control group, with parents of typically developing children, to enhance the robustness of the findings. A longitudinal design would also make the results stronger. Future research could also have additional questions on current and past parental mental health diagnosis, as well as asking about ASD diagnosis of the parents. This information would be useful in deciding about the origin of high levels of anxiety and depression shown in the results. Research in the future could collect more demographic information from parents, including their level of income, and offer paper-based surveys to facilitate participation from all income levels. Future research could also collect information on what medication children are taking and their dosage, to have a better understanding of the study sample and the use of medication in relation to parental measures.

In conclusion, the current study investigated the relationship between parental well-being and comorbid psychopathology in children with ASD. Findings from the study showed that high levels of comorbid psychopathology were present for children, and parents reported poor mental health in general, with high numbers reporting abnormal levels of anxiety and depression. Results also showed that parental well-being measures of anxiety and depression in particular, were significantly higher with more severe impairment of the child. In addition, QoL of parents was significantly lower with more severe comorbid psychopathology of the child. These findings highlight the importance of screening for co-occurring psychological conditions in children with ASD, not only to avoid diagnostic overshadowing and provide better treatment for children, but to potentially protect parent's and caregiver's psychological well-being as well. More research is needed in the future to continue investigating the relationship between comorbid psychopathology in children with ASD and parental well-being.

Compliance With Ethical Standards

Conflict of Interest: All the authors of this article declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of

National University of Ireland Galway and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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