

## Brain Structural Abnormalities: Psychiatric Comorbidity in Autism spectrum disorders

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### Abstract

Autism spectrum disorders are a group of neurodevelopmental disorders that are characterized by impaired social interaction and communication skills, and are often accompanied by other behavioral symptoms such as repetitive or stereotyped behavior and abnormal sensory processing. Individual symptoms and cognitive functioning vary across the autism spectrum disorders.

Little is known about the associated psychiatric disorders that may contribute to impairment. We identify the rates and type of psychiatric comorbidity associated with ASDs and explore the associations with variables identified as risk factors for child psychiatric disorders.

### Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by social communication difficulties and restricted and repetitive behaviours among strengths in varied domains. ASD is highly prevalent but there is considerable heterogeneity in its aetiology, clinical presentation and underlying brain connectivity. Consequently, a variety of behavioural and psychosocial treatments are sought by families. However, there is little consensus on which treatments are most effective. Thus, a diagnosis of ASD is associated with substantial costs to the individual, the family and the community.

ASD is a lifelong condition with a median age of diagnosis >4 years, although most current intervention strategies target children <6 years to promote early behavioural change. Individuals with ASD and their families face significant challenges during developmental transitions. School-age children in particular often remain unengaged in social settings, reducing opportunities for socio-communicative development. This has led to investigations of alternate and creative means of expression such as music that might improve social communication, increasing prospects for meaningful relationships. Furthermore, cross-culturally applicable music-based interventions hold potential for scalability at home, school and global community settings.

Previous randomized controlled trials (RCTs) of music interventions for ASD have reported positive effects of music on emotional engagement, social interaction, and communication and parent-child relationships, suggesting that musical activities in a therapeutic context can promote measurable behavioural changes in children with ASD. Strengths in music processing have been noted since the first description of ASD and many studies have reported intact or enhanced musical skills such as absolute pitch, enhanced melodic memory and contour-processing in children with ASD. Greater brain responses to song versus speech in fronto-temporal brain regions and intact emotional responsiveness to music have also been demonstrated. Supporting anecdotal reports from parents and caregivers have described the profound effects music has had on children with ASD.

### Behavioural outcomes

Primary behavioural outcomes included a social communication battery consisting of the CCC-2 to measure pragmatic communication, SRS-II to measure symptom severity and PPVT-4 to measure receptive vocabulary. Secondary outcomes were FQoL and the maladaptive behaviours subdomain of the VABS. Outcomes were selected to provide both direct and parent-reported evaluations of treatment-related change using measures that have good psychometric properties, limited practice effects and applicability to a wide range of individuals and were collected at baseline and post-intervention for  $n = 50$  participants.

### Statistical analysis

Behavioural outcomes were analysed by fitting linear mixed-effects models (LMEMs) with restriction maximum-likelihood estimation to cope with missing data, inhomogeneity of dependent-variable-variance across factor levels and unequal group size. LMEMs with treatment group (MT, NM), timepoint (baseline, post-intervention) and their interaction as well as participant intercept as random effect were estimated for all primary and secondary behavioural outcomes. Prior to analysis, data were checked for normality. A group×timepoint interaction indicating a change in MT vs. NM post-intervention at  $P < .016$  (Bonferroni-corrected from alpha-level of  $P = .05$  to account for three primary behavioural outcomes) was considered significant. Clinical significance was limited to changes from baseline to post-intervention within MT or significant difference between MT and NM post-intervention as confirmed by post hoc Tukey tests at alpha-level of  $P = .05$ . An intention-to-treat analysis was carried out, whereby missing data from any drop-out participants was replaced with data at baseline. Both unstandardized (beta-coefficients and mean difference) scores and standardized effect sizes (standardized mean difference, Cohen's  $d$ ) are reported since standardized effect sizes are often influenced by study design and complexity of models used.

### Discussion

Evidence-based behavioural and psychosocial interventions for school-age children have received limited attention. Neuroscience-informed support for such interventions offers the opportunity to integrate brain development with behavioural approaches, allowing development of individualized treatment paradigms.



## Conclusion

ASDs are a group of disorders characterized by impairments in three domains, namely communication, reciprocal social interaction and behaviors that are restricted and repetitive in nature. Physicians play a crucial role in the early identification of children with these disorders since they are the first point of contact and the starting point for referral to appropriate centers for further evaluation and management. These disorders are increasing in prevalence, so that physicians are more likely to encounter them during their practice. Therefore, physicians need to be aware of the variable presentation of these disorders in order to identify affected children early and refer them appropriately to specialized centers for evaluation, counseling and intervention. Furthermore, physicians need to feel comfortable in dealing with public concerns regarding controversial issues about the etiology and management of these disorders.

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