**The Role of Attentional Mechanisms in Shaping Verbal and Nonverbal Communication in Boys with ASD**

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***Purpose***

Successful interaction depends on both verbal and non-verbal cues, which require shared attention between speakers to effectively convey and decode information. Because of this, effective communication relies on three core pillars: robust language skills, sharp attentional focus, and well-developed social abilities. Rather than operating in isolation, the neural networks responsible for language, attention, and social processing must work together in a balanced, integrated manner to ensure seamless communication (Smith et al., 2014). For individuals with Autism Spectrum Disorder (ASD), who regularly encounter barriers in verbal and non-verbal social exchanges, we expect to find structural or functional differences in these specific brain networks. Ultimately, we hypothesize that these underlying neural variations are directly linked to the communication difficulties observed in the autistic population.

***Methods***

This project explored functional connectivity configurations across the Default Mode Network (DMN), Salience Network (SN), Dorsal Attention Network (DAN), and Language Network (LN) in a cohort of male children with ASD. Utilizing resting-state fMRI data derived from the Autism Brain Imaging Data Exchange II dataset (Di Martino et al., 2014), the researchers employed Principal Component Analysis (PCA) to delineate sample-specific regions of interest. The analyzed sample consisted of 53 males diagnosed with ASD and 27 typically developing control subjects, all aged between 5 and 12 years. To assess both verbal and nonverbal communication domains, the study selected specific subsamples characterized by corresponding subscale data from the Autism Diagnostic Interview-Revised (ADI-R; Lord et al., 1994). While group-level comparisons were executed using a General Linear Model (GLM; Nieto-Castanon, 2020), evaluating the specific network-communication interactions within the ASD cohort involved constructing independent GLMs for each unique connection. These models utilized the specific contrasts of [ASD (0); Age (0); non- and verbal ADI-R(1)], and all reported p-values underwent strict FDR correction.

***Results***

Group comparisons indicate that the ASD group exhibits underconnectivity between the SN and LN ($p=0.003$, beta=-0.49); ($p=0.04$, beta=-0.38) and overconnectivity between the DMN and LN ($p=0.003$, beta=0.5); ($p=0.02$, beta=0.4), with findings remaining significant after controlling for IQ. Furthermore, verbal ($p=0.016$, beta=-0.45); ($p=0.02$, beta=-0.46) and nonverbal ($p=0.03$; beta=-0.42) communication impairments in ASD are associated with reduced connectivity within and between the DAN and SN rather than the LN.

***Conclusion***

Because the cross-group evaluations demonstrated hyperconnectivity between the LN and DMN in male individuals with ASD, this study reinforces previous evidence regarding a breakdown in network segregation. This reduced differentiation indicates that the language apparatus is less distinct from the mentalizing network in pediatric ASD populations (Zhao et al., 2016; Gao et al., 2019). Additionally, data revealed that verbal communication capacities were predicted by reduced connectivity both internally within the DAN and along the path between the DAN and SN, whereas nonverbal communication deficits correlated exclusively with hypoconnectivity isolated within the DAN itself. Keeping in mind that the SN facilitates the shifting of focus while the DAN coordinates sustained concentration on highly salient external variables (Brissenden et al., 2016), a specific model is proposed. It is assumed that if nonverbal communication deficits are driven by faulty sustained attention - which hampers the ability to pinpoint and decode social signals - then verbal communication barriers might be caused by an atypical integration of both sustained and shifting attention networks during active message transmission and decoding. Taken together, these insights demonstrate that communication challenges in ASD are primarily rooted in an attentional framework involving disrupted sustained and switching operations, rather than stemming from autonomous anomalies within the language network. These outcomes highlight that analyzing the cooperative dynamics of attentional and social brain networks is essential for uncovering the underlying neural mechanisms of communication impairments in ASD.

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