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What are the neural mechanisms underlying reduced eye contact and social interaction difficulties in ASD during live social interactions?

Abstract:

At its core, reduced eye contact fundamentally originates from sluggishness in brain activity. In fact, a study conducted in 2022 discovered that during eye contact with individuals who have ASD , the dorsal parietal cortex of the brain is extremely less active than in neurotypical individuals . This is important not only to identify individuals with ASD but also to contribute to poor social relationships, leading to resultant outcomes such as discrimination and isolation from social events. Therefore, this paper will focus on making an in-depth inquiry on the current knowledge and methodology used in studying the neural mechanisms that underlie atypical eye contact. We will examine current research papers and literature on the neural bases of processing eye gaze while highlighting some of the limitations of traditional neuroimaging approaches. Therefore, we will outline the potential solutions to combating these kinds of symptoms, such as Applied Behavior Analysis(ABA) or Cognitive Behavioral Therapy(CBT) and improving social functioning for individuals with ASD.

Introduction

Autism spectrum disorder is a chronic neurodevelopmental illness defined by “sustained deficits in social communication and social interaction” as well as “limited, repeated behavior patterns, interests, or activities”. The most characteristic feature of the disorder is people's reduced use of eye contact in non-convergent social scenarios. This decrease is a primary source of social deficit for the people with diminished visual direction who are even identified as “a quintessential very early and highly certain autism-related atypicality” Individuals with ASD are much less likely to look to the eye and typically choose the mouth area of the face while children with ASD smile non-genuine behind maximal eye gazes. ASD contrasts in eye gaze and regulation is strongly linked to social cognition, emotional complexity, and shared consideration difficulties.

It is not an understatement to state that those with ASD also enters a social outcast scenario. The inability to follow through with casual conversations in which eye contact is key in that a message can clearly get across, can force individuals with ASD outside of social groups. This not only affects one’s self-confidence and esteem about themselves but also limits them from working in corporate environments or teamwork-related activities as a normal conversation can turn out to be much more difficult than expected. This following paper will thus outline the current limitations of neuroimaging methods, how are autistic individuals shown as social outcasts in contemporary society, and what current therapy methods are present

Literature Review

2.1 Current Issue regarding ASD

Autism Spectrum Disorder (ASD) represents one of the most challenging and intriguing frontiers in research(Elysa Jill Marco et al., 2011). Characterized by a complex array of cognitive, behavioral, and social

implications, ASD profoundly affects individuals and their families across many demographics, and thus became a universal condition that applies and can apply to anyone. (Joachim Hallmayer et al., 2011).

Autism, originating from the Greek word 'autos', meaning 'self', aptly reflects the social isolation often seen in individuals with this condition; in the field of psychology and neuroscience, it refers to a complex neurodevelopmental condition which the Diagnostics and Statistics Manual (DSM) describes as a range of conditions characterized by challenges in social interaction, communication, and restricted or repetitive behaviors and interests. (American Psychiatric Association, 2013) The word 'autism' originates from the Greek word 'autos,' meaning 'self,' which reflects the social isolation often observed in individuals with this condition. Autism is part of a broader spectrum–Autism Spectrum Disorder (ASD), meaning that it encompasses a range of symptoms and abilities, varying significantly from person to person.(Uddin, 2011)

In the realm of familial and social dynamics, ASD significantly influences and reshapes relationships and community interactions. Individuals with ASD may experience difficulties in understanding and responding to social cues, which can challenge their ability to form and maintain relationships. For families, this can mean navigating unique communication styles, behaviors, and needs. Contemporary methods that many families have ranged from helpful self talk, family activities, or even just relaxation exercises. Through their efforts and current support networks of service systems, families have utilized ways to not feel stressed themselves while caring for their child. Communities may also need to adapt to be more inclusive and supportive of individuals with ASD, recognizing their unique contributions while providing the necessary accommodations for their participation in social and communal activities.
(Smith, Greenberg and Mailick, 2014 +2X)

The provision and evolution of early diagnostic markers are critical for effective interventions; specifically, early diagnostics allow for certain insights into the child's developmental trajectory and tailored interventions that cater to the unique needs of the child. For instance, the genetic variations associated with neural developmental disorders like ASD serves as a great example for such markers. Current standards in clinical practices involve a combination of behavioral assessments, developmental screenings, and diagnostic tools like the Autism Diagnostic Observation Schedule(ADOS) and the Autism Diagnostic Interview-Revised(ADI-R) to understand the severity of a child's condition. Additionally, advancements in neuroimaging techniques techniques such as functional magnetic resonance imaging(fMRI) and electroencephalography(EEG) provide further insights into the basis of ASD, which aids in in identifying structural and functional differences in the brain(Allen et al., 2015; + 2X).

Learning about how ASD can manifest in their prenatal years is integral to the current research, which seeks to understand the diversity in cognitive, behavioural, and social aspects among children and adolescents with ASD(Mahajan, R., & Mostofsky, S. H. (2015).

2.2 Current Limitations of NeuroImaging methods

Neuroimaging methods are pivotal towards helping doctors and medical professionals comprehend what the brain is

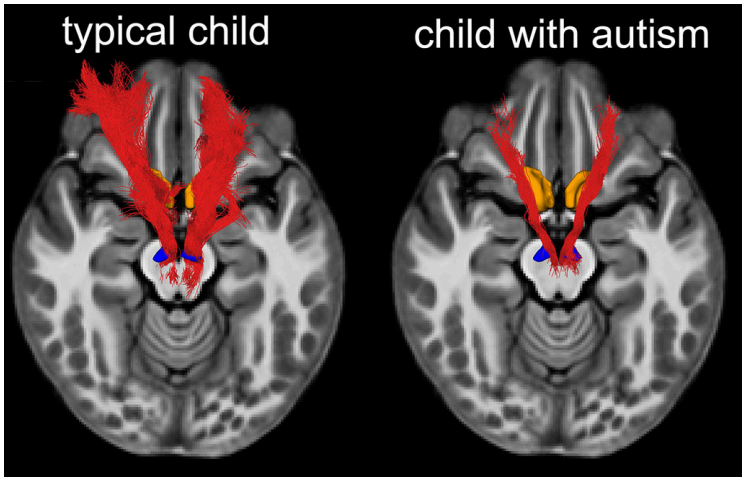

Figure 1. MRI scans reveal that kids with autism contain deficits in a brain pathway that makes social interactions feel rewarding. (Digitale)

currently going through, especially for ASD patients, it has been a huge step towards finding a cure for autism or yet, better medication or solutions rather than therapy. This called for a study from Stanford in which researchers collected MRI scans of 40 children with autism and 40 children without autism. They thus examined the intricate brain wirings in 24 children with autism and 24 children without autism and the functional connections of those children. The result was that the density of nerve-fibre tracts in the mesolimbic reward pathway was significantly lower in children with autism than those without autism, summing up that lower density of nerve-fibre tracts was linked to greater social impairments on a clinical evaluation of their social skills.

Many studies are limited in their ability in determining the patient's approach towards real-world social interactions. Conventional neuroimaging methods, such as fMRI, constrain head movement and do not allow for the simultaneous measurement of brain activity in two interacting individuals. This limitation has led to a growing interest in using two-person neuroimaging paradigms to study the nature and perspective of social interactions for individuals with ASD.

Conclusion

In conclusion, reduced eye contact is a core symptom of ASD that significantly contributes to social communication difficulties. Often becoming the reason for societal stigma towards individuals with ASD, while existing research has provided valuable insights into the neural correlates of eye gaze processing in ASD, conventional neuroimaging methods are limited in their ability to determine real-life interactions.

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