Gaze Sensitive Theta Oscillations in Young Autistic Children

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Background

The neural mechanisms underlying atypical eye contact in autism remain unclear. EEG is commonly used to explore these mechanisms, with N170 component being one of the most reported findings. However, obtaining ERP components from young autistic children with high support needs is challenging due to the high number of stimulus repetitions required, leaving this age group underrepresented. A suitable alternative is the exploration of oscillatory rhythms. Theta oscillations (4–8 Hz) have been linked to enhanced attention to social stimuli and emotional arousal in both infants and adults, and to the N170 response to gaze stimuli in adults. Studying theta activity in response to gaze stimuli in young minimally verbal autistic children at electrodes associated with the N170 component could provide insights into neural mechanisms underlying gaze processing in autism.

Aims

- To explore variations in theta rhythm in response to dynamic gaze shifts at P7 and P8 in minimally verbal autistic (AU), intellectually disabled (ID), and typically developing (TD) 4–8-year-old children.

Methods

This study included data collected from 33 children (AU: *n* = 11, mean age = 6.38±1.03 years; TD: *n* = 15, mean age = 6.26±0.97 years; ID: *n* = 7, mean age = 6.6±0.6 years). EEG signals and videos were recorded while each child was exposed to dynamic gaze-shift trials (Figure 1). Theta power variations over time were obtained through time-frequency decomposition and baseline normalized (dB). Statistical analyses compared responses to conditions within each group using a linear mixed-effects model.

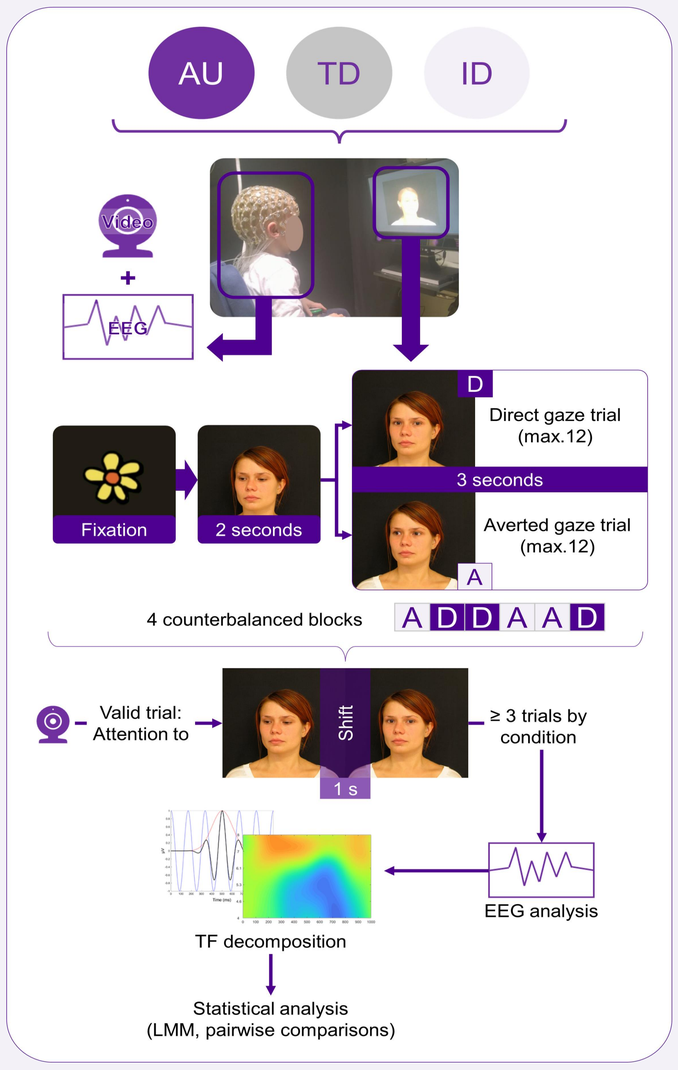

Fig 1. Graphical representation of experimental procedures and data analysis.

Results

Different patterns of activity were observed between groups. Significantly **higher theta power** was observed for **direct** compared to averted gaze at **P8 in TD** (50-225 ms, $p<0.01$) and **P7 in AU** (50-175 ms, $p<0.01$), while increased power **for averted gaze** was observed at **P8 in AU** (25-275 ms, $p<0.01$) and **both electrodes** of interest in **ID** (P7: 375-425 ms, $p<0.01$; P8: 50-500 ms, $p<0.01$).

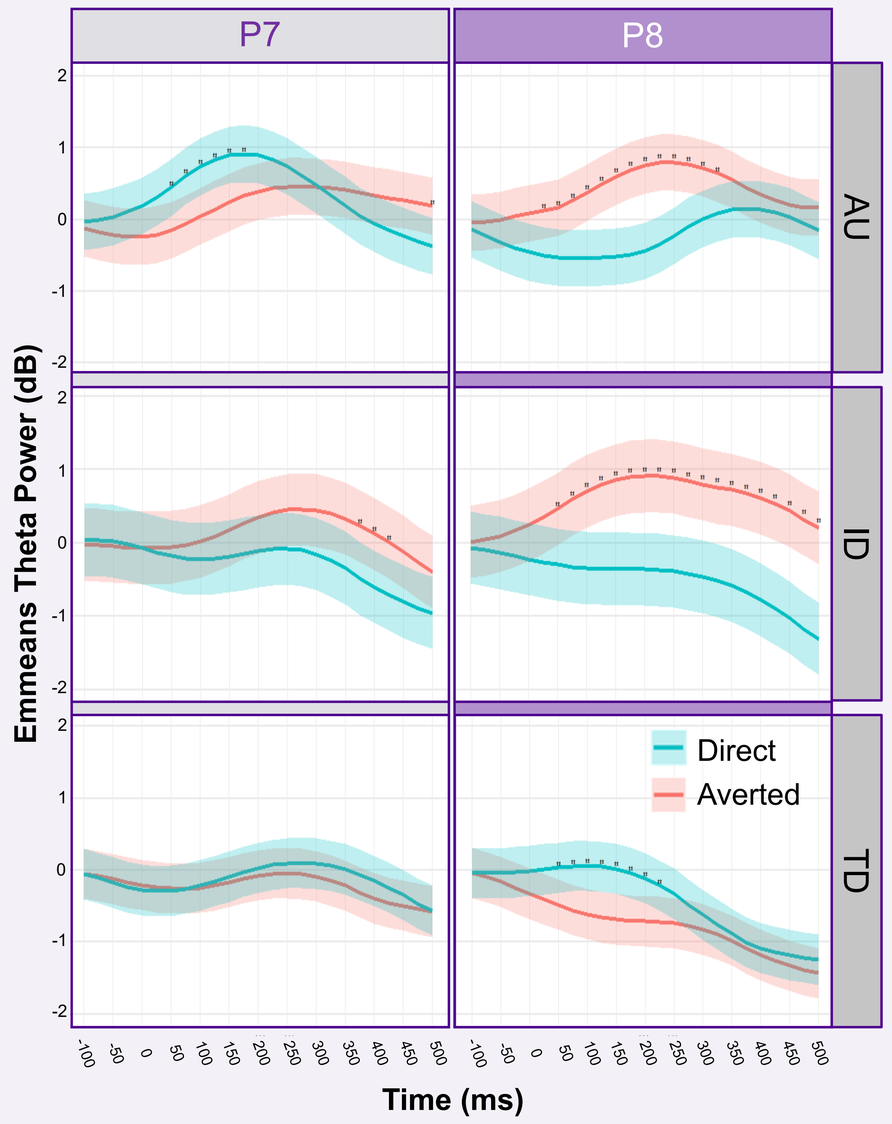

Fig 2. Variations in mean theta power (dB) across time for direct and averted gaze. ** $p < 0.01$ (corrected)

Conclusions

Different patterns of theta activity were observed in the three groups in response to direct and averted gaze stimuli.

These findings suggest that analyzing variations of theta-power across time can provide deeper insight into gaze processing differences in autistic children with high support needs.

Given the small sample size of this study, further research is needed to clarify the significance of these results.

INSAR2026
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