

THE LONGITUDINAL GAMMA BAND EEG ACTIVITY IN AUTISTIC CHILDREN

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Background

It has been suggested that in children with autism spectrum disorder (ASD) the cortical brain activity would show an imbalance between excitation and inhibition, which is reflected in atypically high baseline gamma activity. Previous research in the gamma band have, however, been conflicting. In some of the studies, heightened gamma activity has not been found, whereas in some studies it has. A part of the research has also shown age-related changes in gamma band activity during development.

Objectives

- The study aimed at investigating longitudinal gamma band EEG activity in autistic children, typically developing children and children with intellectual disability without ASD.
- The specific aim was to investigate whether the baseline gamma band EEG is atypical in autistic children and whether it is a consistent finding longitudinally.

Methods

Nineteen autistic children (2.5–5.6 years), 19 typically developing children (TD, 2.4–5.8 years) and 17 children with intellectual disability without ASD (ID, 3.5–6.2 years) participated in the study. The baseline EEG was recorded in two different time points with 24 months in-between. EEG was recorded when the children watched a 3-minute video of a person building with Lego bricks. The gamma band activity (24.4–44.0 Hz) was analyzed in central and parietal areas to avoid myogenic artefacts. The group differences were analysed with nonparametric tests due to non-normal distributions and small sample size.

Table 1. Participant characteristics at the beginning of the study

	ASD	TD	ID
Gender (boys/girls)	17/2	16/3	14/3
Chronological age	4.1 (2.5-5.6)	4.2 (2.4-5.8)	4.6 (3.5-6.2)
IQ	60 (42-88)		59 (45-79)

Results

In the first measurement point (see figure 1), the groups differed statistically in parietal gamma band EEG activity (Kruskal-Wallis $H=6.92$, $p=.031$) but not in central gamma band EEG ($H=2.84$, $p=.242$). Children with ASD had more increased parietal gamma band power than TD children (Mann-Whitney $U=64.00$, $p=.027$) and children with ID ($U=52.00$, $p=.021$). TD and ID groups did not differ in parietal gamma band EEG activity ($U=108.00$, $p=.868$).

At 24-month follow-up (see figure 2), the groups no longer differed in either parietal ($H=.62$, $p=.718$) or central ($H=1.49$, $p=.475$) gamma band EEG activity.

For ASD children, both parietal (Wilcoxon $Z=-2.04$, $p=.041$) as well as central ($Z=-3.30$, $p<.001$) gamma band EEG were statistically larger in the first measurement point, compared to the second. For TD and ID children, the central gamma band EEG was higher in the beginning than in the follow-up (TD $Z=-2.90$, $p=.004$; ID $Z=-2.80$, $p=.005$), but parietal gamma band EEG showed no difference between the two time points.

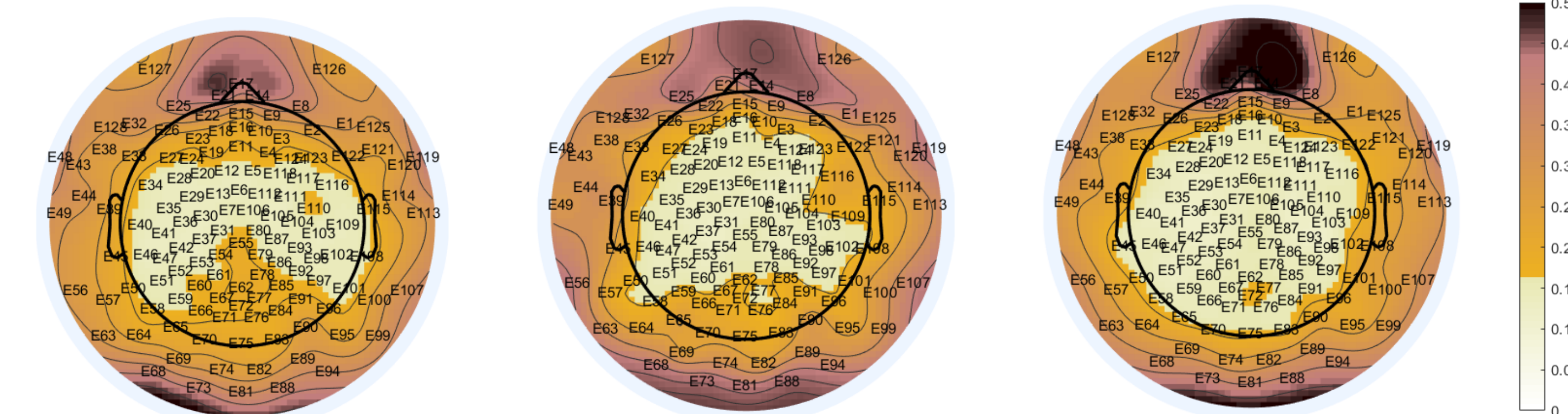


Figure 1 Gamma band activity (24.4-44.0 Hz) in ASD, TD and ID children in the beginning

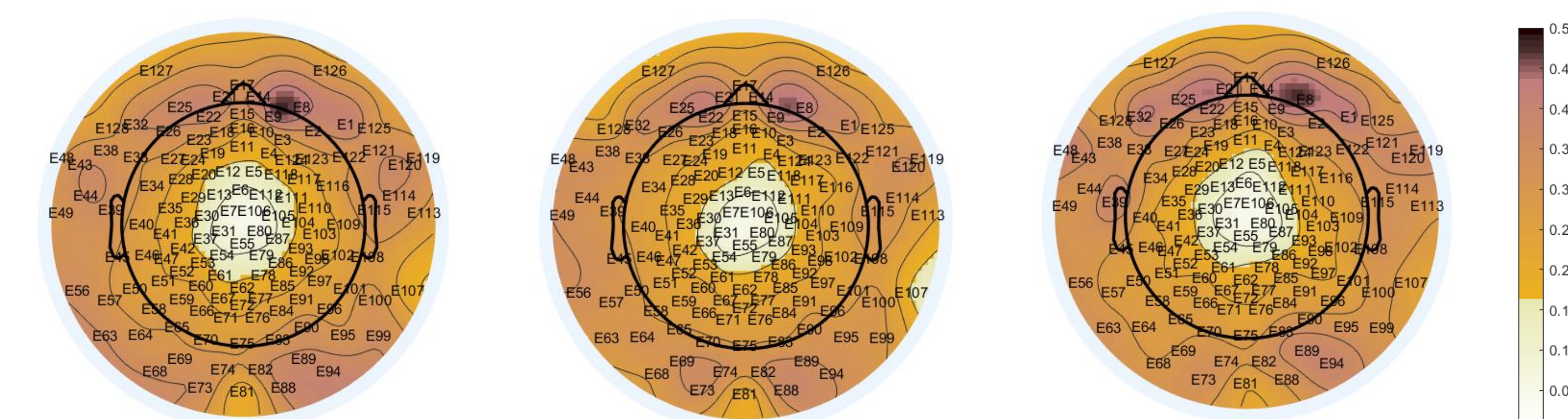


Figure 2 Gamma band activity (24.4-44.0 Hz) in ASD, TD and ID children at the 24-month follow-up

Conclusions

- The study supports previous studies by showing that the gamma band activity is higher in early development in children with ASD than in children with TD and ID without ASD.
- However, the autism-specific difference seems to evaporate during development. The present findings warrant further longitudinal studies with larger samples and multiple measuring points.

