

Association between eyes closed resting state alpha EEG power and social responsiveness in youth with and without ASD: The GENDAAR Study

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Background

- Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by impairments in social communication and repetitive behaviors.
- Alpha power, EEG activity between 8 and 12 Hz is present during resting with greater power when the individual's eyes are closed than when eyes are open.
- Previous research has found lower alpha power in youth with ASD compared to typically developing (TD) youth (Neuhaus et al., 2021, review Wang et al, 2013) and has been associated with attention, cognition, social understanding and imitation in individuals with ASD (Neuhaus et al., 2021; Perry et al., 2011).
- The aims of the project were to evaluate diagnostic differences in alpha power, relationship between social responsiveness and alpha power, and considering communication deficits in autism and evaluating the relationship between communication within social responsiveness and alpha power.
- We predicted that alpha power will be lower in youth with ASD compared to youth without ASD.

Methods

Participants included 152 youth between the ages 8-17 years from the NIH funded ACE GENDAAR study. ASD diagnosis was confirmed standardized measures and all participants had a verbal IQ>70.

Gender	N	ASD	TD	Verbal IQ avg	SRS avg
Male	76	38	38	104.73	64.08
				SD: 21.279	SD: 117.50
Female	76	38	38	106.67	92.25
				SD: 19.3	SD: 192.35

Table 1: Group Characteristics

Measures:

- Parents of children completed the Social Responsiveness Scale-2 (SRS-2) which is a 65-item rating scale measuring autism traits.
- Eyes closed data was collected with high density EEG system. Data were processed per Neuhaus et al. (2021). A fast fourier transformation (FFT) was applied to artifact free EEG data to extract alpha power.
- Regions of interest (ROIs) for alpha power were calculated over: left frontal, mid frontal, right frontal, left central, left posterior, mid central, mid posterior, right central, and right posterior.

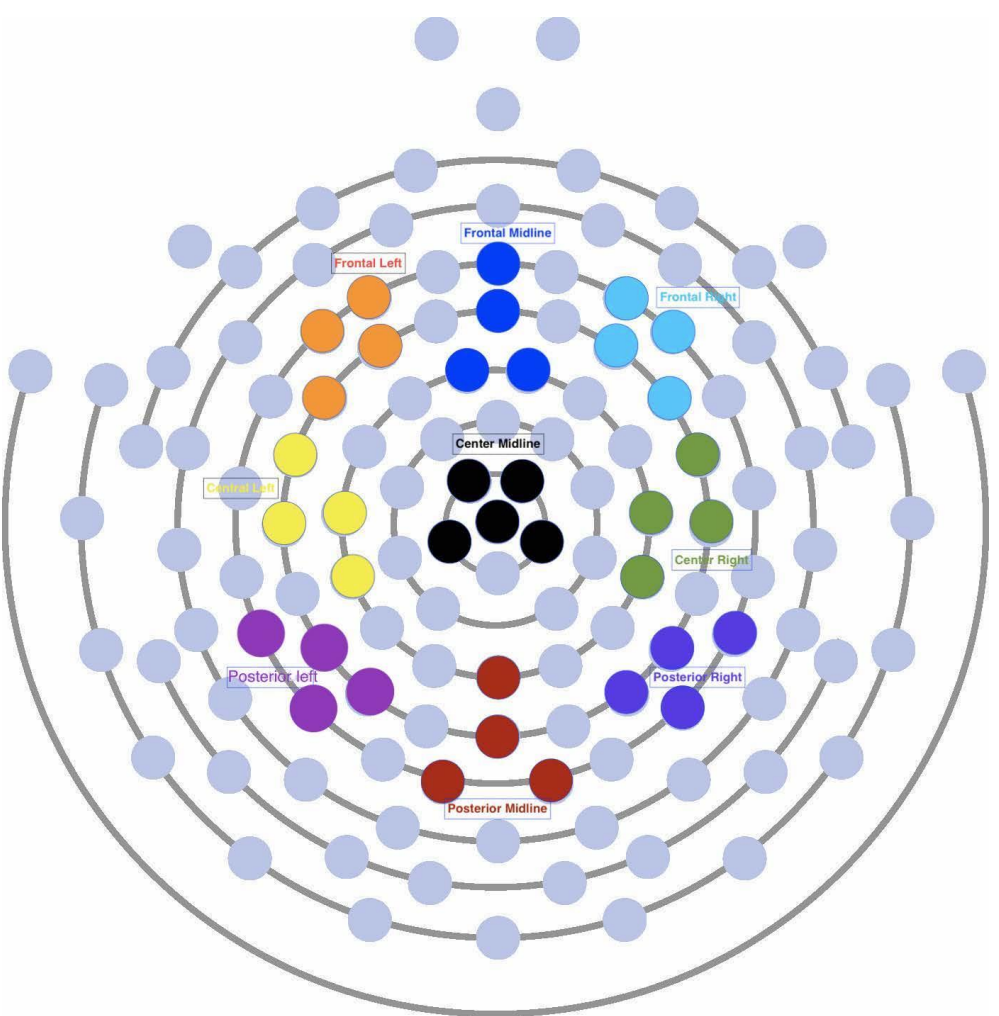
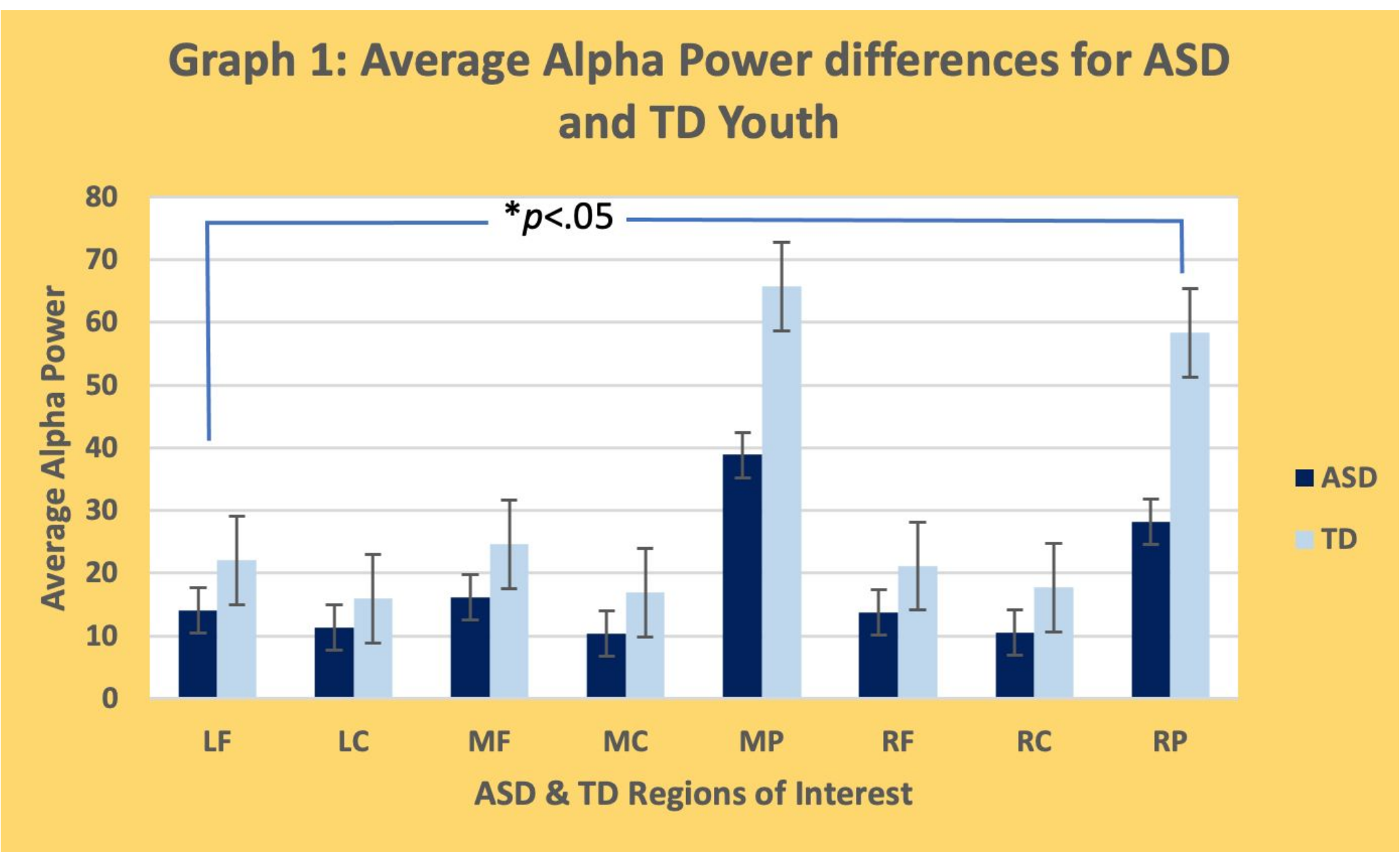


Figure 1: EEG Regions of Interest

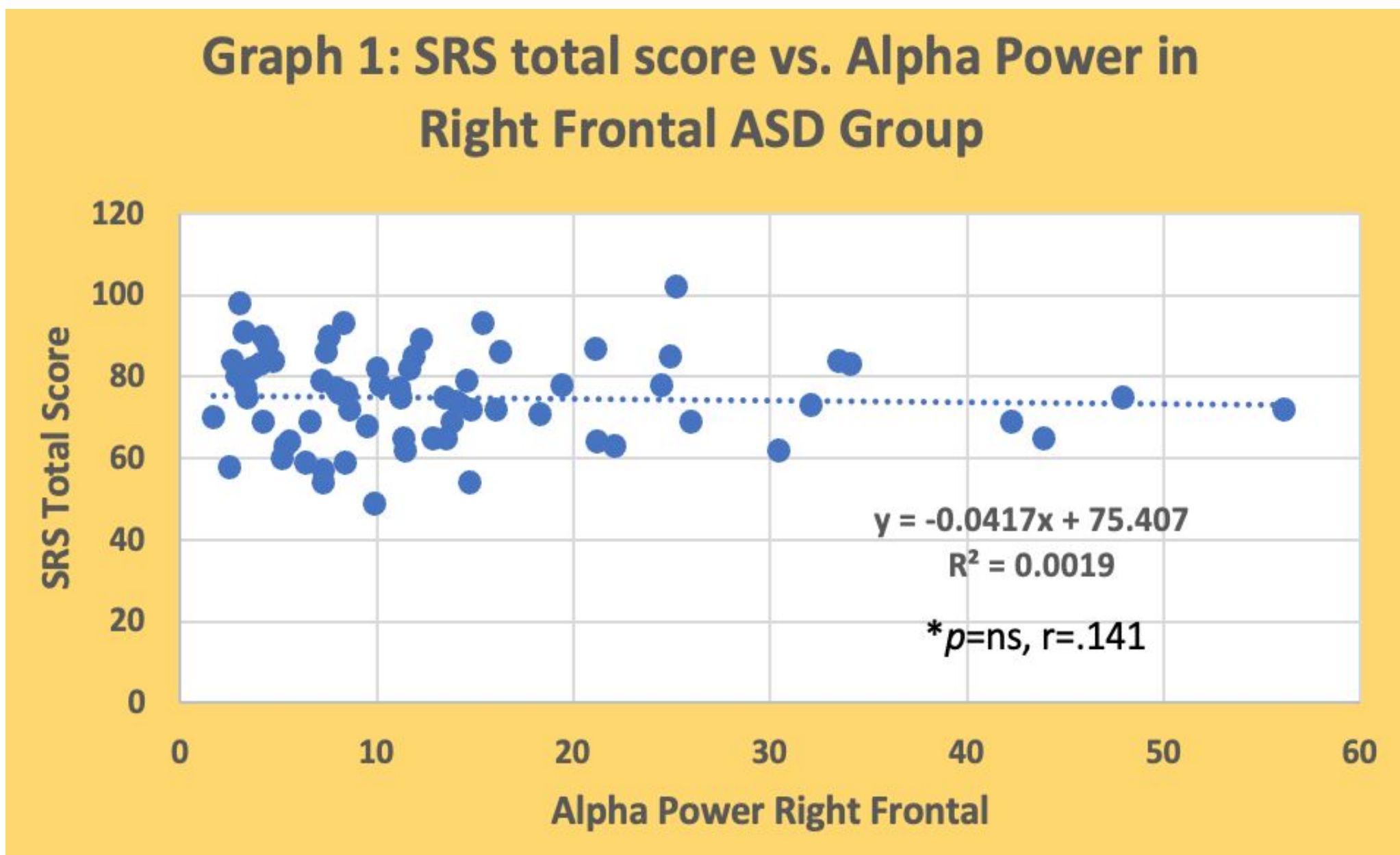
Results

1: Alpha power differences by diagnostic group (ASD, TD)



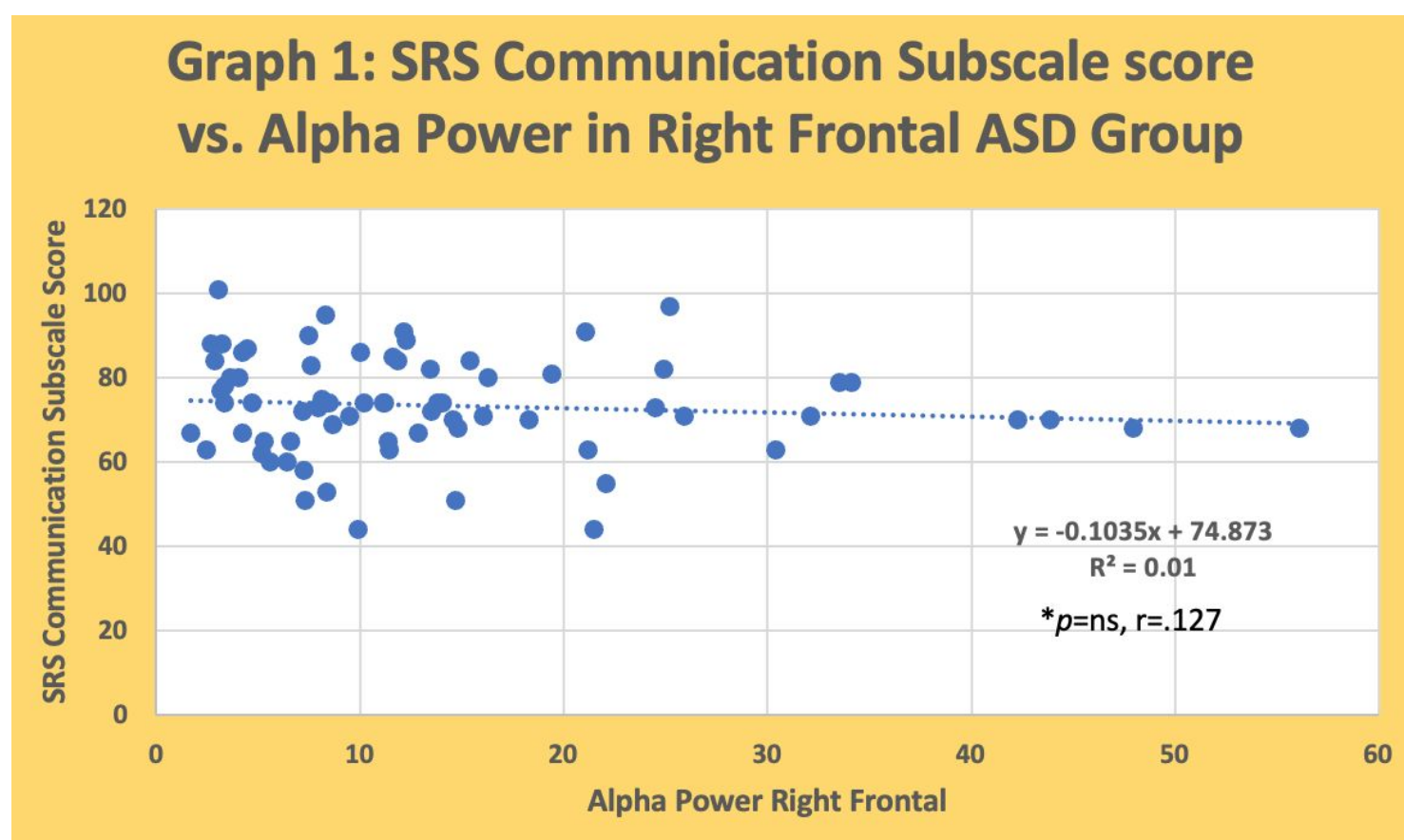
There was a significant main effect of eyes closed alpha power by diagnosis in **LF, MF, RF, LC, MC, MP, RC and RP regions** ($F(1,150)s > 6.14, ps < .05$). No significance was observed for the LP region ($F(1,150) 2.17, p = .14$)

2: Correlations between the SRS total score and alpha power within ASD group



Within the ASD group, correlations between the SRS total score and alpha power were non-significant for all regions ($p > .05$). For LF ($r=.075, p=.530$), MP ($r=-.039, p=.743$), RF ($r=.141, p=.234$), LC ($r=-.027, p=.818$), MC ($r=.001, p=.991$), MF ($r=.091, p=.444$), RC ($r=-.059, p=.621$), RP ($r=-.100, p=.401$), LP ($r=-.042, p=.723$).

3: Correlations between SRS Communication Subscale score and alpha power within the ASD group.



Within the ASD group, correlations between the SRS Communication Subscale Score and alpha power was non-significant for any regions. For LF ($r=.219, p=.062$), MP ($r=.061, p=.611$), RF ($r=.180, p=.127$), LC ($r=.017, p=.885$), MC ($r=-.020, p=.868$), MF ($r=.127, p=.283$), RC ($r=-.030, p=.800$), RP ($r=-.042, p=.726$), LP ($r=.010, p=.931$).

Discussion

- Our results are consistent with prior research suggesting alpha power is reduced in youth with ASD when compared to TD.
- There was no significant correlations that were observed with SRS-2 parent report of autism traits and eyes closed alpha power.
- This work extends the previous work by our research group in Eyes Open resting (Neuhaus et.al, 2021).
- Further research should look at other phenotypic correlates such as the Vineland and verbal/nonverbal IQ and its relationship to alpha power.
- This research can shed light on the variability in ASD and TD resting states.

References and Acknowledgements

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