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Preliminary report on the effects of propranolol on gastrointestinal symptoms, anxiety, and heart rate variability in autism spectrum disorder

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OVERVIEW

Autism spectrum disorder is a neurodevelopmental disorder that is characterized by impaired social communication, along with cognitive impairments including repetitive behaviors and fixated interests. Some individuals with ASD are known to experience co-occurring gastrointestinal (GI) symptoms. This study examined the effects of propranolol on GI symptoms, anxiety and HRV in individuals with Autism Spectrum Disorder. These findings may help individuals find a medication that can change the stress response and therefore ease GI symptoms along with the related problem behaviours.

STUDY AIM

Hypothesis 1→ Propranolol will reduce GI symptoms in ASD, especially constipation.

Hypothesis 2 → HRV will be negatively correlated with GI symptoms, particularly for constipation, after 12 weeks of propranolol.

Exploratory → Effects of propranolol on anxiety were explored.

METHODS

Measures

- **CGI-S:** Administered to the participant or their parent/caregiver in person or over the phone at baseline and week 12 sessions. Assesses changes in anxiety and gastrointestinal symptoms
- **GSI:** Administered to the participant or their parent/caregiver in-person or over the phone during the baseline and week 12 sessions. This allows a rating the severity of gastrointestinal symptoms.
- **Time-domain HRV measurements:** 5-minute Electrocardiogram measurements were taken using a BIOPAC MP160. The pNN50 was calculated to represent HRV.

RESULTS

Descriptives	N	Mean	SD	SE
Baseline Constipation	26	0.654	0.892	0.175
12 Week Constipation	25	0.760	0.879	0.176
Baseline Diarrhea	26	0.038	0.196	0.038
12 Week Diarrhea	25	0.080	0.277	0.055
Baseline Average Stool Consistency	26	0.077	0.272	0.053
12 Week Average Stool Consistency	25	0.160	0.374	0.075
Baseline Stool Smell	26	0.077	0.272	0.053
12 Week Stool Smell	25	0.040	0.200	0.040
Baseline Flatulence	26	0.538	0.761	0.149
12 Week Flatulence	25	0.320	0.690	0.138
Baseline Abdominal Pain	26	0.192	0.491	0.096
12 Week Abdominal Pain	25	0.280	0.542	0.108
Baseline Unexplained Daytime Irritability	26	0.462	0.761	0.149
12 Week Unexplained Daytime Irritability	25	0.280	0.458	0.092
Baseline Nighttime Awakening	26	0.346	0.485	0.095
12 Week Nighttime Awakening	25	0.200	0.500	0.100
Baseline Severity Score	26	2.385	1.813	0.356
12 Week Severity Score	25	2.120	2.242	0.448

Table 1

Paired Samples T-test					95% CI of Cohen's d	
	t	df	p	Cohen's d	Lower	Upper
Baseline Constipation – 12-week Constipation	-0.531	24	0.600	-0.106	-0.498	0.288
Baseline Diarrhea – 12-week Diarrhea	-1.000	24	0.327	-0.200	-0.594	0.198
Baseline Avg. Stool Consistency– 12-week Avg. Stool Consistency	-1.000	24	0.327	-0.200	-0.594	0.198
Baseline Stool Smell– 12-week Stool Smell	1.000	24	0.327	0.200	-0.198	0.594
Baseline Flatulence– 12-week Flatulence	1.659	24	0.110	0.332	-0.074	0.731
Baseline Abdominal Pain– 12-week Abdominal Pain	-1.000	24	0.327	-0.200	-0.594	0.198
Baseline Unex. Daytime Irritability– 12-week Unex. Daytime Irritability	1.000	24	0.327	0.200	-0.198	0.594
Baseline Nighttime Awakening– 12-week Nighttime Awakening	1.000	24	0.327	0.200	-0.198	0.594
Baseline Severity Score - 12-week Severity Score	0.535	24	0.597	0.107	-0.287	0.499

Note. Student's t-test

Table 2

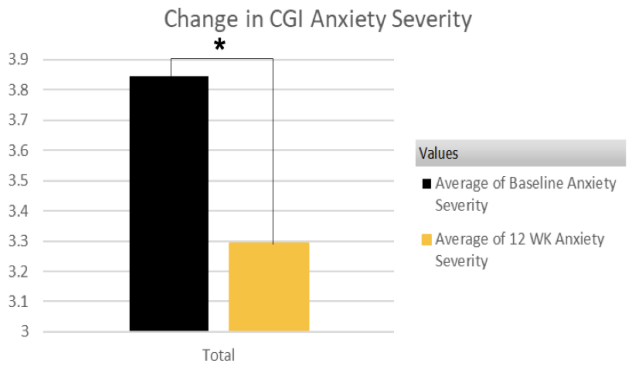

Figure 1

RESULTS SUMMARY

Hypothesis 1→ Not Supported
There were no statistically significant differences between baseline GI symptoms and GI symptoms after 12 weeks of propranolol. See Table 1 for descriptive statistics and Table 2 for the results from the *t*-test.

Hypothesis 2 → Not Supported
In a subset of participants from an ongoing analysis, propranolol significantly increased HRV after 12 weeks. However, there was no statistically significant relationship between HRV and constipation.

Exploratory → Effects of propranolol on anxiety?
Propranolol significantly reduced anxiety after 12 weeks. Mean CGI-S for overall ASD severity was 3.62 at baseline (*SD*=0.50), decreasing to 3.47 (*SD*=0.52) at week 12 (*p*=0.082), and mean CGI-I at 12-weeks was 2.87 (*SD*=0.91sdev) for overall ASD severity. See Figure 1.

DISCUSSIONS

- Given that propranolol had no significant effect on GI symptoms in participants with ASD, there were some significant effects that were found. Propranolol significantly increased HRV in participants with ASD, while also decreasing Anxiety Severity. Continuing to explore the effects of pharmacological treatments that reduce the stress response may lead to new treatments for those with GI issues.

Future Directions:

- Focus on other measures that may be related to gastrointestinal symptoms.
- Conduct similar studies using the same measures with a different anxiolytics.

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