

The Effects of Autistic-like Traits on Prosodic Cue-weighting in a Matched Speech Perception and Production Task

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1. Background

Prosodic focus is realized along multiple phonetic dimensions including f0 (with the highest relative importance), intensity, and duration among measures of voice quality and spectral tilt. Studies in the prosodic dimension have shown that the relative importance of each cue (i.e., cue-weighting) varies between individuals (e.g. [1]) but the factors that motivate these individual differences remain unanswered. These differences may be due to individual cognitive processing styles. For example, [2] found that *higher levels* of autistic-like character traits indicated by the Autism Spectrum Quotient (AQ) scores correlated significantly with increased abilities to discriminate *low-level* auditory pitch and duration but not intensity differences for pure tones. This study examines whether prosodic cue-weighting in production and perception of *high-level* realistic speech stimuli is predicted by autistic-like traits in a non-clinical population, as indicated by their AQ scores (ranging from 50 to 200) [3]).

2. Perception and Production Task

We recorded 42 native Canadian English speakers/listeners. Based on their overall AQ score quartiles, we analyzed the prosodic data of 18 participants grouped into a high AQ population (highest quartile, AQ > 124) and contrasted them to a low AQ population (i.e. lowest quartile, AQ < 104). We conducted perceptual identification tasks with stimuli in sentence context (e.g. “Lynn and Neil gazed at the moon”), with one of the three possible nouns manipulated for one of three prosodic parameters: f0, intensity, or duration. We included a *full condition* with values extracted from natural focus in previous literature (f0: +3st, intensity: +6dB, duration: +66%), and a *half condition* created by halving these values. Listeners had to identify the noun in focus (i.e., 33.3% chance probability). Mixed effects logistic regressions showed that high AQ participants differed significantly from low AQ participants by their perception of pitch ($p=.019^*$) and intensity ($p=.01^{**}$), but not duration ($p=.158$) (see Fig. 1), and, for intensity, only the high AQ participants were more accurate in the *full condition* than in the *half condition* ($p=0.03^*$). The *full condition* was significantly different from the *half* one for all three parameters. Similar sentences were used for the production task, eliciting out-of-focus (background), broad focus, and narrow focus conditions. Duration, intensity and f0 ranges of the stressed syllable were extracted. Linear mixed effects models did not show any significant effect of AQ level across any of the acoustic parameters. Results for f0 range approached the 5%

significance level ($p = 0.054$), suggesting that participants with higher AQ scores produce lower f0 ranges.

3. Discussion

Our results suggest that differing autistic-like character traits appear to have a greater influence on the perception than on the production of focus. Our findings for perception suggest that individuals with high AQ were more sensitive to changes in f0 and intensity to mark focus than individuals with low AQ, in line with proposals positing that individuals with higher levels of autistic traits are better able to detect fine-grained differences in low-level (and non-linguistic) acoustic stimuli. While no significant differences between AQ groups are observed at the duration level, it was found that overall listeners are more sensitive to duration differences than to the other cues (see Fig.1), suggesting possible ceiling effects. Our results for production along the f0 dimension agree with findings showing that individuals with autistic traits show less variability in their production of prosody.

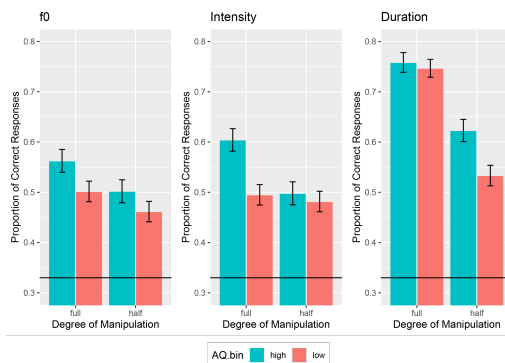


Figure 1. Perception results for the three examined phonetic parameters, split by condition and AQ score.

4. References

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