Turn-taking differs between parents and therapists speaking to children with ASD

Micha Elsner & Benjamin Allen (OSU) & Elizabeth Kryszak (Nationwide) & Kiwako Ito (OSU)

elsner.14@osu.edu

Children with Autism Spectrum Disorder (ASD) often lag behind their typically-developing (TD) peers in communication skills and educational outcomes. These deficits appear to reflect inherent differences in language processing, but may also be influenced by differences in language input from caregivers. Indeed, the two can operate in a feedback loop in which parents find it harder to communicate with ASD children and this leads them to provide less useful input. The right input can be a critical factor in determining the course of development; Early Intensive Behavioral Intervention (EIBI), an intervention in which a child spends up to 40 hrs/week interacting with a treatment team, has been shown to lead to signnifcant gains in language, cognitive, and adaptive skills in young children with ASD [4]. Yet the precise differences between parental input to TD vs. ASD children, and the impact of specific language used in EIBI on changes in language and cognitive skills, have yet to be evaluated.

In this study, we evaluate differences in conversational turn-taking, a critical skill for early social interactions [5], in three groups (n=10/group): parent-ASD child interactions (avg. age 2;09); EIBI therapist interactions with the same childen; age-matched parent-TD child controls (3;03). Recordings of child-therapist interactions represent the first 5 weeks of EIBI. We use samples from LENA recordings to assemble a large corpus of comparable recordings (30 min/subj, avg 592 utterances, std 172), which are transcribed by hand in the CHAT format.

We follow previous work [2] in analyzing the length of pauses between utterances; we also look for differences in interruptions (where two transcribed utterances overlap). Unlike in previous work [3], pause durations and interruption rates do not differ significantly between groups.

We extend our analysis by constructing a shallow dialogue act tagger based on automatically-produced dependency parse trees [1]. Utterances by adults are categorized as non-sentential (discourse particles and bare NPs), declarative, imperative, polar question or WH-question. Utterances by children cannot be reliably parsed and are treated as a single category. Proportions of utterance types across groups of adult speakers are shown in Fig 1. Therapists use more non-sentential utterances than the other adults.

Table 1 shows matrices of (first, second) utterance, normalized to show the distribution of continuations after each utterance type. The pattern differs across groups (likelihood ratio of multinomial logit with random effects, $p < .001$). TD children often speak after parental utterances, especially questions. ASD children do so less frequently overall, but more often after their parents than to therapists. Therapists respond more often to child utterances than either group of parents. They use non-sentential utterances more after all utterance types. Examination of the transcripts suggests that therapists emphasize their full sentences using repeated non-sentential utterances, especially discourse markers, filled pauses and exclamations, to retain the child's attention, coordinate the conversation and reinforce the topic of the discussion. However, perhaps due to the unfamiliarity of the therapist, this strategy is unsuccessful in eliciting linguistic responses to questions.

Children with ASD are known to have trouble with conversational coordination [3], a finding replicated here. Our study goes beyond earlier work by using dialogue acts to find specifically that ASD children respond poorly to questions, and by comparing conversations between parents and therapists. We find evidence that therapists use more non-sentential utterances such as discourse markers. Therapist speech patterns do not approximate TD parental speech but are adapted to meet the attentional needs of children with ASD.
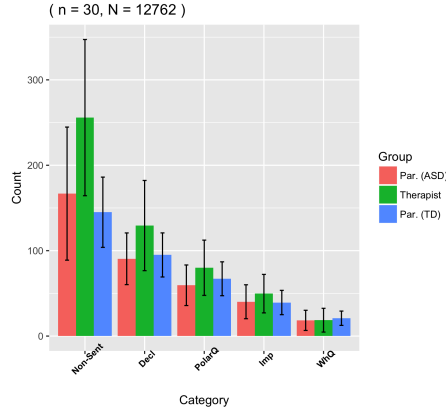
Figure 1: Utterance types by speaker category.

Parent - TD child

	Counts	nsent	decl	imp	polarq	whq	child
nsent	48 (26-62)	0.20	0.15	0.07	0.08	0.05	0.39
decl	106 (72-148)	0.16	0.22	0.06	0.08	0.04	0.35
imp	76 (46-101)	0.18	0.19	0.07	0.07	0.03	0.44
polarq	88 (46-105)	0.09	0.08	0.02	0.11	0.03	0.66
whq	84 (30-185)	0.05	0.06	0.02	0.08	0.02	0.70
child	64 (40-89)	0.23	0.14	0.06	0.14	0.06	0.33

Parent - ASD child

	Counts	nsent	decl	imp	polarq	whq	child
nsent	76 (48-107)	0.36	0.11	0.09	0.10	0.03	0.25
decl	122 (94-190)	0.23	0.22	0.10	0.11	0.03	0.26
imp	52 (47-85)	0.36	0.10	0.18	0.07	0.01	0.24
polarq	68 (55-113)	0.23	0.09	0.08	0.17	0.06	0.27
whq	66 (42-199)	0.15	0.09	0.04	0.11	0.12	0.27
child	34 (15-81)	0.28	0.11	0.07	0.11	0.04	0.39

Therapist - ASD child

	Counts	nsent	decl	imp	polarq	whq	child
nsent	152 (96-186)	0.48	0.19	0.10	0.07	0.03	0.08
decl	71 (22-134)	0.37	0.26	0.13	0.10	0.02	0.11
imp	80 (54-109)	0.34	0.15	0.24	0.08	0.01	0.08
polarq	53 (28-101)	0.34	0.15	0.10	0.16	0.03	0.14
whq	104 (45-179)	0.31	0.14	0.04	0.18	0.08	0.10
child	48 (40-61)	0.38	0.14	0.10	0.10	0.05	0.20

Table 1: Dialogue act pair statistics. Row shows first utterance, column second. "Count" column shows median raw count and quartile range; table shows median probability $p(\text{second}|\text{first})$. (Because they are medians, rows do not sum to exactly 1.)

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