Declarative or declarative question? – on the acoustics of English prosody of Hong Kong trilingual children with autism spectrum disorder

Bruce Xiao Wang[1], Sarah Si Chen[1], Fang Zhou[1], Jiang Liu[2], Cheng Xiao[2], Angel Chan1, Tempo Tang[1]
[1]Department of Chinese and Bilingual Studies, Hong Kong Polytechnic University, Hong Kong, Hong Kong.
[2]Department of Languages, Literatures and Cultures, University of South Carolina, Columbia, SC, United States.

1. Introduction

Autism spectrum disorder (ASD)

- A neurodevelopmental disorder
- Deficits in social communication and interaction [1]
- Difficulties in perceiving and producing reciprocal prosodic cues (e.g., focus marking)

Speech prosody

- Important communicative functions, e.g., affective, pragmatic and syntactic [2]; Changes in the prosody leads to change in sentence meaning [3]
- Focus: From a functional perspective, focus refers to an emphasis on some part of a sentence as motivated by a particular discourse situation.

Declarative question

- Sentence-final syllables with rising intonation [4-5]
- Elicit different sentence prominence with focus placed on different syllables [6]

2. Aim

- To compare the production of English focus marking between Cantonese autistic children with Cantonese and English typically developing (TD) children

3. Methods

Participants:

	Cantonese ASD (12 male, 4 female)	Cantonese TD (12 male, 4 female)	English TD (12 male, 4 female)
Age	9.6 ±1.1	9.7 ±1.5	9.8 ±1.8

Stimuli

- In a gallery scenario
- A asks B a question
- C can only hear B's response to A, but not A's question
- Participants instructed to act as C to guess A's question

Focus type	Statement Questions	Answers
a. Broad focus	*Amy is kissing the doll*?	No, she is not.
b1. Initial contrastive focus	*Amy* is kissing the doll?	Lily is kissing the doll.
b2. Medial contrastive focus	Amy is *kissing* the doll?	Amy is hugging the doll.
b3. Final contrastive focus	Amy is kissing the *doll*?	Amy is kissing the lady.

Linear Mixed-Effects Models (LMM)

- Response variables: duration, f0, f0 range, intensity
- Explanatory variables:
  - groups (e.g., Cantonese ASD, Cantonese TD)
  - *relative position to focus* (e.g., pre-focus)
  - Interaction between groups and *relative position to focus*

4. Results

Between-group differences

		pre-focus	on-focus	post-focus	broad-focus
Duration	Monosyllabic			CTD < CASD* CTD < ETD***	
Mean f0	Monosyllabic	CASD > ETD*	CASD > ETD*		
	Disyllabic			CTD < ETD*	
Mean intensity	Monosyllabic	CASD < ETD**	CASD < ETD**	CASD < ETD**	CASD < ETD**
	Disyllabic	CASD < ETD*** CTD < ETD*	CASD < ETD*** CTD < ETD*	CASD < ETD*** CTD < ETD*	CASD < ETD*** CTD < ETD*
f0 range	Monosyllabic				
	Disyllabic				

*.05, **.01, ***.001

Within-group differences

	Duration	Mean f0	f0 range	Mean intensity
Monosyllabic				
CASD	pre < broad* post< broad**	post > broad*	pre < broad* post > broad***	
CTD	pre < broad***		pre < broad** post > broad***	
ETD	pre < broad*** post < broad***	post > broad***	on > broad***	
Disyllabic				
CASD	post < broad***	post < broad*		pre < broad* post < broad**
CTD	post < broad***			
ETD	pre < broad* on > broad* post < broad***	post > broad***	pre < broad** on > broad ***	pre < broad*

*.05, **.01, ***.001

5. Discussion

Empirical studies in TD adult speakers

- OFE and PFC of f0 were reported in native American English speakers [7]
- Some results are conflicting for L2 English speakers (L1 Cantonese):
- a. PFC of f0 and intensity, but no OFE for some subjects [8]
- b. No OFE or PFC of f0 in L1 Cantonese L2 English speakers [9]

Previous studies in TD and autistic children

- Significantly higher mean f0[10] and higher f0 range [11, 12] in autistic speech
- Mixed results about word duration: significantly longer word [11] or shorter duration [13]
- Tend to produce topic and focus equally or accentuate the beginning of a sentence regardless of the information structure [14]

However, most previous studies only conducted between group comparison and lack of theoretical background (be it linguistic or clinical)[15]

The current study investigates between and within group difference taking *focus conditions* into consideration

- **Between group:**
  - **Meanf0:** CASD > ETD, consistent with [10], but not with [16]
  - **Intensity:** CASD < ETD at all focus locations, consistent with [17] that children with ASD have lower intensity, but not with [18]
- **Within group:**
  - **CASD** and **CTD**: no clear pattern of **OFE**;
  - **CASD:** showed **PFC** in duration.
  - **ETD**: **PFC** in duration (consistent with findings in [19]), **OFE** in f0 range (consistent with findings in [9])

6. Conclusion

- CASD and CTD did not mark focus in the same way as ETD in declarative questions.
- ETD used focus marking for information prominence in declarative question, but had incomplete knowledge of OFE and PFC (e.g., only had OFE for f0 range, not PFC), possibly due to immaturity of language processing.

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