Comprehension of exhaustive wh-questions by Mandarin-speaking children with DLD and children with ALI

Xueming Xing Guangdong University of Foreign Studies

Background

Developmental Language Disorder (DLD, previously known as SLI—Specific Language Impairment) refers to a significant deficit in language ability that cannot be attributed to hearing loss, low nonverbal intelligence, or neurological damage (Bishop 1992, Bishop et al. 2017, Leonard 2014). Individuals diagnosed with DLD are found to have difficulties in areas related to the structure of a language, such as phonology, morphology, syntax, and semantics.

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized primarily by deficits in social interaction and communication and by restricted and repetitive behaviors (American Psychiatric Association, 2013). Auism and language impairment (ALI) represents a subtype of ASD (Kjelgaard & Tager-Flusberg 2001, Tager-Flusberg 2006, Tager-Flusberg & Joseph 2003, Georgiou & Spanoudis 2021).

Some studies suggest that children with DLD and those with ALI show similar symptoms with respect to language and behavior (Andres-Roqueta & Katsos 2020, Bishop 2010, Georgiou & Spanoudis 2021, Kjelgaard & Tager-Flusberg 2001, Tager-Flusberg & Joseph 2003, Perovic *et al.* 2013). Therefore, the two types of children are very likely to be misdiagnosed.

Exhaustivity is a central feature of the semantics of *wh*-questions. Under an exhaustive reading of a *wh*-question, the answer exhausts the relevant set of elements satisfying the predicate (Schulz 2015).

Figure 1: Example picture for a single *wh*-question

(1) Q1: In this picture, who is taking a dog?
Q2: In this picture, who all are taking a dog?
('All' is considered as an exhaustive marker in English.)

a. The boy (1), the grandma (4) and the girl (5). exhaustive list
b. # The boy (1). singleton

Figure 2: Example picture for a paired *wh*-question

(2) Q: In this picture, who is holding what?

a. The aunt (is holding) an apple (1&5), the uncle (is holding) an umbrella (2&6), the boy (is holding) a football (3&7). exhaustive paired list
b. # The aunt (is holding) an apple (1&5). single pair
c. # The aunt, the uncle and the boy (1&2&3). subject list
d. # An apple, an umbrella and a football (5&6&7). object list

- Previous studies mainly focus on the comprehension of exhaustive *wh*-questions by TD or DLD children speaking *wh*-movement lanaguges (e.g. English, German). Children with DLD are found problematic in the exhaustive property of single, especially multiple wh-questions compared with their TD peers and major errors committed by children with DLD are consistent in type with those reported by TD ones.
- Singleton responses are the most frequent non-target answers to single and multiple wh-questions and exhaustive lists of subjects or objects to multiple wh-questions.

  (de Villiers *et al.* 2018 (**Mandarin, children with lanaguge impairment**), Foryś-Nogala *et al.* 2016 (Polish), Roeper 2004 (English and German), Roeper *et al.* 2007 (German), Schulz 2015 (a review study concerning different languages), Schulz & Roeper 2011 (German)).
- No study has ever reported the performance of children with ALI.

This research aims to figure out:

a. whether DLD children speaking Mandarin Chinese, a *wh*-in situ language, have difficulty with exhaustive wh-questions as reported previously;

b. whether children with DLD and those with ALI display similar profiles in exhaustive *wh*-questions and whether their performance stems from the same source.

Experiment

Table 1: Participants description

		DLD (N=18)		ALI (N=17)		TDA (N=27)	
		Mean	SD	Mean	SD	Mean	SD
Age (months)		62.32	10.09	65.26	8.80	61.97	8.02
language tests	PPVT-R	46.00	10.52	53.82	14.01	77.88	20.62
	Receptive Language	21.67	3.80	19.24	4.70	31.67	2.63
	Expressive Language	26.50	5.44	24.76	4.87	39.89	2.56
	Language Development	48.17	6.26	43.76	7.18	57.08	13.97
Non-verbal IQ		94.00	10.75	93.24	10.75	110.93	9.93

- Peabody Picture Vocabulary Test-Revised Chinese Version 1990 (PPVT-R for short) (Sang &Miao 1990)
- Rating Scale for Pre-school Children with Language Disorder-Revised Chinese version 2008 or Rating Scale for School Children with Language Disorder-Revised Chinese Version 2009 (Lin, Huang, Huang & Xuan 2008, 2009)
- Wechsler Preschool and Primary Scale of Intelligence-Fourth Edition (Chinese version) (WPPSI-IV (CN) for short) (Li & Zhu 2012)

- The DLD group, the ALI group and the TDA group were matched by age (p=.461).
- All the children in the ALI group (and only these children) were diagnosed with ASD by professional therapists based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (APA 2013).
- All the children in the DLD group and the ALI group had at least two of the four indexes in the language tests around or below 1.25 standard derivation of the normal value.
- All the participants had a normal non-verbal IQ (no lower than 70).

A question-with-picture task

Figure 1: Example picture for a single *wh*-question

(3) a. shui qian-zhe gou? (谁牵着狗？)
who take-ASP dog
Who is taking a dog?
(subject *wh*-questions, 5 trials)
b. dou shui qian-zhe gou? (都谁牵着狗？)
all who take-ASP dog
Who (all) is taking a dog?
(subject *wh*-questions, 5 trials)

Figure 2: Example picture for a paired *wh*-question

(4) shui na-zhe shenme? (谁拿着什么？)
who hold-ASP what
Who is holding what?
(*who-what* questions, 5 trials)

Results and Discussion

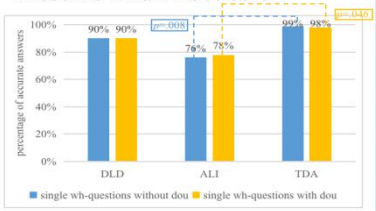

Figure 3: performance of the three groups in single wh-questions with/without *dou*

The Kruskal-Wallis test suggests a significant difference among the three groups in single wh-questions either with or without *dou* (without *dou*: p=.008<.05; with *dou*: p=.046<.05).

The significant difference is only detected between the ALI group and the TDA group in the paired post *hoc* comparisons (without *dou*: adjusted p=.008<.05; with *dou*: adjusted p=.046<.05).

The appearance of *dou* does not enhance the exaustive reponses of the children with ALI. Main errors committed by the children with ALI are singleton responses (without *dou*: 14%; with *dou*: 11%).

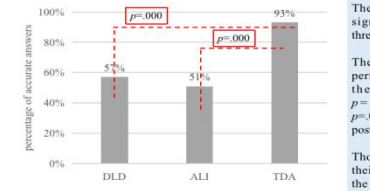

Figure 3: performance of the three groups in paired wh-questions

The Kruskal-Wallis test suggests a significant difference among the three groups (p=.000<.05).

The two langugae impaired groups performed significantly worse than their TD peers (SLI vs. TDA: p=.000<.05, ALI vs. TDA: p=.000<.05) according to the paried post *hoc* comparisons.

Though no significant difference in their accuracy, the DLD group and the ALI group show different error types.

Responding with an exhaustive list of subjects or of objects is the major errors in the DLD group, accounting for 23% of the whole responses.

Subject list answers are not evidenced in the ALI group.

Table 2: Responses types by the DLD group and the ALI group

	pair list	plural (not all) pairs	single pair	subject list	object list	one subject	one object	other
DLD	57%	3%	3%	9%	14%		2%	11%
ALI	51%	1%	6%		13%	1%	7%	21%

target responses

The subject *wh*-word (谁 *who*) rather than the object *wh*-word (什么 *what*) appears in more than half of these other errors (accounting for 12% of the whole responses) in 1/3 of the children with ALI. (e.g.,"谁拿着伞，谁拿着球.....")

Wh-words totally appear three times in two children with DLD. However, they drop this word immediately in two of the three responses. (e.g.,"谁拿着苹果，妈妈拿着苹果，叔叔拿着雨伞.....")

a. whether DLD children speaking Mandarin Chinese, a *wh*-in situ language, have difficulty with exhaustive wh-questions.

- The performance of Mandarin-speaking children with DLD in paired wh-questions is consistent with previous findings about DLD children speaking a *wh*-movement language.
- However, Mandarin-speaking children have no difficulty with single *wh*-questions. It seems that the *wh*-in situ property is beneficial for them to access exhaustive responses.

b. whether children with DLD and those with ALI display similar profiles in exhaustive *wh*-questions and whether their performance stems from the same source.

- In single *wh*-questions, only children with ALI are outperformed by the TD children.
- This group of ALI children are reported to have difficulty with simple subject questions (e.g., 谁在推小羊？ 'Who is pushing the sheep?' target answer: 小狗 'The dog'.) (children with DLD reach ceiling level in this reagrd) (Dai & He 2021). Their performance in simple *wh*-questions and in single exhaustive *wh*-questions is found significantly positively co-related with each other (r=.634, p=.006). Their difficulty with simple subject questions may affect their performance in exhaustive single *wh*-question.

- Though no significant difference in the accuracy of the two language-impaired groups, different error types of them suggest that their difficulty may be induced by different reasons.
- Children with DLD succeed in single *wh*-questions and main errors they commit are exhaustive list of subjects or of objects in paired *wh*-questions, suggesting that they do have the knowledge of exhaustivity, their failure in paired *wh*-questions lies in their inability to link exhaustive pairs.

  Given the high proportion of an exhaustive list of objects, the absence of an exhaustive list of subjects and the frequent emergence of the subject *wh*-word ('谁 'who') in the ALI group's non-target responses for paired *wh*-questions, I propose that this group of children fail to realize they need to answer both *wh*-pronouns. They choose to answer the object *wh*-pronouns because object *wh*-questions are easier for them.

Selected References

Dai & He. 2021. Comprehension of Wh-questions by Chinese Children with Specific Language Impairment and Those with High-Functioning Autism. Modern Foreign Languages (Bimonthly) 44(4): 522-535.
de villiers, J., C. Ning, X. Liu, Y. Zhang & F. Jiang. 2018. The acquisition of exhaustive pairing in multiple wh-questions in Mandarin. Journal of Psycholinguistic Research 47(6): 1369-1389.
Foryś-Nogala, M., E. Haman, N. Katsos, G. Krajewski & P. Schulz. 2016. Syntactic, semantic and pragmatic correlates of the acquisition of exhaustivity in wh-questions: A study of Polish monolingual children. Language Acquisition 24(1): 27-51.
Gavarró, A. & Lewandowski, W. 2009. Multiple interrogatives: Bulgarian vs. Polish, child and adult. Paper presented on the 19th Colloquium on Generative Grammar.
Krifka, M. 2001. For a structured meaning account of questions and answers. In C. Fery & W. Sternefeld (Eds.), Audiatur vox sapentia. A Festscrift for Arnim von Stechow (pp. 287–319). Berlin: Akademie Verlag.
Roeper, T., & J. de Villiers. 2011. The acquisition path of wh-questions. In de Villiers, J. & T. Roeper (eds.). Handbook of generative approaches to language acquisition. Amsterdam: Springer, 189-246.
Schulz, P. 2015. Exhaustivity. In Armon-Lotem, S., J. de Jong & N. Meir (eds.). Methods for assessing multilingual children: Disentangling bilingualism from Language Impairment. Book Series: Multilingual Matters, 76-94.
Schulz, P., & T. Roeper. 2011. Acquisition of exhaustivity in wh-questions: A semantic dimension of SLI? Lingua 121: 383-407.
Zimmermann, M. 2010. Quantifying question particles and the non-exhaustiveness of wh-questions. Ms. Potsdam University.
He Xiaowei. 2020. A Review of Overseas Linguistic Studies on Specific Language Impairment and Some Reflections. Chinese Journal of Language Policy and Planning(26): 61-70.