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The Use of Aspect markers in Mandarin-speaking Children with Specific Language Impairment*

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Abstract

Difficulties in grammatical morphology have been considered a hallmark for specific language impairment (SLI) in English-speaking children. Cross-linguistically, deficits in grammatical morphology are observed in languages like German and Swedish where inflectional morphology plays an important role. Stokes and Fletcher (2003) found that Cantonese-speaking children with SLI were less productive in using aspect markers and such deficit is interpreted as a consequence of their limited processing capacity. This study examined the use of aspect markers in Mandarin-speaking children with SLI by an elicitation task and a standardized picture comprehension test. Their memory spans were measured by a word span task and a non-word repetition task. Our results show that, on one hand, these children improved in their production of aspect marker within one year span and their performance is similar to that of the four-year-old controls. On the other hand, their comprehension of aspect remained inferior to the four years olds. The dissociation in the developmental growth in producing and comprehending aspect suggest that their problem with aspect marker is not simply a delay. Besides, SLI children's memory spans were shorter than the two control groups but these scores were not correlated with their use of aspect. The capacity limitation account proposed by Stokes and Fletcher is not supported.

I. Introduction

Children with specific language impairment (SLI) suffer from unexplained difficulties in acquiring their first language. For English-speaking children with SLI, deficits in grammatical morphology have been identified as their clinical hallmark. Since a mastery of grammatical morphology requires both proper linguistic knowledge and adequate computational space, accounts of different orientations have

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been proposed: some work toward a defective linguistic knowledge or a delay in maturation of such knowledge while others concentrate at the limited processing capacity of SLI.

One of the best known processing capacity accounts is the Surface Hypothesis (Leonard, 1989) which proposed that children with SLI suffered from a general limited capacity that affected perceptually and functionally the acquisition of grammatical morphemes, such as tense markers /-ed/, /-s/ and plural /-s/. However, other research (Rice and Oetting, 1993, Cleave and Rice, 1996) found that perceptual saliency could not explain why children with SLI handle plural /-s/ relatively better than third person singular present tense /-s/, and why more contracted copulas are used than their full form versions. Based on a formal analysis on tense and agreement, Rice and Wexler (1996) argued that since at an earlier stage of language development, normally developing children also mark tense optionally, therefore SLI children are going through a prolonged period of optional marking tense, which is termed as extended optional infinitive period (EOI).

Cross-linguistically, developmental deficits in grammatical morphology can also be observed in languages that have rich inflectional morphology. However, in many cases, problems with grammatical morphology are not restricted to use grammatical morphemes optionally in obligatorily contexts. Language impaired Norwegian-speaking children often substituted present tense form for the past tense form (Bjerkkan 1999). For German-speaking children, the major problem in grammatical morphology is on subject-verb agreement, not on the marking of tense (Clahsen 1989). However, in Swedish, such difficulties are not found because there is no subject-verb agreement in the language. What troubles Swedish SLI is the use of inverted word order in topicalization (Hansson 1998). Lindner and Johnston (1992) put forward the morphological richness hypothesis and argued that children with SLI suffered from a reduced processing capacity and the English SLI children focus on word order at the expense of grammatical morphology while German-speaking SLI children the other way round.

The morphological richness hypothesis allows the issue extended to languages like Chinese where inflectional morphology virtually plays no role in the process of language acquisition. Stokes and Fletcher (2003) examined the use of aspect markers in a group of Cantonese-speaking children with SLI (C-SLI) and found that although these children could encode aspect, they were less productive when compared with their age-matched peers. Since these C-SLI children could repeat sentences containing aspect markers, Stokes and Fletcher suggested that a processing-limitation account could best explain their performance in the production task.

Several points need to be clarified in Stokes and Fletcher's study. First, the morphological richness account suggests that cross-linguistic variations in grammatical deficit observed in SLI children should be taken as a function of the languages being learned. SLI children allocate most of their limited resources to dominant areas and thus German-speaking did better in marking finiteness than their English-speaking counterparts. However, it is unclear if the deficits observed in C-SLI can be interpreted in the same way: C-SLI children concentrate their learning resources in certain dominant areas such that they are more restricted in learning aspect markers and became less productive in using them. While it is likely that Cantonese-speaking children need to take care of the word order of Cantonese as one of the dominant grammatical marking devices, just as in Mandarin, it is doubtful if the acquisition of aspect marker in Cantonese constitutes a special component competing for learning resources. Although aspect markers in Chinese form a closed set and thus are truly grammatical morphemes, their acquisition processes are not comparable to the acquisition of grammatical morphology in English or German. Without the need of constructing morphological paradigms, the computational space for the acquisition of Chinese aspect markers should not be as demanding. Therefore, it is very likely that the restriction in using aspect markers productively observed in Stokes and Fletcher's study is just one of the many difficulties C-SLI children faced in the learning process. By definition, SLI children are less proficient than their age-peers in using their language and therefore a limitation in using aspect markers is not too surprising. Since Stokes and Fletcher's study did not include any language-matched controls, it is hard to determine if such a restriction is an uncommon developmental phenomenon reflecting a bias in allocating limited processing resources to the dominant component of Cantonese, such as word order.

Stokes and Fletcher concluded that the C-SLI children's performance in using aspect markers is consistent with a limited-processing-capacity interpretation but no direct evidence on their SLI subjects' memory capacity limitation is reported. In the literature, numerous studies have reported that children with SLI suffer from a shorter memory span so it is highly likely that memory limitations can also be found in these C-SLI subjects. However, it is too risky to juxtapose two findings obtained in two different contexts and propose a causal interpretation. Even if evidence in both areas is collected from the same group of subjects, various causal interpretations are still available. The critical question is whether the current state of deficit in processing capacity can account for the difficulties in using aspect markers. Some co-existing problems observed children with SLI could be merely correlations without causal links while some have to be traced back to an earlier stage of development (Bishop 1997).

To clarify the above questions, this study examined the use of aspect markers in Mandarin-speaking children with SLI (M-SLI). Although Mandarin and Cantonese are mutually unintelligible because of their phonological differences, they are so close typologically that most concerns on the acquisition of aspect markers in Cantonese are applicable to Mandarin. Four tasks were employed to collect language samples and test scores to see if M-SLI children have more difficulties in using aspect markers than their normally developing age-peers and if there are observable correlations between these M-SLI children's processing capacity and their use of aspect marker. In addition, we would like to see if there are any language specific problems in using aspect markers, as suggested by the Surface Hypothesis. The use of perfective *le* and progressive *zai* are two candidates for this exploration because on the perceptual side *le* is unstressed and sometimes is placed in the word-medial position while *zai* is preverbal and is more salient. On the functional side, *zai* has a predicative homophonous counterpart and while *le* has two different interpretations: perfective and current relevancy. With these different dimensions of concern, investigating the relative difficulties in using *zai* and *le* may allow us to see how form and function interact in the language acquisition process.

II. Method

Subjects

Three groups of children were included in this study: (1) SLI group: it is made up of ten Mandarin-speaking children with SLI who were out-patients of the Taipei City Early Intervention Center. They had been followed for two years in a longitudinal study of a wider scope of investigation. Two sets of data from this group of children were used: Set One (SLI-1) was collected when they were around six (average = 6;2) and Set Two (SLI-2) was collected one year later, when they were about seven ;(2) Age-matched controls: there are ten normally developing children, with a mean age of 6;1; (3) Younger controls: there are ten younger normally developing children, with a mean age of 4;2. The two control groups were recruited from three kindergartens in Taipei. Altogether, there are four sets of data, two from the SLI group and two from the control groups: one age-matched and one younger control. These four sets of data were included so as to perform a four-way comparison: (1) developmental changes within the SLI group, (2) developmental changes between the two control groups, (3) comparisons between the SLI group and age-matched peers and (4) comparisons between the SLI group and the younger controls.

Tasks and Procedure

Four tasks were included for analyses here: (1) Picture-story narratives elicitation, (2)

Comprehension of aspect (3) Word Span and (4) Non-word repetition. Subjects of the SLI group were tested at the Taipei City Early Intervention Center and subjects of the two control groups were tested at their schools. All subjects were tested individually and testing sessions were audio-recorded.

Picture-story Narrative Elicitation Eight sets of four-frame picture series, adopted from Cheung (1998), were used to elicit language samples from the subjects. These pictures depict common daily events such as shopping, going to school. Subjects were asked to tell what they saw and they were prompted with ‘what is the picture about?’ and ‘what’s next?’

Audio-recorded language samples were transcribed and coded for aspect markers and verb types. Three aspect markers: perfective *le*, progressive *zai*, and durative *zhe* were coded. Experiential *guo* is not found in the four sets of language samples so it is not included in the later discussion. Verbs used with these aspect markers were further categorized into six types, following Li and Bowerman (1998):

1. accomplishment – e.g. mai yifu ‘buy clothes’
2. achievement – e.g. bizi diao le ‘cup dropped’
3. activity – e.g. xiao pengyou zai pao ‘a boy is running’
4. mixed telic-stative – e.g. zai chuan qiezi ‘putting on shoes’
5. semelfactive – e.g. ta yizhi tiao ‘he is jumping’
6. stative – e.g. zuo zai shangmian ‘sitting on something’

Comprehension of Aspect (TCL-Aspect) A standardized picture comprehension test, Subtest 4 of Test on Children’s Language (TCL, Chang 1991), was administered to examine children's comprehension of aspect. TCL, which is made up of 21 test items, is a test on children’s receptive grammar. Among them, four items are on aspect: two on the progressive *zai* and two on perfective aspect. The rest of the test taps on other grammatical components such as negation, locative, noun modifier *-de*. The four test items are listed below:

Table 1 Test Items in TCL Targeted at Aspect

10. Baba zai chuan pixie	'daddy is putting on his shoes'
11. Didi zai kai men	'Little brother is opening the door'
15. Mama chi guo fan le	'Mommy has eaten her meal'
16. Baba chuanhao xie le	'Daddy his put on his shoes'

Word Span This task was first used in Cheung (2003) and was adopted here

with a modification on scoring. Subjects were asked to repeat animal names verbatim and the recall had to be in correct order. Test trials began with two names, such as xiao-zhu 'pig', qing-wa 'frog' and once the child passed three out of five trials, the test moved up one level that is made up of one more animal names. The task terminated when the child failed to move up to a higher level. The maximum length of the word list is seven. For each level the child succeeded in repeating names, a score is computed by dividing the number correct attempts by the total attempts. For example, subjects who passed with four trials receive 0.75 point for that level and for subjects passed with three trials, his score is 1.0.

Table 2 Animal Names Used in the Word Span Task

1. xiao-gou 'dog'	5. da-xiong 'bear'	9. shi-zi 'lion'	13. wu-gui 'turtle'
2. xiao-mao 'cat'	6. da-xiang 'elephant'	10. jing-yu 'goldfish'	14. hai-tun 'dolphin'
3. xiao-zhu 'pig'	7. qing-wa 'frog'	11. mu-ni 'cow'	15. ban-ma 'zebra'
4. xiao-niao 'bird'	8. lao-shu 'mouse'	12. hu-die 'butterfly'	16. qi-e 'penguin'

Non-word Repetition This task was adopted from Hu (2003). Subjects were asked to repeat six sets of pseudo-words, each with three bi-syllabic items. The task started with three practice trials. One point is given for each accurate production both in articulation and in position. The maximum score of this task is thirty-six.

Table 3 Pseudo-words used in the Non-word Repetition Task

1. ba2gan, zhaodai2, ku4shang4
2. shangkai2, dao4gai4, zhan2pu3
3. bangzhai4, kandu3, sha4gao3
4. zhan4ta2, shu4gao3, baikong4
5. gashao3, bang4ku3, dan3di
6. shaoga, ban4zhu4, kangdai3

III. Results

Production of aspect markers

The total number of aspect markers produced by the three groups of subjects ranged from 102 to 110. The two sets of data from the SLI group are quit similar, SLI-1 has 110 aspect markers and SLI-2 113, both of which are also close to the six years old controls' 107 aspect markers. When divided by the total number of utterances elicited, approximately 2 aspect markers were used in every 10 utterances in these four sets of data..

Of the three aspect markers examined in this study, *le* is used most frequently, more than 70% of the total. The other two markers, *zhe* and *zai*, are evenly used in two data sets: SLI-2 and NL6. For the other two sets, SLI-1 and NL4, more *zai* is found. Only 3 counts of *zhe* were found in SLI-1 and this uneven pattern of distribution is statistically significant ($\chi^2 = 14.73$, $p < 0.05$).

Table 4 Total Number of Aspect Markers Elicited

	<i>le</i>	<i>zai</i>	<i>zhe</i>	Total	No. Utt.	Asp/utt
SLI-1	98 (89.09%)	9 (8.18%)	3 (2.73%)	110.00	432	0.2546
SLI-2	93 (82.30%)	10 (8.85%)	10 (8.85%)	113.00	446	0.2534
NL4	74 (72.55%)	20 (19.61%)	8 (7.84%)	102.00	414	0.2464
NL6	88 (82.24%)	9 (8.41%)	10 (9.35%)	107.00	475	0.2253

Results on the association of aspect marker type and verb type are shown in Table 5. The perfective marker *le* is frequently used with achievement verbs, more than 50% of the time. The use of progressive *zai* is evenly associated with accomplishment verbs (37.5%) and activity verbs (37.5%). Durative *zhe* is usually used with mixed-telic-state verbs (70%). These patterns of association are observed in all four sets of data. Some unique patterns of use are found in some groups. In SLI-1, progressive *zai* is not used with achievement verbs and durative *zhe* is not used with activity verbs. Besides, in NL6, *zai* is not used with mixed-telic-state verbs. However, these patterns are statistically insignificant. The use of *zai* with achievement verbs in fact is also infrequent in the other three sets of data (SLI-2 = 1; NL4=1 and NL6=2) and a very low percentage of use of *zhe* with activity verbs is also found in NL4.

Table 5 Association of aspect marker type and verb type

		Achievement	Accomplish- ment	activity	mixed-telic- state	state	sub-total
<i>le</i>	SLI-1	55 (56.12%)	13 (13.27%)	16 (16.33%)	14 (14.29%)	0	98
	SLI-2	60 (64.52%)	14 (15.05%)	9 (9.68%)	10 (10.75%)	0	93
	NL4	46 (62.16%)	9 (12.16%)	9 (12.16%)	9 (12.16%)	1 (1.35%)	74
	NL6	50 (56.82%)	5 (5.68%)	14 (15.91%)	19 (21.59%)	0	88
	Total	211(59.77%)	41 (11.61%)	48 (13.60%)	52 (14.73%)	1 (0.28%)	353
<i>zai</i>	SLI-1	0	3 (33.33%)	3 (33.33%)	3 (33.33%)	-	9
	SLI-2	1 (10%)	5 (50%)	3 (30%)	1.00 (10%)	-	10
	NL4	1 (5%)	7 (35%)	8 (40%)	4 (20%)	-	20
	NL6	2 (22.22%)	3 (33.33%)	4 (44.44%)	0	-	9

	Total	4 (8.33%)	18 (37.5%)	18 (37.5%)	8 (16.67%)	-	48
<i>zhe</i>	SLI-1	-	-	0 (0%)	3 (100%)	-	3
	SLI-2	-	-	4 (40%)	6 (60%)	-	10
	NL4	-	-	1 (12.5%)	7 (87.5%)	-	8
	NL6	-	-	3 (30%)	7 (70%)	-	10
	Total			8 (25.8%)	23 (74.2%)	-	31

The use of aspect markers in individual subjects is also examined. From Table 6, we can see that all our subjects used *le* at least once. However, 7 out of 10 subjects in SLI-1 never used *zai* and 8 out of 10 did not use *zhe*. One year later, some progress is found but there are still half of the SLI children failed to do so. Compared with the two control groups, the seven years old SLI subjects (SLI-2) are quit similar to the normally developing four-year-old children.

When the three aspect markers are considered together, six children in SLI-1 used *le* only (see Table 7). One year later, three children remained non-user of *zai* and *zhe*, which is similar to those of the two control groups, each with children used *le* only. Besides, in SLI-1, only one subject used all three aspect markers and three in SLI-2. Four subjects in NL4 and five subjects in NL6 used all three markers.

Table 6 Number of Non-User of the three aspect markers

	<i>Le</i>	<i>zai</i>	<i>zhe</i>
SLI-1	0	7	8
SLI-2	0	5	5
NL4	0	3	5
NL6	0	4	3

Table 7 Types of Aspect Markers Used by Subjects

<i>le</i>	+	+	+	+
<i>zai</i>	-	-	+	+
<i>zhe</i>	-	+	-	+
SLI-1	6	1	2	1
SLI-2	3	2	2	3
NL4	2	1	3	4
NL6	2	2	1	5
Total	13	6	8	13

TCL and the Two Memory Tests

The average score on the comprehension of aspect in TCL (TCL-Aspect) across

the four sets is 2.7. As expected, NL6 has the highest average score, 3.45 and SLI-2 came second, 3.0. SLI-1 and NL4 are the same, 2.7. Statistical analyses revealed that NL6 is significantly higher than the other three sets. No other significant differences were found.

A slightly different developmental picture is obtained when the complete TCL is considered. While NL6 is still the highest (mean score = 19.04), only a small difference is found between NL4 and SLI-2 (NL4 = 15.56; SLI-2 = 16.10). SLI-1 remains the lowest (mean score = 13.8). A one-way ANOVA is conducted and the difference is significant. Post hoc t-tests revealed that the average score of NL6 is significantly higher than the other three sets and SLI-1 is significantly lower than the other three sets. A small difference is found between NL4 and SLI-2 but is insignificant.

Children with SLI performed poorly in the word span task and no significant progress is found in the second year. In SLI-1, the average word span score is 1.8 and in SLI-2 it is 2.25. The word span scores of the two control groups, NL4 and NL6, are 3.25 and 3.85 respectively. Statistical analyses showed that NL6 is better than NL4 and NL4 is better than both SLI-1 and SLI-2. The difference between SLI-1 and SLI-2 is insignificant. Similar pattern of performance is found in non-word repetition. Significant differences are found in the contrast between NL6 (mean = 16.75) and NL4 (mean = 12.11), and in the contrast between NL6 and SLI-1 (mean = 9.89).

Finally, two series of correlation analyses, one for the two control groups and one for the SLI group, were conducted and the focus is on the relation between the use of aspect and memory capacity. Variables examined are: total number of aspect markers elicited, TCL-aspect, TCL and word span and non-word repetition. Results in the control group show that both word span and non-word repetition correlate with TCL-aspect and TCL significantly (word span with TCL aspect: $r = 0.3312$; word span with TCL: $r = 0.4958$; non-word with TCL-aspect: $r = 0.3407$; non-word with TCL: $r = 0.4958$). However, in the SLI group only one moderate correlation is found between word span and TCL ($r = 0.3737$, $p < .05$).

Table 8 Mean Scores on word span, non-word repetition, TCL and TCL-aspect

	Word span	Non-word repetition	TCL-total	TCL-Aspect
SLI-1	1.8 (.61)	9.89 (5.42)	13.8 (2.94)	2.70 (0.95)
SLI-2	2.25 (.41)	14.44 (6.69)	16.1 (1.97)	3.00 (1.05)
NL4	3.25 (.61)	12.11 (5.26)	15.56 (2.31)	2.70 (1.08)
NL6	3.85 (.59)	16.75 (5.81)	19.04 (1.89)	3.45 (0.86)

SLI-1 = SLI-2 < NL4 < NL6	SLI-1 < NL6; NL4 < NL6	SLI-1 < SLI-2 = NL4 < NL6	SLI-1 = SLI-2 = NL4 < NL6
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IV. Discussion and Conclusion

Language samples elicited from the eight sets of picture-story revealed that Mandarin-speaking children with SLI in the first data set were not as productive as their age-peers in using aspect markers, just as reported in Stokes and Fletcher's (2003) study on Cantonese-speaking SLI. In the first data set of the SLI group, more than half of the subjects used *le* as their only aspect marker and only one subject used all three aspect markers. In addition, only three counts of *zhe*, the durative marker, is found and they are all used with mixed-telic-state verbs. As a contrast, in the age-matched control group (NL6), half of the children had three aspect markers, i.e. *le*, *zai* and *zhe* in their aspectual system and only two subjects have only aspect marker. Ten counts of *zhe* were found and they were used with activity verbs and mixed-telic-state verbs.

In the second year data, the SLI group showed some progress: more subjects used all three aspect markers and fewer of them used *le* as the only marker. With such improvement, SLI subjects' performance in SLI-2 resemble to that of NL4, which suggests that the two data sets, SLI-1 and NL6, may stand on the two ends of the same developmental path. Performance of the M-SLI children in SLI-1 is below that of the four years old controls and they moved up to the age four level one year later. Test scores in the sentence comprehension test (TCL) give support to this interpretation: the average score on the receptive grammar in the SLI-1 is 13.8 and one year later (SLI-2) they moved up to 16.1, which is at the same level of the younger controls (mean = 15.65). However, such parallel in developmental growth is not found in the comprehension of aspect. The SIL children did not make any progress in test items focusing on aspect. In other words, the SLI children have an uneven progress in understanding Mandarin grammar. They showed a general growth in grammar, with the comprehension of aspect an exception.

Another exception on the parallel between SLI-2 and NL4 is in their performance in word span. The SLI group started with a low score of 1.80 and they did not make progress large enough in the second year such that their average score is still inferior to the four years old controls (SLI-2 = 2.25 and NL4 = 3.25). This gap suggests that our SLI subjects' performance in using aspect markers may not be directly determined by their processing capacity as measured by word span. If the processing strength in using aspect markers can be reflected in word span, children in SLI-2 should perform as the same level as those in NL4, which, in fact, is not.

Moderate correlations are found between the comprehension of aspect, word span and non-word repetition in the control group but not with the SLI group. This finding further suggests that M-SLI children's difficulties in aspect cannot be accounted for by their concurrent processing capacity limitation.

Finally, it is also interesting to find that between perfective *le* and progressive *zai*, *le* is the most productive one: it is the most frequently used and is used with most types of verb. Besides, all the subjects used *le* to mark aspect in the elicitation task. Based on these findings, it can be concluded perceptual saliency alone does not determine the relative ease of acquisition between *le* and *zai*. However, we also need to beware of possible task-induced effects in these results. The picture-stories used in the elicitation task might bias toward the encoding of completions events and change of state.

To summarize, age-six and age-seven M-SLI children displayed a limited productivity in using aspect markers, which is similar to that reported in Stokes and Fletcher (2003). When compared with controls, the seven-year-old M-SLI children performed at a level comparable to that of the normally developing four-year-olds in most areas, with an exception in comprehension of aspect. Therefore, their difficulties in using aspect markers should not be considered a delay. Besides, the two measures on memory capacity do not show any correlations with the use of aspect markers though M-SLI children's performance in these two tasks is inferior to the two control groups. A more elaborated account of capacity limitation is needed to explain the dissociation between these tasks.

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