

Article

Aspectual Production in Preschool Mandarin-Speaking Autistic Children Plus Language Impairment

Lijun Chen ^{1,2,*}  and Weizhe Qiu ³ ¹ Bilingual Cognition and Development Lab, Center for Linguistics and Applied Linguistics, Guangdong University of Foreign Studies, Guangzhou 510420, China² Faculty of English Language and Culture, Guangdong University of Foreign Studies, Guangzhou 510420, China³ Center for Linguistics and Applied Linguistics, Guangdong University of Foreign Studies, Guangzhou 510420, China* Correspondence: chenlj@gdufs.edu.cn

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Abstract: Aiming to determine whether the linguistic deficits observed in autistic children with language impairment (ALI) represent a qualitative deviance or a quantitative delay in grammatical development, this study adopted a priming picture-description task to examine the production of four Mandarin aspect markers (*zai-*, *-zhe*, *-le*, *-guo*) among 4- to 6-year-old preschool autistic children with ALI (mean age = 5;5 years), with age-matched typically developing (TD) children (mean age = 5;4 years) serving as a control group. The results showed that children with ALI produced significantly fewer utterances with *-zhe* and *-guo* than TD peers, while both groups used *zai-*, *-zhe*, and *-le* far more frequently than *-guo*. Unlike TD children who preferred verb-final *-le*, children with ALI showed a pronounced tendency to use sentence-final *-le* (a developmentally earlier form than the verb-final *-le*). Additionally, children with ALI had a stronger inclination to collocate *-le* with Achievement verbs, which represent the prototypical combinations of aspect markers and verbs. Further correlation analysis indicated that their difficulties in producing *-zhe* and *-guo* were not significantly associated with general language production ability or non-verbal intelligence. All these linguistic features demonstrate that the acquisition of aspect markers in children with ALI is characterized by developmental delay rather than qualitative deviance. This research provides empirical evidence and useful implications for targeted clinical language intervention focusing on aspect markers for Mandarin-speaking children with ALI.

Keywords: Autistic Children with Language Impairment (ALI); Preschool Children; Aspect Markers; Production; Mandarin Chinese

1. Introduction

The core diagnostic features of autistic children include persistent deficits in social communication and interaction, restricted interests, and repetitive behaviors [1]. However, a subgroup of autistic children exhibits comorbid language impairments [2]. Based on language profiles, autistic children can be classified into autistic children with normal language (hereafter ALN) and autistic children with language impairment (hereafter ALI) [3]. Children with ALN demonstrate language abilities comparable to age-matched typically developing (TD) peers, whereas those with ALI show significant language impairment [4]. Prior research indicates difficulties in the production of aspect markers among children with ALI [5]. However, it remains unclear the nature of such difficulties. This

study aims to investigate this issue. Furthermore, the entangled encoding of tense and aspect in Indo-European languages impedes the isolation of pure aspectual acquisition. This methodological challenge necessitates a language in which aspect is grammatically encoded independently of tense. Mandarin Chinese (hereafter Mandarin) meets this criterion, being a quintessential aspect-prominent and tenseless language [6] with overt grammatical aspect markers but no obligatory tense morphology. Given this typological feature, this study investigates the production of aspect markers by Mandarin-speaking children with ALI to advance understanding of the fundamental nature of their aspectual acquisition.

1.1. Aspect Markers in Mandarin

Aspect is a grammatical category that encodes the internal temporal structure or the stage of completion of an event or state, rather than its location in time [7]. According to Smith's two-component theory, aspect includes grammatical aspect (or viewpoint aspect) and lexical aspect (or situation types/Aktionsart) [8]. Grammatical aspect is typically realized through specific morphological or syntactic markers, such as verb inflections, auxiliary verbs, and particles.

The typical aspect markers in Mandarin include *zai-*, *-zhe*, *-le*, and *-guo* [8]. The progressive marker *zai-* denotes ongoing dynamic events [9], as in (1). The durative marker *-zhe* signals the duration of a state or the resultative state of an action/event [10], as in (2). The perfective *-le* manifests two distinct forms: the verb-final *-le* marking event completion, as in (3), and the sentence-final *-le* indicating change-of-state or speaker modality [9]. Crucially, sentence-final *-le* may also encode perfectivity when denoting event completion, as in (4), leading scholars to categorize both *-le* variants as the perfective marker [11,12]. The experiential marker *-guo* references past events or experiences [13], as in (5).

- (1) 张三 在 跑步。
Zhāngsān zài pǎobù.
Zhangsan ZAI run
"Zhangsan is running."
- (2) 小美 穿 着 裙子。
Xiǎoměi chuān-zhe qúnzi.
Xiaomei wear-ZHE skirt
"Xiaomei is wearing a skirt."
- (3) 李四吃 了一个 苹果。
Lǐsì chī-le yí gè píngguǒ.
Lisi eat-LE one CL apple
"Lisi ate an apple."
- (4) 小明 把 杯子打碎 了。
Xiǎomíng bǎ bēizi dǎsuì-le.
Xiaoming BA cup break-LE
"Xiaoming broke the cup."
- (5) 叔叔 坐 过 飞机。
Shūshu zuò-guo fēijī.
uncle sit-GUO airplane
"My uncle has the experience of taking airplane."

Lexical aspect denotes the intrinsic temporal characteristics of a verb or verb phrase [8]. In Mandarin, lexical aspect is conveyed through five distinct categories of verbs, as outlined by Smith [8]. These include Activity verbs (e.g., *changge* "to sing"), State verbs (e.g., *zhidao* "to know"), Accomplishment verbs (e.g., *gai yizuo fangzi* "to build a house"), Achievement verbs (e.g., *dasui* "to shatter"), and Semelfactive verbs (e.g., *diantou* "to nod one's head").

1.2. Acquisition of Aspect Markers in Mandarin-Speaking TD Children

Mandarin-speaking TD children can distinguish the perfective marker *-le* from the progressive marker *zai-* by 30 months [14] and utilize aspectual cues for event recognition akin to adults by age 3 [15]. The acquisition

sequence of the four aspect markers begins with *-le*, followed by *zai-*, *-zhe*, and finally *-guo* [16,17]. Critically, studies by Erbaugh [16] and Li et al. [17] did not distinguish the verb-final and sentence-final *-le*. Empirical comparisons reveal earlier mastery of the sentence-final *-le* (by 1;8) than the verb-final *-le* (2;0–2;3) [18].

The acquisition of aspect markers by TD children follows the Aspect Hypothesis [19]. According to this hypothesis, children initially combine one aspect marker with the type(s) of verbs that require a semantically simple operation and form the prototypical aspect-verb combination, such as past or perfective markers with Achievement verbs before extending them to Activity and State verbs. In languages with progressive aspect, children first associate progressive markers with Activity verbs, later extending them to Accomplishment and Achievement verbs [20]. Mandarin-speaking TD children, in the early stages of aspect marker development, tend to combine the perfective marker *-le* with Achievement verbs, the progressive marker *zai-* with Activity verbs, the durative marker *-zhe* with Activity verbs, and the experiential marker *-guo* with Accomplishment verbs [21] or Activity verbs [17]. This tendency gradually diminishes as children's mastery of aspect markers advances.

1.3. Acquisition of Aspect Markers in Mandarin-Speaking Children with ALI

Diagnosis and interventions are more effective at a younger age [22]. Further, preschool age represents a critical window for aspectual development in TD children, making it particularly informative for examining potential delays or atypical patterns in children with ALI. Therefore, preschool children with ALI were investigated in this study.

Previous studies have found that three- to six-year-old preschool children with ALI demonstrate preserved comprehension of aspect markers [23–25]. However, these children exhibit significant difficulties in the production of Mandarin aspect markers compared to their TD peers and those with ALN [23,26,27].

Chen et al. compared four- to six-year-old children with ALI, children with developmental language disorder (DLD) (Developmental Language Disorder (DLD) is a condition characterized by a distinct profile of language difficulties. These difficulties cause functional impairment in everyday life, are associated with poor prognosis, and the disorder itself occurs without a known biomedical aetiology [28]), and age-matched TD children with a priming picture-description task [26]. The authors found that both the ALI and DLD groups produced lower proportions of target sentences (i.e., sentences with the target aspect marker) than TD children for all the four aspect markers, and children with ALI produced higher proportions of sentences with bare verbs and sentences irrelevant to the task than TD children for these aspect markers. Nevertheless, it is worth noticing that children with ALI (also those with DLD) produced sentences with other aspect markers for *-zhe*, *-le* and *-guo*, and the authors regarded these sentences as non-target responses. The study concluded that while the ALI group shared similarities with the DLD group, and their deficits were attributed to delayed aspectual development itself, rather than the broader temporal processing impairment proposed by Zhou et al. [29].

Chen et al. investigated the production of aspect markers *zai-*, *-zhe* and *-le* by three- to five-year-old children with ALI, those with ALN and their TD peers using a priming picture-description task [23]. The authors divided the participants' responses as target responses and non-target ones, and found that children with ALI produced significantly fewer target responses for *zai-* than children with ALN and TD children, whereas the three groups exhibited similar performance for *-le* and *-zhe*. Nonetheless, intra-group comparisons indicated that children with ALI produced more target responses for *zai-* than for *-le* and *-zhe*. The study concluded that production deficits were specific to children with ALI and linked to their general language abilities, explicitly arguing against pragmatic deficits as the primary cause advocated by Su and Naigles [24].

Chen and Durrleman further explored the production of aspect markers *zai-*, *-zhe*, *-le* and *-guo* with a syntactic priming picture-description task in four- to six-year-old children with ALI compared to age-matched TD children [27]. However, unlike Chen et al. [23,26] in which aspect markers were combined with different types of verbs, all the four aspect markers were combined with Activity verbs by Chen and Durrleman [27]. The results showed that children with ALI produced fewer target responses for all markers than TD children, with the largest gap observed for *-guo*; intra-group analysis revealed that children with ALI produced more target responses for *zai-* and *-zhe* than for *-guo*, mirroring early TD developmental trajectories. The authors concluded that the overall pattern supports a developmental delay account.

The effect of lexical aspect, as predicted by the Aspect Hypothesis, was revealed in all the three studies. Namely, children with ALI tended to produce prototypical verb-aspect combinations. For instance, they combined *-le* more

frequently with Achievement verbs than Accomplishment or Activity verbs, and *zai-* more often with Activity verbs than other types of verbs.

However, although the three studies provide valuable and systematic evidence regarding the production of aspect markers in children with ALI, certain methodological and analytical limitations warrant consideration to further refine our understanding. First, the priming picture-description tasks employed in these studies offer a controlled and direct method for eliciting the production of aspect markers. However, the scoring criterion that categorizes sentences using other aspect markers as an error may be overly stringent. This approach potentially conflates true grammatical deficits with differences in aspectual perspective or pragmatic choice. A child's selection of an alternative marker could reflect a legitimate, though non-prototypical, interpretation of the event's temporal structure (e.g., conceptualizing a pictured completed event as ongoing). Consequently, the scoring method might overestimate grammatical impairments by not distinguishing between inability to use an aspect marker and a different aspectual viewpoint. Second, these studies provide a focused analysis on the verb-final *-le*. Nevertheless, the exclusion of the sentence-final *-le* represents a significant analytical gap. Within Mandarin linguistics, numerous analyses regard the sentence-final *-le* (when it signals completion) as the perfective aspect marker [11, 12]. Therefore, its omission results in an incomplete portrait of aspectual production in children with ALI. Following the precedent of Zhou et al. [29], a unified analysis of the verb-final *-le* and the sentence-final *-le* (when it signals completion) as the perfective marker would offer a more comprehensive assessment.

Addressing the inconsistencies in previous research findings and the aforementioned limitations, and in response to the call for “early detection, early diagnosis, and early intervention”, this study aims to further investigate the production of aspect markers *zai-*, *-zhe*, *-le*, and *-guo* by preschool Mandarin-speaking children with ALI through a priming picture-description task, with comparisons to age-matched TD children. This study seeks to address the following three research questions:

- (1) What are the characteristics of aspectual production in children with ALI compared with TD children? Synthesizing the findings of Chen et al. [26] and Chen and Durrleman [27], it is predicted that, compared to their age-matched TD peers, Mandarin-speaking preschool children with ALI will produce significantly fewer sentences containing any aspect marker.
- (2) What are the characteristics of the combination between aspect markers and different lexical aspect verbs in children with ALI compared with TD children? Based on the Aspect Hypothesis and previous research [26,27], it is predicted that children with ALI will show a stronger tendency to combine aspect markers with prototypical verb types than TD children, and will be less flexible in extending aspect markers to non-prototypical verb types.
- (3) What can be revealed by the performance of children with ALI in aspectual production? The differential performance across the four aspect markers is predicted to shed further light on whether the linguistic deficit in children with ALI is best characterized as a developmental delay or a specific deviance. To be specific, if the proportions across the four markers in children with ALI shows a hierarchy mirroring the early acquisition sequence in TD development, with the greatest difficulty observed for *-guo*, it would provide strong support for a developmental delay account, as suggested by Chen et al. [26] and Chen and Durrleman [27].

2. Methodology

2.1. Participants

Sixteen monolingual Mandarin-speaking children with ALI aged four to six years were recruited from special schools and hospitals, with a confirmed diagnosis of autism by professional therapists based on comprehensive naturalistic observations of children's social communication, interaction, and restricted/repetitive behaviors, as well as detailed caregiver interviews regarding children's developmental history and daily behavioral performance; 16 monolingual Mandarin-speaking age-matched TD children were recruited from regular kindergartens. All the participants' parents signed a consent form on behalf of their children, which was approved by the Medical Ethics Committee of the Xi'an TCM Hospital of Encephalopathy.

The children's non-verbal intelligence was measured using scores from the Wechsler Preschool and Primary Scale of Intelligence-Fourth Edition (Chinese version) [30]. Their language abilities were assessed based on scores

from the Chinese version of the Peabody Picture Vocabulary Test-Revised (PPVT) [31], as well as language comprehension and language production scores from the Rating Scale for Preschool Children with Language Disorder-Revised (for children under 5;11 years old) [32] or the Rating Scale for School Children with Language Disorder-Revised (for children over 6 years old) [33].

For children with ALI, their non-verbal intelligence scores were higher than 79, and at least two of the three language scores were 1.25 standard deviations (SD) below the norm (following Chen et al. [23]). For TD children, their non-verbal intelligence scores were higher than 93, and all three language scores fell within the normal range. Participant information is presented in **Table 1**.

Table 1. Participants basic information.

Group	Gender	Age (M/SD)	PPVT (M/SD)	LC (M/SD)	LP (M/SD)	NVI (M/SD)
ALI	1F	5;5/0;6	54.75/13.92	19.25/4.85	24.98/4.93	92.31/10.38
TD	4F	5;4/0;5	75.75/21.54	32.38/2.47	40.19/2.04	109.38/10.76

Notes: F = female, M = mean, SD = standard deviation, LC/LP = language comprehension/production, NVI = non-verbal intelligence.

Results of independent samples *t*-tests indicated that the two groups were age-matched, $t(30) = 0.383$, $p = 0.704$. However, the ALI group scored significantly lower than the TD group on all three language ability measures: $t_{PPVT}(30) = 3.276$, $p = 0.003$; $t_{\text{language comprehension}}(30) = 9.642$, $p < 0.001$; $t_{\text{language production}}(30) = 11.405$, $p < 0.001$. In addition, the non-verbal intelligence of the ALI group was also significantly lower than that of the TD group, $t(30) = 4.563$, $p < 0.001$.

2.2. Experimental Task

Since autistic children can exhibit the same syntactic priming effect as TD children [34], this study employs a picture description task under the priming paradigm to investigate the production of aspect markers by children with ALI. In this task, the experimenter first describes one picture using a sentence containing the target aspect marker, and then asks the participant to describe another picture with the same event structure.

2.2.1. Materials

Each aspect marker is accompanied by five test items, with each item consisting of a priming part and a target part. All verbs used in this task are Activity verbs, and each verb appears only once in the test items for each aspect marker. Following the studies by Li and Bowerman [19], each picture for the aspect markers *zai-*, *-zhe*, and *-le* comprises two small images: both small images for *zai-* depict an ongoing event (see **Figure 1**, left); both small images for *-zhe* represent the duration of an action or state (see **Figure 1**, middle); the first small image for *-le* shows an ongoing event, and the second depicts a completed event (see **Figure 1**, right).



Figure 1. Examples of the test pictures for *zai-*, *-zhe*, and *-le*.

The experiential aspect marker *-guo* mainly indicates that someone has had the experience of a certain action or event in the past, rather than referring to a specific action or event [35]. Therefore, each test item for *-guo* includes only one picture, and a photo beside the character in the picture indicates the character's past experience (see **Figure 2**).



Figure 2. Example of the test pictures for the aspect marker *-guo*.

In addition to the test items, each aspect marker has one practice item with the same format as the test items, which is not scored. The experimental pictures were presented via PowerPoint on a laptop or tablet.

2.2.2. Procedure

The experiment was conducted individually by the researcher and an assistant in a quiet room. At the beginning of the task, the experimenter explained the requirements: “XXX, let’s play a picture description game. I’ll describe one picture first, and then you describe another. Let’s try it together. Are you ready?”

For each test item, the experimenter first described the priming picture (taking *-le* as an example): “Look, in this picture (pointing to the priming picture with a finger), ‘The little girl drew a picture.’ Now, what about this picture? (pointing to the target picture with a finger)”. In the pilot study, we observed that the participant might perceive the two small images of the large picture for *zai-*, *-le* and *-zhe* as two separate pictures. To resolve this problem, we traced the outline of the large picture to emphasize its integrity when providing instructions to the participant. Additionally, we covered the first small image immediately after the experimenter completed delivering instructions and began awaiting the participant’s behavioral response. Then the participant was expected to describe the target picture using the perfective marker *-le*, such as “The little boy washed his hands.”

The practice item was conducted before the test items for each aspect marker. For the practice items, the experimenter praised them and repeated the target sentence if they produced it; otherwise, the experimenter described the picture with the target sentence. For the practice item of the experiential marker *-guo*, the experimenter first explained the meaning of the photo in the picture: “Look, this photo was taken when the little boy played football last week, so ‘The little boy has the experience of playing football.’ Now, what about this picture?” The participant was expected to describe another similar picture using the experiential marker *-guo*. The experimenter provided only appropriate encouraging remarks and no corrective feedback on the participants’ responses during the formal test. The assistant was responsible for audio-recording the session and documenting the participants’ productions. The entire experiment lasted approximately 15 min.

2.2.3. Data Treatment

After the experiment, the experimenter verified the assistant’s records against the audio recordings. Any discrepancies were resolved by the experimenter and the authors of this study through joint listening to the recordings.

As noted earlier, participants’ use of non-target aspect markers to describe pictures was legitimate interpretation of the event’s temporal structure though it was non-prototypical compared to the use of the target aspect marker. Therefore, the scoring method used in Chen et al. [23,26] and Chen and Durrleman [27] could not distinguish between inability to use an aspect marker and a different aspectual viewpoint. Therefore, unlike these studies which categorized participants’ responses to each aspect marker as either target or non-target, this study collated and categorized the responses of each participant across all four markers into seven types, including sentences using the progressive marker *zai-* (denoted as *zai-* in the following analysis), sentences using the perfective marker *-le* (including verb-final *-le* and sentence-final *-le* that signals event completion; denoted as *-le* in the following analysis), sentences using the durative marker *-zhe* (denoted as *-zhe* in the following analysis), sentences using the experiential marker *-guo* (denoted as *-guo* in the following analysis), sentences with bare verb forms (i.e., sentences with no aspect marker; denoted as *bare verb sentences* in the following analysis), sentences irrelevant to the task (such as descriptions of picture details or personal feelings; denoted as *irrelevant sentences* in the fol-

lowing analysis), and other types of productions (including single nouns and no response; denoted as *others* in the following analysis).

Participants' productions were analyzed from four perspectives. First, the percentage of each type of production relative to the total productions was calculated for each participant, and these percentages were then compared both between and within groups. Second, the production of the verb-final *-le* and the sentence-final *-le* was compared. Third, the types of verbs collocated with each aspect marker were categorized and compared. Fourth, the correlations between participants' performance in the production of aspect markers and overall language production ability as well as non-verbal intelligence was analyzed.

3. Results

Since the data in this study were not normally distributed, as assessed by the Kolmogorov-Smirnov test, non-parametric tests were employed for data analysis using SPSS (version 22).

3.1. Overall Production Patterns

The number of participants producing each response type, along with mean percentages (%) of each response type, is presented in **Table 2**.

Table 2. The number of children and mean percentage (%) for each response type in the production task.

Response Types	ALI		TD	
	N	M/SD	N	M/SD
<i>zai-</i>	16	24.38/6.8	16	25.63/2.5
<i>-le</i>	15	22.19/7.06	16	23.44/3.01
<i>-zhe</i>	16	18.75/6.71	16	24.06/2.02
<i>-guo</i>	10	8.43/8.51	16	23.75/2.24
bare verb sentences	13	11.56/9.61	3	1.25/2.89
irrelevant sentences	11	10.31/11.18	5	1.56/2.39
others	7	4.38/6.29	1	0.31/1.25

Notes: N = the number of children who produced this type of response, bare verb sentences = sentences with bare verb forms, irrelevant sentences = sentences that are irrelevant to the task, others = other types of responses.

The results of the Mann-Whitney U tests indicated no significant differences between the two groups in the production of *zai-*, *-le*, and "others": $U_{zai-} = 119.5, p = 0.752$; $U_{-le} = 127, p = 0.985$; $U_{others} = 78, p = 0.061$. However, the ALI group produced significantly fewer *-zhe* and *-guo* than the TD group: $U_{-zhe} = 64.5, p = 0.015$; $U_{-guo} = 14, p < 0.001$. In contrast, they produced significantly more bare verb sentences and irrelevant sentences than the TD group: $U_{bare\ verb\ sentences} = 36.5, p < 0.001$; $U_{irrelevant\ sentences} = 65, p = 0.017$.

Friedman tests revealed significant differences among the seven production types in the ALI group, $\chi^2(6) = 43.606, p < 0.001$. Post-hoc comparisons showed that children with ALI produced significantly more *zai-*, *-zhe*, and *-le* than *-guo*, bare verb sentences, irrelevant sentences, and others; there were no significant differences between *zai-*, *-zhe*, and *-le*, nor between *-guo*, bare verb sentences, irrelevant sentences, and others. For TD children, significant differences were also observed among the seven production types, $\chi^2(6) = 84.816, p < 0.001$. Post-hoc comparisons indicated that TD children produced significantly more *zai-*, *-zhe*, *-le*, and *-guo* than bare verb sentences, irrelevant sentences, and others; no significant differences were found between the four aspect markers, nor between bare verb sentences, irrelevant sentences, and others.

In summary, inter-group comparisons showed no significant differences between the two groups in the production of *zai-*, *-le*, and others. However, children with ALI produced significantly fewer *-zhe* and *-guo*, but significantly more bare verb sentences and irrelevant sentences than TD children. Intra-group comparisons revealed that children with ALI produced significantly more *zai-*, *-zhe*, and *-le* than *-guo*, bare verb sentences, irrelevant sentences, and others, while TD children produced significantly more *zai-*, *-zhe*, *-le*, and *-guo* than bare verb sentences, irrelevant sentences, and others. Additionally, it is noteworthy that among the 16 children with ALI, one failed to produce *-le*, and 6 failed to produce *-guo*.

3.2. Comparison between the Verb-Final *-le* and the Sentence-Final *-le*

Although there was no significant difference between children with ALI and TD children in the production of the perfective marker *-le*, previous studies have shown that TD children acquire the sentence-final *-le* earlier than the verb-final *-le* [18]. Therefore, this section further compares the proportions of the verb-final *-le* and the sentence-final *-le* in the production of the perfective marker *-le*. The number of children in both groups who produced the verb-final *-le* and the sentence-final *-le*, as well as the proportions of the two variants relative to the total production of the aspect marker *-le*, are presented in **Table 3**.

Table 3. The number of children and mean percentage (%) for the verb-final *-le* and the sentence-final *-le*.

Group	Verb-Final <i>-le</i>		Sentence-Final <i>-le</i>	
	N	M/SD	N	M/SD
ALI	11	36.89/32.36	15	63.11/8.36
TD	16	69.17/32.97	9	30.83/8.24

The results of the Mann-Whitney U tests indicated that children with ALI produced significantly fewer sentences with the verb-final *-le* than TD children, $U = 53$, $p = 0.004$; in contrast, they produced significantly more sentences with the sentence-final *-le* than TD children, $U = 65.5$, $p = 0.017$.

The Wilcoxon tests showed that although the experimental task primed participants to produce the aspect marker *-le* using the verb-final *-le*, there was no significant difference in the proportions of the sentence-final *-le* and the verb-final *-le* produced by children with ALI, $Z = 1.645$, $p = 0.100$; on the contrary, TD children used the verb-final *-le* more frequently than the sentence-final *-le*, $Z = 2.188$, $p = 0.029$.

In summary, although there was no significant difference between children with ALI and TD children in the overall production of the perfective marker *-le*, children with ALI produced a high proportion of the sentence-final *-le* even they were primed with the verb-final *-le*. Additionally, five children with ALI did not produce any sentences with the verb-final *-le*.

3.3. Verbs Combined with the Perfective Marker *-le*

As noted in previous studies, the aspect markers *zai-* and *-zhe* are both combined with Activity verbs in the early stages of children's aspect marker development [17,21], and all verbs in the priming sentences of this study were Activity verbs. Therefore, children's combination of *zai-* and *-zhe* with Activity verbs in their productions cannot reflect the actual combination patterns between these two aspect markers and verbs. Further, the number of children with ALI who produced the experiential marker *-guo* was relatively small, making it unsuitable for analyzing its combination with various verb types. Therefore, this section primarily compares the distributional patterns of how the perfective marker *-le* was combined with different verb types in the productions of the two groups of children.

Children in both groups combined *-le* with Activity, Accomplishment, or State verbs in their productions. The proportions of the three types of verbs combined with *-le* are presented in **Table 4**.

Table 4. The number of children and proportion (%) of verb types combined with *-le*.

Group	ALI		TD	
	N	M/SD	N	M/SD
Activity verbs	6	13.56/20.9	10	42.6/39.98
Accomplishment verbs	3	4.89/10.53	2	4.38/13.15
Achievement verbs	15	81.56/25.37	12	53.02/39.84

Friedman tests indicated that there were significant differences among the three types of verbs combined with *-le* in the productions of children with ALI, $\chi^2(2) = 17.245$, $p < 0.001$. Post-hoc tests revealed that children with ALI produced significantly more sentences with the "Achievement verbs + *-le*" combination than with the "Activity verbs + *-le*" and "Accomplishment verbs + *-le*" combinations. Significant differences were also found among the

three types of verbs combined with *-le* in the productions of TD children, $\chi^2(2) = 11.055, p = 0.004$. Post-hoc tests showed that TD children produced significantly more sentences with the “Activity verbs + *-le*” and “Achievement verbs + *-le*” combinations than with the “Accomplishment verbs + *-le*” combination.

Mann-Whitney U tests demonstrated that children with ALI produced significantly fewer sentences with the “Activity verbs + *-le*” combination than TD children, $U = 74, p = 0.043$. However, no significant differences were observed between the two groups in the production of sentences with the “Achievement verbs + *-le*” combination ($U = 86.5, p = 0.119$) or with the “Accomplishment verbs + *-le*” combination ($U = 121, p = 0.809$).

Therefore, even though Activity verbs were used as primes to elicit children’s production of the aspect marker *-le*, some children in both groups did not combine *-le* with Activity verbs. Furthermore, children with ALI produced significantly fewer sentences with the “Activity verbs + *-le*” combination than TD children and tended to combine *-le* with Achievement verbs.

3.4. Correlation Analysis

Children with ALI showed significantly worse language production ability and non-verbal intelligence than TD children. Therefore, the significantly lower production of *-zhe* and *-guo* in children with ALI might be related to these two indicators. To determine whether there was a correlational relationship between them in children with ALI, Kendall’s correlation test was adopted to examine the associations between the production of *-zhe* and *-guo* by children with ALI, and their language production ability (i.e., the language production scores from the Rating Scale for Preschool/School-Aged Children with Language Disorder-Revised), as well as their non-verbal intelligence (i.e., the non-verbal intelligence scores from the Wechsler Scales). The results of correlation analysis are presented in Table 5.

Table 5. Correlations between ALI’s language production ability, non-verbal intelligence and their performance on *-zhe* and *-guo*.

	<i>-zhe</i>		<i>-guo</i>	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Language production ability	0.289	0.154	0.288	0.147
Non-verbal intelligence	0.048	0.712	0.047	0.815

As can be seen from Table 5, although children with ALI exhibited significantly poorer language production ability and non-verbal intelligence than TD children, there were no significant correlations between their performance in the production of *-zhe* and *-guo* and their language production ability as well as non-verbal intelligence.

The findings of this study are summarized as follows: (1) Children with ALI demonstrated comparable production of *zai-* and *-le* to TD children, but produced significantly fewer *-zhe* and *-guo* than TD children; (2) Intra-group comparisons revealed that children with ALI produced significantly more *zai-*, *-zhe* and *-le* than *-guo*; (3) Although the experimental task used the verb-final *-le* as the prime, children with ALI produced a higher proportion of the sentence-final *-le*, and five of them even failed to produce any sentences with the verb-final *-le* at all; (4) Despite the use of Activity verbs as primes to elicit children’s production of the aspect marker *-le*, both children with ALI and TD children combined *-le* with Achievement verbs and Accomplishment verbs, and children with ALI tended to combine *-le* with Achievement verbs to a great extent; (5) There were no correlations between the poor performance of children with ALI in the production of *-zhe* and *-guo* and their language production ability as well as non-verbal intelligence.

4. Discussion

This study investigated the production of four Mandarin aspect markers (*zai-*, *-zhe*, *-le*, *-guo*) in preschool children with ALI compared to age-matched TD peers using a priming picture-description task. The results revealed several key patterns that provide nuanced insights into the nature of aspectual acquisition in this population. The following discussion integrates these findings with prior literature.

Our findings indicate that while children with ALI produced *zai-* and *-le* at rates comparable to TD children, their production of *-zhe* and *-guo* was significantly reduced. They also produced more bare-verb sentences and irrelevant

sentences. This pattern differs from Chen et al. [26] and Chen and Durrleman [27], as these two studies reported that children with ALI produced fewer target responses (sentences with the target aspect marker) for all markers than their TD peers. Our findings are also partially consistent with Chen et al. [23], which found that children with ALI produced lower proportion of target responses for *zai-* than TD children while show similar performance with TD children on *-le* and *-zhe*. Nevertheless, their intra-group comparisons indicated that children with ALI produced more target responses for *zai-* than for *-le* and *-zhe*.

These discrepant findings between this and previous studies likely stem from a fundamental difference in scoring methodology. Prior studies categorized any use of a non-target aspect marker as an error (non-target response). This approach may overestimate grammatical impairment, as a child's choice of an alternative marker could reflect a legitimate, though non-prototypical, interpretation of the event's temporal structure. Our cross-marker categorization method, which classified all productions based on the actual aspect marker used, provides a more holistic view of their developing aspectual system. Within this framework, the relatively preserved production of *zai-* and *-le* suggests that children with ALI have acquired some productive capacity for grammatically encoding the core concepts of "progressive" and "perfective". Their core difficulties appear more specific to the "durative state" category marked by *-zhe* and the "experiential" category marked by *-guo*. This profile of selective deficit aligns perfectly with a delayed manifestation of the typical acquisition sequence. TD children do not acquire all aspect markers simultaneously but follow a sequence (*-le* > *zai-/zhe* > *-guo*) [16,17]. The performance of these preschool children with ALI in this study could be seen as progressing along this same sequence at a slower pace, making the later-acquired *-zhe* and *-guo* particularly vulnerable at their current developmental stage.

However, one notable inconsistency requires reconciliation. Namely, while the perfective marker *-le* is the first aspect marker to emerge in TD children's linguistic development [16,17], children with ALI demonstrate better performance on the progressive marker *zai-* than on other aspect markers [23,26,27]. This discrepancy may be attributed to the differential effects of language input and the varying morphological salience of distinct aspect markers. Specifically, *-le* is the most frequently occurring aspect marker in spoken Mandarin [36], a distributional feature that likely explains why it emerges earliest in TD children's productive repertoire. In contrast, children with ALI, who present with deficits in communicative skills, may be less susceptible to the effects of ambient language input. Additionally, *zai-*, which carries a falling tone in its canonical pronunciation, exhibits greater morphological salience than the other three markers and is thus more readily retrievable [37].

A critical finding concerns the use of *-le*. Despite being primed with the verb-final *-le*, children with ALI produced a higher proportion of the sentence-final *-le*, and five children failed to produce any verb-final *-le* at all. This pattern directly mirrors the developmental trajectory of TD children, for whom the sentence-final *-le* is acquired earlier than the verb-final *-le* [18]. This result may support the developmental delay account. It demonstrates that children with ALI have grasped the concept of perfectivity, as evidenced by their use of the sentence-final *-le* that signals event completion. Their difficulty would lie in mapping this concept onto the specific syntactic position of verb suffixation. The verb-final *-le* requires tighter syntactic integration, whereas the sentence-final *-le* is more syntactically independent and may be more easily perceived and used by children as a holistic marker of event completion [38]. The preference for the sentence-final *-le* in children with ALI is consistent with an earlier developmental strategy seen in TD children. This suggests that the aspectual deficit in children with ALI might involve a delay in the process of grammatical encoding, rather than a lack or deviance in the underlying aspectual concept.

Our study confirmed the applicability of the Aspect Hypothesis to children with ALI. Despite all primes using Activity verbs, children with ALI showed a stronger tendency to combine *-le* with Achievement verbs and used the "Activity verb + *-le*" combination significantly less than TD children. This finding is consistent with the trends reported by Chen et al. [23,26] and Chen and Durrleman [27], indicating that both children with ALI and TD children rely on prototypical verb-aspect combinations. However, our finer-grained analysis suggests that children with ALI exhibit greater persistence in this reliance. While TD children demonstrated more flexibility in combining *-le* with Activity verbs (though still less than with Achievement verbs), children with ALI were more constrained. This further reinforces the developmental delay explanation. In the early stages of aspect acquisition, children universally depend on semantically transparent, prototypical combinations (e.g., *zai-* + Activity verbs). As development proceeds, they gradually extend aspect markers to verb types requiring more complex semantic operations [20]. The performance of children with ALI indicates they might be lingering in an earlier phase of this extension process, showing slower progression in dissociating aspect markers from their prototypical verb combinations and

achieving more abstract mappings. This is not a deviant pattern but a prolonged typical trajectory.

The lack of significant correlation between the performance of children with ALI on *-zhe* and *-guo* and their general language production ability or non-verbal intelligence is a noteworthy finding. It suggests that their difficulties with these specific markers cannot be solely attributed to their overall language impairment or general cognitive ability. This deficit demonstrates a degree of domain-specificity, being more directly tied to the internal mechanisms and developmental timing of the aspectual system itself. This supports the contention of Chen et al. [26] that the difficulties of children with ALI in producing aspect markers stem from a delay in aspectual development per se, rather than being merely a secondary consequence of broader temporal processing deficits [29] or pragmatic impairments [24]. While overall language ability undoubtedly supports the refinement of grammatical systems, our results indicate that the delay in aspectual acquisition has a relatively distinct profile within the phenotype of children with ALI.

In summary, the collective findings of this study—(1) selective difficulty with later-acquired markers (*-zhe*, *-guo*); (2) preference for a syntactically simpler form (sentence-final *-le*) acquired earlier by TD children; (3) stronger and more protracted adherence to prototypical verb-aspect combinations; and (4) the relative independence of these deficits from general language scores—converge to paint a coherent picture of developmental delay. The aspectual production system of children with ALI may not exhibit fundamental “deviance” from the TD developmental path. Instead, it functions like a “delayed mirror”, reflecting features characteristic of TD children at an earlier developmental stage: an aspectual system under construction but not yet fully elaborated, a clear acquisition sequence, syntactic realization lagging behind conceptual understanding, and a strong reliance on semantically transparent prototypes. Therefore, our findings may support a “delayed” rather than a “deviant” profile of aspectual acquisition in children with ALI. Our findings are consistent with those of Meng et al. [39], which is the first longitudinal research to investigate the developmental patterns of a wide range of Mandarin grammatical markers in autistic children. Their results showed that autistic children’s language development differs quantitatively but not qualitatively from that of typically developing (TD) children, as they acquired grammatical markers in a typical sequence, albeit at a slower rate.

The developmental delay account points to clear directions for clinical intervention. The primary task is to prioritize the most challenging markers, namely *-zhe* and *-guo*, training them within prototypical semantic contexts to solidify their core meanings. Secondly, the well-attested syntactic priming effect in this population [28] can be actively utilized. Structured priming tasks that model the verb-final *-le* can help counteract the observed preference for the sentence-final *-le*. Furthermore, interventions can capitalize on the children’s robust reliance on prototypical verb-aspect combinations (e.g., “Achievement verb + *-le*”). This reliance should be viewed not as a deficit but as a productive starting point from which to carefully extend the use of *-le* to other verb types, such as Activity verbs, by embedding them in contexts where completion is unambiguous.

Several limitations should be acknowledged. First, the sample size was modest; future research with larger cohorts is needed to confirm the robustness of these patterns. Second, while the use of Activity verbs across items controlled for verb type, it limited our ability to fully examine interactions between all aspect markers and the full range of lexical aspect categories. Future studies should incorporate a wider variety of verbs. Third, although the priming task effectively elicited target structures, it may impose additional cognitive demands on children with ALI. Supplementing such tasks with analyses of naturalistic speech samples would provide more ecologically valid data. Fourth, the data were only analyzed quantitatively in this study. Qualitative analysis, such as exploring the types and characteristics of errors in their verb-aspect combination, should be included in future research. Finally, and most critically, the cross-sectional design and the use of age-matched rather than language-matched TD controls limit the strength of the developmental delay interpretation. While the patterns are consistent with delay, we cannot definitively rule out that the observed differences are partly attributable to general language ability rather than a specific, delayed trajectory in aspectual development. Future longitudinal studies that track children with ALI over time and compare them to both age-matched and younger language-matched TD controls would provide the most direct and conclusive test of the developmental delay hypothesis.

5. Conclusions

Employing a refined analytical approach, this study systematically examined the production of aspect markers (*zai-*, *-zhe*, *-le*, *-guo*) in Mandarin-speaking preschool children with ALI. The findings demonstrate that aspectual

acquisition of children with ALI may be characterized by developmental delay rather than deviance since their patterns in the production of aspect markers mirror the early developmental trajectory of TD children. To be specific, they produced fewer later-acquired markers (*-zhe* and *-guo*) but comparable amounts of early-acquired ones (*zai-* and *-le*) to TD peers, preferred developmentally immature variants of *-le* (sentence-final over verb-final), and relied more strongly on prototypical verb-aspect combinations.

In conclusion, this study supports empirically a developmental delay account of aspect marker acquisition in Mandarin-speaking children with ALI. Their challenges primarily reflect a slower pace of development along the typical trajectory, rather than a qualitatively different, deviant path. This finding carries implications for clinical intervention: language training for children with ALI should incorporate developmentally sequenced, targeted input and practice for aspect markers, paying particular attention to later-acquired and more difficult forms (e.g., *-guo*, verb-final *-le*). Intervention can strategically build upon their natural reliance on prototypical combinations while systematically guiding them toward more flexible and abstract aspectual mappings.

Author Contributions

Conceptualization, L.C. and W.Q.; methodology, L.C.; formal analysis, L.C.; investigation, L.C. and W.Q.; resources, W.Q.; data curation, W.Q.; writing—original draft preparation, L.C.; writing—review and editing, W.Q.; visualization, W.Q.; supervision, L.C.; project administration, L.C.; funding acquisition, L.C. Both authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

This study involving human participants was reviewed and approved by the Medical Ethics Committee of Xi'an TCM Hospital of Encephalopathy (protocol code: 西脑伦理 2017-01; January, 6th, 2017).

Informed Consent Statement

Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors upon request, without undue reservation.

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Conflicts of Interest

The authors declare no conflict of interest.

AI Use Statement

During the preparation of this work, the authors used Doubao for English-language polishing. The authors subsequently reviewed and edited the content as necessary and take full responsibility for the final content of the

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