

## The current situation and characteristics of the language ability of hearing-impaired children in China

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### Abstract

The primary school stage is an important period to cultivate language development and basic language ability. Although there are many studies on the reading and writing skills of hearing children, very little research has been conducted on these skills of hearing-impaired children. This study focuses on analysing the current situation and the development characteristics of hearing-impaired children in China. With a sample of 114 hearing-impaired children and a total of 640 hearing children, who were enrolled in the elementary school attached to Hebei Normal University, this study conducted a survey, test and interview. The collected data were analysed using Statistical Package for the Social Sciences and content analysis. The study concluded that the language skills of hearing-impaired children remained at a low level and may not even improve with the rise in grades. Regarding the academic skills of hearing-impaired children, individual differences between hearing-impaired children are large and the academic skills of hearing-impaired children tend to be delayed compared to hearing children.

Keywords: Hearing, hearing ability, language;

## 1. Introduction

Language ability refers to the ability to use language to convey the content of thinking correctly, which is closely related to our learning knowledge. For children, the primary school stage is an important period to cultivate language development and basic language ability (Agabekova, 2017). In elementary schools, formal language education begins, and literacy, vocabulary, grammar and reading are taught at the same time. According to the learning guidelines of Mandarin (Ministry of Education, Culture, Sports, Science and Technology, 2018), the purpose of the Mandarin subject is to develop children's ability to properly express their ideas and language comprehension skills, to strengthen their communication skills, to improve their thinking ability and imagination and to cultivate their respect for the language (Soubhi et al., 2016). Activities used to achieve this goal consist of speaking, listening, writing, reading and other language-related activities.

To develop children's language skills, specific language activities should be based on the stage of children's development (Zakopoulou & Georgiou, 2016). The Chinese language education policy states that the goal of language education is to develop children's ability to accurately use Chinese characters and to cultivate their ability to properly express their ideas through various reading experiences (Ministry of Education of the People's Republic of China, 2011). The development of language ability is emphasised as the core education (Golabi & Hajilou, 2016).

### 1.1. Related studies

In a study on normal schoolchildren's language skills (Tanaka, 2009), a diagnostic survey, consisting of character recognition skills, reading comprehension, appreciation skills, grammatical skills and reading comprehension skills, was conducted. This study shows that, in the elementary school period, hearing children's reading skills are higher than the required levels for their grade/age. For example, first graders' reading skills are at the required level for the first semester of second graders; beginning second graders' reading skills are at the required level for the third semester of second graders; third graders' reading skills are at the required level for the first semester of fourth graders; and beginning fourth graders' reading skills are at the required level for the third semester of fourth graders. The study also shows that hearing children's language skills gradually improve with the rise in grades.

A study conducted in China (Zhang, 2010) shows that acquisition, understanding, memory and processing of language skills are indispensable for the skilful use of language. Reading comprehension is most important in the development of language skills. Reading also improves vocabulary and grammar skills (Kovacs, 2020).

In Japan, Europe and the United States, many studies have been conducted on hearing-impaired children in the above four aspects. The results show that compared with hearing children, hearing-impaired children may have different developmental characteristics (Sulkarnayeva, 2017). These studies contain discoveries about the literacy characteristics of hearing-impaired children. On the other hand, in China, although there are many studies on the reading and writing skills of hearing children, very little research has been conducted on these skills in hearing-impaired children (Orsel & Yavuz, 2017). The language competence of hearing children in China is assessed according to the level specified in China's Compulsory Education Guidelines (Wu et al., 2016). Although the literacy of hearing-impaired children is carried out according to the provisions of compulsory education language guidelines, there is very little research on the language skills of hearing-impaired children and their development status of the above four aspects of language skills is not clear (Kovacs et al., 2021).

### 1.2. Purpose of the study

This study focuses on analysing the current situation and the development characteristics of hearing-impaired children in China. By comparing them with hearing children of the same grade, the language abilities of hearing-impaired children in the four language fields above are analysed; and then,

with the development characteristics of hearing children, as the reference, the language development characteristics of hearing-impaired children are identified.

## **2. Materials and methods**

### *2.1. Participants*

The children who participated in this study were enrolled in special needs schools and regular elementary schools in S City, Hebei Province, China.

#### *2.1.1. Hearing-impaired children*

There were a total of 114 hearing-impaired children in the third, fourth, fifth and sixth grades of the elementary school, who were enrolled in a special needs school in S City, Hebei Province, China, and had no other disabilities besides hearing loss.

#### *2.1.2. Hearing children*

There were a total of 640 children from grades 3, 4, 5 and 6 who were enrolled in the elementary school attached to Hebei Normal University.

### *2.2. Data collection instrument*

This study consisted of a questionnaire that examined individual attributes and a test that assessed the language skills of hearing-impaired children and hearing children.

#### *2.2.1. Survey of personal attributes by questionnaires*

To investigate the individual characteristics of the target children, the interview form attached to the questionnaire was employed with the consent of each school.

#### *2.2.2. Test implementation*

The language test created by the Hebei Provincial Board of Education was conducted for third- to sixth-grade elementary schoolchildren to evaluate the four abilities: literacy, vocabulary, grammar and reading comprehension. The test on the target children lasted for 45 minutes.

### *2.3. Procedure*

#### *2.3.1. Questionnaire*

To investigate individual attributes, the gender, grade and disability of the target children were requested. If they had hearing impairment, they were asked about three more items: (1) hearing level; (2) cochlear implant or hearing-aid wearing status; and (3) communication modes.

#### *2.3.2. Test experiment*

The test consists of four areas: literacy (scoring: 100 points), vocabulary (scoring: 100 points), grammar (scoring: 100 points) and reading comprehension (scoring: 100 points). The total score is 400 points. In the evaluation of language ability, the status and characteristics of language development in hearing-impaired children will be investigated based on the total score of the test and the scores of the above four sub-items.

Literacy, the children's ability to read and write Chinese characters, was investigated. Two types of tasks were used in the research. Task 1 was the task of writing pinyin, which is a phonetic symbol, according to the provided Chinese characters. Task 2 was the task of writing the Chinese characters suitable for the pinyin presented. Due to a large number of homonyms in Chinese, it was investigated whether appropriate Chinese characters could be used to express different meanings according to subjects.

Vocabulary, the children's ability to understand and use the words, was investigated. Three types of tasks were divided by grade for the research. Task 1 for third graders was to present appropriate

words according to the rules of word composition. Task 2 for fourth graders was to provide similar words to the presented words. Task 3 for fifth and sixth graders was to add the missing two words in a four-word idiom. The children's understanding and usage ability of words were investigated through four-character idioms.

Grammar was the children's ability to use grammar correctly. Two types of tasks were employed in the survey. Task 1 was to understand the meaning of phrases and the use of grammar. Task 2 was to make a sentence according to the specified theme. In any case, these two types can ascertain the grammatical proficiency of the target children.

Reading comprehension was the children's ability to understand the texts correctly. The survey method was to read the text and complete the questions according to the content. Through understanding the text, it was ascertained whether the children could appropriately connect words in the text that they do not know and could interpret them according to their own experience, and whether they could understand a story that they had not experienced or could not imagine.

## 2.4. Data analysis

### 2.4.1. Analysis of quantitative data

The Statistical Package for the Social Sciences Statistics 21 statistical programme was employed to analyse the data. The current language development state of the four sub-items of each grade according to the total score for hearing-impaired children will be clarified through comparison with hearing children. The current language development characteristics of the four sub-items of each grade according to the total score for hearing-impaired children will be illustrated as a comparison with hearing children with the rise in grades.

### 2.4.2. Content analysis of qualitative data

The status of the target children's gender, grade, hearing loss, hearing level and hearing-aid wearing (only for hearing-impaired children) on the questionnaire was tabulated. In the language ability of hearing-impaired and hearing children, the subordinate items based on the total score and the four subordinate items of 'literacy', 'vocabulary', 'grammar' and 'reading comprehension' indicate the tendency of responses in each grade. Furthermore, the average value and standard deviation are calculated for each of the four subordinate items by grade. Evaluation points are set for the four sub-items in the language test, with a score of 100 for 'literacy', 100 for 'vocabulary', 100 for 'grammar' and 100 for 'reading comprehension'. The language test examines the differences between hearing-impaired children and hearing children in terms of a total score and four sub-items scores, and the change characteristics in the hearing-impaired children with the rise in grades.

## 3. Results

### 3.1. Participants

The study has 114 hearing-impaired children from grades 3 to 6, of which 78 are boys and 36 are girls. This study also has 640 hearing children from grades 3 to 6, of which 334 are boys and 306 are girls.

Table 1. Participants' information

Grade	Hearing-impaired children		Hearing children	
	Girls	Boys	Girls	Boys
3	7	19	80	80
4	5	21	80	80
5	13	17	80	80

6	11	21	80	80
Total	114		640	

Only hearing-impaired children were asked about hearing levels, cochlear implants and hearing aids.

### 3.1.1. Hearing-impaired children's hearing levels

Among the hearing-impaired children participating in this study, 76.1% (84 children) had severe hearing disorders, 23.7% (27 children) had moderate hearing disorders and 1.8% (3 children) had mild hearing disorders.

### 3.1.2. Usage of hearing equipment

Table 2 shows the usage of hearing equipment and the number of hearing-impaired children. Among them, the number of hearing-impaired children who mainly use cochlear implants is the largest (55 children), accounting for 48.2%. 23 (20.2%) children with hearing impairment wore hearing aids. 34 children (29.8%) used them simultaneously. Two children (1.8%) did not wear any hearing aids at all.

Table 2. Usage of hearing aids

Usage	Kinds of hearing aids	Number	%
Use	Hearing aids	55	48.24
	Cochlear implants	23	20.18
	Both	34	29.82
Not use	—	2	1.76
Total		114	100

### 3.2. Status of language development of hearing-impaired children

To explore the difference in Chinese test scores between hearing-impaired children and hearing children, the Mann–Whitney test was carried out based on the formal evaluation. Regarding language competence and the four language domains, the results are presented in Table 3. The scores on the Chinese language test of hearing-impaired children were significantly lower than those of hearing children ( $p < 0.05$ ), and there were significant differences between hearing-impaired children and hearing children in grades 3–6.

In addition, the Mann–Whitney review was conducted to explore the differences between hearing-impaired children and hearing children in four areas of their Chinese language test, and the results are shown in Table 3. In terms of the total scores, there were significant differences between hearing-impaired children and hearing children in grades 3–6 ( $p < 0.05$ ), and the scores of hearing-impaired children were significantly lower than those of hearing children.

In terms of literacy, the scores of hearing-impaired children and hearing children were significantly different among grades 3–6 ( $p < 0.05$ ). Hearing-impaired children scored lower than hearing children in all grades. In terms of vocabulary, the scores of hearing-impaired children and those of hearing children were significantly different in all grades ( $p < 0.05$ ). The scores of hearing-impaired children were lower than hearing children, and the gap between hearing-impaired children and hearing children kept widening as the grade went up.

In terms of grammar, the scores of hearing-impaired children were significantly lower than those of hearing children, and there were significant differences in grades 3–6 ( $p < 0.05$ ). As for reading,

the scores of hearing-impaired children were lower than those of hearing children, with a significant difference ( $p < 0.05$ ). Particularly in grade 6, the difference in average scores between hearing-impaired children and hearing children was greatest.

### 3.3. Developmental characteristics of language competence in hearing-impaired children

For the total scores of language ability, as shown in Figure 1, one can see that the language ability to hear children improves with the rise in grades. For hearing-impaired children from grades 3 to 4, the trend of improvement is the same as for hearing children; however, for hearing-impaired children from grades 4 to 6, the total test score did not improve with the rise in grades.

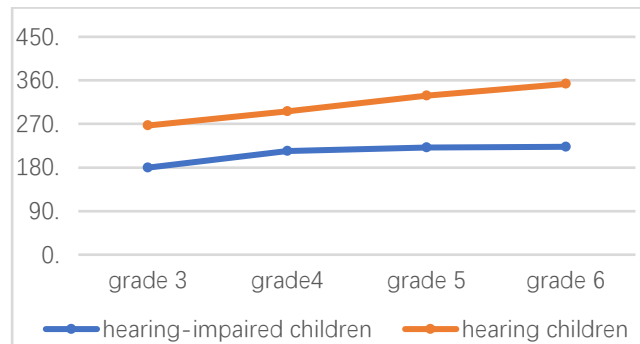


Figure 1. Trends in total scores for children

For literacy, as shown in Figure 2, we can see that with the rise in grades of hearing children show improvement in literacy. For hearing-impaired children, from grades 3 to 4, the trend of improvement is the same as for hearing children; however, from grades 4 to 6, literacy level does not show the same trend of improvement.

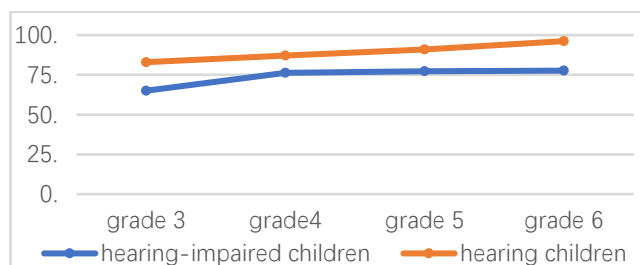


Figure 2. Trends in literacy scores for children

For vocabulary, as shown in Figure 3, with the rise in grades, the vocabulary of hearing children tends to improve. For hearing-impaired children, from grades 3 to 4, vocabulary shows the same trend as hearing children, but from grades 4 to 6, vocabulary does not show the same trend of improvement. For hearing-impaired children, there is a slow developmental tendency from grades 3 to 4, but there is little change after grade 4.

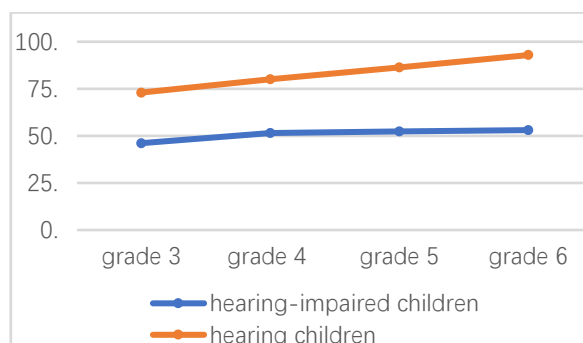


Figure 3. Trends in vocabulary scores for children

For grammar, as shown in Figure 4, with the rise in grades, the score gap between hearing-impaired children and hearing children had become larger. With the rise in grades, hearing children's grammar level had improved, but hearing-impaired children's grammar level did not show improvement. The grammar score of hearing-impaired children was the lowest of the four language areas.

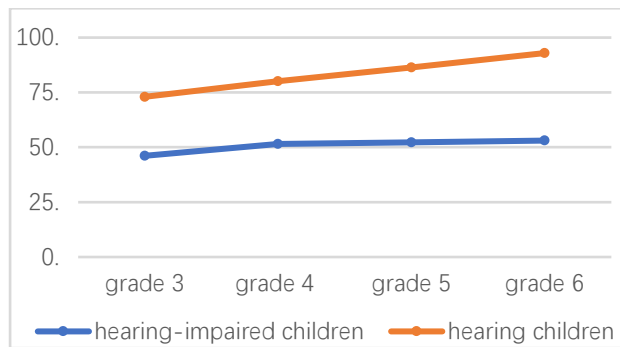


Figure 4. Trends in grammar scores for children

For reading comprehension, as shown in Figure 5, hearing children's reading skill improved with the rise in grades. Hearing-impaired children showed the same development pattern as hearing children from grades 3 to 4, and their reading comprehension ability was constantly improving during this period. However, from grades 4 to 6, hearing-impaired children's reading skills did not improve.

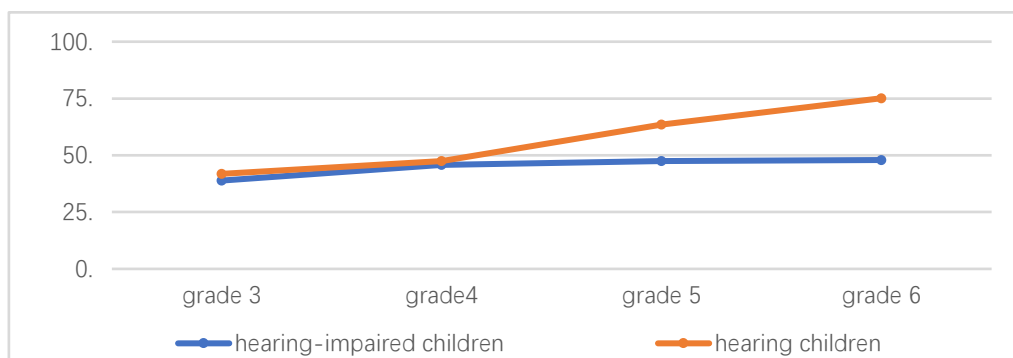


Figure 5. Trends in the reading ability of children

Table 3. Comparison of test scores for hearing-impaired and hearing children

Grade	Participants	N	Literacy (100 points)	Vocabulary (100 points)	Grammar (100 points)	Reading comprehension (100 points)	Total score (400 points)
Grade 3	HI children	27	65.06	46.13	29.76	38.88	179.83
	H children	160	82.98	73.01	69.00	41.84	266.83
	<i>p</i>		0.020*	0.010*	0.032*	0.015*	0.000*
Grade 4	HI children	27	76.37	51.46	40.44	45.73	214.00
	H children	160	87.09	80.05	81.52	47.49	296.15
	<i>p</i>		0.004*	0.005*	0.000*	0.000*	0.030*
Grade 5	HI children	29	77.22	52.32	44.28	47.52	221.34
	H children	160	90.93	86.40	87.64	63.46	328.43
	<i>p</i>		0.001*	0.000*	0.001*	0.000*	0.000*

Grade 6	HI children	31	77.65	53.06	44.28	47.92	222.91
	H children	160	96.21	92.94	88.48	75.12	352.75
	<i>p</i>		0.000*	0.000*	0.000*	0.000*	0.000*

\*  $p < 0.05$ .

HI children: Hearing-impaired children; H children: Hearing children.

## 4. Discussion

### 4.1. Overall language ability

It was shown that the average score of language skills of hearing-impaired children was lower than that of hearing children in all grades. With the rise in grades, hearing-impaired children showed a developmental trend between grades 3 and 4, but they did not show the same developmental trend from grades 4 to 6. The results suggested that, on average, hearing-impaired children had lower language skills than hearing children, and after grade 4, their language skills no longer improved with the rise in grades. The measurement of language skills was based on vocabulary, syntax and morphemes, as was done for hearing children. However, it has been pointed out that the acquisition of typical vocabulary, syntax, and morphemes does not always give the whole picture of the language development of hearing-impaired children (Notoya et al., 1998; Yavas & Yavuz, 2020).

The speed of language development of hearing-impaired children tends to be significantly slower than hearing children. The overall language ability of hearing-impaired children remains at a low level. And there is still a 9-year barrier in the language skills of hearing-impaired children. From the above, it was evident that the speed of development of language ability in hearing-impaired children tends to be significantly delayed compared to that of hearing children, and that the overall language ability of hearing-impaired children is at a low level (Jahangard et al., 2020).

### 4.2. Addressing the four language areas

#### 4.2.1. Literacy

It was shown that the average literacy score of hearing-impaired children was lower than that of hearing children in any grade, and there was no tendency for the literacy score of hearing-impaired children to improve with the rise in grades. The scores of hearing-impaired children in literacy are generally low, and individual differences are large. In 'Vocabulary and Grammar Differences between Deaf and Hearing Children', Takahashi et al. (2017) compared to the difference in literacy between hearing-impaired children and hearing children; and the difference between individual hearing-impaired children was larger. The literacy score of this study agrees with the results of previous studies. There was a big difference between individual hearing-impaired children in the fifth and sixth grades.

#### 4.2.2. Vocabulary

For vocabulary, the scores of hearing-impaired children were lower than those of hearing children, and the difference between hearing-impaired children and hearing children widened as the grade increased. There were large individual differences between hearing-impaired children. A single vocabulary test was conducted to examine the use of the vocabulary of hearing-impaired children (Marschark et al., 2004; Tavoozy & Jelveh, 2019). The result showed that the difference between individual hearing-impaired children's groups was larger than the difference between hearing-impaired children and hearing children. The result of this study is consistent with the results of previous studies.

According to the long-term vocabulary acquisition of hearing-impaired children contained in 'Evaluation of Vocabulary of Hearing-impaired Children by Item Response Analysis' (Yokkaichi et al., 1995), the number of the acquired vocabulary of hearing-impaired children is smaller than that of



hearing children. The study also showed that the vocabulary development of hearing-impaired children is delayed compared with hearing children. Regarding the qualitative aspects of vocabulary for hearing-impaired children, the understanding of the meaning of the vocabulary is ambiguous, especially the meaning of highly abstract vocabulary and vocabulary that is rarely encountered in everyday life. Even for acquired vocabulary, hearing-impaired children's understanding of the meaning is weaker than hearing children's, and hearing-impaired children have difficulty making the connection between vocabularies (Aigerim et al., 2021).

The vocabulary scores in this study support the findings of previous studies. From the responses of hearing-impaired children, hearing-impaired children do poorly on test questions related to four-character idioms and their meanings. In addition, according to 'Relationship between Word Classification Ability and Word Comprehension Ability in Vocabulary Comprehension of Hearing-impaired Children' (Seki et al., 1982), the vocabulary level of hearing-impaired children in middle school is, in general, lower than that of hearing children in higher grades of elementary school. This study also showed that the difference in vocabulary scores between hearing-impaired children and hearing children increased with the rise in grades.

#### 4.2.3. Grammar

In terms of grammar, the scores of hearing-impaired children were significantly lower than those of hearing children. From grades 3 to 4, a developmental tendency was shown in hearing-impaired children's groups, but after grade 4, no developmental tendency was shown in hearing-impaired children's groups. From previous studies on the grammar ability of hearing-impaired children, the percentage of correct sentences is generally lower in hearing-impaired children than in hearing children, and many mistakes can be found in those sentences which were written by hearing-impaired children (Saito et al., 1990).

Katsumata and Sawa (2000) say that it is difficult for hearing-impaired children to acquire basic grammar skills centred on the use of particles and auxiliary verbs, and it is difficult to show growth with age. From the results of this study, there was a greater difference in grammar ability between hearing children and hearing-impaired children. It was also revealed that as the grades increased, hearing-impaired children did not improve their grammar skills. In each grade, problems such as misuse of particles, incorrect word order and lack of syntactic elements were observed in the grammar ability of hearing-impaired children.

#### 4.2.4. Reading comprehension

In terms of reading comprehension, the scores of hearing-impaired children were lower than those of hearing children in all grades. Until now, there have been many reports of experiments and surveys on the ability of hearing-impaired children to understand sentences. This research shows that the ability of reading comprehension of hearing-impaired children remained at grades 3–4. Regarding reading comprehension, due to their lack of grammar knowledge, hearing-impaired children tend to interpret sentences based on their own experience and the meaning of words (Agatsuma, 2000; Theodorou & Meliones, 2019).

Nakano and Sato (1971) and Agatsuma (1983) pointed out that the reading skills of many hearing-impaired children remain at the level of fourth and fifth grades of elementary school. These studies were conducted 30–40 years ago, but it is hard to say that the situation has improved significantly now. This study shows that the average reading comprehension skill of hearing-impaired children corresponds to the grade 4 level of hearing children. The result of this study is consistent with the results of previous studies. The '9-year wall', which is said to be more delayed than hearing children in reading comprehension, still exists. This is a future task for the development of language skills of hearing-impaired children.

## 5. Conclusion

The purpose of this study was to clarify the current development state of language skills of hearing-impaired children by comparing them with those of hearing children. This study shows that the language skills of hearing children improve with the rise in grades but confirmed that the language skills of hearing-impaired children also improve with the rise in grades. Overall, the language skills of hearing-impaired children remained at a low level and may not even improve with the rise in grades.

Regarding the academic skills of hearing-impaired children, individual differences between hearing-impaired children are large and the academic skills of hearing-impaired children tend to be delayed compared to hearing children. The focus of this study is on hearing-impaired children in Shijiazhuang, China; it is not claimed that it is universal for all hearing-impaired children. In addition, it is not claimed that all areas of language skills are covered in our study. In the future, it will be necessary to conduct more research on the development of hearing-impaired children.

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