



# Speech sound production accuracy produced by North Korean defectors' adolescent children born in China

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**Purpose:** Children from North Korean defector families possess different characteristics from children with other multicultural and multilingual backgrounds in Korea, partially due to the fact that the number of children born in third countries is higher than those of children born in North Korea. The purpose of the study is to analyze the word-level speech sound productions of adolescent children of North Korean refugee mothers, primarily through a calculation of speech sound accuracy.

**Methods:** The participants consisted of 11 adolescent children whose mothers were North Korean defectors, and whose fathers were Chinese. Participants' speech sound production skills were assessed using 103 words from the KS-PAPT and U-TAP.

**Results:** Korean defectors' adolescent children have lower consonant accuracy (PCC=79.14%) compared to vowel accuracy (PVC=94.71%). The consonant accuracy of liquid /ㄹ/ was significantly lower than those of other manners of articulation. The consonant accuracy of word-final codas was significantly lower than those of other positions in word.

**Conclusions:** This current research has clinical implications for the assessment and analysis of the speech production abilities of the adolescent children of North Korean refugees.

**Keywords:** speech sound production, migrant youth, North Korean defectors, PCC



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## INTRODUCTION

The growing number of immigrants and foreign workers has led to an increase in the number of linguistic minorities currently residing in Korea [1]. Among them, children from North Korean defector families possess different characteristics from children with other multicultural and multilingual backgrounds in Korea, partially due to the fact that the number of children born in third countries is higher than those of children born in North Korea [2].

Many of the children of North Korean defector families were born and raised in China. They learn Korean as a second language after Chinese, which is established as their first language [3]. When examining second language acquisition, the interference of the first language should be considered, since the errors in the early stage of second language learning reflects the characteristics of the first language [4]. They perceive and articulate Korean phonemes based on the already established Chinese phoneme sys-

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tem, which makes it difficult for them to accurately perceive and articulate Korean, which can lead to communication disorders [5,6].

**Phonological systems of Korean and Chinese**

According to Kim and Shin [7], the syllable structure of Korean is [C0-1]-V-[C0-1] (Table 1). The 18 initial consonants are /p-, p\*-, p<sup>h</sup>-, t-, t\*-, t<sup>h</sup>-, k-, k\*-, k<sup>h</sup>-, m-, n-, s-, s\*-, h-, tɛ-, tɛ\*-, tɛ<sup>h</sup>-, l-/; the 7 vowels are /i, ɛ, a, ʌ, o, u, u/; the 10 diphthongs are /jɛ, ja, jʌ, jo, ju, wi, wɛ, wʌ, uɿ/; and the 7 final consonants are /-p, -t, -k, -l, -m, -n, -ŋ/.

Meanwhile, Chinese has 21 initial consonants, /p-, p<sup>h</sup>-, t-, t<sup>h</sup>-, k-, k<sup>h</sup>-, m-, n-, f-, s-, ɕ-, ʂ-, x-, ts-, ts<sup>h</sup>-, tʂ-, tʂ<sup>h</sup>-, tɕ-, tɕ<sup>h</sup>-, l-, ʅ-/; 9 vowels, /i, u, y, o, A, ə, ə, u, ɤ/; 10 diphthongs, /ae, ei, ao, ow, ia, ie, iu, uo, uA, ye/; 4 triphthongs, /iao, iow, uae, uei/; and 2 final consonants, /-n, -ŋ/ [8].

However, simply analyzing the differences in the phonological systems of the two languages cannot fully explain the nature of the learners' errors. This is because the errors occur not only in different sounds, but also in similar sounds between the phonological systems. For the intervention of speech sound disorders of bilingual speakers, it is necessary to categorize errors that appear in each language population, and to specifically suggest effective intervention programs in order to reduce them.

The purpose of the study is to analyze the word-level speech sound productions of adolescent children of North Korean refugee mothers, primarily through a calculation of speech sound accuracy. It will contribute towards finding an effective way to teach the Korean language to children and adults

whose first language is Chinese.

**METHODS**

**Participants**

The participants consisted of 11 adolescent children whose mothers were North Korean defectors, and whose fathers were Chinese. There were six males and five females. Their primary language was Chinese. They were born in China, lived in China, and then moved to South Korea with their mother. Their chronological ages ranged from 9 to 19 years old. Their period of residence in South Korea ranged from 1 month to 3 years and 6 months, and their period of school education in South Korea ranged from 0 month to 2 years and 9 months. It was reported that they had no problems with hearing, oral structure and function, or cognitive ability from their parents or school teachers (Table 2).

**Tools and Procedures**

Participants' speech sound production skills were assessed using 103 words from the Korean Standard Picture of Articulation and Phonological Test (KS-PAPT) [9] and the Urimal Test of Articulation and Phonation (U-TAP) [10]. The KS-PAPT contains a total of 75 words. The U-TAP contains a total of 30 words (The words /k\*ori/ ('tale' in Korean) and /tɕɛktɕɛk/ ('tweet' in Korean) were included in both tests and tested once). The KS-PAPT allows for the phonological assessment of children aged 3 to 6 years old, and the U-TAP allows for the phonological assessment of children aged 2 to 6 years old. Both tests are used to assess children's speech sound produc-

**Table 1.** Phonological Systems of Korean and Chinese

	Korean	Chinese (Putonghua)
Initial consonants	p p* p <sup>h</sup> t t* t <sup>h</sup> k k* k <sup>h</sup> s, s*, h tɛ tɛ* tɛ <sup>h</sup> m n l	p p <sup>h</sup> t t <sup>h</sup> k k <sup>h</sup> f s ɕ ʂ x ts ts <sup>h</sup> tʂ tʂ <sup>h</sup> tɕ tɕ <sup>h</sup> m n l ʅ
Final consonants	p t k l m n ŋ	n ŋ
Vowels	i ɛ a ʌ o u jɛ ja jʌ jo ju wi wɛ wʌ uɿ	i u y o A ə ə u ɤ ae ei ao ow ia ie iu uo uA ye iao iow uae uei
Syllable structures	[C0-1]-V-[C0-1]	[C0-1]-V-[C0-1]
Tones	N/A	high level, high rise, falling-rising, high falling, neutral

**Table 2.** Participants information

Participant	Age	Residence period	Education period	Gender	Parent nationality	
					Mother	Father
1	18;5	3;6	2;4	M	China	North Korea
2	17;10	2;11	1;2	M	China	North Korea
3	16;6	2;9	2;9	M	China	North Korea
4	10;8	2;8	2;8	M	China	North Korea
5	17;1	2;8	2;1	F	China	North Korea
6	17;2	2;2	2;1	M	China	North Korea
7	19;0	2;2	2;2	F	China	North Korea
8	15;7	1;11	1;6	M	China	North Korea
9	17;9	1;1	0;8	F	China	North Korea
10	12;8	0;9	0;8	F	China	North Korea
11	9;0	0;1	0	F	China	North Korea

tion and provide normative data for the percentage of correct consonants (PCC).

**Data analysis**

The participants' speech sound accuracy was analyzed. The PCCs and the Percentage of Vowels Correct (PVCs) of 11 adolescent children of North Korean refugee mother were analyzed in total, and thereafter, the speech sound accuracy was further investigated according to the position in word and the place and manner of articulation.

The paired sample t-test was performed to compare the speech sound production accuracy according to the position in word and the place and manner of articulation.

**RESULTS**

**Percentage of consonants and vowels correct**

First, the PCCs and the PVCs of 11 adolescent children of North Korean refugee mothers were analyzed in total. The mean of PCCs of 11 adolescent children of North Korean refugee mothers was 79.14 (SD=9.69) (Table 3). Their PCCs ranged from 64.46 to 95.18. The mean of PVCs of 11 adolescent children North Korean refugee mothers was 94.71 (SD=10.15). Their PVCs ranged from 65.38 to 100. The results of the paired sample t-test show that the mean of PVCs was significantly higher than those of PCCs ( $t=5.386, p=0.000$ ). However, the range of PVCs among participants was as large as that of PCCs.

**Speech production accuracy according to place of articulation**

Next, the speech production accuracy was analyzed according to place of articulation: The average accuracy of bilabial production was 78.44 (SD=11.33); the average accuracy of alveolar production was 79.62 (SD=9.93); the average accuracy of alveolo-palatal production was 73.03 (SD=16.52); the average accuracy of velars production was 78.45 (SD=11.85); and the average accuracy of glottal production was 97.40 (SD=5.78) (Table 4). The results of the paired sample t-test show that the mean of the accuracy of glottal production was significantly higher than those of bilabials ( $t=5.796, p=0.000$ ), those of al-

**Table 3.** Percentage of consonants and vowels correct

Measures	Mean	SD	Range
PCC	79.14	9.69	64.46–95.18
PVC	94.71	10.15	65.38–100

veolars ( $t=6.413, p=0.000$ ), those of alveolo-palatals ( $t=4.598, p=0.001$ ) and those of velars ( $t=7.006, p=0.000$ ).

**Speech production accuracy according to manner of articulation**

Afterwards, the speech production accuracy was analyzed according to the manner of articulation: The average accuracy of plosive production was 80.68 (SD=9.24); the average accuracy of fricative production was 78.79 (SD=10.29); the average accuracy of affricates production was 75.40 (SD=13.62); the average accuracy of nasal production was 83.85 (SD=13.50); and the average accuracy of liquid production was 66.12 (SD=20.10) (Table 5). The results of the paired sample t-test shows that the mean of the accuracy of liquid production was significantly lower than those of plosives ( $t=3.548, p=0.005$ ) and those of nasals ( $t=2.783, p=0.019$ ).

**Speech production accuracy according to position in word**

Lastly, the speech production accuracy was analyzed according to the position in the word: The average accuracy of word-initial onsets production was 87.52 (SD=7.35); the average accuracy of word-medial onsets production was 84.05 (SD=5.99); the average accuracy of word-medial codas production was 78.65 (SD=19.08); and the average accuracy of word-final codas production was 58.21 (SD=21.87) (Table 6). The results of the paired sample t-test shows that the mean of the accuracy of word-final codas production was significantly lower than those of word-initial onsets ( $t=5.327, p=0.000$ ), those of word-medial onsets ( $t=4.491, p=0.001$ ) and those of word-

**Table 4.** Speech production accuracy (%) according to place of articulation

Measures	Mean	SD	Range
Bilabial accuracy	78.44	11.33	65.85–97.56
Alveolar accuracy	79.62	9.93	64.71–97.06
Alveolo-palatal accuracy	73.03	16.52	44.44–94.12
Velars accuracy	78.45	11.85	60.61–93.94
Glottal accuracy	97.40	5.78	85.71–100.00

**Table 5.** Speech production accuracy (%) according to manner of articulation

Measures	Mean	SD	Range
Plosive accuracy	80.68	9.24	66.25–97.50
Fricative accuracy	78.79	10.29	61.90–95.24
Affricates accuracy	75.40	13.62	47.06–94.12
Nasal accuracy	83.85	13.50	54.29–100.00
Liquid accuracy	66.12	20.10	30.77–100.00

**Table 6.** Speech production accuracy (%) according to position in word

Measures	Mean	SD	Range
Word-initial onset accuracy	87.52	7.35	79.10–98.51
Word-medial onset accuracy	84.05	5.99	73.58–92.45
Word-medial coda accuracy	78.65	19.08	47.37–100.00
Word-final coda accuracy	58.21	21.87	33.33–96.30

medial codas ( $t=3.903, p=0.003$ ).

## DISCUSSION

When working with multicultural children with speech sound disorders, it is necessary to classify the speech sound errors in which the L1 interference phenomenon is prominent and to develop systematic and effective intervention programs for them. This study aimed to explore the word-level speech production accuracy of the adolescent children of North Korean defectors born in China. We analyzed participants' speech sound accuracy from their productions of 103 words from KS-PAPT and U-TAP.

First, the PCCs and the PVCs of 11 adolescent children of North Korean refugee mothers were analyzed in total. The analysis presented in this study highlights that North Korean defectors' adolescent children have lower consonant accuracy (PCC=79.14%) compared to vowel accuracy (PVC=94.71%). Considering that they learned Korean as a foreign language before entering Korea, the PCC of 79% was lower than we expected. According to [11], a PCC of 79% indicates a mild-moderate disorder. These research results are consistent with previous studies that Chinese speakers learning Korean experience greater difficulties in consonants as opposed to vowels.

Although the overall mean of PVCs was higher than that of PCCs, the range of PVCs among 11 participants was as wide as that of PCCs. This findings suggests that vowel production should not be overlooked when exploring the speech sound accuracy in children from multilingual backgrounds.

Then, the speech production accuracy was further investigated according to place and manner of articulation and position in word. As a result of examining the speech production accuracy according to the place of articulation, the accuracy of the glottal / ㅎ / was significantly higher than those of other places of articulation. Except for the glottal sound, there was no significant difference in speech production accuracy according to place of articulation.

As a result of examining the speech production accuracy

according to manner of articulation, the consonant accuracy of liquids / ㄹ / was significantly lower than those of other manners of articulation. For Chinese speakers learning Korean, Korean liquid is difficult to pronounce because the two languages have different phonological systems. Korean liquid has two allophones: flap [r] and lateral [l] whereas Chinese liquid is separated to two phonemes: retroflex [ʀ] and dental [l] [12].

The influence of first language was also shown in the speech production accuracy according to the position in word. The consonant accuracy of word final codas was significantly lower than those of other positions in word. Korean final consonants are not easily recognizable compared to initial consonants because they are unreleased. It is more difficult for Chinese learners to perceive them because Chinese does not have a closing consonant ending. As in Chinese only /n/ and /ŋ/ can come at the end of a syllable, Chinese learners tend to omit or substitute the Korean final consonants [13,14].

This study provides an initial reference for the word-level speech production accuracy produced by North Korean defectors' adolescent children born in China. The study had a small sample size and did not include direct control groups. In follow-up studies, it is necessary to analyze the speech sound error patterns.

The basic purpose of speech rehabilitation is communication, and accurate pronunciation is important for good communication. This current research has clinical implications for the assessment and analysis of the speech production abilities of the adolescent children of North Korean refugees. To clinicians, it is important to identify significant speech sound production patterns in second language learners. Understanding the phonology of their native language would be helpful to differentiate patterns associated with speech differences with speech disorders.

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