The Current Status of ㅢ in Seoul Korean: Monopthongization in Progress
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The Current Status of *ɨi* in Seoul Korean: monophthongization in progress*

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1. Introduction

Late Middle Korean had six falling diphthongs: *ɨ y*, *ǝy*, *ay*, *uy*, *oy*, and *ʌy*. Of these, five have monophthongized. The diphthong *ɨ y*, or to be more exact, the current form of the Late Middle Korean diphthong *ɨ y*, is the only remaining one in contemporary Seoul Korean. The current form of the Late Middle Korean diphthong *ɨy* can have two different diphthongal realizations. In word-initial position, it tends to be realized as [ɨi], but [ɨ̯i] is the form when the diphthong occurs in non-word-initial position (cf. Y.C. Chung 1991). I, thus, represent this diphthong as *ɨi*.

Researchers have suggested that *ɨi* is also going through a change following the other falling diphthongs. One extreme claim is made by Kim (1976), who argued that this diphthong has completely monophthongized and is not present in Korean any more. Chung (1991) and Kim-Renaud (1986) also observe that *ɨi* is very often produced as a monophthong and suggest that in some phonological contexts, the underlying form may not be *ɨi* any longer.

In consideration of these suggestions the present paper examines the current status of *ɨi* in Seoul Korean. This paper shows based on quantitative evidence that the diphthong is undergoing a monophthongization change in one phonological environment, and that it has already gone through monophthongization changes in the other phonological (or morphological) contexts. An attempt is also made to provide phonetic and structural explanations of these changes.

The organization of this paper is as follows: in sections 2 and 3 some relevant information on the monophthongization of *ɨi* is provided; in section 4 the methodology of this study is introduced; in sections 5 and 6 the results of the statistical (Varbrul) analyses of the data are provided and discussed; in section 7 phonetic and phonological accounts of the monophthongization of *ɨi* are provided. This section is followed by concluding remarks in section 8.

2. Background

Seoul Korean had the falling diphthongs shown in (1) in the 15th century. Though some scholars suggest that Seoul Korean also had the diphthong *i y* in this period, it is a minority opinion.

(1) Falling diphthongs of Late Middle Korean (15C)

[-bk]	[+bk]	
(iy)	ɨy	uy
	ǝy	oy
	ay	ʌy

Following Hong (1988) and Park (1992), this study assumes that present-day Seoul Korean has the monophthongal system shown in (2). That is, it is assumed that vowel *ɛ* has merged with *e* and that *ü* and *ø* have monophthongized to *wi* and *we*, respectively.

(2) Monophthongs of Seoul Korean

[-bk]	[+bk]	
i	ɨ	u
e	ə	o
	a	

Present-day Seoul Korean has the diphthongs shown in (3); they are all rising diphthongs except *ɨi* . The starred sequences indicate those that are not allowed in contemporary Seoul Korean.

(3) Diphthongs of Seoul Korean

a) *w* diphthongs

wi	*wɨ	*wu
we	wə	*wo
	wa	

b) *y* diphthongs

*yi	*yɨ	yu
ye	yə	yo
	ya	

c) isolated diphthong: ɨi

3. The change of Middle Korean diphthong *ɨ y* in different dialects of Korean

Though Seoul Korean still retains it, middle Korean diphthong *ɨ y* has already monophthongized in some dialects of Korean. In the Chunla dialect the diphthong changed to *ɨ* in all phonological and morphological contexts. In the Kyongsang dialect it changed to *i*, with the exception of the possessive marker *ɨ y*, which changed to *e*. In the Phyongan dialect, *ɨ y* changed to *i* or *u* in post-consonantal position and to *i* or *ɨ* non-post-consonantally, and the possessive marker *ɨ y* changed to *e*. However, it is reported that Kangwon and Chungchung dialects still retain this diphthong, as is the case with the Seoul dialect.

In the Seoul dialect *ɨi* shows extreme variation. This diphthong is very often produced as a monophthong. Also different monophthongs alternate with *ɨi* . Different patterns of variation are observed in three distinct phonological environments. There are two important constraining linguistic factors: 1) presence of the preceding consonant, 2) syllable position within the word, 3) morphological status of *ɨi* , i.e., whether *ɨi* is a possessive marker or not. When *ɨi* is preceded by a consonant, there is variation between [i] and [ɨ̯i], [i] dominating the variation. When there is no preceding consonant, syllable position is an important constraint: in word-initial syllable variation between [ɨ̯i] and [ɨ] are visible; in a non-word-initial syllable [i] and [ɨ̯i] alternate, [i] again dominating the variation. One exception to this generalization is the possessive marker *ɨi* , which shows variation between [e] and [ɨ̯i], the former being the dominant variant.

4. Methods

4.1. data

The data were collected during my fieldwork in Seoul, Korea in the summer of 1994 and the winter to early Spring of 1995. Recordings were made from some 60 Seoul Korean speakers stratified by age, social status and sex. There were 3 age groups, 3 social status groups and 2 gender groups, making 18 cell groups. Four different styles of speech were elicited — two styles of spontaneous speech: in-group speech and interview speech; and two styles of read speech: sentence reading and word-list reading.

4.2. Preliminary analysis

As introduced earlier, variation involving the diphthong *ɨi* in Seoul Korean is subject to the following constraints: whether there is a consonant preceding the diphthong, whether the diphthong appears in a word-initial or non-word-initial syllable, and whether *ɨi* is a possessive marker or not.

Considering previous suggestions (e.g., Chung 1991 and Kim-Renaud 1987), the first issue to settle is whether *ɨi* is still the underlying form in all these phonological and morphological contexts. As the first step towards settling this issue, a preliminary statistical analysis was conducted. The data was examined to check which vowel is now produced by Seoul Korean speakers in the environments where the diphthong *ɨi* would have appeared before the beginning of monophthongization (i.e., in the environments where the orthographic form *ɨi* is used in the written language of present-day Korean). The results of this preliminary analysis are given in (4).

(4) ♦post-consonantally (e.g., *hɨi mang* 'hope')

	ɨi	*i*	*N*	Assumed U.R.
ingroup	1(2%)	42(98%)	43	
interview	1(1%)	100(99%)	101	/i/
sentence reading	40(18%)	183(82%)	223	
word reading	126(72%)	49(28%)	175	

♦non-post-consonantally

•word-initial syllable (e.g., *ɨi ca* 'chair')

	ɨi	*i*	*N*	U.R.
ingroup	7(44%)	9(56%)	16	
interview	57(54%)	49(46%)	106	/ɨi/
sentence reading	212(58%)	153(42%)	365	
word reading	253(72%)	96(28%)	349	

•non-word-initial syllable (e.g., *cuɨi* 'caution')

	ɨi	*i*	*N*	U.R.
ingroup	0(0%)	29(100%)	29	
interview	9(3%)	252(97%)	261	/i/
sentence reading	27(11%)	208(89%)	235	
word reading	159(64%)	88(36%)	247	

♦as a possessive marker (e.g., *na-ɨi* 'my (*I*+Pos)')

	i	*e*	*N*	U.R.
ingroup	1(6%)	17(94%)	18	
interview	4(3%)	140(97%)	144	/e/
sentence reading	224(27%)	610(73%)	834	
phrase reading	99(29%)	237(71%)	336	

One important factor that needs to be considered is the characteristics of the orthographic system of Korean called *hankul*. *Hankul* was invented in the 15th century modeling the actual pronunciations of the then Seoul Koreans (cf. C.S. Lee 1994:261). This writing system was faithful to the speakers' (presumed) actual productions especially in its representation of vowels. There is, accordingly, general agreement among researchers that the present discrepancies between the spellings and the actual pronunciations of Korean vowels are due to linguistic change.

One of the upshots of the property of the Korean spelling system being faithful to actual pronunciations is that 'spelling pronunciation' can easily occur unlike in other languages. The results given in (4) first reveal that there is a radical difference between spontaneous (conversational) and read speech in the speakers' production. Since we are examining the phonemic status of *ɨi* in different environments, it should naturally be the case that our assessment of the underlying form be based on spontaneous speech, not read speech, because the latter is not a true reflection of the phonological system native to the speakers. Thus here read speech, where spelling pronunciation is dominant, is not considered in the assessment of the underlying form in each environment.

Let us then take a look at the results of the preliminary analysis more closely and consider what these results suggest. First, the results can be taken to suggest that *ɨi* has (nearly) monophthongized to *i* in the post-consonantal environment. [i] was the dominating variant in this context: 99 percent (142/144) of the tokens found in spontaneous (ingroup + interview) speech were realized as [i]. Only two tokens were produced as a diphthongal variant. The results also suggest that non-post-consonantal *ɨi* has also (nearly) monophthongized to *i* when it appears in a non-word-initial syllable. *i* occurs in this environment 97 percent (281/290) of the tokens found in spontaneous speech. Actually *ɨi* may have gone through one and the same change (not two separate changes) in these environments, where non-word-initial *ɨi* has changed to *i*. (Note that post-consonantal *ɨi* is always non-word-initial *ɨi* .) The possessive marker *ɨi* , which always appears in a non-word-initial position, seems to have taken a different path of change. The results indicate that Seoul Korean speakers now almost categorically (97% (157/162)) use the form [e] instead of the diphthongal variant as the possessive marker.

However, there is one phonological environment where there is a strong competition between the diphthongal variant and [ɨ]. It is word-initial position (or non-post-consonantal position in a word-initial syllable). In this context [ɨi] occurs in 52% (64/122) of the tokens found in spontaneous speech. From a diachronic point of view, this result indicates that Seoul Korean still retains the diphthong *ɨi* in this environment.

In sum, the results given in (4) can be interpreted as follows: *ɨi* has changed to *i* when it is neither a word-initial vowel nor a possessive marker, to *e* when it is used as a possessive marker, but still remains an underlying diphthong in word-initial position. The above quantitative results support C.S. Lee's (1994) suggestion

that ⁀ii remains a diphthong only in word-initial position. Based on the results shown in (4), I assume in this study that underlying ⁀ii is present in Seoul Korean only in word-initial position and that ⁀ii has already monophthongized in the other phonological or morphological contexts. The focus of this paper will be the variation between [i] and [i͡i] in word-initial position.

(5)

Variable	Variants
(⁀ii$_i$)	[i] ~ [i͡i]

(NB. Subscript 'i' refers to 'word-initial'.)

4.3. Variable rule analysis of (⁀ii$_i$)

The judgement of the variants of the variable (⁀ii$_i$) was made twice: at the time of the transcriptions and before the statistical analysis. Each token was judged as one of the two variants of the variable. Another Seoul Korean speaker independently judged one hundred tokens of this variable. Her judgements and mine showed a high degree of agreement. There was 91 percent of agreement between her judgements and mine. Unread and misread potential tokens were excluded from the analysis. This study is based on 836 tokens of the variable (⁀ii$_i$).

The tokens of (⁀ii$_i$) were subject to Varbrul analysis (Ivarb version 2.3. Pintzuk 1988). The factor groups listed in (6) were considered in the analysis of the variable (⁀ii$_i$). Only external constraints (see Kang 1997 for a detailed discussion of the division of external factor groups into their factors) were considered in this analysis, since no linguistic constraints were predicted to play a significant role in the alternation of the two variants of (⁀ii$_i$).

(6) Factor groups considered in the variable rule analysis of (⁀ii$_i$)

Factor groups	Factors
1. speech style	ingroup, interview, sentence reading, word-list reading
2. gender	male, female
3. social status	upper, middle, lower
4. age	16-25, 26-45, 46 or older

5. Results

The results of the Varbrul analysis of the tokens of (⁀ii$_i$) are given in (7). In the table the percentage of application indicates the percentage of the monophthongal variant, i.e., [i], among the tokens. Three factor groups, 'speech style', 'social status', and 'age' were selected as significant in the variation being discussed. The speakers produced the monophthongal variant clearly more often in more casual speech than more formal speech. Also the frequency of monophthongal production showed a linear relationship with both the social status and age scales. The rate of monophthongal production showed an increase towards the lower end of both these scales. However, 'gender' was not chosen as a significant constraint, suggesting that the two gender groups did not show a significant difference in their behavior toward this variable.

(7) Goldvarb probabilities for factors for (i͡i)

Factor groups	Factors	Weight	% Applications	Total N
*Speech Style	ingroup	0.70	56	16
	interview	0.63	46	106
	sentence R	0.56	42	365
	word list R	0.39	28	349
Gender	male	0.52	39	427
	female	0.48	34	409
*Social Status	upper	0.43	30	293
	middle	0.51	38	306
	lower	0.57	44	237
*Age	16-25	0.58	43	263
	26-45	0.52	39	268
	46+	0.41	29	305

Input = 0.36, loglikelihood = -523.473
Total chi-square = 77.392, Chi-square/cell = 1.248

* The starred factor groups indicate those selected as significant in the stepwise regression analysis.

6. Discussion

The results given in (7) can be taken as suggesting that *i͡i* is currently going through monophthongization in word-initial position. Both age group and social class distribution of the two variants of the variable (i͡i) exhibit the patterns that can be typically observed in phonological changes in progress. The fact that the diphthongal, not monophthongal, variant (i.e., *i͡i*) is orthographically represented by the spelling can be taken as additional evidence supporting the claim that the diphthong is now monophthongizing. (The Korean orthographic system was invented, as mentioned earlier, modeling the actual pronunciations of the 15C Seoul Korean speakers.) The two variants seem to be in close competition with each other. In spontaneous speech, the diphthongal and the monophthongal variants occur about 52% and 48% of the time, respectively. This result suggests that the diphthong *i͡i* is still present in Seoul Korean as an underlying vowel (despite its limited phonological distribution), refuting some researchers (e.g., Kim 1976) claim that the diphthong has completely monophthongized.

7. Possible explanations

In this section an attempt is made to provide explanations of the monophthongization change of the diphthong *i͡i* . First, I claim that acoustic/ perceptual factors have played a significant role in this change. Second, I adduce structural pressure as another factor that motivates the monophthongization of *i͡i* , the only remnant of the six Late Middle Korean falling diphthongs.

7.1. A phonetic explanation

Phonetically diphthongs are defined as vowel-like sequences that cannot be characterized by a single vocal tract shape or by a single formant pattern (Kent and Read 1992, Laver 1994). The diphthongal sequence is normally considered as consisting of two components: 'glide + vowel' or 'vowel + glide'. (Phoneticians also use the term 'onglide' or 'onset' to refer to the first part of the diphthong and the term 'offglide' or 'offset' to refer to the second part ' (Peters 1991).)

Previous studies (e.g., Fox 1983) showed that the perception of diphthongs are crucially dependent on the first two formants of the vocoid sequences like in the perception of monophthongs. What is noteworthy is that languages prefer a certain type of diphthongal sequences than others. According to Lindau, Norlin and Svantesson (1990), diphthongs occur in about one third of the world's languages. Diphthongs of the *ay*-type occur in 75 percent of these languages and the *aw*-type occur in about 65 percent. Similar findings are reported by Kawasaki (1982) and Eström (1971). What these findings suggest is that languages prefer those diphthongs whose onset and offset are maximally (or sufficiently) different perceptually and in sonority, as Lindblom (1986) suggests.

The diphthongs of Seoul Korean do not seem to be an exception to this tendency of the world's languages. As shown in (3b), the sequence *yi*, whose onset and offset are least perceptually and acoustically distinct, is not allowed in Seoul Korean. (9) has been made based on the average F1 and F2 values of the monophthongs of Seoul Korean produced by ten male speakers reported in Yang (1993). On the basis of these values, the differences between each vowel and *i* in both F1 and F2 formant frequency values were calculated. Then using the formula (8) the distance between each vowel and the vowel *i* in acoustic vowel space was calculated. The formula used in this calculation is given below:

(8) Distance in vowel space from *i* = $\sqrt{(\text{F1 difference})^2 + (\text{F2 difference})^2}$

(9) Average F1 and F2 values of Seoul Korean monophthongs produced by 10 male speakers and the acoustic distance in vowel space between the vowel *i* and each of the other vowels (source of F1 and F2 values: Yang 1993)

Vowel	F1 (Hz)	F1-difference from *i*	F2 (Hz)	F2-difference from *i*	Acoustic distance from *i*
i	341	0	2219	0	0
e	490	149	1968	251	291
ɨ	405	64	1488	731	734
a	738	397	1372	847	935
ə	608	267	1121	1098	1130
u	369	28	981	1238	1238
o	453	112	945	1274	1279

The values of acoustic distance from each vowel to *i* are given in the last column of (9). Since the formant frequency values of *y* are presumed to be very similar to those of *i* (the shape of the vocal tract when *y* is produced is highly

similar to that for the production of *i*: see Kent and Read 1992:136), the latter's values are also used for *y*.

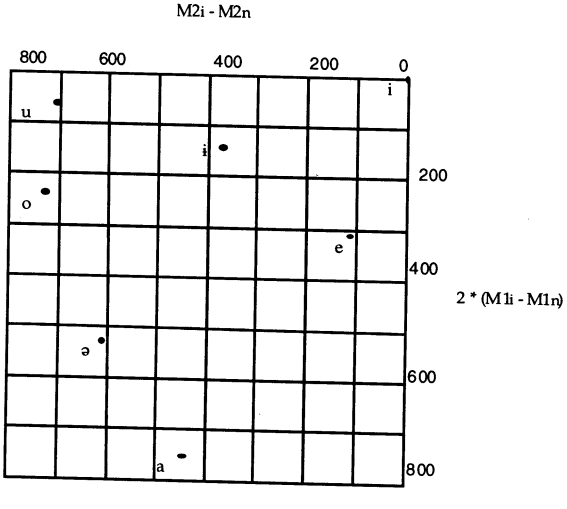
Though the onset and offset of diphthongs do not necessarily correspond exactly to the monophthong produced independently (Ladefoged 1982), (9) shows that the vowel *ɨ* is the second closest in acoustic vowel space to the vowel *i*, next to *e*. This finding suggests that the onset and the offset of the diphthong *ye* and *i͡i* may not be as perceptually distinguishable as those of the other diphthongs. When the languages' preference of those diphthongs whose onsets and offsets are maximally (or sufficiently) perceptually different is considered, the result may also suggest that the diphthongs *ye* and *i͡i* are least perceptually stable among all the diphthongs of Seoul Korean that involves *y* or *i*. The calculation of the perceptual distance using the formula (10) confirms this claim as shown in (11). The fact that the diphthong *ye* in Seoul Korean is also going through monophthongization (Nam 1984, Kang 1996) provides additional support behind the claim.

(10) $P = (1000/\log_{10} 2)\ (\log_{10} (1 + f/1000)$ Fant (1973)

(11) Perceptual distance from *i* (calculated based on f1 and f2 values of (9))

Vowel	F1 (Mel)	F1-difference from *i*	F2 (Mel)	F2-difference from *i*	Perceptual distance from *i*
i	425	0	1692	0	0
e	577	152	1575	117	192
ɨ	492	67	1319	373	379
a	800	375	1250	442	580
ə	688	263	1088	604	659
u	455	30	990	702	703
o	541	116	963	729	738

(12) Seoul Korean vowels on the plane of perceptual distance from vowel *i*



The formant charts shown in (12) graphically shows the clearly shorter perceptual distances of *e* and *i* from *i* (see sections 5.8 and 6.6.2 of Kang 1997 for details).

As a complement to the phonetic explanation given so far, a structural explanation is given in the following section formalized in a phonological (OT) framework. The two are both needed for the accurate description of the dual causation of *ii* monophthongization.

7.2. A phonological explanation

A phonological explanation is given in the framework of the correspondence model of OT (McCarthy and Prince 1995). To account for the variable nature of the variation involving (ii), the notion of 'variable dominance' (Reynolds 1994) is also adopted here. The constraints used in my phonological account of the monophthongization of *ii* are listed in (13).

(13) Constraints
1.*F-Diph: Falling diphthongs are prohibited.
2 *i: *i* is prohibited.
3. MAX(i): Every *i* in underlying representation has a correspondent in surface representation.
4. L-Anchor: The leftmost element of underlying representation has a correspondent at the leftmost position of surface representation.
5. *Coda: Coda is not allowed.

As discussed earlier, the falling diphthongs of Late Middle Korean have all monophthongized except *ii* . This indicates that the structural pressure to monophthongize *ii* has been present for a rather long time in Seoul Korean (cf. Y.C. Chung 1991) and can be considered a strong motivating factor for the monophthongization of *ii* . The constraint *F-Diph (cf. Rosenthall 1994) is used in this study to represent this internal pressure toward the monophthongization of *ii* in Seoul Korean. The diphthongal realization of *ii* has a duration considerably longer than the monophthongs of Seoul Korean, supporting the standard assumption held by phonologists that falling diphthongs are associated with two moras (cf. Schane 1995, McCarthy 1995, Rosenthall 1994).[1] Accordingly, it is assumed in this study (also following Y.S. Lee 1993 and Kim-Renaud 1986) that the onset and the offset of *ii* are linked to two separate moras.

The high central unrounded glide *i* is rarely found in the world's languages. Few languages (cf. Maddieson 1984) have this glide. The markedness constraint, *i is motivated by this observation. Different vowels show different deletability. MAX(i) penalizes deletion of underlying *i*. L-Anchor penalizes the deletion of a word-initial segment, which is rarely observed cross-linguistically. Languages, as well documented, prefer an open syllable to a closed syllable. This general cross-linguistic tendency is represented by the constraint, *Coda, which penalizes candidate forms with a coda consonant.

Another crucial assumption is made in this paper. Korean is one of those languages which distinguish glides and vowels underlyingly (e.g., *ui* 'the ear of a cow' vs. *wi* 'top' and *kiun* 'power' vs. *kyun* 'germ'), so it is assumed following Hayes (1989) that in Korean the moraic structure of vocoids is given in UR. Tables (14) and (15) show that variable ranking between *F-Diph and Max(i) are the main

cause of variation between the diphthongal variant and *i* ; the constraint ranking in (16) shows that the strengthening of the constraint *F-Diph is another cause of the monophthongization of *ii* . (The ranking in (16) indicates that *F-Diph and Max(i) are unranked (or variably ranked); the arrow indicates that *F-Diph is gaining strength relative to Max(i); see Kang (1997) for details.)

(14) L-Anchor, *i̯ , *Coda >> *F-Diph >> Max(i)

μμ || iisa	L-Anchor	*i̯	*Coda	*F-Diph	Max(i)
ii.sa				*!	
☞i.sa					*
i.sa	*!				
i̯i.sa		*!			
ii̯.sa			*!		
i̯sa		*!			*
i̯sa	*!				

*V̯ : moraless vocoid, V:vocoid associated to a mora.

(15) L-Anchor, *i̯ , *Coda>> Max(i) >> *F-Diph

μμ || iisa	L-Anchor	*i̯	*Coda	Max(i)	*F-Diph
☞ii.sa					*
i.sa				*!	
i.sa	*!				
i̯i.sa		*!			
ii̯.sa			*!		
i̯sa		*!		*	
i̯.sa	*!				

(16) Constraint ranking

*L-Anchor, *i̯ , *Coda >> {*Falling Diph, MAX(i)}

8. Conclusion

This paper has examined the current status of the diphthong *ii* , the only remnant of the six Late Middle Korean falling diphthongs. In this paper, I first showed based on quantitative evidence that *ii* still remains in Seoul Korean as an underlying vowel contrary to some researchers' claim. It was also shown that the distribution of *ii* is limited only to word-initial position though the diphthong

retains its traces in orthographical representations in other phonological environments as well. I also suggested (on the basis of quantitative evidence) that non-word-initial *ɯi* has changed to *i* through phonological change, and that the possessive marker *ɯi* has monophthongized to *e* through morphologically conditioned change, while the diphthongal variant and [ɨ] are in close competition with each other in word-initial position.

Then an attempt was made to provide phonological and phonetic explanations of the monophthongization of *ɯi*. It was suggested that two factors have played an important role in this change. One was the internal structural pressure to monophthongize *ɯi*, which is the only remaining falling diphthong in Seoul Korean. This factor was formalized as the phonological constraint, *Fall-Diph, in my phonological account. It was shown that the pressure toward the monophthongization of *ɯi*, i.e., the strength of the constraint *Fall-Diph, is growing increasingly stronger.

I suggested that lack of perceptual salience was another important motivator in the monophthongization of *ɯi*. Languages are more likely to retain perceptually stable diphthongal sequences, i.e., those diphthongs whose onset and offset have sufficient auditory/perceptual distinction, than perceptually unstable (diphthongal) sequences. *ɯi* was shown to have the second smallest internal perceptual distinction of all the existing diphthongal sequences of Seoul Korean involving a high front vocoid next to *ye*, which is also going through monophthongization.

Notes

1. I assume here following Kenstowicz (1994:45) that a mora is, at least for vowels, a unit of metrical time.

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