

Local relationship in consonant insertion

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An, Young-ran. 2010. Local relationship in consonant insertion. *Studies in Phonetics, Phonology and Morphology* 16-3. 401-413. When a consonant is inserted in the Korean total reduplication, the choice of a consonant is not randomly made. Among other factors that may affect the choice of a consonant, this paper focuses on the local relationship in the consonant insertion, and argues that the choice of a consonant refers to context; that is, a consonant is chosen by some contextual requirements. The epenthetic behavior makes reference to a preceding consonant, as well as a following vowel, in a reduplicative form of *VCVC-CVCVC*, in which *C* indicates an inserted consonant. The local relationship in the process of consonant insertion is viewed with general wellformedness conditions in the language, e.g. sub-syllabic constituency and syllable contact. Sub-syllabic constituency requires that an inserted consonant refer to the existing following vowel. Syllable contact laws play a crucial role in determining an inserted consonant following an existing consonant on the border of syllables. (Stony Brook University)

Keywords: Korean reduplication, consonant insertion, sub-syllabic constituency, syllable contact

1. Introduction

In a type of Korean reduplication, a consonant is epenthesized in the reduplicant when the base begins with a vowel as in (1).¹

- (1) a. ulkit-pulkit 'blue and red'
b. oson-toson 'on good terms'
c. opul-kopul 'meanderingly'
d. oŋki-ʃoŋki 'densely'
e. ʌlki-sʌlki 'entangled'

Various consonants can be inserted in the reduplicant, e.g. labial (1a), alveolar (1b, e), velar (1c), palatal (1d) in terms of place of articulation; a stop (1a, b, c), an affricate (1d), a fricative (1e) in terms of manner of articulation.² Some initial questions for this phenomenon include the following:

¹ The paper adopts a phonemic transcription, agnostic of narrow phonetic transcription, which is not relevant to the present process.

² The reduplicant portion is marked with an underline, according to the convention in phonology. The question of how to determine the base and the reduplicant is not addressed in this paper; for its discussion, see An (2006, 2010).

- (2) a. What are possible consonants to be inserted?
 b. Can we predict which consonant to be inserted?
 c. If it is predictable, how can we predict it?

There is no constraint against any occurrence of a consonant in the onset of the reduplicant, except for /ŋ/, which is not allowed in the onset in the Korean language, in any event (Table 1). Therefore, any consonant that can come in the position of onset can also take place in the onset of the reduplicant.

Table 1. The consonant inventory of Korean

Place Manner	Place				
	Bilabial	Alveolar	Palatal	Velar	Glottal
Stop	p p ^h p'	t t ^h t'		k k ^h k'	
Affricate			tʃ tʃ ^h tʃ'		
Nasal	m	n		ŋ	
Fricative		s s'			h
Approximant	(w)	l	(j)	(w)	

The next question is then whether it would be possible to predict which consonant to be inserted in the reduplication. An investigation of the V-initial total reduplication from a dictionary (*Essence Korean Dictionary* 2006) reveals that the choice of consonants is not random; rather, there is a tendency that consonants /t, p, tʃ/ are more frequent than other consonants /k, s, m, j/. This tendency was not replicated in the statistics of the entire corpus (*Sejong Balanced Corpus* 2007); that is, it was not replicated in the frequencies of consonants in all positions, in word-initial positions, or in syllable-initial positions. In the corpus the three most frequent consonants

were /n, k, t/ in all positions, /k, s, t/ in word-initial positions, and /k, t, tʃ/ in syllable-initial positions.

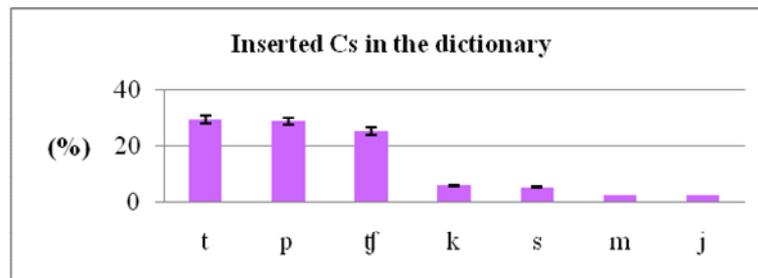


Figure 1. The frequency of inserted consonants in the dictionary

Figure 1 shows that the choice of a consonant is not made haphazardly; there is a pattern in the choice, which awaits explanation. In this paper, I do not attempt to provide a full-fledged account for the consonant choice; I will rather argue that the choice is probabilistic and it is partially determined by context. Among other contextual factors, my argument focuses on immediate segmental context, i.e. preceding and following segments to the inserted consonant (CI).³ First, I look into the relationship between CI and its following vowel in the next section. Next, I examine the relationship between CI and its preceding consonant in the subsequent section. Finally, I conclude the paper by furnishing general and specific remarks on the current phenomenon.

2. Local relationships

2.1 CV relationship

Focusing on a form of VCVC-CVCVC in reduplication in which C stands for CI that is followed by V and preceded by C, I investigate how CI is related to the following V. It appears that there is indispensable relationship between a consonant and a vowel, to the extent that C and V tend to behave in tandem, which has been found cross-linguistically.⁴ In this

³ I focus on the adjacent segments in context which can potentially affect the choice of inserted consonants in this paper, and I leave the role of distal segments in context for future research.

⁴ The tendency that CV, rather than VC, act together in a closer relationship is also espoused by the articulatory phonology: (Goldstein *et al.* 2008: 4)

It can also explain macroscopic universal patterns associated with syllable structure, for example, why syllables with onsets (CV) are universal while those with codas are not. This follows from the fact that the in-phase mode is more

section I argue that the close-knit relationship of CV in the Korean reduplication is also motivated from the language internal structure.

According to the examination of *Sejong Balanced Corpus* and of the experimental results which were obtained by a behavioral experiment (word creation task, N=55, 1352 tokens; An 2006, 2010; Appendix A) in which the participants were asked to create a natural reduplicated form with a nonce base form, there was found significant correlations between the pattern of CV sequences from the corpus and that from the experiment, $r_s = .797, p < .01$.⁵

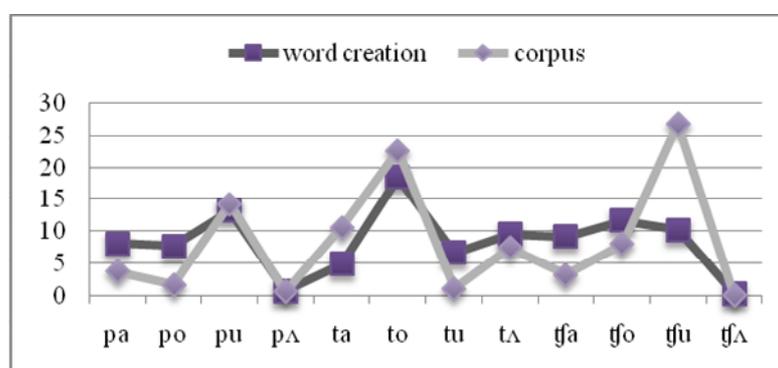


Figure 2. CV sequences in the experiment and the reduplication-only corpus: VCVC-bases, C = /t, p, tʃ/, V = /a, o, u, ʌ/⁶

The CV combining pattern in the experiment appears to replicate the CV combining pattern in the reduplication-only corpus. This implies that the CV combination in the experiment may be simply due to the existing pattern in the lexicon, or else there may be a deeper reason for the parallel between the two patterns. I hypothesize that there is a close relationship between onset C and nucleus V in the choice decision of CIs in the Korean reduplication. I propose Hypothesis 1 as follows:

(3) **Hypothesis 1**

Speakers are aware of a close relationship between onset C and

accessible and more stable. Similarly, it can account for the fact that onsets and Vs combine relatively freely, while combinations of V and coda Cs can be more restricted and for the fact that onsets emerge earlier in phonological development.

⁵ As for the corpus, I examined the reduplication-only corpus, as well as the entire corpus, between which only the reduplication-only corpus showed to have correlations with the experiment responses in terms of CV sequences.

⁶ I looked into only these three consonants for CI for the sake of exposition, since they occur most frequently both in the corpus and the experiment.

nucleus V when they choose a C for CI.

With regard to the CI choice in the reduplication, I propose that Korean speakers are implicitly aware that onset and nucleus are more tightly connected than nucleus and coda at the sub-syllabic level. The CV combination patterns both in the word-creation experiment and the reduplication-only corpus testify that existing Vs affect the choice of CIs, which indicates an intimate relation between onset C and nucleus V.

(4) Structural representations of a syllable (σ)



Behavioral experiments have shown that Korean speakers tend to group C_1 and V (4b), rather than V and C_2 , as a unit in a syllable of C_1VC_2 , contrary to prediction that V and C_2 will form a sub-syllabic unit on the basis of the classical syllable structure (4a), onset + rime which sub-hierarchically consists of nucleus V and coda C (Chen *et al.* 2004; Derwing *et al.* 1993; Lee Y. 2006). I argue that this language-specific property of Korean can be attributed to an abstract representation of a syllable, i.e., “body (= onset + nucleus) + coda” (4b),⁷ by which the Korean speakers are affected when they determine a consonant before an existing vowel.⁸ That is, the speakers make reference to the body, not rime, structure in their consonant insertion behavior.

The lexical statistics of CV combinations, which seemingly coincide with their corresponding combinations in the experiment, does not merely exercise force in the choice of CIs. It is also the phonotactic probabilities in speakers’ mind that affect the choice of CIs. Speakers remember frequent reduplicated forms whose CV combinations are also in store for them to use in creating new reduplicated forms, which means that more frequent forms are more influential in creating novel forms. For instance, Figure 2 shows that the speakers in the word-creation experiment chose /pu/, /to/, /tʃo/ most frequently, among other CV combinations of pV, tV, tʃV, respectively, which is actually confirmed by the fact that the most frequent *single* reduplicated forms with pV, tV, tʃV are ult^huŋ-pult^huŋ ‘bumpy,’

⁷ Note that this syllable structure is implicitly implemented in the spelling norms of Korean. Korean employs a syllable-based spelling system, in which the locus of C_1 , in a structure of C_1VC_2 , should always be filled up with a place holder even when only V(C_2) exists, whereas the locus of C_2 can be left empty when only (C_1)V exists, e.g. 아 /a/, 악 /ak/, 가 /ka/.

⁸ For this constituency, a reviewer suggests an idea of “schema” (Bybee 2001), which is claimed to exist among the segments in the words of a language. This notion of schema appears to be similar to what I argue for, but I am not adopting this specific term in my paper.

oson-toson ‘harmoniously,’ onki-fonki ‘thickly’ (closely after umul-f’umul ‘hesitantly’ and aki-f’aki ‘charming’) in the corpus. This implies that the CV combinations in the most frequent forms, not those in all occurring forms, have more impact on phonotactics.

The research in this section shows that lexical statistics may provide the basis for the phonotactics of language, which cannot be absolutely determined but rather, probabilistically determined. The finding specifically indicates that language users make use of their implicit knowledge of phonotactics based on token frequency.⁹

The fact that speakers’ behavior is influenced by the sub-syllabic CV constituency in such a language as Korean typologically predicts that the intimate relationship of CCC in a language like Arabic or Hebrew will also affect its speakers’ behavior. Indeed, it was confirmed that Arabic native speakers, given nonce verb forms, rated a form containing identical Cs the worst and a form containing no homorganic Cs the best in a wordlikeness rating experiment, which shows that Arabic speakers are implicitly aware of the restriction imposed on the CCC composition (Frisch & Zawaydeh 2001).

- (5) a. /babaθa/ (identical)
 b. /θabama/ (similar adjacent)
 c. /baʃafa/ (similar nonadjacent)
 d. /baʔada/ (nonhomorganic)

The cohesive relationship of CV not only identifies a source for preferring specific consonants as CIs in the consonant insertion in reduplication, but it also incorporates and supports the idea for the sub-syllabic CV constituency for the Korean language, whose argument has not been utilized to explicate any other linguistic behaviors, despite its solid intuition.¹⁰

2.2 C.C relationship

In addition to the role of the following context of CI, CI is predicted to be affected by the preceding context: in the reduplicated form of VCVC-

⁹ A reviewer rightly pointed out the issue of the explanatory power that token frequency may have on the phonotactics. I assume that all segments have an equal chance to occur, but there may be language-specific constraint for some combinations of segments. In my paper I focused on a subset of combinations (C=/t, p, tʃ/, V=/a, o, u, ʌ/) out of all possible combinations, which do not appear to show specific constraints in the CV combinations.

¹⁰ One might wonder if there is a case of coda C insertion, in which we may be able to seek relationship between the inserted coda Cs and the preceding extant Vs. If such a case exists, I predict that the relationship between coda Cs and preceding Vs are not as close as the relationship between onset Cs and following Vs, in the Korean language. I am not aware of any instance of coda insertion at this moment.

CVCVC, CI is preceded by a consonant. I look into what kind of relationship, if any, there is between CI and its preceding C, in this section.

Among other structural requirements, there is a constraint imposed on adjacent Cs that are right across a syllable boundary (Davis & Shin 1999; Kang E. 2004; Vennemann 1988, among others):

(6) Syllable Contact Law (SYLLCON)

Rising sonority across a syllable boundary is not allowed.

I argue that the epenthesized Cs in reduplication are chosen in consideration of this wellformedness condition. The constraint SYLLCON was respected in 98.28% of the dictionary data, which contained 58 words of the form V.CVC-**CV.CVC**. In the behavioral experiment (word creation task, N=55, 817 tokens with the form of V.CVC-**CV.CVC**), the experimental results show that SYLLCON was respected in 97.67% of the responses.

The constraint SYLLCON has been argued to be a crucial driving force behind many phonological processes in Korean, including n-epenthesis (7), consonant copy in the Jeju dialect (8), nasalization (9), and lateralization (10) (Davis & Shin 1999; Kang E. 2002, 2005; Lee M. 2006; Sohn 2008, among others):

- | | | | |
|----------------------------------|---|----------------------------------|---------------------|
| (7) a. /ʌkim+i/ | → | [ʌ.kim.ni] | ‘molar’ |
| b. /tʃom+jak/ | → | [tʃom.njak] | ‘mothball’ |
| c. /tʃ ^h akhan jʌtʃa/ | → | [tʃ ^h ak.han.njʌ.tʃa] | ‘a good woman’ |
| d. /til-in ijaki] | → | [ti.lin.ni.ja.ki] | ‘the story I heard’ |
| (8) a. /pitan+os/ | → | [pi.tan.not] | ‘silk clothes’ |
| b. /mul+ankjʌŋ/ | → | [mul.lan.kjʌŋ] | ‘goggles’ |
| c. /tʃitʃip + ai/ | → | [tʃi.tʃip.p’a.i] | ‘girl’ |
| d. /mas is-ʌn/ | → | [mat.t’i.sʌn] | ‘not tasting good’ |
| e. /hol-apaŋ/ | → | [hol.la.paŋ] | ‘widower’ |
| | | ~ [ho.ra.paŋ] | |
| (9) a. /ap ^h +nal/ | → | [am.nal] | ‘the future’ |
| b. /kjʌp+mal/ | → | [kjʌm.mal] | ‘pleonasm’ |
| c. /nat ^h +mal/ | → | [nan.mal] | ‘word’ |
| d. /kuk+nan/ | → | [kuŋ.nan] | ‘myriads’ |
| e. /kok+mul/ | → | [koŋ.mul] | ‘grain’ |
| (10) a. /kon+lan/ | → | [kol.lan] | ‘difficulty’ |
| b. /sun+li/ | → | [sul.li] | ‘reasonableness’ |
| c. /pjʌn+lon/ | → | [pjʌl.lon] | ‘debate’ |

d. /tikit liil/ → [ti.ki̠.li.i̠] ‘letter t(ㄷ) and l(ㄹ)’¹¹

The reduplicated forms appear to obey an even stronger version of SYLLCON than the lexical entries of the language in general. For example, among the most frequent occurrences for [k.C] combinations in the *Sejong* 2007 corpus, [k.h] occurs in 18.09% of the forms and [k.s] in 16.87%. In contrast, these combinations were extremely rarely produced in the word formation task ([k.h] 0% and [k.s] 12.73%). In addition, [k.t], which obeys SYLLCON, is attested in 4.11% of the corpus data, but in 24.24% of the responses in the experiment.

Reduplicants also differ from the rest of the Korean lexicon in their resistance to glide insertion. Glides are cross-linguistically common as an inserted C, e.g. altruizmus [al.tru.jiz.mus] ‘altruism’ in colloquial Slovak (Rubach 2000), kea [ke.ja] ‘swim’ in Lou (Blevins 2008), kokain [ko.ka.jin] ‘cocaine’ in Czech (Zaleska 2008). Glides, /j/ in particular, have a robust status as an inserted C in Korean, as well (Kang O. 1999):

- (11) a. /a.ka+a/ → [a.ka.ja] ‘baby + vocative’
 b. /mintʃu + a/
 name) → [min.tʃu.ja] ‘Minjoo(proper
 + vocative’
 c. /hakkjo + e/ → [hak.kjo.e] ‘school + locative’
 ~ [hak.kjo.je]
 d. /na.mu+e/ → [na.mu.e] ‘tree + locative’
 ~ [na.mu.je]

However, glides were rarely inserted in the reduplicants: only 1.72% in the dictionary data and 1.96% in the experimental responses. Therefore, glides are most frequently chosen in Korean as an inserted C in the context of V_V, but they are disfavored in the context of C_V. This is an effect of SYLLCON: glides are the most sonorous Cs, and therefore disfavored in the onset position following coda C.

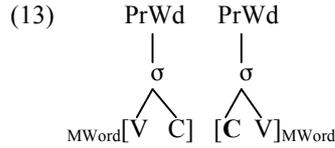
There are other constraints that are under way in the process of the reduplication with CI: ONSET and STEM. The onset filling in the CI-reduplication is part of the universal tendency to have an onset C, and STEM is a language-specific requirement in Korean that calls for retaining coda C in situ (“right-edge demarcation” Kang E. 2002, 2005). A crisp alignment between a morphological category (MWord) and a corresponding prosodic unit (PrWd) is achieved at the right edge on the basis of the following constraint (Kang E. 2005: 10).¹²

¹¹ This is an example of lateralization of coronal-liquid sequences, which is unique in Korean that illustrates the lateralization of an input /t/ sequence in the literature (Davis & Shin 1999: 308).

¹² Kang E. (2005) shows a representation as in (13) to illustrate the consonant copy in the Jeju dialect of Korean, e.g. /katʃuk os/ → [ka.tʃuk.kʰot/ ‘leather clothes,’ /mul ankjʌŋ/ →

(12) STEM_R: Align(Stem, Right; PrWd, Right)

[mul.lan.kjʌŋ] ‘goggles,’ /men-ip/ → [men.**n**ip] ~ [mɛ.**n**ip] ‘with empty mouth’ (copied Cs marked in bold face). The consonant copy is similar to the C-insertion in reduplication in that both epenthesize a consonant in a morpheme/word initial position. Thus I propose that the C-insertion can also be represented as in (13).



I analyze the consonant epenthesis in the Korean reduplication, based on several major constraints, SYLLCON (6), STEMR (12), and ONSET (14).

(14) ONSET: Syllables require an onset.

For example, in the reduplicated form /oson+CVCVC/ the final base C remains in situ due to STEMR, a consonant is inserted in the reduplicant due to ONSET, and the choice of specific segments to be inserted is made by SYLLCON. The output [o.son.-to.son] would be chosen over other forms like [o.son.-o.son], [o.so.n-o.son], [o.son.-jo.son].

(15) Tableau 1. oson-tooson ‘harmoniously’

/oson+RED/	ONSET	STEMR	SYLLCON	DEP-BR ¹³
a. $\text{a. } \text{o.son.} \text{-to.} \text{son}$	*			*
b. $\text{o.son.} \text{-o.} \text{son}$	**!		*	
c. $\text{o.so.n.} \text{-o.} \text{son}$	*	*!		
d. $\text{o.son.} \text{-jo.} \text{son}$	*		*!	*

It is predicted that any Cs may be inserted as long as they respect the sonority profile across a syllable boundary, and it was borne out in the experiment, e.g. /a.pam-/ → [a.pam.-sa.pam], [a.pam.-tʃa.pam].

(16) Tableau 2. apam- → apam-sapam ~ apam-tʃapam (nonce word)

/apam+RED/	ONSET	STEMR	SYLLCON	DEP-BR
a. $\text{a.pam.} \text{-sa.} \text{pam}$	*			*
b. $\text{a.pam.} \text{-tʃa.} \text{pam}$	*			*
c. $\text{a.pam.} \text{-a.} \text{pam}$	**!		*	

¹³ DEP-BR: “Every element of R(eduplicant) has a correspondent in B(ase).”

d.	a.pa.m- <u>a.pam</u>	*	*!		
e.	a.pam.- <u>ja.pam</u>	*		*!	*

The presented analysis fits in well with the Korean phonology which abides by SYLLCON in many other data, and it further reinforces the syllable contact constraints by showing that they are obeyed even in the completely free-choice insertion of consonants in the word creation experiment.

The account in this section defines the relationship between coda C and onset C (= CI) on their contact. It could show why specific Cs were chosen as an inserted C in the reduplicant in relation with the existing base Cs, and how the inserted Cs were discerned perceptually at the syllable and morpheme/word boundary on the basis of sonority.

3. Concluding remarks

I have discussed how phonotactics and phonology are exquisitely intertwined in the consonant insertion in reduplication. First, it was shown how vowels are involved in the choice of inserted Cs: Vowels, the ones following the CIs in particular, served as one of the critical factors that helped to choose certain Cs. The close relationship between C and V has been shown in the finding that the CV combination pattern in the reduplication corpus was replicated in the experiment. This has been expounded on the basis of the CV relationship preferred in the Korean language, the knowledge of which is hardwired in the phonotactics of the language. It was also found that there is a certain relation between the CI and its abutting C, which is another C that is not followed by a V in the base of reduplicated forms, VCVC-CVCVC. The relationship of C-C could be defined by the constraint that crucially applies at a syllable contact, which has been asserted in the literature as one of the essential constraints in the Korean data. CIs in the reduplication were chosen in the way that they do not create a rising sonority across a syllable boundary.

We need to note that the local relationships discussed in this paper cannot solely capture the process of the consonant insertion in reduplication, and that there may be more factors involved in this process. Furthermore, there are some questions to ask for the future research: for one, we wonder how children can achieve the knowledge of the close relationships of CV and C.C in the reduplication, or whether children show the same behavior as in adults' choice of consonants.

Appendix A

Word Creation Experiment: Participants' information and stimuli

The 55 participants varied in age, ranging from 20's to 60's, who were recruited in Seoul, Korea. There were 3 stimuli containing one C, 19 stimuli containing two Cs, 15 stimuli containing three Cs, and 3 stimuli containing four Cs, in the given word creation task, all of which amount to 40. In more detail, there were 2 of the base form VCV, 1 of VVC, 15 of VCVC, 3 of VCCV, 1 of CVCV, 4 of VCCVC, 9 of CVCVC, 2 of CVCCV, and 3 of CVCCVC.

Stimuli

Directions: Each of the following morphemes is part of a reduplicative form. Based on your intuition as a native speaker of Korean, you are requested to fill in each of the blanks with a copied form of the given item. When you create a reduplicant, please make sure that a segment should be different from the correspondent in the given morpheme. Also make sure to read new forms aloud when you are creating them. Feel free to write them in Korean.

Instantiation

- | | | |
|----|------|------------------|
| a. | 웅기중기 | [oŋki-tʃoŋki] |
| b. | 알송달송 | [als'oŋ-tals'oŋ] |
| c. | 오손도손 | [oson-toson] |

Stimuli¹⁴

- | | | |
|-----|----|----------------------|
| 1. | 언들 | ʌntɪl |
| 2. | 우술 | usul |
| 3. | 바직 | patʃik |
| 4. | 언장 | ʌntʃaŋ |
| 5. | 두룩 | tuluk |
| 6. | 오독 | otok |
| 7. | 살캉 | salk ^h aŋ |
| 8. | 오작 | oʃak |
| 9. | 가삼 | kasam |
| 10. | 시렁 | silɒŋ |
| 11. | 울짜 | ultʃ'a |
| 12. | 곰직 | komʃik |
| 13. | 아식 | asik |
| 14. | 아달 | atal |
| 15. | 빠사 | p'asa |

¹⁴ The stimuli were given in Korean for the participants, and the transcriptions provided next to Korean were not in the experiment. Some of the words are from a certain dialect of Korean, which is spoken by none of the participants, and most of them are newly made up for the sake of this experiment.

16.	우칠	uʧ ^h il
17.	우영차	ʌŋʧ ^h a
18.	붕소	puŋso
19.	앗짜	attʃ ^h a
20.	어울	ʌul
21.	츨사	ʧʃolsa
22.	옥수	oksu
23.	아주	aʧu
24.	억짱	ʌktʃ ^h aŋ
25.	어중	ʌʧuŋ
26.	구들	kutɪl
27.	오삼	osam
28.	우끈	uk ^h in
29.	가만	kaman
30.	아장	aʧaŋ
31.	우설	usɪl
32.	고당	kotaŋ
33.	오공	okotŋ
34.	담풍	tamp ^h uŋ
35.	아밤	apam
36.	오감	okam
37.	모든	motɪn
38.	후룩	huluk
39.	오롱	olonŋ
40.	온당	ontaŋ

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