

The Phonology of *ABB* Reduplication in Taiwanese

Yufen Chang

Indiana University

This paper investigates the tonal patterns of *ABB* reduplication, a frequent indicator of onomatopoeia and ideophones in Taiwanese. The data show that the tonal pattern of the suffix *BB* that occurs most frequently is 53-21. In this pattern, the high falling tone, 53, is the result of tone sandhi, with the underlying tonal pattern 21-21. Unlike Mok's (2001) findings that Mandarin, Cantonese, and Hakka have a preference for the high level tone for a similar type of reduplication, Taiwanese onomatopoeia and ideophones favor the low falling tone 21. It was also found that some *BB* suffixes can surface with a separate, distinct tonal pattern, raising the question of which tones are underlying and which derived. Moreover, there do not seem to be regular rules specifying the phonological environment in which each tonal pattern of the *BB* suffix surfaces. Further research on the tonal derivation of onomatopoeia and ideophones should be carried out to provide solutions to these unanswered questions.

1. Introduction

Taiwanese has a large number of non-prosaic words, including many that are onomatopoeia and ideophones. According to Pharies (1979), onomatopoeia is a mimetic expression with inherent acoustic properties similar to the sound it refers to. Ideophones, coined by Doke (1935), categorize a class of words that describe action, state, intensity, color, sound, smell, manner, and emotion. Linguists working on onomatopoeia and ideophones have found that they often have different phonological characteristics than prosaic words. In terms of phonological abnormalities of tone, onomatopoeia and ideophones can demonstrate unfamiliar tonal patterns and decrease in contrasts of tones (Mok, 2001). For example, in Kongo, two adjacent high tones or low tones at the end of an utterance occur exclusively in ideophones (Daelman, 1966, cited in Samarin, 1971). In Lao, a six-toned language, only the mid-high level tone and the high-falling tone are used in onomatopoeia (Crisfield, 1978). However, Taiwanese onomatopoeia and ideophones' tonal characteristics have not yet been investigated in the literature. Thus, this paper seeks to examine the tonal patterns of a particular type of onomatopoeia and ideophones in Taiwanese, known as *ABB* reduplication (Chiang, 1992; So & Harrison, 1996).

ABB reduplication is composed of a root and a double reduplicated suffix. In this article, *A* in *ABB* reduplication stands for the root, and *BB* for the double reduplicated

suffix. The root *A* is usually an adjective, a verb, or a noun, and the suffix *BB* can be either onomatopoeia as in (1), or an ideophonic expression as in (2).

(1) The *BB* suffix as onomatopoeia:
 /tsio hai hai/ 'laugh'
 laugh laughing sound

(2) The *BB* suffix as an ideophone:
 /pHui ki ki/ 'fat'
 fat O O

The function of the *BB* suffix is to add more descriptive weight to the root or to modify the degree of intensity (Chiang, 1992). Previous research on Taiwanese *ABB* reduplication focuses on its morphological derivation (Chiang, 1992) or its semantic differences compared with the root alone or with other similar phrases (Liu, 2003). Mok's (2001) study of Chinese sound symbolism is a thorough examination of onomatopoeia and ideophones, but the languages under investigation in her research were Mandarin, Cantonese, and Hakka. The study seeks to remedy the lack of phonological investigation of Taiwanese onomatopoeia and ideophones in the literature by presenting the tonal patterns of *ABB* reduplication in Taiwanese.

The organization of this paper is as follows. Section 2 reviews Mok's (2001) analysis of *ABB* reduplication. In Section 3, Taiwanese tones and tone sandhi are presented as the background of the analysis. In Section 4, the tonal patterns of *ABB* reduplication in Taiwanese are presented. Section 5 discusses the analysis and remaining unresolved puzzles of *ABB* reduplication. Section 6 concludes the paper with directions for future research.

2. Mok (2001)

The data in Mok's study were analyzed within the framework of Lexical Phonology (Kiparsky, 1982; Halle and Mohanan, 1985) and Steriade's (1988) theory of reduplication. The assumption is that reduplication is a left-to-right affixational process, involving copying the segmental and suprasegmental features of a base. Phonological rules apply lexically or postlexically, and the input and output are governed by prosodic constraints. In the case of *ABB* reduplication, one Cantonese example with tone subscripted is given in (3).

(3) Suffixal base: B₂₁
 Reduplication: B₂₁-B₂₁
 Affixation to root: A₅₅- B₂₁-B₂₁
 Tone change: A₅₅-B₃₅-B₂₁

In (3), a monosyllabic suffixal base *B* is reduplicated and affixed to a word root *A*, forming an *ABB* pattern. A tone change rule is then applied on the middle syllable to derive the correct surface tonal pattern.

Mok's study concludes that the high level tone is the most common tone in onomatopoeia and ideophones. In Mandarin, onomatopoeia and ideophones with the high level tone account for 97.6% of the corpus. In Cantonese, 43% of these are realized with the high level tone and 44% with the low falling tone. Hakka onomatopoeia and ideophones also favor the high level tone, which accounts for approximately 50% of the data. Mok attributes the speakers' preference for the high level tone to acquisition—the high level tone is usually acquired the earliest in L1 and L2 acquisition (Li & Thompson, 1977; Tse, 1978). The unmarked and prominent properties of the high level tone may help explain why speakers of the three languages frequently use the high level tone in onomatopoeia and ideophones.

3. Taiwanese tones and tone sandhi

3.1 Tones

Every single syllable in Taiwanese has two different phonetic tones depending on the environments where it occurs (Du, 1988). When the syllable appears alone or is placed in a phrase-final position, it carries the citation tone. The tonal value varies to the sandhi tone if the syllable occurs in a non-final position of a phrase. According to Cheng (1968), the citation tone is the underlying tone and the sandhi tone is derived. Each citation tone has a sandhi counterpart.

Most linguists agree that there are seven distinct underlying tones in Taiwanese (Chen, 2000, Cheng, 1979, Chung, 1996). The seven tones are divided into two categories, entering tones and non-entering tones, based on the duration of the syllable. Entering tones occur in checked syllables ending in /p, t, k, ?/ while non-checked syllables with non-entering tones end in vowels or sonorant codas. Non-entering tones are also usually longer in duration than entering tones.

The tonal value is usually represented with a 5-level system, proposed by Chao (1968) to transcribe Mandarin tones. In this system, 1 refers to the lowest pitch and 5 to the highest pitch. Different linguists may transcribe each tone with different tonal values. For instance, the tone systems created by Cheng (1979), Chung (1996), and Chen (2000) are slightly different from one another, as shown in (4).

(4) Taiwanese tones transcribed by Cheng (1979), Chung (1996), and Chen (2000)

	Cheng (1979)		Chung (1996)		Chen (2000)	
	Citation tones	Sandhi tones	Citation tones	Sandhi tones	Citation tones	Sandhi tones
Non-entering tones	55	33	55	33	44	22
	53	55	53	55	53	44
	33	21	33	31	22	21
	21	53	31	53	21	53
	13	33	13	33	24	22
Entering tones	53	21	55	31	4	21
	21	53	31	55	32	4 or 53

Given the fact that the three tone systems in (4) do not differ much in tonal values, I have adopted Cheng's transcription of tones in this study.

3.2 Tone sandhi

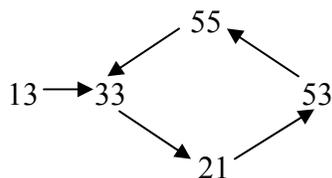
Taiwanese tone sandhi is conditioned by syntactic structures. As long as a syllable does not occur in a phrase-final position, the citation tone is subject to the sandhi tone. Examples showing the variation between citation and sandhi tones are given in (5). Citation tones are parenthesizedized.

- (5) a. /pe tsHia/ 'white car'
 white car
 21(33) 55
- b. /tsHia lian/ 'car wheel'
 car wheel
 33 (55) 53

In (5a), when the word /tsHia/ occurs alone or is placed in the phrase-final position, it carries the citation tone 55. However, the underlying tone 55 is altered to sandhi tone 33 when /tsHia/ occurs in a non-final position of a phrase as in (5b).

It has been observed that the non-entering tones in Taiwanese follow a tone circle in (6) with respect to changing to sandhi tones (Chen, 1987). This circle is like a pushing chain, by which a citation tone is looking for another citation tone to serve as its sandhi tone to surface. For example, a syllable with the citation tone 21 would undergo this tone circle to derive its sandhi tone 53.

(6) Taiwanese tone sandhi circle



In terms of tone sandhi in the entering tones, in Cheng's (1979) and Chung's (1996) transcription, the two entering tones interchange, but Chen's (2000) system is different. According to Chen, the underlying entering tone 4 is subject to the sandhi tone 21, but the tone 32 has two sandhi tone variants. If the last consonant of a syllable is /p/, /t/, or /k/, the entering tone 32 becomes tone 4; otherwise it carries the sandhi tone 53.

4. The present study

The data on which this study is comprised of two kinds: dictionary data and interview data. First, all of the *ABB* reduplication phrases listed in a Taiwanese dictionary (Yang, 2004) were extracted. Then, to ensure that the extracted phrases were frequently used in daily conversation, two Taiwanese speakers (age 57 and 53) were consulted. If they failed to recognize a phrase, it was eliminated from the corpus. During the interview, they were asked to pronounce the *ABB* reduplication phrases from the dictionary for tone transcription and to provide more phrases they would use in daily life. In total, 108 *ABB* reduplication phrases¹ were collected and transcribed based on Cheng's (1979) transcription system (See the appendix for the complete list of phrases).

The data of this study show that all of the seven tones in Taiwanese are utilized in *ABB* reduplication phrases. Since in Taiwanese, a syllable being checked or non-checked carries different tones and has different tone sandhi rules, the tonal patterns reported in this paper are presented based on the syllable structures of the root *A* and the *BB* suffix respectively. Table (7) shows the identified tonal patterns of the root *A* and the *BB* suffix both with non-checked syllables.

(7)	Non-checked syllables	Non-checked syllables		
	Citation tone on <i>A</i> -> Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	21 -> 53	33-55	53-33-55	9
		53-21	53-53-21	2
	33 -> 21	33-55	21-33-55	6
		53-21	21-53-21	7
	13 ->33	33-55	33-33-55	4
		53-21	33-53-21	13
		33-13	33-33-13	1

¹ Note that quasi-ideophonic phrases were not included in the corpus. In a quasi-ideophonic phrase, the suffix does not contain any sound-symbolic elements and it can stand alone without the root base (Mok, 2001). Some examples in Taiwanese are given below.

- a. /lai kian kian/
sharp sword sword 'sharp'
- b. /p^hong sai sai/
inflate lion lion 'inflated'

CHANG: PHONOLOGY OF *ABB* REDUPLICATION

55 ->33	33-55	33-33-55	2
	53-21	33-53-21	14
	33-13	33-33-13	1
53 ->55	33-55	55-33-55	7
	53-21	55-53-21	11
	33-13	55-33-13	3
Total			80

As seen in Table (7), the root *A*, not appearing phrase-finally, undergoes tone sandhi and surfaces with the sandhi tone. With respect to the tonal patterns of the *BB* suffix, the most common pattern is 53-21 (47 phrases). The tonal pattern 33-55 is also used frequently (28 phrases). The tonal pattern 33-13 is only found in five phrases.

The table in (8) summarizes the tonal patterns when the root *A* is a non-checked syllable whereas the *BB* suffix is a checked syllable.

(8)	Non-checked syllables	Checked syllables		
	Citation tone on <i>A</i> -> Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	21 -> 53	53-21	53-53-21	5
	33 -> 21	53-21	21-53-21	7
	13 ->33	53-21	33-53-21	5
	55 ->33	53-21	33-53-21	5
	53 ->55	53-21	55-53-21	4
	Total			26

In (8), when the *BB* suffix is a checked syllable, it carries the entering tones, 53 and 21. No other tones are applied when the suffix is a checked syllable.

Among the 108 *ABB* reduplication phrases, only 2 phrases are found with the root *A* being a checked syllable perhaps because in Taiwanese, words with checked syllables are comparatively much fewer than those with non-checked syllables. The two phrases are followed by *BB* suffixes with non-checked syllables. Table (9) shows the tonal pattern where the root *A* is a checked syllable and the *BB* suffix is not.

(9)	Checked syllables	Non-checked syllables		
	Citation tone on <i>A</i> - > Sandhi tone	<i>BB</i>	Surface tonal patterns	Total
	53 -> 21	53-21	21-53-21	2

As shown in (9), the *BB* suffix following a checked syllable has the tonal pattern, 53-21.

Based on the data of this study, a total of three suffixal tonal patterns have been identified: 53-21, 33-55, and 33-13. The most productive tonal pattern is 53-21, which

accounts for about 69% of the database (75 phrases out of 108). 33-55 is the second most frequently used pattern, with 26% of the *ABB* phrases carrying this tonal pattern (28 phrases). The least frequent pattern is 33-13, with only 5% of the phrases (5 phrases) realized with these tones.

5. Discussion

5.1 Tone sandhi on *ABB* reduplication

Because of Taiwanese tone sandhi, the citation tone of a word is changed into its sandhi form if it is not placed in the phrase-final position. In the case of *AB₁B₂* reduplication, only *B₂* carries the citation tone whereas *A* and *B₁* carry their respective sandhi tones. Following Mok's (2001) analysis of reduplication, *ABB* reduplication is a left-to-right affixational process with *B₂* serving as the base for reduplication. (10) schemes the derivational process of tonal patterns of *ABB* reduplication. The phrase, /pui ki ki/ meaning 'fat,' is used as an example.

(10) Suffixal base:	ki ₂₁
Reduplication:	ki ₂₁ -ki ₂₁
Affixation to root:	pui ₁₃ - ki ₂₁ -ki ₂₁
Tone Sandhi:	pui ₃₃ - ki ₅₃ -ki ₂₁

As shown in (10), the suffixal base *ki₂₁* is reduplicated and then affixed to a word root. However, due to the constraint of Taiwanese tone sandhi, *A* and *B₁*, placed in the non-phrase-final position, appear with sandhi tones. The citation tone 21 on *B₁* changes to its sandhi tone counterpart 53, and the underlying tone 13 on the root *A* to the sandhi tone 33.

5.2 Preferred tone and tonal patterns

Taiwanese has five contrastive tones for non-checked syllables. If the *BB* suffix is non-checked, it would be expected to have five tonal patterns after tone sandhi is applied: 33-13, 21-33, 53-21, 55-53, and 33-55. However, only three patterns have been identified. Among them, the tonal pattern 53-21 occurs most frequently. Note that the tone 53 in the pattern 53-21 is a sandhi tone. Before tone sandhi is applied, the underlying pattern is 21-21. Unlike what Mok (2001) has found in Mandarin, Cantonese, and Hakka onomatopoeia and ideophones, in Taiwanese *ABB* reduplication, the preferred tone is the low falling tone 21, instead of the high level tone 55.

With regard to tones on checked syllables, based on the corpus of this paper, the preferred tone for *BB* suffixes with checked syllables is exclusively 21. A possible reason the other likely tone for a checked syllable, 53, is not used can be attributed to markedness when the two tonal patterns 53-21 and 21-53 are compared. The tonal pattern 21-53, which is a combination of rising and falling, is much more marked than the other falling tone counterpart 53-21. Because falling tones minimize articulatory effort, they are less marked than rising tones (Yip, 2002).

5.3 Some puzzles

It was found that some *BB* suffixes are very productive in use. However, those suffixes do not always have the same surface tonal patterns. For example, the suffix /ki ki/ has two tonal patterns: 33-55 and 53-21, as shown in (11) and (12). The citation tones are parenthesized.

- (11) /ki ki/: 33-55
 a. /liŋ ki ki/ ‘cold’
 55(53) 33 55
 b. /bai ki ki/ ‘ugly’
 55(53) 33 55

- (12) /ki ki/: 53-21
 a. /aN ki ki/ ‘red’
 33(13) 53 21
 b. /hiao ki ki/ ‘whore’
 33(13) 53 21
 c. /pui ki ki/ ‘fat’
 33₍₁₃₎ 53 21

Based on (11) and (12), it seems plausible to postulate that the tone on the root *A* favors a certain type of tonal pattern following it. For instance, word roots with the citation tone 53 tend to be followed by *BB* suffixes with the tonal pattern 33-55. The root carrying the underlying tone 13 prefers the suffixal tonal pattern 53-21. However, the examples in (13) undercut this postulation.

- (13) /pi pi/: 33-55 or 53-21
 a. /əN pi pi/ ‘yellow’
 33(13) 33 55
 b. /we pi pi/ ‘small (used to describe space)’
 55(53) 53 21

In (13a), the root *A* with the citation tone 13, instead of being followed by the predicted tonal pattern 53-21, has 33-55 as its suffixal tones. The example in (13b) also shows that the root *A* with the underlying tone 53 does not restrict itself to the pattern 53-33-55. In Mok’s Cantonese data, some *BB* suffixes have more than one tonal pattern as well. For instance, the suffix /l□p l□p/ can surface with the pattern 22-22 or 55-55 regardless of what tone the root carries, as in (14).

(14) Cantonese *BB* suffix /lɔ̃p lɔ̃p/: 22-22 or 55-55

- | | | | |
|----------|------|-------|----------|
| a. /hau | lɔ̃p | lɔ̃p/ | ‘thick’ |
| | 13 | 22 22 | |
| b. /nyn | lɔ̃p | lɔ̃p/ | ‘warm’ |
| | 13 | 55 55 | |
| c. /jɔ̃u | lɔ̃p | lɔ̃p/ | ‘greasy’ |
| | 21 | 22 22 | |

As shown in (11-14), some onomatopoeic and ideophonic suffixes are not consistent in terms of their tonal patterns, which raises a few questions worth investigating. First, since a suffix may appear with two different tones, which is underlying and which is derived? Previous studies assume that each onomatopoeic and ideophonic expression comes with an underlying tone. With this assumption, does this mean that the Cantonese suffix /lɔ̃p lɔ̃p/, for instance, has two underlying tones? To resolve the problem of the underlying tone, we should investigate how each onomatopoeic and ideophonic expression derives its tone, instead of assuming that the tone has been specified at the underlying level. In addition, based on the data of this study, it can only be concluded that the preferred tonal pattern for the onomatopoeic and ideophonic suffix is 53-21. There do not seem to be rules governing the environment where the other tonal patterns of the suffix appears.

6. Conclusion

In this paper I have presented the tonal patterns of *ABB* reduplication in Taiwanese. Among the five likely tonal patterns for the *BB* suffix when it carries a non-checked syllable, only three patterns, 53-21, 33-55, and 33-13, have been identified, with the tonal pattern 53-21 the most frequently used in *ABB* reduplication phrases. When the *BB* suffix carries a checked syllable, 53-21 is the only tonal pattern. Before tone sandhi is applied, the underlying tonal pattern for 53-21 is 21-21, which shows that the low-falling tone 21 is the preferred tone in Taiwanese *ABB* reduplication. In addition to this finding, some of the onomatopoeic and ideophonic suffixes were found to be able to surface with more than one tonal pattern. If each onomatopoeic and ideophonic expression is created with an underlying tone but surfaces with another, there are likely rules governing the environment in which each tonal pattern occurs. To resolve the questions concerning the underlying tone of suffixes with two tonal patterns, further research on the tonal derivation of the suffix should be carried out to shed more light on the phonology of onomatopoeia and ideophones.

REFERENCES

- Chao, Yuan-Ren. 1968. *A Grammar of Spoken Chinese*. Berkeley: University of California Press.
- Chen, Matthew Y. 1987. The syntax of Xiamen tone sandhi. *Phonology Yearbook*, 4, 107-149.
- Chen, Matthew Y. 2000. *Tone Sandhi: patterns across Chinese dialects*. Cambridge: Cambridge University press.
- Cheng, Robert L. 1968. Tone sandhi in Taiwanese. *Linguistics*, 41, 19-42.
- Cheng, Robert L. 1979. Regularity of sound correspondences in Taiwanese and Mandarin. *Monographs on Modern Linguistics*. Taipei: Taiwan Students' Press.
- Chiang, Wen-Yu. 1992. *The prosodic morphology and phonology of affixation in Taiwanese and other Chinese languages*. Doctoral dissertation, University of Delaware.
- Chung, Raung-Fu. 1996. *The segmental phonology of Southern Min in Taiwan*. Taipei: The Crane Publishing Co.
- Crisfield, Arthur. G. 1978. *Sound symbolism and the expressive words in Lao*. Doctoral dissertation, University of Hawaii.
- Doke, Clement M. 1935. *Bantu linguistic terminology*. London: Longmans, Green.
- Du, Tsai-Chwun. 1988. *Tone and stress in Taiwanese*. Doctoral dissertation, University of Illinois at Urbana-Champaign.
- Halle, Morris, and Karuvannur.P.Mohanan. 1985. Segmental phonology of Modern English. *Linguistic Inquiry*, 16, 57-116.
- Kiparsky, Paul. 1982. Some consequences of Lexical Phonology. *Phonology Yearbook*, 2, 83-138.
- Li, Charles. N., and Sandra. A. Thompson. 1977. The acquisition of tone in Mandarin-speaking children. *Journal of Child Language*, 4, 185-199.
- Liu, Pei-Tsi. 2003. *Semantic investigation on color adjectives with ABB forms in Taiwanese*. M.A. Thesis, National Hsinchu University of Education.
- Mok, Waiching. E. 2001. *Chinese sound symbolism: A phonological perspective*. Doctoral dissertation, University of Hawaii.
- Pharies, David. A. 1979. *Sound symbolism in the Romance languages*. Doctoral dissertation, University of California, Berkeley.
- Samarin, William J. 1971. Survey of Bantu ideophones. *African Language Studies*, 12, 130-168.
- So, Lydia. K. H., and Godfrey. J. Harrison. 1996. A set of Cantonese trisyllabic phrases to use in learning or teaching Cantonese. *Journal of the Chinese Language Teachers Association*, 31, 41-56.
- Steriade, Donca. 1988. Reduplication and syllable transfer in Sanskrit and elsewhere. *Phonology Yearbook*, 5, 73-155.

CHANG: PHONOLOGY OF *ABB* REDUPLICATION

- Tse, Kwock-Ping. 1978. Tone acquisition on Cantonese: a longitudinal case study. *Journal of Child Language*, 5, 191-204.
- Yang, Ching-Shu. 2004. *Taihua shuangyu cidian [Taiwanese-Mandarin bilingual dictionary]*. Kaoshiung, Taiwan: Tunli chubanshe.
- Yip, Moira. 2002. *Tone*. Cambridge: Cambridge University press.

Appendix: *ABB* reduplication phrases

1. Citation tone of the word root A: 21

Surface tonal patterns	ABB phrases	
53-33-55	1. /am mo mo/	‘dark’
	2. /am so so/	‘dark’
	3. /kui sam sam/	‘expensive’
	4. /soN wai wai/	‘feel very happy’
	5. /tiam wai wai/	‘tired’
	6. /tsao mo mo/	‘smelly’
	7. /tsio hai hai/	‘laugh’
	8. /tsio hi hi/	‘laugh’
	9. /yu mi mi/	‘soft’
53-53-21	10. /sio m ^w i m ^w i/	‘cheap’
	11. /tian tiu tiu/	‘hurt’
	12. /jium lap lap/	‘wet’
	13. /jium lok lok/	‘wet’
	14. /sie ko? ko?/	‘mature’
	15. /ki pu? pu?/	‘angry’
	16. /yiu sap sap/	‘thin-cut’

2. Citation tone of the word root A: 33

Surface tonal patterns	ABB phrases	
21-33-55	1. /bun tΣa tΣa/	‘stupid; clumsy’
	2. /həN liu liu/	‘far’
	3. /dZiN tΣao tΣao/	‘quiet’
	4. /pe pao pao/	‘white’
	5. /pe tsaN tsaN/	‘white’
	6. /dZiu tΣa tΣa/	‘itchy’
21-53-21	7. /bu sa sa/	‘confused ; blurry’
	8. /dZam m ^w i m ^w i/	‘sharp’
	9. /koN ma ma/	‘silly’

CHANG: PHONOLOGY OF *ABB* REDUPLICATION

	10. /koN tu tu/	‘stupid’
	11. /sian tao tao/	‘feel sick’
	12. /sian tiu tiu/	‘feel sick’
	13. /sian tu tu/	‘feel sick’
	14. /kao tu? tu?/	‘thick’
	15. /lao ko? ko?/	‘old’
	16. /lie pu? pu?/	‘very enthusiastic’
	17. /lua hu? hu?/	‘hot’
	18. /Ni ko? ko?/	‘hard’
	19. /pe Σa? Σa?/	‘white’
	20. /tN ko? ko?/	‘hard’

3. Citation tone of the word root A: 13

Surface tonal patterns	ABB phrases	
33-33-55	1. /ban tun tun/	‘slow’
	2. /liam ti ti/	‘sticky’
	3. /lo ti ti/	‘muddy’
	4. /əN pi pi/	‘yellow’
33-53-21	5. /lu tsaN tsaN/	‘messy’
	6. /aN ki ki/	‘red’
	7. /aN koN koN/	‘red’
	8. /aN pa pa/	‘red’
	9. /hiao ki ki/	‘whore’
	10. /hiao te te/	‘whore’
	11. /ko te te/	‘stingy’
	12. /hioN kai kai/	‘cruel’
	13. /lu pe pe/	‘like to argue’
	14. /pui ki ki/	‘fat’
	15. /ΣiuN le le/	‘wet’
	16. /tam ti ti/	‘wet’
	17. /yiu təN təN/	‘greasy’
	18. /an tu? tu?/	‘tight’
	19. /kiam to? to?/	‘salty’
	20. /lo kia? kia?/	‘muddy’
	21. /lu sap sap/	‘messy’
	22. /yiu lu? lu?/	‘greasy’
33-33-13	23. /tam ko ko/	‘wet’

CHANG: PHONOLOGY OF *ABB* REDUPLICATION

4. Citation tone of the word root A: 55

Surface tonal patterns	ABB phrases
33-33-55	1. /kim tan tan/ 'shiny'
	2. /o lu lu/ 'black'
33-53-21	3. /hiam tsN̄ tsN̄ / 'spicy'
	4. /hun boN̄ boN̄/ 'smoky'
	5. /kim si si/ 'shiny'
	6. /kN̄ yiaN̄ yiaN̄/ 'shiny'
	7. /o ma ma/ 'black; dirty'
	8. /o sim sim/ 'black'
	9. /paN̄ koN̄ koN̄/ 'aromatic'
	10. /sN̄ liu liu/ 'sour'
	11. /tsim loN̄ loN̄/ 'deep'
	12. /tsi) lin lin/ 'green'
	13. /yiao sa sa/ 'hungry'
	14. /tsi) sun sun/ 'green'
	15. /tso pe pe/ 'coarse'
	16. /tsiN̄ ho ho/ 'call someone as if you were very familiar with him'
	17. /hue lok lok/ 'flowery'
	18. /kN̄ lu? lu?/ 'nothing left'
	19. /sin tsa? tsa?/ 'new'
	20. /ta kok kok/ 'dry'
	21. /ti) b ^w u? b ^w u?/ 'sweet'
	33-33-24

5. Citation tone of the word root A: 53

Surface tonal patterns	ABB phrases
55-33-55	1. /ho liu liu/ 'well'
	2. /kiao lian lian/ 'smart'
	3. /kiao te te/ 'smart'
	4. /lin ki ki/ 'cold'
	5. /bai ki ki/ 'ugly'
	6. /sui tan tan/ 'beautiful'
	7. /am toN̄ toN̄/ 'not condensed (used to describe liquid)'

CHANG: PHONOLOGY OF *ABB* REDUPLICATION

55-53-21	8. /dZan pu pu/	‘light ; not salty enough’	
	9. /kuan tsu tsu/	‘hurry’	
	10. /kuan si si/	‘hurry’	
	11. /kuan tΣi tΣi/	‘hurry’	
	12. /nN̄ gao gao/	‘tired’	
	13. /nN̄ sun sun/	‘soft’	
	14. /pa tu tu/	‘full’	
	15. /pa yN̄ yN̄ /	‘full’	
	16. /pai tsiN̄ tsiN̄/	‘mean’	
	17. /we pi pi/	‘small (in terms of space)’	
	18. /we tun tun/	‘small (in terms of space)’	
	19. /ko yap yap/	‘bitter’	
	20. /we ta? ta?/	‘small (in terms of space)’	
	21. /wN̄ ta? ta?/	‘sure’	
	22. /yoN̄ kia? kia?/	‘strong’	
	55-33-13	23. /nN̄ go go/	‘soft’
		24. /nN̄ so so/	‘soft’
		25. /nN̄ yo yo/	‘soft’

6. Citation tone of the word root A: 53 (entering tone)

Surface tonal patterns	ABB phrases	
21-53-21	1. /bat su su/	‘dense’
	2. /zat toN̄ toN̄/	‘smart’