The Impact of Fast Speech on the
Syllable Structures of Taiwanese and Mandarin

Chun Chung Lin

Taiwanese and Mandarin are generally regarded as two varieties of the Chinese language as they have their own different phonological systems. Basically, they are all monosyllabic as far as their phonological structures are concerned despite the fact that more and more bisyllabic words are being adopted in their modern forms. In theory, each syllable can be spoken separately in slow speech. But in fast speech, many monosyllabic or even bisyllabic words in Taiwanese will change their basic structures either through assimilation, dissimilation, deletion of phonemes or through tone sandhi. In Mandarin, however, sound change in this case takes place by means of tone sandhi only. The purpose of this paper is to look more deeply into the interesting phenomena of sound change in Taiwanese and Mandarin as a result of fast speech in phonological realizations so as to find systematic rules operating underlyingly.

Sound Change in Taiwanese

Since Mandarin is the official language in Taiwan, Taiwanese has been mainly a spoken language not associated with writing although it was originally a literary language. For the time being, almost no Taiwanese speakers below the age of 45 can write all the words they speak except for the very few Presbyterian pastors who preach and read the Bible in Taiwanese. These pastors preach in Taiwanese distinctively and pronounce every word deliberately and clearly. Their speech in this case is relatively slow in comparision with ordinary speech which is daily used by the greatest majority of the people in Taiwan. In ordinary speech, which is usually fast speech, almost no one will retain the regular prominence of each phoneme in the syllable. Even a child learns only the fast speech in this language without knowing constituent words involved. That is to say in normal speech language learners learn and use phonological realizations which are transformed sounds derived through some particular rules. Such kind of fast speech is the good subject matter to find the rules that change the syllable structure of the language.

The basic syllable structure of Taiwanese is (C)V(C) with its mandatory tone. In the first part of this paper we will deal with the segmental phones in relation to fast speech while the suprasegmental phonemes will be discussed in the subsequent sections.

Consonants can be in the initial or in the final position of a syllable and can also be optional in both cases. The vowel in a syllable can be a simple vowel, a diphtong, or even a triphtong. In order to understand the process of sound change, the initial and final consonants are listed:

Initial Consonants				Final Consonants		
p	t	c	k	p	t	k
p'	t'	c'	k'	m	n	ŋ

b	l	j	g
m	n	s	h
			ʔ

In fast speech when assimilation takes place, it is usually anticipatory rather than regressive assimilation. The final consonant of the preceding word will assimilate with the initial consonant of the word that follows. The first and the most common kind of assimilation occurs when two homorganic sounds come in contact. In this case, the word boundary disappears and the first homorganic sound becomes unreleased. The two original syllables in two separate words become two connected syllables. For example,

cap#po	capo	"small newspaper"
cit#tiau	citiau	"that piece"
kim#meŋ	kimeŋ	"golden gate"
keʔ#ko	keko	"bear fruit"
soʔ#ʔa	soʔa	"string"
hak#ki	haki	"semester"
kin#niŋ	kiniŋ	"this year"

All these examples show that all consonant finals except /ŋ/ will become ambisyllabic when they appear before initial homorganic sounds of the words that follow. Therefore, we may write Rule 1 to account for this fact:

$$(1) \quad \begin{bmatrix} \alpha \text{ Cons} \\ \text{Final} \end{bmatrix}_\# \Big/ \begin{bmatrix} \alpha \text{ Cons} \\ \text{Initial} \end{bmatrix} \longrightarrow \begin{bmatrix} \alpha \text{ Cons} \\ \text{Ambisyllabic} \end{bmatrix}$$

/ŋ/ is excluded in this rule as it does not occur in the initial position. In other words, all final consonants followed by homorganic sounds will become ambisyllabic as a result of having two sounds in contact, and subsequently, the word boundary in between that originally separated the two monosyllables will be deleted. In other words, we can easily detect that through assimilation of homogranic sounds and making them ambisyllabic in the process monosyllables in Taiwanese become bisyllables in fast speech.

The second common assimilation occurs when an alveolar nasal precedes a bilabial sound in another syllable. These examples are given below:

sin#pu	simpu	"daughter-in-law"
k'an#boŋ	k'amboŋ	"talking to the dead"
cin#bo	cimbo	"progress"
pin#oub	pimpin	"so-so"
sin#miaŋ	simiaŋ	"one's state of health"

In /sin#miaŋ/ we find that /n/ is first assimilated with /m/ of the word that follows and then when two homorganic sounds come in contact they undergo Rule 1 mentioned above to make /m/ ambisyllabic. It also indicates that Rule 1 is an obligatory rule whenever that kind of environment exists. So now we can write Rule 2 for the examples just given to account for /n/ assimilating with /m/:

$$(2) \quad \begin{bmatrix} \text{nasla} \\ \text{alveolar} \end{bmatrix}_\# \Big/ \begin{bmatrix} \text{bilabial} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{nasal} \\ \text{bilabial} \\ \text{ambisyllabic} \end{bmatrix}$$

/n/ seems to be a very unstable and "gregarious" phoneme for it can also easily assimilate with /k'/ and /k/ and becomes /ŋ/. The examples are given in the following

to validate this statement.

sin#k'u	siŋk'u	"body"
bin#kin	biŋkin	"towel"
kin#kin	kiŋkin	"very light"

From these examples, we can write Rule 3:

$$(3) \quad \left\{\begin{matrix} \text{nasal} \\ \text{alveolar} \end{matrix}\right\} \# \longrightarrow \left\{\begin{matrix} \text{velar} \\ \text{nasal} \end{matrix}\right\} / \left\{\begin{matrix} \text{velar} \\ \text{stop} \end{matrix}\right\}$$

/t/ is usually assimilated with its following consonant in the second word:

sit#bi	sipbi	"lose taste"
c'at#bak	c'apbak	"sneaky eyes"

Rule 4 can account for this phenomenon:

$$(4) \quad \begin{pmatrix} \text{stop} \\ \text{alveolar} \\ +\text{cor} \end{pmatrix} \# \longrightarrow \begin{pmatrix} \text{stop} \\ \text{bilabial} \\ -\text{cor} \\ -\text{voice} \end{pmatrix} / \begin{pmatrix} \text{stop} \\ \text{bilabial} \\ -\text{cor} \\ +\text{voice} \end{pmatrix}$$

When a voiceless stop that is final in the first syllable is followed by an initial consonant in the second syllable, the word boundary disappears and the final consonant of the first syllable is deleted:

c'ut#k'i	c'uk'i	"get out"
cit#ʔe	ciʔe	"one person"
pak#to	pato	"stomach"
gap#tin	gatin	"combined with the sky"

This may be summarized by Rule 5:

$$(5) \quad \begin{pmatrix} \text{stop} \\ -\text{voice} \end{pmatrix} \# \longrightarrow \emptyset / \begin{pmatrix} \text{stop} \\ -\text{voice} \end{pmatrix}$$

Assimilations mentioned above are all anticipatory in nature or the deletion of sounds motivated by the sounds which follow. On the contrary, there is another kind of deletion which is regressive in nature. This refers to the deletion of the glottal stop which occurs as the first consonant of the second word in /ʔa/. /ʔa/ is a diminutive marker is preceded by a consonant, the glottal stop is deleted and the remaining /a/ is regressively assimilated with the final consonant of the first word that precedes it:

c'in#ʔa	c'ina	"scale"
kin#ʔa	kina	"child"
gin#ʔa	gina	"handkerchief"
kim#ʔa	kima	"gold"

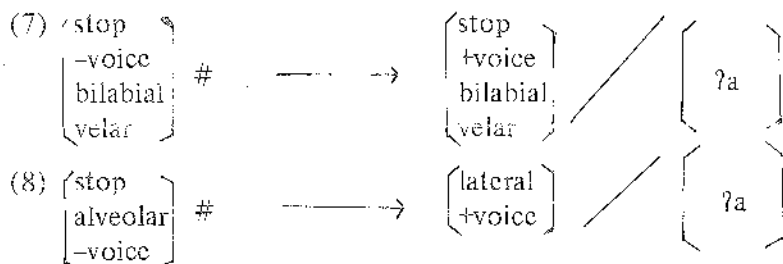Therefore, Rule 6 in effect would be:

$$(6) \quad [\text{nasal}] \# / [\text{ʔa}] \longrightarrow [\text{nasal} + \text{a}]$$

It should be noted here that /n/ is excluded from the nasals in this category since it does not initiate any syllables.

However, if /ʔa/ occurs after the three voiceless stops /p/, /t/ and /k/, the /ʔ/ of the diminutive marker is again deleted, but the stops in the preceding syllables will change from /p/ to /b/, from /t/ to /l/, and from /k/ to /g/. Examples are given below:

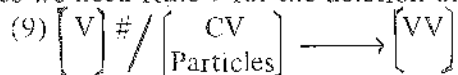|		
ho#sap#ʔa	ho#saba	"drizzle"
tit#ʔa	tila	"nephew"
tek#ʔa	tega	"bamboo"

It is easy to see that /p/ and /k/ are changed into their corresponding voiced stops to assimilate with /a/ while the word boundary and the glottal stop are deleted at the same time. But /t/ is somewhat different in that it becomes /l/ in order to assimilate with /a/. When we look for the reason of this change, we find that in the initial consonants of Taiwanese, there is no voiced counterpart of /t/; that is to say that there is no /d/ at all. And among the initial alveolar consonants, /l/ is the one most similar to /t/ in its phonetic details. In order to speak for these two types of regressive assimilation and deletion of the glottal stop, we need two respective rules, Rules 7 and 8:

$$(7)\ \begin{bmatrix} stop \\ -voice \\ bilabial \\ velar \end{bmatrix} \# \ \longrightarrow \ \begin{bmatrix} stop \\ +voice \\ bilabial \\ velar \end{bmatrix} \Big/ \begin{bmatrix} \\ ?a \\ \\ \end{bmatrix}$$

$$(8)\ \begin{bmatrix} stop \\ alveolar \\ -voice \end{bmatrix} \# \ \longrightarrow \ \begin{bmatrix} lateral \\ +voice \end{bmatrix} \Big/ \begin{bmatrix} \\ ?a \\ \\ \end{bmatrix}$$
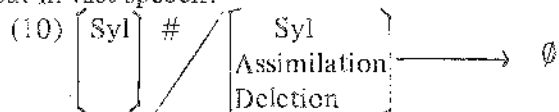
Another kind of the deletion of consonants in particles is also syntactically motivated. This kind of particle by itself does not have any particular meaning but it follows a verb to make the phrase as an idiomatic expression. In fast speech, or even in normal speech, the first consonant of such particles is deleted so that the vowel of the particle is regressively assimilated with the preceding syllable of the verb. Therefore, when the word boundary is deleted, the originally two-word phrase will become one syllable consisting of diphthong or triphthong. For example,

bo#k'i	boi	"disappear"
pai#k'i	paii	"breakdown"
hao#k'i	haoi	"cured"
k'i#lai	k'iai	"stand up"

Hence we need Rule 9 for the deletion of the consonants in such particles:

$$(9)\ \begin{bmatrix} V \end{bmatrix} \# \Big/ \begin{bmatrix} CV \\ Particles \end{bmatrix} \longrightarrow \begin{bmatrix} VV \end{bmatrix}$$

From the rules given so far, we can find that whenever assimilations take place, either anticipatory or regressive assimilations or deletions, the word boundary between two syllables also disappears. To cover the over-all pattern in the syllable structure of Taiwanese, we need an obligatory rule for assimilation and deletion when they occur in fast speech:

$$(10)\ \begin{bmatrix} Syl \end{bmatrix} \# \Big/ \begin{bmatrix} Syl \\ Assimilation \\ Deletion \end{bmatrix} \longrightarrow \emptyset$$

We have to further point out that assimilation and deletion may both be phonologically and syntactically motivated.

As previously mentioned, Taiwanese is mostly a colloquial speech not directly connected with writing in Taiwan today; the ten rules given so far are indicative of actual phonological realizations of Taiwanese. In other words, normal speech, which is in many ways similar to fast speech, utilizes the change of syllables through assimilation, deletion of consonants and deletion of word boundaries. In this sense,

we may also say that at least in fast speech in Taiwanese, syllable structure is assigned on the domain of the phonological phrase rather than on the word which in itself is monosyllabic. As a result, due to syllable structure change because of speed, Taiwanese is no longer a monosyllabic language. Taiwanese, to put it more exactly, looks like a monosyllabic language only on the surface. In fact, in fast speech, Taiwanese uses both monosyllabic and bisyllabic structure in its phonological realizations.

So far, our discussion of the syllable structure of Taiwanese is limited to segmental phonemes leaving the change of the tone to the section on tone sandhi to deal with in this paper. Syllable fusion will also be discussed in the latter part of the paper since it involves the deletion of the whole word but the tone of the deleted word remains with its preceding syllable. This phenomenon is investigated in connection with tone sandhi.

Tone Sandhi in Mandarin

Unlike Taiwanese, fast speech does not have any impact on the syllable structure of Mandarin as far as segmentals are concerned. If we regard Mandarin, or for that matter all Chinese languages as autosegmental, tones will be regarded as suprasegmentals. Then, the most conspicuous impact of fast speech on Mandarin is the change of the tone when certain tones come in a row in a phonological phrase. This is the socalled tone sandhi. The most common tone sandhi in Mandarin is when two tone three's come in juxtaposition, the first tone three is changed to tone two while the second word maintains its original tone three. In order to know the reason of this phonological change in such an environment, we should take a look at the acoustic nature of the tone in Mandarin.

Mandarin has four tones, to be named henceforth tone 1, tone 2, tone 3, and tone 4, in addition to a floating tone which is neutral and has been regarded as toneless by traditional Chinese phonologists. In this study, the theory of neutralization and the metrical theory of relative prominence will be adopted to explain the sandhi rule in Mandarin.

First of all, we will regard the four tones basically as a sequence of low and high tones. Then the four tones will be indicated as follows:

Tone 1   HH
Tone 2   LH
Tone 3   LL
Tone 4   HL

Using such sequences of low and high tones, we can account for the sandhi rule of changing the first tone 3 to tone two. In the following examples, the contour of the first styllable is neutralized from LL to LH to accommodate the second syllable consisting of LL contour.

lao (LL) ren (LL) -- lao (LH) ren (LL) "old man"
hao (LL) chiu (LL) - hao (LH) chiu (LL) "good wine"
kan (LL) chin (LL) - kan (LH) chin (LL) "instantly"

If we use the digital value of tone contour as commonly applied in the literature dealing with Chinese phonology, it may shed better light on this sandhi rule. In

the following value, 1 stands for the lowest while 5 stands for the highest (Chao, 1968):

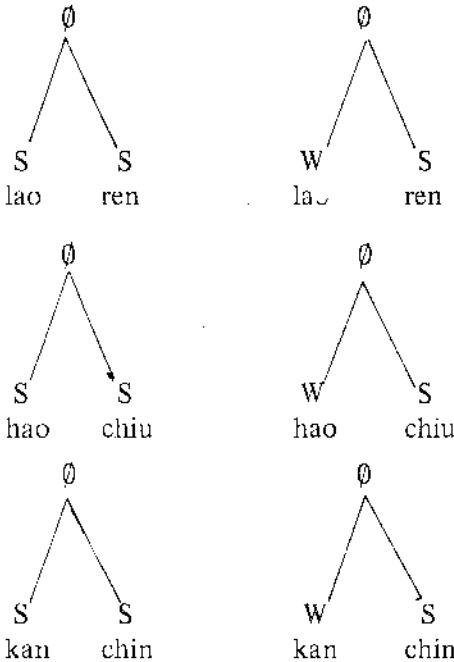| Tone 1 | 55 |
Tone 2	35
Tone 3	214
Tone 4	51

Applying the digital value to the examples given previously, we can have the following:

lao (21) ren (21) -- lao (35) ren (214) "old man"

hao (21) chiu (21) — hao (35) chiu (214) "good wine"

kan (21) chin (21) -- kan (35) chin (214) "instantly"

It has to be added here that 4 in the above-mentioned examples appears at the end of an utterance.

Digital sound value may be a better method in explaining the sandhi rule of changing tone 3 to tone 2 in the presence of another tone 3 following it in that in the newly derived tone, 3 is higher than 2 of the following syllable and 5 is also higher than 2 and 4. It is easy to see that 35 in the derived tone will make the inherent tone of 214 completely dissimilar and as a result will facilitate speech production in the process.

This sandhi rule in Mandarin can also be explained by the metrical theory of relative prominence proposed by Liberman and Prince (1977). Metrical structure of Mandarin is sometimes different from that in English. For instance, "raincoat" in English as a compound noun will receive primary stress on the first syllable, to be indicated as SW. But in Mandarin, *yüyi* will have WS. Take the examples analyzed before, we can have:

$$\emptyset \qquad \emptyset$$
$$S \quad S \qquad W \quad S$$
lao   ren   la␣   ren

$$\emptyset \qquad \emptyset$$
$$S \quad S \qquad W \quad S$$
hao   chiu   hao   chiu

$$\emptyset \qquad \emptyset$$
$$S \quad S \qquad W \quad S$$
kan   chin   kan   chin

In the original inherent tone 3's in a row, each syllable receives same degree of prominence in terms of length, duration, and loudness. It is apparent that tone 2 with a

35 contour is less stressed than tone 3 with a falling and dipping contour 214.

In fast speech, when a third tone word is followed by a third tone particle, the sandhi rule has to be applied to the first word and the particle can undergo another rule to become a neutral tone. The fact that the first word retains its derived tone indicates that tone sandhi took place before the particle becomes a neutral tone. In the examples below, digits in parentheses indicate tone and "0" stands for neutral tone:

ke (3) yi (3)——→ke (2) yi (3) ——→ke (2) yi (0) "permitted"
lao (3) hu (3) ——→lao (2) hu (3) ——→lao (2) hu (0) "tiger"
ta (3) ni (3) ——→ta (2) ni (3) ——→ta (2) ni (0) "hit you"

In these examples, the first application of the sandhi rule is obligatory and this rule should be applied even in very slow speech. The second application of the rule to render the second syllable neutral in tone is optional and this optional rule is used in very fast speech.

This phenomenon also occurs in reduplicated words in Mandarin. Words, especially verbs and classifiers, can be reduplicated. In normal speech, the sandhi rule makes the first syllable become tone 2 and then in fast speech the second syllable changes to a neutral tone:

chung (3) chung (3)——→chung (2) chung (3)——→
            chung (2) chung (0) "every kind"
hsiang (3) hsiang (3) ——→hsiang (2) hsiang (3) ——→
            hsiang (2) hsiang (0) "think and think"

It should be pointed out that in very slow speech, two tone 3's can be said in a row and even some non-native speakers of Mandarin do this in their normal speech. But this non-native speech sounds very strange and uncomfortable to hear. Ordinarily, however, trained or untrained fluent speakers would apply the obligatory sandhi rule to facilitate their speech. On the contrary, in fast speech, only by application of the sandhi rule can one make his speech fast.

Tone Sandhi in Taiwanese

Tone sandhi in Taiwanese is even more complicated or more intriguing than that in Mandarin. In Taiwanese, each word has an inherent tone when it stands alone. Only in very slow and deliberate speech can two words syntactically connected be said with their inherent tones. But in reality, no one will ever say anything in this way. In normal speech, each of the first word will derive another tone according to the sandhi rule when it occurs before another word and hence has its derived tone in its environment. Therefore, speed in speech will make each word have a derived tone different from its original inherent tone.

Basically, there are eight tones in Taiwanese. But in the present author's 'dialect, which is the most prevalent in Taiwan, there are seven tones with tone six being extinct (Cheng, 1968). The eight tones with the sequence of tone contours are listed below:

Tone 1 (HH) Tone 2 (HM) Tone 3 (LL) Tone 4 (LL)
Tone 5 (LM) Tone 7 (MM) Tone 8 (HH)

Examples of tone sandhi are given below with tones indicated in parentheses:

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tin (1) tin (1) — — —→ tin (7) tin (1)   "sweet"
neng (2) neng (2)———→ neng (1) neng (2)   "soft"
c'ao (3) c'ao (3) ——→ c'ao (2) c'ao (3)   "stinky"
k'ua? (4) k'ua? (4)——→ k'ua? (8) k'ua? (4)   "wide"
teng (5) teng (5) – ·—→ teng (7) teng (5)   "long"
tang (7) tang (7) ———→ tang (3) tang (7)   "heavy"
pe? (8) pe? (8)   ——→ pe? (4) pe? (8)   "white"

These examples are all reduplicated words, but the sandhi rule operating on them is the same as that for non-reduplicated words. Although "phonological features of tone" have been proposed by Wang (1967) and Cheng (1968) to explain the Taiwanese sandhi rule, their solutions do not seem straightforward and somewhat are lacking in descriptive adequacy. Disregarding phonological features of tone, the present author proposes the tone contour of low, mid, and high to account for tone sandhi in Taiwanese. Before rules are written, the tone contour for each of the abovementioned examples is listed in the following to show the change from the inherent tone to the derived tone:

$$1 \longrightarrow 7 \qquad HH \longrightarrow MM$$
$$2 \longrightarrow 1 \qquad HM \longrightarrow HH$$
$$3 \longrightarrow 2 \qquad LL \longrightarrow HM$$
$$4 \longrightarrow 8 \qquad LL? \longrightarrow HH?$$
$$5 \longrightarrow 7 \qquad LM \longrightarrow MM$$
$$7 \longrightarrow 3 \qquad MM \longrightarrow LL$$
$$8 \longrightarrow 4? \qquad HH? \longrightarrow LL?$$

Since these rules are universal, a syllable derives its tone according to one of these rules operating in these examples. Let us now begin writing rules that are the most straightforward in terms of the language learner's intuition and processing. An arrow in the rule indicates the application of tone sandhi to derive a tone from its inherent tone.

(11) LL? ——→HH?
(12) HH? ——→LL?
(13) MM ——→LL
(14) HH ——→MM

As to the other three tones, in which HM becomes HH, LL becomes HM, and LM becomes MM, we find that a high tone will remain a high tone; a low contour will become higher. So H remains H, but L will become higher while M remains the same if accompanied by L but will raise to H if accompanied by H. Now let us set:

$\alpha = H$
$\beta = L$
$\beta + 1 = M$
$\beta + 2 = H$

There are two preconditions apparent from our corpus: M will raise to H if accompanied by H but will remain the same if accompanied by L. Then we can write the rule for HM → HH on the basis of our first precondition:

(15) $\alpha/(\beta+1) \to \alpha\alpha = HH$

As to LL → HM, we find the Low-low contour is raised higher by Rule 16:

(16) $\beta\beta \to (\beta + 2)(\beta + 1) = HM$

The reason why in the derived tone H precedes M is that all derived tones are either at the same level or decline leftward, as in Rule 16.

In LM → MM, we should remember that M remains M if accompanied by L, but L is always raised higher on the contour. Rule 17 reflects this regularity in tone sandhi in Taiwanese.

(17) $\beta \, (\beta + 1) \to (\beta + 1)(\beta + 1) = MM$

These Taiwanese sandhi rules seem to be more straightforward than the ones based on rising-falling features. They also seem to be more adequate descriptively to account for the language learner's intiution in acquisition and phonological realization.

Tone Sandhi in Triple Republication in Taiwanese

In Taiwanese, adjectives and adverbs can be reduplicated three times to express the degree of intenseness of these modifiers. This kind of triple reduplication in speech is accompanied by a special set of tonal changes in the first and second syllables. As usual, the third syllable retains its inherent tone. The change for the second syllable follows the tone sandhi rules just analyzed above. But the tone change for the first syllable operates on two different rules. If the inherent tone is 2, 3, or 4, it follows the formerly discussed sandhi rules; that is, tone 2 to tone 1, tone 3 to tone 2, and tone 4 to tone 8. Another rule is that all tones 8, 7, 5, and 1 will finally change to tone 5 with a rising in its end. This can be illustrated by the following examples:

pe? (8) pe? (8) pe? (8) ——→pe? (4) pe? (4) pe? (8) ---
pe? (5) pe? (4) pe? (8)   "very very white"
ho (2) ho (2) ho (2) ——→ho (1) ho (1) ho (2)   "very very good"

Further examples are given to illustrate all other possibilities implied in the previous statement about tone sandhi in triple reduplication.

k'in (1) k'in (1) k'in (1) ——→ k'in (7) k'in (7) k'in (1) ——→
k'in (5) k'in (7) k'in (1)   "very very light"
te (2) te (2) te (2) ——→te (1) te (1) te (2)   "very very short"
jiok (4) jiok (4) jiok (4) ——→ jiok (8) jiok (8) jiok (4)   "very very enough"
siok (8) siok (8) siok (8) ——→ siok (4) siok (4) siok (8) ——→
siok (5) siok (4) siok (8)   "very very vulgar"
ban (7) ban (7) ban (7) ——→ ban (3) ban (3) ban (7) ---→
ban (5) ban (3) ban (7)   "very very slow"
hoain (5) hoain (5) hoain (5) ——→ hoain (7) hoain (7) hoain (5) ——→
hoain (5) hoain (7) hoain (5)   "very very unreasonable"
t'ian (3) t'ian (3) t'ian (3) ——→ t'ian (2) t'ian (2) t'ian (3) ——→
                                             "very very painful"

Now we may ask why tones 1, 2, and 8 apply no sandhi rule further for the first syllable in triple reduplication. Their tone contours seem to imply an answer: They are respectively HH, HM, and HH. Therefore, we may write Rule 18 for this phenomenon:

(18) If the first syllable in triple reduplication has already derived a tone with
    HH or HM contour, the derived tone remains the same for this syllable

without further undergoing rule application.

But why do tones 8, 7, 5, and 1 change to 3, 4, 7, in its first application of the rule on the first syllable and then to tone 5 in its second rule application? Again, we find that these tones have contour respectively as LL, LL, and MM. When they are changed to tone 5 (LM + rising), tone 5 will actually be LMH or LH which is higher than the derived tone of LL and MM. Consequently, we need another rule to explain the last rule in triple reduplication in Taiwanese:

(19) If the derived tone of the first syllable in a triple reduplication is LL or MM, change it to LMH.

Segmental Deletion and Tone Fusion in Taiwanese

Finally, we are going to discuss one of the most intriguing phenomena resulted from speed in speech that takes place in Taiwanese. In this case, when two or three words occur together, one of the words in the middle or the last word in the phrase will lose its total segmentals and the word's tone will be fused into its preceding word. In the following examples, tone contour of each word and the fused syllable is put in parentheses (Yip, 1980):

a. ca (MM) heng (HH) ——→cang (MH)   "yesterday"
b. ka (ML) goa (HH) me (MM) – →ka (MH) me (MM)   "scold me"
c. ca (MH) bo (HH) lang (LM) ——→ca (MH) lang (LM)   "woman"
d. lai (MM) k'i (HM) hia (HH) ——→lai (MH) hia (HH)   "go there"

In a), *he* is deleted while *ng* remains with H to make one final syllable with the first syllable. In the process, the first word also loses its second M in its tonal contour. In b), the second syllable which is *goa* meaning "me" in English completely loses its segmentals while its second H remains and the first syllable also deletes its second L. The same situation applies to c) and d). As a result of these segmental deletions and tone fusions, we have shortened syllables by retaining their simplified tonal contour. But the meaning remains all the same although their phonological relizations are completely different from their original syllable structures. But by means of the tonal contour we are able to trace their tone fusion.

Conclusion

Fast speech has impact on the syllable structures of Taiwanese and Mandarin in terms of segmental assimilation, deletion, loss of word boundaries and tone sandhi. In Mandarin, tone sandhi can be explained by tonal neutralization on the basis of tone contour and by the metrical theory of relative prominence. In Taiwanese, the tone contour of high, mid, and low, offers a very straightforward solution to complicated operation of the tone sandhi rules. In conclusion, we find that fast speech results in sound change in phonological realizations which are accomplished by appropriate application of underlying rules which have been analyzed in this paper.

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