A Speech Perception-Based Study of the Patterning of Sonorants in Consonant Clusters

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ABSTRACT

This study explores sound alternations in a consonant cluster in which at least one consonant is a sonorant (a son/C cluster, hereafter). In this study, I argue that phonological processes affecting son/C clusters result from low perceptual salience rather than from the Syllable Contact Law as discussed in Vennemann (1988), Clements (1990), Rice & Avery (1991), Baertsch & Davis (2000), among others. That is, as a main factor motivating the alternations in the cluster, I consider contrasts of weak perceptibility triggered by phonetic similarity between two members of a cluster (Kawasaki 1982, Ohala 1992, 1993). Based on the findings from a typological survey in 31 different languages, I show that a speech perception-based account makes a correct prediction regarding the patterning of sonorant/sonorant sequences and that of obstruent/sonorant sequences, while the syllable contact account does not.

Keyword : sonorant, consonant cluster, perceptual salience

1. Introduction

Speech perception phenomena have been drawn on by researchers in the area of phonological theory to elucidate synchronic phonological processes such as neutralization, consonant/consonant metathesis, place assimilation, etc. (Steriade 1995, 1997, Hume et al. 1997, Hume 1998, Jun 1995) In this paper, I argue that speech perception also plays a crucial role in providing a predictive account of the motivation underlying phonological processes observed in a consonant cluster in which at least one consonant is a sonorant (a son/C cluster, hereafter) that is, in sonorant plus sonorant, obstruent plus sonorant, or sonorant plus obstruent sequences.

In many different languages, a son/C cluster is targeted by phonological processes. For

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example, the /nl/ sequence is modified in a wide range of languages although types of phonological processes applying to the sequence can be different depending on the language. As illustrated in (1), by assimilation /nl/ is realized as [ll] in Klamath, Ponapean, Toba Batak, Moroccan Arabic, Leti, and Uyghur, while it is realized as [nn] in Tatar and Yakut. In Kazakh, /nl/ surfaces as [nd] as the result of dissimilation.

(1) a. /nl/ → [ll]

Klamath: /honlina/ → [hollina] 'flies along the bank' (Barker 1964, Rice & Avery 1991)

Ponapean: /nan + lɛŋ/ → [nallɛŋ] 'heaven' (Rehg & Sohl 1981, Rice & Avery 1991)

Toba Batak: /lɛan + lali/ → [lɛallali] 'give a hen-harrier' (Hayes 1986)

Moroccan Arabic: /ban + li/ → [balli] 'it seemed to me' (Amakhmakh 1997)

Leti: /na + losir/ → [llosir] '3sg, to follow' (van Engelenhoven 1995)

Uyghur: /hayvan + lAr/ → [hayvallar] 'animals' (Hahn 1991)

b. /nl/ → [nn]

Tatar: /khayvan + lÄr/ → [khayvannar] 'animals' (Poppe 1963)

Yakut: /oron + lAr/ → [oronnor] 'beds' (Krueger 1962)

c. /nl/ → [nd]

Kazakh: /aywan + lAr/ → [aywandar] 'animals' (Bekturova & Bekturov 1996)

Likewise, obstruent plus sonorant sequences can be targeted by phonological processes. For instance, /pl/ surfaces as [mn] in Korean, e.g. /pəp + li/ → [pəmni] 'pinciple of law', and as [pt] in Yakut, e.g. /ɪskaap + lAr/ → [ɪskaaptar] 'cabinets' (Davis & Shin 1999, Krueger 1962). Sonorant plus obstruent sequences can also be modified by different phonological processes. Thus, as illustrated in (2), an /lt/ sequence is realized as [nt] in Ponapean, [ss] in Rendille, and [ll] in Finnish and Yakut.

(2) a. /lt/ → [nt]

Ponapean: /til + tilep/ → [tintilep] 'mend a roof (durative)' (Rehg & Sohl 1981)

b. /lt/ → [ss]

Rendille: /ɖél-t-a/ → [ɖéssa] 'you will give birth' (Sim 1981)

c. /lt/ → [ll]

Finnish: /kult + an/ → [kullan] 'gold, gen.' (Sulkala & Karjalainen 1992)

Yakut: /uol + tAAɣAr/ → [uollaaɣar] 'than a son' (Krueger 1962)

A goal of this study is to provide a predictive account of the motivation underlying the processes. This paper is organized as follows. In section 2, I propose that phonological modifications in son/C clusters occur due to low perceptual salience triggered by phonetic similarity between two segments in a son/C cluster. In addition, I discuss problems of the syllable contact account where phonological modifications of son/C clusters are explained by relying on the Syllable Contact Law. In section 3, I draw on findings from a typological survey of alternations in son/C clusters to show that the speech perception-based account correctly predicts the patterning of sonorant/sonorant sequences and that of obstruent/sonorant sequences, while the syllable contact account does not.

2. Motivation: speech perception-based account vs. syllable contact account

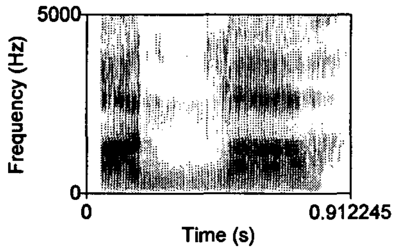
With respect to phonological processes in son/C clusters, I argue that low perceptual salience rather than the Syllable Contact Law is a factor motivating them. That is, as a main factor motivating the alternations in the clusters, I consider contrasts of weak perceptibility triggered by phonetic similarity between two members of a cluster (Kawasaki 1982, Ohala 1992, 1993). In section 2.1, I provide the speech perception-based account and in section 2.2, I discuss problems associated with the syllable contact account.

2.1 Speech perception-based account

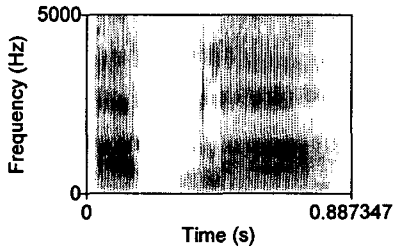
According to Kawasaki (1982) and Ohala (1992, 1993), a given speech signal is detected better when there is a large modulation in the signal. This is because a sharp change in the signal increases the salience of cues in the portion of the signal where the modulation takes place. On the other hand, if a small modulation occurs between two sounds in a sequence due to the acoustical and auditory similarity of two sounds, they would be subject to confusion and modification.

With respect to sound alternations observed in son/C clusters, following Kawasaki (ibid.) and Ohala (ibid.), I hypothesize that contrasts of weak perceptibility triggered by phonetic similarity between two segments in a son/C cluster play a crucial role. In hypothesizing a degree of similarity between segments, I consider segment internal cues such as the presence or absence of formants, anti-formants, silence, release burst and frication. As contextual cues of consonants, I take into account both vowel transitions, which include place cues, and a spectral difference between two consonants in a sequence. I assume that two segments sharing more acoustic properties are phonetically more similar to each other than those sharing fewer acoustic properties.1)

Regarding sonorant/sonorant and obstruent/sonorant sequences, I hypothesize that a sonorant consonant is phonetically more similar to another sonorant consonant than to an obstruent. This is based on the observation that sonorants have formants and/or anti-formants in common, while obstruents do not have such internal cues. In addition, obstruents have internal cues such as silence, release burst or frication noise which will make them distinct from sonorants. For instance, [l] and [n] are expected to be phonetically more similar to each other than [l] is to [t]. Spectrograms of [anla] and [atla] spoken by an American phonetician in figure 1 show that the transition from [t] to [l] can be more easily detected than that from [n] to [l].



[anla]



[atla]

Figure 1. Spectrograms of [anla] and [atla] spoken by an American English speaker

Under the assumption that phonetic similarity between segments in a son/C cluster motivates phonological change in the cluster, it can be predicted that sonorant/sonorant sequences will be more likely targets of phonological processes than sonorant/obstruent sequences within a language. For example, if /pl/, whose members are less similar to each other, were targeted by a phonological process in a language, then we would expect /ml/, whose members are more similar to each other, to also be modified. As will be discussed in section 3, the findings from the typological survey show that this is a correct prediction.

1) Even if two segments have the same acoustic cues, the two segments can be perceptually dissimilar to each other due to the different quality of the cues. For example, two vowels having the same acoustic properties would be perceptually separable if one is longer in duration. Thus, in addition to the number of shared acoustic properties, the quality of the properties needs to be considered in establishing a similarity scale.

2.2 Syllable contact account

Phonological modifications of son/C clusters have often been explained by relying on the Syllable Contact Law, which prohibits rising sonority over a syllable boundary (Vennemann 1988). That is, it has been considered within the syllable contact account that son/C clusters such as heterosyllabic nasal plus liquid sequences (e.g. /nl/, /nr/, /ml/, /mr/, etc.) and heterosyllabic obstruent plus sonorant sequences (e.g. /pn/, /pl/, etc.) are dispreferred sequences because the sonority of the onset liquid is higher than the coda nasal and thus undergo phonological modifications. However, the syllable contact account has problems. First, it cannot be generalized to cases in which syllable contact is not relevant, as in Leti where tautosyllabic /nl/ surfaces as [ll], e.g. /na + losir/ → [llosir] '3sg, to follow' (Hume et al. 1997). Second, the syllable contact account is also problematic since it cannot provide a unified account of the same types of phonological modifications found in nasal plus liquid and liquid plus nasal sequences, for example, in Korean where both /nl/ and /ln/ surface as [ll], e.g. /non-li/ → [nolli] 'logic', /s★l + nal/ → [s★llal] 'New Year's Day'. Within the syllable contact account, the modification of /nl/ into [ll] is an expected change since the sequence violates the Syllable Contact Law. However, the same change applies to the /ln/ sequence in Korean although the sequence is fine with respect to the Syllable Contact Law. Thus it has to be assumed within the syllable contact account that the modification of /nl/ and /ln/ result from different factors although the same type of phonological change occurs in both types of sequences.

Regarding the patterning of sonorant/sonorant sequences and that of obstruent/sonorant sequences, the syllable contact account predicts that an obstruent plus sonorant sequence would be more likely to undergo a phonological modification than a sonorant plus sonorant sequence. This prediction emerges from the proposal that violations of the Syllable Contact Law are not equally serious (Murray & Vennemann 1983, Clements 1990).

> "[...] the optimality of two adjacent, heterosyllabic segments increases in proportion to the extent that the first outranks the second in sonority. In this view, a sequence such as am.la, for example, constitutes a lesser violation than a sequence such as at.ya." (Clements 1990: 319)

Thus, in a heterosyllabic A.B sequence a violation is serious in proportion to the difference between the sonority of A and that of B. Based on this, we predict that if a sequence with a more serious violation is modified in response to the Syllable Contact Law, we would also expect a sequence with a less serious violation to be modified as well. For example, if a nasal plus lateral sequence is modified, we would expect that a stop plus lateral sequence also gets modified since the latter violates the Syllable Contact Law more seriously than the former. We therefore would not expect a language where a sequence with a lesser violation of the Syllable Contact Law gets modified while a sequence violating the law more seriously remains unchanged.

As discussed in section 2.1, regarding the patterning of sonorant/sonorant and obstruent/sonorant sequences, the opposite prediction is made within the speech perception-based account: sonorant/sonorant sequences are more likely to be targeted by phonological processes than obstruent/sonorant sequences within a language. In section 3, predictions of the speech perception-based and the syllable contact account are tested against the results of a typological survey in 31 different languages, and the survey shows that the speech perception-based account makes a correct prediction regarding the patterning of sonorant/sonorant sequences and that of obstruent/sonorant sequences.

3. Cross-linguistic survey of the patterning of sonorant/sonorant vs. obstruent/sonorant sequences

In this section, I show that the speech perception-based account correctly predicts the patterning of sonorant/sonorant sequences and that of obstruent/sonorant sequences through the typological survey of 31 languages, alphabetically ordered as follows: Choctaw, Chukchee, Dɛg, Finnish, Fur, Kazakh, Kikamba, Kimatuumbi, Klamath, Koasati, Korean, Leti, Mara, Moroccan Arabic, Mutsun, Oromo, Ponapean, Rendille, Selayarese, Sidamo, Somali, Swedish, Tatar, Toba Batak, Turkish, Udi, Uyghur, Yakut, Yindjibarndi, and Zoque. The main reason why these languages were chosen is that the patterns attested in the languages are relatively well-studied. In choosing languages from the same family, phonological patterns were also considered so that generalizations regarding the patterning of son/C clusters were not biased due to languages of the same family showing the same phonological patterns of the clusters.

The typological survey shows that, as predicted by the speech perception-based account, phonological modification involving obstruent/sonorant sequences implies that of sonorant/sonorant sequences in a given language when the same type of a sonorant consonant is involved. This generalization is made by comparing the patterning of nasal/liquid sequences with that of obstruent/liquid sequences given in section 3.1, and the patterning of nasal/nasal sequences with that of obstruent/nasal sequences given in section 3.2.

3.1 Nasal/liquid vs. obstruent/liquid sequences

As predicted by the speech perception-based account, nasal/liquid sequences are more likely to be subject to phonological processes than obstruent/liquid sequences within a language. This pattern is found by comparing the patterning of nasal plus liquid sequences with that of obstruent plus liquid sequences, and the patterning of liquid plus nasal sequences with that of liquid plus obstruent sequences. I present the patterning of nasal or obstruent/lateral sequences and that of nasal or obstruent/rhotic sequences separately since most surveyed languages illustrate different patterns in the sequences depending on whether the liquid involved is a lateral or a rhotic.

3.1.1 Nasal plus liquid vs. obstruent plus liquid sequences

Nasal plus liquid sequences are more likely targets of phonological processes than obstruent plus liquid sequences within a language. There is no surveyed language where obstruent plus liquid sequences are modified by phonological processes while nasal plus liquid sequences are not, as can be seen from Table 1:

Table 1. Phonological patterning of nasal plus liquid vs. obstruent plus liquid sequences in the surveyed languages

Target of phonological processes		Languages
nasal + lateral vs. obst + lateral	Both	Kazakh, Koasati, Korean, Leti, Mara, Toba Batak, Yakut, Yindjibarndi
	Neither	Dɛg, Somali
	only nasal + lateral	Klamath, Moroccan Arabic, Tatar, Turkish, Uyghur
	only obst + lateral	none
nasal + rhotic vs. obst + rhotic	Both	Moroccan Arabic, Ponapean, Rendille, Toba Batak
	Neither	Leti, Somali
	only nasal + rhotic	Dɛg
	only obst + rhotic	none

Surveyed languages not shown in the table above are indeterminate since only nasal plus liquid or obstruent plus liquid sequences are attested.

Patterns found in Tatar are provided below as representative of cases with a modification only in nasal plus lateral sequences.

(3) Tatar (Poppe 1963)

(Nasals: /m, n, ŋ/, Obstruents: /p, b, t, d, k, g, ʔ, c, tʃ, dʒ, f, v, s, z, ʃ, ʒ, x, h/)

nasal + lateral sequences

/nl/ → [nn]	/khayvan + lÄr/	→	[khayvannar]	'animals'
/ml/ → [mn]	/khanım + lÄr/	→	[khanımnar]	'ladies'

obstruent + lateral sequences

/kl/ → [kl]	/balık + lÄr/	→	[balıklar]	'fish'
/tl/ → [tl]	/at + lÄr/	→	[atlar]	'horses'

In Tatar, /nl/ and /ml/ surface as [nn] and [mn], respectively. On the other hand, /kl/ and /tl/ do not undergo any phonological modification. To my knowledge, there are no other nasal or obstruent plus lateral sequences attested in the language.

The typological survey shows that nasal plus lateral sequences are more likely targets of phonological processes than obstruent plus lateral sequences within a language. Within the speech perception-based account, this is a predicted pattern since members of nasal plus lateral sequences are more phonetically similar to each other than those of obstruent plus lateral sequences. On the other hand, the syllable contact account incorrectly predicts the opposite pattern: an obstruent plus lateral sequence will be more likely to undergo phonological processes than a nasal plus lateral sequence. This is because the former violates the Syllable Contact Law more severely than the latter.

3.1.2 Liquid plus nasal vs. liquid plus obstruent sequences

It is shown from the survey that, as predicted by the speech perception-based account, liquid plus nasal sequences are more vulnerable to phonological modification than liquid plus obstruent sequences within a language. There is no surveyed language where liquid plus obstruent sequences are modified while liquid plus nasal sequences are not, as can be seen from Table 2:

Table 2. Phonological patterning of liquid plus nasal vs. liquid plus obstruent sequences in the surveyed languages

Target of phonological processes		Languages
lateral + nasal vs. lateral + obst	Both	Choctaw, Finnish, Koasati, Kuman, Ponapean, Rendille, Somali
	Neither	Dɛg, Kazakh, Klamath, Swedish, Tatar, Uyghur, Zoque
	only lateral + nasal	Korean, Leti, Mara, Moroccan Arabic, Sidamo, Toba Batak, Turkish, Udi
	only lateral + obst	none
rhotic + nasal vs. rhotic + obst	Both	Finnish, Ponapean, Swedish
	Neither	Kazakh, Klamath, Leti, Moroccan Arabic, Somali, Tatar, Toba Batak, Uyghur, Yakut, Yindjibarndi, Zoque
	only rhotic + nasal	Dɛg, Mara, Rendille, Sidamo, Udi
	only rhotic + obst	none

Mara is a representative case illustrating the pattern that lateral plus nasal sequences are more likely to undergo phonological change than lateral plus obstruent sequences. In Mara, some lateral plus nasal sequences are modified. However, all lateral plus obstruent sequences attested surface unmodified.

(4) Mara (Heath 1981)

(Nasals: /m, n, ɳ, ɲ, ŋ/, Obstruents: /b, d, d̪, ɖ, ɟ, g/)

<u>lateral + nasal sequences</u>

Change:

/ln/ → [l] /bal + niwi-ɟaɲi/ → [baliwiɟaɲi] 'we wrote it'

/ɭn/ → [ɭ] /baɭ + niwi-ɭini/ → [baɭiwiɭini] 'we sneaked along'

No change:

/lɳ/ → [lɳ] /wul + ɳiɾiɾi/ → [wulɳiɾiɾl] 'small ones'

/lm/ → [lm] /balmaɳa/ → [balmaɳa] 'hat'

/ɭm/ → [ɭm] /mbiɭmuɾ/ → [mbiɭmuɾ] 'grub sp.'

/lɲ/ → [lɲ] /ɲil-ɲiluna/ → [ɲilɲiluna] 'trevally fish'

/ɭɲ/ → [ɭɲ] /wuɭ-ɲin/ → [wuɭɲin] 'genital cover'

/lŋ/ → [lŋ] /ɖalŋunɟi/ → [ɖalŋunɟi] 'frilled lizard'

/ɭŋ/ → [ɭŋ] /buɭŋu/ → [buɭŋu] 'ashes'

lateral + obstruent sequences

/ld/ → [ld]	/gulduɾu/	→ [gulduɾu]	'bonefish'
/lɖ/ → [lɖ]	/ɖil + ɖil/	→ [ɖilɖil]	'feathered stick'
/ɭɖ/ → [ɭɖ]	/ɖimaɭ + ɖimaɭ/	→ [ɖimaɭɖimaɭ]	'(cloud) to appear'
/ɭb/ → [ɭb]	/ɭuɭbab/	→ [ɭuɭbab]	'juvenile euro'
/lb/ → [lb]	/balba/	→ [balba]	'river'
/ɭb/ → [ɭb]	/biɭbaɾ/	→ [biɭbaɾ]	'neck'
/ɭg/ → [ɭg]	/baɭgan/	→ [baɭgan]	'mangrove sp.'
/lg/ → [lg]	/balgiɲ/	→ [balgiɲ]	'salty'
/lɟ/ → [lɟ]	/gulɟi/	→ [gulɟi]	'grinding stone'
/ɭɟ/ → [ɭɟ]	/waɭɟa/	→ [waɭɟa]	'dugong and turtles'

Patterns found in Rendille are given below as representative of cases with a modification only in rhotic plus nasal sequences.

(5) Rendille (Sim 1981, Zaborski 1986)

(Nasals: /m, n, ɲ, ŋ/, Obstruents: /b, t, d, ɖ, k, g, tɕ, dʑ, f, s, x, ħ, h/)

rhotic + nasal sequences

/rn/ → [rn] or [rr]	/fúrne/	→ [fúrre] or [fúrne]	'we opened'
/rm/ → [rm]	/karamu/	→ [karmo]	'calabash (pl.)'

rhotic + obstruent sequences

/rt/ → [rt]	/isléirten/	→ [isléirten]	'they went together'
/rb/ → [rb]	/garbó/	→ [garbó]	'shoulder blades'
/rɖ/ → [rɖ]	/fírɖe/	→ [fírɖe]	'escape, I/he'
/rg/ → [rg]	/ɖárge/	→ [ɖárge]	'be full, I/he'
/rf/ → [rf]	/dʑírfe/	→ [dʑírfe]	'plait, I/he'
/rs/ → [rs]	/wárase/	→ [wórse]	'I mixed'
/rtɕ/ → [rtɕ]	/kártɕa/	→ [kártɕa]	'cook! (pl.)'

In Rendille, only the homorganic /rn/ sequence can optionally be a target of phonological change. Rhotic plus obstruent sequences never undergo phonological change. To my knowledge, rhotic plus nasal or obstruent sequences which are not given in (5) do not occur in the language.

Based on the survey findings discussed, we can generalize that in a given language, a phonological process involving liquid plus obstruent sequences implies that of liquid plus obstruent sequences. This is predicted by the speech perception-based account. Since members of a lateral plus nasal sequence are phonetically more similar to each other than those of a lateral plus obstruent sequence, the former is expected to be more vulnerable to phonological change than the latter. However, within the syllable contact account, it is predicted incorrectly that no modification will apply to lateral plus nasal or lateral plus obstruent sequences since the sequences respect the Syllable Contact Law. Thus, phonological modifications of liquid plus nasal or obstruent sequences need to be motivated by a factor other than the Syllable Contact Law.

3.2 Nasal/nasal vs. obstruent/nasal sequences

The typological survey illustrates that nasal/nasal sequences are more likely to undergo phonological modification than obstruent/nasal sequences within a language. Among 31 languages surveyed, the opposite pattern is found only in Leti.

The patterning of nasal/nasal vs. obstruent/nasal sequences in the surveyed languages is as follows:

Target of phonological processes		Languages
nasal + nasal vs. obst. + nasal	Both	Chukchee, Korean, Ponapean, Sidamo, Toba Batak
	Neither	Dɛg, Oromo, Somali
	only nasal + nasal	Choctaw, Koasati, Mara, Selayarese, Tatar, Uyghur
	only obst + nasal	none
nasal + nasal vs. nasal + obst.	Both	Choctaw, Chukchee, Kimatuumbi, Koasati, Korean, Ponapean, Selayarese, Sidamo, Tatar, Toba Batak, Uyghur, Yakut
	Neither	Dɛg, Kuman, Somali
	only nasal + nasal	Kazakh, Mara
	only obst + nasal	Leti

Table 3 Phonological patterning of nasal/nasal vs. obstruent/nasal sequences in the surveyed languages

In some surveyed languages, heterorganic nasal/nasal sequences are not attested while heterorganic nasal/obstruent sequences are modified by place assimilation. In other surveyed languages, nasal/nasal or obstruent/nasal sequences are not attested. Those languages are considered as indeterminate cases and not shown in the tableau above.

The patterns found in Uyghur are given as a representative case illustrating the pattern that nasal/nasal sequences are more likely to undergo phonological change than obstruent/nasal sequences:

(6) Uyghur (Hahn 1991)

(Nasals: /m, n, ŋ/, Obstruents: /p, b, t, d, k, g, q, ɢ, ʔ, tʃ, dʒ, f, s, z, ʃ, ʒ, x, h/)

<u>nasal + nasal sequences</u>

/nm/ → [mm] /kälgänmän/ → [kälgämmän] 'I have come'

<u>nasal + obstruent sequenes</u>

/tm/ → [tm] /kätma/ → [kätma] 'go, negative

/sm/ → [sm] /ismim/ → [ismim] 'my name' (loanword from Farsi)

3.3 Chi-squared Test

Based on the patterning of nasal/liquid vs. obstruent/liquid sequences and that of nasal/nasal vs. obstruent/nasal sequences in the surveyed languages, I conclude that within a language sonorant/sonorant sequences are more likely to undergo phonological processes than obstruent/sonorant sequences. A Chi-squared test was performed on the combined findings in Table 1 through Table 3. The test illustrates that the result is statistically significant.

Table 4. Contingency table of number of cases showing the same or different patterning of sonorant/sonorant and obstruent/sonorant sequences

		son/son sequences	
		no modification	modification
obst/son sequences	same as son/son sequences	I 28 (20.45)	II 39 (46.55)
	different from son/son sequences	III 1 (8.55)	IV 27 (19.45)
		Total deviance = 13.60	

In Table 4, numbers that are not in parentheses represent observed frequencies and the ones in parentheses are expected frequencies. Cell I and II include cases showing the same patterns in both sonorant/sonorant and obstruent/sonorant sequences. On the other hand, cases illustrating different patterns in the sequences are in cell III and IV. That is, cell III represents the case where a sonorant/sonorant sequence undergoes phonological modification while an obstruent/sonorant remain unmodified, and cell IV the case with the reversed pattern. The test shows that the patterning of sonorant/sonorant sequences is significantly different from that of obstruent/sonorant sequences within a language ($p < 0.001$).

4. Conclusion

It is argued in the present study that low perceptual salience triggered by phonetic similarity of two segments in the cluster is a key factor motivating phonological processes in son/C clusters. Based on the findings from a typological survey concerning alternations in sonorant/sonorant and obstruent/sonorant sequences, it was shown that the speech perception-based account makes correct predictions regarding the patterning of those sequences. According to the survey, sonorant/sonorant sequences are more likely to be targeted by a phonological process than obstruent/sonorant sequences within a language, as predicted by the speech perception-based account. However, the syllable contact account incorrectly predicts that an obstruent plus sonorant sequence (e.g. /tl/) is more likely to undergo a phonological process than a sonorant plus sonorant sequence (e.g. /nl/) since the former violates the Syllable Contact Law more severely than the latter.

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