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PHONOLOGICAL VARIATION IN GLIDES AND DIPHTHONGS OF SEOUL KOREAN: ITS SYNCHRONY AND DIACHRONY

DISSERTATION

Presented in Partial Fulfilment of the Requirements for

the Degree Doctor of Philosophy in the Graduate

School of the Ohio State University

By

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The Ohio State University
1997

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ABSTRACT

This dissertation is an investigation of phonological variation in Seoul Korean; three lenition processes are examined in this research: *w* deletion, *y* deletion and *ɨ͜i* monophthongization. This study is based on three different models: the Labovian quantitative paradigm as its sociolinguistic model, Optimality Theory as its phonological model, and Ohala's phonetic explanation model of sound change as its phonetic model. These three models all crucially contribute to my explanation of variation and changes currently observed in the diphthongal system of Seoul Korean.

This study first shows that *w* deletion in Seoul Korean is a process conditioned by both linguistic and social factors. In particular, it suggests that the place of articulation of the preceding consonant is an important factor among linguistic constraints: bilabial and nonbilabial consonants show dichotic effects in triggering the deletion of following *w*. Dominant deletion of *w* after labial consonants is claimed by the current study to be attributable to the effect of the OCP as a rule trigger.

This study also shows that Seoul Korean has two different processes of *y* deletion: categorical deletion and variable deletion. It is claimed that two different processes of *y* deletion are triggered by two distinct OCP constraints which have rather different strengths. The different strengths of these two constraints are shown within the OT framework using the device of a constraint hierarchy. It is also suggested that *y* deletion before the vowel *e* is a sound change in progress. The present study claims that this change is caused by a relative lack of perceptual saliency of this diphthongal sequence.

The current study also shows that the diphthong *ɨ͜i* has completely monophthongized except in word-initial position. It is suggested that *ɨ͜i* monophthongization involves not one diachronic change but actually three different changes. It is claimed that *ɨ͜i* monophthongization has dual causation: structural pressure to eliminate the only remaining falling diphthong *ɨ͜i* and a relative lack of acoustic modulations between the component segments of this diphthong. Ample sociolinguistic and theoretical implications of the major findings of this study are discussed in the final chapter.

Dedicated to my parents who have shown constant love and care

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2. Hyeon-Seok Kang, "Past-marking and the question of system in Trinidadian English." CLS 30, (1994).

3. Hyeon-Seok Kang, "Discourse constraints on past marking in Trinidadian English." Proceedings of 18th Mid-America Linguistics Conference, (1995).

4. Hyeon-Seok Kang, "Variability in the deletion of the palatal glide *y* in Seoul Korean: the variable process and it implications." BLS 22, (1996a).

5. Hyeon-Seok Kang, "The deletion of *w* in Seoul Korean." Working Papers in Linguistics 44, Dept. of Linguistics, The Ohio State University, (1996b).

6. Hyeon-Seok Kang, "The acoustic and intonational correlates of the informational status of referring expressions in Seoul Korean." Language and Speech 39.4, (1996c).

7. Hyeon-Seok Kang "The monophthongization of *ɨi̯* in Seoul Korean and its current status." BLS 23, (1997).

FIELDS OF STUDY

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1. Goals of the research

As exemplified by Labov (1966), Trudgill (1974) and L. Milroy (1980) among others, studies in phonological variation have given us important insight into sociolinguistic and linguistic issues such as the correlation between linguistic structure and social structure, linguistic systems in contact, linguistic changes in progress, and the implications of variation for linguistic theory. This dissertation undertakes another study in phonological variation attempting to make its own contributions to these issues.

The present research has the following goals. The primary goal is to investigate the phonological variation observed in glides and diphthongs of Seoul Korean on the basis of a large sociolinguistic database and thus to uncover the current status of the diphthongal system of Seoul Korean. Three lenition processes will be the objects of research in this study: the deletion of the labiovelar glide *w*, the deletion of the palatal glide *y*, and the monophthongal realizations of the diphthong *ɨi*. Two questions that are closely related to the current status of the diphthongal system of Seoul Korean are whether there are any phonological changes in progress in the system and if there are any, which diphthongs are going through linguistic changes under what motivations. A number of researchers (e.g., T.Y. Choi 1983, K.W. Nam 1975) have suggested that the diphthongal systems of Korean dialects are in an unstable condition. Following this suggestion, this research will aim to reveal instabilities and ongoing changes in the diphthongal system of Seoul Korean and find the system's current status.

With the main goal of revealing variation and change in Seoul Korean diphthongs, this research also aims to provide phonological explanations of the instabilities and changes. Optimality Theory (OT), which has been suggested by researchers (e.g., Guy 1994, Kiparsky 1994) to be the most compatible phonological model with variation studies, will be adopted as the phonological framework to account for the observed variation in the linguistic variables under study. Since OT is still a categorical grammar that does not provide a specific mechanism to allow variation within a single linguistic system, I will follow Reynolds (1994) and add the notion of the 'Floating Constraint' to OT, and examine whether the OT model with this added device can account for the observed variation.

This research also aims to provide a phonetic explanation of the ongoing changes observed in the diphthongal system of Seoul Korean. It will examine, in particular, whether the proposed OT constraints (especially OCP constraints), whose strengthening in Seoul Korean phonology will be claimed to be the main triggers of the ongoing changes, have any phonetic basis. I will show that the OCP constraints proposed in this research have a perceptual basis, and claim that perceptual factors are one of the primary motivators of the changes in progress observed in some Seoul Korean diphthongs. Ohala's phonetic model of sound change will be crucially relied upon in my phonetic explanation of the changes.

1.2. Change and developments in the diphthongal system of Seoul Korean

The history of the Korean language can be divided into five periods (C.S. Lee 1984): the Old Korean period (before 10C), the Early Middle Korean period (10-14C), the Late Middle Korean period (15-16C), the Pre-Modern Korean period (16-19 C), and the Modern Korean period (20C-). The diphthongal system of Seoul Korean has gone through rather drastic changes over these periods.

The nature of the diphthongal system of Seoul Korean before the 15th century is not well documented. There is not enough evidence from which to reconstruct the system of diphthongs in the periods before the 15th century. Researchers (e.g., K.M. Lee 1969, B.H. Choi 1985), however, suggest that the *w* diphthongs in Figure 1.1 probably existed in Late Middle Seoul Korean (the claim that *wi* was present is a minority opinion). This suggestion is made on the assumption that the monophthongal system of Seoul Korean in this period is as given in Figure 1.2 (cf. K.M. Lee 1972, Y.C. Kim 1990). (The monophthongal system is closely linked to the developments and changes of Seoul Korean diphthongs and so it will be discussed where relevant.) The *w* diphthongs claimed to be present in this period are all rising diphthongs.

(wi)	
	wə
	wa

Figure 1.1. The *w* diphthongs of Seoul Korean (15C)

i	ɨ	u
	ə	o
	a	ʌ

Figure 1.2. The monophthongal system of Seoul Korean (15C)

Rising diphthongs of *y* suggested by researchers to have been present in this period are given in Figure 1.3. There is no agreement as to the existence of /yi/ in this period. While scholars such as K.M. Lee (1969) and S.H. Choi (1977) claim that this diphthong was present, W. Huh (1965) and B.H. Choi (1985) take the position that this diphthong was not part of the phonological system of Seoul Korean in this period.

(yi)	yɨ	yu
	yə	yo
	ya	yʌ

Figure 1.3. The rising *y* diphthongs of Seoul Korean (15C)

The falling *y* diphthongs of Seoul Korean in the 15th century are given in Figure 1.4. The presence of the diphthong *iy* in this period is controversial too. K.M. Lee (1969) and S.H. Choi (1977) claim the existence of this diphthong in this dialect on the basis of morphophonemic evidence (see T.E. Kim 1986 for details), while scholars like W. Huh (1965) and Y.S. Moon (1974) express an opposite opinion.

(iy)	ɨy	uy
	əy	oy
	ay	ʌy

Figure 1.4. The falling *y* diphthongs of Seoul Korean (15C)

Another controversial claim made by some researchers is that there were some triphthongs in Seoul Korean in the Late Middle Korean period. For instance, B.H. Choi (1985) suggests that Seoul Korean had the triphthongs *way* and *wəy* in this period. S.H. Toh (1986) also makes a claim that Seoul Korean had triphthongs like *yay* and *yəy*. However, since a majority of scholars do not support the existence of the diphthongs *wi*, *yi*, and *iy*, and the aforementioned triphthongs in this period, I will follow the majority position in this research that these diphthongs and triphthongs were not part of the system.

The diphthongal system of Seoul Korean shown in Figures 1.1, 1.3 and 1.4 has gone through changes with the passing of time. The most dramatic changes are observed in the *y* falling diphthongs. The diphthong *ʌy* was lost with the loss of the monophthong ʌ, which began in the 16th century (K.U. Kang 1993). The diphthongs *ay* and *əy* changed, respectively, to the monophthongs *ɛ* and *e* (in the period from the end of 18C to the beginning of 19C: K.W. Nam 1975). These changes were followed by the respective monophthongization of *uy* and *oy* into *ü* and *ö* (Y.S. Moon 1974). These four monophthongization processes are claimed by most researchers to be motivated mainly by the asymmetry in the monophthongal system of Late Middle Seoul Korean shown in Figure 1.2, where the [-high, -back] positions in the vowel space are not occupied by any monophthongs. The monophthongal system of Seoul Korean in the late 19th century that resulted from the aforementioned changes is given in Figure 1.5.

[-back]		[+back]	
i	ü	ɨ	u
e	ö	ə	o
ɛ		a	

Figure 1.5. The monophthongal system of Seoul Korean (late 19C)

With the loss of *ʌy*, *ay*, *əy*, *uy*, and *oy*, *ɨy* has become the only falling diphthong remaining in Seoul Korean. However, researchers (e.g., Chung 1991, Kim-Renaud 1986b) have suggested that this diphthong is also in an unstable condition and is going through a monophthongization in present-day Seoul Korean. Even if it is the case that *ɨy* still remains as a falling diphthong in present Seoul Korean, it is clear that the *y* falling diphthongs that were present in Late Middle Korean have almost disappeared.

There were also changes in rising diphthongs. The diphthong *yɨ* was lost between 16 to 18th century and was not part of the diphthongal inventory in the 19th century. Four diphthongs, i.e., *we*, *wɛ*, *ye*, and *yɛ*, were added to the diphthongal system after the

respective monophthongization of *əy* and *ay* into *e* and *ɛ*. The rising diphthongs of Seoul Korean at the end of the Pre-Modern Korean period are illustrated in Figure 1.6.

(1) *w* diphthongs		(2) *y* diphthongs		
			yu	
we	wə	ye	yə	yo
wɛ	wa	yɛ	ya	

Figure 1.6. The *w* and *y* rising diphthongs of Seoul Korean (late 19C)

Further changes have been observed in the monophthongal system of Modern Seoul Korean. There is a general agreement among researchers that the vowels *ü* and *ö* have diphthongized to *wi* and *we* (e.g., Kim-Renaud 1974, K.R. Park 1992) and also that the vowel *ɛ* has raised to *e* (Hong 1988, H.B. Lee 1971) thus producing the current system of Seoul Korean monophthongs as given in Figure 1.7. These monophthongal changes have also resulted in changes in the diphthongal system of Modern Seoul Korean. One *w* diphthong, *wi,* came into existence and two rising diphthongs, i.e., *wɛ* and *yɛ*, have disappeared.

i	ɨ	u
e	ə	o
	a	

Figure 1.7. The current monophthongal system of Seoul Korean

One unique diphthong in the diphthongal inventory of contemporary Seoul Korean is *ɨy*, or to be more exact, the current form of the Late Middle Korean diphthong *ɨy*. Following the standard phonological assumption (cf. McCarthy 1995, Shane 1995) that falling diphthongs are linked to two moras rather than one, I will represent this diphthong as *ii*. The diphthong *ii* is an isolated and phonologically deviant diphthong, since all the other falling diphthongs of this dialect have monophthongized and the other diphthongs currently present in Seoul Korean are all rising. Figure 1.8 shows the present diphthongal system of Seoul Korean.

(1) *w* diphthongs		(2) *y* diphthongs		
wi				yu
we	wə	ye	yə	yo
	wa		ya	

(3) isolated diphthong: *ii*

Figure 1.8. The diphthongal system of contemporary Seoul Korean

The variations and changes that have persisted in the diphthongs of Seoul Korean have not disappeared. The diphthongs of this dialect still show interesting variations and changes in progress. The main purpose of this research is to investigate these diphthongal variations and changes which contemporary Seoul Korean exhibit, and to attempt to provide phonological and phonetic explanations to them.

1.3. Sociolinguistic model: Labov's quantitative paradigm

The sociolinguistic model adopted in the present research is Labov's quantitative paradigm. This model is different in its aim and methodology from other sociolinguistic models such as the 'ethnographic approach' of Hymes and Gumperz or from the macro-sociolinguistic approach of Fishman and Ferguson (which is often called the sociology of

language). In this section, I will briefly discuss the goals of the Labovian sociolinguistic approach and the methodology typically adopted by this paradigm.

First, the Labovian approach is different from other sociolinguistic approaches in that it is more linguistically oriented. Though sociolinguistics can be defined as the "study of language in relation to society" (Hudson 1980:1), there seem to be differences among sociolinguistic approaches in the degree of interest in society or social aspects of language. When compared to the other approaches, the Labovian paradigm seems to put more (or equal) emphasis on linguistic aspects of language than social aspects, while the others are primarily focused on social aspects of language. The corollary of this difference is that the Labovian approach shows interest not only in finding correlations among linguistic features (or linguistic structure) and social structure, but also in the implications of variation for linguistic systems in contact (e.g., Labov 1971, Labov, 1973, Trudgill 1986), language change (e.g., Labov 1980, Labov 1990, Milroy and Milroy 1978) and linguistic theory (e.g., Labov 1972a, Cedergren and D. Sankoff 1974, Guy 1991).

Another important difference that may distinguish the Labovian paradigm from other sociolinguistic approaches is the former's quantitative approach to sociolinguistic investigation. In the Labovian paradigm, when there are "different ways of saying the same thing" (Hudson 1980:141), the former, i.e., 'different ways', is defined as variants of the latter, i.e., 'the same thing'. For instance, when a variationist observes that the last consonant of words like 'burning', 'swimming', and 'paying' is produced by English speakers variably as [ŋ] or [n], the two alternatives are defined as variants of one linguistic variable, which is often labeled as (ng) (cf. Wardhaugh 1986).[1]

What Labov found in his earlier sociolinguistic research is that linguistic variables and social variables do not match each other in a one-to-one relationship, but rather that only frequencies of the occurrence of a given variant over those of the others change along

[1] A linguistic variable is commonly given in parentheses in sociolinguistic literature, and so '(ŋ)' represents a linguistic variable 'ŋ'.

the social scale such as age, gender or social status. To make an example, the [n] variant of the (ng) variable discussed above is used more frequently by males than females in English-speaking communities, but the [n] variant is not matched exclusively to males. This finding became one of the important motivators that made Labov and his collaborators adopt the quantitative method. The adoption of the quantitative method, on the other hand, has enabled Labov and his followers to make claims about linguistic changes in progress and about the nature of contact between linguistic systems on the basis of quantitative evidence.

Labov (1963) is one of the classic studies which show how the quantitative sociolinguistic method can contribute to our investigation of language change and variation. In this study Labov investigates two sound changes in progress in Martha's Vineyard, the centralization of the diphthongs *ay* and *aw*. Based on his observation that the residents of Martha's Vineyard often produce the vowel of such words as 'right', or 'twice' as [əy] and that of 'out', 'house' or 'doubt' as [əw] (deviating from the Standard pronunciations [ay] and [aw]) Labov conducted a sociolinguistic research on these two variables. Since a survey conducted in the 1930s gave evidence that this centralization tendency was not very visible in this island at that time, the centralization of the two diphthongs had to be considered as a new trend. Labov's research found that different age groups living in Martha's Vineyard produced the centralized diphthongs with different frequencies as summarized in Table 1.1, i.e., different age groups behaved differently with respect to the variables (ay) and (aw).

Age	(ay)	(aw)
75-	25%	22%
61-75	35%	37%
46-60	62%	44%
31-45	81%	88%
14-30	37%	46%

Table 1.1. Centralization of (ay) and (aw) by age level on Martha's Vineyard (Source: Labov 1963:291)

The table above shows a pattern that the younger the age group, the more frequently the group uses the centralized variants (with the exception of the youngest group). Labov also found that the frequency of the use of the centralized variants significantly correlates with the degree of the speaker's identification of him/herself with Martha's Vineyard or with how positive the speaker's attitude is toward his/her native island. The informants were divided into three groups on the basis of the subjects' responses to the questions designed to elicit the informants' evaluation of the island. The group of residents who has positive attitude toward the island used the centralized diphthongs significantly more often than the other groups who have neutral or negative attitudes, as shown in Table 1.2.

Persons	Attitude	(ay)	(aw)
40	Positive	63%	62%
19	Neutral	32%	42%
6	Negative	09%	08%

Table 1.2. Diphthong centralization and attitude towards Martha's Vineyard (Source: Labov (1963:306))

Labov explains the exceptional behavior of the youngest group (shown in Table 1.1) with this social factor of 'positive attitude' or 'the speaker's positive identification with the island': many members of the youngest group do not positively identify themselves with the island because they, unlike older groups, still have the choice as to whether to stay in or leave the island for education or employment. Quantitative evidence shown in Tables 1.1 and 1.2 was the major basis upon which Labov could claim that the centralization of the two diphthongs is a change in progress and further a socially-motivated sound change. This study thus provides a good model exemplifying that the quantitative method can be a very effective method of investigation for studies of linguistic variation and change.

With the background discussed so far, I will now turn to the general procedure of investigation (stages of investigation) that variationists typically go through in their sociolinguistic research. The first step of research in quantitative sociolinguistics is the selection of the speech community and language to investigate. The choice of speech community depends on many different factors, but most important among them are the investigator's knowledge of the language spoken in the community, the researcher's familiarity with the linguistic situation and social setting of the community, and financial resources and time that the investigator can invest in his/her research.

The second step is the collection of the data. This step includes tasks such as sampling of the speakers, decision on data elicitation methods, and actual data elicitation and recording. In sampling, a decision has to be made as to whether to use random sampling or judgment sampling. It should also be decided whether to use an individual sociolinguistic interview as a primary method of data elicitation or social network approach (cf. L. Milroy 1980), or methods like 'unsystematic observations' (cf. Labov 1972b), a 'rapid and anonymous survey' (L. Milroy 1987) or a telephone survey.[2] If the interview method is adopted, a decision has to be made whether to complement this method with other elicitation methods allowing access to speakers' more casual speech like the participant observation method or its modified versions (cf. Vidich 1971). The collection of data includes not only linguistic data but also the gathering of the personal information

[2]The final three techniques can also be used to complement the first two methods.

(e.g., age, sex, job, birthplace, etc.) of those speakers who have been sampled and have agreed to be a subject.

The third step involves the identification of linguistic variables and their variants. This step usually follows the transcription of the recorded data. To reduce the risk of wasting time and financial resources for ill-designed research, often one or two pilot studies are conducted to identify the variables and their variants before a large-scale variation research is undertaken. Those linguistic variables that have significant social or sociohistorical or theoretical implications are usually selected as the object of investigation.

The fourth step involves performing statistical analyses of the tokens of the linguistic variables. The statistical techniques used in variation studies have been refined as the quantitative paradigm has undergone further development. Variationists have developed a series of statistics programs called Varbrul (e.g., *Varbrul* by Cedergren and D. Sankoff, *Varbrul 2* by D. Sankoff, *Varbrul 3* by Rousseau and D. Sankoff, *MacVarb* by Guy, *I-*, *T-*, *M-Varb* by Pintzuk) that are designed especially for the purposes of sociolinguistic investigation. The use of Varbrul programs is usually complemented by the use of commercial statistical packages like SPSS or SYSTAT for standard statistics such as the correlation test, the chi-square test, ANOVA, or factor analysis, etc.

The final step involves the interpretation of statistical results. The investigator can make various claims on the basis of his/her interpretation of the results. The investigator may claim that there exist differences among (some) social groups in their behavior toward a certain linguistic variable based on uneven distributions of the variants among these social groups, and attribute these differences to a certain aspect of social structure of the community under study (e.g. Labov's (1963) study on Martha's Vineyard); or may argue that a linguistic change is underway based on the gradual decrease (or increase) of one variant over the others along the age scale (e.g., Cedergren's (1984) study of the lenition of (ch) in Panamanian Spanish); or may claim that a given linguistic theory is better than the others in that the former is able to explain the variation pattern of a given variable in its framework (Guy 1991); or may argue that more than one linguistic system is competing in a given speech community based on a radical difference in linguistic behavior between the highest and lowest social class groups (e.g., Winford 1993).

1.4. Sociolinguistic theories of the initiation and spread of phonological change

As suggested earlier, quantitative sociolinguists have always shown interest in linguistic change, especially change in progress (probably because variation and change are closely related and variation is often a sign of linguistic change). Labovian sociolinguists' primary interest, unlike that of historical linguists', lies mostly in the social setting and mechanisms of sound change, that is, by which social group linguistic innovations are introduced and under what social motivation, which social groups are the early adopters of linguistic innovations and spread them to the other social groups (leading the linguistic change) and under what motivation, and which group resists this change, and so on. There have been some different claims among sociolinguistic researchers on these issues, i.e., issues of initiation and spread of linguistic innovation and change. In this section, I will briefly discuss the main claims of the four leading researchers in this area, Kroch, Milroy and Milroy, and Labov, comparing their different theoretical positions. As is well-known, sociolinguists distinguish two types of sound change: socially conscious change and unconscious change. I make it clear that the four researchers' theories concern the latter, socially unconscious change, rather than the former.[3]

Kroch's position on linguistic innovation and its spread is that phonological changes generally begin at the lowest social class and spread to the higher groups of the social hierarchy. Linguistic innovations initiated by the lowest social group may or may not reach higher social groups. The innovative form will be last adopted by the highest

[3]Labov refers to socially conscious change as 'change from above' and unconscious change as 'change from below'. The latter is the main mechanism of sound change. I refer to 'unconscious change' as sound (phonological) change in this study.

social group, if it successfully reaches the top of the social scale. Kroch (1978:348) summarizes his ideas on phonological innovation and change as follows:

(1.1)

1. Ordinary unconscious phonological changes are definitely not arbitrary but are, in general, phonetically motivated processes.
2. Prestige is a secondary factor in the propagation of phonetically motivated linguistic changes, whose linguistic character is the original basis of their diffusion.
3. The main force of social prestige is to inhibit phonetically conditioned processes, both of change in progress and of stable inherent variation, in the speech of high status groups and those whom they influence.

As the first and second statements above suggest, most phonological changes are, according to Kroch, phonetically-motivated. Kroch's account of linguistic innovation crucially relies on his observation that the speech of low class speakers, which he calls 'popular dialects', tends to show more phonetic conditioning (as exemplified by features like simplified articulation and the tendency to delete perceptually similar segments) than the speech varieties of higher class speakers. Kroch suggests that the tendency of popular dialects to be heavily subject to phonetic conditioning is the major source of phonological innovation and change, implying that the social origin of linguistic change is, in most cases, the lower social class of the speech community.

As suggested by the third statement above, one important social factor in Kroch's theory on the spread of linguistic innovation and change is 'prestige'. Kroch's claim is that high status social groups in the community generally resist linguistic innovations originating from the lower class speakers because they have a desire to distinguish themselves from the other social groups. This implies that the lack of prestige of the innovative form is a main obstacle in its spread to the whole community. As a result, Kroch's theory of phonological innovation and its spread predicts the social class distribution of an innovative form (and a change in progress) to be linear, with highest use in the lowest class group and progressively lower rates of use in higher class groups (Figure 1.9). In this respect, Kroch's theory is different from Labov's, which predicts a curvilinear social distribution of the linguistic innovation, as will be discussed shortly.

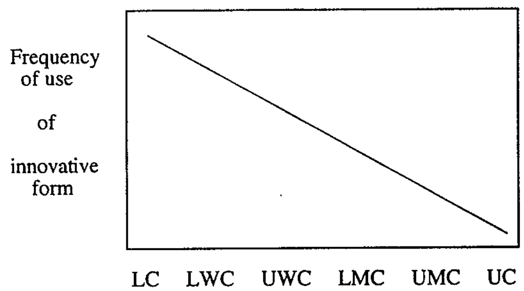


Figure 1.9. Linear social class distribution of a change in progress as predicted by Kroch's theory

The concept of social network plays an important role in Milroy and Milroy's (M & M henceforth) account of the initiation and spread of linguistic change. Two types of social network are proposed: a 'close-knit network', a group of people who have dense, multiplex relationships with a strong internal bond; and a 'loose-knit network', a group of people who have relatively simple, tenuous relationships with a weak bond among the members. According to M & M (1985:359 ff.), the close-knit social network functions as "a norm-enforcement mechanism" and as "a conservative force, resisting pressures to change from outside the network", while a loose-knit network often plays the role of a bridge transmitting linguistic innovations.

Unlike Kroch and Labov, M & M (1985) attempt to distinguish 'linguistic innovators' clearly from 'the early adopters of a linguistic innovation'.[4] They suggest that linguistic innovators tend to be marginal members of a social network, who do not strongly

[4]M & M suggest that those social groups that, Labov claims, generally lead linguistic change, i.e., intermediate social class groups, are probably early adopters rather than innovators.

identify themselves with their local group, while the early adopters of the innovation are usually core members. According to the Milroys, these tendencies are attributable to the social mechanism that marginal members of a network are under less pressure to follow the linguistic norm of the group and that core members can be more effective in spreading the innovative form to the other members of the network. One important condition on the successful spread of a linguistic innovation is the presence of multiplex links among marginal and core members of the innovating group and also of numerous weak ties that connect different social networks of the community to one another. M & M's suggestion is that core members of each social network are pressured to accept the linguistic innovation, only when the input of the transmission comes from multiple networks and when they are repeatedly exposed to the innovation.

Multiplex weak social ties are not found frequently in rural areas or in communities where social mobility is rarely found. The Milroys propose that this is why linguistic innovations and changes are more often found in urban areas, especially in big cities, where maximum social insecurity and mobility are observed. They also attribute Labov's finding that linguistic changes are often initiated by the 'interior' groups of the community to the fact that these groups have more weak ties than the highest and lowest social groups.

As opposed to Kroch's position, Labov (1990, 1972d) suggests that though linguistic innovations 'can' originate from any subgroup of the community, they are often introduced and spread by 'interior' social groups (especially upper working class and lower middle classes), rather than by the 'extreme' social groups (upper class and lower class). These innovations usually occur "when the separate identity of the subgroup is weakened by some internal or external pressures" (Labov 1972d:178). The interior groups are claimed to have a more positive social motivation to initiate innovations as markers of 'group solidarity' or 'local identity' than the other social groups, which is why they are usually linguistic innovators.[5]

Prestige plays a significant role in Labov's theory as well as in Kroch's. However, the role of prestige is very different in two theories. While it suppresses phonological change in Kroch's theory, prestige (or positive evaluation), overt or covert, is claimed to be the main motivating factor in the spread of linguistic innovations in Labov's theory. When the innovative form is evaluated positively by the members of the innovating group, it spreads becoming an indicator of 'group membership'. If the innovation is further given a positive evaluation by the other social groups, the change spreads throughout the community, becoming one of the norms that define the speech community. Since, according to Labov, the interior groups are usually the innovators and lead the change in the vanguard, changes in progress are claimed to show, typically, a curvilinear pattern of social class distribution (Figure 1.10). This prediction by Labov's theory of linguistic innovation and its spread is clearly different from Kroch's proposal illustrated in Figure 1.9.

[5]The readers are, however, reminded of Milroy and Milroy's (1985:369) suggestion that Labov's 'intermediate' groups are not actually linguistic innovators but probably early adopters of innovations.

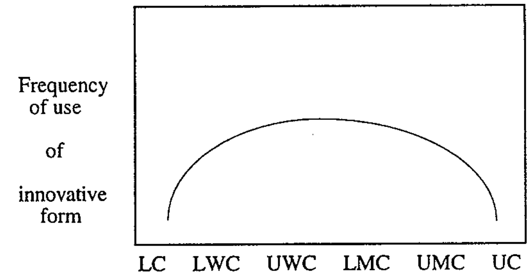


Figure 1.10. Curvilinear social class distribution of the innovative form as predicted by Labov's theory

Labov (1990, 1972d) also claims that women, rather than men, are often the linguistic innovators and lead the phonological changes (see Eckert 1989, Di Paolo 1988, Luthin 1987 for examples of female-initiated changes). He attributes the predominance of female-led sound changes over male-initiated changes primarily to the asymmetry of childcare situation in most, if not all, societies, where primary child caregivers (mother, aunt, grandmother, schoolteacher, etc.) are mostly females. Labov's claim is that since children are, by childcare situation, exposed to female-initiated innovations more frequently and also at earlier ages than to male-initiated innovations, female-led changes tend to be accelerated. Thus according to Labov, there are two social groups that are most likely to lead linguistic changes, i.e., the intermediate social class groups and female speakers.

Three major sociolinguistic theories of phonological innovations and their spread were discussed in this section. M & M's theory is different from Kroch or Labov's in that it adopts and utilizes the concept of social network as a basic social unit. The primary difference in Labov and Kroch's positions lies in the social origin of phonological innovations and changes. In addition, Labov stresses the role of women in linguistic changes. The current research does not take the social network approach as its method of sociolinguistic investigation (see Chapter 3 for the research methodology of the present study), so it can neither support or refute M & M's theory of linguistic innovation and its spread. However, this study will examine the social class distribution of the innovative forms of the linguistic variables under study and consider its possible implications for Labov's and Kroch's theories.

1.5. Phonological framework: Optimality Theory

The phonological model adopted in this research is the Correspondence model of Optimality Theory (OT). OT is a constraint-based phonological model, and is different from traditional derivational theories in its assumption that important phonological generalizations are found not in the input structures and rule operations but rather in the properties of the output structures. The basic principles of OT outlined in Prince and Smolensky (1993) and McCarthy and Prince (1993) are as follows:

(1.2)

1. Universality: Constraints are universal across languages.
2. Violability: Constraints can be violated.
3. Ranking: Constraints are ranked on a language-particular basis.
4. Inclusiveness: The constraint hierarchy evaluates potential candidates that are admitted by general considerations of structural well-formedness.
5. Parallelism: Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set.

One important theoretical position of OT is that there are no phonological rules or intermediate representations between the input and the output structures. Only the existence of the underlying representation and the surface representation is assumed in this theory. A function Gen (generator) produces a set of potential candidates on the basis of the input.

Gen is "a fixed part of universal grammar and contains information about the representational primitives and their universally irrevocable relations" (Prince and Smolensky 1993:4). Gen generates all the possible forms that conform to these representational primitives and that do not violate universally irrevocable relations ('Inclusiveness').

Constraints, often conflicting with one another, are essentially universal; each language basically has the same set of constraints. What is different across languages is the ranking of constraints, i.e., languages do not have identical constraint hierarchies, which leads to the emergence of different phonological phenomena in different languages. The potential candidates produced by Gen are evaluated by the function Eval according to each language's constraint hierarchy. The candidate which best satisfies (or minimally violates) the language-specific hierarchical ranking is chosen as an optimal (most harmonic) form by the function Eval and realized as the output. The choice of an optimal form is not made serially or in isolation but the whole constraint hierarchy and the whole candidate set are considered in parallel ('Parallelism'). The optimality-theoretic grammar is suggested to have the following structure (from Prince and Smolensky 1993:4):

(1.3)

Gen (input) —> {$cand_1$, $cand_2$, $cand_3$......$cand_n$}
Eval ($cand_1$, $cand_2$, $cand_3$......$cand_n$) —> <u>output</u>

It has been suggested (e.g., Guy 1994, Kiparsky 1994) that OT is potentially the most compatible with variation studies among the existing phonological models. The primary basis for this suggestion is that the OT model has a noncategorical nature in the sense that constraints are violable in its system. In this respect, OT is clearly different from traditional derivational models where a violation of a constraint necessarily results in the ill-formedness of surface forms. However, as Zubritskaya (1995) notes, OT is still categorical in the sense that it allows only one optimal form, which is chosen by the language-specific strict dominance relationship among the constraints. The OT model is not different from other phonological models in this respect. To overcome this categorical nature of OT and 'explain' variation, two different approaches have been taken by phonologists who have interest in variation.

The first approach does not involve any addition of new concepts or elements to the existing model of OT. In his attempt to explanation variation, Kiparsky (1993, 1994) suggests that more than one constraint hierarchy coexists in cases where a linguistic variable has variants: the reason why more than one variant alternates with a single variable is that each of the coexisting constraint hierarchies produces its own optimal form. This approach is often called the 'grammar competition model', since in OT each constraint hierarchy constitutes a separate grammar. This line of explanation is plausible in cases where more than one linguistic system coexists, i.e., in communities where more than one dialect or language is spoken. Typical cases of this situation will be creole or AAVE situations (see Singler 1996 for the use of the grammar competition model in his attempt to explain phonological variation in Vernacular Liberian English). However, this model does not seem to be adequate in explaining cases of intrasystemic variation, i.e., situations where there exists variation in a single dialect or language, because this model has to assume the coexistence of a plural number of grammars to account for variation.

A different line of approach is proposed by Reynolds (1994). He suggests that the presence of competing forms of a linguistic variable can be accounted for by assuming that some OT constraints are variably ranked (or unranked) with respect to one another.[6] In particular, he introduces to the OT model the theoretical device of 'Floating Constraints' (FCs), whose concept he describes as follows (Reynolds 1994:116):

[6]A similar approach to explanation of phonological variation is taken by Liberman (1993).

(1.4)

> ...within a given language or dialect, it may be the case that a particular constraint X may be classified only as being ranked somewhere within a certain range lying between two other constraints W and Z, without specifying its exact ranking relative to a certain other constraint Y (or constraints Y_1, Y_2, etc.) which also falls between W and Z. A graphic representation of such a variable constraint ordering is as follows:
>
> $$\text{CONW} >> \overset{\text{................CONX................}}{\left\{ \text{CONY}_1 >> \text{CONY}_2 >> \ldots >> \text{CONY}_n \right\}}\ \text{CONZ}$$
>
> Here, the constraint (or constraints) which appears on the higher level in the representation is the FC, while those on the lower level are "hard-ordered" or "anchored" constraints. The range over which the FCs may extend is defined, not in terms of the constraints (W and Z), which the FC lies between, but rather in terms of the particular subset of fixed or anchored constraints (Y_1, Y_2, ... Y_n) with regard to which the FC is considered to be unranked. In other words, the FC may be allowed to fall in any position with respect to its anchored subset — above Y_1, below Y_n, or at any point in between; this is the essence of the FCs relationship with its anchored subset or range.

The main point of Reynolds' proposal is that there are some OT constraints which are not ranked with respect to one another. The most simple case will be when two constraints are not ranked relative to each other (cf. Figure 1.11.1). In this case, either of the two can be assumed to be an FC. In some instances, constraint X dominates Y, choosing variant A as an optimal form; in other cases constraint Y dominates X, choosing variant B as the output. If two constraints, say Y_1 and Y_2, are not ranked relative to an FC and Y_1 dominates Y_2 (cf. Figure 1.11.2), three situations obtain. X can dominate Y_1 and Y_2; X can dominate only Y_2; X can dominate neither of the two. In this case, three different variants can be realized as an output. These two cases are illustrated below.

(1)

$$\text{ConW} \gg \left\{\begin{matrix}\text{ConX}\\ \text{ConY}\end{matrix}\right\} \gg \text{ConZ}$$

*possible dominance relationships

1) ConW >> ConX >> ConY >> ConZ
2) ConW >> ConY >> ConX >> ConZ

(2)

$$\text{ConW} \gg \left\{\begin{matrix}\ldots\ldots\text{ConX}\ldots\ldots\\ \text{ConY}_1 \gg \text{ConY}_2\end{matrix}\right\} \gg \text{ConZ}$$

*possible dominance relationships

1) ConW >> ConX >> ConY_1 >> ConY_2 >> ConZ
2) ConW >> ConY_1 >> ConX >> ConY_2 >> ConZ
3) ConW >> ConY_1 >> ConY_2>> ConX >> ConZ

Figure 1.11. Constraint dominance relationships when an FC is active in a given language: (a) when two constraints are variably ranked; (b) when three constraints are variably ranked.

As more and more constraints are variably ranked to an FC, the situation becomes more complex and a larger number of dominance relationships between an FC and anchored constraints become possible, as can be expected.

Between Kiparsky's and Reynold's OT approach to the explanation of phonological variation, the current research adopts the latter. It seems to me that Reynolds' (1994) approach is the only viable attempt to incorporate variation into the existing OT model, especially in intrasystemic variation situations. The validity and descriptive, explanatory adequacy of his proposal remains to be tested. I will apply his modified OT model to the data for the variables under investigation and examine how well OT with the added device of the "FC" can explain the variation patterns of the variables.

1.6. Phonetic model: Ohala's perception-based model of sound change

In 1.4, I have discussed four sociolinguists' theories of the initiation and spread of phonological change. Their interest was primarily in locating the social locus of linguistic

innovation and change and finding the motivation and social paths of the spread of linguistic innovation. As suggested earlier, phonological change can be either socially conscious or unconscious, i.e., sound change can be either change from above or below the level of social consciousness. Socially unconscious changes are "the basic form of linguistic change" and "make up the major mechanism of linguistic change" (Labov 1990:215). There is also an agreement among researchers that many unconscious sound changes are phonetically-motivated (Kroch 1978; Labov 1994:419ff.). Kroch suggests that as discussed earlier, a majority of sound changes are phonetically motivated. Labov suggests that some of the phonetically- or internally-motivated innovations lead to linguistic change "in response to social motivations" (Labov 1972c:123).

Similarly, most historical linguists, following the Neogrammarians, define sound change as change in sounds that is conditioned or motivated by 'phonetic' factors. Researchers have proposed two types of phonetic motivation in sound change: the ease of articulation on the part of the speaker (e.g., Müller 1864, Ladefoged 1984) and perceptual constraints on the part of the listener (e.g., Sweet 1888, Jonasson 1971). Ohala places stress on the latter, i.e., on the role of the listener in sound change, and takes the position that a majority of sound changes are perceptually motivated. The current research relies on Ohala's (1981, 1993) perception-based model of sound change in its attempt to provide phonetic explanations of the ongoing changes in the diphthongal system of Seoul Korean. The basic ideas and claims of this model will be briefly discussed below.

Ohala's phonetic explanation of sound change begins with the observation that there is an extreme degree of variability in speakers' production of sounds; the production of the 'same' sound is different not only from person to person but also in different phonetic environments and in different speech rates and styles: no repetition of the 'same' sound is identical. The reason why each variation does not result in 'sound change' is that the listener has the ability to normalize phonetic variations relying on the recognition of the phonetic environment where the sequence is produced and reconstruct the intended sound sequence. This scenario holds in most cases of synchronic phonetic variation. That is, the listener 'corrects' the distortions in the intended sound sequence and reconstructs the intended sequence based on his/her unconscious phonetic knowledge of the language.

However, there are cases where the listener fails to 'correct' or miscorrects the distortions. Ohala suggests that a mini-sound change occurs in these cases.[7] Three different types of mini-sound change are suggested by Ohala. The first type is single confusion about the sound itself, which occurs when similar acoustic-auditory cues of articulatorily distinct sounds confuse the listener. The confusion originates from the many-to-one mapping relation between vocal tract configuration and the output sound, i.e., from the fact that different vocal tract shapes can produce acoustically/auditorily similar or identical sounds. One classic example of this type of linguistic change is observed in the development of Classical Greek from Proto-Indo European, where labial or labialized velar consonants change to labial stops. Ohala cites the following examples from Meillet (1967).

(1.5)

Proto-Indo-European	Classical Greek	
*ekwo:s	hippos	'horse'
*gʷiwos	bios	'life'
*yekʷr̥	hepatos	'liver'

The observed substitution of labial (labialized) velars by labials is due to the acoustic similarities between labial and velar consonants (see Lehiste 1964, Jakobson et al. 1952), which motivated the primarily phonetic feature 'grave' (that can be defined as 'involving a peripheral articulation in the vocal tract and having a concentration of acoustic energy in the

[7]Ohala's 'mini-sound change' is similar to the concept of 'linguistic innovation' of sociolinguists. Ohala's main interest is in how linguistic innovations are initiated at their earliest stage, not in the social locus of linguistic innovations or their spread. According to Ohala, a mini-sound change occurs when a single listener fails to correct the distortions in the intended sound sequence caused by its phonetic environments. Sociolinguists' theories predict that social factors (motivations) will play an important role in whether a mini-sound change initiated by a single person (a linguistic innovation at its earliest stage) will spread to the other members of his social group and to the other groups of the community.

lower frequencies'). Ohala claims that the acoustic similarities between labials and velars can cause perceptual confusion in some listeners, and that when the listener-turned speakers make substitutions and these substitutions are adopted as a norm in the speech community, a maxi-sound change occurs. His claim is supported by identical changes found in other languages like Isthmus Zapotec (Suarez 1973) and Wet Teke (Guthrie 1967-1970).

The second type of mini-change occurs when the listener fails to normalize or correct for perturbations caused by the phonetic environment of the sound. Ohala refers to this case as 'hypo-correction'. He suggests that there can be two different situations of hypo-correction. The first is when the listener does not have enough latent phonetic knowledge or linguistic experience of the language, as in the case of young children in the process of acquiring their language. The second situation arises when the listener, for some reason, fails to perceive the phonetic environment which causes or conditions perturbations in the intended signal. The reasons for failing to perceive the conditioning environment may be some lack of salience in the environment sound itself — as when oral or nasal stops are not released (it is well documented that most or many of the acoustic cues of stops are given at the time of release) or when the conditioning sound is far away from the conditioned (affected) segment.

One example of hypo-correction given by Ohala (1993) is the development of French nasal vowels from the 'vowel + nasal' sequences — i.e., the change from VN > Ṽ. Supported by Kawasaki's (1986) finding that listeners hear more nasalization on the vowel of the 'nasal + vowel + nasal' sequence when nasal consonants are attenuated or totally eliminated, Ohala (1991) suggests that French nasal vowels arose because listeners failed to hear the nasal consonant ("perhaps because it was unreleased" (ibid:324)) and attributed the perturbations by the nasal to the vowel itself. As evidence that listeners did not recognize the conditioning environment, he cites the loss of the nasal consonant following the vowel.

Another example given by Ohala (1989) is patterns of tonal developments observed in languages like Chinese, Punjabi and Kammu. The following Kammu examples are cited by Ohala (1989:181):

(1.6)

Southern Kammu	Northern Kammu	
klaaŋ	kláaŋ	'eagle'
glaaŋ	klàaŋ	'stone'

(Source: Svantesson 1983)

Ohala claims that the tonal developments of these words originate from the synchronic phonetic variation that the fundamental frequency on vowels is higher after a voiceless consonant than a voiced consonant (Hombert et al. 1979, Löfqvist et al. 1989). Some listeners of this language, he suggests, failed to attribute the distortions (i.e., higher fundamental frequency) in the speech signal to the source of perturbations (a voiceless consonant).

The third type of mini-change arises when the listener corrects for imagined distortions which s/he thinks were conditioned by a certain phonetic environment. Ohala refers to this situation as 'hyper-correction' and claims that when the listener-turned speaker produces the sound sequence as s/he has erroneously reconstructed, this type of mini-change occurs. Ohala (1981) gives the following sound change as an example.

(1.7)

Pre-Shona		Shona	
*-bwa	>	-bɣa	'dog'
kumwa	>	kumɣa	'to drink'

(Source: Guthrie 1967-70; Mkanganwi 1972)

Ohala interprets this change, a change from a labio-velar /w/ to a velar /ɣ/ after a labial, as follows. When the listener hears *w*, it gives cues of both a labial and a velar. Listeners,

however, ascribe the labial portion of *w* cues to the preceding bilabial consonant and factor it out (hyper-correction). The velar portion of *w* cues, on the other hand, is not ascribable to any other adjacent sound and becomes the basis of reconstructing *w* as *ɣ*. Another example cited in Ohala (1981) is the change from /pyam/ to /pin/ 'diminish' in Chinese. The acoustic cues of labiality in the sequence *ya* of /pyam/ (the sequence *ya* is labialized being surrounded by labial consonants) were apparently attributed by (some) listeners of this language to the preceding consonant rather than to the following labial.

To recapitulate, Ohala claims that the following four outcomes can occur when the listener receives the speaker's variable, often distorted, phonetic productions.

(1.8)

1. Correction
2. Confusion of acoustically similar sounds
3. Hypo-correction
4. Hyper-correction

He suggests that among these the last three outcomes can lead to sound changes. He opposes the claim by some historical linguists that while assimilatory changes are natural, dissimilatory changes are not, a claim which presumably comes from the premise that ease of articulation or the principle of the least articulatory effort is the primary motivation of linguistic change. However, according to Ohala's view of sound change, i.e., the view that sound change is primarily motivated by perceptual factors, dissimilatory changes are at least as equally natural as assimilatory changes.

There have been studies (e.g., Wright 1986, Kawasaki 1986, Kawasaki-Fukumori 1992, Lindblom 1986, 1990, Fowler 1986) which support the main claim of Ohala's model of sound change, the claim that perceptual factors play an important role in sound change. Some of these studies are on the phonetic influence on sound change and others are on phonological universals in general (especially universal constraints on types of vowel systems and sound sequences). Among these, the most interesting and relevant to the present research are Lindblom (1986) and Kawasaki-Fukumori (1992). Lindblom (1986) finds that vowel systems derived on the basis of the criterion that they have been largely shaped by the principle of 'sufficient perceptual contrast' closely match actual vowel systems of natural languages. Kawasaki-Fukumori (1992) calculates perceptual distance between the segments of some selected sound sequences and finds that universally rare sound sequences have little or a small acoustic/auditory distance between the component segments of the sequence. These researchers suggest that 'maximum/sufficient perceptual contrast' is an important motivator of sound change and of constraints on sound sequences in general; their findings imply that acoustic/auditory factors play a major role in the diachronic selection of speech sounds and sound sequences.

It may not be that the initiation of every socially unconscious sound change can be explained by Ohala's model. However, it is probably the only well-established phonetic model of sound change (which is defined by most historical linguists as changes in sounds motivated by 'phonetic' factors). This model is also compatible with sociolinguistic models of sound change since it concerns only with the initiation of linguistic innovation at its earliest stage, not its spread, which may be mostly socially-motivated. In this research I present more evidence that supports Ohala's phonetic model of sound change. It will be shown that the ongoing linguistic changes observed in the Seoul Korean diphthongs are clearly perceptually motivated and thus conform to Ohala's model of sound change.

As mentioned earlier, the primary purpose of this dissertation is to investigate variation and changes involving Seoul Korean diphthongs and to uncover the current status of the diphthongal system of Seoul Korean. The present research is conducted following the Labovian sociolinguistic paradigm. It also attempts to account for the synchronic variation observed in Seoul Korean diphthongs phonologically within the framework of Optimality Theory and explain the ongoing sound changes phonetically along the lines of

Ohala's model of sound change. It will be claimed that the synchronic variation shown in this research is caused by the coexistence of competing phonological constraints, and that the changes in progress have been triggered by either perceputal (i.e., phonetic) or structural (i.e., phonological) factors .

This chapter has been (mostly) an introduction of the sociolinguistic and theoretical models which the present study is based on. The rest of this dissertation is organized as follows. In Chapter 2, I discuss the social and linguistic settings of Seoul Korean, and introduce previous studies of phonological variation in Korean. This introduction is followed by the discussion of the linguistic variables that will be examined in subsequent chapters. Chapter 3 presents the methodology used in the current research. Field methods, sampling methods, and statistical methods adopted in the study will be described and explained. Chapters 4, 5, and 6 investigate the sociolinguistic variables involving the glides and diphthongs of Seoul Korean. Chapter 4 examines the variable deletion of the labiovelar glide *w*; Chapter 5 investigates the categorical and variable deletion of the palatal glide *y*; Chapter 6 analyzes the monophthongization of the diphthong *ɨi*. Each of these chapters attempts a phonological account of the observed variations and phonetic explanations of ongoing changes. In Chapter 7, I summarize the major findings of this research and discuss their synchronic and diachronic implications relating them to the theoretical models assumed at the outset of the current study.

CHAPTER 2

THE SEOUL SPEECH COMMUNITY AND SEOUL KOREAN IN ITS LARGER CONTEXT

2.1. The Seoul community

Korea is a peninsula country situated in Far Eastern Asia. It is located contiguous to its Northern continental neighbors Russia and China and adjacent to insular Japan (Figure 2.1). It is claimed that Korea has a history longer than four thousand years. Korea had three unified kingdoms: Silla (661 - 935), Koryo (935 - 1392) and Chosun (1392 -1910), but was occupied by Japan in 1910 and remained under its rule until the end of World War II. It is a well-known fact that the Korean Peninsula has been divided into two separate countries, South Korea and North Korea, for ideological reasons since the war. The population of South Korea is approximately 45 million. Its gross national product (GNP) is over 300 million dollars, and ranks 15th in the world. But its GNP per capita is just slightly over 10 thousand dollars. It is thus economically not yet a fully developed but fast-growing country. Korea had been heavily influenced by Chinese culture up until the beginning of the 20th century. Confucianism and Buddhism have been the main religious and cultural influences on the thought and behavior of the Korean people. Now, with the introduction of western culture that began at the end of the 19th century, South Korea has a complex mix of oriental and western culture. People and events are evaluated by both traditional oriental values and relatively new western values, though the latter are fast becoming a dominant element in the Korean value system. Seoul, whose dialect is the object of the current research, is the capital city of South Korea.

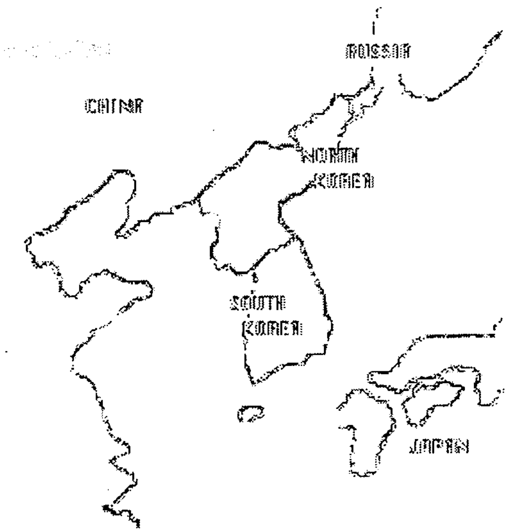


Figure 2.1. The location of Korea in Far Eastern Asia

South Korea consists of eight major administrative districts called *to* 'province' and six special-status cities, i.e., Seoul (capital), Pusan, Taegu, Inchon, Taechon, and Kwangju, each of which is administratively independent of the province where it is geographically located. These provinces and cities of South Korea are illustrated in Figure 2.2. Seoul is situated near the center of Kyongki Province and also near the center of the Korean peninsula.

Seoul has been one of the major cities throughout Korean history. 'Wirye', the then name of Seoul, was briefly a capital city of Paekche Kingdom (which existed in the western part of the Korean Peninsula from 18 BC - 663 AD) before the kingdom moved its capital to Kongju. Though not the national capital, 'Namkyong' (another old name of Seoul), was one of the three major cities in the Koryo Dynasty (918 - 1392 AD) along with

Pyongyang and the capital Kaesong.[1] Then, Seoul became the central city of Korea (the name then was *Hanyang*) when it was chosen by the Chosun Dynasty (1392-1910 AD) as its capital in 1394. Seoul has been the nation's capital ever since. Seoul, accordingly, has been the capital city of Korea for more than six hundred years.

Figure 2.2. Administrative districts of South Korea

[1]The literal meaning of *Namkyong* is "Southern capital".

The increase in Seoul's population as a national capital had been gradual until the end of the 19th century. The population was 0.1 million (rough estimation) in 1394 and 0.28 million in 1894. Since the beginning of the 20th century, Seoul's population has begun to increase dramatically mostly because of the migration of people from other cities and provinces (one feature of 'centralization' effected partly by industrial revolution and growth, and partly by the 'prestige' of the capital city) and also because of Seoul's geographical expansion and decreased mortality rate. The population of Seoul was 1.4 million in 1948, 3.3 million in 1963, 6.3 million in 1973, and 8.7 million in 1981, reaching near 11 million in 1994 (cf. D.S. Im 1994:150). Seoul showed a slight decrease in population last year because of the active developments of Seoul's new satellite cities, but still Seoul residents account for almost 1/4 of the South Korean population.

Seoul's area has also expanded notably through its history. The expansion trend has continued with the exception of the Japanese-occupied period (1910 - 1945), during which Seoul had only the status of a colonial capital.[2] Seoul's area was 251 km^2 in 1394, (33 km^2 in 1928), 268 km^2 in 1948 with 9 wards, and 627 km^2 in 1981 with 17 wards (cf. D.S. Im 1994:150). Seoul now occupies 627 km^2 with 22 wards. Refer to Figure 2.3 for Seoul's overall shape and 22 administrative districts called *ku* 'ward'.

Seoul is now among the world's ten largest cities. It is a complex, crowded city that has both the advantages and problems of a metropolis. Seoul is the hub of almost every field in South Korea: politics, commerce, industry, education, arts, sports, etc. It is the political center of South Korea where you find the Chief Executive, the national government, the National Assembly, and foreign embassies. Seoul is also the hub of business and industry: the city produces almost 40% of the gross domestic product (GDP) of the nation; about 70% of the currency circulates within this city; about 45% of the manufacturing companies are in the metropolitan area. Seoul is also the center of culture:

[2]The population of Seoul (called 'Kyongsong' at that time), however, increased continuously despite the reduction of Seoul's area during the colonial period.

approximately 40% of the nation's colleges are in this city; many national theaters and museums are located here; a majority of the major (international and domestic) art, music, and sports festivals are held in the city. Thus it could be claimed that Seoulites have access to almost all the resources and opportunities South Korea can offer.

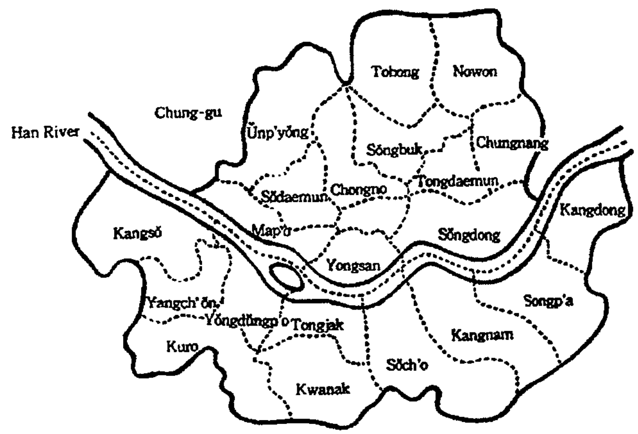


Figure 2.3. Administrative districts of Seoul

Seoul also has complex problems like other large cities. The most fundamental cause of these problems is the size of its population that amounts to 11 million. As mentioned earlier, the main cause of the dramatic increase of population in the present century, especially for the last 50 years, was the influx of the 'outlanders', residents of other regions. They come to Seoul for education and employment, and settle permanently, Seoul being a place of 'prestige' and opportunities. The term 'Seoul *thobagi*' (a 'trueborn' Seoul resident) refers to those Seoulites who have lived in the city for six to nine decades spanning three generations since the time of grandparents. Urban specialists estimate the number of such 'trueborn' Seoulites now residing in the city at about 6 percent of Seoul's

current population (0.7 million), which clearly shows how active the migration of 'outlanders' to Seoul has been in the present century, making trueborn Seoulites a very small minority group.

The colossal size of Seoul's population, naturally, has caused various problems in such areas as traffic, pollution, and housing. Traffic congestion is a major problem in Seoul as in many other populated cities of the world. Approximately 40 percent of the nation's vehicles or 50 percent of the passenger cars operate within the Seoul area. The fast-growing number of passenger cars is aggravating the already serious condition of the city's traffic. The multiple, complex routes of Seoul's subway system is not solving the traffic problem. Air pollution is another problem in Seoul. Exhaust fumes emitted by the enormous number of cars, the presence of industrial plants and factories in some areas of Seoul, and the use of *yontan* (briquette) for heating by some residents of Seoul in the wintertime are the major causes of air pollution. Shortage of housing has also been a problem in the city. The city government has not been able to provide enough quality housing to the city's residents who need it. As a result, the cost of housing has risen at a fast speed for the past 50 years. The housing situation is, however, improving with the recent large-scale construction of condominiums and apartments in Seoul and its satellite cities. Now, according to the government census (1993), approximately 75% of the families residing in Seoul live in self-owned housing.

Seoul's economy is in relatively good condition. It has grown at a rate higher than 6 percent for the past ten years. The unemployment rate has been kept low: 2.4 percent in 1992 and 2.8 percent in 1993. The average monthly income per household of Seoul residents, which was approximately two thousand dollars in 1994, has grown by more than 8 percent in the past two years.

The city has changed drastically over the past 50 years. Many of the past foreign visitors and Koreans who have returned home from abroad often find themselves lost in the very streets and avenues they once knew. Seoul is still changing and growing. Economic growth, however, does not come alone but is necessarily accompanied by its unwelcome by-products, such as the permeation of materialism and individualism into the Seoulites. Seoul may be characterized as a city with two faces — economic vigor and liveliness, and metropolitan indifference and apathy.

2.2. Seoul Korean in its larger context

2.2.1. Dialects of Korea and their diphthongal systems

The dialects of Korea consist of roughly nine dialects: Kyongki (or, Seoul-Kyongki), Kangwon, Hwanghae, Chungchung, Kyongsang, Chunla, Cheju, Hamkyong, and Phyongan dialects. Chungchung, Kyongsang, Chunla, Hamkyong, and Phyongan dialects can be further divided, respectively, into its North and South subdialects, e.g., North Chungchung and South Chungchung dialects, North Kyongsang and South Kyongsang dialects, etc. Certainly each of the other four dialects can also be further divided but we will not be concerned with the subdivision of these dialects, because their subdialects are relatively homogeneous, sharing most linguistic (phonological, grammatical, prosodic, etc.) features. For instance, the Seoul dialect is a subdialect of Kyongki and differs little linguistically from the other subdialects of Kyongki. Figure 2.4 shows the geographical distribution of the nine dialects of Korea. Only Kyongsang and Hamkyong dialects are tone languages. Phyongan and Chunla dialects are claimed to have phonemic vowel length (long vs. short vowels).[3] The Phyongan dialect shows neither synchronic palatalization process nor has gone through the diachronic palatalization change. Only the Cheju dialect retains the Late Middle Korean vowel ʌ.

[3]The Kyongki dialect also had this feature, but it is now claimed (cf. Magen and Blumstein 1993, J.K. Park 1985) that the dialect has lost much of this feature through linguistic change.

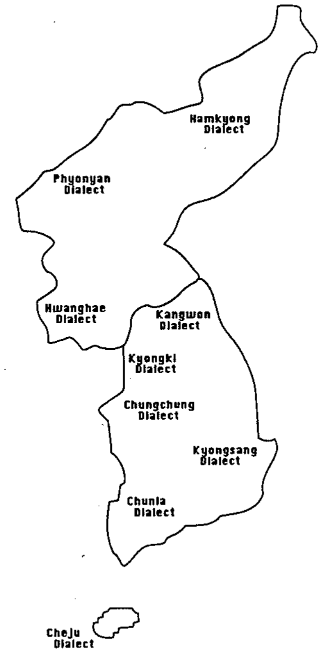


Figure 2.4. Dialects of Korea

Since the current research is a study of phonological variation in Seoul Korean diphthongs, I will introduce and discuss the diphthongal systems of Korean dialects below, the purpose of which is to place the Seoul Korean system in a bigger perspective in relation to the systems of other dialects. Since, unfortunately, not all dialects have been studied well or reliably enough, the discussion of the diphthongs will be confined to the following five dialects: Kangwon, Chungchung, Chunla, Kyongsang, and Phyongan dialects. The diphthongal system of the Kyongki dialect is identical to that of Seoul Korean, discussed in Chapter 1. Generally subdialects of a given dialect show more linguistic differences from the Seoul-Kyongki dialect when they are spoken in a geographic area farther away from the

Seoul-Kyongki area. Thus to contrast the linguistic differences between Standard Korean (Seoul-Kyongki Korean) and other dialects, the discussion of Chungchung, Chunla, and Kyongsang dialects will be focused on the southern varieties of the respective dialects, while northern varieties will be the main focus when the Phyongan dialect is discussed.

The Kangwon dialect is linguistically very similar to the Seoul-Kyongki dialect, which is why some Korean dialectologists group the two into one dialect group (the Central dialect), along with the Hwanghae dialect. A few subdialects of Kangwon, however, have characteristics of a tone language influenced by neighboring Kyongsang and Hamkyong dialects. Y.K. Han (1992:52) suggests that *ü* has diphthongized to *wi* in this dialect but that the diphthongization of *ö* has not yet occurred. Figure 2.5 shows the diphthongal system of this dialect. The only difference between Seoul and Kangwon dialects in the system is that *yɛ* and *wɛ* still remain as diphthongs in the latter. The difference comes from the fact that in the Kangwon dialect, *e* and *ɛ* are two different phonemes in its monophthongal system. The diphthong *ɨi* is still retained but often produced as a monophthong [ɨ] or [i]. After a preceding consonant, *ɨi* is usually produced as [i] (B.K. Lee 1977:313). B.K. Lee (1977:320) also suggests that in this dialect *w* and *y* frequently delete after a consonant (e.g., /cwasək/ -> [casək] 'seat', /kwɛnc^{h}anta/ --> [kɛnc^{h}anta] 'decent'; /p'yam/ --> [p'ɛm] 'cheek', /kyə/ --> [ke] 'chaff'), the deletion of *y* often happening with the fronting of the following vowel.

(1) *y* diphthongs			(2) *w* diphthongs	
		yu	wi	
ye	yə	yo	we	wə
yɛ	ya		wɛ	wa

(3) ɨi

Figure 2.5. Diphthongs of the Kangwon dialect (B.K. Lee 1977: 305, 314)

The vowel system of the Phyongan dialect is also quite similar to that of Seoul Korean. The vowels *ü* and *ø* have diphthongized as in Seoul Korean. The distinction between *e* and *ɛ* is, however, still made by speakers of the Phyongan dialect. The Middle Korean diphthong *ɨy* has changed to *i* or *ɨ* when no consonant precedes it, and has changed to *u* or *i* when it follows a consonant (Y.B. Kim 1992). The exact phonological or morphological conditioning of the variable change of *ɨy* has not been well studied. The possessive marker *ɨy* has changed to *e*. Some traces of Middle Korean diphthongs *ay* and *əy*, which respectively monophthongized to *ɛ* and *e*, are still present: the forms /sai/, /mai/, /kəi/, /səi/, respectively, correspond to /sɛ/ 'bird', /mɛ/ 'hawk', /ke/ 'crab', /se/ 'three' of the other dialects. *y* deletes when coronal consonants precede the *y* diphthongs (e.g., /tyaŋ/ --> [taŋ] 'bowels', /nyən/ --> [nən] 'year', /tyuŋ/ --> [tuŋ] 'middle'). The diphthong *ye* is exceptional: after any consonant, *y* deletes categorically before *e* (e.g., /ɨnhye/ --> [ɨnhe] 'grace', /kyesan/ --> [kesan] 'calculation', /ɾyecəl/ --> [ɾecəl] 'etiquette') regardless of whether the consonant is coronal or not (cf. H.K. Choi 1991:574). The diphthongs of the Phyongan dialect as suggested by Y.B. Kim (1992) are given in Figure 2.6.

(1) *y* diphthongs			(2) *w* diphthongs	
		yu	wi	
ye	yə	yo	we	wə
	ya		wɛ	wa

Figure 2.6. Diphthongs of the Phyongan dialect (Y.B. Kim 1992:339)

The Chungchung dialect still retains ü. As a result, the diphthong *wi* is not present in this dialect (Figure 2.7). The vowels *e* and *ɛ* are distinguished, though Y.M. Han (1992) reports that younger speakers do not distinguish the two consistently. The diphthong ɨi̯ is also retained. Like the Kangwon dialect, ɨi̯ shows synchronic variation. ɨi̯ is usually produced as [i] in non-word-initial syllables (e.g., /cuɨi/ --> [cui] 'caution', /saɨi/ --> [sai] 'intention of resignation') and variably produced as [ɨi̯],[4] [i], or [ɨ] in a word-initial syllable (S.H. Toh 1977:99-100). *w* variably deletes after a consonant (Y.M. Han 1992:115). *y* deletes before the vowel *e* after a consonant; S.H. Toh (1977:104) suggests that *y* deletion occurs before the same vowel even without a preceding consonant (e.g., /yecəne/ --> [ecəne] 'previously', /toye/ --> [toe] 'ceramic art'). Often *yə* is realized as [e], with and without a preceding consonant (e.g., /myənto/ --> [mento] 'shaving', /pyənso/ --> [penso] 'toilet', /yəpʰyəne/ --> [epʰene] 'wife'), but most often after a bilabial consonant (S.H. Toh 1977:101-103). The diphthongal system of the Chungchung dialect as proposed by Y.M. Han (1992) is given in Figure 2.7.

[4]The symbol "̯" is used in this study to indicate which vocoid of ɨi̯ is less prominent.

(1) *y* diphthongs			(2) *w* diphthongs	
		yu		
ye	yə	yo	we	wə
yɛ	ya		wɛ	wa

(3) ɨi̯

Figure 2.7. Diphthongs of the Chungchung dialect (Y.M. Han 1992:114)

The vowels *e* and *ɛ* have merged in the Chunla dialect. The front rounded monophthongs ü and ö have not diphthongized yet, though ü and ö, respectively, show variation with *wi* and *we*, which may suggest that the two are going through a linguistic change following the pattern of other dialects such as Kyongki or Phyongan. The Middle Korean diphthong *ɨy* has monophthongized to *i* in all phonological and morphological contexts. H.K. Choi (1991:591) claims that the diphthongs of this dialect generally show a monophthongization trend. *w* often deletes when a consonant precedes it (e.g., /hwalo/ --> [haɾo] 'furnace', /k'wəŋ/ --> [k'əŋ] 'pheasant').[5] *y* often deletes after a preceding consonant frequently palatalizing the previous or following segment (e.g., /pyəluk/ --> [peɾuk] 'flea', /hyəŋ/ --> [heŋ] 'elder brother', /kyalɨmhan/ --> [caɾɨmhan] 'slender'). As in the Chungchung dialect, y is variably deleted before the vowel /e/ even without a preceding consonant. K.K. Lee (1986) suggests that the diphthongal system of the Chunla dialect is as given in Figure 2.8, which shows that this dialect has only two 'phonemic' *w* diphthongs.

[5]Korean has a phonological rule that changes /l/ to [ɾ] intervocalically.

(1) *y* diphthongs			(2) *w* diphthongs
		yu	
ye	yə	yo	wə
	ya		wa

Figure 2.8. Diphthongs of the Chunla dialect (K.K. Lee 1986)

The Kyongsang dialect has lost the distinction between the vowels *e* and *ε* as in the Chunla dialect. The front rounded vowels *ü* and *ö* diphthongized to *wi* and *we* earlier than in other dialects, and then re-monophthongized to *i* and *e* (e.g., /kwi/ > /ki/ 'ear', /s'weki/ > /s'eki/ 'wedge'), losing *w*. The Middle Korean diphthong *ɨy* monophthongized to *i* (e.g., /ɨysa/ > /isa/ 'doctor', /yuɨy/ > /yui/ 'attention'). The only exception is the possessive marker *ɨy*, which has changed to *e*. The inventory of this dialect's diphthongs is the smallest among the dialects of Korea, as shown in Figure 2.9. This dialect does not allow the 'consonant + glide' sequence (H.C. Kim 1983, C.H. Choi 1984). *w* and *y* of the diphthongs shown in Figure 2.9, i.e., *yə*, *ya*, *yu*, *yo*, *wa*, are near categorically deleted when a consonant precedes them. According to Y.S. Kim (1982), the diphthong *ye* is not present in this dialect at all. The diphthong *wə* has also monophthongized to *ə* (e.g., /wəlkɨp/ > /əlgɨp/ 'salary', /wənsu/ > /ənsu/ 'foe') in this dialect (Y.S. Kim 1982:333).

(1) *y* diphthongs		(2) *w* diphthongs
	yu	
yə	yo	
ya		wa

Figure 2.9. Diphthongs of the Kyóngsang dialect (Y.S. Kim 1982:333)

As we have seen so far, the diphthongs of Korean dialects generally have an unstable status. The most unstable is the diphthong *ɨi*. As discussed above, *ɨi* has already monophthongized in Phyongan, Chunla and Kyongsang dialects. The patterns of monophthongization of this diphthong are different across the dialects. In the Phyongan dialect the diphthong has changed to *i* or *ɨ* word-initially or after a vowel and *i* or *u* after a consonant; in the Chunla dialect *ɨi* has monophthongized to *ɨ* in all contexts; in the Kyongsang dialect it has changed to *i* with the morphological exception of the possessive marker *ɨi*, which has monophthongized to *e*. Even in other dialects which have *ɨi* as a phoneme, the diphthong shows synchronic alternation with monophthongs. In Kangwon and Chungchung dialects, the diphthong *ɨi* is usually produced as [i] in non-word-initial syllables and alternates among [ɨi], [i], and [ɨ] in word-initial position. If a consonant precedes *ɨi*, the diphthong is near categorically produced as [i].

Another diphthong that also shows a high degree of instability is *ye*. According to Y.S. Kim (1982), the Kyongsang dialect has lost this diphthong. The diphthong shows different behavior from that of the other *y* diphthongs in Phyongan, Chungchung and Chunla dialects. In the Phyongan dialect, *y* deletes categorically before *e* after a consonant, while deleting before any other vowel only after a coronal consonant. In Chungchung and Chunla dialects, *y* often deletes before *e* even without a preceding consonant, while deleting rarely before any other vowel without a preceding consonant.

Scholars (e.g., H.K. Choi 1991:92, T.Y. Choi: 1983:97) also have pointed out the monophthongizing trend of *w* diphthongs in Korean dialects. As noted earlier, the diphthongs *wi*, *we*, and *wə* of the Kyongsang dialect have monophthongized to *i*, *e*, and *ə*, respectively (Y.S. Kim 1982). *w* also variably deletes in probably every dialect discussed above. These three types of variation, i.e., the variations involving *ɨi*, *ye*, and *w*, will be examined in subsequent chapters. It will be shown that these three types of variation are also clearly observed in the Seoul dialect and have rich theoretic and diachronic implications.

2.2.2. Seoul Korean

Seoul Korean (or the Seoul dialect) is, as mentioned earlier, a subdialect of the Kyongki dialect. Seoul Korean had four relatively distinct social class dialects up until the end of the Chosun Dynasty (1392-1910): the variety used in the royal court, the variety used by the nobles, the variety spoken by the commoners, and the variety spoken by the lowly. These rather distinct social dialects could coexist, because the society of the Chosun kingdom was socially and legally stratified into three distinct classes: *yangban* (nobles), *sangmin* (commoners) and *chenmin* (vulgars). However, as the society became more horizontal after the collapse of the Chosun Dynasty, the clear distinctions among the social class dialects have been lost. H.K. Choi (1991:82) suggests that present-day Seoul Korean can be considered mostly as the descendant of the social dialect used by the common people of the Chosun kingdom. This suggestion is supported by *hankul machwumpep thongilan* ("a Unification Proposal for Spelling and Pronunciation of Standard Korean") published by *cosen ehakhoy* ("the Society of the Korean Language") in 1933, when the remnants of the old social system still remained. The publication defines Standard Korean as 'the current dialect of Seoul used by the middle class group'. It is believed that the features of the speech varieties spoken by the nobles and the lowly all but disappeared from the elements of the Seoul dialect by the end of the colonial period (1910-1945). Now the social class dialects of the 'past' sense do not exist any longer in Seoul. *phyocwn palumpep* ("Standard pronunciation of Korean") published by the Ministry of Education in 1988 defines Standard Korean as 'the linguistic variety spoken by cultured (or well-educated) speakers in Seoul'.

As mentioned earlier, Seoul has been flooded with the incoming 'outlanders' for the past 50 years. It is estimated that approximately 25 percent of the current adult population

were born in Seoul. The remaining 75 percent are from other regions of Korea. As a result, there has been an extreme degree of dialect contact between Seoul and other dialects. What is remarkable is that Seoul Korean has not lost its identity despite extreme linguistic contact with other dialects; it has not been as seriously influenced by other linguistic varieties as one would expect. The parents may have come from other areas of Korea but the children of these 'outland' parents have acquired the Seoul dialect unfailingly. The parents encourage their children to acquire Seoul Korean, while endeavoring themselves to modify their native speech following the Standard mold. I attribute these social, linguistic phenomena to the prestige of the Seoul dialect, and suggest that the prestige factor has preserved Seoul Korean relatively intact from the influence of other dialects. New residents of Seoul and their children make efforts to learn the Seoul dialect because its command will make them socially more respectable and enhance their chance of social advancement. This speculation is supported by the ongoing spread of the Seoul dialect into other regions of South Korea. The dialect of Cheju, whose economy is heavily dependent on tourism, is in danger of extinction from direct contact with the Seoul dialect (or with Seoul-dialect speaking tourists). In other regions, younger speakers are often observed to speak a near-perfect Standard dialect in more formal settings, which is a relatively new phenomenon. The prestige of the Seoul dialect, without a doubt, comes from the special status of Seoul as the center of the nation, which was discussed in detail in 2.1.

2.3. Phonological variation and linguistic variables in Seoul Korean

2.3.1. Phonological variation in Seoul Korean and previous studies

Variation may be one of the defining properties of language. Languages without sociolinguistic variables are hard to imagine, whether the variables are stable ones or variables that have diachronic implications. Seoul Korean is no exception. Most of the known sociolinguistic variables are, however, confined to the phonology of Seoul Korean;

little morpho-syntactic variation worth an extensive sociolinguistic investigation is observed in this dialect.

Linguistic variation is observed both in Seoul Korean's consonantal and vowel systems. Consonantal variation will be first discussed. The following three linguistic variables involving consonants are worth mentioning. One involves the tensing of word-initial obstruents, i.e., the tensification of the lenis stop, fricative and affricate at the beginning of the word (e.g., [toŋgɨɾami] ~ [t'oŋgɨɾami] 'circle', [seda] ~ [s'eda] 'strong', [cuŋguk] ~ [c'uŋguk] 'China').[6] Older and younger speakers show a clear difference in their behavior toward this variable, the latter exhibiting a preference for the tense variant. The change of a lenis obstruent to its tense counterpart (e.g., /kacʰi/ > /k'acʰi/ 'magpie', /sak/ > /s'ak/ 'bud', /cita/ > /c'ita/ 'gain weight') has been going on for rather a long time (K.W. Nam 1984:130), yet it seems to have become more active recently. Not a few lexical items are present in Seoul Korean whose word-initial obstruent is produced as tense by younger speakers, but not by older speakers. The nature of this change is not clear, though the general pattern seems to suggest that it is not a regular but diffusive change.

The second notable consonantal variation is found in the simplification of a syllable-final consonant cluster. Seoul Korean allows a two consonant sequence in coda position phonemically but not phonetically, thus it is always the case that one of the two syllable-final consonants is deleted (e.g., /hɨlk/ –> [hɨk] 'dirt') or the second consonant has to become an onset of the following syllable through re-syllabification (/hɨlk+e/ (*dirt* + Loc) –> [hɨl-ge] 'dirt(Loc)').[7] Eleven possible syllable-final consonant clusters of Seoul Korean, that is, /ps/, /ks/, /nc/, /ls/, /ltʰ/, /nh/, /lh/, /lm/, /lp/, /lpʰ/, and /lk/, show variable patterns of deletion conditioned by both phonological and grammatical factors (cf. Y.S. Hong 1988).

[6]Korean plosives have a three-way distinction: lenis, aspirated and fortis (cf. 4.2 of Chapter 4).
[7]There is a weakening rule in Korean that makes lenis voiceless stops voiced between voiced segments.

Syllable-final consonant clusters can occur in Korean only in nouns and verbs.[8] When a vowel-initiated 'suffix' follows a cluster (a vowel-initiated 'independent morpheme' shows different behavior), /ps/, /ks/ and /lp/ can delete the second consonant only, thus showing variation between [C_1C_2] and [C_1] (e.g., /kaps+i/ (*price* + Subj) –> [kapsi] ~ [kabi] 'price (Subj)'), whereas /lk/ and /lm/ can delete the first consonant alone showing, as a result, variation between [C_1C_2] and [C_2] (e.g., /talk+ɨl/ (*hen* + Obj) –> [talgɨl] ~ [tagɨl] 'hen (Obj)'). However, the cluster /ls/ categorically deletes the second consonant without allowing the second consonant to appear in the surface form (e.g., /tols+e/ (*first birthday* + *on*) –> [tore] 'On your first birthday'). The variation discussed so far occurs only in nouns, where other syllable-final consonant clusters are not found.

When a cluster is followed by other phonological environments (i.e., when a cluster is not followed by a vowel-initiated suffix), which include a (following) consonant, pause and word boundary, the second consonant (C_2) deletes in /ps/, /ks/, /nc/, /ls/, /ltʰ/, /nh/, and /lh/ (e.g., /saks+to/ (*price* + *also*) –> [sakt'o] 'price also'),[9] and the first consonant (C_1) deletes in /lm/ (e.g., /salmta/ –> [samt'a] 'boil'). These two cases of categorical deletion occur both in verbs and nouns. /lp/, /lpʰ/, and /lk/, however, show variation: either of the two consonants can delete (e.g., /palpta/ –> [palt'a] ~ [papt'a] 'tread', /ilkta/ –> [ilt'a] ~ [ikt'a] 'read'). The three clusters, however, show variation only when they occur in verbs. Among the three, only /lk/ and /lp/ can occur in nouns, where the first consonant (C_1) categorically deletes in /lk/ (e.g., /talk+tali/ (*hen* + *leg*) –> [takt'aɾi] 'leg of a hen') and the second consonant (C_2) in /lp/ (e.g., /yətəlp+myəŋ/ (*eight* + *person*) –> [yədəlmyəŋ] 'eight people').

[8]I follow the standard assumption of Korean syntacticians that verbs and adjectives are not syntactically distinctive in Korean. Thus the term 'verbs' in this section refers to both verbs and adjectives of Korean 'traditional' grammar.
[9]Lenis obstruents become fortis when preceded by an obstruent and also in some other rather complex phonological and morphological environments in Korean (see C.S. Lee (1994:328-331) for details).

Y.S. Hong (1988), a previous sociolinguistic study of Seoul Korean, investigates this (rather complex) variable process empirically among others. She proposes a rule, which she calls "a cluster reduction principle", to explain consonant cluster simplification in verbs. Her generalization, which accounts for all the categorical cases of cluster simplification in verbs, is 1) delete the obstruent consonant, 2) if both are obstruents or sonorants, delete a coronal consonant. The variable cases of deletion in verbs is, she proposes, due to two competing forces, speaker-internal grammar, i.e., 'a cluster reduction principle', and school grammar (prescriptive grammar), which prohibits the deletion of the obstruent consonant in the cluster (the phonetic forms [papta] and [ikta] from the underlying /palpta/ 'tread' and /ilkta/ 'read', respectively, are prescriptions by school grammar).[10] There are, however, still some remaining issues regarding this variable process; the most interesting among these is why in nouns, the cluster /ls/, which deletes the second consonant (C_2) categorically, shows different behavior from that of the other clusters (i.e., /ps/, /ks/, /lp/, /lk/ and /lm/) when a vowel-initiated suffix follows it.

Seoul Korean has always allowed liquids word-medially and word-finally but did not allow liquids in word-initial position before it had a linguistic contact with English, which dates back to the end of the 19th century. Thus the modern-day use of liquids in word-initial position in Seoul Korean can be considered as a contact-induced change. This contact-induced change has brought one consonantal variation with itself: the variable substitution of English liquids in word-initial position by Korean consonants when loan words (from English) are produced (e.g., [ɾemon] ~ [lemon] for English 'lemon', [ɾibon] ~ [libon] for 'ribbon'). Though the use of word-initial liquids is confined to loan words, the variation is not insignificant when the large number of English borrowings within the Korean vocabulary, which has resulted from a massive importation of English words for

[10]Note that Hong's principle deletes /p/ and /k/ from /palpta/ and /ilkta/, respectively, because they are obstruents.

the past 50 years, is considered.[11] Three different consonants [l, ɾ, n] can be used for English *l* and *r* in word-initial position (e.g., [laita] ~ [rayta] ~ [nayta] for English 'lighter'), though the third variant, [n], is scarcely used by younger speakers now. Some speakers use [l] more often than [ɾ] and other speakers, vice versa. Y.S. Hong (1988) examines this variable in her dissertation and shows that the substitution of Seoul Korean [l, ɾ, n] for English *l* and *r* is affected mostly by social factors, i.e., age, social class, and gender.

Y.S. Hong's (1988) findings are as follows: 1) [ɾ] is a dominant variant but the use of the variant [l] is spreading gradually throughout the community; only the male group with age 10-30 favors [l] over [ɾ] (i.e., uses [l] more than 50 percent of the time). 2) younger speakers show a tendency to produce [l] more often than older speakers; however, the age-group difference is minor among female speakers. 3) males tend to use [l] more often than females; this tendency is clear in younger speakers but not in older speakers. 4) higher class speakers use the variant [l] more often than lower class speakers; one exception is found in the young (age 10-20) mid-class speakers: they produce [l] more often than their higher class counterparts, showing a crossover pattern. Y.S. Hong (1988) does not discuss linguistic constraints on the variation involving this variable, but a possible constraint that deserves examination is whether the liquids of the original English words, e.g., [l] of 'lemon' and [r] of 'ribbon', affect the substitution process of Seoul Korean speakers.

Let us now turn our attention to variation observed in Seoul Korean vowels. Three areas of variation involving vowels are especially notable. The first involves the variable process 'umlaut', found not only in Seoul Korean but in most dialects of Korea. Umlaut is a process which changes a back vowel to a front vowel conditioned by the [-back] (or [coronal]) feature of the following vocoid *i* or *y*, i.e., a process where a nonfront vowel

[11]There are some loan words from Western languages other than English, but the number of such words is rather small.

regressively assimilates to the frontness (or coronality) of *i* or *y* (e.g., /uŋtəŋi/ –> [uŋdeŋi] 'puddle', /səkyu/ –> [segyu] 'petroleum'). This process is known to occur more often in Southern dialects of Korea, i.e., Kyongsang and Chunla dialects. As discussed below, the process is conditioned by both linguistic and external factors.

C.K. Ahn (1987) is a dissertation that examines umlaut in the Jeonju community, where a regional subdialect of Chunla is spoken. He found that the process is linguistically conditioned by the following constraints: 1) origin of words (native, Sino-Korean and foreign), 2) the presence of morpheme boundary between the conditioning *i* or *y* and the preceding vowel, 3) the presence of a coronal consonant intervening between the conditioning and the conditioned segment.

Native words were more often umlauted than Sino-Korean words; recently adopted foreign words were rarely umlauted. Intra-morphemic umlaut was more common than inter-morphemic umlaut; especially umlaut occurred only 3 percent of the time when a nominative suffix /i/ follows the potential target.[12] A coronal consonant, with a few exceptions, blocks umlaut when it occurs between the conditioning and the conditioned segment, i.e., the surface form of /halməni/ 'grandmother' is not [halmen^{y}i] but near categorically [halmən^{y}i] (cf. Hume 1990). It is expected that the linguistic constraints active in the Jeonju dialect also play an important role in umlaut in Seoul Korean.

C.K. Ahn (1987) also found that social factors of age, social class, and gender condition this process. Younger speakers showed umlaut less often than older speakers; higher class speakers produced fewer umlauted forms than lower class speakers. These two results are probably attributable to a higher level of education associated with the younger speakers and the higher class speakers, which, in turn, may explain the reason why a lower social value is attached to umlauted forms. The results of C.K. Ahn's (1987) research also suggest that umlaut is not expanding but dwindling in the Jeonju community.

[12]For instance, /kəkcəŋ+i/ (*worry*+Subj) was very rarely umlauted into [kəkc'eŋi].

The spread of higher education throughout the community is suspected to be a factor in this change. Gender difference was also found: men applied umlaut more often than women, in line with the usual pattern found in other speech communities, i.e., the pattern that women are more likely to use the more standard, prestigious form (cf. Labov 1990). Again the same external constraints are expected to be active in variation involving umlaut in Seoul Korean, though this needs yet to be confirmed by an empirical study.

C.W. Kim (1971) suggests that vowel raising is a tendency observed in the whole vowel system of Seoul Korean. This raising tendency of Seoul Korean vowels is another source of variation involving vowels. As Y.S. Hong (1988) persuasively showed in her study through acoustic measurements of F1 and F2 and commutation tests, the vowel *ε* is believed to have raised to *e*, merging with the latter. Few Seoul Koreans now seem to distinguish the two consistently both in production and perception.

The vowel *o* has also shown a tendency to raise to *u* in non-word-initial syllables. This tendency has been observed for longer than one and a half centuries. Quite a few lexical items, most of which are native Korean words, have gone through this raising phonemically (e.g., /caco/ –> /cacu/ 'frequently', /kitoŋ/ –> /kituŋ/ 'pole', /təok/ –> /təuk] more'). Chae (1995) is a dissertation that closely investigates the raising of *o* to *u* in Seoul Korean. She maintains that variation between [o] and [u] observed in some lexical items of Seoul Korean, mostly bound morphemes, reflects the continuation of the linguistic change that most actively happened in the 19th century. She suggests that the reason why these items lag behind the other lexical items in change is that most of the items occur in morpheme-initial position, considered as one of the phonologically 'strong' environments in Korean (Kim-Renaud 1986a). She supports her claim with the generalization that most of those *o*'s which did not go through raising occur in phonologically strong environments (i.e., word-initial position and morpheme-initial position), or in Sino-Korean words (i.e., less than perfectly nativized Korean words), or in relatively archaic expressions. One distinctive feature of the *o* to *u* raising is that unlike in the *ε* to *e* change, Sino-Korean words have not been affected, which account for approximately 50 percent of the Korean vocabulary and many of which are believed to be nativized. As Chae (1995) suggests, the *o* to *u* change may now be under way in Sino-Korean words; this is an issue that should be examined by future studies.

The raising of *ə* to *ɨ* is also observed in some lexical items of Seoul Korean. These items thus show alternations between the vowels [ə] and [ɨ] (e.g., /səta/ –> [səda] ~ [sɨda] 'stand'). The raising of *ə* to *ɨ* used to occur mostly in two linguistic contexts: in a word-initial syllable usually when the vowel is produced as a long vowel (e.g., /ə:lin/ –> [ə:ɾin] ~ [ɨ:ɾin] 'adult'); in non-word-initial syllables (mostly) of function words such as proforms and conjunctions (e.g., /kɨlənik'a/ –> [kɨɾənik'a] ~ [kɨɾɨnik'a] 'therefore'). Lee and Park (1991) suggest that the raising of /ə:/ to [ɨ:] in a word-initial syllable is now found only in the speech of old speakers and is fast disappearing because of the loss of the long vowel in Seoul Korean. The status of the raising of *ə* to *ɨ* in non-word-initial syllables is not clear. The impression is that the speech of younger speakers shows this raising at least as often as that of older speakers. The raising of *ə* is observed often especially after consonants *k*, *t*, and *l*, as in the case of the raising of *o*.

The third area of vowel variation in Seoul Korean involves the monophthongization trend of the diphthongs, which is the main object of the current research. As noted earlier, the variation involves the deletion of the glides *w* and *y* and the monophthongal realizations of the diphthong *ɨi*. The linguistic variables concerning these lenition processes will be discussed in detail in the next section.

2.3.2. Linguistic variables of the current study

2.3.2.1. Variable (w)

We saw in our earlier discussion in 2.2.1 that *w* is often deleted in dialects of Korea. Researchers have observed the deletion of *w* in Kangwon (B.K. Lee 1977),

Chungchung (Y.M. Han 1992) and Chunla dialects (H.K. Choi 1991). The deletion of *w* occurs in the Seoul dialect too. Martin (1992) and H.K. Choi (1982) observe that the deletion of *w* is a commonly found phonological phenomenon in Seoul Korean.

Seoul Korean speakers have recently become rather sensitive to *w* deletion because of the incumbent President of Korea's frequent 'deletion' of *w*. The President is a native speaker of the South Kyongsang dialect, which has few *w* diphthongs in its vowel inventory (cf. Figure 2.9) . He exerts efforts to switch to Seoul Korean when he makes public speeches. However, his efforts often undershoot the target, i.e., he fails to produce *w* diphthongs of Seoul Korean. The Seoulites' interpretation of the President's speech is "the President often 'deletes' *w* (like an uneducated man)", not knowing the vowel system of the President's dialect, while the fact is that his native linguistic system rarely has *w* underlyingly in lexical items where Seoul Korean has it. Not a few books, in which the President's 'deletion' of *w* is discussed or joked about, have been published since he took office in 1992. As a result, Seoul Korean speakers have become more conscious of *w* deletion than before, though they still do not seem to be well aware that they themselves delete *w*.

It is not clear whether the deletion of *w* is a stable variation or implies an eventual linguistic change. According to Y.S. Kim (1982), the South Kyongsang dialect went through the diphthongization of *ü* and *ö* to *wi* and *we*, respectively, earlier than other dialects and then underwent a respective re-monophthongization of *wi* and *we* to *i* and *e*; *wə* has also monophthongized to *ə* in this dialect. However, it is not clear whether other dialects are also following this path of monophthongization, though T.Y. Choi (1983) suggests that a similar change is under way in the Chunla dialect.

One common phenomenon observed in most dialects of Korea is that *w* deletes more often when a consonant precedes it than when not. The deletion of *w* also seems to be affected by what the preceding consonant is. B.K. Lee (1977) suggests that especially labial consonants are a strong trigger of *w* deletion. Researchers have also observed the deletion of *w* occurring without a preceding consonant (e.g., K.C. Soh 1989, H.K. Choi 1991, Martin 1992). This observation seems to suggest that *w* deletion in Korean is not just a simplification of a consonant cluster in the syllable onset, as some phonologists may claim.

The deletion of *w*, or of any segment, is a phonetic continuum. There seem to be two options in defining the variants of (w). The first is to define three variants, i.e., presence of *w*, deletion of *w*, and half-presence of *w*, after somehow delimiting the boundaries among the three, though this would not be an easy task. The second option is to define two variants, i.e., presence of *w* and deletion of *w*, while excluding ambiguous tokens from analysis. I take the second option in this study, since my observation is that Korean speakers tend to make categorical judgments as to the presence vs. absence of *w*. Any perceived labialization of a consonant will also be considered as *w* presence: both [kw] and [k^w], for instance, will be counted as *w*-presence. Accordingly, the variable (w) of the current study has two variants, [w] and [ø].

2.3.2.2. Variable (y)

It was shown earlier that dialects of Korea exhibit various patterns of *y* deletion. *y* deletes categorically after palatal consonants (*c*, c^h, *c'*), and in most dialects, *y* deletes variably after other types of consonants. In variable deletion, the deletion of *y* often follows the fronting of the following vowel (e.g., /p'yam/ –> [p'ɛm] 'cheek', /myəlc^{h}i/ –> [melc^{h}i] 'anchovy'). The Kyongsang dialect, however, shows a rather different behavior; in this dialect *y* deletes 'categorically' after any consonant: the CGV sequence is not allowed in this dialect.

One exceptional diphthong is *ye*, as discussed earlier; the Kyongsang dialect does not have this diphthong; in Chungchung and Chunla dialects, *y* can delete before the vowel *e* without a preceding consonant (S.H. Toh 1977).

y deletion is more conservative in Seoul Korean than in other dialects; it happens only in two environments: 1) after palatal consonants, categorically as in other dialects, 2) before the vowel *e*, i.e., in the diphthong *ye*. As in Chungchung and Chunla dialects, *y* deletion in the second environment is variable and occurs both with and without a preceding consonant, though the frequency of deletion is significantly higher after a consonant. As in *w* deletion, post-consonantal *y* deletion (before *e*) is affected by what consonant precedes the glide. Sonorants and obstruents show rather different behavior, as will be discussed in detail later in Chapter 5.

Seoul Korean speakers are not very conscious of this sociolinguistic variable. Though they delete *y* often, they do not seem to be aware that they do. Most of the informants give a 'candid' negative response when they are asked if they use *y*-deleted forms in their speech. Usually some effort on the part of the fieldworker, including a vocal demonstration of the two phonetic forms, is needed to persuade the informants that they actually delete *y*. This suggests that the Seoul community is not sensitive to this sociolinguistic variable yet: the variable is still 'below the level of conscious awareness' (Labov 1972C).

Like the variable (w), the variable (y) is defined as having two variants in this study: [y] and [ø]. Some Korean phonologists (Kim-Renaud 1986, S.K. Kim 1976) make a claim that /s/, /l/, and /n/ are, respectively, palatalized to [s^y], [l^y], and [n^y] before *y* in Korean and then *y* deletes after triggering the palatalization.[13] However, [sy] and [s^y], [ly] and [l^y], [ny] and [n^y] are not, respectively, phonologically distinguished from each other in Korean, and also hardly distinguishable phonetically.[14] [sy] and [s^y], for instance, may be just two transcriptions of the same phonetic production in Korean. Considering this, T.Y. Choi (1983) and K.W. Nam (1984) take the position that *y* is present, if only *s*, *l*,

[13]Korean also has a rule that changes /t/ to [c] before /i/ (e.g., /kuti/ –> [kuci] 'without failure').
[14]This is not only true in Korean but also in other languages. Though Kimatuumbi has both *n* and *ñ* as phonemes, the language does not distinguish *ñ* and *ny* phonologically, i.e., the two are not contrastive. Odden (1996:5) also suggests that only some, not all, speakers of Kimatuumbi phonetically distinguish *ñ* and *ny*.

and *n* are palatalized by *y*. I take the same position in this study. Any perceived palatalization of these consonants is considered as a token of [y], just as any labialization of a consonant is taken as a token of [w] in the variable (w).

2.3.2.3. Variable (ɨi)

The completed monophthongization and monophthongal realizations of the diphthong *ɨi* in different dialects of Korea were discussed in detail earlier. To summarize, *ɨi* has changed to different monophthongs in Phyongan, Chunla, and Kyongsang dialects; Kangwon and Chungchung dialects still have *ɨi* as a phoneme, but its realizations are often monophthongal. It was also pointed out that diachronic changes and synchronic variation involving *ɨi* have been conditioned by phonological and morphological constraints, i.e., whether *ɨi* is preceded by a consonant, whether it occurs in a word-initial syllable or not, and whether it is used as a possessive marker.

Seoul Korean also retains the diphthong *ɨi* as a phoneme, but the diphthong shows alternations between diphthongal and monophthongal realizations like Kangwon and Chungchung dialects. The variation pattern of the diphthong *ɨi* in Seoul Korean is as follows. After a consonant, *ɨi* shows alternations between [i] and [ɨ̯i], the first variant dominating the variation. When there is no preceding consonant, the variation is crucially conditioned by whether the diphthong occurs in a word-initial syllable or not.[15] *ɨi* is realized either as [ɨi̯] or [ɨ] in a word-initial syllable, but as either [i] or [ɨ̯i] in non-word-initial syllables, the first variant dominating the variation in the latter case. When *ɨi* is used as a possessive marker, it shows variation between [e] and [ɨ̯i], with the former as a dominant variant. In sum, the variation involving *ɨi* may be claimed to have three (or four) subdomains of variation where mostly different pairs of variants show alternations.

It is not clear whether the variation involving *ɨi* should be analyzed as three (or four) subvariations of one linguistic variable or separate variations of different variables. We

[15]When *ɨi* is preceded by a consonant, syllable position within the word is not a constraint.

may have two options. Since each area of variation has "a closed set of variants" (Labov 1982:30), each, it seems, can be defined as a linguistic variable. On the other hand, each area of variation originates from the tendency of the diphthong *ɨi* to have monophthongal realizations; this fact may suggest that the three (or four) different domains of variation are just subvariations of one linguistic variable. The main point to consider in the choice between the two alternatives is which will be more effective for the purposes of this study. One factor to note is possible separate linguistic changes in these different domains of variation. If the alternating variants in each area of variation are competing forms in separate monophthongization changes as previous studies (e.g., K.W. Nam 1975, Kim-Renaud 1986b) suggest,[16] it would be better to analyze the competing forms in each domain of variation as the variants of a separate linguistic variable, for the analysis that way will reveal the current status of separate monophthongization changes more effectively. The current study will show later in Chapter 6 that actually three, rather than four, separate monophthongization changes (and thus three linguistic variables) are involved in the monophthongization of the diphthong *ɨi*.

[16]K.W. Nam (1975), for instance, claims that in Seoul Korean *ɨi* is monophthongizing to *i* after a preceding consonant and in non-word-initial syllables, and to *ɨ* in a word-initial syllable, when no consonant precedes it; Y.C. Chung (1991) claims that the possessive marker *ɨi* has nearly changed to *e* in Seoul Korean.

CHAPTER 3

METHODOLOGY

3.1. Introduction

This chapter describes the methods by which the data for this dissertation were collected and analyzed. 3.2 discusses how the sampling of the speakers was conducted in this study. Background information on sampling is provided in 3.2.1; sampling methods of previous studies of Seoul Korean are discussed in 3.2.2; the sample design for the current study is introduced in 3.2.3; social class and age group divisions of the present research are discussed in 3.2.4. 3.3 describes how the fieldwork for the current study was conducted based on the planned sampling; the pilot study for this dissertation is also briefly discussed. 3.4 describes the current study's methods of data collection: the structure of the sociolinguistic interview conducted for this research is discussed in 3.4.1; the collection of ingroup speech is discussed in 3.4.2. 3.5 discusses the statistic methods used in the current study.

3.2. Sampling methods

3.2.1. Background

The most important issue in sampling is how the investigator collects speech data from a sample of speakers that is representative of the speech varieties of the population of a given speech community. As will be discussed later, this issue is necessarily closely related to such issues as what the sampling universe (i.e., the boundary of the population of the speech community in question) is, how the population is stratified, and how large the sample size is.

Broadly speaking, there are two different types of sampling – random sampling and judgment sampling. Random sampling is a method where the researcher randomly selects a sample of speakers from the target population. Researchers usually use such lists as electoral registers or telephone directories to get at the target population, and randomly select speakers from the list. However, while random sampling has an advantage over judgment sampling in that the former is less likely to invite bias than the latter, random sampling used in sociolinguistic projects also has its own problems in 'representativeness', as L. Milroy (1987) points out.

The first problem is that possible sample sizes of sociolinguistic projects are too small to claim that the randomly selected speakers are statistically representative of the population that the projects aim to investigate. That is, the sampling size attainable in sociolinguistic projects using random sampling cannot measure up to the statistical standards required in other disciplines (cf. Romaine 1980).[1] Sampling errors can be minimized and statistical confidence intervals can be narrowed (Woods, et al 1986), only when a relatively large sample is chosen from the population. However, this goal is unattainable in sociolinguistic projects because of the limited time and financial resources available to the researchers.

The second problem originates from the difficulty the investigator finds in the replacement of the speakers in the original sample who cannot be interviewed for various reasons. To ensure representativeness, these members should be replaced by others who have identical social and linguistic characteristics. However, this ideal replacement is impossible in sociolinguistic projects, because the researcher does not usually know the social and linguistic characteristics of the sampled speaker before s/he interviews that person and gathers relevant information. In view of the high rate of randomly selected speakers who cannot be contacted or refuse to be interviewed, this problem is not trivial.

[1]The primary reason why sociolinguistic projects cannot have a statistically adequate sample size is that the processes of gathering, transcribing and analyzing data are all very time-consuming.

The omission of the speakers who cannot be interviewed from the sample, an alternative to replacement, is also problematic, because there is not a little possibility that these speakers might share certain social or linguistic features and so introduce bias in the collected data (see McEntegart and Le Page 1982 for such an example). Based on the observation of these problems, Romaine (1980:170) makes the statement that "in view of the specific linguistic as well as other requirements which must typically be met in sociolinguistic research, I doubt that random sampling in its strictest sense is even a possible, let alone realistic goal."[2]

Judgment sampling is a method in which the investigator identifies beforehand the characteristics of the speakers to be studied and then collects speakers who fit the specific categories (e.g., middle-class, female speakers in the 35-50 age group) until the desired quota is filled. Judgment sampling has an advantage over random sampling in that the former is often more economical than the latter in terms of time and money required in the field project. However, there are two preconditions that must be met for judgment sampling to be successful. The first is that the researcher should be well aware of the socio-cultural structure of the community under investigation. Only on the basis of thorough knowledge of the community under study can judgment sampling be successful. The second condition is that sample speakers should be selected based on defensible principles. The researcher has to show that the process of informant selection is rational and unbiased.

Whether the sociolinguistic researcher decides to choose a sample of speakers by random sampling or via judgment sampling, there are some issues s/he has to consider before the actual sampling. First of all, the investigator should define the sample universe, i.e., the rough boundary of the community or of a specific group in the community that

[2]However, Romaine's statement should not be taken as meaning that random sampling has a methodological flaw; it just suggests that random sampling in its strict sense is often hard to be adopted in sociolinguistic projects.

s/he aims to investigate. Related to this issue and also important in urban studies is how native speakers of an urban speech variety are defined, for it is often the case that a significant part of an urban population are immigrants from other areas. For instance, Labov (1966) sampled speakers of New York who had lived there from earlier than eight years old; Lennig (1978), on the other hand, defines native speakers of Parisian French as those who lived in Paris from age 1 to age 14.

Secondly, the investigator should decide how s/he will stratify the population of the speech community for his/her project. The stratification of the population should be decided based on the investigator's knowledge of the internal structure of the community and also on the aim of the project. Generally, most of the sociolinguistic studies stratify the population on the basis of social parameters such as age, social class and gender. In communities where more than one ethnic group coexists, ethnic groups should also be considered as one of the factors (e.g., Horvath 1985, Winford 1972, Labov 1966).

The most controversial social variable in the stratification of the population is social class, since it is an abstract concept that cannot be defined biologically like gender or numerically like age. The division of social classes of a given community can also be crucially different according to whether the researcher has the Marxist (socialist) view of society and history, or the functionalist (capitalist) view. Most of the sociolinguistic studies, however, are based on the latter view, i.e., the view that social class is "a relatively continuous scale on which individuals are ranked according to assorted personal characteristics such as level of education, income, occupation, etc." (Guy 1988:41).

Researchers use one or more indicators to stratify social class. Macaulay (1977) uses occupation to decide his informants' social class in Glasgow, while Jahangiri (1980) uses an informant's education level as the social class indicator in the city of Tehran, Iran. Romaine (1978) and Reid (1978) relied only on the father's occupation to determine the social class of schoolchildren in Edinburgh. Many of the researchers, however, use more than one indicator to decide the speaker's social class. Labov (1966) assesses an informant's social class based on the composite index of his/her occupation, education and income, and divided the informants into five different social class groups. Trudgill (1974), on the other hand, uses as many as six indicators of social class — occupation, income, education, housing, locality,[3] and the father's occupation. Researchers may place different weights to indicators, based on his/her judgment of the relative importance of different indicators within a specific community (see, e.g., Shuy et al. 1968).

The question of sample size is another controversial issue in sociolinguistic projects. As discussed earlier, only a fairly large size of sample can be said to be representative of the kinds of population typically studied in sociolinguistic projects. However, as observed clearly in Shuy et al.'s (1968) study, where the researchers collected data from 254 families but eventually were able to analyze the data of only 36 speakers, limited time, financial resources, and manpower do not allow sociolinguists to collect data from a statistically desirable number of informants and analyze them. For instance, a sociolinguistic project where the intended population is stratified into four age groups, three social class groups, and two gender groups, requires at least 96 informants (4 *3 *2 *4), if the researcher aims to allot four speakers to each cell following Labov's (1981) suggestion.[4] Studies of this size require a great deal of energy and resources and, often, more than one fieldworker.

In reality, sociolinguistic research projects often fill cells with fewer than four speakers and few studies sample as many as 96 speakers (even if the researcher adopts the above-mentioned social class stratification (4 *3 *2)). For instance, Holes' (1987) study of Bahraini Arabic was based on data from 87 speakers; Trudgill's (1974) study of Norwich English sampled 60 speakers; Guy's (1981) study of Brazilian Portuguese had 20

[3]Trudgill gives different areas of Norwich (e.g., Eaton, Thorpe, Lakenham, Hellesdon and Westwick) different social index scores. For details, see Trudgill (1974:40-41).

[4]Labov (1981:38) suggests that "sociolinguistic data on a given variable is quite firm if there are four or five speakers in each cell".

informants. Despite statistical shortcomings, these studies succeeded in revealing the important sociolinguistic structures of the respective communities under investigation. Part of the reason that this was possible is that as G. Sankoff (1980) suggests, linguistic behavior may be more homogeneous within social groups than other types of human social behavior.

3.2.2. Difficulties in Fieldwork in Seoul; sampling in previous studies

As discussed in the previous chapter, Seoul is a gigantic city with more than 10 million residents. It is far from an easy task to obtain a representative sample of its population. The lack of a sample frame, i.e., the list that enumerates the population, makes it nearly impossible for a fieldworker to attempt random sampling in this city. The electoral register and the telephone directory, usually used as sample frames for random sampling in sociolinguistic projects, are not available for fieldworkers to use in Seoul. The electoral register is allowed to be reviewed only right before elections in this city. Korea Electric Communications Corporation, which is in charge of telephone services in Korea, stopped publishing Seoul's telephone directory a few years ago, when they decided that the size of the directory had become too large to publish.

A second problem in sampling Seoul's population is the paucity of native Seoul Korean speakers among the residents. As mentioned in the previous chapter, about 75 percent of the adult population, from which most of the sample speakers are chosen in sociolinguistic projects, are not native Seoul residents. Accordingly, even if there were a good sample frame, locating enough native speakers of Seoul Korean using random sampling would be a very difficult process.

Another problem in doing fieldwork in Seoul is the one that fieldworkers encounter in every large city. Residents of a big city are, generally, not very approachable or accessible to fieldworkers. The difficulty of this problem is made more serious in Seoul due to the characteristics of Korean culture. Steinberg (1989:75) suggests that 'family loyalty' and 'clan solidarity' are among the most important elements of Korean culture. Though the significance of these values are diminishing under the influence of Western culture, the Korean people still have a strong tendency to distinguish their ingroup members clearly from people outside of their circles. They rarely greet or talk to people who they are not familiar with; they do not welcome an approach by 'unknown' or 'less known' people. This trend may be observed in almost every society. But the degree to which the Korean people distinguish insiders and outsiders of their circles is clearly higher than in most of the other societies. As a result, to attempt a contact with Seoul residents without the introduction of a person whom the residents themselves know is a hard task for fieldworkers.

Because of the problems mentioned so far, previous sociolinguistic studies of Seoul Korean sampled informants using, mainly, a networking procedure (Horvath 1985), i.e., through the selection of speakers within the fieldworkers' network and those within the networks of those already interviewed. Hong (1988) sampled 60 speakers by judgment sampling. She used a typical networking approach. She and her male assistant, both of whom were Seoul residents at the time of the project, first contacted the members of their respective social networks and collected data from them, then asked them to introduce some other speakers within their networks. This procedure was repeated, until the targeted 30 cells (Hong's sample consists of 5 age groups, 2 gender groups and 3 social class groups), were each filled with 2 informants.

Chae (1995) used a somewhat different approach. She chose two neighborhoods in Seoul, where she suspected a relatively higher ratio of Seoul natives resided. Her informants were chosen from these two neighborhoods. Chae (1995) also relied basically on the networking procedure to recruit informants, though additional methods were also employed: she solicited interviews paying door-to-door visits to some households,[5] and

[5]Chae (1995:86) reports 22.6% (7/31) of success rate in her door-to-door interview attempts.

also recruited some informants at a village center for the elderly, a bakery, and a Catholic church. She collected data using these methods from 48 speakers.

3.2.3. Sample design

Because of the problems associated with using random sampling (in Seoul) discussed earlier, the current research uses judgment sampling like the previous studies. The sample was designed as given in Table 3.1. Though the allotment of 4 or 5 speakers is recommended as desirable for quantitative sociolinguistic projects, each cell was filled with 3 sample speakers, considering (realistically) the time that a fieldworker is required to spend on data collection, transcription, and analysis.

	Lower Class		Middle Class		Upper Class	
	Male	Female	Male	Female	Male	Female
16-25	3	3	3	3	3	3
26-45	3	3	3	3	3	3
45+	3	3	3	3	3	3

Table 3.1. The sample design for interview speech

NB: The targeted number of speakers: (3 *3 *2) * 3 = 54 speakers

An additional type of fieldwork that was not attempted in the previous studies of Seoul Korean was planned in this project. In order to collect data more representative of informants' everyday language, an attempt was made to record informants' interaction with their ingroup members (which I will refer to 'ingroup speech' henceforth). The recording of ingroup speech of at least one of the three informants in each cell was attempted. As a result, interview speech of at least 54 speakers and ingroup speech of minimally 18 speakers were targeted. The sample design for ingroup speech is given in Table 3.2. As shown in the tables, the Seoul population was divided into three socio-economic class groups and three age groups. The background of each stratification is discussed in the following subsection.

	Lower Class		Middle Class		Upper Class	
	Male	Female	Male	Female	Male	Female
16-25	1	1	1	1	1	1
26-45	1	1	1	1	1	1
45+	1	1	1	1	1	1

Table 3.2. The sample design for ingroup speech

NB: The targeted number of speakers: (3 *3 *2) * 1 = 18 speakers

3.2.4. Socio-economic class and age group division

The residents of Seoul, much like those of other big cities, consist of people with diverse professions and jobs, levels of education, and income. According to the 1990 census of Seoul residents, their occupations range from entrepreneurs, high government officials and professionals to blue collar workers, peddlers and unskilled laborers. Among residents over 30 years old, approximately 22% has a college (or higher) degree; 3% has junior college education; 35% and 20%, respectively, have high- or middle-school education; those with primary education or less make up 20%. However, according to the most recent survey (1996) conducted by Jung-Ang Daily, one of the major newspapers in Korea, almost 50% of Seoul highschool graduates now advance to college or junior college for higher education.

S.C. Kim (1985), a sociologist, divides the Seoul population into three class groups: capitalist class, petit bourgeois class, and working class. Owners and executives of large businesses and high public officials, who possess either a means of production or

political power, belong to the first group. Small business owners (who own a means of production but provide labor themselves) and professionals belong to the second group, while the working class group consists of those who do not possess a means of production but produce wealth, i.e., those salary-paid workers such as white collar workers, skilled and unskilled blue collar workers, and laborers. According to S.C. Kim's classification of social classes, capitalist class, petit bourgeois class, and working class, respectively, accounted for 3, 28, and 69% of the Seoul population in 1980. However, since S.C. Kim's social class division of the Seoul population is based on the socialist view of Seoul society, it is predicted that functionalists' social class division (adopted in most sociolinguistic projects) of the Seoul population will be rather different.

T.S. Hong (1983) divides the social hierarchy of South Korea into three social classes: upper class, middle class, and lower class. According to his division, entrepreneurs, capitalists, and top government officials constitute upper class. The middle class is further divided into upper middle, mid middle, and lower middle. Hong (1983) places professionals, higher government officials, and higher managers of private companies into upper middle class; people like pharmacists, school teachers, and small businessmen into mid middle; and low-paid white collar workers (such as salesmen or clerks) and craftsmen into lower middle. Blue collar workers, laborers, and other urban marginal groups (e.g., peddlers, housemaids, and street cleaners) are classified as belonging to Lower class.

T.S. Hong and K.M. Suh (1985:18-9) estimate that members of upper class are less than 0.5% of the Korean population, and also make a suggestion that those classified in T.S. Hong's (1983) class system as belonging to upper middle class probably have upper social status rather than middle social status. B.C. Kim (1986) actually combines upper and upper middle into one, calling it "upper middle class". According to B.C. Kim (1986), this class constitutes about five percent of the urban population. T.S. Hong and

K.M. Suh (1985:19) also suggest that though lower middle class (of T.S. Hong 1983) is closer to mid middle in income than lower class, members of lower middle class are closer to those of lower class in education level and in social consciousness. B.K. Kim (1984), further, claims that lower middle and lower classes actually form one social class in Korean society.

SEC	Occupational characteristics	Educational characteristics	Percentage
Upper	higher government or business officials, professionals	college graduation or higher	4.9%
Middle	semi-professionals small businessmen white collar workers	college, junior college or highschool	39.3%
Lower	blue collar workers peddlers, laborers lowest employees of service industry	high school, middle school or lower	55.7%

Table 3.3. The socio-economic class stratification of the Seoul population in the current study

The division of social class used in the current study is given in Table 3.3. I divide the Seoul population into three class groups: upper, middle, and lower. Following B.C. Kim (1986), T.S. Hong's (1983) upper and upper middle are combined into upper class. Also following B.K. Kim's (1984) suggestion that Hong's lower middle and lower classes form one social class (sharing similar social status) in Korean society, the two are combined into one class, i.e., as lower class. The division of social class in the current study was made on the basis of informants' occupation and education level, which, Y.M. Kim (1982:335) suggests, are two of the three most important indicators of social class in South Korea along with 'property'. According to the estimation of B.C. Kim (1986:284), upper, middle, and lower classes, respectively, constitute 4.9, 39.3, and 55.7% of the

urban population in South Korea.[6] The social class groups are referred to as 'SEC (socio-economic class) groups' in this study, because social class is evaluated on the basis of both social and economic characteristics of individuals.

Since the current study is a project on language variation and change, it would be desirable to stratify the population into as many age groups as possible. However, realistic considerations of available time and other resources forced me to divide the population into three age groups: 16-25, 26-45, 46 or older. Since speakers younger than 16 were expected to be too constrained (thus showing significant addressee effects) in the face of the fieldworker during the interview, they were excluded from the sample of informants.[7]

The age group division was motivated by the following facts. Age 25 is often considered to be a critical age in Korean society; this is an age when a person usually graduates from college, or when he finishes his military duty (if a person is a man and did not go to college), or when she is considered as most marriageable (if a person is a woman). In other words, 25 is a threshold age when people begin to be considered and treated as 'real' adults by the other members of the society.

Age 45 may also be a critical age in Korean society. It is an age when most people are at their peak in their social and economic activities. People, especially men, are supposed to have established themselves by this age, though not all achieve that goal in reality. Viewed from a different angle, 45 is also an age when one's physical strength and mental productivity begins to decline. In other words, it can be viewed as the starting point of older age. Age 45 is significant from a sociolinguistic perspective too: those over 45 experienced one or both of the two most drastic social and linguistic changes in modern Korean society: the liberation from Japanese rule (and thus the end of a diglossic society)

[6]B.C. Kim (1986) estimates that lower middle class and working class constitute 23.6% and 32.1% of the urban population. The percentage, 55.7%, is the sum of these two numbers. His upper middle class is identical with the upper SEC of the current study.

[7]The Korean people generally show deference to older people. Under Confucian influence it is still not considered to be polite for younger people to talk much in front of older people or to challenge them.

and the Korean War (which caused the most severe dialect contact ever in Korea). The three age groups can be characterized as follows: the group of older adolescents and young adults (16-25), mature adults (26-45), and older adults (46 or older).

3.3. Fieldwork methods

3.3.1. Pilot study

In the summer of 1994, I conducted a small scale pilot study for this dissertation. I examined the following six variables (all of which were discussed in Chapter 2): deletion of *w*, deletion of *y*, monophthongal realizations of the diphthong *ɨi*, raising of *o*, raising of *ə*, and obstruent tensing (word-initial and -medial). The purpose of the pilot study was to obtain a rough idea of how Seoul Korean speakers use each of the variables and what possible difficulties there might be in the investigation of these variables.

The method of the pilot study was as follows. I collected data from eight male upper class speakers of Seoul Korean, thus controlling the social variables 'gender' and 'socio-economic class'. The informants' ages were 16, 22, 32, 41, 49, 51, 58 and 62. These speakers were contacted through introductions by friends and relatives. I interviewed them, recording each informant's speech for about one hour. Four different styles of speech were collected: spontaneous (interview) speech, passage reading, word list reading, and minimal pair reading.

The data were transcribed, and preliminary statistical analyses of the tokens of the variables were made. The analysis of obstruent tensing posed the most serious problems. First, the boundary between a tense and a lenis consonant was not clear. There were many cases where I had difficulty assigning tokens to one of the two categories (lax vs. tense). Second, the data suggested that the variation pattern of this variable may be more significantly correlated with idiolectal traits of a speaker rather than with the characteristics of the social group to which the informant belongs. Raising of *o* and raising of *ə* were found to occur mostly in function morphemes (such as affixes, conjunctions, and

proforms), not in most of the content words. No clear quantitative evidence was found as to whether these raisings reflect ongoing linguistic changes. Accordingly, the other three variables, i.e., *w* deletion, *y* deletion, and monophthongal realizations of *ɨi*, which also commonly involve a lenition process, were selected for this sociolinguistic project.

3.3.2. The fieldwork

A majority of the Seoul residents are, as mentioned earlier, immigrants from other areas of Korea. The first task I had to do was, as a result, to delimit the population to investigate, i.e., to identify speakers of Seoul Korean. Labov (1972d) suggests that children's language is dominantly affected by parents' dialect up until three years old, but that during the preadolescent period, i.e., from about 4 to 13, children's speech pattern is regulated by that of their peers with whom they play. Labov maintains that children are able to eliminate any deviations from the dialect pattern of their peers during this preadolescent period. Applying slightly stricter standards than Labov's (1972d) suggestion, I define Seoul Korean as the speech of those speakers who lived in Seoul from the age of 4 to 18, i.e., those who spent their preadolescent and adolescent period in Seoul.[8]

The fieldwork for this study was conducted from January to April of 1995. I followed the previous studies in using the networking procedure as the primary method of contacting informants. The scarcity of native speakers of Seoul Korean and the characteristics of Korean people and culture mentioned earlier, especially the strong tendency to distinguish ingroup and outgroup people, were the two motivating factors in adopting this method.

I identified myself as a researcher working on the Seoul dialect's intonation and rhythm. This approach may be a little different from other researchers' in that I made it

[8]One exception to this definition is clearly needed for those speakers under 18. Those under 18 who were born in Seoul or moved to Seoul before 4, and have lived in the city ever since are also considered as Seoul Korean speakers in this study.

known that I was investigating the language itself, but it was effective. To make it clear that I was working on the Seoul dialect definitely helped me in contacting and getting informants. Native Seoul residents are conscious that they are a real minority among Seoul's population. Some of them had pride in being a native Seoul resident and showed keen interest in the work I was doing and eagerness to help. The reason why I told informants that I was working on prosodic features is, obviously, to mask the real linguistic features that were being examined.

The data for the current study were collected from four major sources: a general hospital and an electronic shopping complex in Yongsan ward, a Presbyterian church in Chongno ward, and a *toksesil* 'reading room' in Songpha ward. Of the 65 interviewed, 50 informants were from these sources. One common property of these four places is that I knew somebody who was well-known by people working (or studying) at each place.

I was able to contact and interview 24 informants working for the general hospital in Yongsan ward. Since a relative of mine was working for that institution, I was able to contact many native speakers of Seoul Korean employed there without major difficulty. A hospital is an interesting place where people with different status, education level and income work together, which was one of the two primary reasons why I targeted the general hospital as a place to get informants (the other was, of course, that I had a relative working in this institution). Among those who were interviewed were doctors, a pharmacist, medical technologists, nursing aides, electricians, and cleaning ladies. Their social status ranged from upper class to lower class, even though they were all working at the same institution. Their education levels were also diverse: doctors and pharmacists had a college degree or more; many of the medical technologists and nurses had junior college education; electricians and nursing aides usually had highschool education; cleaning ladies had less than that. Most of the informants were recorded in my relative's office during his

absence, mostly during lunch hours or after work. In some cases, I visited the informant's office or workplace and interviewed them there.

The place where I collected the second largest amount of data was an electronic shopping complex in Yongsan ward. A friend's father was the owner of an electronic shop in the complex. For the purpose of getting lower class informants, I asked him to help me contact Seoul natives around the complex. I recorded ten speakers with his help. They include some less-educated shop managers and salesclerks. Since the shops there were usually noisy and crowded during business hours, the interview was conducted in the informant's workplace after working hours; or in a nearby restaurant over lunch if he wanted to be interviewed during lunch hours. I was able to contact only male speakers here.

The third place where I collected data was a Presbyterian church in Chongno ward. I have been a member of the church for about nine years (though I had to miss most of the church services during this period because of my stay in the U.S.). My father and mother have also been members of the church. I was able to contact those church members who are native speakers of Seoul Korean mostly through the help of my mother. The target here was older middle to upper class female speakers. Eight speakers agreed to be interviewed. They were interviewed either in the church office or the elders' meeting room.

Another place where I recruited informants was at the *toksesil* 'reading room' in Songpha ward. I visited this place as soon as I began to do fieldwork, because I thought that I might be able to contact some very young speakers (high school students) there. I made efforts to have a close relationship with the manager of the reading room. A couple of times I had drinks with him and asked him to help me contact students studying at the *toksesil*. I was able to interview eight speakers through his mediation: seven high school students and one young man who was preparing a test that selects lower public officials. They were recorded in one of the vacant reading rooms of the *toksesil*.

Informants were contacted through other methods too. I visited two *tabang* 'tea room' regularly for the purpose of contacting lower class women. (Generally waitresses working in tea rooms have lower education and status in Korean society.) I was able to interview two Seoul-native waitresses and two friends of theirs. They were recorded in the tea room after the business hours. I also visited Sogang University (my alma mater) a few times to contact young educated speakers. I was able to record five speakers with the help of my former advisor and her students. They were recorded on the school campus. Four neighbors of mine also agreed to be informants for my study. The interviews were conducted at their homes.

Most of the data collected for the pilot study was not used for the current study, because new reading materials (i.e., new sentence and word lists) were constructed for this study. However, I was able to contact two speakers who were informants for the pilot study and get new samples of read speech from them. Accordingly, their speech could be used as data for the present investigation.

Sixty five speakers were interviewed altogether during the fieldwork. Five informants' data were, however, not usable. Two speakers were found not to be speakers of Seoul Korean; they came to Seoul after the age of 4 and retained some intonational features of their parents' dialect. Also it was not possible to obtain good read speech from three speakers: one of them was too old to read (i.e., because of her limited vision); two had poor reading ability (their education level was very low).

The allotment of the remaining 60 speakers into the three SEC groups was conducted in the following way. For men, occupation and education were both considered. Those speakers who had the typical characteristics of the three SEC groups both in occupation and education were selected. The typical education levels of three SEC

groups were defined as follows: upper SEC – college graduation or higher, middle SEC – junior college or college drop-out, lower SEC – high school or lower. Highschool students' status was decided on the basis of their fathers' status. Women's social status was decided on the basis of their education level, since many female informants did not have occupation. (A majority of Korean women still do not work after they get married). Those four speakers whose socio-economic class was not clear were excluded from the sample. These were male speakers who had occupational characteristics of middle SEC but educational characteristics of upper SEC, i.e., semi-professionals or lower white collar workers with a college degree. The social distribution of the final sample of 56 speakers for interview speech is as shown in Table 3.4.

	Lower Class		Middle Class		Upper Class	
	Male	Female	Male	Female	Male	Female
16-25	3	4	3	3	3	3
26-45	3	3	4	3	3	3
45+	3	3	3	3	3	3

Table 3.4. The final sample for interview speech

NB: Number of sample speakers for interview speech = 56

Among these 56, 49 were born in Seoul, and 7 were born in other areas but came to Seoul before the age of 4. Sixteen speakers had parents who were both native Seoul residents. The geographical distribution of the 56 informants' residences was wide-spread in the Seoul community. The informants were residents of 17 different wards (among 22 wards of Seoul) as shown in Figure 3.1; two informants were residents of Seoul's satellite cities (Koyang and Pundang). Information about each informant is given in Appendix A.

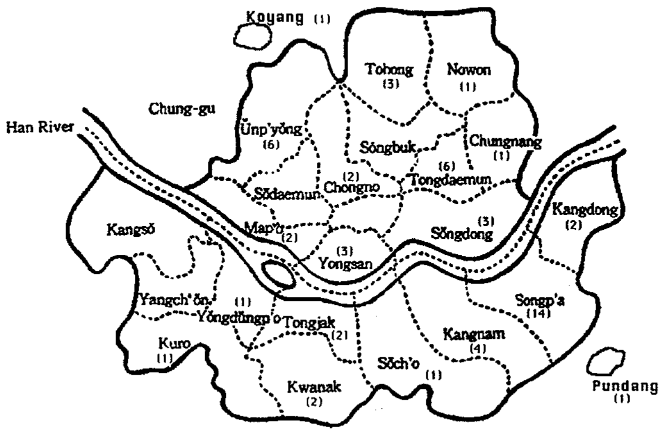


Figure 3.1. Geographical distribution of the informants for the current study

NB: The number in the brackets indicate the number of informants residing in the given ward.

From each of the 18 cells I selected the one speaker who was most cooperative, and asked the informant to arrange a meeting with his/her ingroup member(s) (friends or relatives) that I could attend to record his/her interaction with other group members. If having me do the recording was not an option, I asked the speaker to do it him/herself. The methods that were used in collecting ingroup speech are discussed in 3.4.2.

A majority of the informants were willing to be interviewed without a reward. However, to express my thanks for their help, a present (such as a bakery cake or a ball point pen) was given to most of the informants, which helped me to contact and obtain other informants. A few informants refused to take a reward at all. Some of the informants were willing to help only on the condition that they were rewarded. Most of these informants were given monetary compensation for their help.

3.4. Methods of data collection

This study, as mentioned earlier, relied on two methods for data collection: the interview method and the participant observation method. These methods were slightly modified to adapt them to the sociocultural conditions of the Seoul community. The exact manner in which the two were used is discussed below.

3.4.1. The sociolinguistic interview

The interview was conducted following the order of the sections of the interview schedule (see Appendix B). The length of the whole interview was about 40 minutes. Conversation between the informant and myself lasted for approximately 30 minutes. Then two types of read speech were elicited: sentence reading and word reading.[9] Since sentence reading is less intimidating than passage reading to the informants (and also since it is easier to ask the informants, especially those older than I am, to read sentences than a long passage), the former was adopted for this study rather than the latter. It took about five minutes, on average, for the informant to finish the reading sections of the interview. The elicitation of read speech was followed by two minutes of the self-evaluation test, where the informant was tested on how s/he objectively evaluated his/her linguistic behavior on the sociolinguistic variables under study. After the self-evaluation test, the informant was asked to complete the personal data sheet, which turned out to be the portion of the sociolinguistic interview least liked by informants.

Two recorders, a Sony WM-D6C and a Samsung MY-S793, and two microphones, a Sony ECM 135 and a Sony ECM 66-B, were used for the current study. Most of the recordings were made using the Sony recorder; the Samsung MY-S793 was used twice when I asked two informants to record their ingroup speech since it is simpler to use than the other. The Sony ECM 135 is an omni-directional microphone, while a Sony

[9]A few two-word phrases were also included in the reading materials for the reason to be discussed in Chapter 6. However, I disregard them here, since phrases included were very short and also a small minority.

ECM 66-B is a lavaliere uni-directional microphone. The main difference in function between the two is that the former catches sounds (and noises) coming from different directions, whereas the latter catches sounds from relatively limited directions. The ECM 135 model was used most of the time; the ECM 66-B microphone was used when an individual interview was conducted at a rather noisy place.

At the beginning of the interview I asked the birthdate and birthplace of the subject (and the age when the informant moved to Seoul, if his/her birthplace is not Seoul). This was to check whether the informant fitted my definition of a Seoul Korean speaker. The hometowns of the informants' parents were also elicited. The main purpose of the interview was to elicit as much spontaneous speech as possible from the informant. Identical questions were not asked of all the informants, but questions that could attract each informant's interest and engagement were asked based on the information given by the informant during the interview. For instance, if the informant said that s/he had interests in such and such areas (hobbies, events, or issues), a set of questions related to those areas were asked. Informants generally had a tendency to consider the *inthebyu* 'interview' as a very formal event.[10] Efforts were made to make them feel comfortable during the interview. The informants were told that they could speak freely on any topic that they wanted. The informants' speech was not interrupted. I attempted to show utmost interest in what the informants were saying, and took a sympathetic position on personal or social issues that they were discussing. Some basic questions were also prepared in case I needed them. These are listed in the first section of the interview schedule given in Appendix B.

Sections 2 to 5 of the interview schedule were prepared for the elicitation of read speech. To make each section brief (and thus to give an informant a short break), two sentence lists and two word lists were prepared. The order of the four sections were

[10]"Interview" is used as a loan word in Korean in the form [int^{h}ə byu].

arranged as follows: sentence list 1, word list 1, sentence list 2, word list 2. The sentences and words used for the investigation of each variable were randomly ordered in each section. Informants were asked to read the materials naturally and comfortably, though not all the informants actually did so. Some lower class speakers and some older speakers, in particular, showed signs that the task was not that easy.

Following the elicitation of read speech, a self-evaluation test (Section 6) was performed. The purpose of this test was twofold: to examine 1) how correctly the informants evaluated their actual production of the variables, and 2) how conscious or sensitive the informants were of the variables under study. The test contained 18 questions. Six questions were constructed to examine the informants' self-evaluation regarding the variables (w), (y), and (ii), respectively. I first explained that the two answers given to each of the questions were possible productions by Seoul Korean speakers, and then instructed the informant to choose one of the two which s/he usually produced. Since the informants did not always correctly associate the written form with the actual phonetic pronunciation, I produced the two answers myself and asked for the informant's answer to each of the questions. (As mentioned earlier, some Seoul Korean speakers think that they never delete *w* or *y*, nor monophthongize *ii*.) Some of the informants were probably able to guess what were the main interests of my research project during this test.

At the end of the sociolinguistic interview, I asked informants to complete the personal data section (Section 7), saying that the data would be used as a reference in my research. The section contained 11 rather simple questions: the subjects' name, gender, birthdate, occupation, education level, birth place (and the age when the subject moved to Seoul, if the birthplace was not Seoul), and the name of the ward where s/he currently lived. The other questions were about the informant's parents: their hometowns, occupations and education levels. Lastly, the informant was asked to list the name(s) of the place(s) (other than Seoul) where s/he had lived (if the informant ever did so), and the length of stay in each place. Questions about the informant's or his/her parents' property were not included, because these questions are regarded as too personal in Korean society (there is even a risk that some older informants might consider the fieldworker as impolite or impudent, if they were asked such questions).

The informants were not usually happy when they were asked to fill in the personal data section. A couple of the informants refused to do it; a few informants left some questions unanswered, especially the questions about the informant's education and the education levels and occupations of the informant's parents.[11] In these cases, I had to ask the questions of other people who knew the informant well. The information given in this section was used as the basis for determining the informant's socio-economic class.

3.4.2. Collection of ingroup speech

As mentioned earlier, the one informant who appeared most cooperative and accessible during the interview was selected from each of the 18 sample cells and asked for further help. They were initially asked whether they had a plan to meet their friend(s) or close relation(s) in the near future. If they had such a plan, I asked them whether I could record their speech during the meeting. I also asked those who did not have such a plan to arrange such a meeting. Most of the selected informants were cooperative. Only three people rejected my request flatly; two expressed the wish that they would rather record their interaction without my presence. In the first case, I asked another informant in the same cell for help; in the latter case, I instructed them on how to use the tape recorder, explained the purpose of the planned recording session (i.e., to collect Seoul Korean speech which is more casual and spontaneous than interview speech), and told them that they only had to speak their usual, everyday speech during the recording. Ingroup speech was harder to

[11]See the chapter on education in Korea of Hoare and Pares (1988) for the sensitivity of Koreans to education and their general respect for scholarship and learning.

collect than interview speech, especially because 1) more than one informant is involved (people supposed to appear often did not show up), 2) a meeting place appropriate for recording is not easy to find. However, after spending not a little time and energy, I was able to collect ingroup speech from each of the 18 stratified cells.

The 18 ingroup interactions were held and recorded at various places: seven times at the house of the informant (or the informant's friend or relative), six times at a restaurant, three times at the informant's office or workplace, once on the school campus and once at the *tabang* 'tearoom'. I usually provided some food and drink for the interaction. When a restaurant was a meeting place, the interaction took place over lunch or dinner. Restaurants that are usually not so crowded (and thus not so noisy) were chosen for the group interaction. I just asked the participants to speak their everyday speech, and let 'group dynamism' (cf. Nordberg 1980) control their speech thereafter. Usually I left the scene as soon as the interaction among the participants was established, so that my presence would not hinder the natural flow of their conversation, and came back at the end of the session (see Reid 1978 and V. Edwards 1986 for the use of a similar strategy). Approximately 30 minutes of conversation was recorded in each interaction. Speakers produced more casual speech in ingroup interactions than in the sociolinguistic interview, as the statistical results given in the next three chapters will show.

No. of Participants	No. of Group Interactions
3	8
4	5
5	3
6	2

Table 3.5. The distribution of the number of participants in ingroup interactions

The average number of participants in the interaction was 4, (3.94 to be exact) including myself. (However, Table 3.5 shows that the most 'common' type of interaction took place among three participants.) The interactions where the most and least speakers took part involved 6 and 3 speakers, respectively. Most of the recorded ingroup speech involved interaction with the informant's friend(s) rather than his/her relative(s). Only three recordings out of 18 were of the informant's conversation with his/her relative(s). At the end of the interaction, the participants were asked to complete the personal data sheet (which is identical to Section 7 of the interview schedule). If the participants other than the one who arranged the meeting were also Seoul Korean speakers and belonged to the same stratified cell, their data were included too as ingroup speech of the given sample cell. The final sample for ingroup speech is given in Table 3.6.

	Lower Class		Middle Class		Upper Class	
	Male	Female	Male	Female	Male	Female
16-25	2	2	1	2	1	1
26-45	1	1	2	2	1	1
45+	1	1	1	1	3	1

Table 3.6. The final sample for ingroup speech

NB:*Number of sample speakers for ingroup speech = 25

3.5. Statistical methods

The current research uses variable rule analysis as the main statistical method. Variable rule analysis was designed, and has been used, for the analysis of linguistic variables, i.e., the analysis of speakers' choice among two or more variants (usually) with same meaning. Though the variable rule was first conceived as an extension of generative

grammar, variable rule analysis currently does not necessarily presuppose the involvement of a variable (grammatical) rule in the variation under analysis.[12]

It is well known that linguistic variables are conditioned by both linguistic and nonlinguistic constraints. (For instance, as has been demonstrated, /t,d/ deletion is sensitive linguistically to the preceding and following phonetic environments, and grammatical status of /t,d/, and also to such external constraints as speech style and social status of speakers.) One clear advantage of variable rule analysis (over univariate analyses like a chi-square test) is that it can "separate, quantify, and test the significance of the effects of environmental [conditioning] factors on a linguistic variable" (Guy 1993:8). This advantage comes from the fact that variable rule analysis is a multivariate analysis, which is able to control for the effects of all the other known factors, when estimating the effect of a given factor. This is why the probabilities of variable rule analysis are more reliable than raw percentages or results of univariate analyses.

Constraints on a linguistic variable are referred to as 'factor groups' in variable rule analysis. (For instance, preceding and following phonetic environments of /t,d/, speech style, and social status of speakers are factor groups in the variable rule analysis of /t,d/ deletion.) A factor group is a set of all possible factors; or consists of a set of mutually-exclusive factors, e.g., the 'following phonetic environment' factor group is composed of three factors: consonant, vowel, and pause. Constraints are independent variables that influence speakers' choice of variants of the linguistic variable. The linguistic variable itself is the dependent variable and variants are the possible values of the dependent variable. The user of variable rule analysis usually defines one of the variants as the application value (i.e., the output value which the input changes to when a real or

[12]See Fasold (1991) for the current status of the variable rule. He (1991:17) states that though "the variable rule as a part of linguistic theory has quietly been abandoned", Varbrul (variable rule analysis) "continues to function as a statistical tool for the analysis of variation".

'imagined' variable rule is applied); for instance, in the analysis of phonological deletion, the application value is defined as 'ø'.

Probabilities (or 'weights') assigned to factors are calculated on the basis of the distribution of tokens of the variable in the data, which are coded and entered in the form of a token file. The mathematical model currently used in variable rule analysis that relates the data to factor probabilities is the logistic (or logit-additive) model, which can be expressed by the equation (3.1). In the equation p_0 represents 'input probability' ("the propensity of the variable rule to be applied on its own apart from the influence of the environment" (Fasold 1991:7)), and p_i, p_j and p_k, respectively, represent the probability associated with the factors *i*, *j* and *k* corresponding to the independent variables.

(3.1) $\log (p/1-p) = \log (p_0/1-p_0) + \log (p_i/1-p_i) + \log (p_j/1-p_j) + \log (p_k/1-p_k) \cdots$

Variable rule programs estimate factor probabilities using the algorithm based on the 'maximum likelihood' procedure; they choose the set of factor probabilities (i.e., the effects of factors) that best account for the given data or that are the "most likely to have generated the data" (Sankoff 1988:990). Factor probabilities are numbers that range between 0 and 1. If the weight of a factor is bigger than .5, it increases the probability of (rule) application (cf. equation (3.1)); if the weight of a factor is smaller than .5, on the other hand, it decreases the probability of application; the factor weight .5 is neutral. In Varbrul terms, if the factor weight is bigger or smaller than .5, the factor is said to favor or disfavor (rule) application, respectively.

One feature of variable rule analysis that has been built into recent versions of the program such as Varbrul 2S and the subsequent (binomial) variable rule programs is the automatic selection of those constraints (factor groups) that have statistically significant effects on speakers' choice among the variants of a given variable. The selection of constraints relevant to a given variation is performed by the statistical procedure called a

'stepwise regression analysis'. This stepwise analysis is conducted in two directions, the stepup and the stepdown. The decision as to whether a specific constraint is relevant to a given variation is made on the basis of whether the addition of that constraint to the model (refer to equation (3.1)) significantly improves maximum likelihood (in the case of the stepup), and whether the deletion of that constraint makes likelihood significantly worse (in the stepdown). The stepup and stepdown analyses usually retain the same set of constraints at the end; if not, i.e., if a given constraint is added in the stepup but discarded in the stepdown or if a constraint is neither added in the stepup nor thrown out in the stepdown, the constraint's relevance (significance) to a given variation is uncertain (Sankoff 1988:992).

The current research uses two Varbrul programs, Goldvarb 2.0 developed by Rand and D. Sankoff (1990) and I-Varb 2.3 written by Pintzuk (1988). The two programs are based on the same mathematical model and built on identical statistical assumptions. The main differences between the two are as follows. First, I-Varb is a program developed for the use on the IBM-PC and written in Fortran, while Goldvarb is a Varbrul version programmed in Pascal for the Macintosh. Second, Goldvarb is a stand-alone application requiring no additional programs; I-Varb, on the other hand, needs a PC editor program to create files such as a data file and a condition file, and three setup programs to feed the cell file to I-Varb: 'checktok', 'readtok', and 'makecell'.[13] Despite these differences, the two programs produce little different results out of the same dataset because the two programs are, as mentioned earlier, built on identical mathematical and statistical models and assumptions.

[13]When using an I-Varb, tokens are first coded and entered in a data file. The functions of 'checktok', 'readtok' and 'makecell' are as follows: 'checktok' examines the legality of the code string for each token on the basis of the legal values (provided in the factor specification file) for each factor group; 'readtok' reads a datafile into a token file; 'makecell' makes a cell file with a token file and a condition file as the input.

CHAPTER 4

THE VARIABLE DELETION OF *w*

4.1. Introduction

In Korean, the labiovelar *w* is often observed to delete in speech (e.g., /cuk'wən/ —> [cuk'ən] 'sovereignty', /pwa/ –> [pa] 'look!', /sakwa/ —> [saga] 'apple'). This phonological process is observed not only in Seoul Korean but probably in every dialect of Korea. This process has been discussed by some scholars. For instance, P.K. Lee and K.R. Park (1992:19) observe that the deletion of *w* occurs frequently after bilabial consonants and suggest that *w* deletion is a dissimilatory process in order to avoid successive labial segments. Martin (1992) also makes noteworthy observations. He (1992:36) notes, "the phoneme *w* freely drops after *p, ph, ps, m, wu* ([u]), or *o* ... in sloppy speech (and widely in Seoul) *w* often disappears after nonlabial sounds, too...". Martin's remarks indicate that he is keenly aware that *w* deletion is a variable process and that it occurs more often in certain phonological contexts.

These observations are, though insightful, impressionistic. The pioneering quantitative study of *w* deletion based on recorded speech data was that of Silva (1991). He suggests that *w* deletion is conditioned by such linguistic factors as the articulation point and phonation manner of the preceding consonant and also by the frontness/backness of the following vowel. He also suggests that *w* deletion is sensitive to such external factors as speech style and the social status of the speaker. His study clearly shows that the deletion of *w* is a sociolinguistic process conditioned both by linguistic and external factors. In addition, Silva (1991) attempts to explain the deletion of *w* in terms of phonological theory

using notions of feature geometry (cf. Sagey 1986, Hume 1994) and the Obligatory Contour Principle (cf. McCarthy 1986).

Silva's study, however, has two problematic points. One is his assumption that *w* deletion occurs only after a consonant, while, in fact, *w* deletion can occur with or without a preceding consonant (Martin 1992, K.W. Nam 1984). The other point is that his study is based solely on read speech, which can be considerably different from conversational speech in general (Macaulay and Trevelyan 1973) and especially from vernacular speech (Labov 1972f), where the most interesting patterns of variation and change are believed to be found. (Reynolds (1994) also discusses *w* deletion in his dissertation but since his discussion is based on Silva's data and also assumes that *w* deletion is confined to post-consonantal position, it has the same problems as Silva (1991)).

Tackling these two problematic points in Silva's study, the current study reexamines the variable deletion of *w* on the basis of a larger database. The analysis of my data produces somewhat different results from that of Silva's data. First, unlike Silva's study, the current research finds that bilabial and nonbilabial consonants preceding *w* show dichotically different effects on *w* deletion (supporting P.K. Lee and K.R. Park 1992), i.e., *w* is found to delete significantly more often after bilabial consonants than after other types of consonants. Second, my data confirm the suggestion of Martin (1992) and K.W. Nam (1984) that *w* deletion occurs even without a preceding consonant.

To account for these results, I present explanations along a different line from Silva (1991). It will be claimed that the finding that *w* deletion occurs predominantly after bilabial consonants can be explained by the notion of the Obligatory Contour Principle as a rule trigger (Yip 1988).[1] In order to account for the deletion of *w* in other phonological contexts, I will also suggest that two constraints, *R-Diph and MAX(u), are 'variably

[1] As noted earlier, Silva (1991) also tries to explain the variable patterns of *w* deletion using the notion of the OCP. However, his explanation of *w* deletion relies on the notion of multiple linking (of the [+back] feature) caused by the OCP rather than the rule triggering effect of the OCP.

ranked' in Seoul Korean phonology.[2] It will also be shown that the diachronic loss of *w* that has occurred in most lexical items of Korean containing the 'labial consonant + *w*' sequence is a perception-based change referred to by Ohala (1981:187) as "sound change by the listener".

This chapter is organized as follows. In 4.2, some background information on *w* deletion in Seoul Korean will be provided. The data and methodology used for this study will be discussed in 4.3. The results of the statistical analyses and the self-evaluation test will be given in 4.4 and 4.5, respectively; their implications will be discussed in 4.6. An attempt will be made to provide a phonological account of the synchronic deletion of *w* and a phonetic explanation of the diachronic loss of *w* in 4.7, followed by concluding remarks in 4.8.

4.2. Background

This section discusses some basic concepts in Seoul Korean phonology that will be essential to understanding the methods and results of the current investigation.

The syllable structure of Seoul Korean can be schematized as in Figure 4.1. The minimal syllable is V with three optional elements: an onset, a glide, and a coda. The internal structure of the Seoul Korean syllable is rather controversial; this comes from the uncertain status of two glides of Korean, *w* and *y*. Some phonologists (e.g., Sohn 1987, H.Y. Kim 1990) claim that the GV sequence is a diphthong (thus G forming a constituent with the following V), while others (e.g., S.C. Ahn 1988, Y.S. Lee 1993) argue that CG is a constituent, forming an onset cluster. (See Y.S. Lee 1993 and H.Y. Kim 1990 for a discussion of this debate.) However, despite a serious disagreement on this issue among theoretical phonologists, the socio-historical linguists' position has been consistent as

[2] *R-Diph and MAX(u) are formulated in this study as follows (see 4.7.1 for further discussion).
*R-Diph: Rising diphthongs are prohibited.
MAX(u): Every *u* in the underlying representation has a correspondent in the surface representation.

shown earlier in 1.2: GV sequences in Korean have been defined as diphthongs (e.g., Y.C. Chung 1991, H.K. Choi 1991). The present study takes the position of socio-historical linguists and phonologists like Sohn (1987) and H.Y. Kim (1990), i.e., this study assumes that GV sequences in Seoul Korean are rising diphthongs. One underlying motivation for this assumption is that the deletion of *w* without a preceding consonant cannot be explained by the assumption that glides are onset consonants in Korean.

σ

(C)(G)V(C)

Figure 4.1. Syllable structure of Seoul Korean

As suggested in 1.2, this study also assumes that contemporary Seoul Korean has the monophthongs shown in Table 4.1. That is, it is assumed that the vowels *ü* and *ø* have changed to diphthongs *wi* and *we* (cf. Kim-Renaud 1974 and K.R. Park 1992) and therefore are no longer monophthongs of this dialect. The present study also takes the position (following Hong 1988 and H.B. Lee 1971) that the vowels *e* and *ε* have merged to *e*.

[-bk]	[+bk]	
i	ɨ	u
e	ə	o
	a	

Table 4.1. Monophthongs of Seoul Korean

The current inventory of *w* diphthongs in Seoul Korean is repeated in Table 4.2 for reference. The *w* diphthongs are all rising diphthongs, i.e., 'G + V' sequences (C.S. Lee 1994, Martin 1992). One thing to note is that *w* cannot be combined with rounded vowels. In other words, *w* cannot form a diphthong combined with labial vowels (**wo*, **wu*).

[-bk]	[+bk]	
wi	*wɨ	*wu
we	wə	*wo
	wa	

Table 4.2. *w* Diphthongs of Seoul Korean

The consonants of contemporary Seoul Korean are given in Table 4.3. The table shows that Korean plosives have a three way distinction in phonation type, i.e., lax, tense, and aspirated. As Figure 4.1 suggests, consonants can precede and combine with *w* diphthongs, though not all logical possibilities are actually implemented. When a consonant precedes *w*, a morpheme boundary may be present between the consonant and *w*, e.g., /sam+wəl/ 'March (three+month)', /man+wən/ 'full house (full+people)'. In other cases, there is no morpheme boundary between the two, e.g., /kyo+hwan/ 'exchange (inter+exchange)', /so+nwe/ 'cerebellum (little+brain)'. *w* can also appear intervocalically, e.g., /sawəl/ 'April', /kuwən/ 'salvation', and in word-initial position, e.g., /wicaŋ/ 'stomach', /wənin/ 'reason'.

	bilabial	alveolar	palatal	velar	glottal
stop	p, p', p^h	t, t', t^h		k, k', k^h	
affricate			c, c', c^h		
fricative		s, s'			h
nasal	m	n		ŋ	
liquid		l			
glide	w		y		

Table 4.3. Consonants of Seoul Korean

In addition to underlying /w/, *w* can arise derivationally through "glide formation" (*o*, *u* —> *w* / _____ + *ə*, *a* , e.g., /no+a/ —> [nwa] 'release!', /s'au+ə/ —> [s'awə] 'shoot!') and optional "vowel contraction" (*u* —> *w* / C _____ V, e.g., /cuəs'ta/ —> [cwətt'a][3] '(I) gave', /muəs/ —> [mwət] 'what' (cf. T.S. Eom 1993)). Underlying *w* and

[3]Korean has a coda neutralization rule that neutralizes obstruents to lenis voiceless stops in coda position.

derivational *w* do not show different behavior with respect to *w* deletion, and thus both are included in the analysis as tokens of (w).

4.3. Methods

4.3.1. Data

The analysis of conversational speech was based on recordings of interview speech and ingroup speech. The tokens which appear in the last 20 minutes of the recording were selected as the tokens for this study. On average, approximately 20 to 30 tokens were found for the interview speech of each speaker in this portion of the recording, and 10 to 20 tokens were found for the ingroup speech.[4] The sentences and words chosen for the sentence and word list readings were also designed to contain many tokens of (w). The sentence list and the word list contained 52 and 43 potential tokens of the variable (w), respectively. These potential tokens were designed to reveal the effects of various (possible) linguistic constraints on *w* deletion that will be discussed in the following subsection. Speakers occasionally misread potential tokens; these cases were not included.

Judgments regarding the presence or absence of the glide were made twice: at the time of transcription and before the statistical analysis. Each token was judged {w}, {ø}, or 'ambiguous' (or unclear). Any perceived labialization of the preceding consonant was judged as {w}. Ambiguous cases accounted for approximately 7 percent (N = 601) of the tokens (N = 8603). These tokens were excluded from the analysis. One hundred tokens were selected from each of the three groups of tokens, i.e., from each group of tokens identified by the researcher as {w}, {ø} and 'ambiguous'. Another Seoul Korean speaker checked these tokens independently. Her judgments and mine showed 88, 87 and 78 percent agreement in the {w} group, in the {ø} group and in the 'ambiguous' group,

[4] The number of tokens in the recording of ingroup speech was partly dependent on those who were present as participating members. For instance, if the members who took part in the conversational interaction belonged to the same social group (i.e., same sex, social status and age group), the number of the tokens for that particular group increased because it was possible to include the tokens of *w* from all participants.

respectively. This study is based on 8002 tokens of the variable (w) from 63 speakers' data containing both conversational (ingroup + interview) and read speech.

4.3.2. Variable rule analysis

Silva (1991) formulates the following basic rule of *w* deletion.

(4.1) $w \longrightarrow \emptyset$ / C ____ V

However, as suggested by Martin (1992) and K.W. Nam (1984), *w* deletion is not confined to this environment. *w* deletion can occur even when a preceding consonant is not present, e.g., /howi/ —> [hoi] 'defense', /kiwa/ —> [kia] 'roof tile', /suwən/ —> [suən] 'origin of a stream'. Accordingly, I suggest that rule (4.2) is a more correct representation of the environments where this process occurs.

(4.2) $w \longrightarrow \emptyset$ / (C) ____ V

The specific environments where *w* deletion can "possibly" occur are more explicitly shown by (4.3) and (4.4).

(4.3) $w \longrightarrow \emptyset$ / C ____ V

(4.4) $w \longrightarrow \emptyset / \left\{ \begin{matrix} V \\ \# \end{matrix} \right\}$ ____ V

That is, *w* can delete between a consonant and a vowel, between two vowels, and ("possibly") word-initially before a vowel. The deletion of *w* is very sensitive to whether there is a preceding consonant. According to the analysis of my data, *w* is deleted approximately 5% of the time (83/1752) when there is no preceding consonant and 26% (1634/6250) when there is one (cf. Tables 4.9 and 4.10 in Section 4.4).

Furthermore, (4.3) and (4.4) are affected by somewhat different constraints. Silva (1991) suggests that (4.3) is affected by the place of articulation and the phonation type of

the preceding consonant. A morpheme boundary between the preceding consonant and *w* can also be a factor in (4.3). On the other hand, Martin (1992) and K.W. Nam (1984) suggest that the deletion of *w* after a vowel is sensitive to whether the preceding vowel is rounded or not.

For these two reasons, i.e., because (4.3) and (4.4) have a significant difference in deletion rate and are sensitive to partly different constraints, two separate Goldvarb (Goldvarb 2.1. Rand and Sankoff 1992) analyses as well as the combined analysis were performed. The number of the tokens for the combined analysis was 8002; *w* deletion after a consonant had 6250 tokens and *w* deletion without a preceding consonant had 1752 tokens.

4.3.2.1. Factor groups considered for the combined Goldvarb analysis

Silva (1991) examines the factor groups listed in Table 4.4 in his Varbrul analysis. All the linguistic factor groups considered in Silva's study were also included in my analysis of *w* deletion with slight modifications.

The modifications were as follows. First, in my analysis, five different factors were included under the factor group 'preceding consonant (place)'. In addition to labial, alveolar, palatal, and velar places, the glottis was also included as a place for the analysis of the *h* + *w* sequence. Secondly, though the presence of the morpheme boundary between the preceding consonant and *w* was included as a factor group, only two factors, i.e., ø/present, were coded. The reason that I did not divide morpheme boundary into Sino-Korean morpheme boundary and native Korean morpheme boundary was that few tokens (only 8 among 6250 tokens) in my data had a native Korean morpheme boundary. As in Silva's study, the factor group 'preceding consonant ((phonation) manner)' (i.e., whether the preceding consonant is lax, aspirated or reinforced) was considered only for the plosives, and the factor group, 'following vowel', was divided into [-back] and [+back] vowels.

Factor groups	Factors
*1. preceding consonant, place	labial, alveolar, palatal, dorsal
*2. preceding consonant, manner	lax, aspirated, reinforced
*3. following vowel	front, nonfront
4. morpheme boundary preceding *w*	none, Sino-Korean, native
*5. speech style	minimal pairs, word list, sentences, text
6. age	teen, adult
*7. gender	female, male
8. education level	high school or less, college
9. hometown	Seoul area, other
*10. Father's occupational prestige	higher, lower

Table 4.4. Factor groups considered in Silva (1991:159)

NB: The asterisk (*) indicates those factor groups selected (as significant) in the stepwise regression analysis here and hereafter.

Three additional linguistic factor groups were included in my analysis. Following the suggestions of Martin (1992) and K.W. Nam (1984) that *w* is more apt to delete after a rounded vowel, roundedness (rounded vs. unrounded) of the previous vowel was added as a factor group. This factor group was considered only for those tokens where *w* occurs after a vowel.

The second linguistic factor group that was added concerns whether *w* occurs in an initial or a noninitial syllable of the word. The distinction between initial vs. noninitial syllables has played an important role both in diachronic phonological changes and synchronic variation in Seoul Korean. The sound change of *ʌ* to *a* and *ɨ*, which happened during the Middle Korean period, is one example. The now lost vowel *ʌ* generally changed to *a* in a word-initial syllable and to *ɨ* in a noninitial syllable (H.K. Choi 1991), e.g., /pʰʌli/ > /pʰali/ 'fly' but /namʌlata/ > /namɨlata/[5] 'reprimand'. The change from *o* to *u*, which began early in the 16th century, usually occurred in a noninitial syllable of the word (Chae 1995), e.g., /kocʰo/ > /kocʰu/ 'hot pepper', /namo/ > /namu/ 'tree'. Tensification of obstruents, an ongoing change in Seoul Korean discussed in 2.3.1, occurs

[5]/namɨlata/ later changes to /namulata/ through vowel labialization.

mostly in an initial syllable, e.g., /kwa+samusil/ —> [k'wa+samusil] 'department office', /talɨn/ —> [t'arɨn] 'other'. Because of my impression that *w* deletion is another process sensitive to syllable position within the word, I include this factor group in my Goldvarb analysis.

The third linguistic factor group added in my Goldvarb analysis concerns the presence of a coda in the syllable where *w* appears. Current phonological theories (e.g., Prince and Smolensky 1993, McCarthy and Prince 1995, Rosenthall 1994) suggest that both codas and diphthongs make syllable structure more marked. Syllable structure CGVC is believed to be less natural than CGV, since the former has two marked features (coda and diphthong – if we assume that the GV sequence is a diphthong), while the latter has only one (diphthong). One possibility worth examining is whether *w* deletion occurs more frequently in a more marked structure (CGVC) than in a less marked structure (CGV), i.e., whether markedness in coda position affects markedness in the syllable nucleus in Seoul Korean. The addition of the factor group, 'presence of coda', was motivated by this consideration.

Four potential external constraints, 'speech style', 'gender', 'social status' and 'age', were also considered in my analysis. Refer to Chapter 3 for the division and discussion of the factors of these external factor groups. Table 4.5 lists the factor groups examined in the combined analysis of *w* deletion.

Factor groups	Factors
1. preceding consonant, place	labial, alveolar, palatal, velar, glottal
2. preceding consonant, manner	lax, aspirated, reinforced
3. following vowel	[-back], [+back]
4. syllable position	initial, noninitial
5. preceding vowel	rounded, unrounded
6. morpheme boundary preceding *w*	ø, present
7. presence of coda	ø, present
8. speech style	ingroup, interview, sentence reading, word reading
9. gender	female, male
10. social status	upper, middle, lower
11. age	16-25, 26-45, 46 or older

Table 4.5. Factor groups considered in the variable rule analysis of *w* deletion

4.3.2.2. Factor groups considered for the Goldvarb analysis of postconsonantal *w* deletion

The factor groups (and their factors) examined in the Goldvarb analysis of postconsonantal *w* deletion are listed in Table 4.6. The factor group, 'preceding vowel', was excluded in this analysis, because it is not relevant here. Since the number of the tokens (N = 6250) was large enough to allow Varbrul analyses on subsets of tokens, the tokens of three different styles of speech, i.e., conversational (ingroup and interview), sentence reading, word reading, were also subject to separate Varbrul analyses. The results are given in Appendix C for reference.

Factor groups	Factors
1. preceding consonant, place	labial, alveolar, palatal, velar, glottal
2. preceding consonant, manner	lax, aspirated, reinforced
3. following vowel	[-back], [+back]
4. syllable position	initial, noninitial
5. morpheme boundary preceding *w*	ø, present
6. presence of the coda	ø, present
7. speech style	ingroup, interview, sentence reading, word reading
8. gender	female, male
9. social status	upper, middle, lower
10. age	16-25, 26-45, 46 or older

Table 4.6. Factor groups considered in the variable rule analysis of post-consonantal *w* deletion

4.3.2.3. Factor groups considered for the Goldvarb analysis of non-post-consonantal *w* deletion

The Varbrul analysis of non-post-consonantal *w* deletion considered the factor groups given in Table 4.7. Three factor groups, 'preceding consonant (place)', 'preceding consonant (manner)' and 'morpheme boundary between *w* and the preceding consonant', were naturally excluded in this analysis.

Factor groups	Factors
1. following vowel	[-back], [+back]
2. syllable position	initial, noninitial
3. presence of the coda consonant	ø, present
4. preceding vowel	rounded, unrounded
5. speech style	ingroup, interview, sentence reading, word reading
6. gender	male, female
7. social status	upper, middle, lower
8. age	16-25, 26-45, 46 or older

Table 4.7. Factor groups considered in the variable rule analysis of non-post-consonantal *w* deletion

4.4. Results of Varbrul analysis

The results of the combined Goldvarb analysis (binomial one level analysis and stepwise regression analysis) of *w* deletion are given in Table 4.8. As shown in the table, all the factor groups considered were chosen as significant in the regression analysis. However, those factor groups that show a difference in weight bigger than 0.1 between the two most distinct factors and thus show a relatively clear difference among the factors included only the following six: 'preceding consonant (place)', 'syllable position', 'preceding vowel', 'style', 'social status', and 'age'. Though the factor groups 'morpheme boundary', 'preceding consonant (manner)', 'following vowel', 'presence of the coda' and 'gender' were also selected in the regression analysis, they showed only minor probability differences (smaller than 0.1) among their factors.[6] The reason that these factor groups were selected in the stepwise regression analysis is probably attributable to the large number of the tokens (N = 8002), since a large sample size can make a small amount of difference in probability statistically significant — a larger sample size increases the power of significance tests (Hays 1988, Popham and Sirotnik 1992). The order of the choice in the stepwise regression analysis is given in (4.5).

(4.5) Order of selection in the stepwise regression analysis

1. preceding consonant (place)
2. speech style
3. syllable position
4. social status
5. preceding consonant (manner)
6. age
7. preceding vowel
8. morpheme boundary preceding *w*
9. presence of coda consonant
10. following vowel
11. gender

[6]As Table 4.8 shows, the difference in Goldvarb weight between the two most distinct factors is .049 in 'morpheme boundary', .033 in 'manner of preceding C.', .06 in 'following V', .057 in 'presence of coda', and .039 in 'gender'.

Factor groups	Factors	Weight	% Applications	Total N
*Preceding C (place)	bilabial	0.956	81	886
	alveolar	0.458	23	1860
	palatal	0.289	11	836
	velar	0.345	16	1774
	glottal	0.358	12	894
*Preceding C (manner)	lax	0.510	30	2718
	aspirated	0.477	14	600
	reinforced	0.483	19	810
*Following Vowel	[-bk]	0.531	19	3205
	[+bk]	0.471	24	3045
*Syllable position	initial	0.413	19	3721
	noninitial	0.630	25	2529
*Morph. boundary	zero	0.505	25	5661
	present	0.456	38	589
*Presence of coda	zero	0.522	22	4049
	present	0.465	20	2201
*Preceding Vowel	rounded	0.738	19	200
	unrounded	0.389	06	462
*Speech Style	ingroup	0.655	31	850
	interview	0.620	24	1421
	sentence R	0.430	19	2230
	word R	0.404	18	1749
*Gender	male	0.481	20	3188
	female	0.520	23	3062
*Social Status	upper	0.413	17	2103
	middle	0.496	21	2087
	lower	0.592	26	2060
*Age	16-25	0.550	25	2111
	26-45	0.522	22	2099
	46+	0.427	17	2040

number of cells: 3108 total chi-square = 3486.2958
chi-square/cell = 1.1217 loglikelihood = – 2943.747 Input = 0.256
overall deletion rate = 21.5%

Table 4.8. Goldvarb probabilities for factors for *w* deletion

The results of a separate Goldvarb analysis of post-consonantal *w* deletion are given in Table 4.9. As expected, the number of the factor groups chosen as significant in the stepwise regression analysis is found to be reduced, as the number of tokens decreases. 'Morpheme boundary', which was chosen in the combined analysis as a significant constraint, was not chosen in the analysis of post-consonantal *w* deletion, though the two factors of this factor group showed almost identical weights in the two analyses (i.e., .505 vs. .456 (combined); .504 vs. .459. (post-consonantal)). The factor groups chosen in the stepwise regression analysis was selected in the order given in (4.6).

(4.6) Groups chosen in the stepwise analysis and the order of selection

1. preceding consonant (place)
2. speech style
3. syllable position
4. social status
5. preceding consonant (manner)
6. age
7. presence of the coda consonant
8. following vowel
9. gender

Factor groups	Factors	Weight	% Applications	Total N
*Preceding C (place)	bilabial	0.955	81	886
	alveolar	0.454	23	1860
	palatal	0.298	11	836
	velar	0.354	16	1774
	glottal	0.346	12	894
*Preceding C (manner)	lax	0.509	30	2718
	aspirated	0.475	14	600
	reinforced	0.488	19	810
*Following vowel	[-bk]	0.531	22	3205
	[+bk]	0.468	31	3045
*Syllable position	initial	0.421	24	3721
	noninitial	0.615	29	2529
Morph. boundary	zero	0.504	25	5661
	present	0.459	38	589
*Presence of coda	zero	0.522	26	4049
	present	0.459	27	2201
*Speech Style	ingroup	0.667	39	850
	interview	0.631	30	1421
	sentence R	0.427	22	2230
	word R	0.402	21	1749
*Gender	male	0.476	24	3188
	female	0.525	28	3062
*Social Status	upper	0.414	22	2103
	middle	0.498	25	2087
	lower	0.590	32	2060
*Age	16-25	0.545	30	2111
	26-45	0.524	27	2099
	46+	0.429	21	2040

number of cells: 2585 total chi-square = 3004.0572
chi-square/cell = 1.1621 loglikelihood = – 2654.210 Input = 0.235
overall deletion rate = 26.1%

Table 4.9. Goldvarb probabilities for factors for post-consonantal *w* deletion

The results of a separate Goldvarb analysis of non-post-consonantal *w* deletion are given in Table (4.10). Among the linguistic constraints chosen in the combined Goldvarb analysis, 'following vowel' and 'presence of coda', were not selected in the analysis of non-post-consonantal *w* deletion. Five factor groups show a relatively clear weight difference (bigger than 0.1) between the factor most favorable to *w* deletion and the least favorable. These are factor groups, 'syllable position', 'preceding vowel', 'social status', 'age', and 'style'. However, the factor group, 'style', was not chosen in the step-up analysis, though it was eliminated last in the step-down analysis. Again the fact that 'gender' was not chosen in the regression analysis – though its factors (i.e., male and female) showed a bigger difference in Goldvarb weight here than in the combined analysis – indicates that the primary reason why 'gender' was selected in the combined analysis as statistically significant is due to a large number of tokens. The orders of selection and elimination of factor groups in the stepwise regression analysis are given in (4.7).

(4.7) Results of the stepwise regression analysis

A. factor groups selected in the step-up analysis and the order of selection

1. syllable position
2. preceding vowel
3. social status
4. age

B. groups eliminated in the step-down analysis and the order of elimination

1. following vowel
2. presence of the coda consonant
3. gender
4. style

Factor groups	Factors	Weight	% Applications	Total N
Following vowel	[-bk]	0.504	4	657
	[+bk]	0.497	5	1095
*Syllable position	initial	0.303	1	1090
	noninitial	0.797	10	662
Presence of coda	zero	0.520	5	861
	present	0.480	4	891
*Preceding vowel	[+rnd]	0.738	19	200
	[-rnd]	0.389	6	462
Speech Style	in-group	0.578	5	277
	interview	0.549	5	465
	sentence R	0.477	4	501
	word R	0.436	5	509
Gender	male	0.524	5	869
	female	0.476	4	883
*Social Status	upper	0.385	3	584
	middle	0.501	4	585
	lower	0.614	7	583
*Age	16-25	0.608	7	601
	26-45	0.486	4	553
	46+	0.404	3	598

number of cells: 523 total chi-square = 516.0708
chi-square/cell = 0.9868 loglikelihood = – 272.459 Input = 0.022
overall deletion rate = 4.7%

Table 4.10. Goldvarb probabilities for factors for non-post-consonantal *w* deletion

4.5. Results of the self-evaluation test

Six questions of the self-evaluation test addressed how objectively the informant evaluates his/her own linguistic behavior toward *w* deletion. Table 4.11 gives the six test words used, two answers for each question, and the linguistic contexts where *w* appears in each word. As discussed in 3.4.1, the informant was asked which of the two, (a) or (b), is his/her usual pronunciation. I produced the two phonetic forms myself for the informant to ensure that the informant matched the written forms precisely with the intended spoken forms. The test words were chosen in consideration of the following two linguistic constraints on *w* deletion, 1) presence of a preceding consonant 2) syllable position (within the word).

Words	Answer (a)	Answer (b)	Environments of *w*
1. *hwenhata*	*hwenhata*	*henhata*	#C_____
2. *kwisin*	*kwisin*	*kisin*	#C_____
3. *wangsipli*	*wangsipli*	*angsipli*	#_____
4. *yukwenca*	*yukwenca*	*yukenca*	#σ.C_____
5. *palhwihata*	*palhwihata*	*palhihata*	#σ.C_____
6. *kiwang*	*kiwang*	*kiang*	#σ._____

Table 4.11. The words (containing *w*) used in the self-evaluation test and the linguistic characteristics of *w* in each word

The results of the self-evaluation test are given in Table 4.12. The number of those who reported that their usual pronunciation of each test word was the *w* present form and the *w* deleted form is given in the second and third columns of Table 4.12, respectively. The results of the self-evaluation test were analyzed in ways that took account of both linguistic and social factors.

Words	{w}	{ø}	Environments of *w*
1. *hwenhata*	50	6	#C_____
2. *kwisin*	50	6	#C_____
3. *wangsipli*	56	0	#_____
4. *yukwenca*	38	18	#σ.C_____
5. *palhwihata*	33	23	#σ.C_____
6. *kiwang*	52	4	#σ._____

Table 4.12. The results of the self-evaluation test for each test word

First an analysis of the results was made in order to examine the informants' awareness of the two linguistic constraints concerned. Table 4.13, which analyzes the informants' responses on the basis of the linguistic contexts where *w* appears, shows that

informants' self-evaluation – though indirectly – reflect their production (see the two rightmost columns of the table below). Significantly more informants reported that they delete *w* in noninitial syllables than in initial syllables (45 vs. 12: $\chi^2 = 23.0$, $p < .001$); and post-consonantally than non-post-consonantally (53 vs. 4: $\chi^2 = 21.3$, $p < .001$).[7] This result suggests that Seoul Korean speakers have knowledge of the two linguistic constraints – 'preceding consonant' and 'syllable position' – on the deletion of *w*, though the knowledge may not be conscious.

Environments of *w*	{w}	{ø}	{ø} %	A.D.R
C(I)	100	12	10.7%	24%
C(N)	71	41	36.6%	29%
ø(I)	56	0	0.0%	1%
ø(N)	52	4	7.1%	10%

Table 4.13. Informants' self-report on *w* deletion in different linguistic contexts

NB: a. {ø}% indicates the proportion of the subjects who reported that {ø} is their usual pronunciation
b. A.D.R. refers to the informants' actual deletion rate of *w* in each environment (refer to Tables 4.9 and 4.10).

Informants belonging to three different age groups showed a clear difference in their responses to the test questions (Table 4.14). More younger speakers reported the deletion of *w* than older speakers. This result also reflects three age groups' production pattern (shown in the last column of the table below) but in a rather exaggerated manner. It is not clear how to interpret this exaggerated tendency. One possible interpretation is that older speakers may be more sensitive to the social value of the two variants of the (w) variable, thus under-reporting their *w* deletion.

[7]The contingency tables for the two tests are as follows:

(1) syllable type

	I	N
{ø}:	12	45
{w}:	156	123

(2) preceding C

	C	ø
{ø}:	53	4
{w}:	171	108

	1	2	3	4	5	6	{ø}%	A.D.R.	(Wt.)
16-25	3	5	0	9	12	2	27%	25%	(.550)
26-45	2	1	0	7	7	2	17%	22%	(.522)
46+	1	0	0	2	4	0	6%	17%	(.427)

Table 4.14. Different age groups' self-report on *w* deletion

NB: a. The numbers in the top row refer to each of the numbered test words shown in Table 4.11.
b. 'Wt.' refers to factor weights (see Table 4.8)

The two gender groups showed little difference in their response to the questions, as shown in Table 4.15. This result is not different from our expectations since the gender groups do not really show different behavior in their production, as reflected in their actual deletion rates and, more importantly, factor weights (cf. Tables 4.8, 4.9 and 4.10).

	1	2	3	4	5	6	{ø}%	A.D.R.	(Wt.)
male	3	4	0	10	12	1	18%	20%	(.481)
female	3	2	0	8	11	3	16%	23%	(.520)

Table 4.15. Different gender groups' self-report on *w* deletion

As we saw in Table 4.8, the three SEC groups show rather different behavior in their production of *w*. The result of the self-evaluation test, however, did not reflect their production; the three SEC groups gave very similar responses to the test questions. This suggests either that middle and lower SEC speakers evaluate their behavior to (w) less objectively than upper SEC speakers or that middle and lower SEC speakers are more sensitive (thus showing linguistic insecurity) to the variable (w). The choice of one explanation over the other is just a matter of speculation at this point.

	1	2	3	4	5	6	{ø}%	A.D.R.	(Wt.)
upper	0	3	0	7	9	0	18%	17%	(.413)
middle	3	0	0	7	8	2	18%	21%	(.496)
lower	3	3	0	4	6	2	16%	26%	(.592)

Table 4.16. Different SEC groups' self-report on *w* deletion

4.6. Discussion

4.6.1. Discussing linguistic factors

The results of the three Goldvarb analyses suggest that the point of articulation of the preceding consonant, the roundedness of the preceding vowel and syllable position are the three most important linguistic constraints conditioning the deletion of *w* in Seoul Korean. Though factor groups 'preceding consonant (manner)', 'following vowel (backness)' and 'presence of the coda' were selected in one of the two separate stepwise regression analyses, the minor differences in Goldvarb weight among the factors do not provide support for the interpretation that the effects of these constraints are strong in the variability of *w* deletion. In particular, the fact that the 'ø' coda factor had higher probability of *w* deletion than the 'present' coda factor is not expected and presumed to be a reflection of random variation. The result that 'morpheme boundary' was not selected in the separate analysis of post-consonantal *w* deletion but only in the combined analysis also indicates that this factor is not an important factor in *w* deletion.

As in Silva's (1991) study, the results of the Goldvarb one-level and stepwise-regression analyses of post-consonantal *w* deletion identify the articulation place of the preceding consonant to be the most important constraint. However, in contrast to Silva's research, dorsality is not a significant factor, since dorsal consonants and nondorsal consonants do not show a dichotomy in their conditioning of *w* deletion; rather my data indicate that the operative factor is labiality since bilabial and nonbilabial consonants show a clearly different effect on *w* deletion. These results support previous descriptive statements by P.K. Lee & K.R. Park (1992) and Martin (1992) suggesting that *w* deletes predominantly after labial consonants. The finding that *w* is deleted significantly more often after a rounded vowel than after an unrounded vowel is consistent with the result that *w* deletes considerably more frequently after labial consonants than after nonlabial consonants, because rounded vowels and labial consonants are both labials.

There are three possible explanations of why *w* deletes in the initial syllable of a word significantly less often than in a noninitial syllable. The first possible explanation is given by some Korean phoneticians (e.g., H.Y. Lee 1990, H.B. Lee 1973) who claim that Korean is primarily a language with primary stress on the first syllable of a word.[8] If Korean has stress on an initial syllable and is primarily a duration accent language, the initial syllable will tend to be lengthened (Klatt 1973, Fry 1955) and the chance of *w* deletion will be significantly lowered. However, the claim that Korean is a stress language has not been rigorously examined. Jun's (1995) recent study, which suggests that stress in Korean usually falls on the second syllable of an accentual phrase (an intonational unit intermediate between prosodic word and intonational phrase), seems to weaken the claim that Korean is primarily a language with stress on a word-initial syllable.

Seoul Korean has been known as one of the Korean dialects which has underlying long vowels and uses vowel duration phonemically (e.g., /pa:m/ 'chestnut' vs. /pam/ 'night', /nu:n/ 'snow' vs. /nun/ 'eye'). The second possible explanation for the uneven deletion of *w* in initial vs. noninitial syllables is that this pattern of variation occurs because long vowels occur only in word-initial syllables[9] and long vowels tend not to trigger the

[8]H.Y. Lee (1990:51) formulates his Korean stress rule as follows:
1) Two syllable morphemes:
Stress falls on the first syllable.
2) Three or more syllable morphemes:
If the first syllable is heavy, stress falls on that syllable. Otherwise either on the first or second syllable with no important linguistic difference implied.

[9]This claim holds that an underlying long vowel is shortened when it occurs at a noninitial syllable of the word (e.g., /kun+pa:m/ —> [kunbam] 'roasted chestnut', /s'alak+nu:n/ —> [s'aragnun] 'powder(y) snow').

deletion of *w*. Though recent studies (e.g., Magen and Blumstein 1993, J.K. Park 1985) suggest that long vowels and phonemic length distinction have disappeared in many lexical items of Seoul Korean even in word-initial position, I examined using a Varbrul analysis whether this factor makes any significant difference in the deletion rate of *w* between initial vs. noninitial syllables.

Since there are also claims (C.S. Lee 1994, Jun p.c.) that long vowels appear not in a word-initial syllable but in the initial syllable of a 'prosodic phrase',[10] only the tokens on the word list were used to examine the vowel duration effect. This decision was made because in word list reading, each word is produced both as one prosodic word and as one prosodic phrase. *kuke taysacen* ("The New Korean Dictionary": H.S. Lee 1993) was referred to for the 'prescriptive' underlying long vs. short status of the vowel in the initial syllable of each word. A Goldvarb run incorporating factor group 'vowel length (long vs. short)' to the (slightly modified) existing statistical model[11] was performed on the tokens in word list readings. Only the tokens where *w* appears in an initial syllable were subject to the analysis. The word *hwankak* 'illusion' or 'return', which according to H.S. Lee (1993) has a long initial vowel when used to mean 'illusion' but a short vowel when used as meaning 'return', was excluded from the analysis because of its ambiguity in vowel length. The results (see Appendix D) did not show a significant difference in the triggering of *w* deletion between "allegedly" long and short vowels (0.466 vs. 0.543 in probability, respectively). The factor group 'vowel length' was not chosen in the stepwise regression analysis either. These results suggest that the initial/noninitial syllable constraint on *w* deletion cannot be claimed to come from the vowel length difference.

The third and most convincing explanation is given by principles of word processing along the lines of Cutler et al. (1985) and Hall (1992). Following the claims of

[10]According to this claim, when a speaker produces /i pa:m/ 'this chestnut' as one 'prosodic' phrase – whether the 'prosodic phrase' is an accentual phrase (Jun 1993), phonological phrase (Y.Y. Cho 1990) or rhythmic unit (H.Y. Lee 1990) – it will be pronounced as {i bam}, but when a speaker produces /i pa:m/ 'this chestnut' as two prosodic phrases, it will be pronounced as {i} {pa:m}.

[11]The factor group 'syllable position', was naturally excluded from the model.

the 'cohort model' of word recognition (supported by psycholinguistic experiments like those described in Marslen-Wilson & Tyler 1980 and Marslen-Wilson 1983), these scholars suggest that words are processed from 'left to right' and that lexical access is typically achieved on the basis of the initial part of a word. Based on this observation, they claim that synchronic and diachronic processes of phonological reduction (weakening, attrition and loss) do not typically take place at the beginning of words because of the "saliency" of the initial part of a word (or its significance in word perception) but rather in word-medial or word-final position.

This processing account is supported by, among others, documented examples of diachronic processes in Chinese (Chen 1973) and in Burmese (Maran 1971) and synchronic processes in Klamath (Clements and Keyser 1983) and in Turkish (Haiman 1980). The suggestion by Foley (1977) and Hyman (1975) that word-initial position is a strong (strengthening) position and that word-final and -medial positions are weak (weakening) positions is also in line with the described processing account. Korean does not seem to be an exception to this general tendency observed in languages; Kim-Renaud (1986a) suggests that word-initial position – especially a word-initial segment and also a word-initial syllable – has an exceptional phonological strength in Korean. Following Cutler et al. (1985) and Hall (1992), the present study takes the position that the exceptional phonological strength of word-initial position is mostly ascribable to the significance of the initial part of a word in word perception.[12]

[12] The extraordinary strength of a word-initial segment is formally represented later in this study (see 4.7.1) as the phonological constraint, L-Anchor, which prohibits the deletion of a word-initial segment.

4.6.2. Discussing external factors

The results that factor groups 'style', 'social status' and 'age' were found to be significant make it clear that *w* deletion is a socially conditioned process. The conditioning effects of the four factors of the group 'style' show that the deletion rate of *w* decreases as the degree of monitoring one's speech increases. This result shows that the {ø} variant of the (w) variable is not a standard or prestigious variant. In particular, the deletion of *w* in a word-initial syllable may be often considered as a salient marker of non-standard regional dialects or uneducated speech.

The two gender groups do not exhibit a significant difference in their behavior toward *w* deletion. The results, however, show rather different rates of *w* deletion in both age and social status groups. The deletion rate of *w* increases as the social status and age scale go down. As Tables 4.9, 4.10 and the tables in Appendix C show, the three SEC groups exhibit consistently different behavior toward *w* deletion: the lower SEC group always deletes *w* more often than the middle group and the middle SEC group deletes *w* more often than the upper SEC group — in every phonological and stylistic context. A cross-over pattern (cf. Labov 1972C) indicative of hypercorrection was not observed.

The gradual increase in the deletion rate of *w* down the age scale may suggest an ongoing change, since it is probably not the case that older Korean speakers produce speech significantly more carefully than younger speakers. This interpretation gets some support from the existence of other Korean dialects such as Kyongpuk and Kyongnam dialects (see the discussion of the Kyongsang dialect in 2.2.1), where some of *w* diphthongs have gone through a monophthongization process. T.Y. Choi (1983) suggests that words containing *w* diphthongs are gradually losing *w* in the Chunpuk dialect at an early stage of monophthongization process. It is possible that this lexical diffusion type of change is what is happening in Seoul Korean. However, since there is no conclusive evidence, the claim that *w* deletion is an ongoing change needs further investigation and evidence.

4.7. Possible explanations

4.7.1. Phonological explanations

In this section I attempt a phonological account of *w* deletion in the framework of Optimality Theory. The device of 'floating constraints' (Reynolds 1994) is added to OT as an attempt to account for the variable nature of this phonological process. I would suggest that the constraints shown in (4.8) are active in Seoul Korean phonology and relevant to the deletion of *w*.

(4.8) Constraints required

1. MAX(C) : Every consonant in the underlying representation has a correspondent in the surface representation.
2. MAX(V[+hi, lab]): Every *u* in the underlying representation has a correspondent in the surface representation. = MAX(u)
3. DEP-μ : Every mora in the surface representation has a correspondent in the underlying representation.
4. L-Anchor: The leftmost element of the underlying representation has a correspondent at the left most position of the surface representation.
5. *R-Diph: Rising diphthongs are prohibited.
6. OCP[lab] : The C[lab] C[V-pl, lab] sequence is prohibited.

The MAX and DEP family of constraints, proposed by McCarthy and Prince (1995) as language-universal, penalize the deletion and insertion of segments or autosegments, respectively. MAX(C) prohibits the deletion of an underlying consonant.

The constraint, MAX(V[+hi]), is motivated by a difference in deletability between high and nonhigh vowels, as evidenced by processes of vowel deletion in Yawelmani (Donegan 1985) and Old English (Dresher and Lahiri 1991), where only high vowels delete. A further division of MAX(V[+hi]) is required because in some languages not all high vowels show identical behavior toward deletion. For instance, in Yoruba *i* is subject to deletion in contexts where *u* and the other vowels do not delete (Folarin, A.Y. 1987); in

northern dialects of Greek 'unstressed high vowel deletion' was initiated with *i* and was only later extended to *u* (Dressler and Acson 1985); in Korean, *ɨ* is most vulnerable to deletion among the three high vowels, *i*, *u*, and *ɨ*, (Y.S. Lee 1993). Accordingly, the present study explodes MAX(V[+hi]) into three separate constraints, MAX(i), MAX(u), and MAX(ɨ) (see also Chapters 6 and 7).

Following proponents of moraic theory (Hyman 1985, Hayes 1989) and researchers such as Clements and Keyser (1983) and Levin (1985), I assume in this dissertation that surface glides and vowels are both underlying vowels. However, in Seoul Korean, vowels and glides contrast phonologically, e.g., *ui* 'the ear of a cow' vs. *wi* 'top' and *kiun* 'power' vs. *kyun* 'germ'. (Berber (Guerssel 1986) and Spanish (Harris 1987) are also languages that contrast vowels and glides.) Accordingly, following Hayes (1989), I assume that in Seoul Korean glides and vowels are underlyingly different in that vowels, but not glides, have a mora. I assume that surface glides of Seoul Korean that do not show alternations with vowels are moraless vowels in the underlying representation. The constraint, DEP-μ, originates from these assumptions. DEP-μ prohibits the insertion of a mora that was not present in the underlying representation.

L-Anchor is motivated, as suggested in 4.6.1, by the perceptual salience of a word-initial segment and its resistance to phonological reductions. It penalizes the deletion of a word-initial segment, which is not often observed in the world's languages. L-Anchor is a member of the Anchor family of constraints proposed by McCarthy and Prince (1995) as operative cross-linguistically.

As mentioned earlier, I assume following Sohn (1987) and H.Y. Kim (1990) that GV sequences are rising diphthongs in Seoul Korean. The present study follows the standard phonological assumption (see Schane 1995, McCarthy 1995) that rising diphthongs are associated with one mora rather than two. *R-Diph is required in OT

(Rosenthall 1994) to capture languages' preference for a simple nucleus structure, i.e., monophthongs, over a more complex structure, i.e., short diphthongs.

The 'labial consonant + *w*' sequence is often restricted by languages as exemplified by English (which nearly never allows the sequences *pw*, *bw*, and *mw*), Ronga, and Zulu, among others (Kawasaki 1982). The constraint, OCP[lab], is motivated by this rather commonly observed phonotactic constraint.

The data analyzed in this work show that *w* deletes both with and without a preceding consonant, supporting the suggestions by Martin (1992) and K.W. Nam (1984). The deletion of *w* is, however, not categorical. This phonological phenomenon suggests that the two constraints, *R-Diph (prohibiting a *w*V sequence) and MAX(u) (prohibiting the deletion of *w*), are variably ranked to each other, since the domination of one over the other will result in either the categorical deletion of *w* (if *R-Diph dominates MAX(u)) or non-deletion (if MAX(u) dominates *R-Diph). Tableaux 4.1 and 4.2 illustrate. Since MAX(u) and *R-Diph are variably ranked in Seoul Korean, both [sakwa] and [saka] are chosen as an optimal form by the variable ranking shown in (4.9).

(4.9) Constraint ranking

MAX(u) ~ R-Diph

NB: The symbol '~' is used in this study to indicate that the two constraints left and right of this symbol are variably ranked.

Tableau 4.1.
MAX(u) >> R-Diph

μ μ s a k u a	MAX(u)	*R-Diph
a. ☞ sakwa		*
b. saka	*!	

Tableau 4.2.
R-Diph >> MAX(u)

μ μ s a k u a	*R-Diph	MAX(u)
a. sakwa	*!	
b. ☞ saka		*

Tableaux 4.3 and 4.4 show that MAX(u) and *R-Diph are, however, dominated by two other constraints, DEP-μ and MAX(C), because ill-formed candidates *[kuaca] and *[waca], respectively violating DEP-μ and MAX(C), do not surface from the underlying form. (It is assumed in this study following Reynolds (1994) that if constraint A, in a variable relationship with constraint B, is dominated by another constraint C, constraint B is also dominated by C.) This suggests that the constraint hierarchy in (4.10) holds in Seoul Korean. Since *R-Diph and MAX(u) are variably ranked, two different constraint hierarchies shown above Tableaux 4.3 and 4.4 obtain; the two hierarchies select two different optimal forms (*w* present form and *w* deleted form), as illustrated in Tableaux and 4.3 and 4.4.

Tableau 4.3
MAX(C), DEP-μ >> MAX(u) >> *R-Diph

μ μ k u a c a	MAX(C)	DEP-μ	MAX(u)	*R-Diph
a. ku.a.ca		*!		
b. ☞ kwa.ca				*
c. ka.ca			*!	
d. wa.ca	*!			*

NB: In representing candidates I use the phonetic symbols [u] and [i] for vocoids with a mora and [w] and [y] for those without a mora.

Tableau 4.4.

MAX(C), DEP-μ >> *R-Diph >> MAX(u)

μ μ k u a c a	MAX(C)	DEP-μ	*R-Diph	MAX(u)
a. ku.a.ca		*!		
b. kwa.ca			*!	
c. ☞ ka.ca				*
d. wa.ca	*!		*	

(4.10) Constraint ranking (provisional)

$$\text{MAX(C), DEP-}\mu \gg \left\{ \begin{array}{l} \text{*R-Diph} \\ \text{MAX(u)} \end{array} \right\}$$

NB: *R-Diph and MAX(u) are variably ranked

As shown in Table 4.10 (see Section 4.4), *w* deletes even without a preceding consonant. However, the same table shows that non-post-consonantal *w* deletion occurs in an initial syllable only 1 percent of the time, i.e., non-deletion of *w* is near-categorical. In this dissertation I make the following assumption: if form A occurs more than – or equal to – 95% and form B is realized less than – or equal to – 5% from the same underlying form, I will disregard the rare occurrences of B as exceptional, because 1) the realization as form A is 'near-categorical' and 2) the exceptional cases may come from speech errors by informants (which is one of the characteristics of spoken language), transcription errors on the part of the author, or extraordinary behavior of a few exceptional speakers, i.e., 'outliers', in statistical terms. As a consequence, it is assumed in my phonological analysis that non-post-consonantal *w* deletion does not occur in a word-initial syllable.

To account for this observation, I assume that MAX(u) and *R-Diph, which were previously found to be variably ranked, are dominated by another constraint, L-Anchor, a constraint prohibiting the deletion of the left-most element of the underlying representation.

Only the form in which *w* is present is selected as an optimal form as a result of L-Anchor dominating the two variably ranked constraints. Regardless of the ranking of the two constraints, *R-Diph and MAX(u), the output [weka] is correctly selected, as shown by Tableaux 4.5 and 4.6. The constraint hierarchy in (4.11) has been established so far.

Tableau 4.5

DEP-μ, L-Anchor >> MAX(u) >> *R-Diph

μ μ u e k a	DEP-μ	L-Anchor	MAX(u)	*R-Diph
a. u.e.ka	*!			
b. ☞we.ka				*
c. e.ka		*!	*	

Tableau 4.6

DEP-μ, L-Anchor >> *R-Diph >> MAX(u)

μ μ u e k a	DEP-μ	L-Anchor	*R-Diph	MAX(u)
a. u.e.ka	*!			
b. ☞we.ka			*	
c. e.ka		*!		*

(4.11) Constraint hierarchy (provisional)

$$\text{MAX(C), DEP-}\mu\text{, L-Anchor} \gg \left\{ \begin{array}{l} \text{*R-Diph} \\ \text{MAX(u)} \end{array} \right\}$$

In non-word-initial syllables, however, *w* deletion occurs without a preceding consonant, though the frequency is rather low compared to post-consonantal *w* deletion (10% vs. 26.1%). The constraint hierarchy in (4.11) can correctly account for why both [kiwa] and [kia] shown in Tableaux 4.7 and 4.8 are selected as optimal forms in Seoul Korean. In the two tableaux, candidates (a) and (d) are ruled out for their violation of

DEP-μ. Candidate (e) is, on the other hand, not chosen for it dual violation of MAX(u) and *R-Diph. Variable ranking between *R-Diph and MAX(u) again selects both the {w} form and the {ø} variant as optimal forms.

Tableau 4.7.

DEP-μ >> MAX(u) >> *R-Diph

μ μ kiua	DEP-μ	MAX(u)	*R-Diph
a. ki.u.a	*!		
b. ☞ki.wa			*
c. ki.a		*!	
d. kyu.a	*!		*
e. kya		*!	*

Tableau 4.8

DEP-μ >> *R-Diph >> MAX(u)

μ μ kiua	DEP-μ	*R-Diph	MAX(u)
a. ki.u.a	*!		
b. ki.wa		*!	
c. ☞ki.a			*
d. kyu.a	*!	*	
e. kya		*!	*

Deletion of *w* after a bilabial consonant

As previous studies (see Yip 1988, Clements and Keyser 1983, Clements 1991, McCarthy 1981, Selkirk 1993) have shown, there are languages (e.g., English, Cantonese, Lami, Akkadian, Yao) which have restrictions on adjacent labial segments. For instance, English does not allow successive labial consonants (**pw*, **bw*...) at the beginning of a syllable (Clements and Keyser 1983). Cantonese (Yip 1988) has a constraint that prohibits the cooccurrence of labial consonants in the onset and coda positions of the same syllable

(e.g., **pim*, **ma:p*) and also a weaker constraint against the combination of a labial consonant with a rounded vowel (**tup*, **köm*). Akkadian allows only one labial consonant per word root (McCarthy 1981). While English does not allow the 'bilabial consonant + *w*' sequence at the beginning of a syllable at all, Korean (still) allows it phonemically, or derivationally through 'glide formation' and 'vowel contraction', but rarely phonetically. This is shown by the fact that Korean speakers delete *w* 85% of the time in conversational speech in this context (see Table 2 in Appendix C). Korean may have one of the stronger constraints among languages against the combination of *w* with an adjacent labial segment.[13] This claim is supported by the following three pieces of evidence.

First, as was shown in Table 4.2 (see Section 4.2), *w* can combine with only 'nonlabial' vowels, which is different from such languages as English (e.g., *would*, *won't*), Shimakonde (Liphola p.c.: e.g., *wɗe* 'a lot of' or *kuwʊ́:la* 'to be sick'), or Kimatuumbi (Odden 1996). Second, there exist many lexical items in Korean that have lost *w* after labial consonants (e.g., /mweari/ > /meari/ 'echo', /pwe/ > /pe/ 'hemp cloth', /p^hwita/ > /p^hita/ 'blossom'). This process seems to be at the stage of near-completion, since only a few existing words contain an underlying sequence of a bilabial consonant + *w* (cf. C.A. Kim 1978). The third piece of evidence is the clearly different conditioning effects of labial vs. nonlabial vowels on *w* deletion. As shown in Table 8, *w* deletes significantly more often after labial vowels than nonlabial vowels, 19% vs. 6% in percentage ($\chi^2 = 31.57$, $p < .001$) and 0.738 vs. 0.389 in probability.

Unlike Silva's study, where dorsal and nondorsal consonants showed dichotic effects in the conditioning of *w* deletion, the present study finds rather that labial and nonlabial consonants show clearly different conditioning on *w* deletion. As shown in the tables of Appendix C, read speech and conversational speech show no difference in this respect. Silva (1991:165) claims that *w* is deleted less often after a dorsal consonant

[13]Korean, however, allows the combination of a bilabial consonant and a labial vowel, as shown in the following examples: /mom/ 'body', /mapu/ 'horse-coach driver', /muu/ 'radish'.

because the feature [+bk] is multiply linked to a dorsal consonant and *w* in order not to violate the OCP (which he defines as "at the melodic level, adjacent identical elements are prohibited" following McCarthy 1986). Silva proposes that multiple linking resists the application of deletion or insertion rules since it "maintains the integrity of the two segments as a unit". Silva's (1991) proposal is illustrated in Figure 4.2.

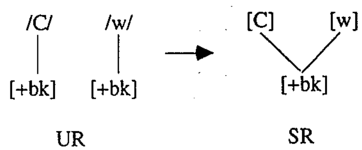


Figure 4.2. Silva's (1991) proposal

I provide a different line of explanation to account for the clear difference in behavior toward *w* deletion between labial and nonlabial consonants. I suggest that *w* deletion, rather than inhibition of *w* deletion, is triggered (mainly) by the OCP. In other words, I claim that in Korean *w* deletes predominantly after labial consonants so as to observe the OCP, i.e., OCP[lab] which prohibits the C[lab] C[V-pl, lab] sequence (this constraint is given earlier in (4.8) where it is proposed as one of the constraints active in Seoul Korean phonology). This is illustrated in Figure 4.3. The deletion of a segment triggered by the OCP is found in such languages as Seri (Marlet and Stemberger 1983) and Leti (Hume 1997).[14] One important difference between the processes in these languages and *w* deletion in Seoul Korean is that the latter is a variable process.

[14]Seri has an OCP constraint prohibiting the presence of two glottal stops in the same syllable (i.e., both in onset and coda), which triggers the deletion of the glottal stop in the coda. Leti has a process that realizes a high vowel (*i* and *u*) as a secondary articulation on an adjacent consonant, i.e., C^y and C^w. A high vowel is not realized as a secondary articulation on the consonant but instead deletes when the following vowel is high. Hume (1997) accounts for this through the use of the OCP-based constraint *[+hi][+hi] which prohibits adjacent tautosyllabic high segments (where secondarily articulated high segments are also considered [+hi].

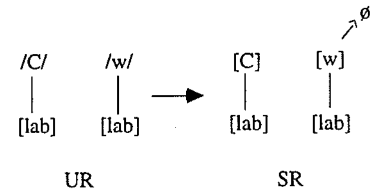


Figure 4.3. Kang's proposal

The fact that *w* deletion is not categorical even after a bilabial consonant reveals that MAX(u) is also variably ranked with respect to OCP[lab]. This makes the relationship among OCP[lab], MAX(u) and *R-Diph rather complicated, because we have earlier established that MAX(u) and *R-Diph are also variably ranked. The logical consequence of the presence of two variable dominance relationships among the three constraints concerned is that the three are all variably ranked with regard to one another. I will give an example below to make this point clearer.

Let us suppose that constraints A and B are variably ranked in a given language and that in that language constraints A and C are also variably ranked. Since A and B variably dominate each other, both of the two dominance relationships, shown in (4.12.1) and (4.12.2), can occur in this language.

(4.12)
1. A >> B
2. B >> A

Because A is also variably ranked with C, C can both dominate A and be dominated by A. This means that the four dominance relationships shown in (4.13) are all possible.

A brief explanation may be in order. First, let us consider the situation where A dominates B. In case C dominates A, C also dominates B (4.13.1); when A dominates C, the dominance relationship between B and C is unknown (4.13.2). Let us now consider the situation where B dominates A. In case C dominates A, the ranking between B and C cannot be determined (4.13.3); however, if A dominates C, it follows that B also dominates C (4.13.4). This result shows that B and C are also variably ranked with regard to each other in this language (see 4.13.1 and 4.13.4), revealing as a consequence that when two pairs of constraints among the three constraints involved are in a variable dominance relationship, the three are necessarily variably ranked with respect to one another.

(4.13)

A >> B (from 4.11.1)

1. C >> A >> B
2. A >> B, C

B >> A (from 4.11.2)

3. B, C >> A
4. B >> A >> C

We have now established that *R-Diph, MAX(u), and OCP[lab] are all variably ranked with regard to one another. This means that six different rankings among these constraints coexist in Seoul Korean phonology as part of a single grammar. These rankings are given in (4.14). In (4.14), MAX(u), R-Diph, and OCP[lab] correspond to constraints A, B, and C in (4.13), respectively.

(4.14)

1. OCP[lab] >> MAX(u) >> *R-Diph (from 4.12.1)
2. MAX(u) >> *R-Diph >> OCP[lab] (from 4.12.2)
3. MAX(u) >> OCP[lab] >> *R-Diph (from 4.12.2)
4. *R-Diph >> OCP[lab] >> MAX(u) (from 4.12.3)
5. OCP[lab] >> *R-Diph >> MAX(u) (from 4.12.3)
6. *R-Diph >> MAX(u) >> OCP[lab] (from 4.12.4)

Since MAX(C) and DEP-μ dominate these variably ranked constraints (cf. (4.10)), the rankings that are relevant to *w* deletion after a bilabial consonant are actually those given above Tableaux 4.9 to 4.14. Since OCP[lab] and *R-Diph both eliminate the same form (i.e., the *w* present form) while MAX(u) eliminates the *w* deleted form for its violation,

only two candidates are chosen as optimal forms in the following six tableaux despite the possibility of six different rankings.

Tableau 4.9.

MAX(C), DEP-μ >> OCP[lab] >> MAX(u) >> *R-Diph

μ μ p u e t a	MAX(C)	DEP-μ	OCP[lab]	MAX(u)	*R-Diph
pu.e.ta		*!			
pwe.ta			*!		*
☞pe.ta				*	
we.ta	*!				*

Tableau 4.10.

MAX(C), DEP-μ >> MAX(u) >> *R-Diph >> OCP[lab]

μ μ p u e t a	MAX(C)	DEP-μ	MAX(u)	*R-Diph	OCP[lab]
pue.ta		*!			
☞pwe.ta				*	*
pe.ta			*!		
we.ta	*!			*	

Tableau 4.11.

MAX(C), DEP-μ >> MAX(u) >> OCP[lab] >> *R-Diph

μ μ p u e t a	MAX(C)	DEP-μ	MAX(u)	OCP[lab]	*R-Diph
pu.e.ta		*!			
☞pwe.ta				*	*
pe.ta			*!		
we.ta	*!				*

Tableau 4.12.

MAX(C), DEP-μ >> *R-Diph >> OCP[lab] >> MAX(u)

μ μ p u e t a	MAX(C)	DEP-μ	*R-Diph	OCP[lab]	MAX(u)
pu.e.ta		*!			
pwe.ta			*!	*	
☞pe.ta					*
we.ta	*!		*		

Tableau 4.13.

MAX(C), DEP-μ >> OCP[lab] >> *R-Diph >> MAX(u)

μ μ p u e t a	MAX(C)	DEP-μ	OCP[lab]	*R-Diph	MAX(u)
pue.ta		*!			
pwe.ta			*!	*	
☞pe.ta					*
we.ta	*!			*	

Tableau 4.14.

MAX(C), DEP-μ >> *R-Diph >> MAX(u) >> OCP[lab]

μ μ p u e t a	MAX(C)	DEP-μ	*R-Diph	MAX(u)	OCP[lab]
pu.e.ta		*!			
pwe.ta			*!		*
☞pe.ta				*	
we.ta	*!		*		

The strength of the constraint, OCP[lab] has been, obviously, becoming more powerful in Seoul Korean phonology. The constraint has been the main trigger of not only synchronic *w* deletion but also of the diachronic change from /labial C + *w*/ to /labial C/; as

mentioned earlier, most of the Korean lexical items with the underlying sequence, /labial C + *w*/, have now lost *w*. This suggests that OCP[lab] can be considered as a floating constraint gaining strength. However, an alternative explanation, i.e., to assume that MAX(u) (which prohibits the deletion of *w*) is a floating constraint and that its strength in Seoul Korean phonology is weakening, is also logically tenable. The two may not be really different from each other because if it is the case that one of the two variably ranked constraints is becoming more (or less) powerful, then the other is necessarily becoming less (or more) powerful relative to the former. If we adopt the first assumption, i.e., the assumption of OCP[lab] as a floating constraint, the formulation of the 'final' constraint hierarchy is as given in (4.14). The arrow indicates that the strength of the constraint, OCP[lab], is gaining strength relative to MAX(u) and *R-Diph in Seoul Korean phonology.

(4.15) Constraint hierarchy

MAX(C), DEP-μ, L-Anchor >> { OCP[lab] ← { *R-Diph, MAX(u) } }

NB: OCP[lab] is assumed here to be a floating constraint; the arrow indicates the direction of the change.

4.7.2. Phonetic explanations

The loss of *w* after bilabial consonants found in many lexical items of Seoul Korean can be considered as a case where the OCP plays the role of a "diachronic rule trigger" (Yip 1988:86). There have been suggestions (e.g., Kenstowicz 1994, Zubritskaya and Sheffer 1995) that the OCP, a phonological configurational constraint, may have a phonetic, perceptual basis. I will show in this section that the diachronic loss of *w* after bilabial consonants observed in Seoul Korean is one case which supports these suggestions. I will argue that perceptual factors play an important role in this linguistic change.

A salient acoustic cue for *w* or any other labial consonant is the lowering of the second and third formants of the adjacent vowel (cf. Lieberman et al. 1956, Kent and Read 1992). When a nonlabial consonant precedes *w*, this acoustic cue remains intact. However, when a labial consonant such as *b, p, m* precedes *w*, the acoustic cue to the presence of *w* is obscured, since the preceding labial consonant provides essentially the same acoustic cue. In other words, the correct parsing of the cue for *w* becomes difficult for the listeners. The difference between CV and C*w*V when C is a labial can hinge on something as subtle as the degree to which the formants are lowered (the lowering effect of a labial consonant on the formants is rather heightened when *w* is added to the preceding labial segment (see the top pair of spectrograms in Figure 4.4)).

As a result, listeners have to distinguish the 'bilabial consonant + *w* + V' sequence and the 'bilabial consonant + V' sequence without the salient cue of a qualitative contrast, formant transition direction. That is, they have to distinguish the two exclusively on the basis of a timing (or duration) difference (and a minor difference in the patterns of the stop burst, if the preceding consonant is an oral stop).[15] However, all salient qualitative acoustic cues are available to the listeners for the distinction of a 'nonlabial consonant + *w* + V' sequence from its *w*-less counterpart. This is shown in the lower two rows of Figure 4.4.

The acoustic ambiguity between the 'bilabial consonant + *w* + V' sequence and the 'bilabial consonant + V' sequence introduces confusion in the perception of listeners, and consequently leads them to attribute the acoustic cue of *w* to the preceding bilabial consonant. As a result, listeners fail to recognize *w* and reinterpret the 'bilabial consonant + *w* + V' sequence as 'bilabial consonant + V'. Ohala suggests that "hypocorrection", one of the three types of 'mini-sound changes' he (1993) discusses, occurs when listeners fail to perceive the phonetic environment which causes perturbations on a nearby segment,

[15]*w* occurring after a bilabial stop has an effect of lowering the mean frequency of the stop burst and making its spectrum more compact (Blumstein 1986).

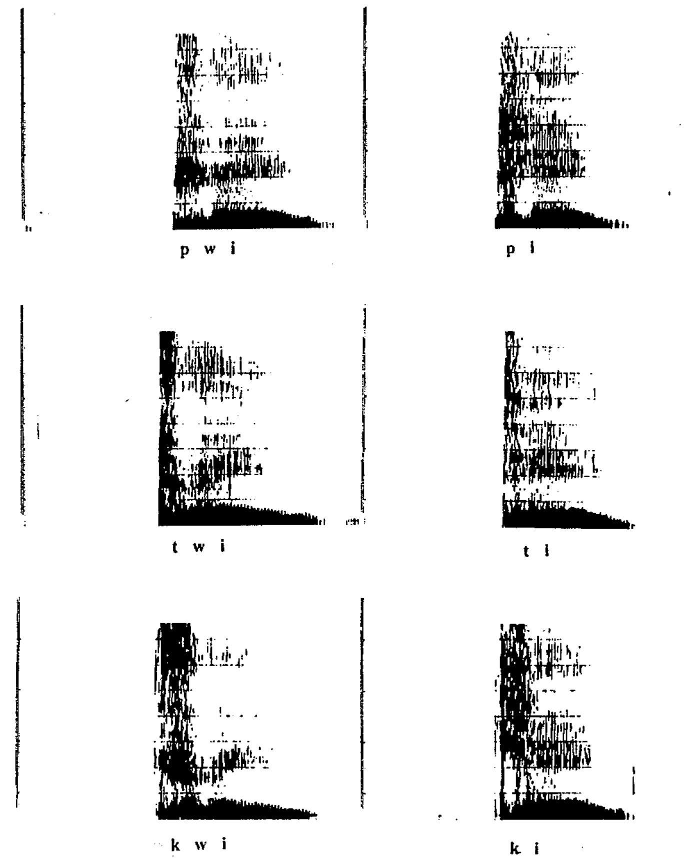


Figure 4.4. Spectrograms for [pwi] vs [pi], [twi] vs [ti] and [kwi] vs [ki]

introducing, for instance, the change from VN > Ṽ in French (see 1.6 for a full discussion). The diachronic deletion of *w* in Korean is realized by a slightly different mechanism. Unlike the above French example, where listeners ascribe perturbations coming from a nasal to the vowel itself, here listeners ascribe *w*-caused perturbations to the preceding bilabial consonant, which eventually leads to listeners' inability to recognize *w*. This lack of acoustic/perceptual distinctions between the two have motivated rarity of sequences of a labial consonant and *w* in the world's languages (Kawasaki 1982, Cutting 1975).

The reinterpretation of 'bilabial consonant + *w* + V' as 'bilabial consonant + V' has resulted in new underlying forms for some lexical items of Korean, as exemplified in Figure 4.5. I suggest that a diachronic change that happened to the words with the 'bilabial consonant + *w*' sequence in Seoul Korean, an OCP-triggered change in Yip's (1988) terms, are perceptually motivated and can be explained as one of those cases which Ohala (1981:187) refers to as "sound change by the listener".

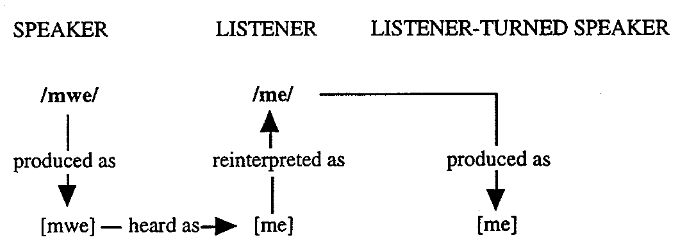


Figure 4.5. Sound change by the listener: from /mwe/ to /me/ 'mountain'

4.8. Conclusion

This chapter has examined the deletion of *w* in Seoul Korean on the basis of a large recorded sociolinguistic database. The results of the statistical analyses of the data reveal

that the deletion of *w* in Seoul Korean occurs more often in some phonological contexts than in others. Most notably it was found that *w* deletes significantly more often after labial segments. Using the notion of the OCP, I have attempted to explain this pattern of variation phonologically in the framework of Optimality Theory incorporating the notion of 'floating constraints'. It was suggested that *w* deletion in Seoul Korean is one example which shows that the OCP can trigger not only a categorical process but also a variable process. It was also suggested that the loss of *w* after a bilabial consonant observed in many lexical items of Korean is an example where the OCP plays the role of the "diachronic rule trigger" (Yip 1988). I showed that this OCP-triggered change can also be explained in perceptual terms along the lines of Ohala (1981): similar acoustic cues of a bilabial consonant and *w* cause listeners' misinterpretation of speakers' productions, which has introduced new *w*-less underlying forms into Seoul Korean.

CHAPTER 5

VARIABILITY IN THE DELETION OF *y*: CATEGORICAL AND VARIABLE PROCESSES

5.1. Introduction

Though the deletion of *w* in Korean has been examined through such studies as Silva (1991) and Kang (1996), the nature of *y* deletion, a parallel process (in some sense), has been little investigated. This chapter will examine the deletion of *y* in Seoul Korean, reveal the constraints conditioning the process, and attempt to provide a phonological explanation of this process. The results of the analysis of the data also suggest that *y* deletion is not just a synchronic process but also a change in progress (which occurs only before the vowel *e*). A phonetic explanation of this ongoing change is also attempted in this chapter.

As in the previous chapter, phonological explanation will be cast within the framework of Optimality Theory (OT) crucially using once again the notions of the OCP (McCarthy 1986) and variable dominance (Reynolds 1994). It will be shown that Seoul Korean actually has two different processes of *y* deletion (one categorical process and one variable process), and that two different OCP's with different strengths are mainly responsible for the two types of *y* deletion.

The phonetic account of the ongoing change will be a perception-based explanation along the lines of Ohala (1981). It will be shown that the onset and offset of *ye* has the shortest perceptual distance among the *y* diphthongs of Seoul Korean when formant frequency and amplitude, the two acoustic parameters most relevant in the perception of diphthongs, are considered. It will be claimed that this is why *ye* alone, among the *y* diphthongs of Seoul Korean, is losing *y*.

The organization of this chapter is as follows: in 5.2, some background information on *y* deletion in Seoul Korean will be provided. The data and methodology are discussed in 5.3. The results of the data analysis and the self-evaluation test will be given in 5.4 and 5.5, respectively. The implications of the results will be discussed in 5.6. I will attempt to provide a phonological account of two synchronic processes of *y* deletion in 5.7 and a phonetic explanation of the diachronic *y* deletion in 5.8, which are followed by concluding remarks in 5.9.

5.2. *y* deletion in Seoul Korean and its background

In this section, I will provide some background information on *y* deletion and then introduce two different processes of *y* deletion that occur in Seoul Korean. The syllable structure and the monophthongal system of Seoul Korean are assumed as in the previous chapter (cf. Figure 4.1 and Table 4.1). Table 5.1 gives the current inventory of *y* diphthongs of Seoul Korean. I assume that *yɛ* has merged with *ye*, following the merger of *e* and *ɛ*. As shown in the table, *yi* and *yɨ* are not possible sequences in Seoul Korean.

[-bk]	[+bk]	
*yi	*yɨ	yu
ye	yə	yo
	ya	

Table 5.1. *y* Diphthongs of Seoul Korean

The current system of Seoul Korean consonants is repeated here in Table 5.2 for ease of reference. As the syllable structure of Korean, CGVC, implies, a single consonant can precede and combine with *y* diphthongs, though not all logical possibilities are actually realized. In particular, the combination of a coronal obstruent and *y* is not allowed underlyingly, though it is allowed derivationally through glide formation[1], e.g., */ty/, */sy/

[1]Seoul Korean has the following *y* glide formation rule : i —> y / ______ + ə, a (cf. E.C. Han 1990, Y.S. Lee 1993). This rule can be both categorical and optional in the sense that this rule has to apply to some verbs but does not have to others.

but /o+si+əs'+ta/ —> [o+sy+ət+t'a] or [o+s^y+ət+t'a] 'came (Hon.)'. (As discussed earlier in 2.3.2.2 *Cy* and *C^y* are not contrastive phonologically and also hardly distinguishable phonetically in Korean, so I assume following T.Y. Choi (1983) and K.W. Nam (1984) that *y* is present in both the phonetic forms *Cy* and *C^y*).

	bilabial	alveolar	palatal	velar	glottal
stop	p, p', p^h	t, t', t^h		k, k', k^h	
affricate			c, c', c^h		
fricative		s, s'			h
nasal	m	n		ŋ	
liquid		l[l,ɾ]			
glide	w		y		

Table 5.2. Consonants of Seoul Korean

With the background introduced so far, I will now discuss the two phonological environments where *y* deletion occurs in Seoul Korean. First, the glide deletes after palatal consonants as (5.2) illustrates. This is a categorical process (S.K. Kim 1976, K.W. Nam 1975) and can be formulated as rule (5.1).

(5.1) y —> ø / $\left\{\begin{matrix} c \\ c^h \\ c' \end{matrix}\right\}$ ____ V (categorical)

(5.2)

/ci+əs'+ta/ "lost"	/cic^hi+əs'+ta/ "skated"	/p^hi+əs'+ta/ "blossomed"[2]	UR
cyəs'ta	cic^hyəs'ta	p^hyəs'ta	G Formation (cf. fn. 1)
cəs'ta	cic^həs'ta	---	*y* Deletion
[cəs'ta][3]	[cic^həs'ta]	p^hyəs'ta	SR

[2]*ci-*, *cic^hi-* , and *p^hi-* , respectively, means 'lose', 'skate', and 'blossom'. *-ta* is a declarative ending; *əs'* is a past tense marker.
[3]As introduced earlier, Korean has a coda neutralization rule that neutralizes obstruents to lenis voiceless stops in coda position, and an obstruent tensing rule that strengthens a lax obstruent to its tense counterpart after an obstruent. However, since these processes are not directly relevant here, they are ignored.

Secondly, as (5.3) shows, *y* variably deletes before *e* — but not before any other vowel. In this process, the deletion rate of *y* is crucially influenced by whether there is a preceding consonant (e.g., /yup^{h}ye/ —> [yup^{h}e] 'confinement') or not (e.g., /toye/ —> [toe] 'ceramic art'). When there is a preceding consonant, the deletion of *y* is significantly more frequent than when there is not (90% vs. 25% according to my data: see Tables 5.9 and 5.10 in Section 5.4).

(5.3) y —> ø / (C) ____ e (variable)

The process (5.1), categorical deletion, will not be discussed until Section 5.6. The main focus from Sections 5.3 to 5.5 will be the process (5.3), the variable process of *y* deletion.

5.3. Methodology

5.3.1. Data

Since the tokens of variable (y) do not appear as often as those of variable (w) in the data, the tokens of (y) in all portions of the recordings of conversational speech were used for this study (the last 20 minutes of recordings of conversational speech were used for the analysis of variable (w)). The sentence and word lists contained 26 and 25 potential tokens of variable (y), respectively. The potential tokens were designed to reveal the effects of the linguistic constraints on *y* deletion (which will be discussed in the following subsection).

One noticeable difference between the tokens of (y) in spontaneous speech and those designed tokens (i.e., tokens in read speech) is that while the designed tokens show a relatively balanced proportion between tokens where *y* occurs in a word-initial syllable and those where *y* appears in non-word-initial syllables, the tokens found in spontaneous speech are mostly instances of (y) appearing in a word-initial syllable (see Table 5.3). This asymmetry is attributable to the fact that in those words commonly used in conversational speech, tokens of (y) appear in a word-initial syllable much more often than in non-initial syllables. As a result, a simple comparison of percentages of *y* deletion can be very misleading in the interpretation of the results of this study because there is a significant difference between word-initial and non-initial syllables in the frequency of *y* deletion (as will be shown later).

	Initial	Noninitial
ingroup	257 (87%)	38 (13%)
interview	379 (75%)	123 (25%)
sentence list	464 (38%)	768 (62%)
word list	522 (44%)	661 (56%)

Table 5.3. The distribution of tokens – style vs. syllable position

NB: In conversational speech (ingroup and interview speech) the tokens of variable (y) occur mostly in word-initial syllables.

The judgment regarding the presence and the absence of the glide was made at the time of the transcriptions and rechecked before the statistical analysis. Each token was judged {y}, {ø] and 'ambiguous'. Any perceived palatalization of the preceding consonant was considered as a token of {y}. Ambiguous cases accounted for approximately 6 percent (207/3419) of the tokens. They were excluded from further analysis. Misread and unread potential tokens were also excluded.

Instances of (y) which occur before *e* and after palatal consonants were 7 in interview speech and 22 in ingroup speech. The sentence-list and word-list contained no such tokens. As expected, *y* deleted categorically in all the 29 cases, so these tokens were not included in the variable rule analysis either (because they are not variable cases). One hundred tokens were chosen from each of the {y}, {ø}, and 'ambiguous' token groups. Another Seoul Korean speaker independently checked these tokens and labeled each as {y}, {ø}, and 'ambiguous'. There was 85, 87, and 72 percent agreement between her judgments and mine in {y}, {ø}, and 'ambiguous' token groups, respectively. The study

of the variable deletion of *y* is based on 3212 tokens of variable (y) from 63 speakers' data containing both conversational and read speech.

5.3.2. Variable rule analysis

5.3.2.1. A preliminary varbrul analysis

A preliminary statistical analysis of the tokens was performed using Goldvarb (version 2.1 Rand and Sankoff 1992). Factor groups listed in Table 5.4 were considered in this analysis.

First, the presence/absence of the preceding consonant was considered because, as noted earlier, the deletion of *y* is sensitive to whether there is a preceding consonant or not. The consonants that can occur before the sequence *ye* are *p, k, k', h, l, ɾ, n* and *ŋ*.[4] To examine whether these consonants show different effects on the deletion of *y*, each consonant was coded as a separate factor and the factor group, 'preceding consonant', was also considered in the analysis. One thing to note here is that the consonants *l, ɾ, n* and *ŋ* can occur before *ye* only in non-word-initial syllables, i.e., there are no word-initial sequences *lye, ɾye, nye*, and *ŋye*.

As discussed in the previous chapter, the distinction between initial vs. noninitial syllables is an important distinction in Korean. Accordingly, the factor group, 'syllable position', was also considered as a possible constraint on *y* deletion. External constraints, 'speech style', 'gender', 'social status' and 'age', were included as well in the analysis to see whether variable *y* deletion is also sensitive to social and stylistic factors.

Factor groups	Factors

[4]The consonants *l, ɾ* and *n* are all from underlying /l/. As discussed earlier, /l/ becomes *ɾ* in intervocalic environments. /l/ is also nasalized to [n] after the sequence 'consonant + morpheme boundary', e.g., /yoŋ+lye/ —> [yoŋ+nye] 'usage' (cf. Kim-Renaud 1986:41a).

1. presence of a preceding consonant	ø, present
2. preceding consonant	*p, k, k', h, l, ɾ, n, ŋ*
3. syllable position	word-initial, non-word-initial
4. speech style	ingroup, interview, sentence reading, word reading
5. gender	male, female
6. social status	upper, middle, lower
7. age	16-25, 26-45, 46 or older

Table 5.4. Factor groups considered in the preliminary variable rule analysis of *y* deletion

The results of the preliminary Varbrul analysis were very problematic (Table 5.5). The constructed statistical model showed a very bad fit to the data (χ^2/cell = 3.1696). It is presumed that this result is due to the fact that the constraints considered show rather different effects on post-consonantal *y* deletion, on the one hand, and on non-post-consonantal y deletion, on the other. Most notably these two were subject to rather different effects by the factors of 'syllable position'. (Refer to Tables 5.9 and 5.10 in Section 5.4: while the initial and noninitial syllable factors, respectively, show Varbrul weights .295 and .657 in post-consonantal *y* deletion, the two show weights .168 and .970 in non-post-consonantal *y* deletion.) The most radical discrepancies between expected frequencies and observed frequencies of deletion were found in cells where *y* (i.e., the presence of *y*) is preceded by a consonant and appears in a non-word-initial syllable.[5] Among the 15 cells where the difference between the two values was bigger than '10', 14 were such cells. In Varbrul analysis, if a chi-square/cell value is bigger than 1.5, the results of the analysis are not generally considered as very reliable. Since 3.1692, the chi-square/cell value of the preliminary analysis, is much bigger than 1.5, the results of this analysis cannot be taken as trustable. The fact that the factor group, 'presence of the

[5]While the probabilities for the factor 'initial' are rather similar (.168 vs .295: .127 difference) between the two types of deletion (post-consonantal and non-post-consonantal *y* deletion), those for 'noninitial' are quite different (.657 vs .970: .313 difference). As a result, the combination of the data for non-post-consonantal *y* deletion and the data for post-consonantal *y* deletion produces a much higher expected value of *y* deletion for those cells where *y* (the presence of *y*) occurs post-consonantally in a noninitial syllable.

preceding consonant', was not selected in the stepwise regression analysis – despite a clear difference in Goldvarb weights of its two factors (.668 vs .164) – also reveals the unreliability of the results from the preliminary analysis. Accordingly separate Varbrul analyses of the two types of tokens of (y) – those for post-consonantal *y* and those for non-post-consonantal *y* – were performed.

Factor groups	Factors	Weight	% Applications	Total N
Presence of C	present	0.668	90	2242
	ø	0.164	25	970
*Preceding C	pʰ	0.591	90	527
	k	0.795	96	805
	k'	0.294	97	75
	h	0.832	95	351
	l	0.018	70	70
	ɾ	0.036	81	182
	n	0.019	70	154
	ŋ	0.024	73	78
*Syllable position	initial	0.139	55	1622
	noninitial	0.865	85	1590
*Speech Style	ingroup	0.586	50	295
	interview	0.560	56	502
	sentence R	0.536	74	1232
	word list R	0.416	77	1183
Gender	male	0.512	71	1646
	female	0.487	69	1566
*Social Status	upper	0.424	69	1101
	middle	0.525	71	1087
	lower	0.556	70	1024
*Age	16-25	0.615	76	1131
	26-45	0.598	73	988
	46+	0.301	61	1093

number of cells: 603 — total chi-square = 1911.2879
chi-square/cell = 3.1696 — loglikelihood = – 889.633 — Input = 0.917
overall deletion rate = 70%

Table 5.5. Goldvarb probabilities for factors for *y* deletion (preliminary run)

NB: a. Starred factor groups are those chosen as significant in the stepwise regression analysis.
b. % applications indicate % of deletion.

5.3.2.2. Factor groups considered in the Varbrul analysis of post-consonantal *y* deletion

Table 5.6. shows the factor groups considered in the Goldvarb analysis of post-consonantal *y* deletion. Six possible constraints – two linguistic and four external constraints – were included in the statistical model. The factor group 'presence of a preceding C', considered in the preliminary Goldvarb analysis, was naturally excluded.

Factor groups	Factors
1. preceding consonant	*p, k, k', h, l, ɾ, n, ŋ*
2. syllable position	word-initial, non-word-initial
3. speech style	ingroup, interview, sentence reading, word reading
4. gender	male, female
5. social status	upper, middle, lower
6. age	16-25, 26-45, 46 or older

Table 5.6. Factor groups considered in the variable rule analysis of post-consonantal *y* deletion

5.3.2.3. Factor groups considered in the Goldvarb analysis of non-post-consonantal *y* deletion.

One linguistic factor group, 'syllable position', and four external factor groups, 'speech style', 'gender', 'social status' and 'age', were considered in the Goldvarb analysis of non-post-consonantal *y* deletion. Those two factor groups considered in the preliminary analysis, 'presence of a preceding C' and 'preceding C', were not included in the model because they are not relevant in this analysis.

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

Table 5.7. Factor groups considered in the variable rule analysis of non-post-consonantal *y* deletion

5.4. Results of variable rule analysis

The results of the Goldvarb analysis of post-consonantal *y* deletion are given in Table 5.8. Five of the six factor groups were selected as significant in the stepwise regression analysis. In the order of selection, the chosen groups are 'preceding consonant', 'age', 'syllable position', 'speech style', and 'social status'. The factor group, 'gender', was not chosen as significant, suggesting that male and female speakers showed little difference in their behavior toward *y* deletion. The deletion rates of *y* in initial vs. noninitial syllables are misleading, because sonorant consonants, which trigger a deletion of *y* significantly less often than obstruents (75% vs. 94%), can occur before *ye* only in noninitial syllables.

As Table 5.8 shows, sonorant consonants (i.e., *l, ɾ, n, ŋ*) showed relatively uniform effects on *y* deletion, i.e., the weight of each sonorant consonant was as follows: *l* (0.076), *ɾ* (0.141), *n* (0.076), *ŋ* (0.096). The loglikelihood significance test did not find a significant difference ($p > .05$) between the Goldvarb run where each of the sonorant consonants was analyzed as a separate factor (Table 5.8) and the run where the sonorant consonants were collapsed together. Table 5.9 gives the results of the latter Varbrul run. However, it was not possible to collapse the obstruent consonants as one factor, because the same test found that the Goldvarb run where they were collapsed together showed a significantly worse fit of the model to the data in terms of loglikelihood.

The results of the Goldvarb run of non-post-consonantal *y* deletion are given in Table 5.10. Four of the five factor groups, 'syllable position', 'age', 'speech style' and 'social status' were selected in the stepwise analysis and in that order. Again the factor group, 'gender', was not chosen as a significant constraint on *y* deletion. As noted earlier, the results show that the main difference between post-consonantal *y* deletion and non-post-consonantal *y* deletion is the strength of the factor group, 'syllable position'. The effect of this constraint is noticeably stronger in non-post-consonantal *y* deletion.

Factor groups	Factors	Weight	% Applications	Total N
*Preceding C	p	0.503	90	527
	k	0.688	96	805
	k'	0.625	97	75
	h	0.747	95	351
	l	0.076	70	70
	ɾ	0.141	81	182
	n	0.076	70	154
	ŋ	0.096	73	78
*Syllable position	initial	0.294	91	958
	noninitial	0.658	89	1284
*Speech Style	ingroup	0.637	96	141
	interview	0.616	95	280
	sentence R	0.535	91	898
	word R	0.409	86	923
Gender	male	0.502	90	1165
	female	0.498	89	1077
*Social Status	upper	0.419	87	788
	middle	0.534	91	764
	lower	0.556	91	690
*Age	16-25	0.630	94	801
	26-45	0.603	94	687
	46+	0.280	82	754

number of cells: 489 total chi-square = 588.3383
chi-square/cell = 1.2031 loglikelihood = – 586.667 Input = 0.945
Overall deletion rate = 90%

Table 5.8. Goldvarb probabilities for factors for post-consonantal *y* deletion (1st run)

Factor groups	Factors	Weight	% Applications	Total N
*Preceding C	p	0.504	90	527
	k	0.689	96	805
	k'	0.626	97	75
	h	0.747	95	351
	sonorant C	0.099	75	484
*Syllable position	initial	0.295	91	958
	noninitial	0.657	89	1284
*Speech Style	ingroup	0.641	96	141
	interview	0.611	95	280
	sentence R	0.538	91	898
	word R	0.408	86	923
Gender	male	0.502	90	1165
	female	0.498	89	1077
*Social Status	upper	0.421	87	788
	middle	0.532	91	764
	lower	0.556	91	690
*Age	16-25	0.628	94	801
	26-45	0.601	94	687
	46+	0.282	82	754

number of cells: 375 total chi-square = 470.7270
chi-square/cell = 1.2553 loglikelihood = – 590.548 Input = 0.945
Overall deletion rate = 90%

Table 5.9. Goldvarb probabilities for factors for post-consonantal *y* deletion (2nd run)

Factor groups	Factors	Weight	% Applications	Total N
*Syllable position	initial	0.168	04	664
	noninitial	0.970	70	306
*Speech Style	ingroup	0.696	08	154
	interview	0.652	07	222
	sentence R	0.436	39	334
	word R	0.333	30	260
Gender	male	0.539	25	481
	female	0.462	24	489
*Social Status	upper	0.408	24	313
	middle	0.519	24	323
	lower	0.568	25	334
*Age	16-25	0.599	30	330
	26-45	0.594	28	301
	46+	0.325	17	339

number of cells: 114 total chi-square = 141.3995
chi-square/cell = 1.2403 loglikelihood = – 270.202 Input = 0.103
Overall deletion rate = 25%

Table 5.10. Goldvarb probabilities for factors for non-post-consonantal *y* deletion

5.5. Results of the self-evaluation test

As in the self-evaluation test of *w* deletion, six questions were designed to test whether the subjects were aware of the linguistic constraints on *y* deletion and how correctly they evaluate their speech behavior toward the variable (y). The linguistic constraints were identified before the design of the test on the basis of the results of the pilot study. The identical procedure that was used in the self-evaluation test for the (w) variable was used in this test too. I produced the two phonetic forms for the informant to make sure that the informant correctly associated the written forms (cf. Section 6 of Appendix B) with the two variants and asked the informant which form is the one s/he usually produces in her/his speech. Table 5.11 shows the test words used, the two answers for each question, and the phonological contexts where *y* appears.

Words	Answer (a)	Answer (b)	Environments of y
7. *yesul*	*yesul*	*esul*	#____
8. *kyeki*	*kyeki*	*keki*	#C____
9. *toye*	*toye*	*toe*	#σ.____
10. *hwapʰye*	*hwapʰye*	*hwapʰe*	#σ.C____
11. *corye*	*corye*	*core*	#σ.C____
12. *pʰyehə*	*pʰyehə*	*pʰehə*	#C____

Table 5.11. The words (containing *y*) which were used in the self-evaluation test and the phonological environments of *y* in each word

NB: Among the four test words where *y* follows a consonant, only in *corye* a sonorant consonant precedes *y*.

The results of the test are given in Table 5.12. The numbers of the subjects who reported that their usual speech forms are {y} and {ø} for each question are given respectively in the second and third columns of the table. The environments where *y* appears in each word are repeated in the rightmost column.

Words	{y}	{ø}	Environments of y
7. *yesul*	55	1	#____
8. *kyeki*	21	35	#C____
9. *toye*	39	17	#σ.____
10. *hwapʰye*	17	39	#σ.C____
11. *corye*	24	32	#σ.C____
12. *pʰyehə*	17	39	#C____
Combined	173	163	

Table 5.12. The results of the self-evaluation test for each test word

The first thing to note is that the proportion of the subjects who reported that they usually delete the glide is much larger in this test than the self-evaluation test for the variable (w) – 48.5% vs. 17% (cf. Table 4.12), if we average out the deletion of the glide (*w* or *y*) in different contexts. This reflects the subjects' overall deletion pattern (cf. Tables 5.5 and 4.8) where *y* is deleted in a much higher percentage than *w* (70% vs. 21.5%). The results of the self-evaluation test were first analyzed in order to examine whether the subjects were aware of the three linguistic constraints on *y* deletion: 1) whether there is a preceding consonant, 2) whether the preceding consonant is an obstruent or a sonorant, 3) whether *y* occurs in a word-initial or noninitial syllable.

A clearly higher percentage of subjects reported that their usual speech form is {ø} when a consonant precedes *y* than when it does not – 65% vs. 16% (see Table 5.13). A chi-square test found the difference to be significant ($\chi^2 = 69.5$, $p < .001$). A larger proportion of speakers reported that they delete *y* after p^h or *k* than after *r*. The difference, however, was not statistically significant ($\chi^2 = 1.87$, $p > .10$).

Environments of *y*	{y}	{ø}	{ø}%	A.D.R.
non-post-cons.	94	18	16%	25%
post-cons.	79	145	65%	90%
(son (*r*)+*y*:	24	32	57%	75%)
(obst (p^h, *k*)+*y*:	55	113	67%	94%)

Table 5.13. Informants' self-report on *y* deletion in different phonological contexts

NB: a. {ø}% indicates the proportion of the subjects who reported that {ø} is their usual pronunciation; 'A.D.R.' refers to the informants' actual deletion rate of *y* in each environment (refer to Tables 5.5 and 5.9).
b. 75% and 94% are the deletion rates after sonorant consonants and obstruents as a whole, respectively, rather than the respective deletion rates after '*r*' or 'p^h and *k*' (cf. Table 5.9).

The results shown in Table 5.14 suggest that the subjects are generally aware of the constraint 'syllable position' on *y* deletion. As stated earlier, the reason why there is no difference[6] in the deletion percentages of post-consonantal *y* between initial vs. noninitial syllables (see Table 5.9: 91% vs. 89%) is that the sonorant consonants, which trigger *y* deletion less often than obstruents, occurs before *ye* only in non-word-initial syllables. To eliminate this complicating factor, only the tokens where obstruents precede *y* were considered in the table. (Naturally, the results from question 11 (*corye*) of the self-

[6]If anything, the percentages show a difference in the opposite direction to our expectation.

evaluation test were also eliminated from the tabulation.) Similar percentages of the subjects reported that their usual pronunciation is {ø} in '*kyeki* and *p^hyehə*' and '*hwap^hye*', respectively (66% vs. 70%), which roughly reflects the subjects' actual production pattern. A dramatic effect of the constraint, 'syllable position', was revealed in non-post-consonantal *y* deletion: only one subject reported – through his response to question 7 (*yesul*) – that his usual pronunciation is the {ø} form when non-post-consonantal *y* occurs in an initial syllable, i.e., when a word contains word-initial *y*. This result is also generally consistent with the subjects' actual deletion rate of *y* in this phonological environment.

	Post-Consonantally		Non-Post-Consonantally	
	{ø} %	A.D.R.	{ø} %	A.D.R.
Initial Syl.	66%(74/112)	91%(85/958)	2%(1/56)	4%
Non-Ini.-Syl.	70%(39/56)	97%(21/800)	39%(17/56)	70%

Table 5.14. Informants' self-report on *y* deletion in different syllable positions

NB: Only the tokens where obstruents precede *y* were considered in post-consonantal *y* deletion; the results of question 11 (*corye*) of the self-evaluation test were also eliminated from the tabulation as a consequence.

A rather similar pattern of responses to that observed in the self-evaluation of *w* deletion was exhibited by the three age groups (Table 5.15). The older the group is, the less deletion of *y* it self-reported. However, unlike in the self-evaluation test for the variable (w), the results were close to the relative actual deletion rates of each group, i.e., the results did not show a clear exaggerated trend (or underreporting by the older speakers) observed in the test for the variable (w).

	7	8	9	10	11	12	{ø}%	A.D.R.	(Wt.)
16-25	1	13	7	16	12	16	57%	76%	(.615)
26-45	0	15	6	10	11	13	48%	73%	(.598)
46+	0	7	4	13	9	10	40%	61%	(.301)

Table 5.15. Different age groups' self-report on *y* deletion

NB. a. The numbers in the top row refer to the numbered test words shown in Table 5.11.
b. {ø}% indicates the average percentage of the group members who reported that {ø} is their usual pronunciation.
c. Wt. refers to the Varbrul weight for each group (see Table 5.5).

The two gender groups, on the other hand, did not show a significant difference in their responses in the self-evaluation test as shown in Table 5.16 ($\chi^2 = 1.49$, $p > .20$). This result also generally reflects the two groups' actual production behavior toward the variable (y).

	7	8	9	10	11	12	{ø}%	A.D.R.	(Wt.)
male	1	19	9	21	18	19	52%(87/168)	71%	(.512)
female	0	16	8	18	14	20	45%(76/168)	69%	(.487)

Table 5.16. Different gender groups' self-report on *y* deletion

The analysis of self-evaluation by the three SEC groups produced a rather unexpected result. More people belonging to the highest SEC group reported that their usual pronunciation is the *y* deleted form than those who belong to the middle SEC group; also slightly more people who belong to the middle SEC group reported that their usual pronunciation is the {ø} form than those belonging to the lower SEC group. This result does not reflect their production behavior toward the variable (y) as reflected in the Goldvarb probabilities for the three SEC groups. (As explained earlier, Varbrul probabilities are much more reliable than percentages because the former are calculated with all the other constraints on *y* deletion controlled.) This result again suggests either that the

two lower SEC speakers do not evaluate their behavior objectively or that linguistic sensitivity of these SEC groups toward the (y) variable – which probably comes from their linguistic insecurity – induces them to give less candid answers.

	7	8	9	10	11	12	{ø}%	A.D.R.	(Wt)
upper	0	14	5	17	15	16	59%	69%	(.413)
middle	1	11	4	12	9	13	44%	71%	(.496)
lower	0	10	8	10	8	10	43%	70%	(.592)

Table 5.17. Different SEC groups' self-report on *y* deletion

5.6. Discussion

5.6.1. Discussing linguistic constraints

The results of the Goldvarb analyses shown in Tables 5.9 and 5.10 suggest that three linguistic constraints condition the variable deletion of *y* in Seoul Korean. The first is the presence of a consonant preceding *y*. The deletion of *y* occurs approximately 90 percent after a consonant and 25 percent without a preceding consonant. This result indicates that the presence of a consonant is a crucial constraint on *y* deletion.

The results also show that consonant type is another important factor in *y* deletion. As explained in 3.5, in Varbrul terms, when the weight of a given factor is above .5 (or under .5), that factor is said to favor (or disfavor) the application of the rule. Table 5.9 shows that in terms of Goldvarb probabilities obstruent consonants (*p, k, k'* and *h*) favor *y* deletion, while sonorant consonants disfavor it. The table also shows that *y* deletes after obstruents approximately 94% on an average and 75% after sonorant consonants. This result implies that the diphthong *ye* is almost monophthongized after obstruent consonants but not quite yet after sonorant consonants. T.Y. Choi (1983) suggests that in the Chunpuk dialect *y* diphthongs (not just the *ye* sequence) have monophthongized after obstruents but not after sonorant consonants, i.e., he suggests that the diphthongs *ye*, *yə*, *ya*, *yu*, *and yo* have monophthongized to *e*, *e*, *ε*, *ü*, and *ö*, respectively only after obstruents.[7] A similar pattern of change is exhibited in the Seoul dialect but only in the diphthong *ye*.

The third linguistic constraint that is shown by the Goldvarb results to play an important role in the variable deletion of *y* is whether *y* occurs in a word-initial syllable or a noninitial syllable. This constraint has significant effects on both post-consonantal and non-post-consonantal deletion of *y* (see Tables 5.9 and 5.10). Yet its effect is considerably stronger in non-post-consonantal *y* deletion. The results of the data analysis show that the deletion of *y* rarely occurs in an initial syllable when there is no preceding consonant, i.e., when *y* is a word-initial segment. Only 4 % of deletion occurs here as opposed to 70 % of deletion in noninitial syllables. These results support Kim-Renaud's (1986a) claim that a word-initial syllable, especially the initial segment of a phonological word, has a phonologically strong nature in Korean; the results also support Foley (1977) and Hyman's (1975) suggestion that cross-linguistically word-initial position is a phonologically strong position while word-final position is a weak (weakening) position, when it is considered that a significant portion of Korean lexical items are two-syllable words thus often making a non-word-initial syllable identical with a word-final syllable.

5.6.2. Discussing external constraints

The fact that *y* deletion is a sociolinguistic process is evidenced by the result that factor groups 'social status' and 'age' are found to be significant constraints in the Varbrul stepwise analyses. The results show that the upper status speakers 'disfavor' *y* deletion, while the other SEC groups 'favor' the process (see Tables 5.9 and 5.10). A more clear difference in *y* deletion in terms of Varbrul weight is shown among the age groups. The results show that while the oldest group disfavors *y* deletion, the two younger groups favor it. This result suggests (coupled with external evidence discussed below) that *y* deletion is

[7]T.Y. Choi (1983) assumes that the Chunpuk dialect has a 10-vowel monophthongal system: *i*, *ü*, *ɨ*, *u*, *e*, *ö*, *ə*, *o*, *ε*, *a*.

not just a synchronic process but also a change in progress. The result seems to indicate that *ye* has almost monophthongized after obstruent consonants, while the *ye* to *e* change after sonorant consonants is still under way. (Recall that *y* deletes 94% and 75% after obstruents and sonorant consonants, respectively.) In fact, K.W. Nam (1984:23) makes a similar claim: he suggests that *ye* has virtually monophthongized to *e* in all the post-consonantal contexts except after /l/, which can be realized as [l], [ɾ] and [n] as discussed earlier.

The claim that *ye* is monophthongizing to *e* obtains external support from prescriptive literature, if we accept the common wisdom that prescriptive grammar follows actual production by the members of a speech community only reluctantly when that production is predominant. The production of *ye* as *e* – i.e., the deletion of *y* before *e* – has not been allowed by prescriptive grammar until recently. However, the latest publication on standard pronunciation by the Ministry of Education (1988), *phyocwun palimpep* ("Standard Pronunciation of Korean"), contains an article saying that "the diphthong *ye* can be pronounced as *e* after a consonant unless /l/ precedes it".[8] This statement is a prescription that *ye* should be pronounced as *ye* after /l/ – i.e., [l, ɾ, n] – while allowing the monophthongal production when obstruents precede the diphthong. This (prescriptive) statement implicitly reveals that the deletion of *y* before *e* after sonorant consonants is still not as prevalent as the deletion of *y* after obstruent consonants.

Another piece of evidence supporting the monophthongization change of *ye* is found in the spelling changes of some words containing an "obstruent + *y* + *e*" sequence. The spelling of such words as *kyeta*, *khyekhyehata*, *hyealita*, and *pyeta* officially changed to *keta*, *khekhehata*, *healita*, and *peta* through the 1988 spelling reform, *hankul*

[8]The publication uses orthographic rather than phonetic symbols following the custom of traditional Korean grammar and linguistics. The statement is actually as follows: "The production of (/ye/) as (/e/) is allowed except in (/ye/) and (/lye/)". The reason that /ŋ/ is disregarded in this statement is attributable to the fact that /ŋ/ always occurs in the previous orthographic letter, not in the same letter with /ye/ (e.g., :/kuŋ-ye/). Nam's (1984) statement mentioned above follows the same practice, and that is probably why he failed to mention /ŋ/.

macchuwumpep kaycengan ("Revision Proposal for the Korean Spelling System").[9] These spelling changes are considered as a clear reflection of the diachronic loss of /y/ before *e* after obstruents.

The finding that *y* deletes even without a preceding consonant (nearly exclusively in noninitial syllables) seems to show that the diachronic loss of *y* before *e* is extending to the other phonological environments. (A similar change is found in Japanese, which lost *ye* during the 18th to 19th century (Vance 1987).) The fact that the loss of *y* is happening only in *ye* but not in the other *y* diphthongs points to the possibility that there may be inherent instability in this diphthong that the other *y* diphthongs of Seoul Korean do not share. In the following section I will attempt to provide a possible phonological explanation of this instability in *ye*. A phonological account of the categorical deletion of *y*, which was discussed in 5.2, will also be attempted. Two OCP constraints with different strengths are proposed for the explanation of two different processes of *y* deletion.

5.7. Phonological explanations

One of the interesting facts in *y* deletion in Seoul Korean is, as noted above, that two rather different processes cooccur. To repeat, one is a categorical process formulated as (5.1) where *y* deletes after palatal consonants; the other is a variable process which occurs only before the vowel *e*. Considering that Korean does not have the diphthong *yi*, the defining feature that distinguishes the vowel *e* from the other vowels of Seoul Korean which can combine with *y* is the feature [back] — the vowel *e* is [–back], while the others are [+back] (cf. Table 5.1). If we adopt the feature system of Clements and Hume (1995), the phonological feature that distinguishes *e* from the others is the feature [coronal]. The Seoul Korean data examined in this study show that both categorical and variable deletion of *y*, a coronal vocoid in Clements and Hume's (1995) model, is triggered by an adjacent

[9]The meanings of the words given in the sentence are as follows: *kyeta* 'fold', *khyekhyehata* '(be) stuffy', *hyealita* 'count' and *pyeta* 'lay ones' head (on the pillow)'.

coronal segment — an OCP effect. I propose that the two types of *y* deletion in Seoul Korean are mainly attributable to the two OCP constraints shown in Figure 5.1.

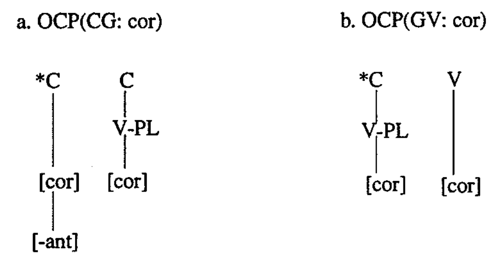


Figure 5.1. Two proposed OCP constraints against adjacent coronal segments in Seoul Korean

OCP(CG: cor) is a constraint which prohibits the sequence 'palatal consonant + *y*' in Seoul Korean, while OCP(GV: cor) prohibits the sequence '*y* + *e*'. I consider these two as part of the phonological constraints operating in Seoul Korean. Korean has morpheme structure constraints that prohibit the following underlying sequences: */ty/, */t^hy/, */t'y/, */sy/, */s'y/, */cy/, */c^hy/ and */c'y/. In other words, Seoul Korean has no morphemes with the underlying sequences of 'obstruent coronal C + *y*'. Accordingly, previous studies such as H.S. Kim 1994 and Clements 1991 proposed OCP-based cooccurrence restrictions against the above sequences. However, the sequences, *ty*, *t^hy*, *t'y*, *sy* and *s'y* are possible as surface forms; they can arise as derived forms through glide formation. For instance, [has^yə] or [hasyə] is a surface form that derives from underlying /ha+si+ə/ (*do*+Hon.+Conn.), except in the most careful speech where [has^yiə] can be produced by speakers. Only the sequence 'palatal C + *y*' is prohibited in Seoul Korean on the surface. Since constraints in OT are restrictions on surface rather underlying representations, the formulation of OCP(CG: cor) as shown in Figure 5.1 is required.

I suggest by proposing the above two OCP constraints that both categorical and variable processes of *y* deletion are OCP-triggered (Yip 1988). That is, I suggest that *y* is deleted in Seoul Korean in order to satisfy the two OCP constraints proposed in Figure 5.1. However, the strengths of OCP(CG: cor) and OCP(GV: cor) are not identical. I argue that this is why one triggers categorical deletion and the other, variable deletion. The difference in the strengths of these two constraints can be shown in the framework of Optimality Theory (OT) if we incorporate the concept of 'variable dominance' to this theory (cf. Reynolds 1994). It will be shown that variability involving *y* originates from a variable dominance relationship between OCP(GV: cor) and MAX(i) (cf. (5.4)), both of which are dominated by OCP(CG: cor).

I suggest that the constraints listed in (5.4) are in operation in Seoul Korean phonology and are needed to explain the deletion of *y* in Seoul Korean.

(5.4) Constraints required

1. OCP(CG: cor) : The C[cor, -ant] G[cor] sequence is prohibited.
2. OCP(GV: cor) : The G[cor] V[cor] sequence is prohibited.
3. MAX(V[+hi], [cor]): Every *i* in underlying representation has a correspondent in surface representation. = MAX(i)
4. MAX(V[-hi]): Every nonhigh vowel in underlying representation has a correspondent in surface representation.
5. MAX(C): Every consonant in underlying representation has a correspondent in surface representation.
6. L-Anchor: The leftmost element of underlying representation has a correspondent at the leftmost position of surface representation.
7. DEP-μ: Every surface mora has a correspondent in underlying representation.
8. *R-Diph: Rising diphthongs are prohibited.

OCP(CG: cor) is motivated by languages' tendency to disfavor the sequence 'palatal C + *y*' as also evidenced in Fox (Kawasaki 1982) and Sre (Manley 1972), where the sequence is prohibited. (But the 'alveolar C + *y*' sequence is allowed in these languages.) Many languages have restrictions on the combination of *y* with front vowels, e.g., Ainu (Shibatani 1990), Japanese (Vance 1987), Bulgarian (Scatton 1975). OCP(GV: cor) reflects this rather prevalent tendency of the worlds' languages. As discussed in the

previous chapter, the MAX and DEP family of constraints penalize the deletion and insertion of segments or autosegments, respectively. See 4.7.1 for a discussion of L-Anchor, the motivation of *R-Diph, the division of MAX(V) into MAX(V[+hi]) and MAX(V[-hi]), and an explosion of MAX(V[+hi]).

As discussed in Chapter 4, glides and vowels are contrastive in Korean, e.g., *nwi* 'who' vs. *nui* 'sister', *kyək* 'quality' vs. *kiək* 'remembrance'. Accordingly, I assume following Hayes (1989) that different moraic structures are given in underlying representation to vowels and glides in Korean, i.e., vowels and glides are assumed to be vowels with and without a mora underlyingly, respectively. I also follow Y.S. Lee (1993) in assuming that not all vowels have a mora in Korean. It is assumed that those verb stem-final vowels which obligatorily go through glide formation without compensatory lengthening when the verbal ending ə (or *a*) or the past-tense marker *əs'* (or *as'*) is attached to them,[10] are not associated with a mora in underlying representation.[11] (See Y.S. Lee 1993:244 ff. for detailed discussion.)

One aspect of *y* deletion that is very different from *w* deletion examined in the previous chapter is that *y* deletion occurs only in two specific phonological contexts: after a palatal consonant and before the vowel *e*. In the other phonological environments, *y* deletion never occurs. This suggests that the constraint, MAX(i) (penalizing *y* deletion), dominates *R-Diph (prohibiting '*y* + V' sequence) in Seoul Korean as shown in (5.5). (Recall that MAX(u) and *R-Diph are variably ranked.) Tableau 5.1 illustrates. Since

[10] ə and *a* are allomorphs of the same morpheme; they can be the allomorphs of both the connective ending and the imperative ending, which happen to have the same phonetic form. The realization of the two allomorphs are governed by Korean vowel harmony rule (cf. Kim-Renaud 1986c). Alternation between *əs'* and *as'*, the past-tense marker, is subject to the same rule.

[11] There are two types of verb stem-final vowels in Korean. One type goes through glide formation without compensatory lengthening whenever another morpheme beginning with ə or *a* is attached to them, e.g., /o+a/ —> [wa] 'come! (*come*+Imp.)', /keu+ə/ —> [kewə] 'vomit! (*vomit*+Imp.)'; the other type is optionally subject to glide formation, and the optional glide formation is always accompanied by compensatory lengthening, e.g., /po+a/ —> [poa] ~ [pwa:] 'see! (*see*+Imp.)', /ki+ə/ —> [kyə:] ~ [kiə] 'crawl! (*crawl*+ Imp.)'.

MAX(i) dominates *R-Diph in Seoul Korean, the *y* present form is selected over the *y* deleted form except in the cases discussed below.

Tableau 5.1

μ μ cokio	MAX(i)	*R-Diph
☞ cokyo		*
coko	*!	

(5.5) MAX(i) >> *R-Diph

First let us consider the categorical deletion of *y*, which occurs when *y* is preceded by a palatal consonant. The examples of categorical deletion are given in Tableaux 5.2 and 5.3. /ci+ta/ 'lose (*lose* + Decl)' of Tableau 5.2 and /cic^{h}i+ta/ 'skate (*skate*+Decl)' of Tableau 5.3 have stem vowels which obligatorily go through glide formation (when another morpheme beginning with *ə* (or *a*) is attached) and do not trigger compensatory lengthening. Accordingly it is assumed following Y.S. Lee (1993) that the stem-final vowels of these words are moraless in underlying representation. Since the deletion of *y* is sensitive to whether *y* occurs in an initial or noninitial syllable of the word, I consider each case separately throughout my phonological account of *y* deletion.

Tableaux 5.2 and 5.3 illustrate the categorical deletion of *y* in a word-initial and a non-initial syllable, respectively. In these tableaux, the optimal form is candidate (b), the *y* deleted form, which violates MAX(i). Seoul Korean's choice of candidate (b) over the other candidates as an optimal form shows that MAX(i) is dominated in this dialect by the following constraints: OCP(CG)[12], MAX(C), MAX(V[-hi]), and DEP-μ (cf. (5.6)). Candidate (a) is ruled out because it violates OCP(CG); candidates (c) and (d) are ruled out because of their violation of MAX(C) prohibiting the deletion of an underlying consonant.

[12]Henceforth, I refer to OCP(CG: cor) and OCP(GV: cor) as OCP(CG) and OCP(GV), respectively.

(Candidate (d) actually violates both MAX(C) and DEP-μ which are unranked with regard to each other; in this study I will mark only the first violation of unranked constraints as 'fatal', in the sense that the candidate is already eliminated from further consideration.) Candidate (e) fatally violates MAX(V[-hi]) which penalizes the deletion of a non-high vowel; candidate (f) is ruled out for its violation of DEP-μ prohibiting the insertion of a mora. Based on the ranking given in (5.5) and the categorical deletion of *y* exemplified in Tableaux 5.2 and 5.3, the dominance relationship given in (5.6) is established.

Tableau 5.2. Input: /ci+əs'+ta/ '*lose* + Past + Decl'

μ μ ci+əs'+ta	OCP (CG)	MAX(C)	MAX (V[-hi])	DEP-μ	MAX(i)	*R-Diph
a. cyəs'ta	*!					*
b. ☞cəs'ta					*	
c. yəs'ta		*!				*
d. iəs'ta		*!		*		
e. cis'ta			*!	*		
f. ciəs'ta				*!		

Tableau 5.3. Input: /cic^{h}i+əs'+ta/ '*skate* + Past + Decl'

μ μ μ cic^{h}i+əs'+ta	OCP (CG)	MAX(C)	MAX (V[-hi])	DEP-μ	MAX(i)	*R-Diph
a. cic^{h}yəs'ta	*!					*
b. ☞cic^{h}əs'ta					*	
c. ciyəs'ta		*!				*
d. ciiəs'ta		*!		*		
e. cic^{h}is'ta			*!	*		
f. cic^{h}iəs'ta				*!		

(5.6) Constraint ranking (provisional)

OCP(CG), MAX(C), MAX(V[-hi]), DEP-μ >> MAX(i) >> R-Diph

Now let us turn to the variable deletion of *y*. As mentioned in 5.4, *y* deletes approximately 94% and 75% of the time when an obstruent and a sonorant consonant precede it, respectively. Thus the generalization is that *y* deletes a majority of the time or more when a consonant precedes it, but not categorically or near-categorically. (Recall that the critical value of 'near-categorical' deletion was set at 95% (see 4.7.1)). Note that the constraint OCP(GV), not OCP(CG), plays a crucial role in *y* deletion before *e*. The variable pattern of *y* deletion in this phonological context suggests that constraints, MAX(i) and OCP(GV), are variably ranked with regard to each other: when OCP(GV) dominates MAX(i) – i.e., in case OCP(GV) >> MAX(i) holds – deletion occurs; and in the other case, i.e., when MAX(i) >> OCP(GV) holds, *y* is retained. Since we have established that MAX(i) is dominated by the four constraints shown in (5.6), it follows that OCP(GV) is also dominated by these constraints because there is no evidence that OCP(GV) is variably ranked with regard to any of these four constraints.

Tableaux 5.4 and 5.5 illustrate the post-consonantal deletion of *y* in a word-initial syllable using *phyeki* 'disposal' as an example, while Tableaux 5.6 and 5.7 illustrate post-consonantal *y* deletion in a non-word-initial syllable with *ciphye* 'bill' as an example. In each tableau, candidates (a) and (d) are ruled out because they violate DEP-μ and MAX(V[-hi]), respectively; candidates (e) and (f) are prohibited for their respective violation of MAX(V[-hi]) and MAX(C). Since OCP(GV) and MAX(i) are variably ranked with regard to one another, both the constraint rankings shown above Tableaux 5.4 and 5.5 (and also above Tableaux 5.6 and 5.7) can hold in Seoul Korean phonology and both the *y* present and *y* deleted forms can be selected as optimal. Post-consonantal (variable) *y* deletion exhibits essentially the same pattern of deletion both in word-initial and non-initial syllables as shown in Tableaux 5.4 to 5.7, unlike non-post-consonantal *y* deletion to be discussed shortly.

Tableau 5.4

MAX(C), MAX(V[-hi]), DEP-μ >> OCP(GV) >> MAX(i) >> *R-Diph

μ μ p^hieki	MAX(C)	MAX (V[-hi])	DEP-μ	OCP(GV)	MAX(i)	*R-Diph
a. p^hieki			*!			
b. p^hyeki				*!		*
c. ☞ p^heki					*	
d. p^hiki		*!	*			
e. p^hyki		*!				
f. yeki	*!			*		*

Tableau 5.5

MAX(C), MAX(V[-hi]), DEP-μ >> MAX(i) >> OCP(GV) >> *R-Diph

μ μ p^hieki	MAX(C)	MAX (V[-hi])	DEP-μ	MAX(i)	OCP(GV)	*R-Diph
a. p^hieki			*!			
b.☞ p^hyeki					*!	*
c. p^heki				*!		
d. p^hiki		*!	*	*		
e. p^hyki		*!				
f. yeki	*!				*	*

Tableau 5.6

MAX(C), MAX(V[-hi]), DEP-μ >> OCP(GV) >> MAX(i) >> *R-Diph

μ μ cip^{h}ie	MAX(C)	MAX (V[-hi])	DEP-μ	OCP(GV)	MAX(i)	*R-Diph
a. cip^{h}ie			*!			
b. cip^{h}ye				*!		*
c.☞ cip^{h}e					*	
d. cipi		*!	*			
e. cip^{h}y		*!				
f. ciye	*!			*		*

Tableau 5.7

MAX(C), MAX(V[-hi]), DEP-μ >> MAX(i) >> OCP(GV) >> *R-Diph

μ μ cip^{h}ie	MAX(C)	MAX (V[-hi])	DEP-μ	MAX(i)	OCP(GV)	*R-Diph
a. cip^{h}ie			*!			
b.☞ cip^{h}ye					*	*
c. cip^{h}e				*!		
d. cipi		*!	*			
e. cip^{h}y		*!				
f. ciye	*!				*	*

Through the examination of the data considered so far, constraint ranking (5.7) is established. As discussed earlier, the Seoul Korean data analyzed in this work suggests that the deletion of *y* is not just a synchronic process but also a diachronic process, i.e., a linguistic change in progress. This suggests that OCP(GV) is gaining strength relative to MAX(i), which is indicated by the arrow shown above the constraint, OCP (GV).

(5.7) Constraint ranking (provisional)

$$\text{OCP(CG), MAX(C), MAX(V[-hi]), DEP-}\mu >> \left\{\begin{matrix}\overleftarrow{\text{OCP(GV)}} \\ \text{MAX(i)}\end{matrix}\right\} >> \text{*R-Diph}$$

I have mentioned earlier that non-post-consonantal *y* deletion shows a rather different pattern from that of post-consonantal *y* deletion. It occurs a majority of the time in a non-word-initial syllable but this process is near-categorically absent in an initial syllable (see Table 5.10), evidencing the strong nature of a word-initial segment. This pattern of deletion suggests that L-Anchor, prohibiting the deletion of a word-initial segment, dominates OCP(GV), and also MAX(i) which is variably ranked with regard to OCP(GV). This dominance relationship is formulated in (5.8).

$$\text{(5.8) L-Anchor} >> \left\{\begin{matrix}\text{OCP(GV)} \\ \text{MAX(i)}\end{matrix}\right\}$$

Tableaux 5.8 and 5.9 illustrate non-post-consonantal *y* deletion in a word-initial syllable with *yesul* 'art' as an example. Though the two constraint rankings shown above the tableaux are both realized in Seoul Korean phonology, only the *y* present form is selected as an optimal form because L-Anchor dominates OCP(GV) which triggers the deletion of *y*. In the two tableaux candidates (a) and (c) are ruled out because of their violations of DEP-μ and L-Anchor, respectively, and (d) and (e) forms are eliminated because they violate MAX(V[-hi]).

Tableau 5.8

MAX(V[-hi]), DEP-μ, L-Anchor >> OCP(GV) >> MAX(i) >> R-Diph

μ μ iesul	MAX (V[-hi])	DEP-μ	L-Anchor	OCP(GV)	MAX(i)	*R-Diph
a. iesul		*!				
b. ☞ yesul				*		*
c. esul			*!		*	
d. isul	*!					
e. ysul	*!					

NB: It is assumed that the vowel *e* of candidate (c) of Tableaux 5.8 and 5.9 is a correspondent of *e* of UR. If *e* of candidate (c) corresponds to /i/, then the candidate is a violation of MAX(V[-hi]) and also eliminated.

Tableau 5.9

MAX(V[-hi]), DEP-μ, L-Anchor >> MAX(i) >> OCP(GV) >> R-Diph

μ μ iesul	MAX (V[-hi])	DEP-μ	L-Anchor	MAX(i)	OCP(GV)	*R-Diph
a. iesul		*!				
b. ☞ yesul					*	*
c. esul			*!	*		
d. isul	*!					
e. ysul	*!					

Tableaux 5.10 and 5.11 illustrate non-post-consonantal *y* deletion in a non-word-initial syllable. As Table 5.10 shows, *y* deletes in this phonological environment about 70% of the time – nearly as often as after sonorant consonants. The constraint, L-Anchor, is not relevant to the deletion of *y* in this environment. Again we need two tableaux for illustration (Tableaux 5.10 and 5.11) because OCP(GV) and MAX(i) are variably ranked with respect to each other and two different constraint rankings shown above Tableaux 5.10 and 5.11 are both relevant to Seoul Korean phonology. Candidate (a) is ruled out because it violates DEP-μ, and candidates (d) and (e) are eliminated due to their violation of MAX(V[-hi]).

Tableau 5.10

MAX(V[-hi]), DEP-μ, L-Anchor >> OCP(GV) >> MAX(i) >> R-Diph

μ μ (toie)	MAX (V[-hi])	DEP-μ	L-Anchor	OCP(GV)	MAX(i)	*R-Diph
a. toie		*!				
b. toye				*!		*
c.☞ toe					*	
d. toi	*!					
e. toy	*!					

Tableau 5.11

MAX(V[-hi]), DEP-μ, L-Anchor >> MAX(i) >> OCP(GV) >> R-Diph

μ μ (toie)	MAX (V[-hi])	DEP-μ	L-Anchor	MAX(i)	OCP(GV)	*R-Diph
a. toie		*!				
b.☞ toye					*	*
c. toe				*!		
d. toi	*!					
e. toy	*!					

On the basis of the dominance relationships among the constraints shown in (5.7) and (5.8), the constraint ranking given in (5.9) is finally established. (5.9) shows that

while OCP(CG: cor) is an undominated constraint, OCP(GV: cor) is dominated by five more powerful constraints. This explains why OCP(CG: cor) triggers categorical deletion of *y* and OCP(GV: cor) can trigger only variable deletion.

(5.9) Constraint ranking

OCP(CG), MAX(C), MAX(V[-hi]), DEP-μ, L-Anchor >> {OCP(GV) ← MAX(i)} >> *R-Diph

To summarize, in this section I have attempted to provide a phonological account of *y* deletion in Seoul Korean. I have suggested that two different processes of *y* deletion are triggered by two different OCP constraints operating in Seoul Korean. I have claimed that these two constraints have rather different strengths, which result in two different types of deletion — categorical and variable deletion of *y*.

5.8. Phonetic, perceptual account of instability in *ye*

I have suggested in the previous section that the reason why *y* deletes often before *e* is because there is an OCP constraint in Seoul Korean that prohibits the sequence of 'coronal vowel + coronal glide'. I also suggested that the deletion of *y* before the vowel *e* is a linguistic change in progress. Yip (1988:86) claims that the OCP can function not only as a synchronic rule trigger but also as a trigger of a diachronic process. I would suggest that the deletion of *y* before the vowel *e* in Seoul Korean is one example, where both synchronic and diachronic processes are observed to be triggered by the OCP simultaneously.

As mentioned earlier, a number of researchers including Pierrehumbert (1993), Kenstowicz (1994) and Zubritskaya and Sheffer (1995) have suggested that often the OCP, a phonological constraint, has a phonetic (i.e., perceptual or articulatory) basis. I would argue that the OCP constraint that triggers the diachronic deletion of *y* has a perceptual basis and supports the above researchers' suggestion. In the remainder of this section I will attempt to show why only *ye*, among the *y* diphthongs of Seoul Korean, shows instability. I will argue that instability in *ye* comes from perceptual factors, and that the monophthongization of *ye* to *e*, a presumed OCP-triggered diachronic change, is a perceptually motivated process.

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

What is noteworthy is that languages prefer a certain type of diphthongal sequence over others. According to Lindau, Norlin and Svantesson (1990), diphthongs occur in about one third of the world's languages. Diphthongs of the *ay*-type occur in 75 percent of these languages and the *aw*-type occur in about 65 percent. Lindau et al. (1990) report that these two types of diphthongs are the most frequently found among the languages which they surveyed. On the other hand, Eström (1971), who examined 83 languages that have diphthongs, reports that languages prefer those whose nucleus has greater sonority (or amplitude) — i.e., languages prefer low vowels to mid vowels, and mid vowels to high vowels as a nucleus of the diphthong. Eström's findings are summarized in Table 5.18.

a/ɑ	o/ɔ	e/ɛ	u	i
83%	34%	25%	18%	7%

Table 5.18. Percentage of languages for which the indicated vowel is the nucleus of a 'nucleus + glide' sequence (N = 83)
(Source: Eström 1971 (quoted in Lindblom 1986:37))

Kawasaki (1982) also makes a similar suggestion on the basis of her survey of diphthongs of various languages. She (ibid.: 28) notes that "combinations of a low vowel and a high vowel are favored over other combinations of vowels", which is basically the same finding as that of Lindau et al. (1990). Another important point that her survey reveals is that rising diphthongs also prefer the combination of 'low vocoid + high vocoid', though the sequence in their cases is not 'low vowel + high glide' but 'high glide + low vowel' (see Kawasaki ibid.:28). What these three reports, which are very comparable to one another, suggest is that languages prefer those diphthongs whose onset and offset are maximally (or sufficiently) different in the acoustic-auditory domain. These surveys also support rather impressionistic observations made by scholars (e.g., Stockwell 1978, Stampe 1972, and Rosenthall 1994) that languages prefer diphthongs which have maximal differentiation in formant frequency and/or sonority (amplitude) between the glide and the nucleus.[13]

The diphthongs of Seoul Korean do not seem to be an exception to this cross-linguistic tendency. As shown in Table 5.1 in Section 5.2, the sequence *yi*, whose onset and offset are least perceptually distinct, is not attested in Seoul Korean. Ohala (1980, 1992) suggests that maximum (or sufficient) perceptual distance is important to languages' selection of not only diphthongal sequences but sound sequences in general. He (1992:325) suggests that the following four acoustic parameters are the most relevant to the perception of sound sequences: spectral shape, amplitude, periodicity and fundamental frequency. Among these, spectral shape (which, for vowels, can be largely understood in

[13]Stockwell (1978:343) suggests that diphthongs tend to maximize the perceptual distance from the onset to the offset in the vowel space; Stampe (1972:582) observes that diphthongs are developed in such a way as to polarize the difference in sonority and color (i.e., palatality and labiality) between the glide and the nucleus; Rosenthall (1994:19) suggests that languages prefer those diphthongs whose glide and nucleus have a maximal sonority distance.

terms of formant frequency) and amplitude are considered as relevant parameters in the perception of diphthongal sequences, because the onset and offset of diphthongs, which are both vocoids, are not well distinguished in periodicity (i.e., voicing) and fundamental frequency (F0). The importance of formant frequency and amplitude in the languages' choice of their diphthongal systems are clearly supported by the three surveys of diphthongs discussed earlier. I will show below that the onset and offset of *ye* are the least perceptually contrastive of all the '*y* + vowel' sequencies of Seoul Korean.

Among the two acoustic parameters relevant to the perception of diphthongs (i.e., formant frequency and amplitude), let us first consider formant frequency. Since there is a general agreement among researchers (e.g., Fox 1983) that F1 and F2 are the most important formants in the perception of diphthongs as well as monophthongs, these two will be examined here. The current study relies on Yang (1993), the most recent acoustic study of Seoul Korean vowels, for the F1 and F2 frequency values. Table 5.19 shows the average F1 and F2 values of the monophthongs of Seoul Korean produced by ten male speakers as reported in Yang (1993).

Vowel	F1 (Hz)	F2 (Hz)
i	341	2219
e	490	1968
ɨ	405	1488
a	738	1372
ə	608	1121
u	369	981
o	453	945

Table 5.19. Average F1 and F2 values of Seoul Korean monophthongs produced by 10 male speakers (Source: Yang 1993:237)

Since a perceptual rather than acoustic scale is relevant to the current discussion, the Hz values of F1 and F2 given in Table 5.19 have been converted to the Mel values using the following formula:

(5.10) $P = (1000/\log_{10} 2)(\log_{10}(1 + f/1000))$ (Source: Fant 1973:48)

Then the calculation of the standard Euclidian distance on the 'formant frequency' plane – i.e., F1 * F2 plane – between the two vocoids of the *y* diphthongs was performed using the formula (5.11), where the 'glide' distance from the onset (i) to the offset or nucleus (n), D_{in}, is defined as the Euclidean distance between the two coordinate points, ($M1_i$, $M2_i$) and ($M1_n$, $M2_n$), on the F1 * F2 plane. (M1 and M2, respectively, refer to F1 and F2 values that have been converted to the Mel values.) Since the formant values of *y* are presumed to be very similar to those of *i* — the shape of the vocal tract when *y* is produced is highly similar to that for the production of *i* (Kent and Read 1992:136) — the latter's values were used for the glide.

(5.11) $D_{in} = \sqrt{(M1_i - M1_n)^2 + (M2_i - M2_n)^2}$

NB: D: glide distance from the onset to the offset of a diphthong;
M1 and M2: F1 and F2 values in Mel.

The results are given in the last column of Table 5.20. Though the onset and offset of diphthongs do not necessarily correspond exactly to the monophthong produced independently (Ladefoged 1982), Table 5.20 shows that the vowel *e* is perceptually closer to *i* on the F1 * F2 plane than any other vowel of Seoul Korean in terms of 'formant frequency'.

Vowel	F1 (Mel)	F1-difference from *i*	F2 (Mel)	F2-difference from *i*	Euclidian distance from *i* in terms of formant frequency (Mel)
i	425	0	1692	0	0
e	577	152	1575	117	192

ɨ	492	67	1319	373	379
a	800	375	1250	442	580
ə	688	263	1088	604	659
u	455	30	990	702	703
o	541	116	963	729	738

Table 5.20. Perceptual distance of each vowel of Seoul Korean from *i* in terms of 'formant frequency' (calculated based on the F1 and F2 Hz values given in Table 5.19)

The short glide distance between the onset and offset of *ye* on the F1 * F2 plane can be observed in the spectrogram shown in Figure 5.2, where the spectrograms for the five *y* diphthongs of Seoul Korean are given. The spectrogram for *ye* shows relatively minimal differences in F1 and F2 between the onglide and the offglide, when compared to the spectrograms for the other *y* diphthongs. The analysis of formant frequency distance conducted so far predicts that *ye* will be a perceptually indistinct diphthong, which would be more likely to undergo monophthongization than would more salient diphthongs.

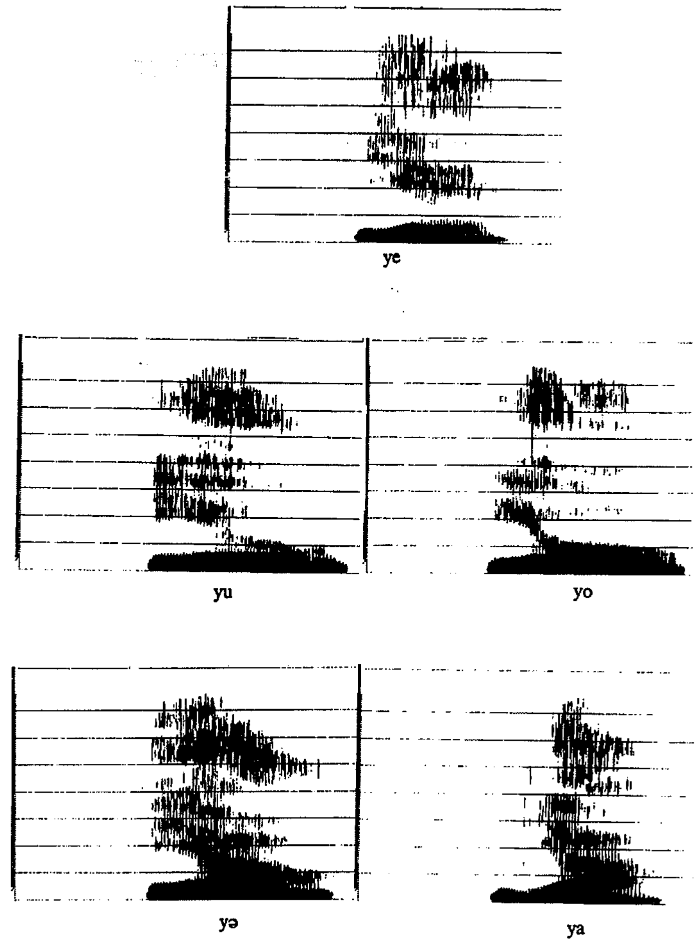


Figure 5.2. Spectrograms for the rising diphthongs of *y* in Seoul Korean

Now let us go on to examine the difference between onset and offset of the *y* diphthongs in another acoustic parameter, 'amplitude'. There seems to be a general agreement among researchers that the amplitude or intensity of vowels is highly correlated with the frequency value of F1 (e.g., Lindblom (1979:161) suggests that "vowel intensity is governed mainly by the frequency of the first formant."), which also has significant correlations with vowel height and mouth opening (Ladefoged 1982:178, Kent and Read 1992:92). This means that amplitude of vowels can be roughly approximated by the frequency value of F1, and that the difference in amplitude between the onset and offset of diphthongs can be approximated by the difference in the F1 values of the two. Based on this rationale, the current study makes use of the absolute difference in (Mel transformed) F1 values between the onset and the offset for the approximation of the amplitude distance between the two.

The F1 values of Seoul Korean monophthongs and their respective differences from the F1 value of the vowel *i* are given in the second and third columns of Table 5.21, respectively. The Hz values have been converted to the Mel values using the formula (5.10) because again a perceptual rather than acoustic scale is relevant here. The table below suggests that *u* and *ɨ*, both high vowels, have probably the shortest amplitude distances from *i*, while the low vowel *a* has the largest amplitude distance. The results shown in Table 5.21 make us predict that considering vowel intensity alone, *ye* would be more salient than *yɨ* and *yu* but less salient than *yo*, *yə*, or *ya*.

Vowel	F1 (Mel)	F1-difference from *i* (Mel)
i	425	0
e	577	152
ɨ	492	67
a	800	375
ə	688	263
u	455	30
o	541	116

Table 5.21. Difference in F1 values (Mel) between *i* and each vowel of Seoul Korean as an approximation of the perceptual amplitude distance from *i*

Following Ohala's suggestion that sound sequences are governed by the simultaneous effects of several factors (of which we are considering spectral shape and amplitude), we can combine the formant frequency and amplitude measures just discussed (Tables 5.20 and 21) into a 'composite' perceptual distance measure. The 'composite' perceptual distance can be approximated by taking both amplitude distance, approximated by the difference in F1 values, and glide distance on the F1 * F2 plane into consideration.

The consideration of both these two parameters are essential in the approximation of 'actual' perceptual distance, because these two both play an important role in the choice of diphthongs by languages. In other words, one of these two parameters alone cannot make a correct prediction of languages' preference or dispreference of certain types of diphthongs, if we assume that languages prefer (or disprefer) diphthongal sequences with maximal (or minimal) differentiation between the onglide and the offglide. Table 5.20 suggests that three diphthongs, i.e., *yu*, *yo*, and *yə*, have larger glide distances on the F1 * F2 plane than *ya*, which is suggested as the type of rising diphthongs most favored by languages. Also Table 5.21 suggests that the diphthong with the least amplitude distance between the glide and the nucleus is *yu*. However, *yu* is a sequence allowed in Korean and also unlike *ye* it does not show any sign of instability. These facts combine to show that neither glide distance nor amplitude distance alone cannot adequately explain why certain types of diphthongal sequences are preferred or dispreferred by languages.

It is a very difficult question how to weight formant frequency and amplitude, the two acoustic parameters relevant in the perception of diphthongs. There is no known or established answer to this question. One possible and plausible way of calculating the composite perceptual distance is to obtain the average of the following two values giving an equal weight to the two — the glide distance between the onset and the offset and the amplitude distance between the (on)glide and the nucleus approximated by the difference in F1 values. This method assumes that differences in formant frequency and amplitude (between the onset and the offset) play comparable roles in the perception of diphthongs.[14] The rightmost column of Table 5.22 lists the approximated perceptual distance of each of the 'y + vowel' sequences calculated in this method. The table shows that the onset and the offset of *ye* are the least perceptually distinguishable among the 'y + vowel' sequences allowed in Seoul Korean.

Diphthongal sequences	Perceptual distance in terms of formant frequency (Mel)	F1-difference (Mel)	Average difference (Mel)
**yi*	0	0	0
**yɨ*	379	67	223
ye	192	152	172
ya	580	375	478
yə	659	263	461
yu	703	30	367
yo	738	116	427

Table 5.22. Composite perceptual distance of each of the 'y + vowel' sequences obtained by averaging the values of glide distance on the F1 * F2 plane and amplitude distance as approximated by the differences in F1 values

NB: The starred sequences are not allowed in Seoul Korean.

[14]The findings by the three surveys seem to suggest that amplitude plays at least as important a role as formant frequency because languages' preference of *ay* and *aw* type diphthongs and of low vowels as a nucleus of diphthongs may be explained more by the amplitude parameter than the formant frequency parameter (refer to Table 5.20).

Another way of calculating the composite perceptual distance is to weight the F1 difference significantly heavier than the F2 difference and then approximate the perceptual difference between the onset and the offset. Lindblom (1979, 1986) observes that languages exploit differences in F1 significantly more than differences in higher formants in the distinction of their vowels. He (1986:22) notes "if vowel systems had developed security margins guaranteeing a certain amount of perceptual differentiation in communication under noisy conditions, they would be expected to exploit F1 (height or sonority) more than other formants...". He (1979) also shows that the frequency of confusions in the identification of vowel pairs in Swedish and English reported in Nooteboom 1968 and Peterson and Barney 1952, respectively, can be chiefly determined by the first formant differences between vowel pairs — i.e., the smaller difference in F1 values there is between a vowel pair, the more often the pair was confused with each other. On the basis of this rationale, he proposes to weight F1 significantly more than higher formants in the prediction of possible vowel systems of the world's languages, while not attempting to provide a definite answer to the question of how much more weight should be assigned to the F1 difference.

In our case, one plausible weighting is to give the F1 difference twice the weight of the F2 difference because the former is relevant to both the glide distance on the F1 * F2 plane and the amplitude distance (between the onset and the offset), while the latter concerns only the distance in formant frequency. We can then calculate the standard Euclidian distance using the formula (5.12). The final column of Table 5.23 lists the perceptual distance between onset and offset of each *y* diphthong obtained using this method.

(5.12) $D_{in}\ (\text{composite}) = \sqrt{(2 * (M1_i - M1_n))^2 + (M2_i - M2_n)^2}$

Diphthongal sequences	2 * Perceptual F1 difference (Mel)	Perceptual F2 difference (Mel)	Perceptual distance from *i* (Mel)
**yi*	0	0	0
**yɨ*	134	373	396
ye	304	117	326
ya	750	442	871
yə	526	604	801
yu	60	702	705
yo	232	729	765

Table 5.23. Composite perceptual distance of each of the 'y + vowel' sequences obtained by giving twice as heavy weight to the F1 difference as to the F2 difference

The two proposed methods of calculating the composite perceptual distance produce very comparable results. Both identify *yi*, *yɨ* and *ye* as the sequences whose onset and offset are the least perceptually contrastive. Both also select *ya* as the most optimal 'glide + vowel' sequence, as is supported by the three surveys mentioned earlier. (These results, in turn, suggest that the weightings given in the current study to amplitude and formant frequency in the perception of diphthongs are reasonably correct.)

The sequences *yi* and *yɨ* are not possible sequences in Seoul Korean. When the languages' preference of those diphthongs whose onset and offset are maximally (or sufficiently) perceptually different is considered, the results also suggest that *ye* (which has even less internal perceptual distinction than *yɨ*), is less perceptually stable than any other *y* diphthong of Seoul Korean. I would suggest that this is why, among the *y* diphthongs, *ye* alone is going through a monophthongization change. Seoul Korean speakers may have more difficulty perceiving the onglide *y* in the sequence *ye* than in the other 'y + vowel' sequences because of the similarity between the two vocoids of this diphthong in their acoustic, auditory characteristics. The perceptual distance between the onset and offset of the (logically) possible 'y + vowel' sequences is shown in Figure 5.3, where the weighted differences in F1 and F2 of each vowel from *i* (these values are from Table 5.23) are

located on the 'perceptual distance (from *i*)' plane. The figure shows that *e* has the shortest perceptual distance from *i* among the possible vowels that can follow *y* in Seoul Korean.

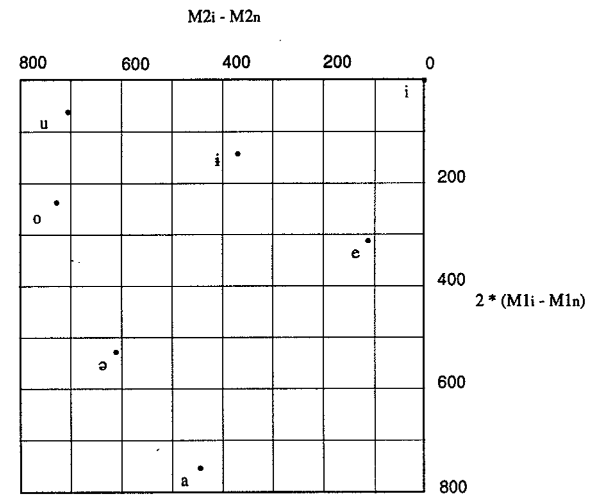


Figure 5.3. Seoul Korean vowels on the plane of perceptual distance from *i*

NB: The (x,y) values for each vowel are from Table 5.23

5.9. Conclusion

This chapter has examined *y* deletion in Seoul Korean on a sociolinguistic database. It was first shown that Seoul Korean has two distinct processes of *y* deletion: categorical and variable processes. The first five sections of this chapter focused primarily on the variable deletion. I attempted to reveal the linguistic and external constraints which condition this variable process relying on statistical evidence. The results of the statistical analyses suggested that the deletion of *y* is not just a synchronic process but also a change in progress.

An attempt was also made to provide a phonological account of two processes of *y* deletion. I suggested that two different OCP constraints trigger the deletion of *y* in Seoul Korean. It was claimed that the strengths of these two OCP constraints are crucially different: the stronger one triggers the categorical deletion, while the weaker one triggers the variable deletion. The different strengths of the two OCP constraints was shown within the framework of Optimality Theory expanded by the notion of 'variable dominance' (Reynolds 1994).

An attempt was also made to provide a phonetic account of the ongoing monophthongization of *ye*. It was suggested that *ye* is perceptually the most unstable among the *y* diphthongs of Seoul Korean. This suggestion was based on the finding that *e* is perceptually closest to *i* in the perceptual vowel space constructed considering both amplitude and formant frequency, the two acoustic parameters most relevant in the perception of diphthongs. It was argued that the ongoing monophthongization of *ye* in Seoul Korean is motivated primarily by perceptual factors.

CHAPTER 6

THE CURRENT STATUS OF *ɨ͜i*: MONOPHTHONGIZATION IN PROGRESS

6.1. Introduction

Late Middle Korean had six falling diphthongs: *ɨy*, *əy*, *ay*, *uy*, *oy*, and *ʌy* (see Figure 1.4).[1] Of these, five have monophthongized. The diphthong *ɨy*, or to be more exact, the current form of the Late Middle Korean diphthong *ɨy*, is the only remaining one in contemporary Seoul Korean and can have two different diphthongal realizations. In word-initial position,[2] it is realized as [ɨi̯], but [ɨ̯i] is the form when the diphthong occurs in non-word-initial position (cf. Y.C. Chung 1991). (*ɨ̯* and *i̯* indicate the glide (less prominent) counterpart of *ɨ* and *i*, respectively.) Further, Korean phonologists typically propose CGVC as the syllable structure of Seoul Korean, thus making the VG sequence an anomaly. I, accordingly, represent this diphthong as *ɨ͜i* in this study.

Researchers have suggested that *ɨ͜i* is also going through a change following the paths of the other falling diphthongs of Late Middle Korean. One extreme claim is made by S.K. Kim (1976), who argued that this diphthong has completely monophthongized and is not present in Korean any more. Y.C. Chung (1991) also suggested that the diphthong may be a 'psychological' diphthong but is not usually phonetically realized in Korean. However, these scholars' opinions are not a majority position among Korean phonologists and dialectologists. Most scholars (e.g., Kim-Renaud 1986b, C.A. Kim 1978, H.K. Choi 1991) hold the position that this diphthong is present as a phoneme in Seoul Korean,

[1] If /iy/ was also present in Late Middle Korean as some scholars claim, then the number reaches seven.
[2] The term 'word-initial position' is used in this chapter only when I refer to word-initial segment position; the term 'word-initial position' is not identical to 'word-initial syllable position'.

though there is also general agreement among them that the diphthong is going through monophthongization in present-day Korean.

Though past studies of *ɨ͜i* (e.g., Kim-Renaud 1986b, Y.C. Chung 1991) made careful and interesting observations concerning the monophthongization of *ɨ͜i*, these studies were based on rather limited data, i.e., mainly based on the author's personal observations or impressions. The change and current status of *ɨ͜i* has never been investigated on the basis of a large database in the framework of quantitative sociolinguistics, whose methodology is known to have a particular advantage in the investigation of linguistic changes in progress.

In light of this, this chapter presents a quantitative analysis of the monophthongization of *ɨ͜i*. I show, based on quantitative results, that the monophthongization of *ɨ͜i* involves not just a single diachronic change but several changes that occur (or have occurred) in different phonological and morphological environments. I also show that only one change among these may be currently considered as a change in progress, while the others are completed changes. I then attempt to provide phonetic and phonological explanations of the monophthongization of *ɨ͜i*. While both phonetic and phonological explanations address the issue concerning the motivation behind monophthongization, the phonological account also attempts to provide an answer as to why the change is happening the way it is. The phonological explanation also gives an account of the synchronic variation involving *ɨ͜i*.

This chapter is organized as follows: in 6.2. the methodology of this study is introduced. In 6.3. the results of the statistical (Varbrul) analyses of the data are provided. In 6.4. the results of the self-evaluation test are given. In 6.5. the implications of the results are discussed. In 6.6. phonetic and phonological accounts of the monophthongization of *ɨ͜i* are attempted. This section is followed by the concluding remarks in 6.7.

6.2. Methods

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

Though the vowel written orthograhically as *ɨi* " " used to be (without doubt) the falling diphthong *ɨi*,[3] it is not clear whether it is still underlyingly a diphthong in all the different phonological and morphological contexts where the diphthong used to appear (especially when the common observation made by scholars is considered that the diphthong is monophthongizing). This was the reason why it was not possible to decide earlier (in 2.3.2.3) whether the current investigation is dealing with one linguistic variable or several. This is the first issue that should be addressed in this study. We will, however, begin our investigation of the variation and change of *ɨi* on the supposition that the underlying form is still *ɨi* in all contexts and that we are dealing with one variable, (ɨi).

Like the variable (y), the tokens of (ɨi) do not appear very often in conversational speech. Accordingly the tokens found in all portions of the recordings of conversational speech were used for this study. The sentence and word lists contained 33 and 22 potential tokens of (ɨi), respectively. As in the investigation of (w) and (y), these potential tokens were designed to reveal the effects of the linguistic constraints to be discussed just below.

6.2.1. Preliminary analysis

As introduced in 2.2.1. the variation (and also change) involving the diphthong *ɨi* in Seoul Korean is subject to the following constraints: whether there is a consonant preceding the diphthong, whether the diphthong appears in a word-initial syllable or in a non-word-initial syllable, and whether *ɨi* is used as a possessive marker or not. (As discussed earlier, these three constraints also play an important role in the change and variation of *ɨi* in other dialects: in the Phyongan dialect the diphthong has changed to *i* or *u* after a consonant, and *i* or *ɨ* elsewhere (Y.B. Kim 1992); in the Kyongsang dialect the diphthong has changed to *i* with the exception of the possessive marker (T.H. Paek 1990); in the Kangwon and Chungchung dialects (cf. S.H. Toh 1977), without a preceding consonant the diphthong *ɨi* is usually produced as [i] in non-word-initial syllables and the diphthongal variant alternates with [ɨ] and [i] in word-initial syllables.)

When there is a preceding consonant, *ɨi* shows alternation in Seoul Korean between [i] and [ɨ̯i]. When there is no consonant preceding *ɨi*, syllable position within the word is a crucial constraint. When *ɨi* occurs in a word-initial syllable, an alternation between [ɨi̯] and [ɨ] is observed, but when *ɨi* occurs in a non-word-initial syllable, it is realized as either [i] or [ɨ̯i]. The possessive marker *ɨi*, which occurs only in a non-word-initial syllable, shows different behavior in that it exhibits an alternation between [e] and [ɨ̯i].

As mentioned earlier, the first issue that should be settled is whether *ɨi* is still the underlying form in all these phonological and morphological contexts. As a first step towards settling this issue, a preliminary statistical analysis was conducted. I examined the data to check which vowel is now produced by Seoul Korean speakers in the environments where the diphthong *ɨi* would have appeared before the beginning of monophthongization (i.e., the environments where the orthographic form *ɨi* is used in the written language of present-day Korean). The results of this preliminary analysis are given in Table 6.1.

[3]The horizontal and vertical bars of " " indicate *ɨ* and *i*, respectively.

♦post-consonantally (e.g., *hɨimang* 'hope')

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

♦non-post-consonantally

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

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

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

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

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

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

Table 6.1. Results of the preliminary statistical analysis of *ɨi̯*

NB: The example words are given in the table following their orthographic representations.

The results given in Table 6.1 first reveal that there is a radical difference between spontaneous (conversational) and read speech in the speakers' production. This pattern is noticeably different from the one exhibited by the two previous variables (w) and (y) (see Tables 4.8 and 5.5), where a relatively small difference is observed between spontaneous and read speech. Since we are examining the phonemic status of *ɨi̯* in different environments, it should naturally be the case that our assessment of the underlying form be based on spontaneous speech, not read speech, because the latter is not a true reflection of

the phonological system native to the speakers. I thus do not consider read speech in the assessment of the underlying form in each environment.

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

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

In sum, the results given in Table 6.1 can be interpreted as follows: *ɨi̯* has changed to *i* when it is neither a word-initial vowel nor a possessive marker, to *e* when it is used as a possessive marker, but still remains an underlying diphthong in word-initial position. The quantitative results support C.S. Lee's (1994) suggestion that *ɨi̯* remains a diphthong only in word-initial position. Based on the results shown in Table 6.1, I assume in this study that underlying *ɨi* is present in Seoul Korean only in word-initial position and that *ɨi* has already monophthongized in the other phonological or morphological contexts.

The quantitative results also settle the question as to whether the current study is dealing with one or several variables. Since we assume that *ɨi* has monophthongized except in word-initial position, there is no basis on which to think that the current study is dealing with a single variable. This study is actually concerned with three variables, which I label as (ɨi$_j$), (ɨi$_p$), and (ɨi$_e$), where 'ɨi' represents the orthographic symbol *ɨi* and 'ɨi$_j$', 'ɨi$_p$', and 'ɨi$_e$' respectively, represent 'word-initial ɨi', 'possessive marker ɨi', and 'ɨi elsewhere'. The only property the three have in common in present-day Seoul Korean is that they share the orthographic symbol *ɨi*, i.e., that they are written with the same spelling. The three variables examined in this chapter have different sets of variants as shown in Table 6.2.

Variables	Variants
1. (ɨi$_j$)	[ɨ] ~ [ɨi]
2. (ɨi$_e$)	[i] ~ [ɨi]
3. (ɨi$_p$)	[e] ~ [ɨi]

Table 6.2. Three variables examined in the current study

6.2.2. Tokens of the three variables

The judgment of the variants of each variable was made twice: at the time of the transcriptions and before the statistical analysis. The boundary between the monophthong and the diphthong was clearer than the presence and absence of the two glides *w* and *y*. Each token was judged as one of the two variants of each variable. Another Seoul Korean speaker independently judged one hundred tokens of each of the (ɨi$_j$), (ɨi$_e$), and (ɨi$_p$) variables. Her judgments and mine showed a higher degree of agreement in this study than in the two earlier studies. There were 91, 96, and 99 percent agreement between her judgments and mine in the variables (ɨi$_j$), (ɨi$_e$), and (ɨi$_p$), respectively. As in the analysis of

(w) and (y), unread and misread potential tokens were excluded from the analysis. The variables (ɨi$_j$), (ɨi$_e$), and (ɨi$_p$) had 836, 1315, and 1332 tokens, respectively.

6.2.3. Variable rule analysis

The three variables were subject to Varbrul analyses (Ivarb version 2.3. Pintzuk 1988). The factor groups listed in Tables 6.3 and 6.4 were considered in the Varbrul analyses of (ɨi$_j$) and (ɨi$_e$), and (ɨi$_p$), respectively. Only external constraints — speech style, gender, social status, and age — were considered in the analysis of the variables (ɨi$_j$) and (ɨi$_e$), since no linguistic constraints were predicted to play a significant role in the alternation of the respective two variants of (ɨi$_j$) and (ɨi$_e$). (It is predicted that before the monophthongization of non-word-initial *ɨi* (i.e., when (ɨi) was one variable), there must have been a stage where the presence of the preceding consonant and syllable position were linguistic constraints on the variable (ɨi).) The factor group, 'presence of the preceding consonant', (as well as the external constraints) was considered in the analysis of (ɨi$_p$), because the noun (or pronoun) that precedes the possessive marker can end in either a vowel or a consonant, e.g., *na-ɨi* 'my (*I*+Pos)', *ton-ɨi* 'of money (*money*+Pos)'. The factors of the four external constraints were defined in the same manner as in the analyses of (w) and (y).

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

Table 6.3. Factor groups considered in the variable rule analyses of (ɨi$_j$) and (ɨi$_e$)

Factor groups	Factors
1. presence of preceding consonant	ø, present
2. speech style	ingroup, interview, sentence reading, phrase reading
3. gender	male, female
4. social status	upper, middle, lower
5. age	16-25, 26-45, 46 or older

Table 6.4. Factor groups considered in the variable rule analysis of (ii_p)

6.3. Results of the Varbrul analyses

Results for the variable (ii_j)

The results of the Varbrul analysis of the tokens of (ii_j) are given in Table 6.5. In the table the percentage of application indicates the percentage of the monophthongal variant, i.e., [ɨ], among the tokens. Three factor groups, 'speech style', 'social status', and 'age' were selected as significant in the variation involving (ii_j). The speakers produced the monophthongal variant clearly more often in more casual speech than more formal speech. Also the frequency of monophthongal production showed a linear relationship with both the social status and age scales. The rate of monophthongal production showed an increase towards the lower end of both these scales. However, 'gender' was not chosen as a significant constraint, suggesting that the two gender groups did not show a significant difference in their behavior toward this variable.

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

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

Table 6.5. Goldvarb probabilities for factors for (ii_j)

As mentioned earlier, the subjects showed a more clear (radical in the case of the variable (ii_c)) difference between spontaneous speech and read speech in the variables examined in the current chapter than the variables (w) and (y). Accordingly, a cross-tabulation of speech style and the other factor groups (social and linguistic) will be given throughout this section for reference. Table 6.6 indicates that the social status and age factors show generally homogeneous effects across spontaneous and read speech in the variable (ii_j). (The gender factors may be exceptional in this regard, but the two gender groups' production patterns in spontaneous speech did not show a statistically significant difference in the variable (ii_j) ($\chi^2 = 1.737$, $p > .10$)). As will be shown shortly, considerably different production patterns are observed across spontaneous and read speech in the other two variables.

	Spontaneous speech	Read speech
male	53% (35/66)	36% (131/361)
female	41% (23/56)	50% (118/235)
upper	37% (11/30)	29% (75/263)
middle	50% (37/74)	34% (79/232)
lower	56% (10/18)	43% (94/219)
16-25	64% (16/25)	41% (98/238)
26-45	45% (14/31)	38% (90/237)
45+	42% (28/66)	26% (61/239)

Table 6.6. Cross-tabulation of 'speech style' and three social constraints for (ii_i): percentage of monophthongal production

Results for the variable (ii_e)

Table 6.7 gives the results of the Ivarb analysis of the tokens of the variable (ii_e). The four external constraints were all selected as statistically significant. The effect of speech style on the subjects' choice between the two variants was found to be extremely strong. However, a closer look at the results reveals that none of the three social constraints have a significant effect in spontaneous speech. This is shown in Table 6.8, where the cross-tabulations of speech style and each of the other potential external constraints are given.

Factor groups	Factors	Weight	% Applications	Total N
*Speech Style	ingroup	0.94	99	72
	interview	0.88	97	362
	sentence R	0.56	85	458
	word R	0.08	32	423
*Gender	male	0.54	76	691
	female	0.45	69	624
*Social Status	upper	0.44	72	464
	middle	0.41	66	453
	lower	0.66	80	398
*Age	16-25	0.59	77	437
	26-45	0.39	69	463
	46+	0.52	71	415

Input = 0.85, loglikelihood = -482.028
Total chi-square = 90.240, Chi-square/cell = 1.367

Table 6.7. Goldvarb probabilities for factors for (ii_e)

No (significant) conditioning of the three social constraints is visible in spontaneous speech. This suggests that the reason why the three social factor groups were selected in the Varbrul analysis is based not on the data of spontaneous speech but of read speech. It was observed that for the current variable the subjects produce spelling pronunciations frequently in read speech, especially in word-list reading. The production of spelling pronunciation is saliently observable in this variable because the orthographic representation *ii* is radically different from the underlying form, i.e., *i* (refer to Table 6.1). It is conjectured that the strong effect of speech style on the alternation of the two variants of this variable is also partly due to the subjects' frequent spelling pronunciations.[4] (Note the weight difference between ingroup speech and word-list reading, 0.94 vs 0.08.)

[4]Then the question arises 'why informants produce spelling pronunciations clearly only in the variables examined in this chapter'. I speculate that the following two are the factors. The first is a very clear phonetic (or phonological) difference between monophthongal and diphthongal variants. Diphthongal variants examined in the current chapter have not only two different targets in the vowel space but also a considerably longer duration than monophthongal variants. (On the other hand, sequences '*w* (or *y*) + V' have a clearly shorter duration than *ii* (which is a falling diphthong).) A radical difference in phonetic characteristics of the two types of variants seem to induce the informants to pay more attention to visual

	Spontaneous speech	Read speech
male	98% (239/245)	63% (283/446)
female	97% (184/189)	56% (245/435)
upper	96% (176/184)	57% (159/280)
middle	98% (125/127)	53% (174/326)
lower	99% (122/123)	71% (195/275)
16-25	99% (153/155)	65% (183/282)
26-45	98% (157/160)	80% (162/203)
45+	95% (113/119)	58% (173/296)

Table 6.8. Cross-tabulation of 'speech style' and three potential social constraints on (ii$_e$): percentage of monophthongal production

The results given in Table 6.8 also indicate that the frequency of spelling pronunciations of various social groups is rather unpredictable, i.e., probably determined by idiolectal characteristics rather than social group factors. This interpretation is supported by the fact that Varbrul weights for the social status and age groups (given in Table 6.7) do not show any meaningful relationships with the social status and age scales, respectively.[5]

Results for the variable (ii$_p$)

The results of the Varbrul analysis of the tokens of (ii$_p$) are as given in Table 6.9. The five factor groups considered in the Varbrul analyses were all selected as significant in the stepwise regression analysis.

Factor groups	Factors	Weight	% Applications	Total N
*Presence of preceding C	present	0.55	78	989
	ø	0.37	67	343
*Speech Style	ingroup	0.84	94	18
	interview	0.92	97	144
	sentence R	0.44	73	834
	phrase R	0.37	71	336
*Gender	male	0.47	73	662
	female	0.53	78	670
*Social Status	upper	0.60	82	443
	middle	0.37	65	446
	lower	0.53	79	443
*Age	16-25	0.56	79	432
	26-45	0.42	70	433
	46+	0.52	77	467

Input = 0.80, loglikelihood = -671.680
Total chi-square = 200.026, Chi-square/cell = 1.786

Table. 6.9. Goldvarb probabilities for factors for (ii$_p$)

cues (of diphthongal variants), i.e., spellings, in their read speech.
The second factor is presumed to be a disparity between readers' mentally stored underlying representations and orthographic representations which they see. The disparity between these two representations also seems to play an important role in making readers sensitive to the spellings of words. The fact that informants produced more clear style effects in the variable (ii$_e$) than in (ii$_i$) can be blamed for the second factor: In the case of variable (ii$_i$), the underlying representation has not changed yet. The informants' showing more dramatic style effects in (ii$_e$) than (ii$_p$) is ascribable to the fact that phrase reading, rather than word reading, was used for the latter (cf. Sections 3 and 5 of Appendix B).

[5]One possible interpretation of the cross-tabulation of speech style and social status is that the interior (middle) group of the social hierarchy (often claimed to be the most linguistically sensitive group (e.g., Labov 1972c)) shows hypercorrective behavior in read (i.e., more formal) speech. However, this interpretation is not plausible because a consistent pattern is not observed in the variables (ii$_i$) and (ii$_p$) as shown in Tables 6.6 and 6.10.

The cross-tabulations of 'speech style' and each of the other four factor groups (given in Table 6.10), however, reveal that the significance of these (potential) constraints holds only in read speech; no effect of any of these constraints is observed in spontaneous speech (ingroup and interview speech). As in the case of the variable (ii$_e$), read speech was heavily influenced by spelling pronunciations. Spelling pronunciations were very saliently noticed in the current variable as well as in (ii$_e$) because again the orthographic representation is totally distinct from the underlying form *e* (cf. Table 6.1). However, the degree to which read speech was dominated by spelling pronunciations was lower in this variable than in the variable (ii$_e$). This is, as mentioned above, attributable to the fact that not words but phrases (e.g., *pekco-ii nole* 'a swan song (*swan*-Pos. song)') were included in the reading section for the examination of this variable (cf. Appendix B). The reason why phrases rather than words were used was primarily because it was not possible to make a semantically natural and complete unit with just a single word (e.g., *pekco-ii* 'of a swan (*swan*-Pos.)') since the variable currently examined functions as a possessive marker. It is presumed that phrase reading holds a medial position between sentence reading and word reading in the stylistic continuum as defined by Labov (1972e) in terms of degree of attention paid to speech.

		Spontaneous speech	Read speech
Preceding C	ø	100% (48/48)	61% (181/295)
	present	96% (109/114)	76% (666/875)
Gender	male	97% (67/69)	70% (413/593)
	female	97% (90/93)	75% (434/577)
SEC	upper	98% (42/43)	80% (321/400)
	middle	98% (51/52)	61% (240/394)
	lower	96% (64/67)	76% (286/376)
Age	16-25	97% (28/29)	78% (314/403)
	26-45	97% (57/59)	66% (246/374)
	45+	97% (72/74)	73% (287/393)

Table 6.10. Cross-tabulation of 'speech style' and four potential constraints on (ii_p): percentage of monophthongal production

The subjects' (or the social groups') behavior in read speech with respect to the variable (ii_p) was not very predictable, as in the case of the variable (ii_e). No consistent patterns were observed in various social subgroups' behavior across the two variables. It is conjectured that this is again due to the influence of spelling pronunciations, which was characterized earlier as idiolectally-determined rather than socially-motivated. The cross-tabulation of speech style and the presence/absence of the preceding consonant indicates that the latter is not a significant constraint on the variable (ii_p), at least in spontaneous speech.

6.4. Results of the self-evaluation test

Six questions were designed to test how well the subjects are aware of the monophthongization of *ii* in different contexts and how objectively they evaluate their actual production involving the three variables currently examined. The words used in the test were chosen based on the results from the pilot test (suggesting the completed monophthongization of non-word-initial *ii* and the possessive marker *ii*). Test words were selected among those which are written with the orthographic symbol *ii*, i.e., those words whose production used to involve the Late Middle Korean diphthong *ɨy*. Questions 13 and 14 (see the table below) examine the informants' self-evaluation of their production involving the variable (ii_i); 15 & 16 and 17 & 18 are concerned with the variables (ii_e) and (ii_p), respectively. Table 6.11 shows the test words selected, two answers for each question, and the phonological or morphological characteristics of *ii* in each test word.

Words	Answer (a)	Answer (b)	Characteristics of *ii*
13. *iimi* 'meaning'	*iimi*	*imi*	word-initial *ii*
14. *iisik* 'consciousness'	*iisik*	*isik*	word-initial *ii*
15. *suii* 'voluntariness'	*suii*	*sui*	non-word-initial *ii*
16. *yuii* 'attention'	*yuii*	*yui*	non-word-initial *ii*
17. *kiii sinim* 'his trust'	*kiii*	*kie*	possessive marker *ii*
18. *tongsaii yonglye* 'verbs' usage'	*tongsaii*	*tongsae*	possessive marker *ii*

Table 6.11. The words (containing the spelling *ii*) which were used in the self-evaluation test and the characteristics of *ii* in each word

The results of the self-evaluation test are given in Table 6.12. The number of the subjects who reported that their usual production is the diphthongal form and the monophthongal form are given in the second and the third column, respectively. The phonological or morphological characteristics of each *ii* are repeated in the final column.

Words	Answer (a)	Answer (b)	Characteristics of *ii*
13. *iimi*	41	15	word-initial *ii*
14. *iisik*	44	12	word-initial *ii*
15. *suii*	36	20	non-word-initial *ii*
16. *yuii*	22	34	non-word-initial *ii*
17. *ki ii sinim*	18	38	possessive marker *ii*
18. *tongsaii yonglye*	31	25	possessive marker *ii*

Table 6.12. The results of the self-evaluation test for each test word

As shown in Table 6.13, more informants self-reported a monophthongal production for non-word-initial *ii* and the possessive marker *ii* than for word initial *ii*. The difference between the former (non-word-initial *ii* and the possessive marker *ii*) and the latter (word initial *ii*) in the subjects' self-report of monophthongal production was significant (χ^2 = 24.117, p < .001). The subjects, however, did not show a significant difference between non-word-initial *ii* and the possessive marker *ii* in their self-report (χ^2 = 1.449, p > .20). The results of the informants' report generally reflect the speakers' actual production pattern shown in the last column of Table 6.13, though the results also indicate that many subjects do not objectively evaluate their actual production.[6] Only spontaneous speech was considered in the calculation of the informants' actual frequency of monophthongal production, because read speech is, as mentioned earlier, heavily influenced by spelling pronunciations and not a true indication of the subjects' actual production pattern.

[6] A large discrepancy between the informants' self-report and actual production shown in Table 6.13 also indicates that speakers of Seoul Korean are not well aware of the monophthongization process which *ii* has been going through.

Characteristics of *ii*	Answer (a)	Answer (b)	(b)%	Actual (b)%
word-initial *ii*	85	27	24%	48%(58/122)
non-word-initial *ii*	58	54	48%	97%(423/434)
possessive marker *ii*	49	63	56%	97%(157/162)

Table 6.13. Informants' self-report on their production of different *ii*'s

NB: a. (b)% indicates the percentage of those subjects who reported that the monophthongal variant is their usual pronunciation
b. Actual (b)% indicates the informants' actual percentage of monophthongal production (in spontaneous speech)

The three age groups exhibit a rather clear difference in their frequency of monophthongal production in the variable (ii_i) but no difference in the variables (ii_e) and (ii_p) (refer to Tables 6.6, 6.8, and 6.10). The self-report involving the variable (ii_i), i.e., the responses to questions 13 and 14, reflects the three groups' actual production trend but in an exaggerated manner, prompting a speculation that older speakers under-report their monophthongal production. The same interpretation can account for the informants' self-report involving (ii_e): the three age groups do not show any difference in their actual production but the under-reporting of the older speakers leads to the results shown in the middle column of Table 6.14. However, the three groups' self-report involving (ii_p) does not support the current interpretation.

	(b)% 13 & 14 (ii_j)	(b)% 15 & 16 (ii_e)	(b)% 17 & 18 (ii_p)
16-25	50%(16/38)	55%(21/38)	59%(22/38)
26-45	18%(7/38)	47%(18/38)	47%(18/38)
46+	11%(4/36)	41%(15/36)	64%(23/36)

Table 6.14. Different age groups' self-report on their production of *ii*

The two gender groups exhibited no significant difference in their production involving the three variables (see the last column of Table 6.15; also refer to Tables 6.6, 6.8, and 6.10): only in the variable (ii_j) a slight difference was shown but, as mentioned earlier, it was not statistically significant ($\chi^2 = 1.737$, $p > .10$). The self-evaluation test produced exactly the same result. Overall the same number of informants reported monophthongal production from the two gender groups.

	13	14	15	16	17	18	(b)%	Actual (b)%
male	8	7	12	16	18	11	43%(72/168)	90%(341/380)
female	7	5	8	18	20	14	43%(72/168)	88%(297/338)

Table 6.15. Different gender groups' self-report on their production of *ii*

The three social status groups showed a difference in their production only for the variable (ii_j) (cf. Tables 6.6, 6.8, and 6.10). The production of the monophthongal form increased toward the lower end of the social hierarchy in this variable. In the other two variables no difference was exhibited across the social status groups. A pattern rather similar to the actual production was shown in the self-evaluation involving the variable (ii_j), though the difference among the three groups' self-report was very minor and statistically insignificant ($\chi^2 = .59$, $p > .70$). The subjects' self-reports regarding (ii_e) and (ii_p) produced rather unpredictable patterns, though (again) the differences among the three

groups' self-report were not statistically significant neither in the variable (ii_e) ($\chi^2 = 3.43$, $p > .10$) nor in (ii_p) ($\chi^2 = .88$, $p > .50$). This result may indicate that the differences shown in Table 6.16, especially the results for variables (ii_e) and (ii_p), are just the reflection of statistical fluctuations.

	(b)% 13 & 14 (ii_j)	(b)% 15 & 16 (ii_e)	(b)% 17 & 18 (ii_p)
upper	21%(8/38)	37%(14/38)	61%(23/38)
middle	24%(9/38)	58%(22/38)	58%(22/38)
lower	28%(10/36)	50%(18/36)	47%(18/36)

Table 6.16. Different SEC groups' self-report on their production of *ii*

6.5. Discussion

The results given in Tables 6.5 and 6.6 suggest that *ii* is currently going through monophthongization in word-initial position. Both age group and social class distribution of the two variants of the variable (ii_j) exhibit the patterns that can be typically observed in phonological changes in progress. The fact that the diphthongal, not monophthongal, variant (i.e., *ii*) is orthographically represented by the spelling can be taken as additional evidence supporting the claim that the diphthong is now monophthongizing. (The Korean orthographic system was invented, as mentioned earlier, modeling the actual pronunciations of the 15C Seoul Korean speakers.) The two variants seem to be in close competition with each other. In spontaneous speech, the diphthongal and the monophthongal variants occur about 52% and 48% of the time, respectively. This result suggests that the diphthong *ii* is still present in Seoul Korean as a phoneme (despite its limited phonological distribution), refuting some researchers (e.g., S.K. Kim 1976) claim that the diphthong has completely monophthongized.

On the other hand, no clear conditioning of any social constraint on the variable (ii_e) is visible in the (spontaneous speech) data for this variable. Neither the age groups nor the gender and SEC groups show any noticeable differences in the frequency of monophthongal production (Table 6.8). This result, combined with the informants' near-categorical monophthongal production, suggests that the monophthongization of *ii* in non-word-initial position is complete. As in the two previous chapters (see especially 4.7.1), those 'outlying' tokens which account for less than five percent of the tokens (three percent in the current variable) are assumed to reflect informants' speech errors or some speakers' extraordinary linguistic behavior; they are understood as 'noise' which empirical studies often display, and are hard to control. The results shown in Table 6.8 support C.S. Lee (1994:279), who suggested that *ii* has monophthongized to *i* post-consonantally and in non-word-initial syllables.

The monophthongization of *ii* after consonants *k, p, s,* c^h was officially acknowledged in 1933 with the publication of *cosene chelcapep thongilan* ("A Unification Proposal for the Spelling of the Chosun Language"), which contains an article saying that *ii* should be orthographically written as *i* when *k, p, s,* and *ch* precede *ii*. *Phyocwun palumpep* ("Standard Pronunciation of Korean") published in 1988 by the Ministry of Education now stipulates that *ii* should be produced as [i] after all consonants, acknowledging the total monophthongization of post-consonantal *ii*. The publication also contains an article saying that non-post-consonantal *ii* appearing in a non-word-initial syllable can be produced as [i], though it also says that the diphthongal production is, in principle, the standard pronunciation. (Readers are reminded that the production of (non-post-consonantal) *ye* as [e] in a non-word-initial syllable, which is observed approximately 85% of the time in spontaneous speech, is still not allowed by the same (prescriptive) publication.) The results of the current quantitative study (see Tables 6.1), however,

suggest that *ii* has completely monophthongized to *i* in this environment as well as in the post-consonantal environment.

The pattern exhibited in the results of the statistical analysis of the variable (ii_e) reappears in the statistical results (Table 6.10) for the variable (ii_p). Ninety seven percent of the tokens were monophthongal variants. No (potential) social constraints show effects on the alternation of the two variants of this variable. The three age groups show exactly the same frequency of monophthongal production. These results indicate that the monophthongization of the possessive marker *ii* is also completed. This change is, as suggested earlier, not a sound change in its proper sense, but a morphologically conditioned change. This alleged change gets external support once again from *phyocwun palumpep* ("Standard Pronunciation of Korean"), which contains an article that allows for the production of possessive marker *ii* as [e].

The factor group, 'speech style', was selected as the most important constraint in the Varbrul analysis of each of the three variables. This means that the speakers' choice of the two variants of each variable is most significantly affected by 'speech style'. I have earlier suggested that one important reason why we obtain this result is that spelling pronunciation dominates the speakers' read speech, especially in word-list reading. The same factor is responsible for why the three social constraints are selected as significant in the stepwise regression analyses of (ii_e) and (ii_p). The results given in Tables 6.8 and 6.10, where no consistent social group patterns are observed across the two variables, suggest, as mentioned earlier, that speakers' frequency of producing spelling pronunciations is rather unpredictable and probably governed by idiolectal traits rather than social group factors.

6.6. Possible explanations

This section attempts an explanation of the monophthongization of the diphthong *ii*. Both phonological and phonetic explanations are proposed. The two explanations are complementary; both are needed to address the question of why the monophthongization of *ɨi̯* happens, i.e., the causation problem of *ɨi̯*. The phonological explanation also proposes an account of why the monophthongization of *ɨi̯* has progressed the way it has.

6.6.1. Phonological explanations

As in the previous chapters, a phonological explanation is given in the framework of the correspondence model of OT. The phonological account of the linguistic change where the possessive marker *ɨi̯* changes to *e* is not attempted here because it is not a sound change in the proper sense, but a change conditioned by a morphological factor. The constraints used in my phonological account of the monophthongization of *ɨi̯* are listed in (6.1).

(6.1) Constraints

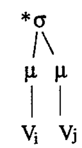
1. *F-Diph: Falling diphthongs are prohibited.
2. *ɨ̯: *ɨ̯* is prohibited.
3. MAX(i): Every *i* in underlying representation has a correspondent in surface representation.
4. MAX(ɨ): Every *ɨ* in underlying representation has a correspondent in surface representation.
5. L-Anchor: The leftmost element of underlying representation has a correspondent at the leftmost position of surface representation.
6. *Coda: A coda is prohibited.

As discussed earlier, the falling diphthongs of Late Middle Korean have all monophthongized except *ɨi̯*.[7] This indicates that the structural pressure to monophthongize *ɨi̯* has been present for a rather long time in Seoul Korean (cf. Y.C. Chung 1991) and can be considered a strong motivating factor for the monophthongization of *ɨi̯*. The constraint *F-Diph (cf. Rosenthall 1994) as given in (6.2) is used in this study to represent this internal pressure toward the monophthongization of *ɨi̯* in Seoul Korean. As mentioned

[7] *ɨy* (which I represent as *ɨi̯* in this study) and *uy* are different from the other falling diphthongs (cf. Figure 1.4) in that they are composed of two high vocoids, thus making their status as a falling diphthong rather dubious. However, it is generally agreed that the two diphthongs have shown a consistent phonological pattern with the other diphthongs. Also, if we assume that the sonority (or intensity) of vowels are determined chiefly by the frequency of F1 as we did in Chapter 5, *ɨ* and *u* have a larger F1 value than *i* in Seoul Korean (see Table 5.19).

earlier, the diphthongal realization of *ɨi̯* has a duration considerably longer than the monophthongs of Seoul Korean, supporting the standard assumption held by phonologists that falling diphthongs are associated with two moras (cf. Schane 1995, McCarthy 1995, Rosenthall 1994).[8] Accordingly, it is assumed in this study (also following Y.S. Lee 1993 and Kim-Renaud 1986b) that the onset and the offset of *ɨi̯* are linked to two separate moras.

(6.2) *F-Diph (No Falling Diphthongs)



The high central unrounded glide *ɨ̯* is rarely found in the world's languages. Few languages surveyed by Maddieson (1984) have this glide. The markedness constraint, *ɨ̯, is motivated by this observation. As discussed in Chapter 4, different high vowels show different deletability. The division of MAX(V[+hi]) into MAX(i) and MAX(ɨ) comes from the need to distinguish different high vowels in their behavior with respect to deletion. MAX(i) and MAX(ɨ) penalize deletion of underlying *i* and *ɨ*, respectively. L-Anchor, as discussed in previous chapters, penalizes the deletion of a word-initial segment, which is rarely observed cross-linguistically. Languages, as well documented, prefer an open syllable to a closed syllable. This general cross-linguistic tendency is represented by the constraint, *Coda, which penalizes candidate forms with a coda consonant.

As shown in the previous section, the monophthongization of *ɨi̯* has been heavily influenced according to whether the diphthong appears in word-initial position or non-word-initial position.[9] Accordingly it will be appropriate to consider the change of *ɨi̯* at these two positions separately throughout this section. A phonological description of each

[8] I assume here following Kenstowicz (1994:45) that a mora is, as least for vowels, a unit of metrical time.
[9] Readers are reminded that word-initial position indicates word-initial segment position, not syllable position in this chapter.

diachronic phase in the monophthongization of *ɨi* is provided below. Two words, *ɨisa* 'doctor' and *koɨi* '(willful) intention', are used as examples for the illustration of *ɨi* monophthongization in word-initial and non-word-initial positions, respectively.

Let us first consider the stage before the beginning of the monophthongization of *ɨi*, i.e., the diachronic stage when the diphthong was the underlying form in all contexts. At this stage, *F-Diph must have been dominated by MAX(i) and MAX(ɨ) as illustrated in Tableaux 6.1 and 6.2. If *F-Diph had dominated either MAX(i) or MAX(ɨ), candidate (b) or (c) would have been chosen as optimal in the two tableaux. Since candidates (d) and (e), which do not violate any constraint other than *ɨ̯ and *Coda (respectively), are not optimal forms either, *ɨ̯ and *Coda are also supposed to have dominated *F-Diph at this stage. As a result, candidate (a) is selected as the optimal form in both tables. (In the representation of the candidates, a vowel indicates a vocoid associated to a mora; *i̯* and *ɨ̯* represent the moraless counterpart of *i* and *ɨ*, respectively.) Only diphthongs associated to two moras are interpreted as a falling diphthong in Seoul Korean. The sequence *ɨi̯* of candidate (e) shown in the two tableaux is interpreted as a sequence of 'V + C' for this reason. The sequences, *oɨ̯* and *oi̯*, of candidates (f) and (g) are also interpreted in an identical manner.

In the two tables, candidates (b) and (c) are, respectively, ruled out by constraints MAX(i) and MAX(ɨ). Candidates (d) (f), and (e) are eliminated due to their respective violation of *ɨ̯ and *Coda. However, candidate (g) is ruled out by two different constraints in the two tableaux: in Tableau 6.1 it is eliminated for its violation of *Coda, while its counterpart in Tableau 6.2 is ruled out for the violation of MAX(ɨ). The constraint ranking at this diachronic phase is given in (6.3), which shows that *F-Diph is dominated by all the other constraints shown in the hierarchy.

(6.3) Constraint ranking before the beginning of the monophthongization of *ɨi*

*ɨ̯, *Coda, MAX(i), MAX(ɨ) >> *F-Diph

Tableau 6.1.

μ μ μ / k o ɨ i	*ɨ̯	*Coda	MAX(i)	MAX(ɨ)	*F-Diph
a. ☞ko.ɨi					*
b. ko.ɨ			*!		
c. ko.i				*!	
d. ko.ɨ̯i	*!				
e. ko.ɨi̯		*!			
f. koɨ̯	*!	*	*		
g. koi̯		*!		*	

Tableau 6.2.

μμμ / ɨ isa	*ɨ̯	*Coda	MAX(i)	MAX(ɨ)	*F-Diph
a. ☞ɨi.sa					*
b. ɨ.sa			*!		
c. i.sa				*!	
d. ɨ̯i.sa	*!				
e. ɨi̯.sa		*!			
f. ɨ̯sa	*!		*		
g. i̯sa				*!	

However, the subsequent gradual monophthongization of *ɨi* indicates that the strength of *F-Diph has become increasingly more powerful. Monophthongization of a diphthong is a weakening process, which typically affects phonologically weak positions first and then stronger positions (cf. Foley 1977:44). This is the reason why the *ɨi* to *i* change in non-word-initial position began before the *ɨi* to *ɨ* change in word-initial position. It is not clear, however, whether the former preceded the latter completely or whether there was any overlap in the two changes. No conclusive evidence that supports either of the two is provided by the literature or previous studies. (Y.C. Chung (1991: 400) suggests without providing persuasive evidence that the *ɨi* to *i* change was probably completed before the beginning of the ɨi̯ to ɨ change in word-initial position.) In the present study I will attempt a phonological account of the monophthongization of ɨi̯ assuming that there was no overlap between the two changes. If there was an overlapping period between the two changes, the account given in this section would be based on a rather idealized linguistic situation.

Let us consider the change from ɨi̯ to *i* first, the first phase of the monophthongization of ɨi̯. This change must have begun with a stage where [i] and the diphthongal form coexisted in competition, i.e., where MAX(ɨ) and *F-Diph variably dominate one another. At this stage, the word *koɨi̯* '(willful) intention', for instance, must have two alternating forms, (a) *koɨi̯* and (c) *koi*, as shown in Tableaux 6.3 and 6.4, while retaining the same underlying form as in the previous stage. Since *F-Diph and MAX(ɨ) are in a variable dominance relationship, the constraint ranking at this stage is as given in (6.4); no other change from the previous stage has happened. The arrow indicates that *F-Diph is gaining strength relative to MAX(ɨ), which means that ɨi̯ is monophthongizing to *i*. Both the constraint hierarchies given above Tableaux 6.3 and 6.4 are possible at this stage. In the two tableaux, candidate (b) is eliminated for its violation of MAX(i); candidates (d) (f), and (e) (g) are ruled out for their violations of and *ɨ̯, *Coda, respectively.

(6.4) Constraint ranking when the monophthongization of ɨi̯ to *i* in non-word-initial position was in progress (Provisional)

*ɨ̯, *Coda, MAX(i) >> {*F-Diph ← / MAX(ɨ)}

Tableau 6.3. *ɨ̯, *Coda, MAX(i) >> MAX(ɨ) >> *F-Diph

μ μ μ / k o ɨ i	*ɨ̯	*Coda	MAX(i)	MAX(ɨ)	*F-Diph
a.☞ ko.ɨi					*
b. ko.ɨ			*!		
c. ko.i				*!	
d. ko.ɨ̯i	*!				
e. ko.ɨi̯		*!			
f. koɨ̯	*!	*	*		
g. koi̯		*!		*	

Tableau 6.4. *ɨ̯, *Coda, MAX(i) >> *F-Diph >> MAX(ɨ)

μ μ μ / k o ɨ i	*ɨ̯	*Coda	MAX(i)	*F-Diph	MAX(ɨ)
a. ko.ɨi				*!	
b. ko.ɨ			*!		
c.☞ ko.i					*
d. ko.ɨ̯i	*!				
e. ko.ɨi̯		*!			
f. koɨ̯	*!	*	*		
g. koi̯		*!			*

However, a consideration of words where ɨi̯ occurs in word-initial position, reveals that another constraint, i.e., L-Anchor, was also active at this stage. (We do not know from what point in time this constraint was part of Seoul Korean grammar; however, it can be conjectured that this constraint had been active for a long period of time because Seoul Korean had few, if any, documented synchronic or diachronic processes where a word-initial segment was deleted.) The presence of L-Anchor is inferred from the fact that the alternation between the diphthongal form and [i] apparently did not occur in word-initial position at this stage. The phonological strength of word-initial position discussed earlier (cf. 4.6.1) is presumed to be the main reason for the lack of variation in this position. Tableaux 6.5 and 6.6 illustrate with *ɨi̯sa* 'doctor' as an example. Though both the hierarchies shown above Tableaux 6.5 and 6.6 are possible at this stage, candidate (c) *isa* is not selected as optimal in Tableau 6.6 (unlike in Tableau 6.4) because it violates the constraint L-Anchor, which dominates both the constraints, *F-Diph and MAX(ɨ).

Tableau 6.5. L-Anchor, *ɨ̯, *Coda, MAX(i) >> MAX(ɨ) >> *F-Diph

μμμ / ɨ isa	L-Anchor	*ɨ̯	*Coda	MAX(i)	MAX(ɨ)	*F-Diph
a. ☞ɨi.sa						*
b. ɨ.sa				*!		
c. i.sa	*!				*	
d. ɨ̯i.sa		*!				
e. ɨi̯.sa			*!			
f. ɨ̯sa		*!		*		
g. i̯sa	*!				*	

Tableau 6.6. L-Anchor, *ɨ̯, *Coda, MAX(i) >> *F-Diph >> MAX(ɨ)

μμμ / ɨ isa	L-Anchor	*ɨ̯	*Coda	MAX(i)	*F-Diph	MAX(ɨ)
a. ☞ɨi.sa					*	
b. ɨ.sa				*!		
c. i.sa	*!					*
d. ɨ̯i.sa		*!				
e. ɨi̯.sa			*!			
f. ɨ̯sa		*!		*		
g. i̯sa	*!					*

Accordingly, we have to add another constraint, i.e., L-Anchor, to the hierarchy given in (6.4). The revised constraint ranking at this stage is given in (6.5). This ranking produces both the constraint hierarchies shown above Tableaux 6.5 and 6.6, given the variable ranking of *F-Diph and MAX(ɨ). In the two tableaux, candidates (b) and (e) are eliminated by MAX(i) and *Coda, respectively; candidates (c) (g), and (d) (f) are ruled out for their respective violation of L-Anchor and *ɨ̯.

(6.5) Constraint ranking when the monophthongization of *ɨi* to *i* in non-word-initial position was in progress

L-Anchor, *ɨ̯, *Coda, MAX(i) >> { *F-Diph / MAX(ɨ) } (←)

It is also conjectured that the constraint ranking right after the *ɨi* to *i* change was as shown in (6.6): *F-Diph comes to dominate MAX(ɨ) after its gradual acquisition of strength relative to MAX(ɨ). The ranking selects only the diphthongal form in word-initial position and [i] elsewhere, as exemplified by Tableaux 6.6 and 6.7, respectively. It is not certain, though, for how long this ranking held in Seoul Korean phonology.

(6.6) (Proposed) constraint ranking following the completion of the monophthongization of *ɨi* to *i* in non-word-initial position

L-Anchor, *ɨ̯, *Coda, MAX(i) >> *F-Diph >> MAX(ɨ)

Tableau 6.7.

μ μ μ / k o ɨ i	L-Anchor	*ɨ̯	*Coda	MAX(i)	*F-Diph	MAX(ɨ)
a. ko.ɨi					*!	
b. ko.ɨ				*!		
c. ☞ko.i						*
d. ko.ɨ̯i		*!				
e. ko.ɨi̯			*!			
f. koɨ̯		*!	*	*		
g. koi̯			*!			*

Let us move on to consider the change of *ɨi* to *ɨ* in word-initial position. One explanation that has to be given is why *ɨi* is changing to *ɨ* in this context, while the change was *ɨi* to *i* in the other phonological environments. Kim-Renaud (1986b) makes the following observations regarding the cause of the splitting of *ɨi*. First, she (1986b:128) makes an insightful suggestion that the change of *ɨi* to *ɨ* in word-initial position is primarily attributable to the 'strength of word-initial position', i.e., that the word-initial segment *ɨ* is retained because of the phonological strength of this position. She (1986b:127) also notes that the change of ɨ̯i to *i* (the choice of *i* over ɨ) in the other environments is natural since *i* is a more sonorous and more typologically natural vowel than ɨ.[10]

I attempt a similar line of explanation to that of Kim-Renaud (1986b) in the current study. I suggest, like Kim-Renaud (1986b), that the reason why ɨ̯i is monophthongizing to ɨ in word-initial position (unlike in other positions) is the phonologically strong nature of a word-initial segment, a segment that is scarcely observed to delete in languages in both synchronic and diachronic phonological processes. It is conjectured that one strong reason why ɨ̯i is changing to ɨ in this position is due to languages' (universal) tendency to preserve a word-initial segment. The ɨ̯i to ɨ change is, presumably, a result of the currently examined language's (or Seoul Korean speakers') efforts to retain the word's most phonologically strong segment (or the most important segment in word recognition) while succumbing to the irresistible structural pressure to monophthongize the falling diphthong. The same explanation was proposed earlier to the question why the monophthongization of ɨ̯i is happening in word-initial position later than in the other positions: the lagging of monophthongization in word-initial position is again due to the phonological strength of this environment, which is especially resistant to weakening processes.

I propose an account that is rather different from Kim-Renaud's (1986b) for the explanation of the ɨ̯i to *i* change in non-word-initial positions. As introduced in 4.3.2.1, the vowel ʌ has changed to *a* in a word-initial syllable and to ɨ in a non-word-initial syllable in Seoul Korean. (The former and the latter changes were respectively completed at the late 18 century and the early 17 century (K.U. Kang 1993), the former lagging behind the latter.) The splitting of ʌ into *a* and ɨ, which are, respectively, a more sonorous (and thus stronger) and less sonorous (and thus weaker) vowel than ʌ, is one of the examples in Seoul Korean which shows that word-initial and non-word-initial syllables are,

[10] This is my interpretation of Kim-Renaud's (1986b:127) statement, "It is naturally the front vowel [i] that is chosen over the least sonorous high back vowel [ɨ]."

respectively, a strengthening and a weakening environment in this dialect (as in many other languages).

However, it seems that Seoul Korean distinguishes not just word-initial vs. non-word-initial syllables; it distinguishes word-initial vs. non-word-initial segments as well. I have already shown two pieces of evidence for this claim in this work. As shown in Table 4.10, (non-post-consonantal) *w* deletion is near-categorically (1%) absent when *w* is a word-initial segment, while non-post-consonantal *w* deletes approximately 10% when it is not in word-initial position; in terms of Varbrul probabilities word-initial and non-word-initial factors have probabilities .303 vs. .797, respectively. (Readers will recall that the presence of the preceding consonant is an important constraint in *w* and *y* deletion, and thus this constraint is controlled in the current discussion.) The pattern of (non-post-consonantal) *y* deletion shows a more dramatic difference than *w* deletion. While the deletion of word-initial *y* is near-categorically absent (only 4% of the tokens) in my Seoul Korean data, non-post-consonantal *y* deletes 70% in non-word-initial position (see Table 5.10); the word-initial and non-word-initial factors have the weights .168 and .970, respectively. However, the difference in deletion rates of post-consonantal *w* and *y* between word-initial vs. non-word-initial syllables is less significant, 24% vs. 29% (in weights, .421 vs .615) in *w* deletion and 91% vs. 89% (in weights, .295 vs .657) in *y* deletion.[11] (Post-consonantal *w* and *y* are naturally in non-word-initial position, whether they occur in a word-initial or non-word-initial syllable.) These results support my claim that Seoul Korean crucially distinguishes a word-initial segment from the others.[12]

On the basis of the above observations, I propose the following answer to the question why ɨ̯i changed to *i* in non-word-initial position. I propose that the

[11] As discussed in 5.4, the deletion rates of post-consonantal *y* are misleading, because sonorant consonants, which trigger the deletion significantly less often than obstruents, can occur before /ye/ only in non-word-initial syllables, but the Varbrul weights given above reflect the actual effects of the two syllable positions.
[12] There is yet another piece of evidence revealing the phonological strength of word-initial position. As discussed in 2.3.1, the 'fortification' of word-initial lenis obstruents, another on-going change in Seoul Korean, occurs only in word-initial position, not in any other positions.

monophthongization of *ɨi* to *i* in non-word-initial position is also a reflection of the (weak) phonological strength of this position. This proposal is based on the fact that the vowel *ɨ* has greater sonority (or intensity) than *i* contrary to Kim-Renaud's suggestion mentioned earlier. (I again assume here following Lindblom (1979) that the sonority (or intensity) of vowels is chiefly determined by their F1 values.) Actually *ɨ* has the largest F1 value among the three high vowels of Seoul Korean (see Table 5.19; see also H.B. Lee and M.J. Zhi 1987:39)

Foley (1977:107) claims that weakening processes occur 'preferentially' and 'more extensively' in phonologically weak environments (such as word-medial and -final positions) as opposed to in strong environments (such as word-initial or post-nasal positions). Preferential weakening is supported by the aforementioned split of *ʌ* to *a* and *ɨ* in Seoul Korean: only in a non-word-initial syllable, weakening to *ɨ* happened. On the other hand, the monophthongization (which is a weakening process) of *ɨi* to *i* over *ɨ* in non-word-initial position exemplifies more extensive weakening in weak environments. Among the two possible options, *ɨ* and *i*, less sonorous vowel *i* was obviously chosen over *ɨ* in non-word-initial position thus undergoing more extensive weakening in this position.

Now let us go back to our earlier discussion. The constraint ranking right before the beginning of the monophthongization of *ɨi* in word-initial position is conjectured as identical to the one given in (6.6): no change in the ranking is needed to explain the linguistic situation at this stage. Tableau 6.8 illustrates this stage with the word *ɨisa* 'doctor' as an example. Candidates (b) and (e) are ruled out for their violation of MAX(i) and *Coda, respectively; candidates (c) (g), and (d) (f) are eliminated for their respective violation of L-Anchor and *ɨ̯.

Tableau 6.8.

μμμ ɨ isa	L-Anchor	*ɨ̯	*Coda	MAX(i)	*F-Diph	MAX(ɨ)
a. ☞ɨi.sa					*	
b. ɨ.sa				*!		
c. i.sa	*!					*
d. ɨ̯i.sa		*!				
e. ɨi̯.sa			*!			
f. ɨ̯sa		*!		*		
g. i̯sa	*!					*

The monophthongization of *ɨi* in word-initial position is presumed to have started with another change in constraint ranking in Seoul Korean phonology. The change would have taken the following form: *F-Diph has come to acquire a constraint strength comparable to that of MAX(i), the two variably dominating one another as a consequence. The constraint ranking that held at this stage is given in (6.7). The ranking indicates that the strength of *F-Diph, i.e., the pressure to monophthongize *ɨi*, has become so strong as to make deletion of underlying *i* possible in Seoul Korean phonology.

(6.7) Constraint ranking that began to hold from the beginning of the monophthongization of word-initial *ɨi*

L-Anchor, *ɨ̯, *Coda >> {*F-Diph ←→ MAX(i)} >> MAX(ɨ)

As a result of this change in grammar, both the constraint hierarchies shown on Tableaux 6.9 and 6.10 have become possible in Seoul Korean phonology as part of a single grammar, selecting both (a) *ɨisa* and (b) *ɨsa* as optimal forms. In case MAX(i) dominates *F-Diph, candidate (a) is chosen; in the opposite case, candidate (b) is selected. The constraint ranking given in (6.7) is also the current synchronic grammar of Seoul Korean. The results given in Tables 6.5 and 6.6 suggest that the two forms are now closely competing with each other and that the *ɨi* to *ɨ* change is an active process. In the tableaux below, candidates (c) (g), and (d) (f) are ruled out for their violation of L-Anchor and *ɨ̯, respectively; candidate (e) is eliminated because of its violation of *Coda.

Tableau 6.9. L-Anchor, *ɨ̯, *Coda>> MAX(i) >> *F-Diph >> MAX(ɨ)

μμμ ɨ isa	L-Anchor	*ɨ̯	*Coda	MAX(i)	*F-Diph	MAX(ɨ)
a. ☞ɨi.sa					*	
b. ɨ.sa				*!		
c. i.sa	*!					*
d. ɨ̯i.sa		*!				
e. ɨi̯.sa			*!			
f. ɨ̯sa		*!		*		
g. i̯sa	*!					*

Tableau 6.10. L-Anchor, *ɨ̯, *Coda >> *F-Diph >> MAX(i) >> MAX(ɨ)

μμμ ɨ isa	L-Anchor	*ɨ̯	*Coda	*F-Diph	MAX(i)	MAX(ɨ)
a. ɨi.sa				*!		
b. ☞ɨ.sa					*	
c. i.sa	*!					*
d. ɨ̯i.sa		*!				
e. ɨi̯.sa			*!			
f. ɨ̯sa		*!			*	
g. i̯sa	*!					*

The ranking given in (6.7), which has held in Seoul Korean phonology since the beginning of the *ɨi̯* to *i* monophthongization, is expected to change to the ranking shown in (6.8) eventually, though it is an open question when the change will be completed.

(6.8) Constraint ranking expected to hold at the completion of the monophthongization of word-initial *ɨi̯*

L-Anchor, *ɨ̯, *Coda, *F-Diph >> MAX(i) >> MAX(ɨ)

The changes in constraint ranking that have occurred in Seoul Korean phonology are summarized in Figure 6.1. The constraint, L-Anchor, is assumed here to have been active since the earliest stage (i.e., since before the beginning of the monophthongization of *ɨi̯*). The figure shows clearly that *F-Diph, i.e., the structural pressure to monophthongize *ɨi̯*, has been gaining strength through the different phases of the monophthongization of this diphthong and has been a strong motivating factor in this diachronic process.

<u>Stage 1</u>: before the beginning of the monophthongization of *ɨi̯*

L-Anchor, *ɨ̯, *Coda, MAX(i), MAX(ɨ) >> <u>*F-Diph</u>

↓

<u>Stage 2</u>: during the monophthongization of *ɨi̯* to *i* in non-word-initial position

L-Anchor, *ɨ̯, *Coda, MAX(i) >> $\left\{\begin{matrix}\text{*F-Diph} \\ \text{MAX(ɨ)}\end{matrix}\right\}$

↓

<u>Stage 3</u>. during the monophthongization of *ɨi̯* to *ɨ* in word-initial position

L-Anchor, *ɨ̯, *Coda >> $\left\{\begin{matrix}\text{*F-Diph} \\ \text{MAX(i)}\end{matrix}\right\}$ >> MAX(ɨ)

↓

<u>Stage 4</u>. at the expected completion of the monophthongization of *ɨi̯*

L-Anchor, *ɨ̯, *Coda, <u>*F-Diph</u> >> MAX(i) >> MAX(ɨ)

Figure. 6.1. Changes in the constraint ranking involving the monophthongization of *ɨi̯* in Seoul Korean

6.6.2. Phonetic explanations

In the previous subsection it was suggested that one important factor that motivates the ongoing monophthongization of *ɨi̯* is the structural pressure that is present in Seoul Korean against falling diphthongs. In this subsection I will argue that there is another motivating factor involving this change. It will be claimed that like the monophthongization of *ye*, the monophthongization of *ɨi̯* is perceptually motivated.

As discussed in the previous chapter, languages show a preference for those diphthongs that have maximal (or sufficient) perceptual distinctions between the onset and the offset. It was shown earlier that the primary motivation for the monophthongization of *ye* is that the diphthong has the least perceptual distinction between the onglide and the offglide among the *y* diphthongs of Seoul Korean. An identical explanation will be given for the monophthongization of *ɨi̯*. It will be shown that *ye* and *ɨi̯* are actually the diphthongs that have the shortest perceptual distances between the onset and the offset among all the existing diphthongs of Seoul Korean.

I will demonstrate the perceptual instability of *ɨi̯* comparing its perceptual distance between the onset and the offset with that of *ye*, which was shown to have the shortest perceptual distance among the *y* diphthongs and whose instability has already been demonstrated. As discussed in the previous chapter, the acoustic parameters that are important in the perception of the diphthongal sequences are spectral shape, which (for vowels) can be largely understood as formant frequency, and amplitude. Accordingly the perceptual distance between the onset and the offset is calculated here taking both formant frequency distance and amplitude distance into account. The two diphthongal sequences, *ye* and *ɨi̯*, share the same property that one of the vocoids involved is the high coronal vocoid though it is an onset with *ye* and an offset with *ɨi̯*. As discussed earlier, *i* and *y* are articulated with very similar vocal tract shapes (Kent and Read 1992:136) and produce highly similar formant values. Accordingly, the formant values of *i* are used for the glide.

The perceptual distances from *i* to the two vowels (i.e., *e* and *ɨ*) are calculated below for comparison of the two diphthongal sequences' perceptual salience.

The respective (perceptual) formant frequency distance of *e* and *ɨ* from *i* on the F1 * F2 plane is given in Table 6.17. The F1 and F2 values of *i*, *e*, and *ɨ* reported in Yang (1993:237) are (341, 2219), (490, 1968), and (405, 1488), respectively. These values were first converted to Mel values (shown in Table 6.17) using Fant's (1973) formula given in (5.10), then the standard Euclidean distance on the F1 * F2 plane was calculated using the formula shown in (5.11). The results show that the perceptual distinction between the onset and the offset in formant frequency is more clear with *ɨi̯* than with *ye*.

Vowel	F1 (Mel)	F1-difference from *i*	F2 (Mel)	F2-difference from *i*	Euclidean distance from *i* in terms of formant frequency (Mel)
i	425	0	1692	0	0
e	577	152	1574	117	192
ɨ	492	67	1333	373	379

Table 6.17. Perceptual distance of *e* and *ɨ* of Seoul Korean from *i* in terms of 'formant frequency' (calculated based on the F1 and F2 Hz values given in Table 5.19)

Based on the rationale that amplitude or intensity of vocoids is highly correlated with the frequency values of F1 (Lindblom 1979), the current study uses the F1 difference between vocoids as an approximation of the amplitude distance between them as in the previous chapter. Mel values are used here since a perceptual rather than acoustic scale is more relevant to the current discussion. The respective amplitude distances from *i* to *e* and *ɨ* approximated using this method are given in Table 6.18. The results suggest that *ye* has a more clear distinction between the onset and the offset than *ɨi̯* in terms of amplitude.

Vowel	F1 (Mel)	F1-difference from *i* (Mel)
i	425	0
e	577	152
ɨ	492	67

Table 6.18. Difference in F1 values (Mel) between *i* and *e*, and *i* and *ɨ*, of Seoul Korean as an approximation of the perceptual amplitude distance from *i* to each of the two vowels

The composite perceptual distances between the onset and the offset of *ye* and *ɨi̯* calculated taking both formant frequency distance and amplitude distance into account are given in Tables 6.19 and 6.20. As in the previous chapter, the current investigation relies on two different methods of obtaining the composite distance, the first of which is to obtain the average of the formant frequency distance and the amplitude distance; the second is to calculate the Euclidean distance after giving twice as heavy weight to the F1 difference (which are relevant to both formant frequency and amplitude distances) as to the F2 difference. The last columns of Tables 6.19 and 6.20 give the composite perceptual distances of *ye* and *ɨi̯* obtained using the first and the second method, respectively. The results given in the two tables indicate that the perceptual distance between the two component vocoids of *ɨi̯* is only slightly larger than that of *ye* (this is graphically shown in Figure 5.3), which in turn suggests that the former is perceptually only slightly more stable than *ye*. Tables 5.22 and 5.23 show that the *y* rising diphthong that has the second shortest perceptual distance is *yu*, whose values are given again in the last rows of Tables 6.19 and 6.20 for reference. The comparison of the values for *ɨi̯* and *yu* indicate that *yu* has a considerably larger perceptual distance between the onset and the offset than *ɨi̯*. These findings suggest that the monophthongization of *ɨi̯* may well be under way motivated by perceptual factors as well as structural pressure against the falling diphthongs.

Diphthongal sequences	Perceptual distance in terms of formant frequency (Mel)	F1-difference (Mel)	Average difference (Mel)
ye	192	152	172
ɨi̯	379	67	223
(*yu*	703	30	367)

Table 6.19. Composite perceptual distance between the onset and the offset of *ye* and *ɨi̯* obtained by averaging the value of formant frequency distance on the F1 * F2 plane and amplitude distance as approximated by the difference in F1 values

Diphthongal sequences	2 * Perceptual F1 difference (Mel)	Perceptual F2 difference (Mel)	Perceptual distance (Mel)
ye	304	117	326
ɨi̯	134	373	396
(*yu*	60	702	705)

Table 6.20. Composite perceptual distance between the onset and the offset of *ye* and *ɨi̯* obtained by giving twice as heavy weight to the F1 difference as to the F2 difference

I have shown so far that *ɨi̯* has only a slightly larger perceptual distance between the onset and the offset than *ye* and a considerably shorter distance than any other (rising) *y* diphthong of Seoul Korean. I have also shown in the previous chapter that the gaps in the system of *y* rising diphthongs of Seoul Korean can be explained on perceptual terms: **yi* and **yɨ* are the '*y* + vowel' sequences that have the least perceptual distances (see Tables 5.22 and 5.23) along with *ye*, which is now going through monophthongization. As introduced earlier, the inventory of Seoul Korean diphthongs involve not only '*y* + vowel' but '*w* + vowel' sequences. If my claim is true that the ongoing monophthongization of *ye* and *ɨi̯* is perceptually motivated, then the gaps (shown in Table 6.21) in the system of Seoul Korean *w* diphthongs should also be explained on perceptual terms because *y* diphthongs, *w* diphthongs, and *ɨi̯* are all part of the system of Seoul Korean diphthongs. In the remainder of this section I will attempt to show that the gaps shown in Table 6.21 are indeed accounted for by the same line of perception-based explanation as I have given to account for the monophthongization of *ye* and *ɨi*. It will also be shown that *ye* and *ɨi* are actually the diphthongs that have the least internal perceptual distances among all the diphthongs of Seoul Korean.

[-bk]	[+bk]	
wi	*wɨ	*wu
we	wə	*wo
	wa	

Table 6.21. *w* Diphthongs of Seoul Korean and the gaps in '*w* + vowel' sequences

As the first step to explain the gaps in the '*w* + vowel' sequences of Seoul Korean, the (composite) perceptual distance between *u* and each of the monophthongs of Seoul Korean is calculated below. The composite perceptual distance is approximated taking both formant frequency and amplitude distances into account as in the previous investigations. Since *w* and *u* are produced with highly similar vocal tract shapes (Kent and Read 1992:136), the F1 and F2 values of *u* are used for the glide. The Hz values shown in Table 5.19 (originally from Yang 1993) have been converted to Mel values using Fant's (1973) formula given in 5.10. Using these values I have calculated the standard Euclidean distance on the F1 * F2 space between *u* and each of the Seoul Korean monophthongs. These values are given in the last column of Table 6.22. The values indicate perceptual distances (in terms of formant frequency) between the onset and the offset of the logically possible '*w* + vowel' sequences of Seoul Korean. The results show that the vowels *o*, *ə*, and *ɨ* are perceptually the closest vowels to *u* (and in that order) in terms of formant frequency.

Vowel	F1 (Mel)	F1-difference from *u*	F2 (Mel)	F2-difference from *u*	Euclidean distance from *u* in terms of formant frequency (Mel)
u	455	0	990	0	0
o	541	86	963	27	90
ɨ	492	37	1319	329	331
ə	688	233	1088	98	253
a	800	345	1250	260	432
i	425	30	1692	702	703
e	577	122	1575	585	598

Table 6.22. Perceptual distance between *u* and each vowel of Seoul Korean in terms of 'formant frequency' (calculated based on the F1 and F2 values given in Table 5.19)

The F1 difference in Mel between *u* and each Seoul Korean vowel is given in Table 6.23. This value is used as before for the approximation of the (perceptual) amplitude distance between *u* and each vowel. The results given in the last column of Table 6.23 show that *i*, *ɨ*, and *o* have the shortest amplitude distances from *u* (and in that order).

Vowel	F1 (Mel)	F1-difference from *u* (Mel)
u	455	0
o	541	86
ɨ	492	37
ə	688	233
a	800	345
i	425	30
e	577	122

Table 6.23. Difference in F1 values (Mel) between *u* and each vowel of Seoul Korean as an approximation of the perceptual amplitude distance of each vowel from *u*

The composite perceptual distance is calculated in two different methods here as in the previous investigations. The average value of the formant frequency distance and the amplitude distance between the onset and the offset of each logically possible '*w* + vowel' sequence of Seoul Korean is given in Table 6.24. The calculation of the Euclidean distance after assigning twice as heavy weight to the F1 difference as to the F2 difference gives the values shown in the last column of Table 6.25.

Diphthongal sequences	Perceptual distance in terms of formant frequency (Mel)	F1-difference (Mel)	Average of the two (Mel)
**wu*	0	0	0
**wo*	90	86	88
**wɨ*	331	37	184
wə	253	233	243
wa	432	345	389
wi	703	30	367
we	598	122	360

Table 6.24. Composite perceptual distance of each of the 'w+ vowel' sequences obtained by averaging the values of glide distance on the F1 * F2 plane and amplitude distance as approximated by the difference in F1 values

Diphthongal sequences	2 * (perceptual F1 difference) (Mel)	Perceptual F2 difference (Mel)	Perceptual distance from *u* (Mel)
**wu*	0	0	0
**wo*	172	27	174
**wɨ*	74	329	337
wə	466	98	476
wa	690	260	737
wi	60	702	705
we	244	585	634

Table 6.25. Composite perceptual distance of each of the 'w+ vowel' sequences obtained by giving twice as heavy weight to the F1 difference as to the F2 difference

Both methods identify *wu*, *wo*, and *wɨ* as having the least perceptual distinction – or the shortest perceptual distances – between the two component segments; both also choose *wa* (suggested by surveys of the diphthongs as the most common type) as the most optimal diphthongal sequence, i.e., as the sequence that has the maximal perceptual distance between the onset and the offset. The respective comparison of Tables 6.24 and 6.25 with 6.19 and 6.20 (see the last columns of these tables) also reveals that *ye* and *ɨ̯i* are the diphthongal sequences that have the least internal perceptual distinction among all the "existing" diphthongs of Seoul Korean.

The relative lack of internal perceptual distinction of **wu*, **wo*, and **wɨ* is graphically shown in Figure 6.2, where the weighted differences in F1 and F2 between *u* and each vowel (these values are from Table 6.25) are located on the 'perceptual distance (from *u*) space'. The fact that **wu*, **wo*, and **wɨ* have the least internal auditory/ perceptual distinction means that they are also the least perceptually stable. Clearly this perceptual instability is presumed to be one strong reason why Seoul Korean lacks these sequences. The results shown in Tables 6.22 and 6.23 also corroborate the claim I have made in the previous chapter, i.e., the claim that the sole consideration of formant frequency or amplitude cannot correctly predict the diphthongal sequences favored or disfavored by languages: according to the formant frequency distance **wɨ* is a more optimal sequence than *wə* (Table 6.22); the amplitude distance selects *wi* as the least optimal sequence next to **wu* (Table 6.23), i.e., **wɨ* and **wo* are suggested to be more optimal than *wi* by the amplitude distance.

In this section I have suggested that the monophthongization of *ɨ̯i* is progressing in Seoul Korean for perceptual as well as structural reasons. I have also demonstrated that the gaps in the diphthongal system of Seoul Korean can be best explained in perceptual terms. Seoul Korean provides strong support to the claim that diphthongal sequences without sufficient perceptual distinctions between their onsets and offsets tend not to be selected by linguistic systems and not to survive even if they are selected. The importance of perceptual distinction between the neighboring segments of sound sequences is not limited to the diphthongal sequences but sound sequences in general (cf. Ohala 1992, Kawasaki 1982).

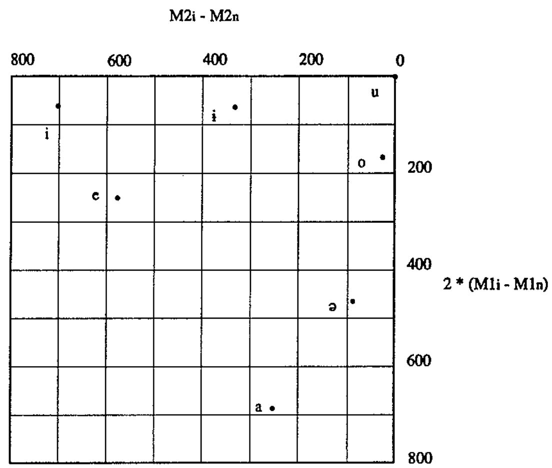


Figure 6.2. Seoul Korean vowels on the plane of perceptual distance from *u*
(The (x,y) values for each vowel are from Table 6.25)

6.7. Conclusion

This chapter has examined the current status of the diphthong *ɨ͜i*, the only remnant of the six Late Middle Korean falling diphthongs, which is claimed by some scholars to have completely monophthongized following the path of the other falling diphthongs. In this chapter, I first showed based on quantitative evidence that *ɨ͜i* still remains in Seoul Korean as an underlying vowel contrary to some researchers' claim. It was also shown that the distribution of *ɨ͜i* is limited only to word-initial position though the diphthong retains its traces in orthographical representations in other phonological environments as well. I also suggested (on the basis of quantitative evidence) that non-word-initial *ɨ͜i* has changed to *i*, and that the possessive marker *ɨ͜i* has monophthongized to *e* through a morphological change, while the diphthongal variant and [ɨ] are in close competition with each other in word-initial position.

Then an attempt was made to provide phonological and phonetic explanations of the monophthongization of *ɨ͜i*. It was suggested that two factors have played an important role in the change. One was the internal structural pressure to monophthongize *ɨ͜i*, which is the only remaining falling diphthong in Seoul Korean. This factor was formalized as the phonological constraint, *Fall-Diph, in my phonological account. It was shown that the pressure toward the monophthongization of *ɨ͜i*, i.e., the strength of the constraint *Fall-Diph, has grown increasingly stronger through the different stages of the monophthongization of *ɨ͜i*. It was also claimed that the phonological strength of word-initial position is chiefly responsible for the ongoing split of *ɨ͜i* to *ɨ* in word-initial position and to *i* elsewhere, and also for the lagging of *ɨ͜i* monophthongization in this position. The phonological explanation was given in the framework of Optimality Theory expanded with the notion of 'variable dominance' (cf. Reynolds 1994).

I suggested that lack of perceptual salience was another important motivator in the monophthongization of *ɨ͜i*: languages are more likely to retain perceptually stable diphthongal sequences, i.e., those diphthongs whose onset and offset have sufficient auditory/perceptual distinctions, than perceptually unstable (diphthongal) sequences. *ɨ͜i* and *ye* were shown to have the smallest internal perceptual distinctions of all the existing diphthongal sequences of Seoul Korean. It was stressed that both formant frequency and amplitude should be taken into account when the perceptual distinctions between the onset and the offset of diphthongs are considered. I have also shown that the gaps in the diphthongal system of Seoul Korean can be neatly explained by the same line of perceptual explanation as given for the monophthongization of *ɨ͜i* and *ye*.

CHAPTER 7

IMPLICATIONS OF THE STUDY AND CONCLUSION

This chapter discusses the implications of the major findings of this study. Some of what will be discussed in the following sections are directly or indirectly related to the five problems which, Weinreich et al. (1968) suggest, should be addressed by theories of language change, i.e., problems of constraints, transition, embedding, actuation, and evaluation — especially the first four. The organization of this chapter is as follows.

In 7.1 possible implications of the current research for sociolinguistic theories of phonological innovations and their social spread will be discussed. It will be suggested that the change patterns involving the phonological variables examined in this work generally support Kroch's rather than Labov's hypothesis on phonological innovations and their spread.

In 7.2 implications for some aspects of phonological theory will be examined. First, the effectiveness of OT in the explanation of phonological variation will be discussed on the basis of my own attempt in this work. Secondly, implications of the patterns of *y* deletion for feature theory will be discussed. It will be shown that the two OCP constraints, proposed as the main trigger of *y* deletion in Chapter 5, can be formulated with naturalness and simplicity only in the system of unified features theory (Clements and Hume 1995). It will be thus argued that the process of *y* deletion in Seoul Korean supports Clements and Hume's feature model, especially their proposal that the same place of articulation features be shared by consonants and vocoids.

It will be also shown that the patterns of variation and change of the diphthongs examined in the current work support the claim by Foley (1977) and Hyman (1975) that

word-initial position is a phonologically strong environment. A suggestion will be made that this finding also has indirect implications for word recognition models (e.g., Marslen-Wilson and Tyler 1980, Pisoni and Luce 1987), and the assumption of segmental representations in word recognition.

In 7.3. the implications of the current study for Ohala's perception-based model of sound change are discussed. The change patterns of Seoul Korean diphthongs exhibited by the current work will be shown to support Ohala's (1981) claim that many sound changes are perceptually motivated. It will also be suggested that the current work supports Ohala's (1992) claim that cross-linguistically common phonotactic constraints are chiefly acoustically/auditorily based.

In 7.4. the changes and the current status of the diphthongal system of Seoul Korean will be discussed. It will be shown that structural and perceptual factors and monophthongal changes have been important constraints on the changes in the diphthongal system of Seoul Korean. Finally in 7.5 concluding remarks of this study will be given.

7.1. Implications for sociolinguistic theories of phonological innovations and their spread

I have shown in this study that the two diphthongal sequences, i.e., *ye* and *ɨi*, are currently going through a monophthongization process in Seoul Korean. As discussed in Chapter 1, Labov (1990) and Kroch (1978) have rather different theories on the social origin and spread of phonological change. While Labov suggests that sound change usually originates from the interior groups of the social hierarchy, Kroch's claim was that phonological change is mostly initiated by the low social status group and that the innovative form is suppressed and last adopted by the high status group (if it ever reaches that social group). Though both theorists seem to allow the possibility that sound change can originate and be led by any social status group and though the SEC groups are not as fully subdivided in this study as in Labov's studies (e.g., 1966), it will be of interest to examine the social distribution of the variants of (y) and ($\underline{ii}_j$) and determine whose theory is more supported by the two ongoing changes in Seoul Korean.

Let us first consider the change of *ye* to *e*. As we have seen in Chapter 5, this change shows a pattern where the deletion of *y* after a consonant somewhat precedes *y* deletion in the non-post-consonantal environment, i.e., ongoing diachronic *y* deletion is more advanced in the former context than in the latter. I will thus consider the *ye* to *e* change in the two environments (post-consonantal and non-post-consonantal) separately for the present purpose. As suggested earlier, since the Varbrul weights (of factors) are a more accurate indication of the sociolinguistic situation (and factor effects) than percentages, the probabilities of the innovative variant use by different SEC groups will be considered and used as a true reflection of the social distribution of this variant in this section. (See Guy et al. 1986 for the use of the same method.) Figures 7.1 and 7.2 show the Varbrul weights of the [ø] (the innovative form) use by the three status groups in the post-consonantal and the non-post-consonantal environment, respectively. The two figures show very comparable patterns, exhibiting a relatively linear pattern across the three status groups.

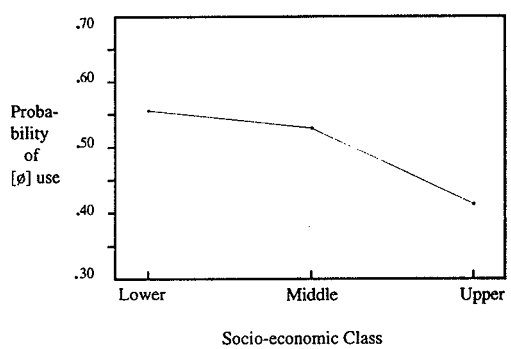


Figure 7.1. Probability of [ø] use in the post-consonantal environment by each socio-economic class (variable (y))

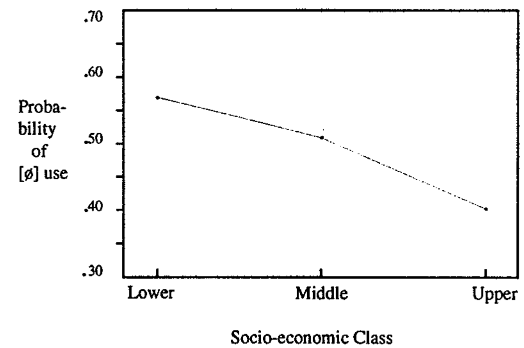


Figure 7.2. Probability of [ø] use in the non-post-consonantal environment by each socio-economic class (variable (y))

The same pattern as exhibited by the variable (y) is shown in the probability distribution of the three status groups for the variable ($\underline{ii}_j$) (Figure 7.3), though the pattern is slightly more linear in the figure below. The factor weights indicate that the innovative form, i.e., [ɨ], is used more often by the lower class group than the other status groups, thus showing a linear pattern across the social hierarchy.

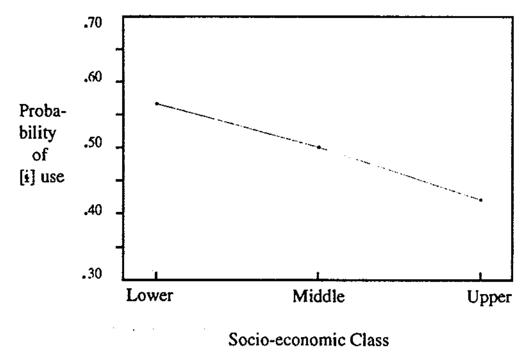


Figure 7.3. Probability of [ɨ] use by each socio-economic class (variable ($\underline{ii}_j$))

The patterns exhibited by the probability distribution of the SEC groups in the variables (y) and (ii) generally correspond to a linear pattern as predicted by Kroch's theory. Accordingly, the results of the current study can be taken as supporting Kroch's rather than Labov's theoretical position, when it is considered that *ye* and *ii* are both going through linguistic change.

However, the results of the current study cannot be interpreted as indicating that Labov's theoretic position is faulty or problematic. It is because there have been many studies whose findings support each of the two theories. (Those supporting Labov's hypothesis include Trudgill's (1974) study of Norwich English and Cedergren's (1973) sociolinguistic research in Panamanian Spanish.) In fact, Guy et al. (1986) suggest that the two theories can be understood not as contradictory but as complementary to each other. I take the same position in this study. My own interpretation of the two researchers' theories (or hypotheses) is that the two may have a different focus in their explanation: Kroch's theory seems to focus more on primarily phonetically motivated sound changes, while Labov's appears to have its focus more on phonological changes which are socially as well as phonetically or structurally motivated.[1]

My interpretation of the difference between the two researchers' hypotheses is based on the following claims of the two researchers. As mentioned in Chapter 1, according to Kroch (1978) the 'main' motivation of phonological changes are phonetic factors. Sound changes are initiated fundamentally for phonetic reasons (perceptual or articulatory) in his hypothesis: difficult articulations are simplified and perceptually indistinct segments tend to be lost in the dialect spoken by the lower class, which is more

[1]One clear example of the latter type of change is the centralization of diphthongs *ay* and *aw* in Martha's Vineyard (Labov 1963). Though this change is considered as an example of 'change from below', little phonetic or structural motivation (but much social motivation) is observed in this change. The historical data document that the centralization of these two diphthongs is a reversal of the previous changes, *əy* > *ay* and *əw* > *aw*, which may be more phonetically motivated since the nucleus and the glide of *ay* and *aw* are more clearly differentiated than those of *əy* and *əw*.

susceptible to phonetic conditioning than the prestige dialect.[2] Prestige, i.e., a social factor, which prohibits the spread of change to the higher social class, is only 'secondary' in his hypothesis.[3] Kroch's theoretic position can be well observed by the following three propositions (1978:348) recited here:

1. Ordinary unconscious phonological changes are definitely not arbitrary but are, in general, phonetically motivated processes.
2. Prestige is a secondary factor in the propagation of phonetically motivated linguistic changes, whose linguistic character is the original basis of their diffusion.
3. The main force of social prestige is to inhibit phonetically conditioned processes, both of change in progress and of stable inherent variation, in the speech of high status groups and those whom they influence.

While Kroch's position is that sound changes are primarily motivated by phonetic factors, the phonetic motivation does not figure in Labov's theory as prominently as in Kroch's theory. Labov (1972d:178) observes that sound changes usually originate with a subgroup of the speech community – usually a medial status group – "at a time when the separate identity of the group had been weakened by [group] internal or external pressures". He claims that the medial status group has more social motivation to initiate sound changes as a marker of 'local identity' or 'group solidarity' unlike either the highest social group, whose members tend to associate themselves with national circles rather than local interests or ties, or the lowest social group, who have no or little local ties or group allegiance in a chronically needy situation.

Thus according to Labov's theory, one important motivating factor of sound changes is social, though the changes are also language-internally (either phonetically or

[2]According to Ohala (1993) sound changes are initiated by a single or a few speakers who misunderstand the speaker's production through 1) confusion of acoustically similar segments, 2) failing to recognize the cause of phonetic perturbations on a segment, 3) hypercorrecting imagined phonetic distortions on a segment. I assume that these misperceptions are more likely to occur to lower SEC speakers or less educated speakers than the other SEC groups. Lower class speakers also tend to produce more simplified articulations than speakers of other SEC groups as their behavior with regard to /t,d/ deletion (Guy 1980) and /h/ deletion (Trudgill 1974) exemplify.

[3]Kiparsky (1988:375) observes that "from this [Kroch's] perspective the causes of sound change are not so much social as inherent in the use of language itself. What needs to be explained by social factors is not why language changes but why change is sometimes impeded".

structurally) motivated. This is basically why in his theory medial status groups, that may have a socially stronger but phonetically weaker motivation than the low status group, are expected to initiate phonological changes. (In this regard, Milroy & Milroy's (1985:369-370) suggestion that the social groups who Labov claims initiate or actuate sound change may not actually be the initiators of sound change but early adopters is noteworthy.)

Then the question arises why do languages present evidence supporting both the theories? One possibility is that there is more than one type of sound change: one type may be primarily phonetically motivated, while the other type is motivated by social factors as well as by phonetic or structural factors. These three types of motivation or causation in sound changes, i.e., phonetic, social, and structural motivation, are actually all evidenced by documented sound changes in various languages (cf. Hock and Joseph 1996:133-152). It may be that the first type of changes (i.e., those that are primarily phonetically motivated) are likely to show a linear pattern as observed in the current study and as predicted by Kroch, while the other type (where social motivation is as important as structural or phonetic motivation) typically shows a curvilinear pattern as Labov suggests.[4] This suggestion is based on the fact that the low class and the medial class may have, respectively, stronger phonetic motivation and stronger social motivation to initiate sound change, as the two researchers observe. This is yet a speculation, but it is a possibility.

Another important claim in Labov's theory is that sound changes are generally led by females, though he acknowledges that male-initiated changes are also observed in languages. In the two ongoing changes investigated in this study, the two gender groups

[4]The examples of the first type of sound change are strongly perceptually-based changes like those shown in the current study or strongly articulatorily motivated changes such as diachronic processes of palatalization, umlaut, or labialization. Less phonetically motivated changes can be diverse. The so-called 'structurally' motivated changes are the most well-known type of less phonetically motivated changes. The motivations of these changes "go beyond the phonetic factors postulated by the Neogrammarians" (Hock 1986:148). The most representative examples of this type of changes are chain shifts that have been observed in various languages including English, Yiddish, and Akha (cf. Labov 1994:271 ff.). Many known cases of merging or split also lack clear or direct phonetic motivation. Intonational changes observed in various languages (e.g, Guy et al. 1986, Britain 1992) do not exhibit any phonetic motivation either.

did not show a clear difference in their linguistic behavior (see Figure 7.4). The results were that the male speakers produced the innovative form slightly more often than the females, suggesting either that neither group is in the vanguard of the change, or the male group is slightly ahead of the females in adopting the linguistic innovation. One possible interpretation of the results is that heavily phonetically conditioned changes may not place any particular gender in the vanguard, or may possibly exhibit a slight lead by the males, whose speech tends to produce phonetically-conditioned non-standard variants more often than the females' speech (cf. Wolfram 1969, Weinberg 1974). However, this interpretation is again only a possibility and needs to be examined further by future studies of phonological changes.

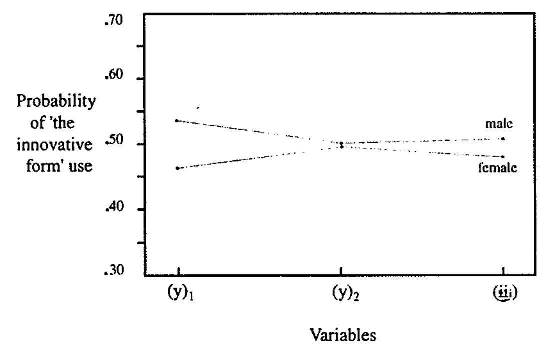


Figure 7.4. Probability of the use of the innovative form by each gender group

NB:$(y)_1$ and $(y)_2$ are actually one and the same variable. They are distinguished here just for expository purpose. $(y)_1$ and $(y)_2$, respectively, indicate (y) in post-consonantal and non-post-consonantal environments.

7.2. Implications for phonological theory in relation to variation

7.2.1. OT and phonological variation

This work has attempted to provide phonological explanations of synchronic variation involving the three variables, i.e., (w), (y), and (ɨi), using the correspondence model of Optimality Theory. It was necessary to expand OT following Reynolds (1994) with the notion of variable dominance (or floating constraints) because OT is not different from other theories of phonology in that it selects only one as the surface form, i.e., because OT has a categorical nature like other phonological theories. However, unlike Reynolds (1994), this work has not claimed that the quantitative results of sociolinguistic variation can be roughly predicted by this expanded theory of OT. This subsection will provide the evaluation of this expanded OT model which this study has adopted as it phonological framework.

Overall the expanded OT model was generally successful in providing phonological accounts of synchronic variation. Three variable dominance relationships between the pairs of constraints shown in (7.1) have been claimed to be the major reason why there exists variation between the competing variants of each variable. The predominant deletion of *w* after a bilabial consonant was attributed to the presence of the constraint OCP[lab] in Seoul Korean (see 4.7.1).

(7.1) Competing constraints that were claimed to trigger variation involving the three variables

(w) — *R-Diph ~ MAX(u)
(y) — OCP(GV:cor) ~ MAX(i)
(ɨi) — *F-Diph ~ MAX(i)

NB. The symbol '~' is used here to indicate that two constraints are unranked or variably ranked with respect to one another.

The constraint rankings given in (7.2) were needed to account for the synchronic variation involving the three variables. (The rankings (7.2.1), (7.2.2), and (7.2.3) come

from (4.15), (5.9), and (6.7), respectively.) The constraint hierarchies show that L-Anchor, which has played a crucial role in the variation and change involving the three variables, and OCP(CG), shown to trigger the categorical deletion of *y*, are not dominated by any other constraint, along with MAX(V[-hi]), *ɨ, *Coda, DEP-μ, and MAX(C). One important fact to note is that the three high vowels of Seoul Korean, i.e., *i*, *ɨ*, and *u*, show rather different behavior towards deletion (which was the main motivation under which MAX(V[+hi]) was exploded into three separate constraints in this study). MAX(i) dominates MAX(ɨ) (see 7.2.3) and *R-Diph (7.2.2), while MAX(u) is variably ranked with respect to *R-Diph (7.2.1). This means that MAX(u) is also dominated by MAX(i), since the latter dominates *R-Diph which is variably ranked with MAX(u).

(7.2) Constraints hierarchies

$$1.\ \text{DEP-}\mu,\ \text{MAX(C)},\ \text{L-Anchor} >> \overleftarrow{\left\{\begin{matrix}\text{OCP[lab]}\\ \left\{\begin{matrix}\text{*R-Diph}\\ \text{MAX(u)}\end{matrix}\right\}\end{matrix}\right\}}$$

$$2.\ \text{OCP(CG), MAX(C), MAX(V[-hi]), DEP-}\mu\text{, L-Anchor} >> \overleftarrow{\left\{\begin{matrix}\text{OCP(GV)}\\ \text{MAX(i)}\end{matrix}\right\}} >> \text{*R-Diph}$$

$$3.\ \text{L-Anchor, *ɨ, *Coda} >> \overleftarrow{\left\{\begin{matrix}\text{*F-Diph}\\ \text{MAX(i)}\end{matrix}\right\}} >> \text{MAX(ɨ)}$$

The expanded OT model has also been generally successful in accounting for the three ongoing changes examined in this study: the loss of *w* after a bilabial consonant, the loss of *y* before the vowel *e*, and the monophthongization of *ɨi*. (The loss of *w* after a bilabial is different from the latter two in that it is near-completion, but since the change is not thoroughly completed, I will consider it as an ongoing change here.) I have suggested that the strengthening of the constraints, OCP[lab], OCP(GV:cor), and *F-Diph, are the main reasons why the respective changes are currently under way. The readers will recall that the first two constraints have a phonetic basis: the two sound sequences, 'bilabial C + *w*' and '*y* + *e*', are not very perceptually distinct or optimal sequences. The constraint, *F-Diph, is structurally motivated; it is a representation of language-internal structural pressure against the falling diphthong in Seoul Korean. The OT model has been able to represent these two types of motivating force behind linguistic changes as phonological constraints shown above, which are arguably universal across languages. This may be a strong advantage of the OT model which derivational phonological models cannot claim that they share.

It has also been shown that the OT model has the potential to account for not only why phonological changes have happened or are happening but the manner in which the changes have proceeded or are proceeding (see chapter 5 of Zubritskaya 1995 in the latter regard). The expanded OT model has successfully explained the ongoing split of *ɨi̯* to *ɨ* and *i* – i.e., the *ɨi̯* to *ɨ* change in word-initial position and the *ɨi̯* to *i* change in non-word-initial position – as coming from the interaction of two constraints, *F-Diph and L-Anchor. (As suggested earlier, both the changes are motivated by identical motivating factors, viz., structural pressure against the falling diphthong and a perceptual factor.) It was suggested that the diphthong *ɨi̯* is changing to *ɨ* because of the phonological (or perceptual) strength of a word-initial segment, i.e., because of the presence of the phonological constraint L-Anchor in Seoul Korean, formally speaking. The presence of the same constraint in this dialect has been claimed to be responsible for why the diachronic loss of non-post-consonantal *y* before *e* and the monophthongization of *ɨi̯* , are happening (or have happened) in non-word-initial position earlier than in word-initial position. This shows that the OT model also has the potential to shed partial light to the 'transition' problem of sound change.

However, the expanded OT model cannot, without doubt, explain all the aspects of variation. First of all, it cannot explain stylistic and social aspects of variation involving

linguistic variables, though phonological theory cannot really be expected to provide explanations of these aspects. As Reynolds (1994:103) suggests, "the extralinguistic factors which help to determine the choice a speaker makes with regard to the use of a given variant (and the probability of making such a choice) are, *in and of themselves*, outside the scope of phonology" (original emphasis). This means that phonological theory can explain – and can be expected to explain – only partial aspects of sociolinguistic variation, primarily its linguistic aspects. This should be one important restriction not limited to the OT model but to all the phonological accounts of sociolinguistic variation and change.

The current study also reveals that the frequency distribution of competing forms of a variable cannot be predicted by the expanded OT model, at least in the variables examined in this study. The notion of 'variable dominance' or 'floating constraints' can only indicate that two or more constraint hierarchies derived from a variable dominance relationship produce competing variants out of a variable; the arrow proposed by Reynolds (1994:118) (and also shown in (7.2)) can indicate which constraint (or variant) is gaining strength, i.e., the direction of change, but not more than that. The numerical or percentile distribution of variants of a variable cannot be claimed to be predicted by phonological theory, because the theory is not a statistical model. This may be another limitation of the expanded OT model or of phonological theory in general when it attempts an explanation of sociolinguistic variation.

7.2.2. Feature theory and *y* deletion in Seoul Korean

I suggested in Chapter 5 that the deletion of *y* in Seoul Korean is triggered by an OCP effect. It was proposed that two OCP constraints present in Seoul Korean are responsible for categorical and variable processes of *y* deletion. The formulation of these constraints are, however, not handled equally simply and naturally by two major models of feature theory: Sagey (1986) and Halle's (1989) articulator-based model and Clements and

Hume's (1995) constriction-based model. In this subsection, I will show that the deletion of *y* in Seoul Korean provides support for the latter model (or unified features theory), which proposes that "a single set of features characterizes place of articulation in both consonants and vowels" (Clements 1991:77).

The main underlying motivation of unified features theory is that interaction between consonants and vocoids, which can take the form of assimilation (e.g., Tulu: Bright 1972, Maltese: Hume 1994), dissimilation (e.g., Berber: Selkirk 1988, Akkadian: Hume 1994), glide strengthening (e.g., Porteño Spanish: Harris 1983), and consonant weakening (e.g., Maxacaí: Gudscinsky et al. 1970), can be explained with more simplicity and naturalness when the same set of articulatorily/acoustically motivated place features are used to describe the consonants and vocoids.[5] This theory thus holds that the pairs, labial consonants and rounded vocoids, coronal consonants and front vocoids, and dorsal consonants and back vocoids, form natural classes, respectively. Yet, in order to capture the cross-linguistic tendency that place features of vowels can spread more freely than those of consonants, the theory proposes that place features of consonants and vowels are arrayed on different planes, i.e., under the nodes V-place and C-place, respectively. It should also be noted that the current version of this theory (Hume 1994, Clements and Hume 1995) holds that each place feature is assigned to an identical tier whether it characterizes a consonant or a vocoid, though the feature may be on different planes.

The two OCP constraints I proposed in Chapter 5 are repeated below in Figure 7.5 in less simplified forms. As the figure shows, the two constraints are formulated following the unified features model, thus characterizing both coronal consonants and front vowels as [cor]. The OCP, taken as 'adjacent identical features are prohibited' (cf. McCarthy 1986), can explain effectively why *y* deletes in the two representations below: the deletion of *y*

[5]Though the place features proposed by Clements and Hume are articulatorily motivated like those proposed by Halle or Sagey, constriction places characterize the features in C & H's model. In other words, the features proposed by unified features theory are not articulator-based as in Halle or Sagey's models.

occurs in order not to violate the OCP, i.e., to avoid the adjacency of the identical feature [cor].

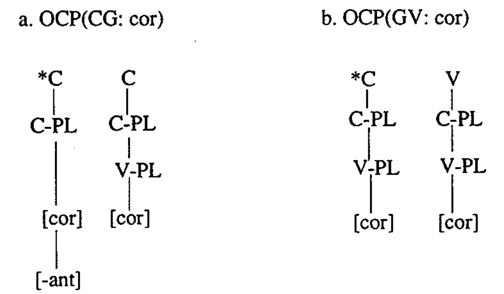


Figure 7.5. Two proposed OCP constraints against adjacent coronal segments formulated based on Clements and Hume's (1995) model

The articulator-based feature models of Sagey and Halle, on the other hand, cannot provide an equally simple account of *y* deletion in Seoul Korean. In Sagey's (1986) feature model, front vocoids are given the place feature [-back] following the SPE tradition, while consonants such as alveolars or palatals are defined as [coronal] segments. This model can formulate the OCP constraint that triggers the variable deletion of *y* (i.e., the deletion of *y* before *e*) as shown in Figure 7.6, but it is obvious that the model cannot explain the categorical deletion of *y* (i.e., the deletion of *y* after a palatal consonant) in terms of an OCP effect, believed to trigger this dissimilatory process, since in this model two different place features, i.e., [coronal] and [-back], define palatal consonants and front vocoids, respectively.

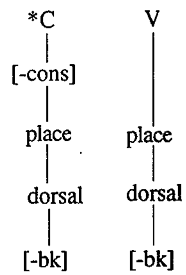


Figure. 7.6. OCP[-bk] formulated based on Sagey's model

Halle's position on the featural characterization of the palatal glide is somewhat different from Sagey's. Halle (1989:9) suggests that *y* is [coronal] in some languages but in others it is characterized as [-back]: he seems to indicate that in languages where the glide phonologically patterns with consonants, it is specified as [coronal], while in those languages in which the glide patterns with vowels, the feature [-back] defines the palatal glide. If *y* shows consistent behavior in a given language by patterning either exclusively with consonants or only with vowels, Halle's proposal does not pose a problem. However, as Hume (1994) suggests, Halle's featural characterization of *y* can be problematic if there exist languages where the palatal glide patterns with both consonants and vowels. It is because a consistent use of a single feature, i.e., [coronal] or [-back], for the glide will not be able to account for the glide's interaction with both consonants and vowels in such languages. We have observed in Chapter 5 that exactly this type of dual interaction is found in Seoul Korean.

If we follow Halle's line of theorizing, two different OCP constraints shown in Figure 7.7 will have to be formulated in order to account for both types of *y* deletion in Seoul Korean. The palatal glide that shows interaction with a consonant is defined as [coronal] and *y* that patterns with a front vowel has been given the feature [-back] as shown in the figure. But the formulation of these two constraints is not possible in any feature

model because it will cause a model-internal conflict: one and the same segment will have to be characterized by two different place features.

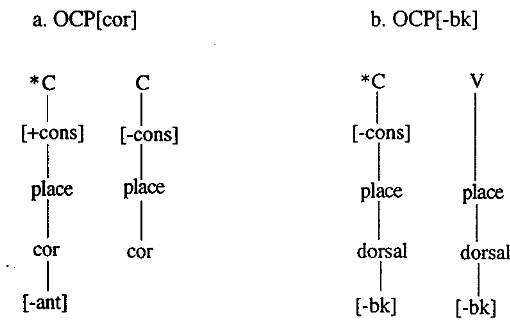


Figure. 7.7. Two conflicting OCP constraints formulated following Halle's (1989) proposed line of theorizing

Another possible option will be to assume that *y* has both the feature specifications, i.e., [coronal] and [-back], and explain the deletion of *y* relying on an OCP effect using two different features. But this assumption will introduce unnecessary complexity and redundancy not only to the phonological account of *y* deletion in Seoul Korean but also into the feature system itself. In fact, the same constriction or articulator movement (involving the tongue front) will have to be characterized by two different features if we make this assumption. This fact indicates that Halle's feature model (as well as Sagey's) cannot account for *y* deletion in Seoul Korean with equal naturalness and efficiency as the unified features model.

In sum, the deletion of *y* in Seoul Korean clearly supports the unified features model of Clements and Hume (1995). We have seen that this feature model can account for *y* deletion in Seoul Korean as a dissimilatory process in a simple and natural manner, without arbitrary assumptions or unnecessary superfluity. It has been shown, on the other hand, that the articulator-based feature models of Sagey (1986) or Halle (1989) cannot adequately or efficiently explain the interaction of *y* with both consonants and vowels observed in Seoul Korean.

7.2.3. Phonological strength of different word-internal positions

Based on his observation that weakening of segments typically occurs in word-medial and -final environments in languages rather than in word-initial position, Foley (1970, 1977) claims that word-medial and -final positions are phonologically weak or weakening environments, where synchronic and diachronic processes like fricativization, voicing, monophthongization, and loss are apt to occur.[6] In this subsection I will show that the patterns of variation and change involving the three lenition processes examined in this study provide strong evidence that indeed word-medial and -final positions are weak positions, while word-initial position is a phonologically strong environment. Different strengths of word-internal positions have important implications for how sound changes, especially weakening or strengthening processes, proceed, i.e., the transition problem of sound change (Weinreich et al. 1968), and also for "positional faithfulness" (see Beckman 1997, Lombardi 1995, Casali 1997), one of the current issues in OT.

The first piece of evidence supporting Foley's claim is given by the different behavior of word-initial and non-word-initial syllables toward the deletion of the two glides, i.e., *w* and *y*. This difference is summarized in Table 7.1, where the deletion rates of *w* and *y* in the two different types of syllables are given and contrasted. The table shows that the deletion of the two glides happens less frequently in a word-initial syllable than in a non-initial syllable throughout the four categories. Factor weights also indicate that a non-initial syllable is an environment favoring the deletion of the two glides while an initial syllable disfavors the deletion. (Recall that .5 is the critical value that decides

[6]See also Hyman (1975:169) for a similar claim. Foley (1977:109) suggests that intervocalic position (V__V) and post atonic position ($\check{V}$__) are also phonologically weak positions cross-linguistically.

between favoring and disfavoring.) The phonological strength of a word-initial syllable is exhibited by less frequent deletion of the two glides in this environment.

	Word-initial σ		Non-word-initial σ	
	ø%	weight	ø%	weight
C*w*V:	24%	(.421)	29%	(.615)
*w*V	1%	(.303)	10%	(.797)
C*y*e	91%	(.294)	97%	(.658)
ye	4%	(.168)	70%	(.970)

Table 7.1. Deletion rates of *w* and *y* in word-initial and non-word-initial syllables

NB. Sonorant consonants, which appear only in a non-word-initial syllable and trigger *y* deletion significantly less often than obstruents (as discussed in Chapter 5), are not included in the tabulation for C*y*e.

The results given in the table, however, reveal another important distinction in phonological strength in Seoul Korean. Both percentages and Varbrul weights indicate that the distinction between word-initial and non-initial syllables is more clear with a non-post-consonantal glide than with a post-consonantal glide, i.e., in *w*V and *ye* than in C*w*V and C*y*e. Since a non-post-consonantal glide in an initial syllable is a word-initial glide, it is suspected that word-initial segment position probably has more phonological strength than the other positions in the same syllable; or a word-initial segment is phonologically stronger than the other segments in a word-initial syllable. (The above table also shows that the deletion of word-initial glides is near-categorically absent.) Kim-Renaud (1986b:128) claims that a word-initial syllable is phonologically strong in Seoul Korean and "especially the initial sound of a phonological word". The statistics given in Table 7.1 can be construed as clearly supporting her claim.

The extraordinary strength of a word-initial segment is also revealed by the two diachronic changes discussed in this study: the diachronic loss of *y* and the monophthongization of *ɨi*. We have observed that the (diachronic) loss of a non-post-consonantal *y* is now active in a non-initial syllable but not in word-initial position, revealing the phonological strength of a word-initial segment. The pattern of monophthongization of *ɨi*, another weakening process, also evidences the strength of a word-initial segment as claimed in the previous chapter. The fact that *ɨi* has changed to *i* not only in a non-initial syllable but also in a word-initial syllable when a consonant precedes it (while changing to *ɨ* in initial segment position) shows that Seoul Korean distinguishes word-initial segment vs. non-word-initial segment as well as word-initial syllable vs. non-word-initial syllable. (See Casali 1997 and Beckman 1997 for examples of the former (e.g., Ogori) and the latter (e.g. Shona) distinction made by languages.)

According to Foley, weakening can also occur in phonologically strong environments. His suggestion is that weakening will "first apply in weak position, and may then generalize to include strong position" (Foley 1977:99). In other words, his theory predicts that segments will weaken in weak positions earlier than in strong positions (if the generalization happens at all). Foley formulates this idea as the second clause of what he terms as the 'inertial development principle':

(7.3) The Inertial Development Principle (Foley 1977:107)

1) Strong elements strengthen first and most extensively and preferentially in strong environments.[7]

2) Weak elements weaken first and most extensively and preferentially in weak environments.

The second statement of Foley's inertial development principle is also supported by the two linguistic changes in progress examined in this study, i.e., the loss of *y* before *e* and the monophthongization of *ɨi*. The monophthongization of *ɨi* began in non-word-initial segment position before affecting word-initial-segment position. The deletion of non-post-

[7]In Foley's theory (like in other researchers') the strength of segments has a close relationship with sonority (or resonance) of segments, i.e., the strength of vowels are proportionate to sonority, but the strength of consonants is generally inversely proportionate to their sonority (see Chapter 3 of Foley 1977 for a detailed discussion of phonological strengths of segments).

consonantal *y* is currently going on almost exclusively in a non-initial syllable (which is a weak environment), as observed earlier. The ongoing spread of *ɨi* monophthongization to word-initial-segment position can be construed as the generalization of a weakening process to a strong environment.

As Hall (1992) suggests, phonological strengths of different word-internal positions may be closely related to how words are processed and recognized by humans. One of the dominant word recognition theories is the processing model called the 'cohort theory' (Marslen-Wilson and Tyler 1980, Marslen-Wilson and Welsh 1978, Marslen-Wilson 1987). Some important claims of this model relevant to the current discussion are 1) words are processed 'on-line' (i.e., as soon as the input is received) in a left-to-right fashion, 2) initial candidate words, i.e., the 'word-initial cohort', are activated on the basis of the acoustic-phonetic information given by the initial part of a word, 3) the sound sequence of a word continues to be processed until a given lexical item is uniquely distinguished from any other word of a given language, 4) most words are recognized before the listener reaches the final portion of a word.

Hall, following the assumptions of the cohort theory, suggests that the reason why the initial portion of words is especially resistant to weakening in the world's languages is that this part is crucial in the processing of words, i.e., because words are identified from a heavy reliance on the acoustic information of the initial part of a lexical item. (In the cohort model, contextual information can play a role only in ruling out (some) candidates among the cohort set activated by the word-initial contact; only the sensory (acoustic) input, not the contextual input, can activate the cohort: see Marslen-Wilson 1987 for a detailed discussion.) An explanation identical to Hall's (1992) can be given to the consistent pattern of variation and change observed in this study, where the initial portion of words is significantly less frequently subject to lenition in synchronic variation and is affected later by diachronic weakening than the non-initial portion — speakers tend to preserve the phonological integrity of the initial portion of words for listeners until the underlying form of that portion itself is changed. In this sense, the findings of the current study can be taken as indirectly supporting the cohort theory. The cohort theory can also offer a plausible explanation of the cross-linguistic tendency that phonological weakening occurs more often in word-final position than in word-medial position (cf. Hock 1986:83, Hyman 1975:169), because according to this theory word-medial position is more important than word-final position in word recognition.

There are different claims among researchers of word recognition as to the exact point when the initial candidate lexical set or the word-initial cohort is activated. For instance, Marslen-Wilson (1984) and Tyler (1984) make a claim that the first 150 ms of a word (which will roughly correspond to the first syllable) needs to be analyzed by listeners before a word-initial cohort is activated. Luce (1986) and Pisoni & Luce (1987), on the other hand, suggest that initial candidate words are already triggered when the processing of a word-initial segment is finished, e.g., when the listener has processed "d" of "desk" produced by the speaker, all words beginning with *d*, such as "dam", "down", "dance," and so on, are activated as the initial lexical set. The implication of this version of the lexical access model is that a word-initial segment is more important in word-recognition than the following segment(s) of a word-initial syllable (i.e., "d" is more important than "e" in "desk", for instance) because the first segment can rule out a much larger portion of the lexical items stored in the listener's mental lexicon than the second or third segment. However, the lexical access model of Marslen-Wilson (1984) or Tyler (1984) predicts no major difference in phonological strength between a word-initial segment and the following segments of a word-initial syllable, because the acoustic information given by the first 150 ms of a word activates the cohort set as a unit. The data examined in this study has shown that in Seoul Korean a word-initial segment is phonologically significantly stronger than the

other segments of a word-initial syllable. Accordingly, this finding can be construed as supporting Pisoni and Luce's model of the activation of the initial lexical set.

7.3. Implications for phonetic explanation of sound change

Neogrammarians and subsequent proponents of the 'Neogrammarian (or regular) hypothesis' have claimed that sound change is fundamentally phonetically motivated. It was earlier pointed out that two different types of phonetic motivation have been proposed by researchers: articulatory motivation and perceptual motivation. Ohala (1993), one of the few phoneticians who has done extensive research on sound change and attempted to provide phonetic explanations of changes in sound, has claimed that sound change arises mostly because of perceptual (acoustic/auditory) rather than articulatory factors.

I have earlier suggested that the three linguistic changes examined in the present research, i.e., the loss of *w* after a labial consonant, the loss of *y* before *e*, and the monophthongization of *ii*, have a clear perceptual motivation. It was shown that the loss of *w* after a bilabial is attributable to the fact that *w* shares similar acoustic/auditory cues with labial consonants, thus tending to cause the listener to ascribe the *w*-caused perturbations on the following vowel to the preceding labial consonant.[8] The loss of *y* before *e* (i.e., the diachronic deletion of *y* from the diphthong *ye*) and the monophthongization of *ii* were also suggested to have been motivated by a relative lack of perceptual saliency of these diphthongal sequences. It was shown that the two diphthongs, i.e., *ye* and *ii*, are the very two diphthongal sequences with the least internal perceptual distances between the onset and the offset in Seoul Korean (see 6.6.2). In this sense this study clearly provides support to Ohala's claim that the major phonetic motivation of sound change is perceptual rather than articulatory.

[8]Readers will recall that this type of perception error on the part of the listener was termed 'hypo-correction' in Ohala's (1981) phonetic model of sound change.

Another claim of Ohala that is supported by the current study is his claim that cross-linguistically common constraints on sound sequences, or languages' favoring or disfavoring of certain types of sound sequences are best explained in acoustic/auditory terms. Ohala (1992) expresses reservation with phonologists' approach to explain segmental sequential constraints relying on phonological constraints like the Sonority Hierarchy Principle[9] or the Obligatory Contour Principle on the grounds that 1) such constraints are unable to explain some commonly observed phonotactic constraints (especially when special, rather arbitrary stipulations are not made to them), 2) the formulation of these phonological constraints may not be a 'real' explanation. The current study provides one piece of evidence supporting Ohala's claim that common phonotactic constraints are primarily acoustically/perceptually based. This evidence is presented below.

The diphthongs, unstable diphthongs, and prohibited diphthongs of present-day Seoul Korean are given in Figure 7.8 for reference. The diphthongal sequences which are not allowed in this dialect are asterisk-marked, and the sequences currently going through a change due to instability are marked with an asterisk within brackets.

a) *w* diphthongs			b) *y* diphthongs		
wi	*wɨ	*wu	*yi	*yɨ	yu
we	wə	*wo	(*)ye	yə	yo
	wa			ya	

c) isolated diphthong: (*)ɨi

Figure 7.8. The diphthongs of Seoul Korean, the gaps, and the unstable sequences

[9]Kenstowicz (1994:254) uses the term Sonority Sequencing Principle (which "requires onsets to rise in sonority toward the nucleus and codas to fall in sonority from the nucleus") rather than the Sonority Hierarchy Principle. A complementary constraint to the Sonority Hierarchy Principle is Clements' (1990) Sonority Dispersion Principle, which stipulates that syllables (of the languages) prefer to maximize the sonority slope in the transition from the onset to the nucleus and to minimize the slope during the nucleus to coda transition.

In Chapter 5, I proposed that the constraint, OCP(GV:cor) (cf. Figure 5.1), is responsible for the prohibition of **yi* and the ongoing change of *ye* in Seoul Korean. This account seems plausible because the 'palatal consonant + *y*' sequence is also prohibited in this dialect. The presence of these two co-occurrence restrictions can be taken as revealing the dialect's strong disfavoring of successive palatal segments. It may also be proposed that the OCP constraint given in Figure (7.9a) prohibit the sequences **wu* and **wo* in Seoul Korean,[10] and that the constraint given in Figure (7.9b), i.e., OCP(VV:+hi), cause instability in *ɨi* and trigger its monophthongization. Through the formulation of these three constraints, we can claim that the three prohibited (i.e., **wu*, **wo*, and **yɨ*) and the two unstable (*ye*, *ɨi*) diphthongal sequences have been given a phonological explanation. However, a phonological account along these lines faces one problem when it tackles the prohibited sequences **wɨ* and **yɨ* (cf. Figure 7.8): no simple and plausible explanation can be given to why these sequences are not allowed in this dialect.

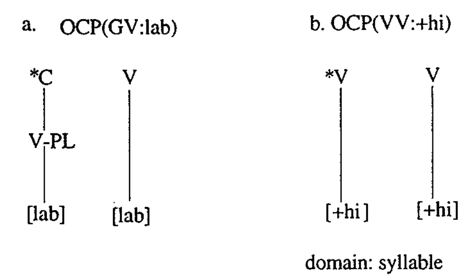


Figure 7.9. Two OCP constraints that can be formulated for a partial explanation of co-occurrence restrictions on diphthongal sequences in Seoul Korean

Ohala's perception-based account of segment sequential constraints, on the other hand, provides a simpler and principled explanation of why the sequences **wɨ*, **wu*, **wo*,

[10]As shown earlier, Seoul Korean also has strong constraints against successive labial segments (refer to (4.7) for OCP[lab] that prohibits the 'bilabial C + *w*' sequence).

**yi*, and **yɨ* are not allowed in this dialect, as well as of the instability in *ye* and *ɨ̯i*. The diphthongal sequences which are prohibited or currently showing instability in Seoul Korean are the seven least acoustically modulated diphthongal sequences in terms of spectral shape and amplitude (see the last columns of Tables 5.23, 6.20, and 6.25), i.e., those seven diphthongal sequences with the least perceptual saliency. This perception-based account not only explains all the co-occurrence restrictions present in Seoul Korean diphthongs but is also more natural and simpler than the phonological account given above. In this sense, the current study supports Ohala's (1992) claim that constraints on sound sequences are mostly acoustically/auditorily based.

One further phonetic implication of the current research is that this study has shown that at least two acoustic parameters, i.e., spectral shape and amplitude, should be considered when the size of acoustic modulations between the onset and the offset of diphthongal sequences is approximated. (As discussed earlier, spectral shape and amplitude are the two most important acoustic parameters in determining the degree of perceptual saliency of diphthongal sequences among amplitude, periodicity, spectral shape, and fundamental frequency.) Kawasaki-Fukumori (1992:81) notes that "acoustically [wi] is considerably better-modulated than [wa], suggesting the greater viability of the former" but finds puzzling evidence indicating the contrary — not a few languages have *wa* but not *wi* (e.g., Japanese and Ainu).[11] Kawasaki-Fukumori's statement is true when modulations in spectral shape (or formant frequency) alone are considered. (See Table 6.22, which suggests that the formant frequency distance between *w* and *i* is much larger than the distance between *w* and *a* in Seoul Korean.) However, the opposite must hold when amplitude, another important acoustic parameter, is considered: *wi* has a much smaller internal amplitude modulation than *wa* (see Table 6.23). The results of the

[11]Kawasaki-Fukumori (1992:81) later notes that "one possible reason for the preference for the low vowel /a/ to be combined with glides, labialized or palatal consonants, and high vowels is the maximal F1 modulation in such sequences, which may not have been weighted properly in the present study".

proposed method of approximation, i.e., approximation of the size of acoustic modulations in both terms of spectral shape and amplitude, can give a plausible account of why *wa* and *aw* are the most-often observed *w* diphthongs in the world's languages, as well as identify perceptually unstable diphthongal sequences. Kawasaki-Fukumori's suggestion holds only when one acoustic parameter, i.e., spectral shape, is taken into account.

In sum, findings of the current research support Ohala's phonetic model of sound change and his acoustic/auditory explanation of common constraints on sound sequences. It should be pointed out, however, that Ohala does not claim that all sound changes or constraints on sound sequences are perceptually motivated. He notes that some sound changes can have their origins in the speaker, rather than the listener (see Ohala 1981:178), and that some segment sequential constraints are articulatorily motivated (see Ohala 1992:328). He (1991:344) also makes it explicit that his model of sound change is a probabilistic model: his model claims only that acoustically/perceptually optimal sequences have a significantly better chance of survival and thus a significantly better chance of being observed in languages than less optimal sequences. Ohala's theory does not and cannot explain why a specific change has occurred in a given language and at a given time, any more than other current models of sound change can.

The phonetic accounts which I have given in this research are also on the basis of a probabilistic model. Ohala's following observation is well to the point: "The forces which tend to eliminate non-optimal sequences ... should not be expected to act in an all-or-nothing fashion" (Ohala 1992:326). Some languages may have sequences that cannot be explained along the acoustic/auditory line of explanation that have been given in this research. Each language's current inventory of segments and sound sequences is presumably the result of complex interactions among phonetic (both perceptual and articulatory) and phonological (or structural)[12] and also possibly social factors. My claim here is only that perceptual factors may be the most important among these and thus can be the most reliable indicator predicting what type of segments and sound sequences are selected by and viable in linguistic systems. The findings of this study also suggest that the consideration of a perceptual factor may be essential in tackling the 'constraint' problem of sound change (Weinreich et al. 1968).

7.4. The changes in and the current status of the Seoul Korean diphthongal system

The changes which have occurred in the inventory of Seoul Korean diphthongs are summarized in Figure 7.10. Figures (7.10a), (7.10b), and (7.10c) illustrate the changes in the inventories of *w*, *y* rising, and *y* falling diphthongs, respectively.

A careful examination of the changes that have occurred in the diphthongal inventory of Seoul Korean reveals that the following three factors (or constraints) have played an important role in triggering changes and shaping the dialect's diphthongal systems of different periods: 1) a change in the monophthongal system, 2) a structural (or phonological symmetry and pattern) factor, and 3) a perceptual factor. One particular feature that stands out in the changes of Seoul Korean vowels is that monophthongal and diphthongal systems of this dialect have affected one another in an important way. The first two factors proposed just above have a direct bearing on this interaction between monophthongal and diphthongal systems. I will show below how the three proposed factors have influenced and shaped the diphthongal system of Seoul Korean giving specific changes as examples.

[12]See Hock (1986:151ff.) and Anderson (1973:127 ff.) for how phonological symmetry and phonological pattern have played a role in sound changes of languages. Also recall that one of the two major motivations of monophthongization of *ɨi* was a structural factor.

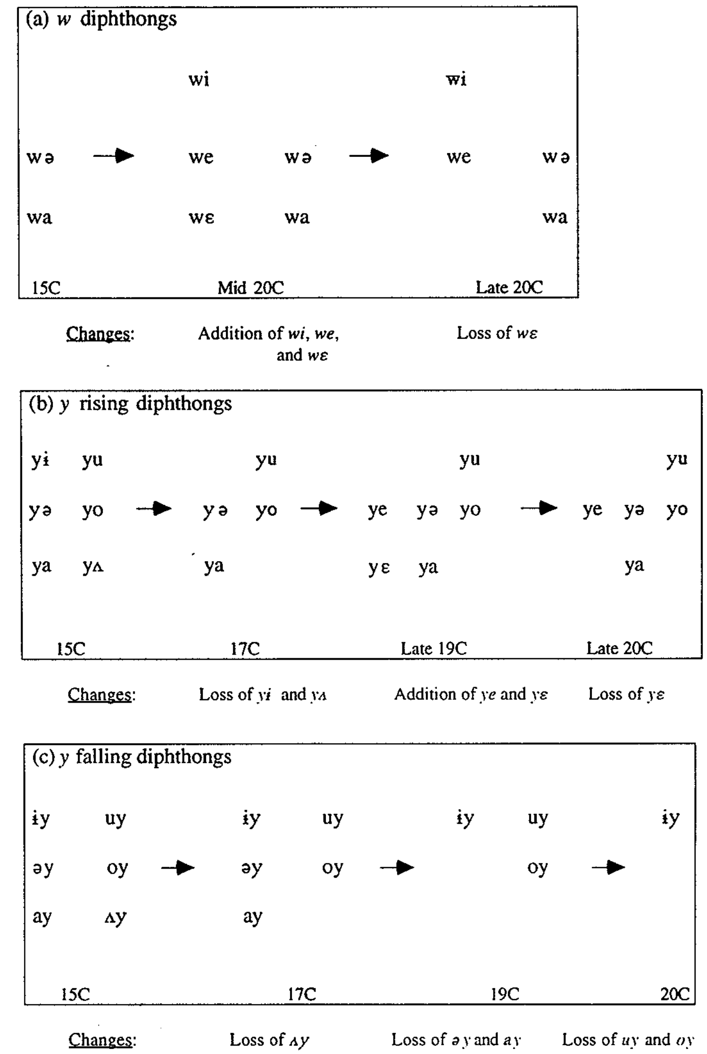


Figure 7.10. Changes in diphthongs of Seoul Korean

First, a change in the monophthongal system has tended to trigger a change in the diphthongal system. The addition of *we*, *wε*, *ye*, and *yε* to the diphthongal system (presumably) in the 19C came from the addition of *ε* and *e* (which, respectively, originate from the monophthongization of *ay* and *əy*) to the monophthongal inventory of Seoul Korean. The addition of *wi* was a result of the diphthongization of *ü*, which also resulted in the loss of *ü* from the monophthongal system.[13] The influence of the monophthongal system over the changes in the diphthongal inventory is evidenced by other changes too. The loss of *yʌ* and *ʌy* in the 17C came from the loss of *ʌ*. The loss of *wε* and *yε* in the present century, on the other hand, originates from the merging of *ε* and *e* (or the raising of *ε* to *e* (cf. Hong 1988)). All these changes provide clear evidence that monophthongal changes in Seoul Korean have caused changes in the diphthongal system in most cases.

As discussed earlier, linguists dealing with historical data have observed that at least some sound changes are triggered by the influence of phonological structure. Researchers (e.g., Martinet 1952, Gvozdanović 1985) have suggested that these so-called 'structurally-conditioned' changes are caused by a language-internal drive to preserve sufficient contrast and symmetry in phonological structure (especially in segment structure) and to sustain a consistent phonological pattern (cf. Hock 1986:159ff.). The most prominent and well-known examples of these structurally-motivated changes are, as mentioned earlier, chain shifts that have been observed in various languages including Korean (Chae 1995). I suggest that this structural motivation is another major factor that has contributed to diphthongal changes in the Seoul dialect. In fact, the monophthongization of most falling diphthongs of Seoul Korean can be categorized as a structurally motivated change, as will be shown below.

The loss of *əy* and *ay*, and the subsequent loss of *oy* and *uy* (through their respective monophthongization to *e*, *ε*, *ö*, and *ü* in the 18C and 19C) are conjectured (as

[13]It is not clear, though, whether *wi* came exclusively from *ü* or there was another source in the formation of this diphthong.

claimed by most Korean historical linguists) to have been motivated by the need to redress an asymmetry in the monophthongal system. Figures (7.11a) and (7.11b) illustrate the monophthongal systems of the early 18C and the late 19C, respectively. The comparison of the two figures provide quite a strong support to the claim that the loss of the above four falling diphthongs is structurally motivated. While the system before the changes shows a rather seriously unbalanced structure, the monophthongal system of the Seoul dialect after the changes exhibits a perfect symmetry in the front and back dimensions.

(a) Before the monophthongization (early 18C)

[-bk]		[+bk]	
i		ɨ	u
		ə	o
		a	

(b) After the monophthongization (late 19C)

[-bk]		[+bk]	
i	ü	ɨ	u
e	ö	ə	o
ε		a	

Figure 7.11 The monophthongal systems of Seoul Korean before (a) and after (b) the monophthongization of *əy*, *ay*, *uy*, and *oy*

I have suggested in this study that the ongoing monophthongization of *ɨi* (or ɨy) is also partially structurally motivated. As discussed earlier, the loss of *ʌy* (16-17C) was followed by the monophthongization of *ay* and *əy* (18-19C), which was, in turn, followed by the monophthongization of *uy* and *oy* (19C). As a result, *ɨi* was made the only falling diphthong remaining in Seoul Korean. On the basis of the cross-linguistic tendency to eliminate a deviant element in the phonological system and attain pattern symmetry (cf. Hock 1986:148ff.), I have suggested that structural pressure, i.e., pressure to eliminate a structurally deviant element, has been one major factor triggering the monophthongization of ɨi̯. The Seoul dialect has also shown a diachronic change where long vowels of many lexical items are shortened (cf. Magen and Blumstein 1993, J.K. Park 1985). If we accept the standard phonological assumption that falling diphthongs and long vowels are linked to two moras, the ongoing monophthongization of ɨi̯ may also be part of the conspiracy present in Seoul Korean to remove two-mora syllables from the dialect's phonological system. The presence of the structurally motivated changes mentioned so far also reveals that many changes in Seoul Korean diphthongs have not been blind to the system (or structure) of diphthongs as some proponents of the Neogrammarian hypothesis might contend but sensitive to how each change has been "embedded" into the system.

The second major factor which I have claimed to be responsible for the monophthongization of ɨi̯ is a perceptual factor. This factor, which can be roughly stated as 'diphthongs which lack sufficient perceptual distance between the two component vocoids tend to be lost because of their lack of perceptual salience', was also shown to be the main trigger of the ongoing loss of *ye*. These two changes in progress indicate that a perceptual factor is another important cause that triggers changes in the dialect's diphthongal system. Besides the two ongoing monophthongizing changes, the loss of *yɨ* in the Pre-Modern Korean period (cf. Figure (7.10b)) is also conjectured to have been motivated by this factor. (Refer to Tables 5.22 and 5.23; the tables show that perceptually *yɨ* is almost as unstable as *ye*.)

There are additional pieces of evidence supporting my claim that a perceptual factor has played a major role in shaping the diphthongal inventory of Seoul Korean. First, this dialect never had *wu*, *wo*, and *wɨ*. It is also a majority opinion that *yi* and *iy* were never part of the diphthongal system of this dialect. When a common property of these

diphthongal sequences, i.e., small internal acoustic modulations, is considered, the indication of these historical facts is that the above five diphthongal sequences have not been selected by this language because of their lack of perceptual stability or optimality (cf. Tables 5.23 and 6.25). Even if it were the case that *yi* and *iy* had been present in this dialect at one time and were lost (as some scholars claim), perceptual instability of these diphthongs must have played a major role in the (hypothetical) subsequent loss of the two.

I have also noted that different phonological strengths of different word-internal positions, which have had an important effect on the two monophthongizing changes examined in this study, are closely related to different inherent perceptual saliency of different word-internal positions.[14] It has already been shown that different inherent perceptual saliency (or different phonological strengths) of different word-internal positions determines which position is affected by monophthongization earlier (or later) than the other positions. This fact can be taken as evidence that a perceptual factor has been crucial not only in triggering diphthongal changes but also in the linguistic generalization (as opposed to the social spread) of these changes.

In this subsection I have addressed the "constraints" problem in the diphthongal changes of Seoul Korean. I have shown that three factors, i.e., a monophthongal change, a structural factor, and a perceptual factor, have played a crucial role in triggering changes in and shaping the diphthongal system of Seoul Korean. The various diphthongal changes illustrated in Figure 7.10 seem to suggest that these three have been almost equally important in building and shaping the dialect's present diphthongal system. The current system of the dialect's diphthongs suggested by the findings of the present study has been already given in Figure 7.10. The fact that *ye* and ɨi̯ (or *ɨy*) are currently undergoing

[14] As mentioned earlier, phonological strength of different word-internal positions has played an important role in some other changes as well. Lenis obstruent fortition, an ongoing change which occurs only in word-initial position, and the change of /ʌ/ to /a/ in a word-initial syllable and to /ɨ/ in a non-word-initial syllable that took place in the 16 to late 18C are such changes.

monophthongization enables us to predict that the diphthongal system of Seoul Korean will take the form shown in Figure 7.12 in the future, though it is hard to predict exactly when.

a) *w* diphthongs

wi	
we	wə
	wa

b) *y* diphthongs

	yu
yə	yo
ya	

Figure 7.12. The predicted diphthongal system of Seoul Korean in the (indeterminate) future

7.5. Concluding remarks

In relation to the overall diphthongal system of Seoul Korean, the present study has investigated three lenition processes observed in this dialect: the deletion of the labiovelar *w*, the deletion of the palatal glide *y*, and the monophthongization of the diphthong *ɨi*. The examination of these three sociolinguistic processes has not only showed the current status of the diphthongal system in Seoul Korean but also revealed that studies of phonological variation can produce rather important results that have implications for different fields of linguistics, such as sociolinguistics, phonology, phonetics, and historical linguistics. Ample evidence that indicates active interaction between sociolinguistics and the latter three fields has been presented in this study. It is hoped that the present study has been able to show that studies of phonological variation can produce fruitful findings and interesting implications not only for its own discipline but for its related fields of linguistics.

APPENDICES

Appendix A

Table 1. List of Informants (interview and ingroup speech)

No	Name	Sex	Age	Occupation	Education	R.A.	B.P.
1.	C. Park	M	24	college student	C	koyang	Seoul
2.	S. Lee	F	67	cleaning lady	P	yongsan	Seoul
3.	S. Kim	F	67	house wife	C	conglo	Seoul
4.	M. Chung	F	60	jeweller	H	puntang	Seoul
5.	H. Lee	M	19	store clerk	H	eunphyeng	Seoul
6.	Y. Chang	M	44	store manager	JC	songpha	Seoul
7.	Y. Lee	M	57	chauffer	P	eunphyeng	Seoul
8.	H. Chung	M	50	store owner	P	tongtaymun	Seoul
9.	Y. Chun	M	51	electrician	H	mapho	Seoul
10.	K. Youn	M	55	farmer	M	eunphyeng	Seoul
11.	C. Kim	M	53	policeman	JC	songpha	Seoul
12	I. Lee	F	62	house wife	JC	eunphyeng	Seoul
13.	C. Song	M	63	jeweller	JC	sengdong	Seoul
14.	S. Kim	M	59	doctor	C	tongcak	Seoul
15.	T. Choi	M	46	doctor	C	yongsan	Kangwon
16.	S. Kim	M	47	m. technologist	C	yengtungpho	Seoul
17.	C. Park	M	33	electrician	H	tongtaymun	Seoul
18.	K. Kim	M	39	electrician	H	inchon	Seoul
19.	Y. Yoo	M	26	unemployed	H	songpha	Chonpuk
20.	K. Kim	M	28	m. technologist	JC	tongcak	Kangwon
21.	K. Pan	M	28	m. technologist	JC	nowon	Seoul
22.	E. Hong	F	59	house wife	C	kangnam	Seoul
23.	S. Lee	M	34	m. technologist	JC	topong	Seoul
24.	C. Choi	F	16	high S. student	H	songpha	Seoul
25.	C. Choi	M	35	unemployed	C	socho	Seoul
26.	Y. Kwon	M	36	engineer	C	topong	Seoul
27.	H. Kim	M	32	college instructor	C	mapho	Seoul
28.	H. Park	M	17	high S. student	H	songpha	Chungnam
29.	C. Kim	M	19	store clerk	H	eunphyeng	Seoul
30.	H. Lee	M	16	high S. student	H	songpha	Seoul
31.	C. Park	M	25	store manger	H	tongtaymun	Seoul
32.	C. Lee	M	16	high S. student	H	songpha	Seoul
33.	W. Shim	M	19	college student	C	topong	Seoul
34.	E. Kwon	M	19	college student	C	songpha	Seoul
35.	K. Lee	F	63	cleaning lady	M	sengtong	Seoul
36.	N. Kim	F	25	nursing aide	H	yongsan	Seoul
37.	Y. Huh	F	19	college student	C	chunglang	Seoul
38.	S. Cha	M	43	m. technologist	JC	kangtong	Seoul
39.	S. Yoon	F	34	m. techonolgist	C	kangtong	Seoul
40.	Y. Park	F	42	tailor	H	inchon	Seoul
41.	P. Yoon	F	65	house wife	C	sengtong	Seoul
42.	O. Yoon	F	72	gallery owner	H	ilsan	Seoul
43.	S. Park	F	61	store owner	JC	tongtaymun	Seoul

(Table 1 continued)

44.	I. Chung	M	62	store owner	P	yongsan	Seoul
45.	C. Kim	F	55	doctor	C	kangnam	Seoul
46.	E. Park	F	25	nursing aide	H	conglo	Seoul
47.	H. Kang	F	39	nursing aide	H	eunphyeng	Seoul
48.	M. Cho	F	30	waitress	H	songpha	Chonnam
49.	C. Park	F	27	housewife	C	tongtaymun	Seoul
50.	H. Ko	F	27	unemployed	JC	kangnam	Seoul
51.	E. Ho	M	18	high S student	C	chung	Seoul
52.	S. Chung	F	40	m. techonolgist	JC	tongcak	Chungnam
53.	M. Park	F	38	pharmacist	C	kangnam	Kyongnam
54.	N. Chin	F	39	housewife	JC	sonpha	Seoul
55.	S. Kim	F	24	secretary	H	kulo	Seoul
56.	S. Chang	F	16	waitress	M	songpha	Seoul
57.	K. Kim	F	23	secretary	H	kwanak	Seoul
58.	C. Yoo	F	20	J. college student	JC	kwanak	Seoul
59.	E. Chung	F	20	J. college student	JC	tongtaymun	Seoul
60.	S. Kim	F	26	unemployed	JC	songpha	Seoul
61	E. Mun	F	19	high S. student	C	tongtaymun	Seoul
62.	K. So	M	17	high S. student	H	songpha	Seoul
63.	E. Choi	F	19	college student	C	songpha	Seoul

NB: a. R.A. and B.P. are abbreviations of 'residential area' and 'birth place', respectively.
b. "m. technologist" refers to 'medical technologist'.
c. "P", "M", "H", "JC", and "C" are abbreviations of primary school, middle school, high school, junior college, and college, respectively.

Appendix B

Interview Schedule

Section 1. Interview (conversational) speech elicitation

Questions often asked of informants:

1. What is your name?
2. What is your birthdate?
3. What are the hometowns of your parents?
4. What do you think about Seoul? Do you like Seoul?
5. What do you think about Japan?
6. What schools did you go to?
7. What subjects do (did) you like at school?
8. Who is the most memorable teacher to you?
9. What do you do in your spare time? What are your hobbies?
10. How many kids do you have? What schools do they go to?
11. Who is your best friend? What kind of person is s/he?
12. Who are your favorite entertainers? Why do you like them?
13. What is your favorite professional sports team? Do you have any particular player you like?
14. What kind of sports do you play?
15. Do you have a girlfriend (or boyfriend)? How did you two meet?
16. How did you meet your husband (or wife)? Are there any interesting episodes that you want to share?
17. Did you have a life-threatening experience either from a disease or an accident? Can you describe that experience?
18. When was your happiest moment in your life? Can you describe your feelings at that time?

Section 2. Please read the following sentences casually and naturally.

1. kɨ hwesa-nɨn samsəŋ kɨlup-ɨi paŋkye hwesa-ya.
2. kəki kɨ ɨica-e anc-a.
3. nan kɨlən yeɨi-to molɨ-nɨn chinku-nɨn silh-ə.
4. yəpwa-la. mun yəl-əla.
5. kyocaŋ-ɨn kɨ sakən-e tehe ɨiasim-ɨl phum-ko is'-ə.
6. samwəl-e-nɨn mwə-nka-lɨl he po-kes'-ə.
7. inseŋ-ɨn c'alp-ko yesul-ɨn kil-ta.
8. kɨ-ɨi yeən-ɨn acu cəŋhwak-he.
9. chamwe-lɨl mək-ko apənim-ɨl pwep-taka yatan mac-as'-ə.
10. kɨ-ɨi cihe-loun chuŋko-e kakpyəl-hi yuɨi-he-la.
11. kamum-ɨlo noŋcak-mul-e khətala-n phyehe-ka is'-əs'-ə.
12. kwantw-əla. kɨnyaŋ tw-ə.
13. chəlho-nɨn acu-te ɨiyekwa-e tani-ko is'-ə.
14. kɨ maɨl-ɨn ice phyehə-ka twe-s'-ə.
15. s'wa-la. cə t'wi-nɨn nom-ɨl s'w-a.
16. ikithek tephyo-nɨn chongsən-hu saɨi-lɨl phyomyəŋ-he-s'-ə.
17. phyeki-ka twen-kəs-tɨl-ɨn yəki-ta pə-lyə.
18. twis-san-ɨi kwisin-i maɨl-e nathana-s'-ta.
19. kɨ cakka-nɨn kɨ suphil-esə ɨikoche-lɨl s'ɨ-ko is'-ə.
20. tal-sok-e kyesu namu-ka i s'-tako yes-salam-tɨl-ɨn nole-he-s'-ə.
21. thwi-nɨn koŋ-ɨl k'ok cap-ki-lan himtɨl-ta.
22. kɨ-nɨn nə-eke cəkɨi-lɨl phum-ko i s'-ta.
23. uli-cip kyelyaŋki-ka kocaŋ-na-n kəs kath-e.
24. cokswe-lil chan kɨ cwein-ɨn swi-əto swi-n kəs kath-ci anh-a s'-ta.
25. na-ɨi silsu-lɨl nə-ɨi nəlp-ɨn maɨm-ɨlo yep'ɨ-ke pat-a cw-ə.

26. kɨ sakən-ɨl kyeki-lo nan kɨ-ɨi sinim-ɨl ət-əs' -ə.

27. kukmin ɨilye cunchik-ɨl chəlphye-ha-myən ət'e.

Section 3. Please read the following words casually and naturally.

1. seŋcwi	2. ilpon-ɨi wisən	3. wecək
4. inhye	5. kwisin	6. saɨi
7. yesul	8. conkwi	9. kwənko
10. ɨica	11. kyeki	12. pwep-ta
13. cuŋɨi	14. kyelyaŋki	15. chamwe
16. pekco-ɨi nole	17. hwaphye	18. yukwənca
19. cihye	20. ɨikoche	21. cokswe
22. kwenchanh-ta	23. moɨi	24. sipwən
25. hwankak	26. yuphye	27. cukɨm-ɨi muto
28. kwansim	29. ɨisik	30. howi
31. hyesəŋ	32. wenil-i-ya	33. yuɨi
34. kweto	35. wənsuŋi	36. kɨ yəin-ɨi mulye
37. khwikhwihata	38. ɨisim	39. hyehwamun
40. paŋkye	41. mokye	

Section 4. Please read the following sentences casually and naturally.

1. kuŋye-nɨn hu-kokulyə-lɨl kənkuk-he-s'-ə.

2. səkcwa kyosu-nɨn kɨ-ɨi cwasək-esə il-ə na- s'-ta.

3. kɨ-nɨn cwein-ɨi suɨi-lɨl ip-ko is'-əs'-ta.

4. kɨ yəca-nɨn suye-lɨl ole koŋpu-he-s'-ə.

5. cə catoŋcha-lɨl chuwəl-ha-lyə ha-ci ma.

6. cə nom-tɨl-ɨn cikɨm moɨi-lɨl ha-ko is'-ə.

7. oillyuk cikhu-e hwaphye kehyək-i is'-əs'-ə.

8. cə kiwa-cip-ɨl kyetan-esə chwalyəŋ-he po-ca.

9. pakcəŋhɨi tethoŋlyəŋ-ɨn pisə-ɨi silsu-lɨl namule-s'-ta.

10. kanthoŋcwe-nɨn conphye wiki-e molly-ə is'-ə.

11. k'waŋk'waŋ-ha-ko kɨ cawite kunin-ɨn kɨ sinsa-ɨi cip-mun-ɨl tutɨlky-əs'-ta.

12. ɨisim-ha-ci mal-ko mit-ə cw-ə.

13. kɨ kəsa ihu kɨtɨl-ɨn waŋ-ɨl yuphye-sikhyə-s'-ə.

14. waŋsipli-ɨi kəci-to yocɨm-ɨn sipwən-ɨn an pat-a.

15. toŋhak hyəkmyəŋ-ɨi ɨiɨi-ka muəs-i-ni?

16. cal moli-nɨn salam-eke kyəlye-lɨl ha-myən an-twe.

17. chəŋwate kyəŋhote-ɨi howi-lɨl pat-ɨl t'e kɨ-nɨn p'utɨs-han səŋchwikam-ɨl nɨk'y-əs'-ta.

18. kɨ toŋsa-ɨi yoŋlye-lɨl cal koŋpu-he pw-a.

19. kɨkəs pwa-la, ne-ka mwəle-s'-ə.

20. tethoŋlyəŋ-ɨn cuk-nɨn kɨ sunkan-e-to kwenchanhta-ko iyakɨ-he-s'-ta.

21. thoci kəle-lɨl kyuce-ha-nɨn colye-ka is'-ə.

22. kɨnyə-ka ne-ke cohwa-lɨl pone ota-ni ike wenɨl-i-ya.

23. pukhan salam-tɨl-ɨn nɨl sulyəŋ-nim-ɨi ɨnhye-lɨl iyakɨ-ha-ci.

24. wimun-ɨl pat-nɨn-ta-nɨn kəs-i haŋsaŋ yukwe-han il-ɨn ani-ya.

25. isɨŋman tethonglyəŋ-ɨn casin-ɨi cəŋchek-ɨl pak'u-nɨnte uɨi maɨi-lɨl toŋwon he-s'-ta.

26. kɨ toin-ɨn hyean-ɨl kaci-ko is'-ə.

27. i kos-i yes-nal hyehwa-mun cali-ya.

Section 5. Please read the following words casually and naturally.

1. pumo-nim-ɨi ɨnhye	2. kiwaŋ	3. kaŋɨi
4. tweci	5. ɨiyekwa	6. cwasək
7. suhyeca	8. sənseŋ-nim-ɨi hunkye	9. yəpwa-la
10. yəncwace	11. chuwəl	12. yeən
13. hweson	14. t'wi-ta	15. colye
16. atɨl-ɨi caphyecɨŋ	17. mes-tweci	18. k'wali
19. ɨisim	20. phyehe	21. səkcwa-kyosu
22. thwita	23. suɨi	24. kyesu-namu
25. cwi-kuməŋ	26. chwikek	27. akɨi
28. phyehə	29. chwalyəŋ	30. yəlswe
31. ɨilye	32. swita	33. palhwihata
34. conphye	35. sənɨi	36. s'weki
37. yuhwa	38. yoŋlye	39. cəkɨi
40. hwənhata	41. yemin	

Section 6. The two pronunciations of the following words are both possible pronunications that we can produce. Please identify the pronunciation which you usually (e.g., when you talk with your friends or your family) use between the two.

1. hwenhata	a. hwenhata ( )	b. henhata ( )
2. kwisin	a. kwisin ( )	b. kisin ( )
3. wangsipli	a. wangsipli ( )	b. angsipli ( )
4. yukwenca	a. yukwenca ( )	b. yukenca ( )
5. palhwitata	a. palhwihata ( )	b. palhihata ( )
6. kiwang	a. kiwang ( )	b. kiang ( )
7. yesul	a. yesul ( )	b. esul ( )
8. kyeki	a. kyeki ( )	b. keki ( )
9. toye	a. toye ( )	b. toe ( )
10. hwaphye	a. hwaphye ( )	b. hwaphe ( )
11. corye	a. corye ( )	b. core ( )
12. phyehə	a. phyehə ( )	b. phehə ( )
13. ɨimi	a. ɨimi ( )	b. ɨmi ( )
14. ɨisik	a. ɨisik ( )	b. ɨsik ( )
15. suɨi	a. suɨi ( )	b. sui ( )
16. yuɨi	a. yuɨi ( )	b. yui ( )

17. ki-ii sinim a. ki-ii sinim ( ) b. ki-e sinim ( )

18. tongsa-ii yonglye a. tongsa-ii yonglye ( ) b. tongsa-e yonglye ( )

Section 7. The following information will be used as a reference for my research. Please fill in the following blanks.

1. Name ( )

2. Sex ( )

3. Birthdate ( )

4. Occupation ( )

5. Last school you attended ( )

6. Birthplace ( )

7. Current residential area ( ) ward

8. Age when you moved to Seoul (in case you were not born in Seoul)

9. Father's hometown ( ) Mother's hometown ( )

10. Father's occupation ( ) Mother's occupation ( )

Father's education level ( ) Mother's education level ( )

11. Places where you resided besides Seoul and the period of each residence

a. ( )

b. ( )

c. ( )

Appendix C

Table 2. Probabilities for factors for *w* deletion after a consonant in spontaneous speech

Factor groups	Factors	Weight	% Applications	Total N
*Prec. C (place)	bilabial	0.951	85	289
	alveolar	0.438	34	873
	palatal	0.335	20	135
	velar	0.366	22	661
	glottal	0.359	17	313
*Prec. C (manner)	lax	0.501	37	1194
	aspirated	0.433	26	117
	reinforced	0.537	31	192
*Following vowel	[-bk]	0.575	33	1134
	[+bk]	0.425	35	1137
*Syllable position	initial	0.462	37	1413
	noninitial	0.562	28	858
Morph. boundary	zero	0.489	39	1899
	present	0.556	27	358
*Presence of coda	zero	0.563	39	1273
	present	0.420	27	998
Speech Style	in-group	0.527	39	850
	interview	0.484	30	1421
*Gender	male	0.466	30	1194
	female	0.538	38	1077
*Social Status	upper	0.435	29	765
	middle	0.518	33	754
	lower	0.548	38	752
Age	16-25	0.520	39	783
	26-45	0.509	33	767
	46+	0.469	29	721

number of cells: 861 total chi-square = 1053.6709
chi-square/cell = 1.2238 loglikelihood = – 1184.070 Input = 0.353

Table 3. Probabilities for factors for *w* deletion after a consonant in sentence reading speech

Factor groups	Factors	Weight	% Applications	Total N
*Prec. C (place)	bilabial	0.962	80	321
	alveolar	0.476	17	629
	palatal	0.249	08	413
	velar	0.340	13	584
	glottal	0.385	10	283
*Prec. C (manner)	lax	0.511	25	957
	aspirated	0.488	10	216
	reinforced	0.477	17	328
Following vowel	[-bk]	0.522	18	1047
	[+bk]	0.480	26	1183
*Syllable position	initial	0.394	18	1249
	noninitial	0.634	28	981
Morph. boundary	zero	0.503	20	1047
	present	0.449	52	1183
Presence of coda	zero	0.488	20	1513
	present	0.525	26	717
Gender	male	0.475	21	1113
	female	0.525	23	1117
*Social Status	upper	0.391	17	749
	middle	0.491	21	749
	lower	0.620	28	732
*Age	16-25	0.567	25	746
	26-45	0.545	24	747
	46+	0.387	17	737

number of cells: 941 total chi-square = 1017.2677
chi-square/cell = 1.0811 loglikelihood = – 812.533 Input = 0.186

Table 4. Probabilities for factors for *w* deletion after a consonant in word reading speech

Factor groups	Factors	Weight	% Applications	Total N
*Prec. C (place)	bilabial	0.953	77	276
	alveolar	0.346	10	358
	palatal	0.369	12	288
	velar	0.418	12	529
	glottal	0.287	10	298
Prec. C (manner)	lax	0.489	24	567
	aspirated	0.534	12	267
	reinforced	0.490	13	290
Following vowel	[-bk]	0.475	14	1059
	[+bk]	0.535	32	690
*Syllable position	initial	0.368	14	1005
	noninitial	0.696	32	744
Morph. boundary	zero	0.511	19	1632
	present	0.338	58	102
Presence of coda	zero	0.493	19	1263
	present	0.519	28	486
Gender	male	0.500	21	881
	female	0.500	22	868
*Social Status	upper	0.387	17	589
	middle	0.469	20	584
	lower	0.645	28	576
*Age	16-25	0.574	25	582
	26-45	0.543	23	585
	46+	0.384	17	582

number of cells: 783 total chi-square = 816.7801
chi-square/cell = 1.0431 loglikelihood = – 593.887 Input = 0.128

Appendix D

Table 5. Probabilities for factors for *w* deletion after a consonant in word reading speech
(NB: Only the tokens where *w* occurs in the initial syllable of the word were subject to the analysis.)

Factor groups	Factors	Weight	% Applications	Total N
*Prec. C (place)	bilabial	0.983	73	120
	alveolar	0.281	03	204
	palatal	0.499	07	140
	velar	0.432	05	337
	glottal	0.267	03	204
Prec. C (manner)	lax	0.569	17	308
	aspirated	0.391	04	157
	reinforced	0.441	04	142
Following vowel	[-bk]	0.483	07	650
	[+bk]	0.531	23	355
Presence of coda	zero	0.431	12	667
	present	0.535	15	338
Phonemic V length	long	.466	11	562
	short	.543	14	443
Gender	male	0.465	12	510
	female	0.536	13	495
*Social Status	upper	0.292	08	338
	middle	0.441	10	332
	lower	0.756	20	335
*Age	16-25	0.684	17	332
	26-45	0.533	14	339
	46+	0.289	07	334

number of cells: 505 total chi-square = 478.6529
chi-square/cell = 0.9478 loglikelihood = – 197 137 Input = 0.042

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