Contrast and hypercontrast in interlanguage

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We report on an experimental study investigating a well-known, yet seemingly intractable, problem in L2 pronunciation, namely, the splitting of native language (NL) allophones into separate target language (TL) phonemes. The results indicate that learners who were trained to contrast the relevant sounds in morphologically-complex words generalized the contrast to morphologically-simple words. However, learners who were taught to make the contrast in morphologically-simple words did not generalize this contrast to morphologically composite environments. Moreover, among speakers who already showed productive control of the contrast in actual words, performance on nonce words revealed a pattern of overgeneralization, or hypercorrection, which was characteristic of neither the NL nor the TL. (University of Wisconsin-Milwaukee)

Keywords: allophonic split, contrast, morphologically-complex, interlanguage hypercorrection

1. Introduction

This paper is intended as a contribution to the literature supporting the idea that interlanguage (IL) phonology can be adequately described only through recourse to abstract constructs and higher order principles of grammar. Specifically, the paper reports on an ongoing study examining the role of various phonological concepts in the explanation of second language sound substitutions, arguing that the acquisition of L2 pronunciation contrasts involves much more than—as is often assumed (cf. Morley 1991, 1994)—simply learning to mimic target language (TL) sounds, or to suppress those of the native language (NL).

Our argument is based on two kinds of substitution phenomena relating to the learning of phonemic contrasts in IL phonology:

(1) *Allophonic Split*
Substitutions based on allophones of the NL which constitute separate phonemes in the TL.

(2) *Hypercorrection of a Contrast*
The lexically inappropriate substitution of one target language phoneme for another in contradiction to the native language transfer

pattern.

In the first of these, which we term *allophonic split*, substitutions result from there being two sounds that are allophones of one phoneme in the learner's NL but which represent separate phonemes in the TL. Two representative examples, both relevant to this paper, are found in Spanish and Korean. In Spanish, [d] and [∂] are allophones of the phoneme /d/ because [∂] occurs after continuant segments and [d] occurs elsewhere; in Korean, [s] and [sÈ] are allophones of syllable-initial /s/ because [sÈ] occurs only before the vowel [i], [s] elsewhere. In English, of course, all of these sounds are separate phonemes, and thus a Spanish speaker learning English must learn to factor the allophones [d] and [∂] into independent phonemes, and a Korean-speaking ESL learner must acquire the contrast between /s/ and /sÈ/.

The second phenomenon we call *hypercorrection of a contrast*, or simply *hypercontrast*. This comprises of a kind of substitution reversal, such that a newly-acquired TL phoneme is extended into environments where, on phonetic grounds, the competing NL sound would be expected, and in fact is appropriate in the TL. For example, after the Korean subjects have mastered to some degree the English TL contrast between [s] and [sÈ], we find that they exaggerate it by incorrectly producing one of the contrasting segments in words where that segment is not instantiated in the TL. It is particularly interesting that the subjects wrongly produce [s] in words such as *shimmer*, (where its opposing segment, [sÈ], is obligated), and that they thus make this substitution even in environments where the NL calls for [sÈ] rather than [s]. We think this represents the end point of a development in which the learner proceeds from a beginning level where no contrast between the sounds in question is made, to a second stage where the contrast develops according to the constraints of phonological theory, and is maintained in only some environments, and from there to a final stage in which the contrast is overextended into new vocabulary items.

The presentation is structured as follows. First we recapitulate the analysis of data from a training study reported elsewhere (Eckman & Iverson 1999, in review) in which ESL learners were taught to make a contrast between two NL allophones, showing how the process of making this kind of split involves two stages of development that are predicted by general principles of phonology. Next we report and review data from two studies involving hypercorrection, identifying the constraints which appear to govern this phenomenon. Finally, we discuss the general implications our findings.

2. Splitting NL Allophones

In this section, we briefly review the discussion in Eckman & Iverson (1997, 1999, in review), and present our findings concerning the stages involved in making a phonemic split between two NL allophones. The rationale, hypotheses and methodology from this work form the basis for our investigation of the hypercontrast phenomenon.

Two general principles which have emerged out of the theory of lexical phonology (Kiparsky 1982, 1985) are Structure Preservation and the Derived Environment Constraint (in the form laid out by Kiparsky 1973, and as further argued by Iverson 1993).

(3) STRUCTURE PRESERVATION
Representations within the lexicon may be composed only of elements drawn from the phonemic inventory.

(4) DERIVED ENVIRONMENT CONSTRAINT
Structure preserving rule applications are restricted to derived environments.

Structure Preservation requires that lexical rules produce segments which are phonemes of the language, and the Derived Environment Constraint holds that structure preserving, or neutralizing, rule applications may not affect basic lexical items. Thus an English lexical rule such as Velar Softening relates word pairs like *electric–electricity*, substituting the phoneme /s/ for /k/ before /i/ in the next morpheme, but this structure preserving rule does not apply in the nonderived, basic contexts of words like *kitty* . Non-structure preserving rules like Flapping in North American English (*matter* = *madder*), however, are free to apply across-the-board, because their creation of segments not found in the phonemic inventory (the flap [À] is not a phoneme of English) is not limited by derived environment considerations.

Hypothesizing that these principles also constrain interlanguage grammars, we predict the existence of progressive stages of learning associated with the influence of an NL allophonic rule on the acquisition of the TL pronunciation. Specifically, as the learner begins to acquire the TL contrast under discussion, the NL postlexical rule defining an allophonic distribution will take on a structure preserving status. This is true because once the learner has begun to contrast natively allophonic segments in some IL words, the rule relating these segments will entail the substitution of one phoneme for another rather than the specification of a single phoneme's allophone—hence the rule becomes subject to the provisions of the Derived Environment Constraint. One way to conform to that principle in this situation, of course, would be for the learner to eradicate the rule completely, achieving native-like competence directly in

this respect. More typical, however, is for the learner's IL to retain the rule while having the grammar still conform to general phonological principles. The rule's newly attained status as structure preserving then means that it may no longer apply in all contexts, in postlexical fashion, but is restricted to apply only in derived environments, i.e., to structures crucially modified by other rules, or to morphologically composite words.

In our Spanish example, the learner begins by erring consistently on English words with intervocalic /d/, producing forms such as [læ∂ër] 'ladder' and [rè∂ër] 'redder' rather than [lædër] and [rèdër]. As acquisition progresses, the learner continues to make errors contrasting /d/ and /∂/, but now only in derived contexts, pronouncing *ladder* correctly with [d] ([lædër], nonderived context) but still erring on *redder* by producing the medial consonant as [∂] ([rè∂ër], derived context). Similarly, a first-stage Korean learner of English would err consistently on TL words containing a /si/ sequence, pronouncing *receive* as [ris˙iv] and both *messy* and *meshy* as [mès˙i], then progress to a stage in which *receive* is pronounced correctly as [risiv] while continuing to err in derived contexts on words such as *messy*. At some later point, if these learners continue to progress and the TL contrast spreads to other lexical items, we could expect application of the rules involved to be further reduced, perhaps eliminated from the IL altogether. But throughout the acquisitional sequence, our hypothesis claims that the learner may err on the relevant contrast in both derived and nonderived contexts, or only in derived environments, but it is excluded for a learner to make the TL contrast in derived environments while continuing to err on this contrast in nonderived environments, i.e., on basic lexical items.

This scenario reduces to the general claim that IL grammars will obey universal principles of grammar, and to the specific prediction that an NL postlexical rule which produces as output a TL phoneme will observe the principles of Structure Preservation and the Derived Environment Constraint. In our view, then, universal principles of grammar place learnability constraints on the kinds of IL grammars that can be acquired. If we are correct about this, it would be possible for a Spanish learner of English to first acquire the contrast between [d] and [∂] in only nonderived environments (words consisting of only a single morpheme), but it would never be possible for a learner to acquire this contrast only in derived environments. In other words, our hypothesis reduces ultimately to the learnablility claim that IL grammars in which [d] and [∂] are contrasted only in derived environments will never be learned.

In order to test this claim, we conducted both a cross-sectional and an instructional study. We elicited pronunciations of English words from sixteen ESL learners: nine native speakers of Spanish, and seven native speakers of Korean. Learners with these two NL backgrounds were

chosen because, as outlined above, their NL includes an allophonic distribution of segments which are contrastive in English. All of the subjects were in the process of learning English as a second language. These learners ranged in age from 17 to 31, each had been in the United States for less than six months, and each was from one of the two lower modules in the University of Wisconsin–Milwaukee ESL Intensive Program.

The first step was to establish a baseline on each of the subjects to determine whether their IL exhibited the relevant contrast: the /d/–/∂/ contrast for Spanish-speaking subjects, and the /s/–/sË/ contrast for Korean speakers. In order to accomplish this, the subjects met individually with one of the authors and/or one of the research assistants appointed to the project. The subjects' pronunciations of words containing the sounds in question were elicited using pictures accompanied by definitions. Pictures were used to avoid the subjects basing their pronunciation on the spelling of the words. The subjects were given directions and examples for an exercise in which they were presented with a loose-leaf notebook containing drawings depicting a word on one page, and a definition of the word on the facing page. The subjects were instructed to pronounce the word that was depicted.

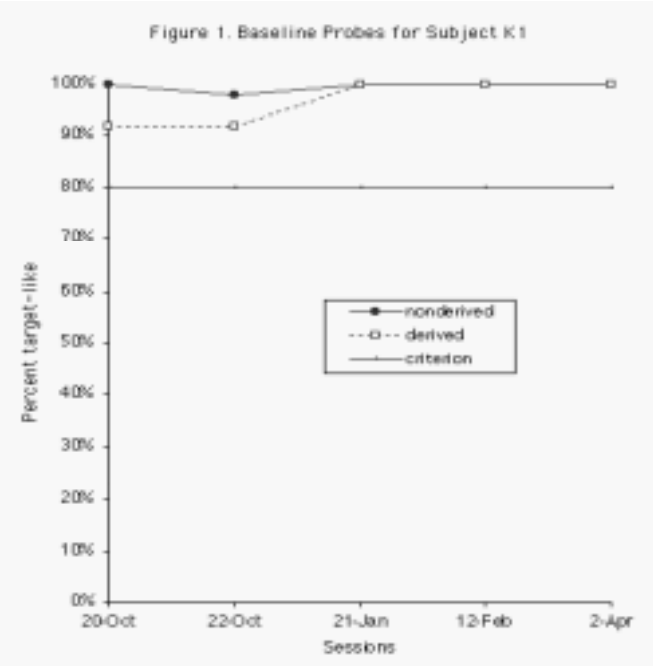
The exercise was designed to elicit English words exhibiting the relevant contrast in both a derived and nonderived environment. Words exhibiting the contrast in a nonderived environment were basic, monomorphemic lexical items. The words exhibiting the contrast in a derived environment contained a suffix, either the progressive "ing" or the adjectival "y" suffix. The exercise was constructed so that the pictures contained a cue indicating which of the two suffixes was to be added to the word being pictured. For example, if the subject was shown a picture of some grass on one page, and a definition of grass on the facing page, the subject was to produce the word *grass*. If the picture and definition presented to the subject also contained the cue "adjective" on the page below the picture and the definition, then the subject was to produce the adjectival form of *grass*, namely, *grassy*. Thus, the subjects produced two kinds of baseline words, those containing the sounds in question in a nonderived context, i.e., without a suffix added, and those with the sound in a derived context, i.e., with the addition of a suffix.

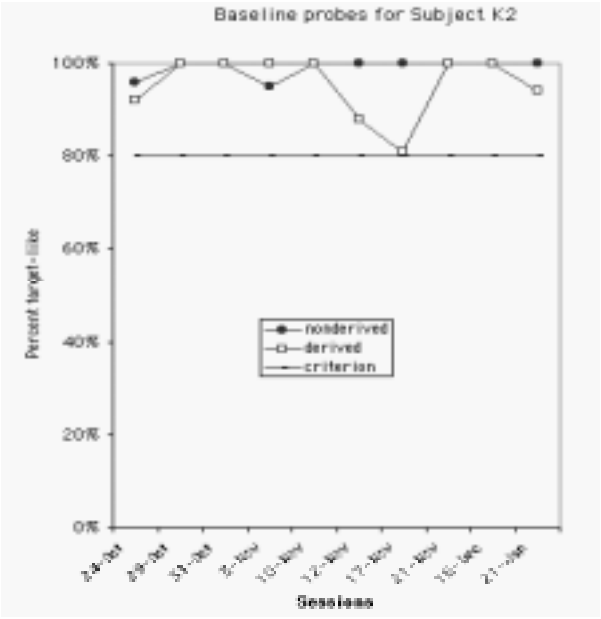
The data were then analyzed to determine whether the subjects exhibited the relevant contrasts in both the derived and nonderived contexts. The criterial threshold used to determine the presence of a contrast was successful production of the contrast in at least 80% of the attempts in two consecutive sessions. This criterion was chosen because we observed that any subject whose performance on the contrast exceeded 80% for two straight sessions did not subsequently fall below the 80% threshold. Thus

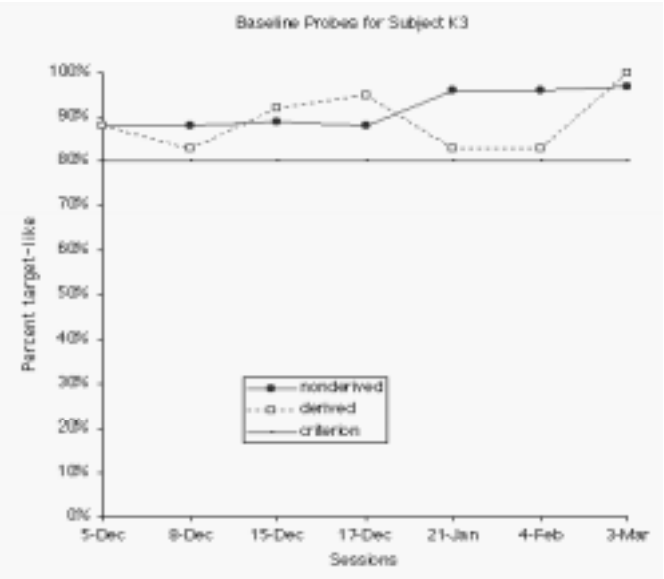
it seemed that 80% performance represented a systematicity from which the subject did not later retreat.

Those subjects who lacked the relevant contrast in both derived and nonderived environments were entered into the instructional study. Those that evidenced the contrast in at least some positions were not eligible for the instructional study, and were therefore designated for the cross-sectional study, the results of which we now outline.

As it turned out, there were no Stage I Korean subjects; therefore, the cross-sectional results include those from all seven of the Korean subjects, plus two Spanish-speaking subjects who were Stage II learners. Figures 1 through 7 show that all of the Koreans exhibited the contrast between /s/ and /sË/ in the nonderived context. More specifically, the facts represented in Figures 1 through 3 show that subjects K1, K2 and K3 were Stage III learners who evinced the contrast in both derived and nonderived environments. The results in Figures 4 through 7 depict Korean learners who, during the initial baseline measures, showed the contrast only in the nonderived contexts, but shortly thereafter evidenced the contrast also in the derived environment.




Baseline probes for Subject K2
100%
80%
60%
40%
20%
0%
Percent target-like
nonderived
derived
criterion
Sessions


Baseline Probes for Subject K3
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90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent target-like
nonderived
derived
criterion
5-Dec
8-Dec
15-Dec
17-Dec
21-Jan
4-Feb
3-Mar
Sessions

Figure 4. Baseline probes for Subject K4

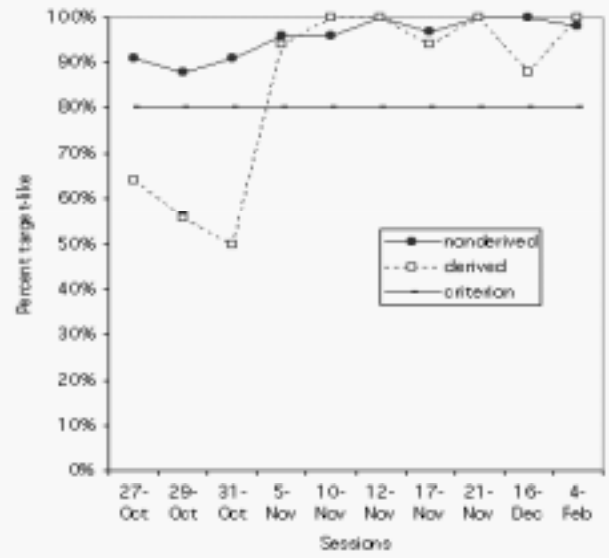
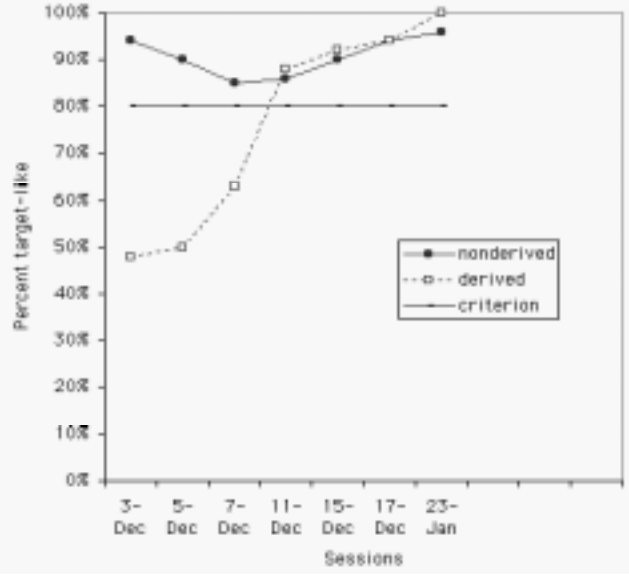


Figure 5. Baseline probes for Subject K5



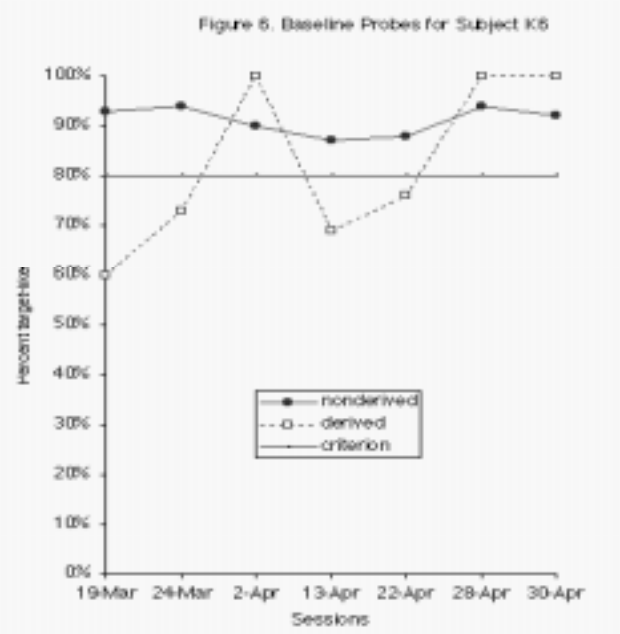


Figure 6. Baseline Probes for Subject K6
100%
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60%
50%
40%
30%
20%
10%
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Percent target-like
nonderived
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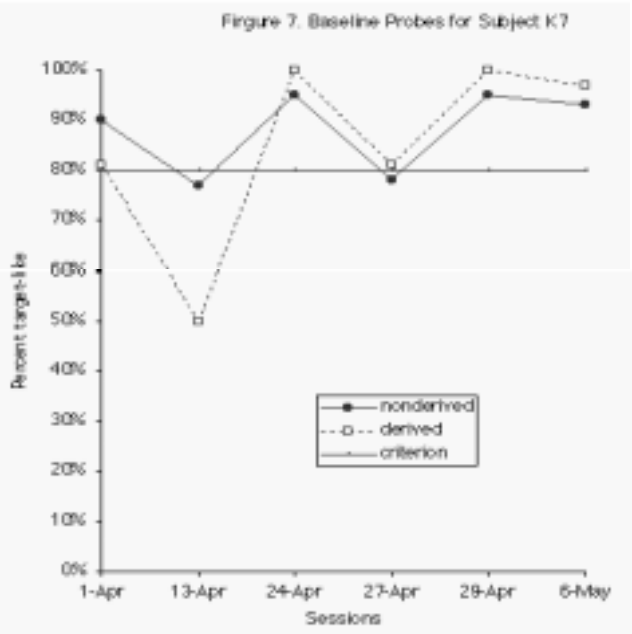
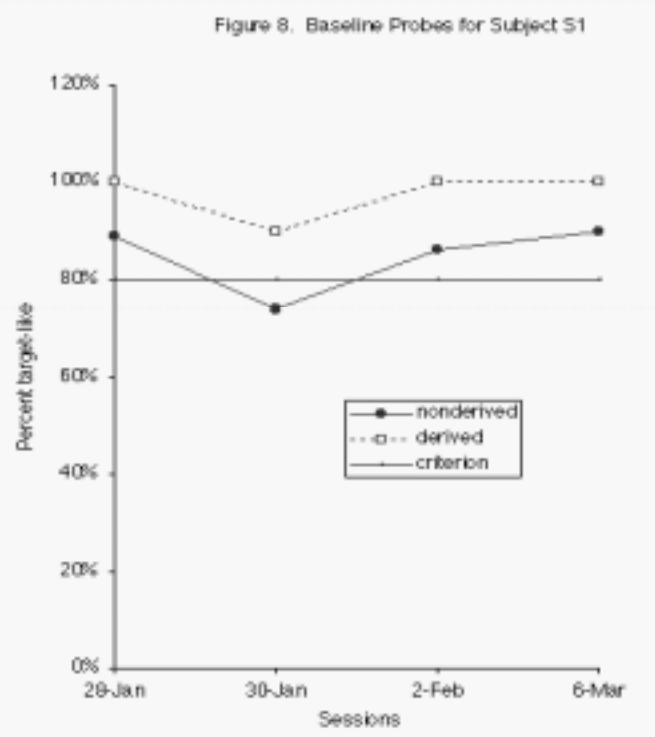
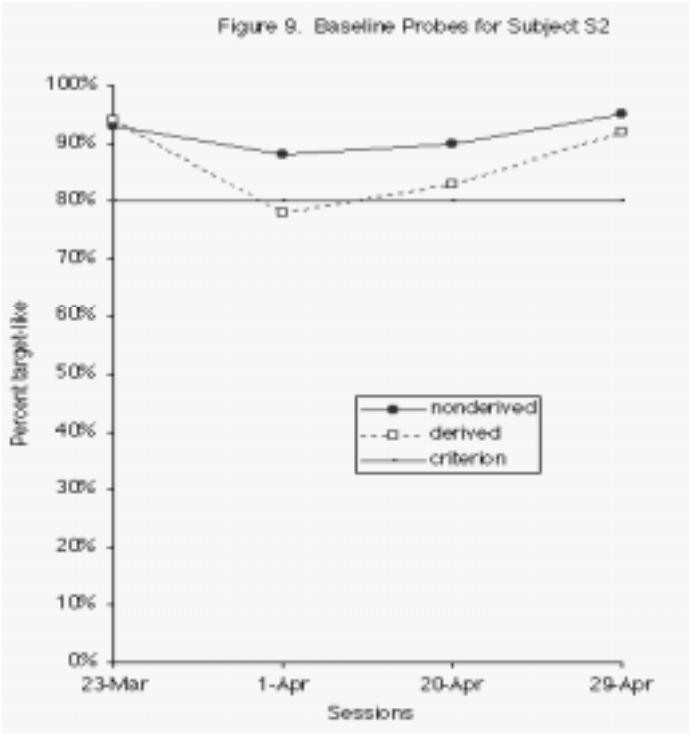
criterion
19-Mar
24-Mar
2-Apr
13-Apr
22-Apr
28-Apr
30-Apr
Sessions


Firgure 7. Baseline Probes for Subject K7
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent target-like
nonderived
derived
criterion
1-Apr
13-Apr
24-Apr
27-Apr
29-Apr
6-May
Sessions

There were two Spanish-speaking subjects who also were entered into the cross-sectional study. Figures 8 and 9 represent the baseline results for subjects S1 and S2, both Stage III learners who exhibited the /d/-/ð/ contrast in both derived and nonderived environments.



In sum, all of the results from the cross-sectional study depict IL grammars that are at either Stage II, having the relevant contrast in only nonderived environments, or Stage III, evincing the contrast in both derived and nonderived contexts. None of the IL grammars we analyzed had the contrast only in derived environments. Therefore, all of the results from the cross-sectional study are in conformity with the hypothesis. We now turn to the instructional study.



The subjects who were entered into the instructional study were trained on the relevant contrasts using a single-subject design (also called a within-subject design, McReynolds and Kearns 1983), as discussed in detail in Eckman and Iverson (in review). The specific type of single-subject design used for the instructional study was a staggered, multiple baseline design in which three subjects were entered into one training condition, and four subjects were entered into the other. Each successive subject in a given condition was administered one additional baseline measure. More specifically, subjects S3, S4, and S5 received instruction on the /d/–/∂/ contrast in only derived environments, while subjects S6, S7, S8 and S9 were instructed on the contrast in only nonderived environments. Subjects S4 and S5 are considered direct replications of S3's treatment. Therefore, S3's baseline was established over two sessions, while the baselines for S4 and S5, respectively, were established over three and four sessions. The procedure was identical with the other treatment group: S6's baseline was established over two sessions, with an additional baseline measure added to the baseline of each additional, replicating subject, meaning that S9's baseline consisted of five measures.

From time to time during the training, the baseline words were elicited from the subjects. It was hypothesized that the subjects would generalize the contrast learned on the basis of the training words (i.e., the nonce words) to the baseline words (i.e., the real words). In fact, it is the subjects' performance on the baseline words that provides the test of the hypothesis: it was predicted that subjects who were trained only on nonce words exhibiting the contrast in derived environments would generalize this contrast to the baseline words and evince the contrast in both nonderived and derived environments; it was further hypothesized that subjects trained only on nonce words exhibiting the contrast in nonderived environments would not necessarily generalize this contrast to derived environments in the baseline words.

Figures 10 through 16 represent the results from the Spanish-speaking subjects entered into the instructional study. As can been seen from the graphs, none of the subjects had the contrast between /d/ and /ð/ during the baseline, or pre-training sessions.

S3, S4 and S5 were trained on words showing the contrast only in derived environments, while S6 through S9 were trained using words containing the contrast only in nonderived environments. Figure 10 shows that S3 acquired the contrast in both nonderived and derived environments at about the same time. Figures 11 and 12 present results which are particularly interesting. S4, although trained on words with the contrast only in derived contexts, generalized this training first to baseline words with the contrast in nonderived positions, and then subsequently to derived environments, while S5, who was also trained in the derived context condition, generalized this contrast only to nonderived environments, but not to derived contexts. Stated differently, S3 responded to the treatment by quickly becoming a stage-three learner; S4 first passed through stage-two, where she had the contrast only in nonderived contexts, before becoming a stage-three learner; and S4 became a stage-two learner, and did not generalized the contrast to the derived environments in the baseline words, despite being instructed only on derived-environment training words. All three of these outcomes are permissible under the hypothesis.

Subjects S6 through S9, whose results are depicted respectively in Figures 13 through 16, were trained in the nonderived condition. As shown in Figure 13, S6 generalized the contrast from nonderived contexts to derived contexts, an outcome which, while not expected, is nevertheless allowed by the hypothesis. The results from S7 are particularly interesting. She acquired the contrast in the nonderived environment on the baseline words by the 5th (February 25th) baseline session, but did not acquire the contrast in derived environments until the 10th baseline elicitation (May 8th). Thus, S7 clearly evidences an acquisition sequence in which she acquired the contrast first in nonderived (or lexically basic) environments and then,

more than two months later, she acquired the contrast also in derived (or morphologically composite) environments. Subject S8 acquired the contrast in the environment in which she was trained, but did not generalize the contrast to derived environments. And finally, S9 acquired the contrast in both environments at the same time, as was the case with S6.

Our training of stage-one subjects, then, produced learners who were either stage-two or stage-three, according to (8) above, while not producing any learners whose IL grammar is excluded by the hypothesis. All of these outcomes confirm our claims, with the results from S4, S5, S7 and S8 being supportive in particularly interesting ways.

To summarize this section, results from our training study suggest that splitting NL allophones into separate TL phonemes entails significantly more than learning to pronounce new sounds. The acquisition of a TL contrast where none exists in the NL is, as our results support, governed by phonological principles which constrain the acquisition to proceed through only some of the logically possible stages of learning.

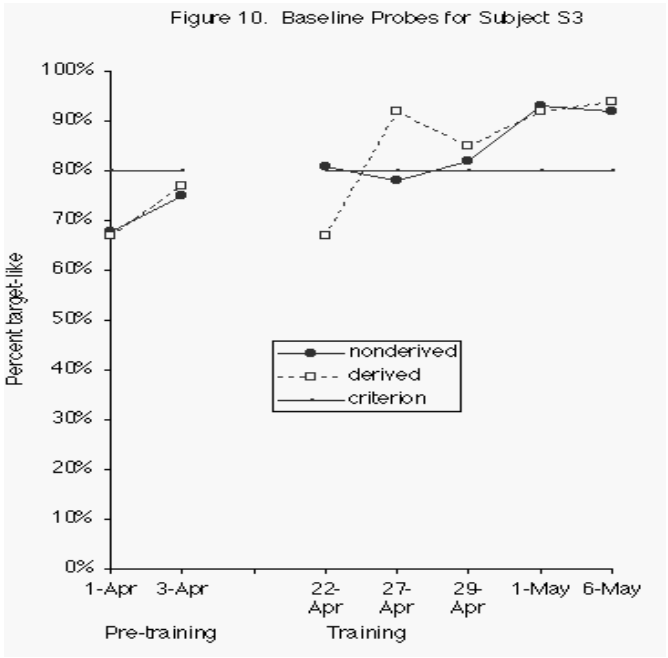


Figure 11. Baseline probes for Subject S4

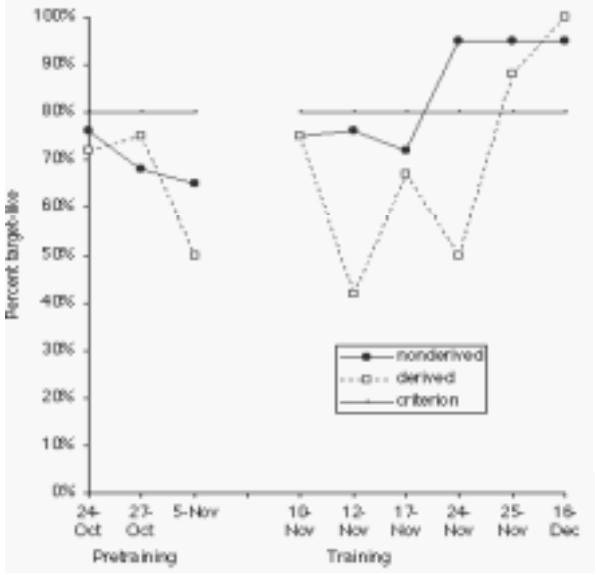


Figure 12. Baseline Probes for Subject S5

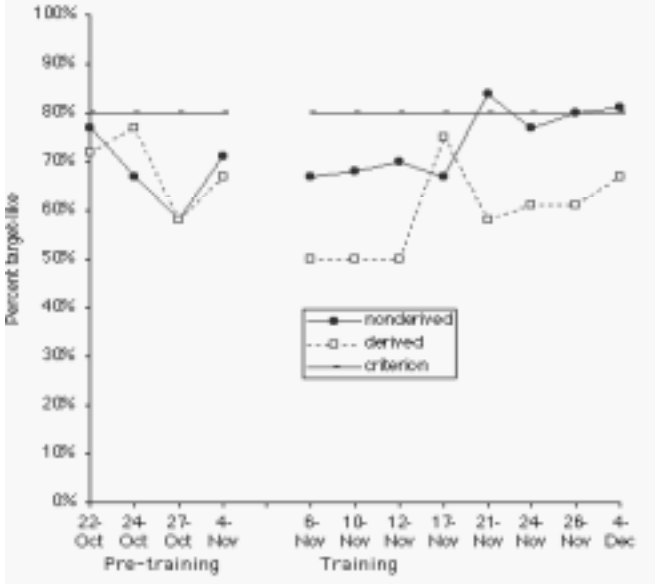


Figure 13. Baseline probes for Subject S6

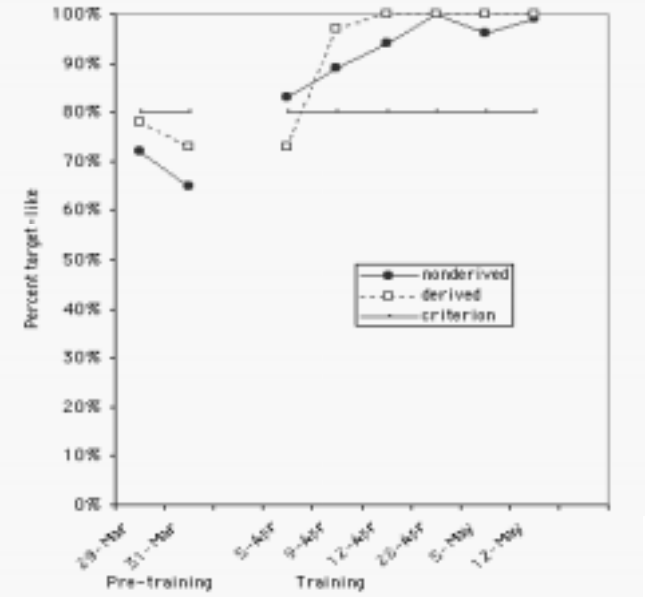
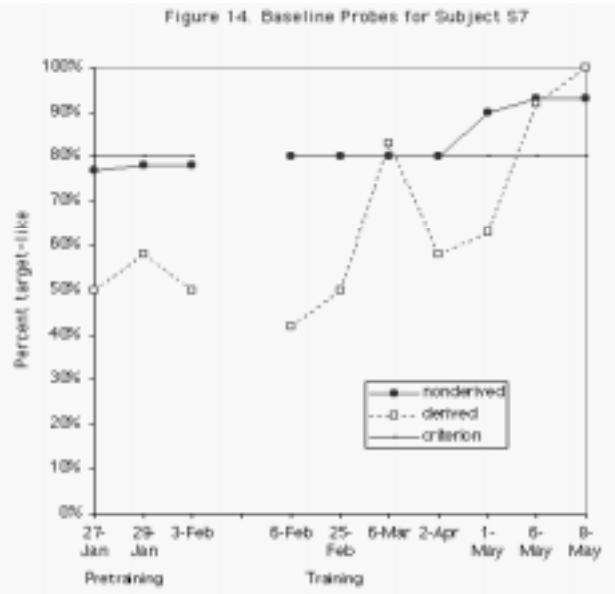


Figure 14. Baseline Probes for Subject S7



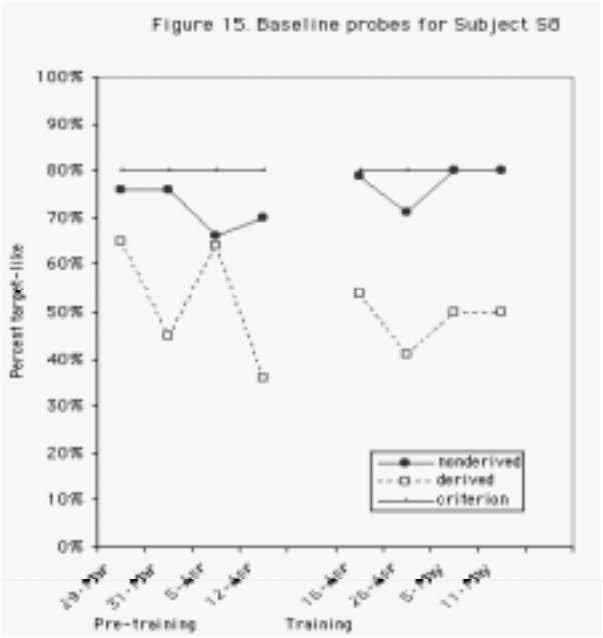


Figure 15. Baseline probes for Subject S8
100%
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20%
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0%
Percent target-like
nonderived
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criterion
19-Mar
31-Mar
5-Apr
12-Apr
16-Apr
26-Apr
5-May
11-May
Pre-training
Training

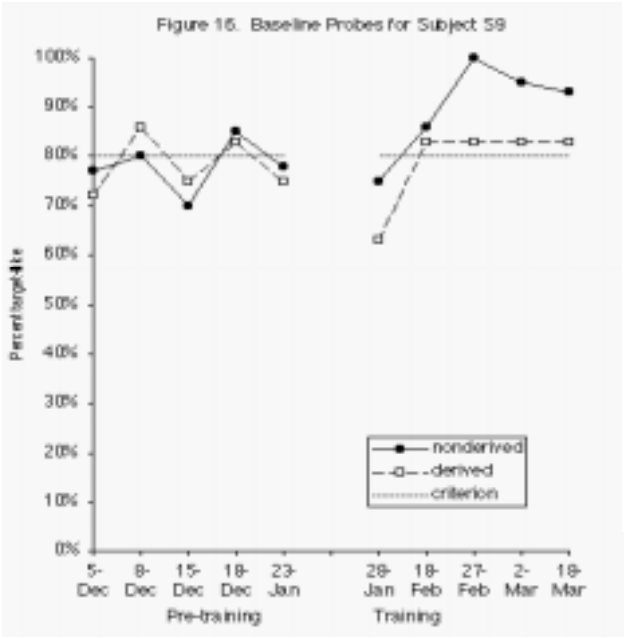


Figure 16. Baseline Probes for Subject S9
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
nonderived
derived
criterion
5-Dec
8-Dec
15-Dec
18-Dec
23-Jan
28-Jan
18-Feb
27-Feb
2-Mar
18-Mar
Pre-training
Training

3. Hpercontrast

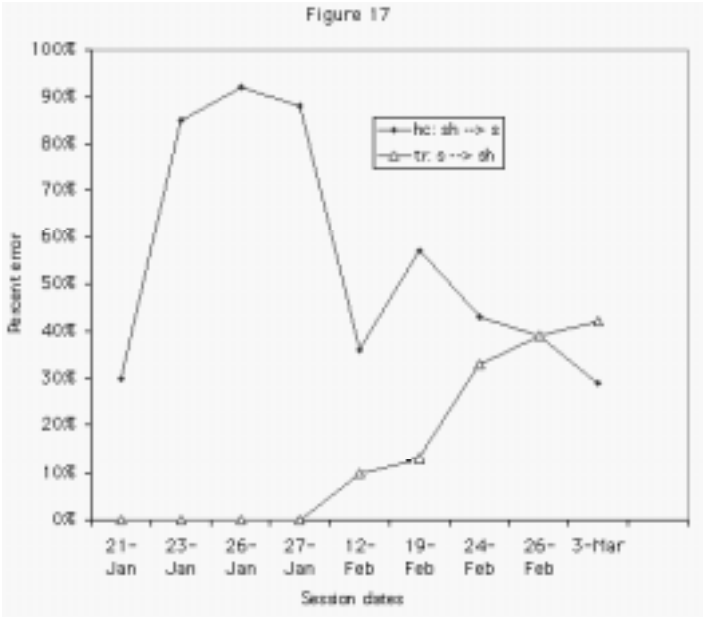
We now turn to the second phenomenon which supports this general hypothesis. We will see in this section that the development of a TL contrast may progress beyond the stage where the learner has acquired the contrast in at least some environments to a further stage where the learner errs by overextending the contrast, a phenomenon we term *hypercontrast*. Errors of this type in fact involve substitutions of the wrong member of the contrasting pair.

Since the protocol for elicitation of hypercontrasts was the same as in the allophonic split study, we begin by simply presenting and analyzing our data. We then attempt to offer an interpretation of, and an explanation for, the facts in terms of a lexicalization strategy, the implications of which we test with data from an additional study carried out on four of the seven subjects. Although we couch our discussion in terms of some empirical claims, the data and accompanying explanation in this area are much "softer" than was the case with the allophonic split discussed above. This is to be expected, we believe, because in this arena we are dealing with the learning of individual lexical items (albeit nonce words), an area of grammar about which it is much more difficult to generalize across learners.

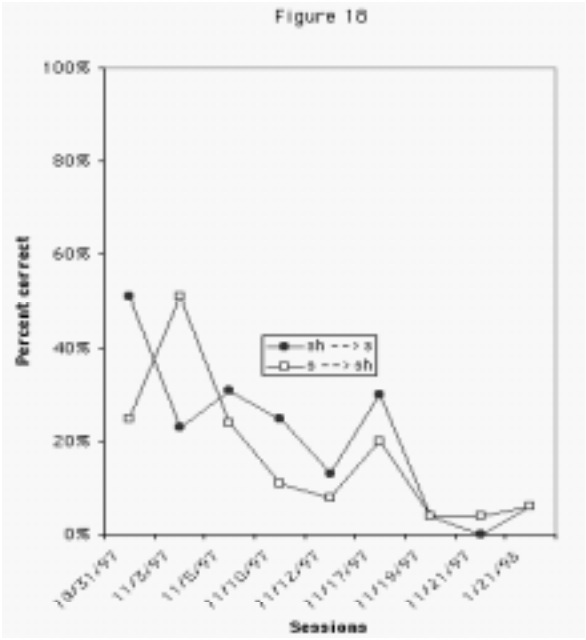
Our data come from the seven Korean subjects who were involved in the study on splitting NL allophones into separate TL phonemes. According to that protocol, only subjects who lacked the relevant contrast in both derived and nonderived environments were to be entered into the instructional study, and, as the graphs in Figures 1 through 7 show, there were no stage-one Koreans. Nevertheless, out of general curiosity, the Korean subjects were also entered into the training phase of the study, and were given instruction on the /s/–/sË/ contrast using nonce words. Subjects K1, K2, K4 and K6 were instructed with words showing the contrast in nonderived environments, and subjects K3, K5 and K7 were trained on the contrast only in derived environments. As was the case with the Spanish-speaking subjects discussed in the previous section, the training was carried out using nonce words illustrating the contrast between /s/ and /s̈/. The results from the training phase of these subjects were quite interesting.

A representation of the kinds of errors made during the training phase is shown for K1 in Figure 17. The pattern of K1's errors on the training words is that for the first four training sessions he produces exclusively the error pattern of substituting incorrect [s] for correct [sË], and no errors in the direction of the NL pattern of substituting [sËi] for target [si]. In the later sessions for K1, we see a sharp decline in the incidence of [sË] for [s] errors (presumably concomitant with his mastery of these new words) as

the influence of the NL pattern begins to emerge, and the subject produces more and more instances of incorrect [siË] for target [si]. This increase in NL interference is surprising in view of this subject's performance in the early sessions on the training words, which showed no NL interference at all (cf. Figure 1).



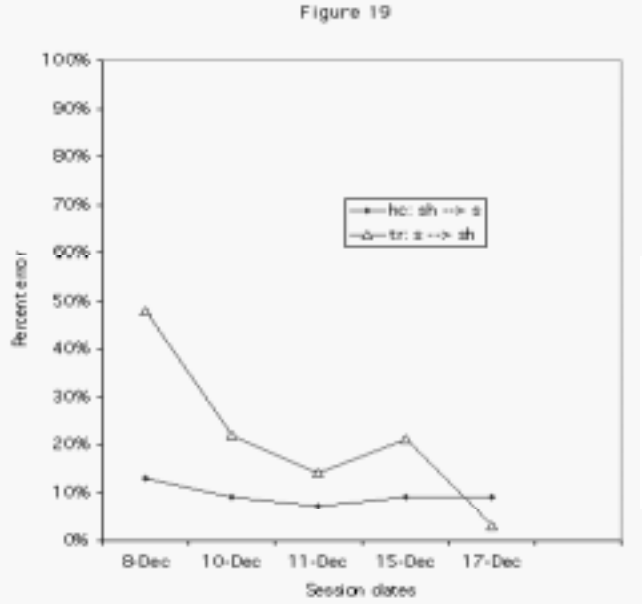
The pattern of K2's errors on the training words, shown in Figure 18, is also interesting, in that he initially produced a preponderance of incorrect [si] substitutions for target [s˙i] (69%), while he produced far fewer of the NL-pattern errors (25%) by substituting [sËi] for [si]. Thus, during the first session, K2 pronounced correctly only 31% of the training words containing [sËi], while he pronounced correctly 75% of the training words containing [s] before [i]. Given that his NL, Korean, has only [sË] before [i] and [s] elsewhere, this is not what one would expect. By the second session, the situation had reversed itself, and K2 was erring on about 50% of words containing [s] before [i] (the NL pattern) and on about 25% of words with [sËi] in that environment. Both error types then gradually decline over the course of training. What is particularly intriguing about this pattern is the emergence of the error type in which a word requiring [sË] before [i] is wrongly produced with [s]. For example, K1 and K2 pronounced the nonce words [nèsËi] and [posËi] as, respectively, [nèsi] and [posi]. Moreover, as the graphs in Figures 17 and 18 show, this error type occurred at least as frequently as the substitution of [sËi] for [si], which corresponds to the NL allophonic distribution.



Hypercontrast—the incorrect substitution, in this case, of [s] for [sË]—is thus a kind of structural hypercorrection. The term hypercorrection has been used extensively in sociolinguistics, of course, and is employed by Preston (1989), for example, to mean the use of a form not yet under the speaker's control in "…an attempt to accommodate towards the encroaching standard" (p. 103). In our view, rather similarly, the substitution of incorrect [s] for target [sË] is an attempt by the learner to avoid a past error, specifically, the production of [sË] for [s] resulting from NL influence.

The behavior of the other five Korean subjects is a bit different, but still interesting. In the case of K3, shown in Figure 19, we see that initially he errs on 70% of the training words in the direction of the NL pattern, producing [sË] before [i], where the target is [s]. This error type declines rapidly to near zero over the next four sessions as the error pattern emerges whereby [s] is substituted for [sË] between 10% and 20% of the time in the pattern characteristic of hypercorrection. K4's performance, which is shown in Figure 20, depicts an initial production of only NL-pattern errors, which sharply declines over the next few sessions as hypercorrection errors emerge, and then declines again. The performance of K5, seen in Figure 21, initially shows a relatively small percentage of errors of both types, which then decline to zero over the next few sessions. K6 produces more NL-pattern errors than hypercorrection errors throughout the training

sessions, as indicated in Figure 22, and K7's productions, graphed in Figure 23, show an initial pattern of NL-transfer errors, which rapidly decline and merge with a steady pattern of hypercorrection errors.



What appears to be consistent across all seven of these subjects is that (1) they all exhibit the /s/–/sË/ contrast in actual words, and (2) they all produce hypercorrections in nonce words, that is to say, in words that are new. Both of these factors would seem to be necessary in order for hypercorrection to take place. We would expect such hypercontrasts only under the condition that the learner has already acquired the /s/–/sË/ contrast, at least to some degree, for without productive control of the TL contrast, the subject would have no basis for producing [s] for the required, and natively motivated, [sË]. It seems natural, moreover, that hypercorrection is also most likely to occur in novel or unfamiliar lexical items in which the contrast has not yet been lexicalized.

In the early stages of IL development, when the learner may not yet have acquired the contrast between /s/ and /s˙/, IL words would be lexicalized with /s/, since the learner has not yet learned /s˙/. At this point, we should expect to find only NL-pattern errors in which [s˙] is substituted for [s]. After the learner has begun to acquire the relevant contrast, then it is possible that some words may be incorrectly lexicalized with /s˙/, producing the hypercorrect error pattern. As the learner becomes more

familiar with these lexical items, the lexical representations stand to be corrected.

Figure 20

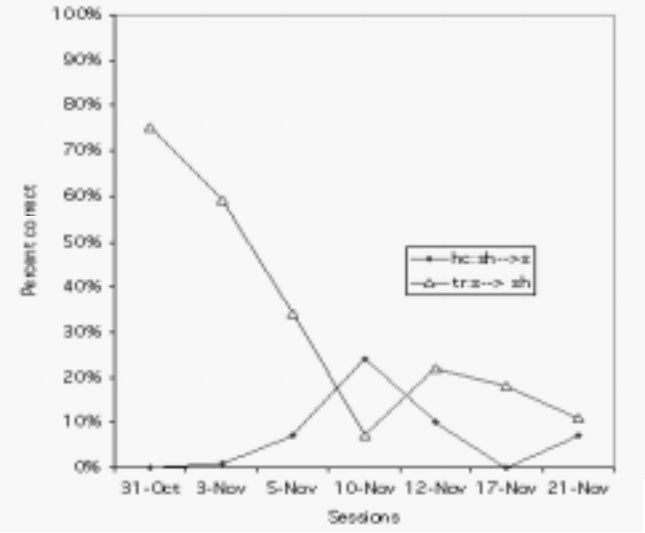


Figure 21

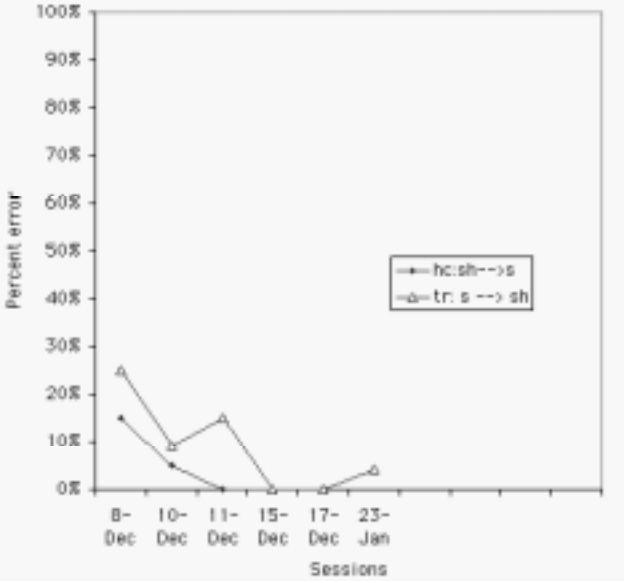


Figure 22

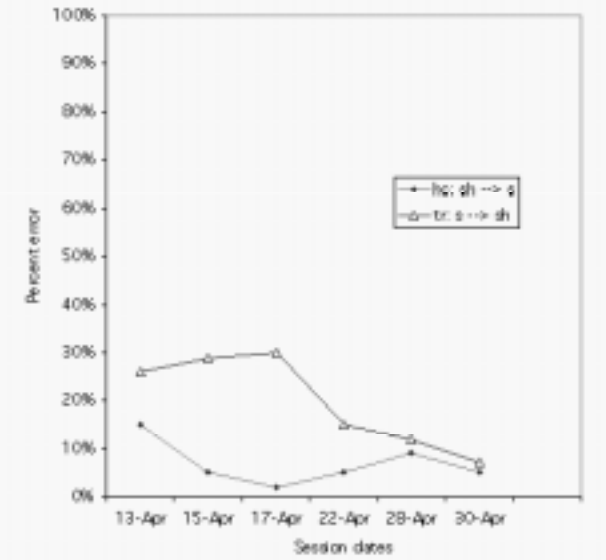
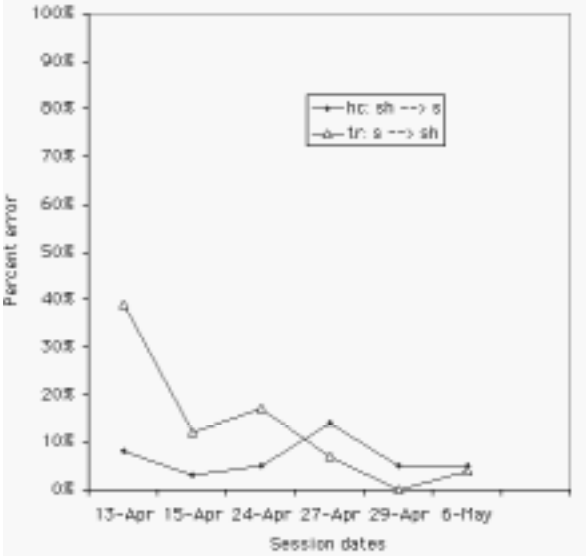


Figure 23



Thus, we see hypercorrection as a strategy for lexicalizing new words. The hypercorrections themselves, we believe, are motivated by speakers' awareness of past errors they have made based on the NL pattern, in this case the substitution of IL [sËi] for TL [si]. This awareness could well sensitize them to their performance in new words, and recognition of the TL-inappropriateness of the NL pattern results in suppression of the rule or constraint that had been the source of their errors in the past. The idea is that, here at this stage of acquisition in second language phonology, i.e., after a contrast has been learned in actual words but before it is fully mastered in novel environments, a competition exists between the native language pattern of distribution and that which results from its suppression via a contrary specification. Under this view, hypercorrection in the present case consists in the overgeneralization that all—not just some—instances of the sequence [sËi] are inappropriate in the TL.

The idea that the hypercontrast error pattern involves lexicalization whereas the transfer error pattern (where [sËi] incorrectly substitutes for target [si]) involves the operation of a rule implies that these error types should evolve and pattern differently. Hypercontrast errors do not result directly from a rule, but are rooted in the process of lexicalization, and so should be concentrated more on particular, novel words. Hypercontrast therefore is more likely to occur at the beginning of the training sessions, and to attenuate as the training proceeds and the words are no longer novel. Because these errors are claimed not to result from the application of a rule, moreover, there presumably is no limiting role played by the Derived Environment Constraint. Hypercontrast errors therefore would be just as likely to occur in nonderived environments as in derived environments. Transfer errors, on the other hand, would be sensitive to universal phonological principles, as we have argued, with the consequence that, if they take place at all, transfer errors should occur in derived environments. Furthermore, since these errors involve the application of a rule, they would be less likely than hypercorrection errors to center around specific lexical items.

There is some support for the first of these two claims, that hypercorrection should be centered around particular lexical items whereas the NL-transfer pattern should not. Tables 1 through 7 show for subjects K1 through K7, respectively, the percentages of hypercontrast and transfer errors for each training word across the training sessions. The training words with the target segment [sË] are presented in the upper half of the tables, and those with the target [s] are presented in the lower half.

Table 1. Percentage of error on each training word for K1

	Training Sessions								
WORDS	1	2	3	4	5	6	7	8	9
nèsËi	29	38	100	100	13	29	29	33	0
posËi	43	13	100	100	22	38	29	25	20
bawsíËÑ	61	100	100	100	64	67	38	60	43
disËíÑ	0	100	100	100	25	0	20	0	0
gesËi	0	63	100	83	25	38	38	33	33
kusËíÑ	29	87	100	100	25	38	38	25	33
Words	1	2	3	4	5	6	7	8	9
nèsi	0	0	0	0	22	16	28	25	20
posi	0	0	0	0	0	0	16	40	42
bawsíÑ	0	0	0	0	0	16	0	0	20
disíÑ	0	0	0	0	22	16	50	50	40
gesi	0	0	0	0	0	16	0	25	33
kusíÑ	0	0	0	0	0	0	28	40	20

Table 2. Percentage of error on each training word for K2

	Training Sessions								
WORDS	1	2	3	4	5	6	7	8	9
nèsËi	44	0	33	33	0	27	0	0	0
posËi	89	33	25	16	0	63	25	0	0
bawsËíÑ	40	0	0	0	0	0	0	0	0
disËíÑ	10	30	0	0	0	0	0	0	0
gesËi	78	55	33	50	0	11	0	0	0
kusËíÑ	100	38	50	57	20	60	0	0	28
WORDS	1	2	3	4	5	6	7	8	9
nèsi	0	27	12	16	0	36	0	0	0
posi	0	20	0	0	25	33	25	20	33
bawsíÑ	0	47	44	16	0	10	0	20	0
disíÑ	89	57	14	33	0	11	0	0	0
gesi	89	50	25	16	20	18	0	0	0
kusíÑ	33	59	25	33	0	0	0	0	0

Table 3. Percentage of error on each training word for K3

	Training Sessions				
WORDS	1	2	3	4	5
sËiyo	38	36	36	13	22
tesËi	0	0	0	0	0
tasË	0	9	0	0	0
mosËi	0	9	0	0	11
kosË	0	9	0	0	0
sËima	0	31	0	22	13
WORDS	1	2	3	4	5
siyo	0	0	0	18	13
tesi	75	72	31	46	0
tas	0	0	0	0	0
mosi	75	16	0	13	0
kos	0	0	0	0	0
sima	33	16	9	13	0

Table 4. Percentage of error on each training word for K4

	Training Sessions						
WORDS	1	2	3	4	5	6	7
nèsËi	0	0	12	0	0	0	0
posËi	0	7	0	16	27	0	0
bawsíËÑ	0	0	22	0	0	0	0
disËíÑ	0	0	0	43	0	0	0
gesËi	0	0	0	43	0	0	0
kusËíÑ	0	0	0	20	12	0	20
WORDS	1	2	3	4	5	6	7
nèsi	78	54	44	0	12	0	0
posi	100	54	38	0	38	28	33
bawsíÑ	22	46	0	0	12	14	0
disíÑ	22	42	0	0	0	0	0
gesi	100	64	33	0	14	0	0
kusíÑ	100	21	70	40	50	38	20

Table 5. Percentage of error on each training word for K5

	Training Sessions					
WORDS	1	2	3	4	5	6
sËiyo	0	0	0	0	0	0
tesËi	0	0	0	0	0	0
tasË	0	28	0	16	0	0
mosËi	0	0	0	0	0	0
kosË	0	0	20	16	0	0
sËima	43	18	0	0	0	14
WORDS	1	2	3	4	5	6
siyo	0	0	0	0	0	0
tesi	50	16	31	0	0	0
tas	0	0	0	0	0	0
mosi	33	9	0	0	0	14
kos	0	0	20	0	0	0
sima	0	0	18	0	0	0

Table 6. Percentage of error on each training word for K6

	Training Sessions					
WORDS	1	2	3	4	5	6
nèsËi	0	0	0	0	0	0
posËi	25	0	0	0	0	0
bawsíËÑ	14	10	9	11	25	22
disËíÑ	0	16	0	0	0	0
gesiË	44	0	0	20	12	0
kusËíÑ	0	9	0	0	12	0
WORDS	1	2	3	4	5	6
nèsi	28	28	23	0	12	0
posi	0	33	69	36	36	12
bawsíÑ	14	9	9	20	0	12
disíÑ	38	16	0	0	0	0
gesi	55	0	27	11	0	0
kusíÑ	16	23	0	0	0	12

Table 7. Percentage of error on each training word for K7

	Training Sessions					
WORDS	1	2	3	4	5	6
sËiyo	0	16	13	16	16	0
tesËi	0	0	0	16	0	16
tasË	14	10	11	16	16	0
mosËi	0	0	0	16	16	0
kosË	14	8	12	16	0	0
sËima	0	0	0	0	0	0
WORDS	1	2	3	4	5	6
siyo	33	16	20	28	0	0
tesi	78	31	11	0	0	0
tas	0	0	0	0	0	0
mosi	60	35	12	0	0	0
kos	0	0	12	0	0	0
sima	25	16	0	0	0	16

The pattern for K1 is that the majority of hypercorrections occurs in the first four training sessions, cresting in sessions 3 and 4, and then declining, presumably as the training words become more familiar. Conversely, the NL pattern of substituting [sËi] for [si] occurs in the second half of the training sessions, being spread fairly evenly across all of the words, with the exception of [bawsíÑ]. It is interesting to note in this case that the minimal pair counterpart of [bawsíÑ], viz., [bawsËiÑ], is the word on which K1 continues to strongly hypercorrect throughout the training.

K2's pattern also shows attenuation of hypercontrast errors as the training progresses, supporting the claim that hypercorrection of a contrast involves mislexicalization of the contrast, which presumably would be corrected as the subjects continued to be instructed on the contrast. Notice also that K2 hypercorrects more on some words than on others, producing no hypercontrast errors on [bawsËíÑ] after the first session and none on [disËíÑ] after the second session, though he continues to hypercorrect on the other words later into the training.

K4's training results are somewhat different in that hypercorrection does not emerge with any significance until the middle training sessions. This could well correlate with the fact that K4 at the beginning was a Stage II learner (cf. Figure 4) for the first few sessions, having the contrast only in nonderived contexts. Interestingly, the vast majority of K4's errors in the first three training sessions follow the NL-transfer pattern.

The pattern for K6 also seems to support the claim that hypercorrection errors are lexically based. He produces no such errors on the words [nèsËi], and virtually none on [posËi] and [disËíÑ], but, on the other hand, he errs throughout the training sessions on [bawsËíÑ].

The training data for subjects K3, K5, and K7, who were trained on the contrast in nonderived environments, are shown in Table 3, 5 and 7, respectively. The results from K3 and K7 are generally supportive of our claim. K5, unfortunately, produced relatively few errors across the training sessions, and neither the hypercorrection errors nor the transfer errors seem to follow any robust pattern.

Focusing on the hypercorrection errors of K3 and K7, we see that K3's hypercorrections are confined mainly to one or two words, while the TL-transfer pattern is more evenly distributed across the training words and throughout the training sessions. K7's errors reflect, we believe, the fact that his maintenance of the contrast across the baseline measures is somewhat erratic. Thus, he produces more transfer-pattern errors in the early sessions, and more hypercorrection errors later on, corresponding generally to his lack of a contrast in at least one environment early on in the training.

To sum up this section so far, we have reported a pattern of L2 substitutions that, in our view, parallel the sociolinguistically observed phenomenon of hypercorrection. We have suggested that this error pattern results from a lexicalization strategy which reflects the learner's sensitivity to past errors. The implications of this claim are that hypercorrection errors should emerge only after the learner has acquired the contrast in question, at least to some extent, that such errors should be more prevalent on novel words, and that, unlike the NL-transfer pattern resulting from the application of an NL rule, hypercorrections of contrast would not be restricted by the Derived Environment Constraint, but would be as likely to occur in basic lexical items as in morphologically composite representations.

To test these implications, we would need to elicit pronunciations of nonce words where the relevant contrast occurred in both derived and nonderived environments. Recall that the original data were collected as part of the study on allophonic split, in which case productions of the contrast were elicited in either a derived environment or a nonderived environment, but not both. Therefore, to test the claim that the Derived Environment Constraint was not operative in hypercorrection errors, we elicited additional data from subjects K1, K3, K6 and K7 in the fall following the sessions during which the previous data were gathered. We used only these four subjects because, by this time, the others had left the ESL program and returned to Korea.

These four subjects were trained on twelve nonce words—six minimal pairs—in which half of the words showed the contrast in nonderived contexts and half showed the contrast in derived environments. The results are displayed in Tables 8 through 11, where again the words targeting [sË] are in the upper half of the table, and those focusing on [s] are in the lower half.

These tables reveal that the hypercontrasts were distributed across both derived and nonderived contexts. K1 hypercorrected predominantly on three words, one of which involved the nonderived context and two of which involved the derived environment. K3 and K7, whose data are given in Tables 9 and 11, respectively, hypercorrected sporadically, but in both environments. And finally, K6, whose results are presented in Table 10, made hypercontrast errors in both environments.

Table 8. Percentage of error for K1 on training words with contrast in both nonderived and derived environments (* indicates derived environment)

	Training Sessions						
WORDS	1	2	3	4	5	6	7
sËiyo	43	9	0	0	0	0	0
nèsËi*	0	0	0	0	0	20	0
tesËi	0	36	27	80	75	100	100
disËíÑ*	16	23	36	80	100	100	100
kusËíÑ*	67	50	20	100	100	100	100
sËima	16	0	0	0	0	20	0
WORDS	1	2	3	4	5	6	7
siyo	50	47	50	40	75	60	68
nèsi*	33	40	11	0	25	0	0
tesi	0	0	0	0	0	0	0
disíÑ*	43	0	0	0	0	0	0
kusíÑ*	16	0	30	0	25	0	0
sima	0	25	40	20	50	40	67

Table 9. Percentage of error for K3 on training words with contrast in both nonderived and derived environments (* indicates derived environment)

	Training Sessions						
WORDS	1	2	3	4	5	6	7
sËiyo	30	38	0	0	0	0	0
nèsËi*	30	12	0	33	0	25	0
tesËi	22	0	0	0	0	0	50
disËíÑ*	0	0	0	0	0	0	0
kusËíÑ*	0	0	0	0	20	0	0
sËima	22	0	0	0	0	0	0
WORDS	1	2	3	4	5	6	7
siyo	0	0	0	0	40	0	33
nèsi*	33	28	0	50	0	0	0
tesi	50	0	0	0	0	0	0
disíÑ*	0	0	0	0	20	0	0
kusíÑ*	0	0	0	0	0	25	0
sima	25	45	16	16	16	0	0

Table 10. Percentage of error for K6 on training words with contrast in both nonderived and derived environments (* indicates derived environment)

	Training Sessions				
WORDS	1	2	3	4	5
sËiyo	38	33	50	40	20
nèsËi*	12	0	0	100	0
tesËi	56	14	57	0	0
disËíÑ*	22	28	0	0	0
kusËíÑ*	0	0	0	0	0
sËima	25	16	0	0	0
WORDS	1	2	3	4	5
siyo	0	0	0	25	40
nèsi*	12	0	0	75	0
tesi	38	50	50	100	20
disíÑ*	22	14	0	0	0
kusíÑ*	0	0	0	25	0
sima	33	84	33	25	0

Table 11. Percentage of error for K7 on training words with contrast in both nonderived and derived environments (* indicates derived environment)

	Sessions						
WORDS	1	2	3	4	5	6	7
sËiyo	56	0	0	0	0	0	0
nèsËi*	14	0	20	33	25	0	0
tesËi	14	16	0	0	0	0	0
disËíÑ*	0	0	0	0	0	0	0
kusËíÑ*	0	0	25	0	0	0	0
sËima	25	0	40	0	50	0	0
WORDS	1	2	3	4	5	6	7
siyo	14	0	0	0	0	0	0
nèsi*	0	0	0	0	0	0	0
tesi	0	0	0	0	0	0	0
disíÑ*	0	28	0	0	0	0	0
kusíÑ*	14	0	0	0	0	0	0
sima	33	28	25	0	75	0	0

4. Discussion

We have presented the results of two broad studies on the acquisition of second language phonological contrasts, one involving generalization from basic to derived environments, the other involving overgeneralization, in the form of hypercorrection, in newly learned words. These events are strategically related, we believe, and proceed in the sequence observed as a matter of grammatical if not logical necessity. Thus, the generalization of a partially learned contrast extends from basic to derived environments, rather than the reverse, because of the persistence of an NL allophonic rule which has suddenly become structure preserving as recognition of the TL contrast takes place. In view of the Derived Environment Constraint, this rule naturally loses its applicability first in basic forms, and only later in derived contexts, because structure preserving (neutralizing) rule applications are universally prohibited in crucially unaltered lexical items. Hence the contrast in question appears first in basic forms, where the NL rule now may not apply, only later generalizing to derived contexts as the effects of the NL rule become suppressed throughout the IL grammar.

This staged development may help shed some light on the claim, made decades ago by Lado (1957), that allophonic splits constitute the most difficult aspect of L2 pronunciation:

(9) "... the kind of problem in which part of a phoneme in the native language can pass as a separate phoneme in the foreign language, and other parts of the same native-language phoneme pass as a different phoneme in the foreign language—that kind of problem is by far the most difficult to overcome."

Lado (1957: 15)

We do not wish to subscribe to the assertion that allophonic splits necessarily represent maximum difficulty in L2 pronunciation, especially in the absence of supporting evidence of our own . It is quite likely , in fact, that circumstances are rather more complex than as painted by Lado, in that it can be shown that certain segments are phonetically more challenging than others, and that a sound's position in the syllable is also a confounding factor. Nevertheless, what is intriguing about Lado's claim is that it seems to entail, other things being equal, that to learn to make a contrast between extant NL allophones is more difficult than to acquire an entirely new TL phoneme, one whose allophones are absent in the learner's NL. While Lado himself provided no empirical evidence for this assertion, subsequent studies (Hammerly 1982; Gierut 1986; Hardy 1993) have supported the claim that allophones, in general, and the effort to contrast NL allophones, in particular, present significant difficulty for a learner.

We suggest that that what may account for the perceived level of difficulty is the staged development that results from an NL allophonic rule's having achieved structure preserving status in the IL. Specifically, there is nothing that guarantees that the learner who has acquired a new contrast in basic lexical items (Stage II) will generalize this contrast to derived environments as well (Stage III). From the viewpoint of a language teacher, therefore, Lado's claim may appear to be supported by the teacher's observations that errors on the contrast persist, presumably in derived contexts, even after the learners have acquired the contrast in monomorphemic words. While our theory predicts development through the two stages for allophonic splits, no such progression is seen in the case of acquiring a new phoneme, because no rule is involved. For this reason, the phonemic splitting of NL allophones appears to rise to the level of "most difficult to overcome" in the learning of TL pronunciation.

The second point we wish to discuss is the hypercontrast exhibited by the Korean subjects. The hypercontrast phenomenon in general presupposes that a TL phonemic contrast is being learned at least in basic forms, perhaps already also having been extended to derived ones. But this error type involves no transfer of NL rules or patterns, as it appears to rest on insecurities associated with mistakes the learner has made, and recognized, in the past. In the case of Korean learners acquiring the English [s]–[sË] contrast, NL interference has precipitated errors of the

kind in which *sea* is pronounced homophonously with *she*, and for this they presumably have been linguistically chastised such that their awareness of the error type becomes cognitively prominent. For these learners, hypercorrection then consists in the overgeneralization—motivated by apparent linguistic insecurity in this matter—that all instances of the sequence [sËi] are inappropriate in the TL, not just some instances ([sËi] is inappropriate in *seek*, but in *sheep* it is correct). As a lexical learning strategy, hypercontrast attenuates as familiarity with the words being learned increases, but there appears to be no derived environment effect associated with hypercontrast precisely because the phenomenon is not due to the interference of any rule.

To the best of our knowledge, there has been no systematic reporting of this kind of hypercorrection in the L2 acquisition literature, only anecdotal evidence—which, as nearly as we can determine, seems to accord quite well with our results. In view of this, we would now like to add our own anecdote involving Greg Iverson's Norwegian-speaking grandfather, Nils. Our point is to show that what was observed about Nils, and, typically, about numerous other L2 learners, is consistent with our Korean subjects' performance on the training words.

The example with Nils involves the /v/ - /w/ contrast of English, which is absent in Norwegian and most other Germanic languages, often causing English learners with those NL backgrounds, including Nils, to err by producing the words *wet* and *vet* both with initial [v]. This type of wholesale neutralization of the contrast is an error that is characteristic of beginning learners; thus, as a new immigrant and novice English speaker, Nils pronounced all English words containing [w] with a corresponding [v], uttering [ay víl go tu vòrk] for *I will go to work*. After sufficient contact with English, however, he eventually mastered the /w/-/v/ distinction, and often learned new words correctly with /w/, as in the place name *Waubun* (Minnesota), though words previously lexcialized with /v/ remained so (*vill, vork*). But in novel words in which /v/ rather than /w/ is correct, he often would produce /w/, the sound which gave him so much trouble to begin with. In these, mainly less common words, hypercorrect /w/ persisted, as in *varmints* pronounced *warmints*.

5. Conclusion

To conclude, we have reported data from two studies that support the claim that certain facts about the pattern of IL phonological development and interference can be accounted for through the principles of phonological theory. We have argued that these principles, which can be linked explicitly to conditions of learnability and contrast, provide an explanation for the observed pattern of L2 substitutions. Thus, the acquisition of second language phonological contrasts involves structured

generalization as well as overgeneralization. The former is a familiar grammatical notion, and observes principles of grammar that have been uncovered in the analysis of primary languages. The latter is familiar from work on primary languages as well, in the study of sociolinguistic variation, but to our knowledge has not been well documented in the literature on second language learning. But together, these patterns of generalization and overgeneralization show interlanguage to be cut from the same grammatical cloth as any other natural language.

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