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The development of a morphological class

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ABSTRACT

English has a class of "semiweak" verbs, which in the past tense have root-vowel ablaut as well as reflexes of the apical stop suffix, for example, *kept*, *told*. This study traces the development of this class in a sample of speakers aged 4-65. The evidence is derived from the variable rates of occurrence of the final *-t,d* in these words in the speech of individuals of different ages. The rate of *-t,d* absence in semiweak verbs systematically declines with increasing age. We identify three ontogenetic stages in the development of the class. In children's speech, these segments rarely appear, suggesting they are underlyingly absent. In young adults they appear but undergo the variable *-t,d* deletion process of English at the same high rate as noninflectional *-t,d* in words like *west*, *old*, implying that such speakers do not treat them as affixes. Finally, some adult speakers show a lowered deletion rate, suggesting that they accord the final stops separate morphemic status. The age distribution of this pattern implies that speakers only arrive at this analysis in adult life, after the age when acquisition is often assumed to be complete.

One problem that must be confronted in studying child language development is that of describing a system that is rapidly changing but that retains structure and systematicity in the midst of the change. This is similar to the problem that has arisen in studies of language change in society. In the sociolinguistic arena, two basic concepts that have facilitated successful approaches to the study of changing structure are *orderly heterogeneity* (Weinreich, Labov, & Herzog, 1968), which highlights the systematic nature of linguistic differences between individuals or social groups, and the *variable rule* (Cedergren & Sankoff, 1973; Labov, 1969), which makes it possible to model quantitatively the alterations that a changing system passes

Earlier versions of this article were presented (as Boyd & Guy, with a somewhat different title) at the Linguistic Society of America meeting in 1979 and the Australian Linguistic Society meeting in 1980. Those versions have already been cited in print, in articles such as Sankoff and Labov (1979), Romaine (1986), and Labov (1989). The preparation of the present version has been hindered by the fact that the authors have been living in different hemispheres since 1979. We gratefully acknowledge the constructive criticism of Bill Labov, Tony Kroch, Charles Ferguson, Eve Clark, and the anonymous reviewers of this journal.

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TABLE 1. *English semiweak verbs*

Ablaut Pattern	Present	Past
u–ɔ	lose	lost
ɛ–ow	sell	sold
	tell	told
i–ɛ	sleep	slept
	keep	kept
	weep	wept
	creep	crept
	sweep	swept*
	leap	leapt*
	leave	left
	feel	felt
	deal	dealt
	kneel	knelt*
	mean	meant
	lean	leant*
	dream	dreamt*

*Words that are often regularized.

through. These concepts from the phylogenetic approach can also be fruitfully applied to the ontogenetic problem, the study of language development within the lifetime of an individual.

One such application is Labov and Labov (1977), a study of the development of *wh-* questions by the authors' daughter. They followed the classic case-study approach: an extended study of the language development of a single individual. Whereas such a study may reveal a lot about the rapidly changing grammar of one child, there is always a question about the extent to which the observations are generalizable to the speech community. Also, longitudinal approaches are less useful in studying changes that occur more slowly. The answer to both problems is a cross-sectional population study, which samples a number of speakers at different ages. This allows us to establish simultaneously the generality of linguistic processes in the population and the course of ontogenetic development.

This is the approach taken in the present study. Our object of interest is the development of morphological categories in the English verbal system. This is a topic much discussed in the acquisition literature (see, e.g., Bybee & Slobin, 1982; Marchman, 1988). Our focus here is specifically on the closed class of "semiweak" verbs, listed in Table 1. These are unique in English because they combine morphological characteristics of both the strong class and the weak. In the past tense, they have a root-vowel change (/slip–slɛpt, luz–lɔst/) like strong verbs *and* an apical stop suffix like the weak verbs, a reflex of the *-ed* past tense marker. However, this class cannot be treated as simply an overlap of the other two classes, because some of its members show

unique properties: absence of voicing assimilation in the suffix (compare *dreamt* with *creamed*) or regressive assimilation (*lost, left*). Rather, they constitute a separate verbal class, which is unproductive and appears to be losing members.[1] Table 1 notes certain of these verbs that in our experience tend to be dialectally or idiosyncratically regularized (i.e., inflected as weak verbs).[2]

For the child language learner this class presents a developmental challenge. As one learns semantic and formal oppositions like {PRESENT} versus {PAST} and attempts to implement these in the lexicon, a few salient generalizations should rapidly emerge. One is the "regular" lexical rule of *-ed* suffixation. Another, salient by reason of the high frequency of many of its exemplars, is root-vowel ablaut. As learners begin to partition the lexicon along these lines, how will they treat the semiweak class? Are they initially subsumed under one of the two larger classes? When do they begin to be treated as a distinct morphological group? Do all speakers treat them in a similar fashion? These were some of the questions we set out to address.

Of course, direct evidence about a speaker's morphological category system is hard to obtain. Our approach to the data problem was to examine a variable phonological process that interacts with, and is sensitive to, morphological structure. This is the one referred to in the literature as *-t,d* deletion:[3] the variable omission in natural speech of /t/ and /d/ from word-final consonant clusters, yielding pronunciations such as *wes' side* and *bes' frien'*. We treat it as a variable rule because it only occurs some of the time, even on successive repetitions of the same phrase by the same speaker in a single speech style. Nevertheless, it is extremely widespread in English; we know of no dialect where the process *never* occurs. It has evidently been operative since the Middle English period, and similar processes are reported for other Germanic languages (Romaine, 1986). Its relevance to the question at hand lies in the fact that the past tense forms of the semiweak verbs are subject to this rule since they all terminate in consonant clusters with final *-t* or *-d*.

Deletion of *-t,d* is one of the most thoroughly studied variable processes in English. Studies such as Labov, Cohen, Robins, and Lewis (1968), Labov (1972a, 1972b, 1989), Wolfram (1969, 1974), Fasold (1972), Guy (1977, 1980), Neu (1980), Baugh (1983), and Nesbitt (1984) revealed several contextual constraints that affect its rate of application. For example, more deletion occurs when a following word begins with a consonant (e.g., *wes' side*) than with a vowel (*west end*). Most such constraints have been found to be remarkably uniform in effect across all dialects and all speakers.

One constraint on *-t,d* deletion that appears to be pan-English concerns the morphological status of the deletable segment. This is where the rule becomes relevant to the issues at hand. All these studies have found that the rule has a lower rate of application in the past tense forms of weak verbs, where the *-t,d* represents the past tense marker (e.g., *missed, packed*), than in uninflected words where the *-t,d* is part of the root morpheme (e.g., *mist,*

pact). This constraint is arguably functional in origin (deleting past tense markers would cause surface identity with present tense forms), but this issue is not pursued here.

Any adequate analysis of English phonology will, of course, require some representation of the distinction between inflected and uninflected words, since this contrast is crucial for many phonological processes. In the formalism of Chomsky and Halle (1968), boundaries are the device used to represent morphological structure. Thus, a regular past tense verb form is represented as having a "word" boundary (#) separating root from affix, whereas the uninflected words have no internal boundaries, as illustrated in (1). The semiweak verbs are distinguished by a different boundary type—a "formative" boundary (+), as in (2). Following this approach, the morphological condition on *t,d* deletion can be characterized as a boundary constraint (i.e., the rule is inhibited after a boundary).

(1) a. Uninflected words: *mist*, *pact* /mɪst, pækt/
    b. Past tense verbs (weak): *missed*, *packed* /mɪs#t, pæk#t/
(2) Past tense verbs (semiweak): *lost*, *left*, *told* /lɔs+t, lɛf+t, tol+d/

In current theoretical treatments, however (e.g., lexical phonology: Kiparsky, 1985; Mohanan, 1986), the prevalent approach is to eschew surface boundaries in favor of a multileveled morphology, so that base and inflected forms are differentiated by their derivational history. Rules that are sensitive to morphological structure must apply in the lexicon, as "bracket erasure" leaves no internal boundaries available to the postlexical phonology (Mohanan, 1986:23–24). In such an approach, one would represent the uninflected class as lexical base forms, the regular weak verbs as involving affixation at level 2, and the adult forms of the semiweak verbs as involving affixation at level 1. However, there is then a problem in the formulation of the *-t,d* deletion rule since, as we have seen, the rule is sensitive both to postlexical context (the initial segment of a following word) and to the internal morphological structure of the word it affects. Accounting for the facts of *-t,d* deletion in this framework would seem to require either abandoning bracket erasure or developing a cyclical theory of the variable rule. However, this is beyond the scope of the present work.[4] For the purposes of this article, we adopt the *Sound Pattern of English* formalism, representing morphological structure in terms of boundaries and utilizing the standard interpretation of this notation that has been developed in the literature on variable rules.

We are now in a position to state our research questions in a formal framework. First, if the morphological constraint on *-t,d* deletion is a boundary condition, do the different types of boundaries have different effects? Second, when do English-speaking children develop distinctive morphological analyses of the semiweak verbs, represented here as in (2)? What analysis of these forms do they have before this? Do all speakers eventually converge on an analysis like (2)?

The strategy we adopted to answer these questions was to use the variable rule of *-t, d* deletion as a probe of the speaker's mental morphological structures. Comparing rates of deletion in uninflected words, semiweak past tense forms, and weak past tense forms, we should be able to infer whether an individual assigned them different morphological analyses or not and whether one, two, or three different analyses were used. We reasoned that if speakers deleted, say, semiweak verbs at the same rate as uninflected words, they probably assigned them the same morphological structure. If there were only a small number of such deletion patterns in the community, and they were ordered with respect to speaker's age, then we would have evidence bearing on the acquisition of this particular morphological distinction.

Some of the prior studies of *-t, d* deletion mentioned earlier investigated the semiweak verbs, with a variety of results. Although most constraints on the rule (especially the inhibition in past tense forms) are quite uniform across English dialects, the semiweak class was sometimes found to inhibit deletion, whereas other studies found it undergoing deletion at a high rate. Some studies even reported contrasting treatments of this class by different members of the same family. These patterns are strikingly confirmed in the recent study by Labov (1989), which showed a child closely matching his parents' rates of *-t, d* deletion in most environments but diverging from them in precisely the semiweak verbs.

Earlier investigations by one of us (Guy, 1977, 1980) suggested that two different grammatical lects existed in the population. One group of speakers treats the final *-t* or *-d* of semiweak verbs as noninflectional, not demarcated from the root by an internal boundary. Thus, they undergo deletion at the same high rate as *west* and *wind*. Another group analyzes these words as containing some kind of boundary and deletes them at a lower rate, although usually not as low a rate as the weak verbs. This implies that these speakers have a distinctive analysis for these forms, involving a formative boundary, which inhibits deletion but not as strongly as a full # boundary. It was also noted by Guy (1980) that the two lects showed age grading, and it was conjectured that they might be developmental stages.

The present work seeks to test these earlier proposals, via a more detailed examination of the age grading in a larger and dialectally more cohesive sample, using improved analytical procedures. The sample population has been greatly expanded by Boyd; the results reported here include data from 42 speakers from Philadelphia and two of its adjoining suburbs (King of Prussia, PA, and Cherry Hill, NJ), ranging in age from 4 to 65.

PROCEDURES

The corpus from which we drew our sample is that collected by William Labov and his associates at the University of Pennsylvania in connection with the Linguistic Change and Variation (LCV) project (Labov, 1984; Payne, 1980). It consists of tape-recordings of sociolinguistic interviews, collected

by trained fieldworkers using standard sociolinguistic survey methods. All speakers were recorded in a familiar setting (usually their own home or a familiar site in their neighborhood, such as a park or a friend's home). The interviews were structured to be as naturalistic and as close to informal conversation as possible, to yield the maximum amount of spontaneous speech.

From the LCV corpus we selected a sample designed to give a broad overall age range coupled with more intensive coverage of the childhood years. Both male and female speakers are included, and the social class range of consultants was restricted to the interior of the class scale, excluding both extremes. All our data were drawn exclusively from spontaneous speech styles; no formal elicitation devices were used. Speakers therefore span the styles that Labov (1972a:79) characterized as casual and careful. Previous studies (e.g., Guy, 1980) have shown only modest style sensitivity for *-t,d* deletion across this stylistic range. For each speaker, a complete study was done of all relevant tokens (i.e., all words terminating in a consonant cluster whose final segment is *-t* or *-d*, other than the word *and*) encountered in one full interview; interviews averaged about 1 hour in duration for adults, but appreciably less for small children.

As we have noted, the rate of *-t,d* deletion is significantly affected by other factors besides morphological structure, especially the following phonetic environment. Our results for these effects replicated those in studies already cited and hence are not examined here. Nevertheless, such factors must be controlled for in order to obtain meaningful comparisons of deletion rates in different speakers. Therefore, we conducted a multivariate variable rule analysis of the data, using the VARBRUL2 program (Rousseau & Sankoff, 1978), coding the data according to the analysis used in Guy (1980). Thus, we distinguished the following three factor groups: preceding phonetic environment (sibilants, fricatives, nasals, stops, and laterals), following phonetic environment (obstruents, liquids, glides, vowels, or pause), and morphological class (uninflected words [i.e., those without a boundary before the final stop], past tense forms of semiweak verbs, and past tense forms of regular verbs). In coding morphological class, we treated *went* as uninflected, as well as cases like *found* and *held*. However, *sent, bent*, and so forth, were included in the semiweak class along with the words in Table 1, despite lacking a vowel change, because we concluded that in terms of the boundary formalism, they should be analyzed with the + boundary. The results to be reported are the parameter values obtained from the VARBRUL2 analysis, representing the probability of stop deletion occurring in the semiweak verbs, as contrasted with the other two morphological classes examined. These values range from 0 (no deletion) to 1 (total deletion).

RESULTS

Analysis of the complete data pool for all speakers yielded the results shown in Table 2. As expected, uninflected words show a high rate of deletion, and

TABLE 2. /-t,d/ *deletion: Effect of morphological class (pooled data—all speakers)*

Class	Probability of Deletion
Uninflected words (e.g., *mist*)	.65
Past tense of semiweak verbs (e.g., *lost*)	.55
Past tense of regular verbs (e.g., *missed*)	.31

past tense forms of weak verbs a low rate. (Furthermore, this ordering of these two categories held for every speaker in the sample for whom enough data were obtained to do a reliable individual analysis.) In the pooled data, the semiweak verbs occupy an intermediate position, undergoing deletion less often than uninflected words but more often than the weak verbs (although they are closer to the former than to the latter).

However, these pooled values obscure the considerable individual variability in the treatment of semiweak verbs that is our point of focus here. To obtain a finer picture of the acquisition of this class, we needed to break the data down as finely as possible. Ideally, this would mean a separate analysis for each individual in the corpus, but achieving this goal depends on the quantity of data available. Meaningful analytical results cannot be obtained if there are fewer than 10–15 tokens of the target category in a data set (Guy, 1980:20). Speakers for whom we have less than this number of tokens cannot be analyzed individually.

In our corpus, the numbers of past tense semiweak verbs obtained were sufficient to undertake individual analyses for 25 of 27 adult consultants, but only 2 of the 15 children (aged 10 and 14). The remaining consultants, including all children under the age of 10, had to be combined in speaker groups for quantitative analysis. The children were combined according to neighborhood peer groups: children of approximately the same age (±1 year), who lived close to one another, played together regularly, and named one another as friends. Six such groups were thus obtained (five pairs and one group of three). In view of the linguistic uniformity of children's peer groups demonstrated by Labov et al. (1968) and Labov (1972b), this procedure should introduce minimal distortion to the analysis. The two adult consultants who were combined for analytical purposes were a married couple, both in their late 50s. The total number of data points obtained is therefore 34, consisting of 27 individual speakers and 7 speaker groups.

The probabilities of *-t,d* deletion in the semiweak verbs for the 34 data points are plotted in Figure 1 against the speaker's age. (For speaker groups, an average age of members of the group is used.) The data clearly show orderly heterogeneity in the age dimension: the probability of deletion declines with increasing age. We have included in the figure a regression line fitted to the dispersion; it has a negative slope equivalent to a decline in deletion probability of .052 for each decade increase in age. The correlation between age and deletion probability is $r = -.72$, which is highly significant. By way

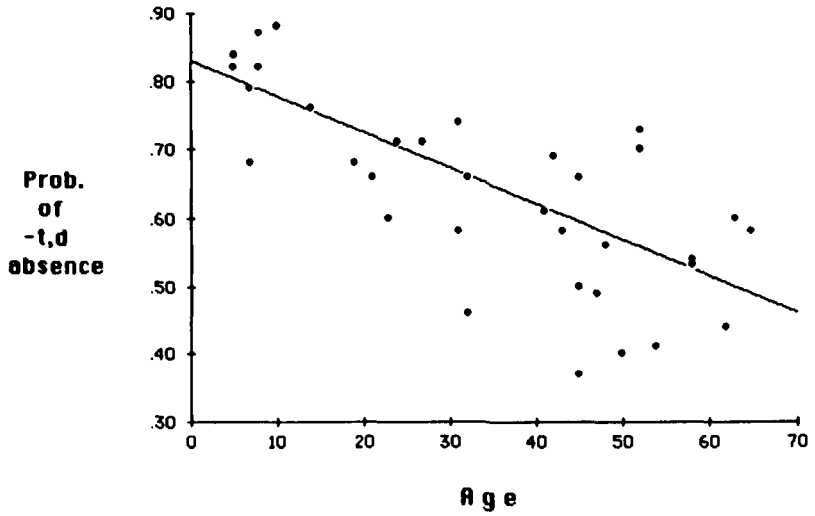

FIGURE 1. Probability of *-t,d* absence in semiweak less verbs, by age.

of contrast, the phonological constraints on this rule correlate with age only to an insignificant extent ($|r| < .2$); regression lines for these are essentially flat, with slopes of about .01 or less per decade.[5] Thus, it appears that only the treatment of semiweak verbs changes significantly with age. How can we account for this?

One point that must be dealt with at the outset is the question of change in progress. Figure 1 represents a distribution in apparent time (Labov, 1966:318–322), not different points in real time. It could therefore represent either a developmental process, through which all speakers of English pass as they age, or a change in progress in which a shift in community norms is occurring, and each successive generation of speakers behaves differently from their predecessors. Which of these two cases obtains here? Is the Philadelphia dialect undergoing a change in progress, involving increased deletion of *-t,d* from semiweak verbs, and possibly the eventual loss of affixes in this verb class?

To answer these questions, we first note that we have no evidence that the whole process of *-t,d* deletion is involved in change or even in age grading. On the contrary, previous studies characterized it as stable and uniform.[6] Our results show age grading just for this one class of words; the other parameter values (including the input probabilities that track the overall rate of deletion per speaker) were not significantly correlated with age. So whatever process is going on, it is affecting just this verbal class. This alone may lead us to suspect acquisition is involved, since diachronic reorganizations of morphological classes tend to be associated with other changes in phonology and syntax. They also tend to be fairly slow, whereas this one, if it is a change in progress, looks to be heading to completion in a single lifetime.

The best kind of evidence for deciding whether change in progress is occurring is historical evidence from real time showing how the items in question were treated in the dialect at an earlier time. In the present case, we have no such evidence (other than the fact that semiweak verbs have existed in English with final affixes for many centuries). Therefore, we must rely on other types of evidence, principally the social distribution of the variable. Previous studies of known changes in progress revealed certain characteristic distributions of innovative forms across a speech community (see Guy, Horvath, Vonwiller, Daisley, & Rogers, 1986; Labov, 1981). Innovations are generally led by the working and middle classes, and by women. They are often differentially acquired by different ethnic groups and geographic areas. They frequently acquire some social evaluation and become subject to style shifting. In the present case, these characteristics are not observed. We found no significant correlation between the rate of deletion in semiweak verbs and other social characteristics of the speaker, such as sex, social class, geographic background, or ethnicity.[7] There is very little social awareness of the different treatments of this verb class, and no style shifting.

Thus, although the absence of real time data means we cannot completely rule out change in progress, the other evidence suggests it is unlikely. Since the characteristic social distributions of change in progress are completely lacking, we conclude that the age grading in Figure 1 represents, in all probability, a developmental sequence reflecting the acquisition of this morphological class.

Viewed in this light, it seems possible to give a more refined analysis of this process of acquisition. The distribution of data points in Figure 1 allows a more discrete interpretation than is suggested by the continuous regression line. In the upper left corner, the children are all tightly clustered with very high probabilities of deletion in semiweak verbs, generally above .75. Next, the younger adults tend to cluster around an approximate mean of .65. Finally, adults 45 years and older, although not as tightly grouped as the others, tend to fall at or below a value of .60. These values are suggestive. Recall that the probability of deletion in uninflected words shown in Table 2 for the pooled data was .65. Therefore, the values in Figure 1 that are appreciably above .65 are showing *preferential* absence of *-t,d* in semiweak verbs; that is, this is the most favored morphological class for deletion. Values that approximate .65, however, represent essential equivalence between this class and the uninflected words. Finally, only those values that are appreciably lower than .65 are displaying an inhibitory morphological constraint on deletion.

We can formalize these observations in terms of three deletion patterns. What we will call Pattern I is high deletion in semiweak verbs, defined as a probability greater than .75. This pattern characterizes most of the children. Pattern II is defined as a probability value between .60 and .75 and characterizes most of the young adults. Pattern III is defined as a deletion probability below .60; most adults over 45 have this pattern. The distribution of speakers across these three patterns is shown in Table 3.

TABLE 3. *Distribution of speakers by age and pattern of deletion in semiweak verbs*[a]

Deletion Pattern	Age of Speaker		
	0–18	19–44	45+
I (probability of deletion > .75)	7	0	0
II (.75 > probability of deletion > .60)	1	9	4
III (probability of deletion < .60)	0	3	10

[a] $\chi^2 = 40.83$, $p < .001$.

The sharpest division is between the children and all the adults. Not a single adult uses Pattern I, and only one of the data points for children crosses into Pattern II. Thus, a very high rate of *-t,d* absence in semiweak verbs is a feature strictly characteristic of the speech of children. The division between older and younger adults is somewhat less sharp. Whereas each adult group has a distinctive, strongly modal distribution in Table 3, about a quarter of the individuals in each age group have the nonmodal pattern. The data suggest that the cohesiveness of cohorts declines with age.

The development within the adult group merits further attention. Figure 1 shows the adult values for deletion in the semiweak verbs trending toward the average value for deletion in the regular verbs (.31). But is this confirmed by the values for each individual? Figure 2 provides such a comparison, plotting the difference between the factor values for the semiweak class and the regular past tense forms for each speaker. (There are fewer data points in this graph because not all speakers had comparable factor values for the past tense forms, either because data were insufficient or because this factor proved to be a knockout.) The general trend of Figure 1 is still apparent, and the division between the younger and older adults is perhaps even more pronounced. But note that for most older adults, the value for semiweak verbs remains above that for regular verbs; crossover occurs for only three speakers.

What is the significance of the three patterns and their age distribution? We propose an explanation in terms of morphological acquisition. First, consider the children's pattern. They exhibit nearly categorical absence of *-t,d* in semiweak verbs. (In fact, several individuals in the peer groups did show complete absence.) We interpret this to mean that children simply do not have a final apical stop in the underlying forms of these words. They treat such words as ordinary strong verbs, marking past tense only by means of the stem-vowel change. The underlying forms would be as shown in the first two columns of Table 4. The /i–ɛ/ vowel alternation that characterizes many of them parallels the ablauting pattern of several strong verbs, for example, *feed-fed, read-read, meet-met.*

In this hypothesis, the child's mental lexicon (by age 5) admits just two

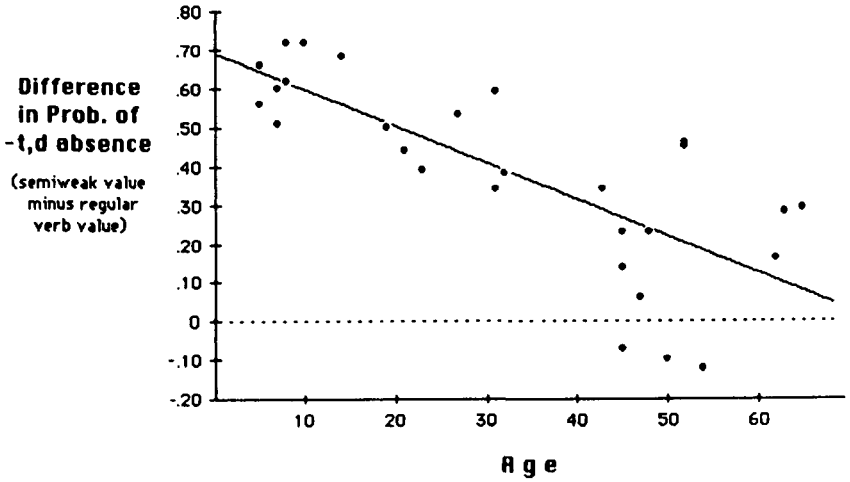

FIGURE 2. Difference in probability of *-t,d* absence between semiweak forms and regular past tense forms, by age.

basic verb classes: weak verbs, which take the apical suffix, and strong verbs, which ablaut. The semiweak class does not exist, and its members are consigned to the strong class.[8] Such final *-t,d*s as do occur in children's speech are considered as sporadic borrowings from adult models.

The second stage of acquisition is represented by Pattern II, where the initial differentiation of the semiweak class from the broader strong class begins. At this point, speakers have recognized that such words do have a *-t,d* in the underlying form, but they are morphologically analyzed as uninflected, according no special status to the final apical stop. The vowel change is still the unique representation of past tense, and the alterations at the end of the word are lexically entered idiosyncrasies analogous to *teach–taught* and *stand–stood*. The underlying forms contain no internal boundaries, as shown in the third column of Table 4.

In the final stage, represented by Pattern III, speakers take a further step in their analysis of verbal morphology. They connect the apical stops in semiweak verbs with those found in regular weak verbs (the orthographic *-ed* suffix). Hence, these *-t,d*s begin to partake of the resistance to deletion that characterizes the *-ed* suffix in weak verbs. But rarely do deletion rates in semiweak verbs drop as low as in regular preterites. The semiweak verbs are, of course, still distinguished by several characteristics, such as the stem-vowel change, regressive voicing assimilation, and nonproductivity. If it is functional considerations that inhibit *-t,d* deletion in regular verbs, they would not operate as strongly here because the {PAST TENSE} meaning is still recoverable after deletion.

These facts can be captured in our formalism by postulating that Pattern III speakers have arrived at some mental treatment of such forms analogous

TABLE 4. *Hypothesized underlying forms*

	Semiweak Verbs				
	Past Tense				
Present Tense	Pattern I	Pattern II	Pattern III	Regular Verbs	Uninflected Words
tɛl	tol	told	tol+d	rol#d	fold
slip	slɛp	slɛpt	slɛp+t	stɛp#t	æpt
liv	lɛf	lɛft	lɛf+t	pəf#t	lɪft
luz	lɔs	lɔst	lɔs+t	tɔs#t	kɔst

to our representation of them in the fourth column in Table 4, which delimits the affix by a + boundary.[9] It is only at this stage that a distinctive third class of verbs is developed, and the final *-t, d*s are accorded some resistance to deletion because of their morphological status.

Movement from the holistic analysis of Pattern II to the atomic analysis of Pattern III is not a step that speakers take early in life. Of the speakers in the sample who show Pattern III, the youngest are 31 and 32 years old, and the average age is 49. This clearly implies that language acquisition is not a process confined to childhood. Figure 1 shows speakers continuing to reanalyze their language well into adult life. But the data also show that mature native speakers of a single dialect may still entertain different mental grammars. Not everyone, evidently, arrives at a Pattern III analysis; it coexists in the adult population with Pattern II.

The difference between the two reanalyses (the childhood shift from Pattern I to II and the adult shift from Pattern II to III) is striking. The earlier shift seems to occur in the entire population at a specific age, but the later one occurs in only part of the population over a much wider age range. What might account for the difference?

The first reanalysis, which involves inserting the final stops in the underlying forms of past tense semiweak verbs, is most plausibly driven by the basic imperative of language acquisition: accommodation to the production of other speakers. The nearly categorical absence of these stops in the speech of children using Pattern I is a qualitative difference from the adult patterns; this should provide sufficient evidence for all speakers to undertake the first reanalysis, when they reach an appropriate developmental level. The surface outputs of Pattern II and Pattern III speakers, however, differ only quantitatively, by relatively small amounts in the frequency of *-t, d* deletion in this small class of verbs. We hypothesize that, in this case, the difference does not provide sufficient evidence to prompt the reanalysis that leads to Pattern III.

Another potential facilitating factor to be considered in the development of Pattern III is the economy and generality of the competing analyses (cf.

Fodor & Crain, 1987). The reanalysis involves a changed derivation for the forms in Table 1. Pattern II treats them as strong verbs and uses lexically specific rules to generate the past tense forms, whereas Pattern III presumably makes use of more general inflectional rules, although some lexically specific rules are still required. If linguistic development favors more general rules and more economical grammars, the Pattern III analysis might be slightly favored. But the magnitude of any such effect should be small in this case. Given that only about a dozen lexical entries are involved, and that some lexically specific rules are required in either case, little grammatical economy is gained by this reanalysis, whereas the cost includes formulating a new verb class with an inflectional pattern differing from both the strong and weak classes. Hence, this is also unlikely to constitute a sufficient factor for provoking the adult reanalysis.

We conclude, therefore, that the adult shift to Pattern III is probably the result of spontaneous linguistic insight by individuals and is neither socially motivated nor developmentally required. As Bates and MacWhinney (1987: 171) noted, "form-form . . . and form-function connections can be observed and pondered in their own right, whether or not the organism is currently being driven to meet some primary need." For some individuals, the eventual result is, evidently, a new analysis.

PHONOLOGICAL FORM CLASSES

Since the developments we postulate involve the reclassification of words in the mental lexicon, it is worth examining the semiweak verbs more closely to see how uniform this process is. The most interesting question to address would be whether the reanalyses proceed word-by-word—a developmental "lexical diffusion." We suspect that this is the case, but to demonstrate it at a statistically significant level would require appreciably more data than were available to us, as it would involve tracking each word separately in the speech of each individual and obtaining sufficient tokens of each to control for the other factors influencing *-t,d* deletion. Our data are, however, sufficient to investigate differentiation between phonological form classes. As we noted, one of the factors affecting *-t,d* deletion is the preceding phonological environment. The main direction of this effect is that preceding /s/, stops, and nasals favor deletion, whereas /l/ and nonsibilant fricatives disfavor (Guy, 1980). Since, fortuitously, all of these environments are represented in the semiweak verbs, we may examine the data to see if such classes are differentiated and whether they are significant for morphological reanalysis.

Since very fine partitioning of the data set unavoidably worsens the obscuring effect of statistical noise, sampling error, and so on, we confine our attention to the most robust aspect of the pattern. In the present case, that is the shift from categorical absence of final *-t,d* in Pattern I to underlying

TABLE 5. *Semiweak verbs in phonologically conservative contexts: /-t,d/ absence by preceding segment (all children under age 14)*

Preceding Segment	*N*	% *-t,d* Absent
/f/ (*left*)	10	0
/l/ (*told, sold, felt*, etc.)	20	0
nasal (*meant, sent, dreamt*, etc.)	46	78
/s/ (*lost*)	3	33
/p/ (*kept, slept*, etc.)	35	97

presence in Pattern II. We therefore focus on the children's data in this section.

When the shift to Pattern II has occurred for a particular set of words, surface absence of *-t,d* in that set should be due entirely to the effect of the phonological deletion process. This effect can be minimized by examining those following phonological environments in which *-t,d* deletion is least likely to occur: nonconsonantal ones (i.e., following pause, liquid, glide, or vowel). If the various phonological form classes of semiweak verbs then show only minor differences in *-t,d* absence, they are probably undifferentiated in the reanalysis process. But if they show substantial differences, then those form classes that show unusual absence of *-t,d* should be lagging in reanalysis. Relevant figures are given in Table 5.

The nearly categorical absence of *-t* in the *kept, slept* group, even in these phonologically conservative contexts, implies that such segments are not present underlyingly; they contrast starkly with comparable uninflected words (e.g., *act, apt*) where the deletion rate is only 44% in the same environments. Therefore, these words must lag in the reclassification from Pattern I to Pattern II. The words with preceding nasals also appear to be lagging in this process. Compare a deletion rate in comparable uninflected words (e.g., *tent*) of 22%. On the other hand, the categorical presence of *-t* in *left*, and in *told, sold*, and so on, indicates that these words are reclassified early and treated equivalently with comparable uninflected forms (which for these speakers in the same following contexts show a deletion rate of 10% on 20 tokens; given the *N*s, this is not significantly different). Concerning *lost*, with only 3 tokens, there is little to be said.

The data may also be taken to indicate that the presence or absence of regressive assimilation could affect the reanalysis. The words that are lagging in this process—those with preceding nasal or /p/—become fairly typical strong verbs without their final stops. They then have only a vowel change. But *lef'* and *los'*, without final stops, are anomalous in the strong class. Only a few such words have stem-final alterations in the past (aside from the addition of *-t,d*), and none have devoicing of a segment other than /d/. Possibly the presence of this stem-final voicing anomaly focuses learners'

attention on the end of the word, facilitating insertion of the final stops. (But this does not explain early reanalysis of *told*, *felt*, etc., unless it has to do with the dearth of strong verbs ending in liquids.)

These data are thus consistent with a view of morphological reanalysis that is granular rather than uniform. The relevant phonological form classes defined by the *-t,d* deletion rule are differentiated in the reanalysis process. Future investigations should examine whether the individual lexical items within these form classes are also differentiated and whether other factors such as frequency (cf. Phillips, 1984) affect the process.

CONCLUSION

The data we have examined clearly indicate that the semiweak verb class of English is treated differently by speakers at different ages, at least with respect to the occurrence or nonoccurrence of final /t,d/. We propose that the observed quantitative differences reflect different stages in the ontogenetic course of development of the speakers' verbal morphological systems. Initially, the semiweak class does not exist, and children assign these verbs to the strong class on the basis of their most salient feature: root-vowel ablaut. Hence, they follow the dominant pattern of the strong class: no alteration at the end of the word. Final apical stops are therefore categorically absent.

At the next stage, these verbs are differentiated from the rest of the strong class as lexical exceptions that undergo stem-final alterations in the past tense. These alterations, we hypothesize, are treated holistically and are not related to the productive pattern of *-ed* affixation in the weak verbs. Quantitatively this means that final apical stops are variably present. All speakers proceed to this stage by late adolescence.

Lastly, some speakers go on to formulate the semiweak verbs as a separate morphological class, which undergoes both ablaut and affixation. This leads to a low rate of final apical stop deletion, as occurs in weak verbs.

This pattern is broadly similar to the stages in morphological acquisition identified by MacWhinney (1976) in his study of Hungarian. In his Stage II, "amalgams are analysed semantically, but not morphologically" (p. 400). Our Pattern II speakers have the correct past tense semantics for the semiweak forms but do not analyze them with any internal morphology. In MacWhinney's Stage III, complex forms begin to be analyzed morphologically, which is what occurs among our Pattern III speakers.[10] Of course, MacWhinney's data refer just to child language and to morphological classes that are more regular than the one we have examined, but the developmental parallels are evident.

This sequence may reflect a general principle of language acquisition. Forms are first acquired holistically; analyses of their internal morphology come later. For example, the process of pidginization (a special case of adult L2 acquisition) classically involves completely holistic acquisition. All forms

are free morphemes devoid of inflection or other internal morphology. It seems that the word—a linguistic sign binding sound to meaning—has a cognitive primacy over formal linguistic processes of morphology and syntax.

Finally, we also conclude that language development does not end with puberty or majority but goes on into adult life. If the empirical facts that one confronts every day in one's language allow multiple interpretations, at least some speakers may arrive over time at a new mental analysis. In this case, the cognitive pressure to do so is fairly slight. The accommodation imperative that drives language development—the motivation to make one's output resemble the corpus of data that one perceives others to be producing—will not exert much influence in a community with the internal diversity evident in Figure 1. But this very age-graded diversity also demonstrates that the ontogeny of language must continue through a speaker's lifetime.

NOTES

1. Certain other groups of verbs share some characteristics of those in Table 1 but with other differences. Verbs such as *taught, thought, caught* have the root-vowel change and final *-t* in the past tense but also have additional irregularities at the end of the root. They are also unaffected by *-t,d* deletion since they lack a final cluster in the past tense. Cases like *found* and *held* have a final stop that is straightforwardly analyzed as part of the root. The *sent, spent* group lack a root-vowel change, and *went* is suppletive. This list is restricted to vowel-changing verbs whose past tense forms terminate in a consonant cluster that can be unambiguously segmented into a root-final consonant and an apical stop affix.

2. Regularizations by adults were rare in our corpus; for the treatment of children's regularizations, see note 8.

3. Referring to this process as a "deletion" implies that the segments in question are underlyingly present. As we shall see, for our youngest speakers this is probably not the case. However, the quantitative analysis reported here does not depend on this assumption; the results may be consistently interpreted in terms of probability of the absence of *-t,d*, regardless of how that absence comes about.

4. These issues are discussed in Guy and Bisol (1988), but the field awaits a more comprehensive treatment of the implications of variation data for phonological theory.

5. Within the morphological factor group we cannot make independent comparisons because VARBRUL normalizes factor values within a group around the .5 value. Therefore, if one factor in a group is trending down with age, some other value(s) in the group must trend reciprocally upward. In our data, the deletion rates in the uninflected words and regular verbs show the consequent positive correlations with age ($r = .164$ and .675, respectively). One might therefore consider the possibility that these rises are the primary (even if weaker) effects, and the fall in semiweak verbs the consequence of normalization. However, this hypothesis is not confirmed by the unnormalized raw frequencies.

6. Comparatively high overall rates of *-t,d* deletion have been noted for Black English Vernacular speakers (Labov 1972b; Wolfram, 1969), and there are dialectal differences in the effect of a following pause (Guy, 1980), but otherwise no major differences have appeared in the populations studied to date.

7. Guy (1980) conjectured that working-class adult speakers might show higher deletion rates in semiweak verbs, but the present study did not find this to be significant. Sex differences were small and inconsistent in our data. Higher deletion rates were found in male children but in female adults.

8. Many children, aged 2–6, go through a stage of regularization, where strong and semiweak verbs are variably treated as weak, forming past tense forms with the *-ed* suffix and no vowel ablaut (e.g., *drinked, leaved*). Such cases were treated as weak verbs in our analysis. Our discussion deals with developments after forms have been correctly identified as exceptions to the regular pattern. Bybee and Slobin's study of regularizations (1982) revealed that the verbs of

their Class III (our semiweak class, plus cases like *said, did*) are regularized less often than most other vowel-changing verbs. They attributed this to the redundant cue to past tense provided by the presence of the final stop. However, they did not discuss the rate of final stop *absence* in their data.

9. In a multilevel morphology, this would be represented as replacing a lexical entry for the past tense that includes the final segment by a derived form involving level 1 affixation.

10. MacWhinney's Stage I addresses the early childhood phenomenon of using inflected forms in semantically inappropriate ways; an analogous situation in English would be the use of *came* or *went* as present tense forms. Our study begins with age groups that already possess the correct semantic analysis of the forms in question.

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