LEXICAL ENTRIES: EVIDENCE FROM SPEECH ERRORS

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Evidence from errors in normal speech can be used to explore the nature of lexical entries of morphologically complex words. This paper explores the question of separate lexical entries for complex forms, the completeness of these entries, redundancy rules, and the role of major and minor rules in production. It is concluded that inflected and productively derived forms have at most minimal separate entries and are produced by major and minor rules. Nonproductively derived forms are also produced by minor morphological rules, but have lexical entries with semantic and syntactic information specified separately from the lexical entries of the base forms.

0. Introduction

There have recently been numerous proposals about the nature of the lexicon and lexical entries. Syntacticians and phonologists, working on different problems and for very different reasons, have begun to put together very similar models of the lexicon. The subject is a very difficult one, however, and it is far too easy to fall into the trap of arbitrarily choosing one type of lexical representation over another. Simplicity and plausibility are often the main or only tools; yet, everyone admits that the simple and plausible can sometimes be wrong. Further, the definition of simplicity and plausibility has an unnerving way of changing given the theoretical model. In this paper, I will argue for specific types of lexical representations using psycholinguistic data from errors arising spontaneously in normal speech production. By using such evidence, we can choose between alternative theoretical positions on a principled basis to arrive at a psychologically real model of the lexicon.

1. Lexical entries

Jackendoff (1975) discusses several alternative ways for representing morphologically complex words in the lexicon. The basic assumption is that such words are not produced by context-free rules, but are listed in the lexicon in some fashion. This follows Halle (1973), Vennemann (1974), and Leben and Robinson (1977), who essentially maintain that all words,

including all members of all paradigms, are directly stored and not created anew each time they are used. Thus, speakers know that words like dogs, happiness, and destruction exist, not just that they are law-abiding productions of the rules of English. The claim is quite plausible. Many other phonologists, e.g. Linell (1979) and Bybee and Brewer (1980), maintain that only some members of paradigms are listed, probably the most common ones; the same should be true for regular, productive derivational forms. Everyone agrees, however, that at least some morphologically complex words are separately listed. We must determine how they are listed.

Jackendoff contrasts two 'theories', which he calls 'full entry' theory and, rather disparagingly, 'impoverished entry' theory. The full entry theory posits that all words are stored in their entirety, fully specified for semantic, syntactic, morphological, and phonological information. In order to explain rule productivity and to relate similar words, Jackendoff posits redundancy rules, which contain all information shared by the words related by the rule, express generalizations in the lexicon, and thus reduce memory load. In the impoverished entry theory, no information is stored with a morphologically complex word, other than commands to take a certain base and apply certain rules to it. Since this amounts to lexically marking a word to undergo a certain rule, a more appropriate name would be the minor rule theory. A word must be actively created each time it is used, but the speaker knows that the word exists and exactly which rules are needed to produce it.

There are two possible variants of a full entry theory. The first, the strict full entry theory, stores the complex word as a single unit. All morphological structure is interpretive, a part of the redundancy rule. The second variant, the structured full entry theory, stores each morpheme of a word in a separate location, uniting them with a hierarchical morphological structure within a single lexical entry. This resembles the minor rule theory in that each morpheme of a complex word is treated as a separate unit in the lexical entry. It differs from the minor rule theory, however, because the 'same' morpheme in different words is stored separately in full for each word, and related via redundancy rules. Dividing the word into fully specified morphemes in this way is parallel to the general view of phonological segments: a morpheme is divided into fully specified segments,[1] with no attempt to give e.g. /b/ a single location in the lexicon.

Jackendoff argues for a full entry theory with only two pieces of evidence. First, many derivational words are associated with semantic and syntactic irregularities, which cannot be predicted and leads to great difficulties if a rule is used to create them. Secondly, some derived forms have no base to be derived from that is an independent word, e.g. aggression/aggressive/aggressor but *aggress. Aronoff (1976) reiterates these arguments and claims that only a full entry theory is possible.

A full entry theory and a minor rule theory are not mutually exclusive, however. First, it is quite plausible that some types of words, e.g. nonproductive derived forms with semantic shifts, might have full entries,

while other types of words, e.g. inflected and productively derived forms with no meaning shifts, might have minor rule representations. Secondly, MacWhinney (1978) has suggested that the entry for a given word may combine elements of a full entry and minor rule representation at different levels. Thus, the semantics could have a full entry while the morphology might make use of minor rules. There is psycholinguistic evidence from speech errors in support of both these possibilities.

2. The corpus

This analysis is based primarily on a corpus of 4700 errors occurring in natural speech that I have collected over a period of two years. All of the errors were caught by ear and written down immediately; none are recorded on tape. This leaves open the possibility of subtle experimenter bias influencing attention, etc.; but the morphological and lexical errors examined here intuitively seem to be relatively resistent to such biases. This corpus has been supplemented with published data from other sources, but that data was preselected with other goals in mind and cannot be considered as reliable for statistical purposes, with the probable exception of Meringer and Mayer (1895) and Meringer (1908).

3.0 Errors

There are four basic types of error that I will examine to gain a window on the structure of lexical entries, all related to the process of locating the proper items in the lexicon. One type of error involves the substitution of one word for a word that is related inflectionally or derivationally. A closely related type of error involves the blending together of two related words. A third type of error is where morphological patterns are used to create new, incorrect inflectional or derivational forms. Lastly, errors involving the loss, addition, or substitution of prefixes will be examined. Inflectional, productive derivational, and nonproductive derivational words have very different characteristics in these types of errors. All these error types have been termed paradigmatic. Errors which involve producing a word or affix in the wrong location in the sentence (sequencing or syntagmatic errors) are far more difficult to interpret and will not be discussed here, though Garrett (1975) and MacKay (1980) have noted their relevance.

3.1 Substitutions

3.11 Inflection

Errors within paradigms in inflectional morphology show a very strong bias in favor of morphologically 'unmarked' forms. The typical case is one of apparent rule failure, where an affix, or stem change, that should have been added has not been. The opposite, where an affix or stem change is added where it should not have been, is rare in comparison.

3.111 Ablaut/Umlaut

One of the most striking examples of this unidirectionality comes

from ablaut in English verbs. When one ablaut form substitutes for another in an error, it is almost invariably the present stem substituting for a past or perfect stem, as in (1).

(1)a. Boy, that draw him out --- drew him out.
b. He had wind up making $200. 'wound'

There are 32 such errors in my corpus. Five additional errors involve irregularities like send/ sent, also only the substitution of present for past and perfect. In contrast, outside of several well-defined, mostly syntagmatic, areas,[2] there are only two errors in my corpus showing past for nonfinite (2a), only one in Fromkin (1973) (2b),

(2)a. Some of these will wound up being orphans. 'wind'
b. knewing what she wanted 'knowing'

and none in any other corpus. The errors in (2) are so rare as to be statistically indistinguishable from chance phonological substitutions; Lecours et al. (1973) that they occasionally occur by chance in a computer simulation of the phonological behavior of jargon aphasics. There are also four errors in my corpus where plural ablaut is lost (3),

(3) They had cute little mouse on --- mice on it.

and no errors in the opposite direction.

Umlaut and ablaut in German are similar. Meringer and Mayer (1895) and Meringer (1908) list 21 cases of the vowel of the present singular intruding on other forms (4a), 8 of the vowel of the nominative singular intruding in plurals and compounds (4b), and 2 cases of the vowel of the simplex adjective intruding in comparative forms (4c).

(4)a. Die Leute kannen --- können nicht.
b. Soweit die Aufzeichnungen in den Klostern reichen. 'Klöstern'
c. junger 'jünger'

There are no examples in the opposite direction, except for one blend.

3.112 Suffixes

Errors involving inflectional suffixes, as in (5),

(5)a. He relax when you go away. 'relaxes'
b. If we just had one strategy for do everything --- for doing ...

are also biased towards base forms with no morphological marking (6).

(6)

pl. -s	⟶ ø	24;	ø	⟶ -s	3
poss. -s	⟶ ø	8;	ø	⟶ -s	ø
3sg. -s	⟶ ø	37;	ø	⟶ -s	14
prog. -ing	⟶ ø	8;	ø	⟶ -ing	1
pst/prf -ed	⟶ ø	3;	ø	⟶ -ed	2
prf. -en	⟶ ø	2;	ø	⟶ -en	ø

As (6) shows, only with the 3sg.pr. verbal suffix -s are there any number of base forms being replaced with inflected forms, and even these are far outnumbered by the errors where base forms replace inflected forms. Most of those errors can be interpreted as errors of number agreement, a conclusion that is bolstered by the bidirectionality of errors involving the suppletive allomorphs of be (7).

(7)

was	⟶ were	4;	were	⟶ was	6
is/am	⟶ are	10;	are	⟶ is	5

All other cases, where no such context-sensitive rule is active, show the very strong bias towards base forms, with the exception of -ed, which, among other things, is too small a sample from which to draw conclusions.[3]

3.113 Suffix substitutions

Often, one inflection substitutes for another in an error (8).

(8) I find that very insulted. 'insulting'

In contrast to when basic forms are involved, all such substitutions are bidirectional, as shown in (9).

(9)

-ing	⟶ prf.	7;	prf.	⟶ -ing	10
prf	⟶ pst	2;	pst	⟶ prf.	2
passive -ed	⟶ -s	1			

3.12 Productive derivation

As yet, few errors have been collected where a productive derivational affix fails to appear where required, or appears where it is not supposed to. The only examples in my corpus involve adverbial -ly (10).

(10)a. For a '73, it's incredible low. 'incredibly'
b. The maximally deflecsh- --- the maximal (deflection of) ...

There are 11 cases of -ly loss, and only one where -ly was added for no reason.[4] This suggests that productive derivation, like inflection, leads to errors of the base substituting for derived forms and rarely the reverse.

3.13 Nonproductive derivation

Nonproductive derivational morphology shows a quite different pattern of errors. Included in this category are all nonproductive or only marginally productive affixes, e.g. -ment, -al, -tion, -ive, etc. Substitution of one derivational form for another is bidirectional, with derived forms substituting for the base as often as the reverse.

It is a very common observation about errors, e.g. Nooteboom (1969), that words almost always substitute for a word of the same syntactic category, e.g. nouns for nouns, prepositions for prepositions, etc.

This holds true for my corpus, where only 3 word substitutions out of 554 violate this constraint.

Substitutions involving derivationally related words are common and often violate this constraint. I have 41 examples, of which 24 (58.5%) involve words of different categories (11).

(11)a. If you're hunger --- hungry, we ...
b. You have the brow ridge of an India --- of an Indian.
c. Charlie Brown has been inabil- --- unable to ...
d. I think he was tendency --- tending to do that.
e. Maybe it was when they were first marriaged --- married.

Presumably, the relationship between these words is closer and different in kind from that between only semantically and/or phonologically similar words, leading to frequent violations of an otherwise almost exceptionless constraint. The common occurrence of these substitutions is also in marked contrast to the virtual nonexistence of substitutions involving productive derivation.

Substitutions of derived forms for basic ones are also common. These occur 17 times (11c-d), as compared to 17 substitutions of basic for derived (11a-b), and 7 cases where it is hard to determine which form is basic (11e). The bidirectionality of substitutions is quite distinct from inflectional and productive derivational substitutions.

3.2 Blends

An interesting characteristic of derivationally related words is the occurrence of blends, where the form produced has the correct affix but the wrong stress and/or vowel patterns, which are appropriate for a related word, as in (12).

(12)a. supériority 'supèriórity' cf. supérior
b. sècretáry 'sécretary' cf. sècretárial
c. indústry 'industry' cf. indústrial

These show disagreement of syntactic category in 17 out of the 22 errors in my corpus (77.3%), against only 4 out of 185 errors (2.2%) for blends of words that are not morphologically related. In 7 cases, the basic form intrudes on a nonbasic one (12a); in 15, a nonbasic form intrudes on a basic one (12b-c). There seems to be an asymmetry in favor of nonbasic forms. The data of Cutler (1980), however, shows a strong asymmetry in the opposite direction, with 37 intrusions of basic forms on nonbasic ones, but only 16 intrusions of nonbasic forms on basic ones. We might conclude that blending is actually bidirectional. Even if Cutler's data is correct, however, and basic forms tend to intrude on nonbasic ones more than the reverse, note that a large number of intrusions of nonbasic forms on basic ones do occur. This is again in contrast to the patterns seen in inflectional substitutions, where the basic form substitutes for nonbasic ones and rarely the reverse.

3.3 Productive use of morphological patterns

3.31 Inflection

Most errors showing a productive use of inflectional patterns so far reported in Germanic languages involve verbal inflection. Errors generally involve the full or partial regularization of forms that belong to minor patterns, or the shifting from one minor pattern to a more general one. There are 16 full regularizations in my corpus and 17 in Meringer (1908) (13).

(13)a. She's always goed --- gone into these weird things.
b. It might be able to be bended.--- 'bent'
c. I carefully looked at 'em and choosed --- chose that one.

I have 4 cases of partial regularization with -ed, 3 with -en, and 1 with pl. -s (14).

(14)a. It tooked a while. 'took'
b. Have we boughten ... 'bought'
c. louse --- lices --- lice

Some errors involve the 'regularization' of weaker minor patterns to stronger minor patterns. I have 8 cases of ablaut giving way to no ablaut and a suffix -en in the perfect (15).

(15) That means you've drinken 3½ ! 'drunk'

There are 5 cases of the vowel /æ/ substituting for other ablaut (16).

(16) You wan --- you won by 14 points.

I have 2 cases with substitution of /ʌ/ for other ablaut (/hʌld/ 'held' and /gʌt/ 'got') and 1 of /a/ (/kat/ 'cut'), and Meringer (1908) reports a similar case, gehissen 'gehiessen' ('called'), but these are too infrequent to be distinguished from chance vowel errors, while /æ/ occurs far more often than chance in such errors.

I have several cases of regular forms giving way to very strong minor patterns. There are 22 instances of verbs that end in /t d/ taking no affix in the past or perfect (17).

(17) So we test 'em on it. 'tested'

This compares to only 3 instances of -ed loss after all other segments combined (cf. (6) above), and is more than three times more frequent than is expected. This suggests the involvement of the rule responsible for hit, cut, etc., easily the strongest and most productive of all minor verb patterns in English.[5] In only one error does any other minor pattern replace -ed (18).

(18) You háve chown --- chewed on ice.

This pattern of /oʊ/ plus -en in the perfect is very common (comprising 21 of the 41 verbs affixing -en) and very frequent. The general pattern for the productive use of inflectional patterns in errors is thus for minor patterns to give way to stronger ones, but for regular forms to give way only to very strong minor patterns.

3.32 Derivation

Productive use of derivational patterns shows no particular tendency for nonproductive affixes to be replaced by productive ones, or for minor patterns to give way to stronger minor patterns (19).[6]

(19)a.	minor	⟶	regular	3;	b.	regular	⟶ minor	5
c.	minor	⟶	stronger	6;	d.	minor	⟶ weaker	5
e.	?			16				

The five groups of errors in (19) are illustrated in (20) with examples from my corpus (S) and from Fromkin (1973) (F).

(20)a.	introducting	'introduction' (F)
	likeliness	'likelihood' (F)
b.	groupment	'grouping' (F)
	intervenient	'intervening' (F)
c.	necessitous	'necessary' (F)
	describation	'description' (F)
d.	expéction	'expectation' (S)
	tomorning	'this morning' (S)
e.	acception	'acceptance' (S)
	philosophist	'philosopher' (S)

One error involves a suffix-substitution in a form with no base (21).

(21)	noture	'notion' (S)

A few errors create forms for which there is no correct lexical item (22).

(22)a.	potterying	'making pottery' (S)
b.	playage	'playing time (on the radio)' (S)
c.	shipwreckers	'shipwrecked people' (S)

Several back-formations can also be found in the data (23).

(23)a.	surveiling	'keeping under surveilance' (S)
b.	prescripted	'prescribed' (S)

A number of errors show the resurfacing of vowels or consonants of the stem when the affix changes to one that has no effect on the stem (24).

(24)a.	derí̱val	/di:raʲvl/	'derivation' (F)	
	decidal	/di:saʲdl/	'decision' (S)	
	profé̱ssoral	'professorial' (F)		
	describation	'description' (F)		
	concédence	/knsi:dnts/	'concession'	(Cutler 1980)

(24)b. explanatings 'explanations' (F)
introducting 'introduction' (F)
perceptic 'perceptual' (F)
informating 'informing' (S)
prescripted 'prescribed' (S) (cf. prescription)

Unlike derivational word substitutions and inflectional errors, there seems to be little difference between major and minor patterns in the productive use of patterns in derivational morphology.

3.4 Prefixes

Prefixed words show an interesting pattern of errors. For no apparent reason, prefixes are lost (34 cases), added (3 cases), or an incorrect prefix is substituted for the correct one (13 cases) (25).

(25)a. They weren't jeal- --- conjealing.
b. positively or negatively remarked --- marked as ...
c. She's so exquisitive --- inquisitive.

It is very easy to show that these cannot be random changes that can affect any phonological sequence even if it is not a prefix. Addition of more than one segment or substitution of more than one segment in a word is unknown in phonological errors that are not syntagmatic errors. Syllable losses are common, but do not follow the same pattern as prefix losses. Looking only at consonant-initial words, the pattern in phonological errors is for the initial consonant to remain, while all segments between it and the first stressed vowel are lost (26).

(26) boon 'baloon'

Prefixes, on the other hand, are usually lost as a unit, including the initial consonant and not including any part of the stem. The frequencies of these two types of errors for prefixes and phonological sequences is shown in (27).

(27)

	Prefix	No Prefix
#CV(C) lost	15	1
everything between #C and V lost	4	12

Prefixes thus act as a separate unit, and are not comparable to any similar sequence of segments in the same position in the word.

4.0 Discussion

It is quite clear that inflectional and productive derivational morphology present different error patterns than nonproductive derivational morphology. The different errors that would be associated with major rules (with no lexicalization), minor rules (an impoverished entry), and redundancy rules (a full entry) can explain these differences.

4.1 Background assumptions and model

Before beginning this discussion, it is necessary to briefly sketch the type of processing model that is being assumed here. Whenever a word, or a rule, is being accessed, more than just one word will be activated by the accessing mechanism. Activation spreads to all words that resemble the target, semantically or phonologically. Each word that is activated attempts to inhibit all other words. Since the target word has the greatest activation, it usually succeeds in inhibiting all the other words, and is chosen and produced.[7] Occasionally a nontarget word becomes overactivated, however, inhibits the target word, and is chosen instead, producing a substitution. A blend of two words results if the activation levels of the target and nontarget words are equal and they inhibit corresponding parts of each other. One important factor in the inhibition of nontarget words is syntactic category. The syntax inhibits all words that belong to a different category than the syntactic slot they are trying to fill, leading to the result that almost all word substitutions and blends involve words of the same category as the target word.

4.21 Major rules

Several types of errors could happen if major rules are used in producing words. First, the rule could fail to apply, giving a substitution of a base for a marked form. Secondly, a rule could apply spontaneously, even though it is not supposed to, giving a substitution of a marked form for a base; this should be rare in comparison to rule failure.[8] Thirdly, the wrong rule might be chosen, exactly parallel to the selection of incorrect lexical items, and with the same cause: in selecting a rule from the store of rules, activation spreads to other rules, one of which becomes overactivated and inhibits the target rule. Such rule substitutions should be bidirectional. Given the syntactic category constraint, rule loss or addition is unlikely if the resulting form would belong to a different syntactic category than the syntactic slot it is to be inserted into.

4.22 Minor rules

If minor rules are used to produce a word , essentially the same types of errors are predicted as with major rules. One additional expected type of error would be the back-formation. A complex noun is incorrectly accessed to fill a verb position, but the syntactic category constraint does not allow this. The verbal base of derived nominals, for example, will be highly activated, but the affixes are inhibited by the syntax. As a result, only the base is inserted into the sentence, and a back-formation results.

4.23 Full entries

Different errors are expected in a full entry theory with redundancy rules. In accessing a lexical item, activation spreads to other words via semantic, phonological, and redundancy rule relations. Morphologically related words are more strongly activated than other words, due to the

influence of the redundancy rule. Redundancy rules add enough activation to overcome the inhibition due to the syntactic category constraint; substitutions and blends may more frequently involve words of different syntactic categories. Both error types should be bidirectional. Activation can also spread from one redundancy rule to another. Although redundancy rules are not normally used to produce known words, a too highly activated redundancy rule can activate its affix and stem changes and blend them together with the target word, inhibiting the target affix and producing what appears to be application of the wrong rule. Since redundancy rules are viewed as operating on new words, an occasional new word formation is possible.

Strict and structured full entries also make different predictions. In a strict full entry theory, there is no way to accidentally produce a back-formation, since stems and affixes are not separate except interpretively. In a structured full entry theory, however, back-formations will be possible, due to the same mechanism as sketched above for minor rules. Secondly, if a morpheme acts as a unit in selection, substitution, loss, or addition, this is compatible with a structured full entry theory, but not a strict full entry theory.

4.24

Note that major rules do not make a viable theory all by themselves. It is clear that any idiosyncracies, as often encountered especially in derivational morphology, must involve at very least lexical marking for rules, i.e. minor rules. This alternative must be combined either with minor rules or with redundancy rules. Actually, the distinction between major and minor rules may be quite small. Bybee and Brewer (1980) suggest that all common inflected forms are listed in the lexicon, but uncommon inflected forms are not. Forms listed in the lexicon would undergo minor rules, while all others would use major rules; they would be the same rules in either case, simply being accessed in different ways. This means that major rules are only strong minor rules that are used productively. Some minor rules, of course, would never be used as major rules.

4.3 Representations

Inflectional, productive derivational, and nonproductive derivational morphology cannot all involve the same type of lexical entry, since the patterns of errors associated with them are quite different.

4.31 Inflection

It is clear that inflectional morphology, even nonproductive patterns like ablaut, cannot have full entry representations. The errors found directly follow the predictions of rules. Base forms often substitute for inflected forms, suggesting rule failure; the reverse rarely happens, as expected. As predicted, rules substitute bidirectionally for other rules within a paradigm. Note that only strong rules are used productively in inflectional errors, while lesser rules never affect forms not marked to undergo them. This also is compatible with the use

of rules. It is probable, then, that many inflected forms have impoverished entries and use minor rules, while others are not listed in the lexicon at all and are produced by major rules that are identical to minor rules.

4.32 Productive derivation

It is clear that productive derivational morphology also cannot have full entry representations. The few errors that occur, with -ly, conform exactly to the predictions of rules. The rarety of these errors is significant; we may assume that the syntactic category constraint limits these errors, as expected for rules but not for full entries.

4.33 Nonproductive derivation

Nonproductive derivational morphology clearly does not fit the predictions made by rules. Word substitutions and blends are bidirectional, showing intrusions of derived forms on bases as frequently as the reverse. This implicates full entry representations. The fact that the syntactic category constraint is so frequently violated implicates redundancy rules. Unlike inflection, minor patterns show no tendency to regularize, and strong affixes often give way to much weaker ones. Rules as in inflection can be ruled out.

Several lines of evidence rule out a strict full entry representation, but are compatible with a structured full entry. Prefix errors show that prefixes are definitely separate morphological units, possible only with structured entries. If prefixes are separate units, it is likely that suffixes are, too. The occurrence of back-formations like surveiling (23) is also compatible only with structured entries. The syntagmatic errors discussed by MacKay (1980) also demand at least a structured lexical entry. Other psycholinguistic evidence, e.g. the lexical decision task experiments of Taft and Forster (1975), also argues for at least a structured full entry.

Some of the errors involving productive use of derivational patterns are incompatible with full entry representations, however. Most of the errors in (20) above are compatible with a blend caused by activation spreading to other redundancy rules. An error such as expection could be a blend of expectation plus the suffix and stem changes associated with -ion. Other errors, however, do not look like redundancy rule blends, i.e. (24) above. In (24a), e.g. decidal, not only has the affix changed, but the vowels and consonants of the base word have resurfaced. These are, of course, possible redundancy rule blends. They are, however, complex, since they require that an incorrect redundancy rule be overactivated and that the base be chosen instead of the target form. There are only two types of simplex errors, both of which should be more common than errors like (24a). First, the base might be chosen, leading to a common type of word substitution. Second, another redundancy rule might be overactivated, producing a blend like /di:sIžl/ or /di:sIzl/ from /di:sIžn/ plus -al, a type of error that does not seem to occur at all. Since such errors are predicted to be common given a full entry representation, we may conclude that the full entry theory is wrong.[9]

Similarly, in (24b), a consonant /t/ has resurfaced after a following palatalizing suffix was removed, either to be replaced by a nonpalatalizing one or in a back-formation; this implies a /t/ in the lexical entry, which in turn implies a minor rule representation rather than a full entry. It might seem possible to maintain that nonproductive derivational morphology has abstract structured full entries like /di:sa^{J}d + iVn/ or /de:ki:d + iVn/ for decision, which then make use of minor morphophonemic rules . While Jackendoff (1975) assumed this, it is directly counter to the purposes of all the phonologists who have argued for full entries, whose main goal was to avoid using such minor rules in the first place. It is more consistent to view these minor morphophonemic rules as part of the word-formation processes they are associated with (cf. Linell 1979). It makes no sense to maintain that speakers are capable of forming rules for major morphological regularities like -ness and -ly and for minor morphophonemic regularities of the kind found in e.g. decision, but are incapable of forming rules for the minor morphological regularities like -tion that they are associated with. Even if such an approach seems possible, it runs into difficulty with the error data discussed above, specifically with the productive use of derivational patterns. Productive and nonproductive affixes freely interchange, indeed, showing no tendency at all for productive affixes to predominate. Regular affixes like -ing can be replaced by minor ones like -ment. This suggests that the structure of major and minor affixes is parallel in some way; and it is clear that major affixes are associated with rules.

We thus find that nonproductive derivational morphology shows clear evidence for full entries and for impoverished entries with minor rules. This means that the lexical representation cannot purely be either one, but must be a hybrid possessing some of the characteristics of both, a possibility suggested by MacWhinney (1978). The solution is fairly straight-forward. Nonproductive derivational morphology involves lexical entries that are fully and separately specified for all semantic and syntactic information; a redundancy rule is present to relate the information contained in related words. These words have impoverished entries for phonological and morphological information, however; minor rules are required to take a base form and make changes or additions in the morphological structure and phonological content. The bidirectional nature of blends and word substitutions is due to a summing of activation spreading through the semantics, phonology, morphology, and redundancy rules. The strong level of activation gives related lexical items the strength needed to overcome the syntactic category constraint. Rule misselection on the morphological level is now possible, leading to errors as in (20) and (24). Note that from a morphological point of view the minor rules used here will be on a roughly equal footing with the minor and major rules used for productive derivational morphology; activation may thus spread to and from these rules, leading to rule substitutions between these two types of derivation. Back-formations are also possible, as predicted by rules. Note that this is the only way to combine full and impoverished entries for these words; an alternative with full morphological entries and impoverished semantic and syntactic entries is not feasible, due to semantic and syntactic irregularities.

This hybrid solution settles both of Jackendoff's arguments against impoverished entries. First, semantic and syntactic irregularity is simply entered in the lexical entry. Second, there is no need for separate independent lexical entries like aggress and surveil that must be specially marked to keep them from being used as real words. There is no obstacle to having purely minor rule representations for productive derivational morphology and for inflectional morphology. Jackendoff is left with no arguments against a minor rule theory of lexical entries.

4.34 Caveat

The primary difference between inflection, even minor and nonproductive inflectional patterns, and productive derivation versus nonproductive derivation is that the former make use of rules at all levels, while the latter use minor rules only for morphology and phonology. This claim is only a statistical one, however. It is plausible that much nonproductive derivation will have full entries at all levels. This is the most straight-forward interpretation of words like possible, which, as Aronoff (1976) argues, should be analyzed as having a suffix with no base. Indeed, (21) above, noture 'notion', almost certainly has such a lexical entry and shows a blend due to overactivation of a redundancy rule, also a real minor rule in this case. Some productive derivational and inflectional forms may conceivably have full entries at one or all levels. I have sketched only the major trends above, as shown by speech errors. It may be hard to predict the type of entry for a specific word for a specific individual.

Swedish provides one excellent example of how difficult it may be to predict the representation of a given word. The word dödd /dö:d/ 'dead' is closely related to dö /dö:/ 'die' phonologically and semantically. Dödd would seem to be analyzable as dö + -d, the perfect participle suffix; this is even very appropriate semantically. Dödd cannot, however, be derived using any rule. A vowel at the end of a stem always shortens before any suffix beginning with a dental stop (Witting 1977), e.g. så /sɔ:/ 'sow', past sådde /sɔd:ə/; there are no exceptions to this for any of the five suffixes beginning with a dental stop. Since dödd violates this rule, no suffixation rule can produce it. In contrast, nonproductive derived nominals like sådd /sɔd:/ 'sowing, seed', do follow the rule . This suggests that, at least when the vowel-shortening rule was introduced 600 years ago, sådd was produced by a minor rule even though it was of a nonproductive type, while dödd, transparent and of a productive type, had a full entry. This is exactly the opposite of what one would normally expect, and shows that armchair guessing about the entries of particular words is fraught with peril.

5. Conclusion

I have examined the types of errors associated with inflectional and derivational morphology in spontaneous speech. Inflectional and derivational morphology show error patterns that can only be produced if such words make use of minor rules at all levels. Nonproductive derivational morphology shows a different pattern of errors that is compatible only with full entries at the semantic and syntactic levels,

with redundancy rules, but with impoverished entries at the morphological and phonological levels, with minor rules. A simplistic claim that all words must have the same type of lexical representation, or that a given word must have the same type of representation at all levels, is thus incompatible with the data. The lexicon is apparently far more complex than some might wish.[10]

Footnotes

[1] Stemberger (1980a) argues that this view of segments is incorrect, and that a minor rule theory for segments is necessary.

[2] There are three well-defined areas where past or perfect ablaut does intrude on present or nonfinite forms. First, when the context is appropriate for either present or past, sometimes both are chosen and blended together. There are 7 such errors in my corpus (a).

(a) Good! Cames right --- comes right off. 'came/comes'

Second, ablaut may perseverate from a previous word (b).

(b) It gets stuck in there. Stuck --- stick it in there.

Third, tense or aspect may perseverate to a verb dominated by another verb with that tense or aspect. There are 29 such errors in my corpus for ablaut (c), 5 for -ed, 4 for -s, and 1 for -ing.

(c) I forgot to wrote ... 'write'

[3] The fact that -ed deletion is normal in many environments (Guy 1975) undoubtedly contributes to the apparent rarety of -ed loss in errors.

[4] There are 4 cases of -ly addition that appear to be blends (d).

(d) I continually to forget ... 'I continually forget/ continue to forget'

[5] At least 28 verbs ending in /t d/ belong to this pattern. Depending on how the rule is formulated, many other verbs ending in other segments and affixing -ed may also belong (Stemberger 1980b).

[6] The data of Fromkin (1973) is fairly complete and so has been added to the statistics in (19). The patterns are also true of just my data. Roughly half of the errors are in my corpus.

[7] For discussion of similar models, see Schönle (1976), Dell and Reich (1977), McClelland and Rumelhart(1980), and Collins and Loftus (1975).

[8] Stemberger (1980a) notes that loss is more common than addition in all aspects of lexical access.

[9] This description is how unconscious analogy would work in adult language in a model of this sort (Rumelhart and McClelland 1980). As can be seen, it is incapable of explaining all the data by itself. Rules are needed as well.

[10] Nowhere have I discussed the form of rules or how abstract they will be. The data discussed here do not bear on that issue, and relevant speech error data is scarce. I will address this issue in a later paper.

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