

Chapter 4

ERRORS OF STRESS AND INTONATION

Anne Cutler

*Laboratory of Experimental Psychology
University of Sussex
Brighton, England*

A correctly produced sentence involves the successful imposition of suprasegmental features at several points: the assignment of primary lexical stress to the correct syllable of polysyllabic words, the correct placement of stress within the sentence and within each constituent of it, and the imposition of an intonation contour, the latter determined by a number of factors, linguistic (whether or not the sentence is a yes-no question, for example), paralinguistic (the emotional state of the speaker), and pragmatic (the function of the sentence in context, whether irony is intended, etc.). There appears to be a kind of Murphy's Law of speech errors that states: There is no component or stage in the production of a sentence but an error can occur there; and, indeed, errors arise at each of the above decision points. It will be seen, however, that certain kinds of suprasegmental errors are more detectable than others.

The several suprasegmental components of a sentence are not independent in their effects. The syllable that takes the brunt of the primary sentence stress is that which happens to carry lexical stress in the focused word. Since a primary correlate of assigned stress is pitch movement, the fundamental frequency contour of an utterance is a function not only of the intonation contour assigned but also of the lexical and sentential stress. They must, however, be considered to be independent in production, and the speech error evidence supports this independence. In the following discussion, errors of lexical stress, of higher level stress, and of intonation will be treated separately.

1. Lexical Stress Errors

This is by far the most commonly collected species of suprasegmental error. In a recent paper, appropriately entitled "Putting the EmPHAsis on the Wrong Syl-LABLE" (1976), Fromkin included a large number of examples of misplaced word stress and the following section draws on her examples (taken both from the 1976 paper and the corpus in Fromkin, 1973) in addition to my own collection of such errors and a number gleaned from the extensive error corpus gathered by David Fay.¹ Examples (1)-(4) are representative of this kind of error:

- (1) / *put things in that abstract that I can 7 justify.*
- (2) *The noise sort of envelopes you-envelops you.*
- (3) *You 're in a real advantag-advantageous position.*
- (4) *That was always thought to be vestig-vestigial.*

In (3) and (4) the erroneous stress has been detected and the error corrected before utterance of the word is complete, whereas in (1) and (2) the whole word has been spoken with incorrect stress. On occasion, false stress placement is accompanied by omission or addition of a syllable:

- (5) In *his life there seems to be ambiguity.* (T: ambiguity)²
- (6) *The theory of psychoanalysis* (T: psychoanalysis)
- (7) *computated* (T: computed) (from Fromkin, 1976)

The stress shift in (5)-(7) could be held to be a consequence of the error of syllable omission or addition: after all, just such errors occur in contexts where they do not affect stress, as in (8)- uttered by an embarrassed newscaster—or (9):

- (8) *The two orbiting scientists carried out experiments in their laboratory-laboratory-oh, I said that word!*
- (9) *Looks like you 're doing end-of-the-semester organize-organizing.*

The strong similarity between such errors as those in (1)-(4) and (5)-(7), however, argues for the reverse explanation: that omission or addition of a syllable can be caused by an initial error involving the misplacement of stress. The location of the misplaced stress in these and similar examples appears to be not at all random; it is immediately noticeable in (1)-(7) that the stress placement in each case suggests another existing word, moreover, a word that is closely related to the target word in both form and content, being a different derivative from the same root morpheme. Thus, in (1) *abstract* (N) bears the stress pattern of *abstract* (V), in (2) *envelope* (V) is stressed as *envelope* (N), *ambiguty* as a substitute for *ambiguity* in (5) immediately suggests *ambiguous*, etc. It is extremely unlikely that these correspondences are accidental.

TABLE 1: *Lexical Stress Errors*

I. Errors with the stress pattern of a morphological relative

A. No change in number of syllables

<i>abstract</i> (N)	<i>hierarchy</i>
<i>administrative</i>	<i>homoge-homogeneous</i>
<i>advantag—advantageous</i>	<i>homogeneous</i>
<i>alter... native</i>	<i>idiosyncra-idiosyncrasies</i>
<i>alternately</i>	<i>imag—imagination</i>
<i>ambig—ambiguity</i>	<i>ling-linguist</i>
<i>anal-analysis</i>	<i>linguist - linguistic</i>
<i>arith —arithmetic</i> (N)	<i>Jap-Japan</i>
<i>articulatory</i>	<i>methodol—methodological</i>
<i>certification</i>	<i>origin</i>
<i>chromat—chromatography</i>	<i>perfectionist</i>
<i>conflicts</i> (N)	<i>personable</i>
<i>con—contextual</i>	<i>phonetic</i>
<i>contributed</i>	<i>photographing</i> (two separate instances)
<i>defect</i> (N)	<i>present-presenting</i>
<i>differences</i>	<i>progress</i> (V)
<i>digest</i> (V)	<i>psycholing-psycholinguistic</i>
<i>disambiguating</i>	<i>psychol-psychological</i>
<i>economist</i>	<i>sarcasm</i>
<i>economists</i>	<i>syllabif-syllabification</i>
<i>elaborating</i>	<i>syntax</i> (three separate instances)
<i>envelopes</i> (V)	<i>vestig—vestigial</i>

B. Number of syllables changed

<i>ambiguty</i> (T: ambiguity)	<i>oblitory</i> (T: obligatory)
<i>bicential</i> [bajsential] (T: bicentennial)	<i>phenomenology</i> (T: phenomenology)
<i>botnical</i> (T: botanical)	<i>philosophal</i> (T: philosophical)
<i>computated</i> (T: computed)	<i>psychoanalis</i> (T: psychoanalysis)
<i>facilty</i> [faesoltij] (T: facility)	<i>similarity</i> (T: similarly)
<i>hospable</i> (T: hospitable)	<i>specifity</i> (T: specificity)

II. Other errors

A. No change in number of syllables

<i>adj-adjusted</i>	<i>comment</i>
<i>alimony</i>	<i>mobility</i>

B. Number of syllables changed

<i>polysabic</i> [pelisebik] (T: polysyllabic)	<i>tremenly</i> [tremanlij] (T: tremendously)
--	---

Table 1 contains my current corpus of word stress errors.³ Phonetic transcriptions are given only where they are needed to avoid ambiguity (the examples come from speakers of American, British, and Australian English; transcribing the vowels would be both difficult and possibly misleading). Primary word stress is represented in each case by \prime , and two other markings are used where necessary: ' , representing secondary word stress with unreduced vowel, and \sim , representing an unstressed syllable with a reduced vowel.

In each of the 59 instances in Section I of the table, the reader should have no difficulty in supplying a related word in which the syllable bearing primary word stress is that which carries the misplaced stress in the erroneous utterance (always providing, of course, that the reader is as familiar with the word *chromatograph* as was the speaker in the eleventh example). The six errors of Section II, however, do not seem to have close relations of this kind, and they present potential counterexamples to the analysis to be presented in the following discussion; but they are very few in number in comparison with the errors in Section I, so that a common source for the latter still seems a fair bet. In at least one case in Section II, a different kind of mechanism may have been involved:

- (10) *There's such a thing as level of expectation and level of aspiration and adj-adjusted people....*

The error, in which the initial [æ] is stressed, is almost immediately preceded by a word beginning with a stressed initial [æ], and may therefore simply be a case of perseveration of an initial sound, as in (11):

- (11) *People pounce back and forth ... (T: bounce)*

Although no such explanation is immediately apparent for the remaining 5 examples of Section II (and there is no context for some of them), Section I will be treated as a homogeneous set for the purposes of the following discussion.

One possible explanation for stress misplacement is that it results from a metathesis of stress markings (for example, ' with ') analogous to the metathesis of other elements. However, the strong tendency for the erroneously chosen stress pattern to be that of a related word speaks against this suggestion; no such principles appear to be at work in the metathesis of features, phonetic segments, or syllables. Nor is there a preference for the primary stress in the error to have moved to the left or right of the target stress; in the 65 errors in Table 1, the stress moves to the left in 32 and to the right in 33 instances. An explanation invoking the supposed preference for initial stress in English can therefore also be discounted.

Another possible explanation for such errors is that they arise at the point at which the motor programs for the articulators are activated, not by selection of the wrong program, as that would result in utterance of the wrong word rather than the right word with the wrong stress pattern, but rather as a blend between adjacent forms, with the overwhelming tendency to semantic relatedness of the blended

words being merely an artifact of the internal structure of the motor program list—no other word sounds more like the target. This suggestion would allow explanation of the errors in Table 1, Section II, as blends of adjacent unrelated words, for example, *comment* with *commend* to produce *comment*. But the problem with this hypothesis, which assumes an internal organization of the motor program list based on sound (each program's nearest neighbor is that for the word sounding most like it), is that some of the errors do not sound very much like their "distractor" forms at all (for example, [a e n e l a j z] / [e n a e l e s i s]). Quite apart from this, length in phonemes, number of syllables, and stress pattern, on which target and distractor almost invariably differ, are three important ways in which words "sound alike" and would almost certainly feature in such an organization.

Instead, the relatedness of target and distractor suggests that lexical stress errors arise at a fairly early level in the production process, at a point at which words related in the way that, for instance, *psychology* and *psychological* are related, are situated close enough to each other to be confused. The data are highly compatible with a model of the mental lexicon in which the rules by which the noun, verb, or adjective derivatives of a particular root are formed are productive in language performance. On this model a cluster such as *psychology*, *psychological*, *psychologist*, etc., would have a single complex lexical entry containing a base form and the rules for producing each surface form; a stress error would arise when the syntactic category specification for the intended utterance results in the appropriate word ending being produced, but the stress features assigned to the surface form are those of one of the other members of the lexical entry.⁴ Thus the lexical stress error data accord with a model of the mental lexicon involving both morphological decomposition⁵ of complex words and conjunct storage of all words derived from a single base.

This suggestion has obvious implications for theories of speech production and comprehension. Evidence from semantically unrelated word substitution errors (malapropisms) suggests that the one mental lexicon serves both the production and comprehension devices, and that its internal organization is comprehension-biased, that is, based on left-to-right phonemic structure (Fay and Cutler, 1977). It was also suggested by Fay and Cutler that the lexicon might be divided into subsections by grammatical category, number of syllables, and stress pattern, since malapropisms are strikingly alike in these three respects as well as in left-to-right phonemic structure. However, the present hypothesis, if correct, would necessarily involve a revision of this picture. The gathering into a single lexical entry of a noun, a verb, and an adjective derived from a single base is incompatible with organization of the lexicon into divisions of syntactic category. Likewise, the presence in one entry of forms with differing stress features precludes the division of the lexicon into sections according to stress pattern. Again, the various members of an entry can have differing numbers of syllables so that organization of the lexicon by syllabic structure could at the most be based, for such complex entries as these, on the number of syllables of the underlying form, whatever that might be.

There exists independent evidence for a division of the lexicon by grammatical category, for which a satisfactory explanation must be found if the present hypothesis is to remain credible. Fay (1975) found that in a lexical decision task, prior knowledge of grammatical category facilitated performance for verbs but not for nouns, and interpreted this as an indication that the lexicon contained separate sections for nouns and for verbs, with the order in which the sections were accessed in the default case (no grammatical category information) being nouns before verbs. His finding can, however, also be accounted for by positing a noun-verb order of scan of separate items within the lexical entry.

On the other hand, a certain amount of independent evidence supports the productive formation rather than independent lexicalization of derived words. First, word formation errors occur that result in a nonexistent form having a correct stem but the wrong affix, even though the affix may be one appropriate to the grammatical category of the target; sometimes such errors involve misplacement of stress, as in (12) and (13), at other times not, as in (14) and (15):

- (12) *a list of donators* (T: donors)
- (13) *the derival of the sentence* (T: derivation) (from Fromkin, 1976)
- (14) */ read his thesis as it was being writed* (T: written)
- (15) *specialating in* (T: specializing) (from Fromkin, 1976)

Second, some experimental work in comprehension tasks provides support for the morphological decomposition of complex words in lexical access. Taft and Forster (1975; 1976) present evidence that in a lexical decision task prefixed words are analyzed into their constituent morphemes prior to lexical access, and that polysyllabic words are similarly decomposed into their component syllables. Murrell and Morton (1974) showed that in a word list, learning task performance on a given item was facilitated in the same way by pretraining on a different derivative of the same root morpheme as by pretraining with the same word. Other studies have indicated that before a word is accessed from the mental lexicon it is stripped of syntactic (inflectional) suffixes (-s, -ed, etc.; Gibson and Guinet, 1971) and of noun- and adjective-forming (derivational) suffixes such as -ness and -able (Snodgrass and Jarvella, 1972).

Conjunct storage of words with different stress patterns in a comprehension lexicon seems, of course, to imply that lexical stress is unimportant for comprehension purposes.⁶ Indeed, we usually hear stress errors as the right word with the wrong stress rather than the wrong word. A hearing error results only when the misplaced stress permits false segmentation, as in (16),

- (16) *He was a master of his craft, a perfectionist.*

which led a hearer to parse the last noun phrase as *a perfect shnist*; only after no entry for *shnist* could be located in the lexicon was the utterance reanalyzed and an error of lexical stress diagnosed.

Note finally that a lexicon structured along the lines suggested here and at the

same time organized by left-to-right phonemic structure, as argued by Fay and Cutler, would perforce make use of a phonemic representation of a considerable degree of abstractness; in many cases, two derivatives from a single stem have quite different initial segments in their surface forms (for example, *analysis* and *analyze*). Abstract phonological representation at the lexical level was in fact suggested by Fay and Cutler on independent grounds, and is also argued by Fromkin (1976).

2. Errors of Phrase and Sentence Stress

Stress placement errors at levels higher than the word also occur with a reasonable degree of frequency; they include errors of stress within nominal compounds and other phrases, errors in placement of primary sentence stress, and errors in assignment of contrastive or emphatic stress. The degree to which these different types of errors are detected by the hearer differs; stress errors within the phrase often stand out with the same glaring obviousness as lexical stress errors, although they do not seem to occur as frequently. Examples (17)-(19) are typical:

(17) *The price of lettuce has just sky-rocketed.* (T: sky-rocketed)

(18) Q. *You ate a cookie, didn't you?*

A. *No, peanut butter.* (T: peanut butter)

(19) *by averaging the six—the six scores* (from Fromkin, 1973)

How do such errors arise? Two explanations seem possible. On the one hand, the stress shift might result from a simple exchange of stress features, since in the majority of cases only two words are involved, one with primary, the other with secondary or tertiary stress. No phonetic accommodation is involved, since within-word stress remains unaltered; the exchange might be considered to take place at a low level in the production process. On the other hand, the stress shift might be a consequence of an independent error involving, for example, a shift or exchange of grammatical marking, otherwise undetectable in any surface phonetic change; Fromkin (1976) cites cases in which the shift of a bound morpheme precipitates a change in stress pattern:

(20) *Larry's Hyman paper* (T: Larry Hyman's paper)

(21) *It's not only us who have screw looses* (T: screws loose)

The evidence available so far does not suffice to decide the issue. Nor does a significant amount of independent evidence exist that might shed additional light, although the malapropism data show a tendency for nominal compounds to substitute for other nominal compounds having stress pattern and one element in common (for example, *ear canal* for *birth canal*, *mailbox* for *lunch box*, *railway station* for *radio station*, *computer program* for *TV program*), one nevertheless finds the occasional example of a noun-noun compound substituting for a noncompounded noun phrase, such as:

(22) *I'll bring a big **picnic table** (T: picnic lunch)*

In (22) the stress pattern of the target is preserved although the compound *picnic table* would normally bear primary-secondary stress.

As with lexical stress errors, a phrase stress error is usually detected; hearing errors result only when the phrase stress is ambiguous, as it is in the following two examples:

(23) *This result was recently replicated by someone at the University of Minnesota in **children**.*

(24) *Mr. Milne came to Rothsay to impress upon this **pretty leftwing gathering***

In (23) the speaker placed emphatic stress on *children* and failed to set off intonationally the prepositional phrase *by someone at the University of Minnesota*, with the result that a hearer parsed the sentence to include a constituent *the University of Minnesota in children* (compare, for example, *the University of Texas in Austin*). In (24) the noun phrase *pretty leftwing gathering* was parsed Adj-Adj-N rather than Adv-Adj-N, probably due to a rather greater than usual degree of stress on the adverb.

In contrast to phrase stress errors, misplacement of sentence stress is rarely detected by the hearer. There is a common-sense reason for this: Practically any word in a sentence can carry the primary stress, a fact well known to children who will play at stressing each word in a sentence in turn. A change in the location of the primary stress will lead to a change in the sentence's focus, and depending on the context may have considerable pragmatic effects, but it will not produce an anomalous sentence. Hence, it is possible that primary sentence stress is often misplaced, and that what the hearer understands is in consequence not what the speaker intended; but unless the misplacement is corrected, there is no way of knowing that an error has occurred. When it seems important to avoid misunderstanding by correcting the misapplied focus, the speaker will do so:

(25) *I think that any **serious approach**—any serious approach to the study of grammar_____*

(26) *And what **I'm saying**—what I'm saying is_____*

The assignment of contrastive stress can also be subject to error, either being applied to the wrong element, as in (27), or not applied when desired (28):

(27) *They 're not **psycholinguists**—they 're not psycholinguists.*

(28) *If the child had—sorry, if the child had and used an interpretation ...*

Again, misapplied contrastive stress does not produce an anomalous sentence, but may create a contextual effect not desired by the speaker. Let me offer just one example of an uncorrected contrastive stress error, for which it is obviously necessary to supply an extended context. The speaker of (29) had found a particular

fault with psychology, and had then in a short digression recounted an anecdote from chemistry exemplifying the same fault; he concluded this digression by saying:

(29) *So this sort of thing happens in other fields.*

Given the mutability of focal stress, it is advisable that I also mention that there was no question of any other *sort of thing* being at issue that might happen in other fields; in the context there was to this hearer's mind no doubt that the primary stress belonged on *other*. The extensive collection of further examples awaits a heightened sensitivity to pragmatic factors on the part of error collectors.

It has frequently been noted by speech error researchers that sentence stress interacts with other errors in some interesting ways. Boomer and Laver (1968) pointed out that slips usually involved the word bearing heaviest stress in a "tone group" (phonemic clause), especially as the origin of an intrusion, and furthermore that the two elements involved in a metathesis were nearly always of the same degree of stress (either both strong or both weak). Nooteboom (1969) claimed that both elements of an error are more often stressed items than unstressed. MacKay (1969) argued that in cases of "forward masking" (anticipation), the masking phoneme is always stressed, and attributed this to a higher level of activation of stressed phonemes in the utterance program. Certainly some element of intrusion from a highly stressed source is apparent in such cases as (30):

(30) *and also intempt-also attempt to conclude-incorrectly!-that the child uses intonation to_____*

But nearly all of MacKay's anticipation errors involved consonants, whereas the brunt of stress is actually borne by the vocalic nucleus of a syllable; if the level of physical activation is indeed the precipitating factor, it is unclear why the masking phonemes were not more often vowels.

Moreover, as Garrett (1975) has pointed out, many of the suprasegmental regularities exhibited by speech errors can be explained by reference to effects of grammatical category and surface structure; and a further confounding may exist in the degree of detectability of errors in stressed versus unstressed syllables. Work on hearing errors (Garnes and Bond, 1975) shows that the stressed syllable is usually perceived correctly, so that hearing errors consist chiefly in misreconstruction of unstressed syllables. This is not surprising, given the acoustic advantages of stressed syllables; unstressed syllables are often considerably compressed in running speech. It could be the case, therefore, that slips in unstressed syllables are in fact as common as those in stressed syllables, but are simply harder to detect; the hearer reconstructs the unstressed portions of the utterance as the speaker intended to say them rather than as they were actually said, that is, a hearing error prevents detection of a speech error.

It has also been observed (Fromkin, 1971; 1976; Garrett, 1975) that primary sentence stress often does not shift when the element that would carry it in the target utterance shifts; in (31) and (32), for example, the sentence stress pattern of

the target is preserved although two words, one of which would have borne stress in the target sentence, have switched places:

- (31) / *can't believe that anyone didn 't **stop to think** and pick up a Big Mac.* (T: didn't think to stop____)
 (32) *We might hare been sending a Wall St. **subscription Journal** to Anne.* (T: Wall St. Journal subscription____)

However, on closer inspection it turns out that the stress pattern is preserved only when both the words involved in the shift are open class items. When closed class words shift or exchange, the stress moves with its bearer:

- (33) ... *they don't know how far they **in** are.* (T: ... *how far in they are*)
 (34) *Where do you suppose are they?* (T: ... *they are*)
 (35) *Consider how could it be.* (T: ... *how it could be*)
 (36) *You can turn it on back now.* (T: ... *back on now*)
 (37) *Just ask me where the tools are. I know where **they're all**.* (T: ... *where they all are*)
 (38) *But it didn 't work **that way out**.* (T: ... *work out that way*)
 (39) *One just [d3est] question!* (T: *Just one question*)

This generalization holds for all the examples in my collection and for all those that I can find in the literature. (Fromkin, 1973, lists 35 examples of exchanges or shifts in which she asserts that the target sentence stress has not changed. Four of these involve closed class items, but in three cases the stress level of the elements involved seems to have been the same, while in the other case:

- (40) / *would like to all remind you ...* (T: ... *to remind you all ...*)

it is hard to see how the stress pattern could have remained unaffected by the shift.) On the one hand, this finding supports the contention of Garrett (1975; 1976) that there is an interesting difference in the way open- and closed class items participate in speech errors. But it also appears to imply that stress "sticks" to a closed class word more than it does to an open class item. Many errors of the type in (33)-(39), however, are cases of contrastive stress (with the conspicuous exception of those involving verb particles, which may be said to bear a degree of stress belonging as much to the verb as to the particle, for example, *turn it on*, *work out*). Contrastive stress can stay behind when its carrier has been lost from the sentence:

- (41) *He acts differently depending on who **he is**.* (T: ... *who he is with*)

If, in fact, the regularity noted in examples (33)-(39) simply reflects the fact that closed class words rarely bear stress unless it is contrastive, and that the "stickiness" of the stress is a product of its contrastive function, then we might expect that contrastively stressed open class words would similarly carry their stress with them when they move. My collection does not, alas, contain examples that would decide this question one way or the other.

3. Errors of Intonation Contour

The preceding observation regarding inconspicuousness of focus assignment errors holds with even greater force for intonational errors. Intonation contours over and above sentence stress pattern depend on several diverse factors—whether the sentence embodies a statement or a yes-no question, references to the discourse context, the emotional state of the speaker. In certain instances, the contour can quite cancel out the meaning of the sentence—ironic tone of voice, for example, produces a conveyed meaning which is the converse of the sentence's literal meaning. As Pike (1945) trenchantly remarks: "If a man's tone of voice belies his words, we immediately assume that the intonation more faithfully reflects his true linguistic intentions" (p. 23). Should a speaker misapply an intonation contour, then, his audience will probably never diagnose an error, but instead will understand the utterance differently from the speaker's intention. Should the misunderstanding be profound, the hapless speaker can only protest: "but I didn't mean it that way."

One does, however, hear contours misapplied. In particular, a terminal contour may not be applied when it ought to be—the sentence is "left hanging"—or is applied when it ought not to be. The hearer's impression in the latter case is that the speaker has changed his mind and decided to add more (42), especially in order to remove unclarity or ambiguity (43), or anomaly of the sentence content (44):

- (42) *Ambiguity occurs when it is impossible to determine the precise meaning of*


a word-construction or sentence.

- (43) *You think you understand and then later on you find you don't understand*

- what he's talking about.



- (44) *I hope it won't take more than two hours, but it might take-more than two*

hours.



As with all errors, the frequency of contour errors rises under conditions of (emotional) stress; what else could account for (45), uttered by an otherwise well-rehearsed participant in a production of *The Importance of Being Earnest*:



(45) ... a character which, according to his own brother's assessment, is...

Some such errors are not simple to explain; in (46), for instance, a fall-rise contour appropriate for a phrase or clause boundary has been applied to half of a nominal compound:



(46) Now the basic notion of a process-state model is this.

In such cases one is reduced to suggesting the possibility of a blend with another sentence pattern.

Finally, sentence intonation can be a valuable tool in explaining other errors. In (47) the intonation contour applied is that appropriate for a yes-no question, such as "Do you talk on the telephone with your right ear?" (a mind-boggling concept in itself, that):



(47) Do you talk on the telephone with which ear?

The contour therefore argues in favor of an explanation of this error in terms of a blend with such an alternative question rather than, for example, simply as a wh-question in which a necessary movement rule has not been applied.

4. Summary

At various stages in the production of a sentence, suprasegmental values are assigned to the elements making up the surface string. Slips can occur at each stage, and the independence of the different suprasegmental operations is attested to by the differing character of the errors at each stage. Word stress errors, in which the wrong syllable of a polysyllabic word is emphasized, show a curious regularity—the erroneous stress pattern is usually that borne by a morphological relative. This evidence is supportive of a model of the mental lexicon incorporating morphological decomposition and conjunct storage of morphologically related words. Phrase stress errors, on the other hand, appear to arise at a level more near the surface, and to exhibit either metathesis of stress features or the effects of an independent error in grammatical marking. Shifts or exchanges of words usually do not affect the sentence stress pattern if open class words are involved, but closed class words carry their stress levels with them. Errors of focus (primary sentence stress) assignment and of contrastive stress are, for semantic and pragmatic reasons, far less detectable

than other stress errors, as also are errors of intonation contour; however, it cannot be concluded that these do not occur. Sentence stress and intonation can be important factors in deciding the correct interpretation of other errors; error collectors are encouraged to pay greater attention to the suprasegmental features of utterances.

Notes

1. Many words in English have more than one possible stress pattern; American English often prefers one pattern for a particular word, British English another. Thus it is common to hear persons whose speech is subject to more than one dialectal influence produce a word such as *research* with differing stress patterns in successive utterances. Such cases, in which alternative stress patterns for the same word might reasonably be supposed to be familiar to the speaker, have been excluded from the present body of data—for example, *supine* (from Fromkin, 1973), *spectators*.
2. T (for target) represents the speaker's intended utterance.
3. Those utterances in Section I (A) of Table 1 that were corrected before the complete word was spoken are given as they were produced; where no correction was produced before the complete word was uttered none is given, but this should not be taken to imply that such utterances were not corrected—many of them were. Eleven examples in Section I (A), 7 in I (B), and 3 examples in Section II are from Fromkin (1971; 1973; 1976).
4. There appears to be no tendency for the distractor to have a higher frequency of occurrence in English than the target. Of the 59 errors in Table 1, the frequency of 48 was compared in the Kucera and Francis (1967) word count with the frequency of their distractor(s) (the remaining 10 pairs either did not appear or had the same orthographic surface form as, for example, *progress*). In 21 cases, the target was of higher frequency, in 28 cases the distractor, a nonsignificant difference ($X^2 = 1.00, p > .3$).
5. The question of how far morphological decomposition should go will be begged pending the availability of a larger body of pertinent data. It seems reasonable to suppose, for instance, that such a word as *responsible*, which although related to and derived from *response* has a semantic specification that is considerably different, might be accorded its own lexical entry. Aronoff (1976) suggests that "the lexicon is arranged according to stems, and that for each stem there is a slot for each canonical meaning, where 'canonical' means derived by regular [word formation] rules" (p. 45). Those derivatives that were formed by irregular rules, however, would be listed separately. It is interesting to speculate that when a complete categorization of word formation rules into regular and irregular is available, the lexical stress error corpus might not show any errors that would reflect a confusion between pairs or sets of words one of which was formed by an irregular rule.
6. Cutler (1976) found that sentence comprehension included tracking the suprasegmental contour to enable the direction of particular attention to the locations of stressed syllables, and suggested that this was compatible with lexical storage of words by stressed syllable. Subsequent research, however (Cutler and Fodor, 1979), has indicated that this result more probably reflects a search for the semantically more central portions of the sentence. Moreover, although in a lexical decision task, access is facilitated by prior presentation of a semantically related word (Meyer and Schvaneveldt, 1971), an unpublished study by David Swinney and myself shows that prior presentation of a word with the same stressed syllable in an auditory word comprehension task does not facilitate access. Lexical stress is probably not a necessary component of the information used for accessing a lexical entry.

References

- Aronoff, M. 1976. *Word formation in generative grammar*. Cambridge, Massachusetts: MIT Press.
- Boomer, D. S. & Laver, J. D. M. 1968. Slips of the tongue. *British Journal of Disorders of Communication*, 3, 2-12.
- Cutler, A. 1976. Phoneme-monitoring reaction time as a function of preceding intonation contour. *Perception and Psychophysics*, 20, 55-60.
- Cutler, A. & Fodor, J. A. 1979. Semantic focus and sentence comprehension. *Cognition*, 7, 49-59.
- Fay, D. A. 1975. Some investigations of grammatical category in performance devices. Unpublished Ph.D. dissertation, Univ. of Texas at Austin.
- Fay, D. A. & Cutler, A. 1977. Malapropisms and the structure of the mental lexicon. *Linguistic Inquiry*, 8, 505-520.
- Fromkin, V. A. 1971. The non-anomalous nature of anomalous utterances. *Language*, 47, 27-52.
- Fromkin, V. A. 1973. *Speech errors as linguistic evidence*. The Hague: Mouton.
- Fromkin, V. A. 1976. Putting the emPHAsis on the wrong sylLABle. In L. Hyman (Ed.), *Studies in stress and accent*. Los Angeles: Univ. of Southern California. Pp. 15-26.
- Garnes, S. & Bond, Z. S. 1975. Slips of the ear: Errors in perception of casual speech. In *Papers from the Eleventh Regional Meeting, Chicago Linguistic Society*.
- Garrett, M. F. 1975. The analysis of sentence production. In G. Bower (Ed.), *Psychology of learning and motivation* (Vol. 9). New York: Academic Press. Pp. 133-177.
- Garrett, M. F. 1976. Syntactic processes in sentence production. In R. J. Wales & E. C. T. Walker (Eds.), *New approaches to language mechanisms*. Amsterdam: North-Holland Publ. Pp. 231 — 255.
- Gibson, E. J. & Guinet, L. 1971. Perception of inflections in brief visual presentations of words. *Journal of Verbal Learning and Verbal Behavior*, 10, 182-189.
- Kucera, H. & Francis, W. N. 1967. *Computational analysis of present-day American English*. Providence, Rhode Island: Brown Univ. Press.
- MacKay, D. G. 1969. Forward and backward masking in motor systems. *Kybernetik*, 2, 57-64.
- Meyer, D. E. & Schvaneveldt, R. W. 1971. Facilitation in recognising pairs of words: Evidence of a dependence between retrieval operations. *Journal of Experimental Psychology*, 90, 227-234.
- Murcell, G. A. & Morton, J. 1974. Word recognition and morphemic structure. *Journal of Experimental Psychology*, 102, 963-968.
- Nooteboom, S. G. 1969. The tongue slips into patterns. In A. G. Sciarone, A. J. van Essen, and A. A. van Raad (Eds.), *Nomen Society, Leyden studies in linguistics and phonetics*. The Hague: Mouton. Pp. 114-132.
- Pike, K. L. 1945. *The intonation of American English*. Ann Arbor: Univ. of Michigan Press.
- Snodgrass, J. G. & Jarvella, R. J. 1972. Some linguistic determinants of word classification times. *Psychonomic Science*, 27, 220-222.
- Taft, M. & Forster, K. I. 1975. Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning and Verbal Behavior*, 14, 638-647.
- Taft, M. & Forster, K. I. 1976. Lexical storage and retrieval of polymorphemic and polysyllabic words. *Journal of Verbal Learning and Verbal Behavior*, 15, 607-620.