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Aphasic Errors as Evidence for the Mental Organization of Morphology[1]

Abstract

Non-existent temporary word forms are the most interesting of all morphological errors, because they provide a possibility for distinguishing between affixation and analogy as means of constructing word forms during speech production. Functionally, word forms consist of morphemes, and errors preserving this structure offer some evidence for affixation. All the word forms produced by the present aphasic speakers, both regularizations and other kinds of errors, were phonotactically acceptable in Finnish. When existing patterns are randomly actuated, the produced word forms often violate some morphophonemic variation rules. The errors prove that some composition of even frequent word forms takes place during speech production.

1.   Lexicalization and decomposition

Morphological errors have been proposed to offer a window to the workings of the mind (Anttila 1976, Karlsson 1977, 1983, Bock & Levelt 1994, Stemberger 1998). There are two opposing views of morphological organization, the full-listing hypothesis and the decomposition hypothesis. The dual-route hypothesis serves as a compromise between the two models (Clahsen 1997, 1999). A redundant system with both decomposition and full listing is also a possibility. All unproductive words have to be lexicalized, but instead of full listing they may e.g. bear some kind of a property which enables the speaker to tell them apart from the productive words (Karlsson 1983, Niemi & Niemi 2002).

Even the full-listing hypothesis has to include some sort of a fallback procedure (Butterworth 1983) or a lexical tool-kit (Aitchison 1987), because speakers are able to inflect new loan words. According to the

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decomposition hypothesis, the base forms, affix morphemes and irregular word forms are listed in the lexicon, i.e. they are listemes (Pinker 2000). It is a common assumption that also the most frequent word forms are listed in the mental lexicon (Stemberger & MacWhinney 1988, Niemi, Laine & Tuominen 1994).

The composition of word forms can be based on different mechanisms, such as affixation (the joining of functionally motivated affixes to stems or base forms)[2] or analogy (formation of a word form according to a model offered by another word form or by a group of words, e.g. a paradigm). A close analysis of erroneous, ill-legal word forms may reveal the mental mechanisms by which the word forms have been constructed by the speaker (Ahlsén 1994).

2. Data

The present data consists of 28 samples of narrative speech. Two pictures – a scene and a series of six pictures – were presented to fifteen aphasic speakers, provided that they were not too tired to perform the task. This resulted in about 1.5 hours of tape-recorded speech, with a total of 4,080 words. The picture description tasks were a part of a longer testing session (Kukkonen 1990).

For the present analysis, all the morphological errors were selected. The number of errors was about fifty. The estimate remained inaccurate due to various difficulties, e.g. in determining the speakers' intentions when their speech was disconnected and pronunciation inaccurate, or in distinguishing between sound substitutions and morphological errors (often only one phoneme was erroneous).

The classification of the errors resulted in certain groups, such as the substitution of the base form (citation form, unmarked form) for an inflected word form (Goodglass & Menn 1985, Lehečková 2001), neologistic compounds or derivations (e.g. what an aphasic called *hyppynaruilija* [hyppy-naru-ili-ja] is usually called "narunhyppääjä" 'a person skipping rope'), substitution of a plural form for a singular one, errors in agreement (agreeing affixes were substituted for genitive or

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[2] Affixation may be contrasted with concatenation which refers to functionless affixation, e.g. *ambulanssissassa* 'in the ambulance' with the reduplication of the inessive suffix (a slip of tongue from the control data of Kukkonen 1993).

locative cases in strings of agreeing nouns, Kukkonen 1993, example 6), and other errors. The frequencies of the error categories are listed below.

> uninflected form used instead of an inflected form
>> nominative singular   25%
>> verb root   7%
>> verb stem (with derivational affixes)   5%
> non-existent word forms   16%
> neologistic compounds or derived words   8%
> partitive plural instead of partitive singular   10%
> errors in agreement   5%
> other errors   24%

In addition there were syntactic errors which could in principle be selection errors (e.g. from a list of word forms). Such errors are irrelevant to the present research question.

3.   Base forms

The concept of a base form is essential for the affixation hypothesis. This is the form of the content word to which affixes are attached. For many Finnish nouns, the base form is the word's stem which also serves as the citation form (nominative singular). The question of the base form is more complicated for Finnish verbs which do not have any free forms used without suffixes (Niemi, Laine, Koivuselkä-Sallinen 1994). The first infinitive serves as the citation form. It is one of the candidates for the unmarked form (Jakobson 1971), the other is the most frequent of the verb forms, the 3rd person singular (active, indicative, present tense) (Karlsson 1977).

Words are conventionally referred to by their citation forms which serve as dictionary entries, but in the production models the base form may serve as the pivot of the lexical entry. Lexical access takes place via the pivot which may substitute for other word forms (satellite entry hypothesis, Lukatela & al. 1980). The present data shows that the aphasics only seldom resort to the conventional citation forms. Most of the unmarking errors resembling base forms may (but need not) result from leaving off some word-final sounds or syllables.

Neologistic compounds and derived words provide firmer evidence for the use of construction procedures in speech production. An analysis of the non-existent word forms may provide further evidence over the mental lexicon and the composition of word forms, e.g. whether it is based on stems (Niemi, Laine, Tuominen 1994) or on prototypical word forms (Karlsson 1986).

4.   Regularization

Regularization errors arise during the speaker's construction of word forms. The speaker retrieves the pivot of the lexical entry, to which he attaches the affixes without applying the required morphophonological rules. Full regularization refers to the concatenation of elements retrieved from the lexicon, while in partial regularization some but not all morphophonological rules seem to have applied. For the present purposes it suffices to assume that the affixes are selected on the basis of some functional information (e.g. stem+plural+inessive, as in Karlsson 1983). According to the production models (Garrett 1982, Levelt 1989, Bock & Levelt 1994), the phonological form of the suffixes is determined late in the derivation process (at the positional level, in the prosody generator, or during phonological processing) because in the exchange errors suffixes are stranded and they accommodate to the exchanged content words.

(1)   *käveleevät*   [kävele-e-vät *pro* kävele-vät]
      walk-SG3-PL3
      'they walk'

(2)   *poikaita*   [poika-i-ta *pro* poik-i-a]
      nestling-PLURAL-PARTITIVE
      'a few nestlings, young birds'

In the most predictable cases, the speaker joins suffix morphemes to nominative singular forms of nouns (example 2) or to the base forms of verbs, the 3rd person singular in example (1). These are examples of full regularization. The interpretation of the errors is complicated. Firstly, the use of the 3rd person singular as the base form (example 1) might in fact be an on-line correction due to some hesitation in the choice of style. The 3rd person singular substitutes for the 3rd person plural in colloquial speech, and the form in (1) may be a blend of two stylistic variants competing for

the same place in the utterance. Secondly, this may simply be a phonological error, the lengthening of the vowel "e" in a syllable carrying secondary stress.

(3)   *tultaan*   *tullaan*   [tul-ta-an *pro* tul-la-an]
      come-PASSIVE-POSSESSIVE   come-PASSIVE-POSSESSIVE
      'are coming'

Example (3) may demonstrate the avoidance of ill-legal word forms and the preference for real words. The speaker is obviously using the verb stem "tul" 'to come', but for this verb there is no such word form as "tultaan". This form may result from regularization. The consonant stem "tul" 'to come' is correct, and what is regularized is the sign of passive. This assimilation rule is unproductive and it is not applied in the corresponding past tense form "tultiin" [tul-t-i-in]. Alternatively we could assume that the speaker locates "tultiin" in his lexicon and constructs the present tense form analogically, e.g.

$$\text{tultiin} : x \text{ ---- } \text{päästiin} : \text{päästään} \Rightarrow x = \text{tultaan}.$$

Furthermore, the stem "tul" is homonymous and the form "tultaan" may be a malapropism (Fay & Cutler 1977, Zwicky 1982).

5.   Analogy and gang effects

An alternative to constructing words by affixation is analogical composition. In the regularization errors, words join the most productive paradigms, whereas gang effects refer to cases where unproductive paradigms attract new members (Bybee 1985, Ch. 5, Prideaux 1984, Stemberger & MacWhinney 1988, modeled by e.g. Skousen 1989 and Stemberger 1998). In example (2), the speaker may have either the word "poika" 'boy, son' or the word "poikanen" 'nestling' in her mind, or she may hesitate between the two words which are competing for the same place in the utterance (a typical occasion for blends). The two words are synonyms in this context. If the speaker ends up having the stem "poikas" in her mind, she may associate it with another paradigm of the type "koiras" 'male (animal)' which may provide the model according to which the word is inflected (proportional analogy, Anttila 1976).

poikas : x — koiras : koiraita $\Rightarrow$ x = poikaita

As the speaker had considerable difficulties in articulation, the avoidance of "s" may be the reason for choosing a strategy which gives rise to a word form with only stop consonants. The form could result from synchronic analogy described by Van Marle (1990) as it shows oversimplification typical of analogy, namely it violates consonant gradation (such violations also occur in slips of the tongue, Dufva 1992). The example may provide some evidence for the variable paradigmatic connections between words and word forms (Paunonen 2003) or for the speaker's examination of partial lexical similarities on which the construction of the word form is based (Anshen & Aronoff 1988).

(4)   *ison   kis linzu linzun   kanssa*   [linzu-n *pro* linnu-n]
      big-GEN ca(t) bird   bird-GEN with (GEN = genitive)
      'with the big bird'

In example (4) we have a non-existent stem "linzu" where a voiced sibilant "z" is substituted for a morphophoneme, i.e. a consonant subject to qualitative consonant gradation (nt : nn). The root seems to have joined a less productive paradigm with a more complex consonant variation (nt : nn : ns, e.g. "kansi" 'cover'). The sign of genitive may be accompanied by an active gap which is filled by an analogous neologism built through overgeneralization ("kansi" $\Rightarrow$ "linzu"). These kinds of overgeneralizations have been observed with lexicalization and they are indicative of full listing. All the production errors need not be selection errors, even if all the stems were listed in the lexicon, but new stems may result from the application of lexical redundancy rules. The lexical form may also be underspecified. Alternatively, the error may be due to phonological complication. This is the only voiced sibilant in the data, and such hypercorrect usage might result from the mild articulation problems of this aphasic speaker. Syntagmatic factors may also play a role here. Both the preceding and the following words have sibilants which might be perseverated and/or anticipated (Kilani-Schoch 1982). The interaction of morphology and articulation may create opportunities for such errors to arise.

(5)   *ankkia*   [ankk-i-a *pro* ankko-j-a]
      duck-PLURAL-PARTITIVE
      'a few ducks'

In example (5) the word "ankka" 'duck' with an illabial vowel in the first syllable has been inflected in the same way as words with a labial vowel in the first syllable (e.g. koira 'dog': koiria [koir-i-a]). The standard partitive plural is "ankkoja", in spoken and dialectal Finnish there is variation, e.g. "ankoi" with only the sign of plural, the sign of partitive missing.

The partitive is famous for its proneness to errors (Helasvuo & al. 2001, Laine & al. 1995, Martin 1995). Partitive word forms are good candidates for full-listed word forms in Finnish because of their high frequency and their "irregularity".

There were six substitutions in the present data where partitive plural was used instead of singular, i.e. marked forms were substituted for unmarked ones (Niemi & al. 1990). The word form *koiria* [koir-i-a] (partitive plural of "koira" 'dog') was used twice when partitive singular *koiraa* [koira-a] was expected. Additionally, the partitive plural form *lehtiä* substituted for the partitive singular "lehteä" [lehte-ä] four times in the data. For irregular words ending in "i" (e.g. lehti 'newspaper'), it is impossible to distinguish between regularization errors and substitutions (the partitive singular/plural *lehtiä* may either be a selection error similar to "koiria" or it may be a regularization error "lehti+ä"). As unstressed (esp. when used in collective sense), the vowel "i" may sometimes undergo phonetic reduction (e.g. Kukkonen 1993, example 3). A tendency for phonetic strengthening may promote the substitution of "ia" for "ea", and weakening would have the opposite effect resulting in partial regularization since a vowel stem is substituted for a consonant stem. Such regularization can be accounted for by analogy, e.g.

$$\text{poikia} : x \text{ — } \text{lehtiä} : \text{lehteä} \Rightarrow x = \text{poikəa}.$$

6.   Discussion

The production of speech may require the application of various strategies. It is not necessary to assume that e.g. morpheme boundaries would be marked in the lexicon, but they may be added by parsing similar to that taking place in perception. In production the speaker has the choice of either retrieving or composing the word form to be used. The present errors

indicated that some kind of construction takes place, but this does not mean that the word forms were not listed. The speaker with difficulties in retrieving lexical information may compose the word form.

The ease of articulation—or some other reasons—may lead the speaker to creatively exploit the variable lexical connections and to produce non-existent but comprehensible word forms. The possible feedback from articulation to morphology can be accounted for by connectionist models of speech production. Regularization is somewhat more common than rendering words irregular. The erroneous words were relatively frequent, and analogical composition can account better for the errors than the affixation hypothesis. Performance factors may also play role in the genesis of morphological errors, as the speaker's failure in selecting one of the word forms competing for the same place in the utterance may result in the contamination of the two stylistic variants.

Linguistic analysis does not explain the errors completely because it ignores e.g. psychological factors such as attentiveness. The pursuit of more reliable results has led aphasiologists to conduct case studies. For normal speech, experimental elicitation of slips is a more appropriate approach, and it should obviously be accompanied by a careful analysis of morphological variation.

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