

Morphological structure in language processing
edited by Harald Baayen and Robert Schreuder

Book review for *Language*

reviewed by

Ingo Plag
English Linguistics
Fachbereich 3
Universitaet Siegen
Adolf-Reichwein-Str. 2
D-57068 Siegen

<http://www.uni-siegen.de/~engspra/>

tel. 0271-740-2560

tel. 0271-740-2349 (secretary)

fax 0271-740-3246

e-mail: plag@anglistik.uni-siegen.de

tel.: 06422-2817 (home)

2047 words (text of review, excl. heading and references)

February 10,2005

Morphological structure in language processing. Edited by Harald Baayen and Robert Schreuder. Trends in Linguistics. Berlin and New York: Mouton de Gruyter, 2004. Pp. viii, 521. ISBN: 3-11-017892-3. \$ 113.50 (Hb)

Reviewed by Ingo Plag, Universität Siegen

The book under review¹ is concerned with the nature of linguistic rules and their psycholinguistic reality, a topic that has been of considerable importance since the foundation of our discipline. Recently, the discussion about these issues has been fuelled both by important advances in psycholinguistics and by the availability of methodologies that allow researchers to study the role of frequency and probability in a much more principled and rigorous fashion than ever before. The existence of large corpora, lexical and syntactic databases as well as powerful statistical software has led to a methodological revolution which has affected even those circles that have hitherto followed the practice of building theories on the basis of asking the linguist in the office next door about the 'grammaticality' of a sentence or a word invented a minute ago.

The use of the new rich arsenal of modern linguistic methodology has led to significant findings in all areas of linguistics, which forces us to rethink and reshape many of our long-cherished concepts, including the 'rule'. Probably the most prominent area of research on these questions is morphology, where books like Pinker's (1999) *Words and rules* have gained a wide readership, and one that extends far beyond our field. But also phonology and syntax are more and more subject to approaches that take gradient, probabilistic phenomena into account, without losing scientific rigor or theoretical orientation.²

The articles in the present volume investigate the structure of words and how humans process complex words. A few years ago, not many theoretical linguists would

¹ I am grateful to Harald Baayen, Maria Braun, Sabine Lappe and Mareile Schramm for comments on an earlier draft of this review.

² See, for example, Bod et al. (2003) for the role of probability in different areas of linguistics.

have taken notice of such a volume. Today things are different and theoretical linguists and psychologists not only take each other's findings into account, but even do work together. The long-term cooperation of Harald Baayen (the linguist) and Robert Schreuder (the psychologist) is a prime example of the successful cross-fertilization of these fields and the present book is one more outcome of this joint endeavour. The volume comprises a collection of articles that can be considered a state-of-the-art reference for questions of morphological processing and its implications for linguistic theory. Although the contributions may sometimes not be very easy to read for the linguist because of the statistical jargon that necessarily accompanies the presentation of experimental results, the reader is rewarded with fascinating insights into the nature of linguistic processing and its repercussions on linguistic theory.

Each article is preceded by an abstract, and the volume has a useful subject index. While the editors did a marvellous job, this cannot be said of the copy-editors, who have overlooked an abundance of type-setting errors and inconsistencies in the notation of linguistic forms in the majority of the papers. This is sometimes irritating, but I strongly encourage the reader to ignore these formal shortcomings in order to be able to fully enjoy the contents of this book.

The book contains 16 high-quality papers, many written by well-known researchers, each of them carefully reviewed by the editors, by other contributors, or by outside reviewers. The studies presented address a wide range of issues concerning the acquisition, representation and processing of morphologically complex words, investigating phenomena in Dutch, French, German, English, Italian, Polish, and Serbian. Many different experimental paradigms are used, so that one also gets a good overview of the current psycholinguistic experimental arsenal. For example, we find studies using visual and auditory lexical decision tasks, different priming techniques (progressive demasking, forward masking, delayed and cross-modal priming), naming tasks, spelling tasks and computer simulations.

From the linguist's perspective, two issues are of particular relevance, and for reasons of space this review will focus on these, neglecting some issues and articles that might be more pertinent for psycholinguists and psychologists. The first of the two

issues concerns the nature and relevance of the paradigmatic axis in the lexicon. A number of experiments described in the volume address the question of how different kinds of relationship between words influence the organization of the mental lexicon and the processing of individual words. The second issue is the question of morphological decomposition. Directly or indirectly, many of the papers in the volume deal with the problem of whether complex words in the mental lexicon are segmented into their constituent morphemes, and if so, under which circumstances such segmentation happens. I will begin with the paradigmatic axis.

Recently, Harald Baayen and his co-workers have established the so-called family size effect: simplex words which occur as constituents in many complex words are processed faster than words with only a few morphological family members (e.g. Schreuder and Baayen 1997). While this effect has been shown with morphological families that include derived words and compounds, it is yet unclear how the number of different inflectional forms in a paradigm, i.e. the inflectional family size, influences lexical processing. This question is explicitly addressed in Daniela Traficante and Cristina Burani's article 'Visual processing of Italian verbs and adjectives: The role of inflectional family size', in which they compare adjectives, which in Italian have small paradigms, with verbs, which have large paradigms. The authors indeed find an inflectional family size effect: a larger number of different forms in the paradigm leads to slower access. They interpret their results plausibly as evidence for the morphological segmentation of verbs as against whole-word access for adjectives. This conclusion is remarkable because the question of whole-word access and representation versus morphological segmentation has hitherto focused on the role of token frequency, not type frequency.

In their paper 'Morphological resonance in the mental lexicon' Nivja de Jong, Robert Schreuder and Harald Baayen further explore the nature of the family size effect. They show that this effect is heavily dependent on the linguistic context. If no context is given, all members of the family contribute to the family size effect. If, however, the context provides information as to which word-category is particularly relevant (for example the category adjective in the context of a comparative suffix, or the

sub-class of scale-focusing adjectives in the context of *very* ___), only those members sharing the relevant information become co-activated. In essence, the context narrows down the co-activation to those family members that are contextually relevant.

Investigating English words, Michael Ford, William Marslen-Wilson and Matthew Davis ('Morphology and frequency: Contrasting methodologies') find that the derivational and compounding family size, but not the inflectional family size influence response latencies to monomorphemic words. In the light of the Italian evidence mentioned above, this is explainable by the small size of inflectional families in English. The strongest predictor for response latencies was, however, not family size, but word form frequency (with monomorphemic nouns) and lemma frequency (with comparatives and superlatives of adjectives). The authors also found effects for the degree of semantic relatedness to other words, which adds yet another dimension to the already complex enough picture.

Laurie Feldman and Matthew Pastizzo further explore semantic issues connected to morphological family size in their article 'Morphological facilitation: The role of semantic transparency and family size'. In two priming experiments, a lexical decision task and a naming task, they investigated whether the expected morphological facilitation varied with the degree of semantic transparency of the morphological family of the target word. In the lexical decision task, they found that latencies depended on how large the semantically transparent family was (this effect was absent in the naming experiment). These results do not only support the reality of morphological families, but they also have methodological implications. Contrary to standard assumptions, semantic transparency as a phenomenon is not restricted to the relatedness of prime and target, but also pertains to whole clusters of words.

Let us now turn to the other major issue introduced above, the problem of morphological segmentation. This problem is not restricted to psycholinguistics but finds its correspondence in morphological theory, for example in word-and-paradigm models as against morpheme-based models. The former rely on relationships between whole word-forms, the latter on relationships between sub-lexical units, assuming morphological segmentation. The results of recent psycho- and neurolinguistic studies

can be interpreted as evidence for the psychological reality of both morphemic and whole-word representations, and morphological theory has started to incorporate these results in various ways (cf., for example, Hay and Plag 2004 on suffix ordering). For inflection, one of the most influential models (see Clahsen 1999, Pinker 1999 for overviews) proposes a dual mechanism, according to which regular inflection always involves computation (irrespective of frequency), while irregular forms are stored as wholes. Other dualistic approaches use race models in which processing by rote and by computation compete with each given word, with the outcome being a function of various properties of the word in question, frequency chiefly among them. On the contrary, single mechanism models use only full-form representations that are organized, for example, in computational networks or analogical sets. In the papers of this volume, all three types of models are being advocated.

For example, Harald Clahsen, Ingrid Sonnenstuhl, and James Blevins present a study in which they extend their dual mechanism model from inflection to derivation, studying German nominalizations and diminutives. They refine their approach by stating that their model now 'treats productive inflection and derivation both as a result of combinatorial operations but associates productive derivation [sic] (like irregularly inflected items) with stored entries' (p. 149). In my view, this begs the question by which mechanism the same type of word, i.e. productively derived derivatives, can be both segmented and not segmented, and how a decomposed item can be 'associated' with a stored whole-word entry in a model where only one or the other, whole-word storage or decomposition, is possible. What irritated me most about this paper, however, is the fact that the authors ignore the counter-evidence to their claims that can be found in their own paper, as well as in other papers (of this volume and beyond). First, the derivational processes investigated by Clahsen et al. pattern like a sub-class of German -*n* plurals, which speaks against the proposed dichotomy of inflectional and derivational morphology. Second, no mention is made of the full-form frequency effects found with regular inflection in earlier studies (e.g. Baayen et al. 1997) and in studies presented in the same volume.

Thus, only some 50 pages later the reader finds a contribution by Harald Baayen, James McQueen, Ton Dijkstra and Robert Schreuder in which full-form frequency effects are investigated ('Frequency effects in regular inflectional morphology: Dutch plurals revisited'). In a number of experiments the authors show that the (relative) frequencies of plural forms influence response latencies. This finding can be interpreted as strong evidence for the independent representation of plural forms for nouns and verbs, in both the auditory and visual modalities, even for forms that are completely regular. In their article 'Frequency effects in processing inflected Dutch nouns: A distributed connectionist account', Matthew Davis, Marten van Casteren and William Marslen-Wilson take up Baayen et al.'s results and show that these can be modeled in a neural network, if homonymous affixes are included in the training set. This shows that frequency effects can be accounted for in a single mechanism system without distinct processing mechanisms of whole-word storage and decomposition.

Frequency effects for regularly inflected forms are also found by Dominik Sandra and Michel Fayol in their study 'Spelling errors with a view on the mental lexicon: Frequency and proximity effects in misspelling homophonous regular verb forms in Dutch and French'. What is especially interesting about the results of this study is the fact that even in an area in which there is complete regularity due to simple, few and straightforward (spelling) rules, language users engage in probabilistic morphological processing.

Overall, the findings accumulated in this state-of-the-art volume suggest at least three important conclusions: First, we are only beginning to estimate the full complexity of lexical storage and processing. There is no model in sight in which different kinds of frequency, semantic and context effects are all taken care of in a satisfactory manner. Second, one has to be very cautious in interpreting behavioral data. In spite of the rhetoric in many current studies, there is no clear one-to-one mapping between subjects' response patterns and underlying computational mechanisms. Third, linguists of all persuasions are well-advised to take note of current psycho- and neurolinguistic findings in order to be able to build theories of greater descriptive and explanatory adequacy. This volume is a good starting point.

References

- Bod, Rens, Jennifer Hay, and Stefanie Jannedy (eds.). 2003. *Probabilistic Linguistics*. Cambridge: MIT Press.
- Baayen, Harald, Ton Dijkstra, and Robert Schreuder. 1997. Singulars and plurals in Dutch: Evidence for a parallel dual route model. *Journal of Memory and Language* 37, 94-117.
- Clahsen, Harald. 1999. Lexical entries and rules of language: A multidisciplinary study of German inflection. *Behavioral and Brain Sciences* 22.6.
- Hay, Jennifer, and Ingo Plag. 2004. What constrains possible suffix combinations? On the interaction of grammatical and processing restrictions in derivational morphology. *Natural Language and Linguistic Theory* 22, 565-596.
- Pinker, Steven. 2003. *Words and rules: The ingredients of language*. New York: Basic Books
- Schreuder, Robert, and Harald Baayen. 1997. How complex simplex words can be. *Journal of Memory and Language* 37, 118-139.