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Syllable structure and sonority in language inventory and aphasic neologisms

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Abstract

Phonological theories have raised the notion of a universally preferred syllable type which is defined in terms of its sonority structure (e.g., Clements, 1990). Empirical evidence for this notion has been provided by distributional analyses of natural languages and of language acquisition data, and by aphasic speech error analyses. The present study investigates frequency distributions of syllable types in German, which allows for a rather complex syllable structure, and in neologistic utterances of a German speaking jargon aphasic. The findings suggest that the sonority structure of the patient's neologisms is generally in accordance with the notion of theoretically preferred syllables. Moreover, comparative analyses suggest that the predominance of the preferred syllable type is especially pronounced in the aphasic data. On the basis of these findings, the influence of sonority in impaired phonological lexical processing is discussed.
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1. Introduction

Investigations of aphasic speech have reported correspondences of aphasic errors to their assumed lexical targets along several phonological dimensions, e.g., the number of phonemes and syllables or the position of segments in the syllable structure. However, the syndrome of phonemic jargon aphasia presents a severe phonological impairment, which makes it difficult to identify target words and thus to investigate the correspondence of the aphasic utterances to well-formed words of the standard language. Phonemic jargon refers to aphasia with fluent speech production, in which the phonological structure of the utterances is impaired to the extent that lexical content is no longer identifiable (Huber, Poeck, & Weniger, 1989). Still, a tool for investigation of possible regularities in aphasic neologisms is provided by analyses of the phonological syllable structure (Christman, 1992a).

One relevant concept expressed in phonological theories is the notion of a preferred syllable type. For example, the simple, open consonant–vowel (CV-) syllable is regarded to reflect the preferred and thus least complex syllable type. Before we will go into the details of determining the complexity of the syllable structure in terms of sonority in the following section, we briefly address some empirical findings related to the preferred syllable type.

Evidence for the notion of a preferred syllable in natural languages is mainly based on the appearance of certain syllable types across different languages (cf. Jakobson, 1969), as confirmed by analyses based on written text samples and dictionary counts (MacNeilage,

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Davies, Kinney, & Matyear, 2000). Here, distributional properties seem to reflect a tendency towards the preferred syllable type in several different languages. The CV syllable is considered the preferred (or least marked) syllable, because it appears in all natural languages and the appearance of any other syllable type in a language implies that the language will contain CV syllables as well. In addition, some studies on language acquisition in children (MacNeilage & Davis, 2001; MacNeilage et al., 2000; Ohala, 1999) and language loss after acquired neurological disorders (Bastiaanse, Gilbers, & van der Linde, 1994a, 1994b; Christman, 1994; Code & Ball, 1994; Romani & Calabrese, 1998) provide some interesting support. Both infants' babbling and some forms of aphasic speech errors are reported to reflect a tendency towards a frequent occurrence of the preferred syllable type.

1.1. Sonority and syllable complexity

The theoretical account, which provides the basis for several previous sonority analyses in aphasic speech (e.g., Bastiaanse et al., 1994a; Christman, 1992a, 1992b, 1994; Romani & Calabrese, 1998), is the sonority theory as proposed by Clements (1990). In general, the sonority value of a speech sound can be defined with regard to phonological features. The basic assumption is that each speech sound is specified for a certain number of natural class features: [syllabic], [vocalic], [approximant], and [sonorant]. Accordingly, a speech sound or segment has a high sonority value when it is positively specified for as many of these features as possible. The only segments with positive specification for all four features are vowels, which in German and most other languages represent the syllable nucleus; all other sound classes are defined without the feature [+syllabic]. Glides, like in English /w/ and /j/, are positively specified for the three remaining features, [+vocalic, +approximant, +sonorant]. Liquids, like /l/ and /r/ are [+approximant, +sonorant], nasals are [+sonorant] and obstruents have no positive specifications. Thus, segments can be ranked along a sonority scale from most to least sonorous. A classification of German phonemes into sound classes and their assignment to sonority ranks is given in Table 1 (see Dogil & Luschützky, 1989, and Meinschäfer, 2003, for comparable classifications in German[1]).

The assignment of segments to sonority ranks provides the basis for understanding Clements' (1990) notion of the 'universally preferred' syllable. This notion will be adopted here because it provides a detailed approach, which has been used before in related studies of aphasic speech (Christman, 1992a, 1992b; Romani & Calabrese, 1998). Clements' Sonority Dispersion Principle holds that optimal syllable onsets will contain a sharp and steady rise in sonority from the margin to the peak. Thus, the preferred syllable should begin with a segment of a low relative sonority value (e.g., obstruent) so that there is a great differentiation between the onset and the highly sonorant peak (e.g., vowel). In contrast, towards the end of the syllable there should be a minimal fall in sonority. Thus, the Sonority Dispersion Principle contends that syllables of obstruent and vowel are the preferred CV syllables.[2] Clements (1990, p. 301) defines the sonority slope of the universally preferred syllable type as follows: "the preferred syllable type shows a sonority profile that rises maximally toward the peak and falls minimally towards the end, proceeding from left to right."

Table 1
Sonority ranks of German phonemes

Sonority rank	Segment class	Segments
4	Vowel	a, e, i, o, u
3	Liquids	l, r
2	Nasals	m, n,
1	Obstruents (fricatives and plosives)	f, v, s, z, ʃ, ç, x p, b, t, d, k, g

An example of a 'preferred syllable' would be /ta/ with a combination of obstruent and vowel (OV), each constituting the end points of the sonority scale. A vowel preceded by an obstruent thus presents a maximum rise in sonority in the onset. A less preferred syllable would be /at/ with the combination of vowel and obstruent (VO), which presents a maximal fall in sonority towards the end. While in both examples, OV and VO, the sonority contrast between the two segments is the same, they differ in the in complexity based on the relative position of each segment. If the obstruent occurs in the syllable-initial position we would consider it low in complexity, whereas it is highly complex, if it occurs in syllable-final position. Thus, the complexity of a syllable is determined by sonority ranks of its segments and by its position within the syllable (cf. Table 2).

As the Sonority Dispersion Principle makes different assumptions for syllable onsets and for syllable offsets, the so-called *demisyllable* has been proposed to form the basic unit for analyses (see for example in, Christman, 1992a, 1992b, 1994; Code & Ball, 1994; Romani & Calabrese, 1998). The notion of the demisyllable differs from the traditional concepts of onset and coda

[1] In contrast to the English language, these categorizations of German phonemes do not contain glides, even though German phonemes of different sonority classes may be realized as glides in a context dependent manner or free variation. Here, the German phoneme /j/ can either be realized as obstruent or glide (Butt, 1992).

[2] Note however, that not all languages are limited to sequences respecting the Sonority Dispersion Principle (see for example, Dell & Elmedlaoui, 1985).

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