

FREQUENCY EFFECTS ON THE EMERGENCE OF POLYSEMY AND HOMOPHONY

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Abstract: *In this paper we try to answer the following questions: Why do frequently used words tend to polysemy and homophony? And what comes first - frequency or the higher number of meanings per word? We shall stress the key role of frequency in the emergence of polysemy and assume an interactive step-up initiated by frequency: High frequency not only favors reduction processes of words or the bleaching of meanings that can result in polysemy; it also plays a crucial role in the creation of metaphors or metonymies, i.e., the main sources of polysemy. Only familiar or frequent source words/concepts tend to be used in metaphorical or metonymical expressions. Through the conventionalization of the metaphors and metonymies, the source words get additional meanings. They now can be used in a higher number of contexts what in turn favors a more frequent use.*

A similar explanation might hold for the development of homophony: Shorter words are known for their tendency to homophony [Jespersen, 1933] and high token frequency. Our explanation: High frequency favors backgrounding processes, such as vowel reduction, lenition and deletion of consonants or even of syllables. This frequency-induced shortening of words often results in sound merger and in a relatively high proportion of homophonous words, i.e., words encoding unrelated meanings.

Keywords: *frequency, polysemy, homophony, metaphor, metonymy*

Introduction

Both polysemy and homophony refer to the phenomenon in which words are having the same phonological form but different meanings. Such words are either classified as polysemous or as homophonous. As polysemous, if they encode related meanings, as for instance *tongue* (part of the body, language, scales,...). And as homophonous, on the other hand, if they encode semantically unrelated meanings. For example *bat* ('flying mammal', 'wooden stick'); *inn, in; I, eye*.

This distinction between polysemy and homophony is, however, not as clear-cut as it might look at a first glance. Because originally related senses can "become so distant that they are perceived as unrelated, such as French *voler* 'to fly' and *voler* 'to steal'" [Nerlich and Clarke, 2003:11].

In this paper we investigate mutual dependencies between token frequency and polysemy and mechanisms involved in the development of both polysemy and homophony. Starting points of these considerations are classical findings such as Jespersen's [1933] observation of an association between shortness of words and

homophony or Zipf's [1949] principles relating high token frequency of words to shortness as well as to semantic versatility. Both these principles seem to be motivated by economy principles in communication and cognition [cf. Fenk-Oczlon and Fenk, 2002].

Before studying the role of frequency in the development of polysemy and homophony we shall outline, in rather general terms, the role of frequency in language and cognition.

The Role of Frequency in Cognition and Communication

The realization of frequency as a determinant of our cognitive processes traces back at least as far as Aristotle. In the course of memorizing, he says, custom "takes the place of nature. Hence we remember quickly things which are often in our thoughts; for as in nature one thing follows another, so also in the actualization of these stimuli; and the frequency has the effect of nature..." Aristotle, quoted from [Suppes, 2009: 164]

In [Hume, 1777; 1993] "it is not reasoning which engages us to suppose the past resembling the future" (p. 25), but "Custom or Habit". This principle explains "why we draw, from a thousand instances, an inference, which we are not able to draw from one instance..." (p. 28).

Needless to mention the frequency of the occurrence or co-occurrence of stimuli as a decisive factor in the best studied and most fundamental forms of learning, such as sensitization, habituation, and conditioning [Kandel and Schwartz, 1982].

A widely discussed advantage and effect of learning is that it prepares the organism for the (near) future; it enables the organism to anticipate (expect, predict, ...), to some degree, the course of events, including the consequences of its own (re)actions. A second advantage and effect: The growing capability to anticipate what's going on has positive effects on the efficiency (speed and/or accuracy) of information processing in the respective domain. This second effect, i.e., the enhancement of the present perceptive-cognitive activities by previous perceptive-cognitive activities, is maybe too obvious to be noticed as extensively: Everybody has experienced that reading texts in a specific language improves through reading texts in that language.

In terms of information theory, *learning* means the extraction of a system's redundancy (patterns, invariants, periodicities). In Shannon's [1949] guessing game technique it is mainly the guessing person's (implicit) knowledge about the statistical structure of the respective language – frequency distributions of graphemes and words, transitional probabilities – what allows her to reduce the number of prognostic errors. In other words: She uses the redundancy of that language and she can use it the better the more familiar she is with that language.

No wonder that our "sensitivity to frequency" [Hasher and Chromiak, 1975] plays a crucial role in language acquisition [Saffran et al., 1996]. But here the point in question is the more or less indirect way in which the frequency of use changes the respective expressions. The probably best studied phenomenon of this kind is the shortening of words through frequent use [Zipf, 1929, Mandelbrot, 1954, Fenk-Oczlon, 1989], i.e., a frequency effect on the level of phonology and/or morphology.

But frequency also affects the level of semantics. Since Zipf [1949] we know that the number of different meanings of words increases with their frequency (*Zipf's Principle of the Economical Versatility of Words*) and that the length of words is inversely related to their relative frequency (*Zipf's Law of Abbreviation of Words*). In [Köhler, 1986] it is argued that frequency influences the word length that in turn influences polysemy. We assume slightly different mechanisms and an interactive step-up between frequent use and polysemy:

The Role of Frequency in the Development of Polysemy

We here suggest the idea of an interactive step-up between frequency and polysemy: Frequent use favours the tendency to shortness and polysemy, and shortness and polysemy favors frequent use for obvious reasons – the use of shorter expressions is economically motivated, and words encoding a higher number of meanings fit in a higher number of contexts. A chicken-and-egg problem? In view of the fundamental role of frequency in information processing (see the above section and [Fenk-Oczlon, 2001]) the strongest and initial impulses are assumed to come by frequency. The presumably relevant mechanisms:

The Emergence of Polysemy: Phonetic Reduction Processes

The influence of frequency on phonetic reduction processes has been documented in numerous works [e.g. Zipf, 1929; Manczak, 1980]. Backgrounding processes, such as vowel reduction, lenition and deletion of consonants or even of syllables are strongly associated with the token frequency of words. When analyzing data regarding rapid speech by American students [Kypriotaki, 1973] it can be shown that aphaeresis (deletion of the initial syllable) appears above all in words which belong to the 1000 most frequent words in English like *suppose*, *because*, *remember*, *almost*, *around*, etc. [Fenk-Oczlon, 1989]. And such reduction processes can result in polysemy:

around → *round* (verb, noun, adj, adv, prep)

remember → *member* (verb, noun)

because → *cause* (conjunction, noun)

The Emergence of Polysemy: Bleaching

Aitchison and Lewis [2003] argue that bleaching (fading of meaning) might be a further source for the development of polysemy. For instance "...words signifying catastrophic events like 'disaster' are subject to bleaching, and consequently, the development of polysemy" (p.263). "A prerequisite for the development of polysemy may be that the word must be widely used" (p.261). Frequent use favors a layering of the (still existing) original concept by more or less related meanings.

The Emergence of Polysemy: Metaphors and Metonymies

Metaphors and metonymies are considered to be the main sources of polysemous sense extensions. For instance: According to Blank [2003], metaphoric polysemy is "based on a more or less salient similarity between two concepts that belong to different or even distant conceptual domains" (p.268). As an example he mentions *mouse* (small rodent, computer device). Metonymic polysemy, he says, is "based on conceptual contiguity, i.e. the typical and salient co-occurrence or succession of elements in frames or scenarios or of these frames themselves" (p.269); e.g. *lingua* (tongue, language).

But metaphors and metonymies, i.e., the main sources for the development of polysemy, might in turn reflect frequency effects: When a new metaphor is created, only words being well-entrenched in the lexicon of the respective language community, or being familiar within this community, can be incorporated in this metaphor. The prerequisite for high familiarity is a rather high token frequency of these words. With the metaphorical/metonymical use of unfamiliar words one would risk the metaphor/metonymy not being understood or being misinterpreted, or that its processing and comprehension would at least require too much time.

Thus we see a strong tendency to metaphorical use of source words (concepts) showing a **high frequency** and/or **prototypicality**:

Prototypical and/or frequently mentioned animals such as *fox, bear, ox, dog, cow, lamb, frog, bird, elephant, camel etc.*, occur more often in metaphors than less prototypical and/or less frequently mentioned animals. (*You are a platypus (duckbill)!* would hardly be understood in Austria.)

Frequent verbs such as *see, hear, smell, touch, sit, stand, lie, eat, drink etc.* are more often used in metaphors than less frequent words.

Prototypical colors such as *black, white, red, green, yellow, blue* have more metaphorical meanings than e.g. *violet*.

In the metaphorical use of frequent verbs or color terms we tend to assume a lower cultural variation than in the use of animal names.

High frequency of predications in which the predicates express typical attributes, activities, or relations between two concepts, results in high conjoint frequency and favors metaphorical use:

The fox is cunning. → He is a fox.

German: *Der Fuchs hat ein rötliches Fell.* 'The fox has a reddish coat' → Bavarian: *Sie is fuchsat.* 'she has red hair'

The cactus is prickly. → He is a cactus.

The parrot "parrots". → He is a parrot.

The parrot is colorful. → She dresses like a parrot.

The same holds for metonymies

German: *Schiffe haben einen Kiel* 'Ships have a keel' → *Tausend Kiele näherten sich der Küste* 'Thousand keels are approaching the coast' [Keller, 1995:176]

He drinks a glass of wine/vodka/whisky → *He drinks a glass.*

An increasing **frequency** of the use of a certain metaphor/metonymy means a conventionalization of this metaphor with potentially two results:

1. The metaphorical character of the metaphor 'bleaches', and it may become a 'frozen' or a dead metaphor.
2. The relevant (vehicle) term may get an additional meaning; the respective word has become polysemous.

The Role of Frequency in the Development of Homophony

The main source of homophony is accidental sound merger. Linguistic history shows that it is often reduction processes that lead to a shortening of words (e.g. loss of final vowels, loss of parts of words). Words with different etymological origin become identical in sound and therefore homophonous. An example from [Blank, 2003]: Old English *earm* 'upper limb of the body', *arme* 'weapon' → Modern English *arm* 'upper limb of the body', 'weapon'.

Already Jespersen [1933] stated an association between homophony and shortness of words: "The shorter the words, the more likely is it to find another word of accidentally the same sound". In English he found about four times more monosyllabic than polysyllabic homophones. Ke [2006] also found high positive correlations between homophony and number of monosyllables in the 5000 most frequent words in English, Dutch and German. And when grouping the 5000 words into 14 frequency bands in decreasing order of frequencies she stated the highest degree of homophony in the highest frequency bands. Although languages vary widely in their number of monosyllables and their degree of homophony, there is a strong association between shortness of words, token frequency, and homophony.

The bridge to our frequency-based explanation concerning the development of homophony is again the association between high token frequency, phonetic reduction processes, and shortness. Frequently used words get shortened, and this can result in sound merger and therefore in homophony.

Conclusion

Regarding the 'chicken and egg problem' mentioned in the third section we may conclude: Frequency comes first! It seems to be the trigger in the emergence of polysemy: Frequent use plays a crucial role in phonetic reduction processes and in the bleaching of meanings that can lead to polysemy (i). High frequency/familiarity of words favors their use in metaphorical/metonymical expressions that are well-known as sources for polysemous sense extensions. Through frequent use metaphors and metonymies become conventionalized, the source words get

additional meanings (ii). Polysemous words are apt to be used in a higher number of different (con-)texts. Thus, polysemy in turn increases the token frequency of the respective words (iii).

In our attempt to explain the development of homophony, token frequency again plays a central role. Phonetic reduction processes, such as lenition and deletion of consonants, vowel reduction etc., affect predominantly frequently used words. In linguistic diachrony words get shortened and this can lead to sound merger and thus also to homophony.

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