The Meanings of Consonants
Author(s): Barbara F. Kelly, William R. Leben, and Robert H. Cohen
Proceedings of the Twenty-Ninth Annual Meeting of the Berkeley Linguistics Society: General Session and Parasession on Phonetic Sources of Phonological Patterns: Synchronic and Diachronic Explanations (2003) pp. 245-253

The Meanings of Consonants

BARBARA F. KELLY [1,3], WILLIAM R. LEBEN [2,3] and ROBERT H. COHEN [3]
[1]*University of California, Santa Barbara,* [2]*Stanford University,* [3]*LexiconBranding, Inc.*

1. Background: Sound Symbolism

Sound and meaning are supposed to be associated only arbitrarily in language, and usually they are. In terms of sound-meaning correspondence it makes no difference whether I eat cooked rice, *bhat*, or *nasi* – it's all the same thing. Still, linguists going at least as far back as Plato's *Cratylus* have come up with exceptions to the arbitrary pairing of sound and word meaning.

The study we report here shows that certain consonants convey meanings quite reliably, and consonants with similar meanings group into standard natural classes. In English there are dozens of cases where word-initial consonants seem to contribute a similar element to word meanings, including the following: *peg, pierce, pike, point, poke, probe, prong, prod; swab, swat, sway, sweep, swerve, swing, swirl, swish, switch, swoop; fire, flame, flare, flash, flicker* (Bloomfield 1933). This has also been attested cross-linguistically. For example, Jespersen (1933) compiles cases from a variety of languages, and Bolinger (1967) considers the morphemic status of these word-initial consonants and consonant clusters. More recently, 'Sound Symbolism,' edited by Hinton, Nichols, and Ohala (1994), examines symbolism cross-linguistically in its many different manifestations.

Saussure (1915) introduced the influential notion of *l'arbitraire du signe*, which identified the arbitrary association between sound and meaning as a basic feature of language. Following Saussure, linguists have espoused the view that the relation between words and meanings is entirely independent of the functional or physical relations between the two (Hockett 1963, Firth 1948). While it is impossible to ignore the essential validity of Saussurean arbitrariness of the relation between sound and meaning, it is worthwhile to look for cases in which the canon of arbitrariness is relaxed. Such cases are interesting because they tend not to be isolated or idiosyncratic. As Ohala (1994) points out, they are often rooted in attributes of the sounds. For example, Malkiel (1990, 1994) suggests that sound symbolism is so entrenched in some languages that regular sound changes fail to alter sound symbolic words, thus motivating new historical sound adjustments. Others have focused on more specific sounds and their sound

symbolic properties. For example, vowels have been found to have certain sound symbolic properties. In a variety of languages front vowels have been associated with properties of being thin, bright, flat, hard while back vowels have been associated with properties of being large in size, heavy, low-pitched, dark (Argelander 1927, Fischer-Jorgensen 1978, Flournoy 1893, Jakobsen 1978, Newman 1933).

Ohala (1994) offers a possible explanation for some of the major cross-linguistic sound similarities. He surveyed past experimental and anecdotal work on sound symbolism and found strong cross-linguistic similarities. One reason for these patterns, Ohala proposes, is what he terms the *frequency code*. This associates sounds with high fundamental frequency with meanings like smallness and qualities such as politeness, deference, or submission. In contrast, words that have low pitch signals and sounds with low fundamental frequency are associated with properties of largeness and assertiveness.

Remarkably little work of an experimental nature has investigated sound symbolism. In one of the few early experiments that have been performed Sapir (1929) tested relations between different vowels and size. In this small experiment he presented subjects with the words *mil* and *mal* and asked them to determine "Which is a large table and which is a small table?" Around 80% of respondents designated *mil* as being the small table and *mal* as being the large. Although there is a possibility that there was semantic interference in this finding due to the association of *mil-* with the fraction 'one-thousandth,' several other experiments have corroborated this finding with respect to front and back vowels.

One of the most detailed studies to examine the sound symbolic properties of consonant sounds was carried out by Greenberg and Jenkins (1996). Greenberg and Jenkins found that among other things subjects judged stops as being relatively abrupt (as opposed to continuous), tight (as opposed to loose), rugged (as opposed to delicate), and inhibited (as opposed to free). Further, subjects judged stops and fricatives as relatively harsh (as opposed to mellow), rough (as opposed to smooth), active (as opposed to passive), sharp (as opposed to dull), difficult (as opposed to easy), and angular (as opposed to rounded).

In other research, LaPolla (1994) asked English speakers with no knowledge of Chinese to make judgments about meanings of spoken words in Cantonese. LaPolla found that English speakers showed a consistency in their use of sounds to guess at the meanings of words in a language they did not know. Words with high pitch were associated with smaller sizes and low pitch words were associated with larger sizes. This finding was corroborated by a separate study in which Cantonese speakers with no knowledge of English were asked to make judgments about English words and also about words in dialects they did not know. Even though some of the early experimental studies have their flaws, many of the sound symbolic effects they found have been corroborated in the non-experimental literature, including many of the survey articles in Hinton, Nichols and Ohala.

One area that has been largely overlooked in studies of sound symbolism is the study of emotions or intrinsic human qualities and speech sounds. Neuro-

psychology research has shown that some emotions are basic, unlearned states (Scherer and Ekman 1984) that can be conceptualized in terms of polar opposites (Plutchik 1980). For example, happiness has a polar opposite of sadness, surprise is opposite anticipation, and acceptance has a polar opposite of disgust. Gradations of intensity lead to different emotions, such as from anger to the less intense annoyance or the more intense rage. Conceivably, emotional states may occur along a continuum on which happiness and sadness are relative to each other.

Emotions are among the most basic of human qualities. To date, sound symbolism studies have examined sound-meaning correspondences relating to size, speed, color, sound, gender, and fundamental frequency. However, no documented sound symbolism research has systematically and empirically tested relations between human qualities and speech sounds. If natural class properties have sound correlates, what about another class relevant to speakers – human qualities?

The current study is an investigation of relations between human qualities and English consonant sounds. The aims of the study are:

i. To examine sound symbolism judgments of English speech with respect to a set of human qualities.
ii. To determine which English sounds best communicate the following meanings: *sad, alive, insecure, daring.*

Our overall goal in carrying out this empirical research is to discover whether there are sound-meaning correspondences relating to human qualities. Further, we aim to confirm the observations from a variety of languages and across a range of studies that there is a basis for claims regarding systematic relationships between sound and meaning.

2. Method

In an earlier related study, reported briefly in Cohen (1995), we tested 150 speakers of Dutch, Polish, Japanese, Italian and American English. For each language, respondents filled out a questionnaire in which they compared pairs of nonsense names for some given quality. A sample question was, "Which name sounds faster, *Tiron* or *Piron*?" Some of the findings established in this research include the discovery that fricatives are sound symbolically faster than stops and that voiceless consonants are smaller and more luxurious than voiced consonants.

In the current project we set out to examine sound symbolic judgments of English speakers with respect to word pair choices and their meanings. In an initial pilot study we asked respondents to judge word pairs according to six basic emotions: sad, happy, fearsome, angry, disgusting, and surprising. Of these, respondents only felt comfortable judging happy and sad. The remaining emotions were not considered appropriate for a study of word pair difference as respondents had trouble relating them to inanimate objects. This meant that a

study of basic emotions and word pairs was not likely to yield meaningful results. To move beyond this problem we ran a further set of pilot tests where respondents made choices according to a set of three human qualities: *daring*, *alive*, and *insecure,* as well as the emotion *sad* which had tested well in the previous study.

Participants

Four hundred and eighteen (418) native speakers of American English participated in the study. Research was carried out through the world-wide-web and subjects completed the study at home using their own computers. The experiment was conceived and designed by researchers at Lexicon Branding, Inc and fielded on the web through the auspices of NFO Research and their national consumer panel. Subjects were controlled for variables of age (all were over the age of 18), sex (207 female and 211 male) and geographical location within the US.

Procedure

Participants were administered an online survey of forced choice alternatives presenting binary choices linking sound features with particular meanings. They were asked about a pair of nonsense names differing only by a single phonetic feature of the initial consonant. Respondents were asked to judge which of the two nonsense names rated higher on a given human quality. For example, for each target quality respondents were asked questions such as: "Which sounds more daring, *Paressa* or *Taressa*?"

Questionnaires consisted of an initial hypothetical product description and 68 questions. Two groups of respondents were given surveys testing the same sound pairs with different words to partial out possible choices on the basis of semantics. For example, in testing liquids, Group 1 was given the pair Renno/Lenno and Group 2 was given the pair Renza/Lenza. In order to counter a skewing effect on the basis of presentation ordering all emotions presented, sound pairs tested, and initial phoneme presentations were randomly ordered throughout the study.

The sound features included in this study are a subset of the features used by linguists to describe and differentiate sounds across the world's languages. While all of the consonant sounds examined here have been investigated in research surveyed above, in the current experiment they were systematically tested with respect to human qualities. The features and individual sound segments tested in the study were as follows:

VOICING:	voiced [b, d, g, v] vs. voiceless [p, t, k, f]
NASALITY:	nasal [m, n] vs. oral [b, d]
CONTINUANCY:	fricative [f, v, s, z] vs. stop [p, b, t, d]
PLACE:	labial [b, p] vs. dental [d, t] vs. velar [k, g]
LIQUIDS:	rhotic [r] vs. lateral [l]

In order to make the task more natural and meaningful, respondents were asked to interpret word pairs as names in the context of a performance sedan. All initial consonants were followed by vowels, and target words had either two or three syllables with CV(C) structure. On the basis of pilot tests the word *daring* was replaced by *courageous* with *d-* initial sounds in order to avoid interference due to alliteration. Other skewing due to frequency of sound and letter correspondences was controlled for by exchanging the letter *k* for c (pronounced [k]), since *k* occurs rarely in word-initial position in English. You may get a sense of the task faced by participants by imagining that these are names of cars and trying to answer questions like the following:

(1)

1.	Which sounds more alive?	Sekka	Zekka
2.	Which sounds more daring?	Balari	Palari
3.	Which sounds more sad?	Merrona	Berrona
4.	Which sounds more insecure?	Dobrax	Tobrax

3. Results

Results were tabulated by combining data for each of the questions dealing with a given sound contrast/attribute combination. This yielded results such as the overall percentage of respondents who selected target words with a voiced [d] versus a voiceless [t] for the question *Which sounds more insecure*?

People react differently to questions such as in (1) above. Some find the answers obvious, while for others they require extremely subtle judgments. Yet results were surprisingly consistent across the sample of 418 subjects. In order to determine if there were differences between the percentage of respondents choosing one sound segment over another across the different sets of word pairs, *t*-tests were carried out on all the data. Zero effects were found for age, sex, and location. Significant differences at the 90th ($p=<.10$) and 95th ($p=<.05$) percentile were found across all pairs excepting [d] vs. [n] in the category *insecure*.

Looking again at the emotions and words presented in (1) above we can see how the overall results patterned across some of the target words and emotions.

(2)

Which sounds more alive?	Sekka	**Zekka**
Which sounds more daring?	Balari	**Palari**
Which sounds more sad?	**Berrona**	Merrona
Which sounds more insecure?	**Dobrax**	Tobrax

The highlighted words in (2) are the words that were most often chosen as conveying the human quality targeted in the question. In the voiced pair [s, z] respondents selected [z] for the quality *alive*. For the quality *daring* the voiceless bilabial stop [p] was

considered more daring than the voiced counterpart [b]. Subjects judged the oral bilabial stop [b] to be significantly more sad than the nasal bilabial [m], and respondents overwhelmingly selected the voiced stop [d] versus the voiceless stop [t] for the quality *insecure*.

Several clusters of features correlated with given symbolic meaning. For example, voicing and continuance combined to produce a very strong effect: [v] was found to be substantially more alive and daring than [b]. However, in non-continuant sounds the opposite effect was found whereby voiced stops [b, d, g] were less alive and daring than voiceless stops [p, t, k]. Overall, the features patterned consistently regardless of what other sound features they combined with. For example:

Voiceless stops sound more alive and daring than voiced stops.
Voiceless stops sound less sad and insecure than voiced stops.
Voiced fricatives sound more alive and daring than voiceless fricatives.
Voiced fricatives sound less sad and insecure than voiceless fricatives.
Dental consonants sound more alive and daring than non-dentals.

5. Discussion

The results fall into place so nicely that it is worth recalling our expectations before the experiment. We were prepared to discover that the consonants that best communicated the meaning *alive* were different from those that communicated *daring* and they had nothing to do with the results for *sad* and *insecure*.

Furthermore, we would not have been totally surprised if the set of consonants that best designated one human quality was arbitrary from a phonetic standpoint. For example, we may have found a pattern where [f, d, l] grouped together for one quality and [f, s, g] grouped together for another. Our study lends itself to several interpretations regarding what features are responsible for groupings. The patterning of voiced fricatives with voiceless stops and of voiceless fricatives with voiced stops is the most puzzling. Clearly, along with the standard features of voicing and manner of articulation, other phonetic factors are determining our results. We cannot speculate here on what those factors might be, but the groupings do have some importance, given the consistency of the results across linguistic features and across attributes of human qualities.

The identical patterning of *alive* and *daring* and of *sad* and *insecure* suggests that the attributes share a semantic relation. Conceivably, the pairs form some kind of semantic unit. This may be a unit as broadly defined as *positive* versus *negative*, with *alive* and *daring* being positive and *sad* and *insecure* being negative. It is fortunate that both *alive* and *daring* were included in the study as the performance of one constitutes an independent check on the other. The same applies to *sad* and *insecure*. They could have come out totally different from one another, but the fact that they didn't demonstrates a semantic relationship between the two attributes.

An even more unexpected finding is that the scale of consonants expressing *sad* and *insecure* is exactly the opposite of the one expressing *alive* and *daring*.

Some of the sound distinctions for the different human qualities are laid out below:

(3)

ALIVE / DARING				**SAD / INSECURE**
Voiceless stops	>	Voiced stops	>	Voiceless stops
Voiced fricatives	>	Voiceless fricatives	>	Voiced fricatives
Dental consonants	>	Non-dental consonants	>	Dental consonants
Stops	>	Fricatives	>	Stops

As we can see when we look at (3) above, voiceless stops were more *alive* and *daring* that voiced stops but voiced stops were more *sad* and *insecure* than voiceless stops. Again, we would not have predicted this patterning before the study. The exact relationship between the two scales provides yet another independent check on the validity of the study, since it is unlikely that one scale should turn out to be the reverse of the other purely by chance.

Since the study asked questions and elicited answers in written form, it is important to consider whether these results speak to sound at all. Conceivably, they might simply tell us about the meanings associated with written characters. If so, the results would be no less interesting, though it would then no longer be appropriate to interpret the experiment as a test of sound symbolism.

Subjects in this study read a written word, said the word aloud, and then made a judgment regarding the relation between the word and a given human quality. Since the written medium played such an important role, it is unlikely that only sound affected the choices that were made. More likely, respondents based their choices on some combination of phonetic and letter-shape information. What is quite clear is that it was not only letter shapes that drove the results.

While the chosen methodology leaves somewhat open the relative roles of sound and writing in subjects' judgments, there are other senses in which the methodology seems to have been well chosen. The research is more easily replicable, and the pool of subjects used was larger than would have been the case if the procedure had been conducted orally. The consistency in responses across the 418 subjects suggests that the methodology did manage to establish a valid association between consonants and human qualities.

This study of the relation between human qualities and English consonant sounds adds to the small body of experimental work on consonant sounds and meanings. The results point to a scale of consonants expressing more versus less

alive, *daring*, *sad*, and *insecure*. This study provides some systematic, empirical evidence for a connection between English consonant sounds and human qualities. It seems then, that although Cratylus, with his voiceless velar-initial name, was being a little daring when he overstated the naturalness of connections between a word and the thing it names, some consonants do have meanings.

References

Argelander, A. 1927. *Das Farbenhören und der synästhetische Faktor der Wahrnehmung.* Jena: G. Fisher.

Bloomfield 1933. *Language*. New York, Henry Holt.

Bolinger, D. 1967. *Aspects of language*. New York. Harcourt, Brace, Jovanovich.

Cohen, R. 1995. There's more to a name. *Stanford Business School Magazine* March edition, pp 8-9.

Firth, J R 1948. Sounds and Prosodies. In F R Palmer, ed. 1970. *Prosodic Analysis*. Oxford: Oxford University Press, 1-26.

Fischer-Jorgensen, E. 1978. On the universal character of phonetic symbolism with special reference to vowels. *Studia Linguistica* 32.80-90.

Flournoy, T. 1893. *Les phénomènes de synopsie.* Paris-Genève.

Greenberg, J. H., and J. J. Jenkins. 1996. Studies in the psychological correlates of the sound system of American English: III. Descriptive ratings of selected consonants. *Word* 22.207-242.

Hinton, L. Nichols, J and Ohala, J. J. 1994. *Sound Symbolism*, Cambridge University Press.

Hockett, C. 1963. Problem of universals in Language. In J. Greenberg (ed) *Universals in Language,* Cambridge MA pp. 1-29

Izard, C.E. 1991. *The psychology of emotions*. New York: Plenum.

Jakobson, Roman. 1978. *Sound and Meaning*, Cambridge, MIT Press.

Jespersen, Otto. 1933. The Symbolic Value of the Vowel 'i'. *Linguistica*, College Park, MD. Reprinted in Selected Papers of O. Jespersen in English French and German,

LaPolla, R. J. 1994. An experimental investigation into phonetic symbolism as it relates to Mandarin Chinese. In Hinton, Nichols, and Ohala, pp.130-147.

Malkiel, Y. 1990. *Diachronic Problems in Phonosymbolism,* Philadelphia, J. Benjamins,

Malkiel, Y. 1994. Regular sound development, phonosymbolic orchestration, disambiguation of homonyms. In Hinton, Nichols, and Ohala, pp. 207-221.

Newman, S. S. 1933. Further experiments in phonetic symbolism. *American Jnl of Psychology 45.53-75.*

Ohala, J. J. 1994. The frequency code underlies the sound-symbolic use of voice pitch. HNO, 325-347.

Ortony, A., & Turner, T. J. 1990). What's basic about basic emotions? *Psychological Review*, 97, 315-331.

Plutchik, R. 1980. A general psychoevolutionary theory of emotion. In R.
Sapir, E. 1929. A study in experimental symbolism. *Jnl. of Experimental Psychology* 12.225-239.
Saussure, Ferdinand de. 1966 [1915] *Course in General Linguistics*. New York: McGraw-Hill.
Scherer, K and P. Ekman, eds. 1984. *Approaches to emotion*, pp. 319-343. Hillsdale, N.J.: Lawrence Erlbaum.

Barbara F. Kelly
Dept. of Linguistics,
University of California,
Santa Barbara,
CA, 93106-3000

bfk0@umail.ucsb.edu

William R. Leben
Dept. Linguistics,
Stanford University
Stanford,
CA, 94305-2150

leben@stanford.edu