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Implicit sound symbolism in lexical access: Evidence from an interference task

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Abstract

Köhler (1929) reported anecdotally that, when asked to choose, subjects were much more likely to attach the name 'takete' to a spiky abstract object, and the name 'baluma' (or, by 1947, 'maluma') to a curvy abstract object. Follow-up work has suffered from the same three weaknesses as Köhler's original anecdotal study: a reliance on small number of stimuli carefully selected by the experimenter; the use of manipulations that were transparent to the subject; and the use of overtly semantic tasks. This paper reports two experiments that replicate and extend Köhler's claims using an implicit interference task that allows for multiple measures per subject, and does not require subjects to make explicit decisions about the relation between visual form and meaning. Subjects undertook a lexical or letter decision task with the stimuli presented inside spiky or curvy frames. Reaction times show interference patterns consistent with Köhler's claims. This demonstrates that the effect is pre-semantic. Neurological reasons for these word/shape and character/shape interference phenomena are discussed.

Keywords: Sound symbolism; Lexical access; Reading; Lexical decision; Interference paradigm; Fusiform gyrus; Inferior temporal lobe

1. Introduction

"For in passing . . . into a world of sounds, we do not abandon the world that really surrounds us."
Wilhelm von Humboldt (1840)
On Language

Saussure (1916) and Hockett (1958) both famously opined that linguistic symbols bear a wholly arbitrary to their referent. The arbitrariness of the sign is usually taken as a foundational assumption of modern studies of language. However, the idea that the relation between a word's sound and its meaning may be in some ways non-arbitrary also has a long history. The earliest extended discussion of the idea that there is a non-arbitrary relation between a word's sound and its meaning—the idea that we now call *sound symbolism*—may be found in Plato's *Cratylus* dialog. Sound symbolism has since been much discussed in both the linguistic and psycholinguistic literatures (Allott, 1995; Brown, 1958; Firth, 1964; French, 1977; Heise, 1965; Hinton et al., 1994; Jakobson, 1990; Jesperson, 1925, 1933; Magnus, 1999; Reiss, 1950, 1967; von Humboldt, 1840). Anecdotal reports and annotated listings (e.g., Heise, 1965; Jesperson, 1925; Magnus, 1999; Reid, 1967; Reiss, 1950) attesting to the reality of sound symbolism abound. However, such listings are unconvincing as a whole, often suggesting that their authors were burdened with an obsessional over-imagination worthy of a conspiracy theorist.

This weak post hoc evidence has also been supplemented by a great deal of experimental and quasi-experimental evidence (Bentley & Varon, 1933; Brown, Black, & Horowitz, 1955; Brown, 1958; Cutler, McQueen, & Robinson, 1990; Johnson, 1967; Johnson, Suzuki, & Olds, 1964; Lapolla, 1994; Miall, 2001; Newman, 1933;

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Ramachandran & Hubbard, 2001; Sapir, 1929; Tarte, 1982; Tarte & Barritt, 1971; Taylor & Taylor, 1962; Taylor, 1963; Taylor & Taylor, 1965; Weiss, 1963a, 1963b, 1964, 1966, 1968; Wertheimer, 1958). The experimental work relating to sound symbolism is quite disparate, focusing on many different aspects of sound and meaning, not all of which are of direct relevance to the present studies. However, three aspects are of direct relevance to the present work.

One relevant theme that emerges from past work is that sound symbolism effects are often seen for nonwords, but not for real words. For example, Sapir's early (1929) results showed that subjects had high levels of agreement in classifying nonwords along various semantic dimensions. Eighty percent of his several hundred subjects preferred the word 'mal,' with its large vowel sound, to small-voweled 'mil' for the name of a large table. These results were replicated and extended in a related study by Sapir's student, Newman (1933). However, they did not stand up in a thesaurus study of real words that was also conducted by Newman, nor in similar studies by Bentley and Varon (1933) or Brown (1958). Other work that has succeeded in demonstrating statistically reliable sound-meaning distinctions in real language (e.g., Cutler et al., 1990; Taylor, 1963; Taylor & Taylor, 1965) has tended to rely largely on post hoc analysis of phoneme-meaning regularities, often failing to demonstrate any direct behavioral effects of such regularities.

The second and third relevant aspects of prior experimental work are related. Most results in favour of sound symbolism have relied upon: (a) a small number of carefully selected stimuli, and (b) manipulations that were transparent to the subject. An example is Köhler's (1929) observation, which is perhaps the most well-known presentation of sound symbolism. In his book 'Gestalt Psychology,' Köhler printed one spiky and one curvy shape (reproduced in Fig. 1) and wrote "If, looking at these two figures [...] the reader is asked to choose which one he would call 'takete' or 'baluma,' he will probably be able to decide with ease" (p. 242)[1] Köhler made no attempt to quantify the probability of the decision, for reasons as obvious to us as to him: because the effect is so compelling that the confirmatory evidence provided by an experiment seems redundant. Holland and Wertheimer (1964) actually collected and presented the relevant data, getting results so nearly unanimous that "No statistics are required to show that this finding strongly confirms Köhler's original observations" (p. 114). The effect has also been demonstrated, with only minor changes, in other languages (Davis, 1961). It was recently replicated using the labels 'kiki' and 'bauba' (Ramachandran & Hubbard, 2001). In that experiment, 95% of subjects matched the spiky shape to the label 'kiki.'

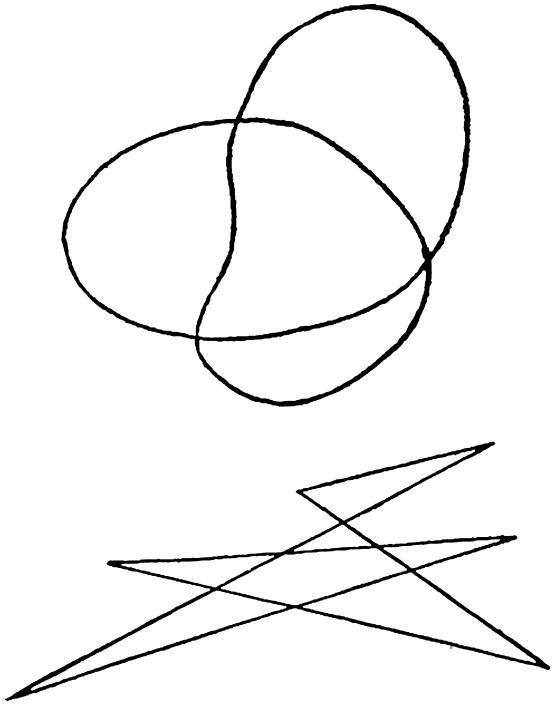

Fig. 1. Reproductions of Köhler's (1929, 1947) original 'baluma'/'maluma' and 'takete' stimuli.

The reliance of Köhler and later researchers on stimuli chosen specifically because they demonstrate the effect of interest, the reliance on transparent manipulations, and the difficulty in getting replications of results with more general stimuli sets leaves open the question of the extent to which sound symbolism may be constructed, rather than discovered, by experimenters. Sound symbolism effects may depend largely upon the experimenter pre-selecting a few stimuli that s/he recognizes as illustrating the effects of interest. We would like to understand if it is actually a general factor in organizing the mental lexicon, or merely a widely agreed upon cultural construct that happens to operate over a very small range of words.

In this paper, experimental evidence is presented that suggests that one form of sound symbolism does have a psychological reality across a wide range of (nonword) stimuli. The experimental task used allowed for repeated measures while keeping subjects unaware that any relation between word form and visual form was being studied. The experiments described here were inspired by Köhler's (1929) observations. Köhler's forced-choice word-picture matching task was turned into an implicit interference task. If subjects really do associate stop strings with spiky shapes and continuant strings with curvy shapes, then it can be hypothesized that curvy

[1] In the later (1947) edition of his book, Köhler used the same shapes but changed the 'curvy name' to the all-continuant string 'maluma.' By then he had apparently actually tested his earlier claim; in that edition the sentence reads "... when asked to match the nonsense words 'takete' and 'maluma' with the two patterns shown [...], most people answer without any hesitation" (p. 224).