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The Symbolic Implications of Vowels and of Their Orthographic Representations in Two Natural Languages

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Ninety-two Hebrew-speaking subjects judged the magnitude, brightness, and hardness symbolism of orthographic characters designating five vowel phonemes in Hindi and in Japanese. For both languages and all three symbolic dimensions, the figural symbolism of the orthographic characters was found to replicate very closely the sound symbolism of their phonemic referents. The ranking of the five vowel characters in order of increasing magnitude and decreasing brightness and hardness was as follows: i, e, a, u, o. *The results were interpreted to suggest that sound patterns and visual patterns tend to carry cross-culturally consistent connotations, and that the symbolic implications of sounds have been embodied in the pattern of orthographic characters in natural languages.*

INTRODUCTION

The idea of phonetic symbolism implies that sounds carry intrinsic symbolic connotations. In the first experimental study of this idea, Sapir (1929) found that CVC trigrams containing low vowels (e.g., *mal*) were judged to be more appropriate labels for large objects than CVC trigrams having the same initial and final consonants but containing a high vowel (e.g., *mil*). Newman (1933), who extended Sapir's work, found the size implications of vowels to vary

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from smallest to largest in the following order: *i, e, a, u,* and *o*. About the same ordering was also obtained by Birch and Erickson (1958) and by Johnson (1967), using somewhat different techniques.

Newman's further examination of the hypothesis that the size connotations of vowels are embodied in the words of English yielded little support. A reexamination of his data, however, led Taylor and Taylor (1965) and Johnson (1967) to conclude that low and high vowels are differently distributed among words indicating smallness and largeness. Johnson also found that in subject-produced "small" and "large" words the relative occurrence of the five vowels varied systematically from *i* to *o* in an order exactly consistent with their subjective size connotations.

Although the symbolic size implications of vowels have been the most consistently supported, reliable differences between vowel phonemes were obtained with regard to several other attributes (Bentley and Varon, 1933; Miron, 1961; Newman, 1933; Taylor and Taylor, 1962; Wicker, 1968*b*). Bentley and Varon (1933) found /a/ sounds to be judged softer and less angular than /i/ sounds, and Newman found the brightness implication of vowels to vary from /i/ to /o/ in the same order as their size implications. Somewhat similar results were obtained by Wissemann (1954). German-speaking subjects who were to invent or select names for different noise patterns agreed in using vowels to express the pitch and color tone of the noises, with /i/ sounds expressing higher pitch and brighter color tone than /o/ sounds.

There has been some disagreement as to the cross-cultural generality of the symbolic connotations of sounds (Brown, 1958; Langer and Rosenberg, 1966; Miron, 1961; Taylor and Taylor, 1962). More recently, Tanz (1971) has presented convincing evidence that in natural languages physical, temporal, and personal distance are conveyed through the contrast between high and low vowels. Thus words signifying "here" tend to contain the high front vowel /i/ and words signifying "there" to contain low back vowels such as /a/.

The purpose of the present study was to examine the possibility that the symbolic connotations of vowel phonemes are reflected in the orthographic representations of these phonomes in the writing systems of natural languages. For each of the two languages, Japanese and Hindi, the conventional orthographic characters designating five phonemes were presented to Hebrew-speaking *S*s for pair comparisons with regard to each of the four dimensions of magnitude, brightness, hardness, and length. For each pair, subjects were to choose which character is more appropriate to represent a larger, brighter, softer, or longer object. Several studies have demonstrated considerable intersubject agreement in associating visual patterns with non-

linguistic sound patterns (Irwin and Newland, 1940; Fox, 1935; Scheerer and Lyons, 1957), and there is some indication that such intersensory connections may have cross-cultural generality (Davis, 1961; Langer and Rosenberg, 1966). A number of these studies suggest that such visual-auditory connections may actually be mediated by affective or semantic connotations (Holland and Wertheimer, 1964; Karwosky *et al.,* 1942; Osgood, 1959; Oyama and Haga, 1963). Yet the possibilities that these connotations may be reflected in attributes of the figural signs comprising the writing systems of natural languages has never been investigated. If the figural symbols designating vowel phonemes in Japanese and Hindi are found to evoke in noncognate subjects symbolic connotations similar to those of their corresponding phonemic referents, this might support the idea that visual and auditory stimuli tend to carry intrinsic symbolic connotations which are universally shared and which, in the process of historical development, have come to be embodied in the pattern of orthographic signs comprising natural writing systems.

In the present study, the attributes of magnitude, brightness, and hardness were selected because they had been found in previous research to contrast vowel phonemes, and because they appeared readily applicable to figural stimuli. In a preliminary study, 85 Hebrew-speaking subjects ranked CVC nonsenese trigrams varying in middle vowel on the magnitude, brightness, and hardness attributes. The symbolic connotations of vowels with regard to these attributes were found to be quite similar to those obtained for English-speakers. For example, the mean ranks of the vowels *i, e, a, u,* and *o,* on the magnitude dimension were 1.92, 2.22, 3.22, 3.82, and 3.84, respectively, in order of increasing size. This was thus the order expected for the Hindi and Japanese vowel characters when arranged by increasing magnitude, by decreasing brightness, or by decreasing hardness. The length attribute was added to explore the possibility that since orthographic signs in natural languages normally consist of line patterns, visual length might be the attribute that captures the magnitude dimension of sound symbolism.

PROCEDURE

Stimulus Material

The characters representing the vowel phonemes /i/, /e/, /a/, /u/, and /o/ in each of two languages, Hindi (or Devanagri) and Japanese (Katakana), were used. As far as is known, the writing systems of the two languages have evolved from different branches (Diringer, 1968). Figure 1 presents the

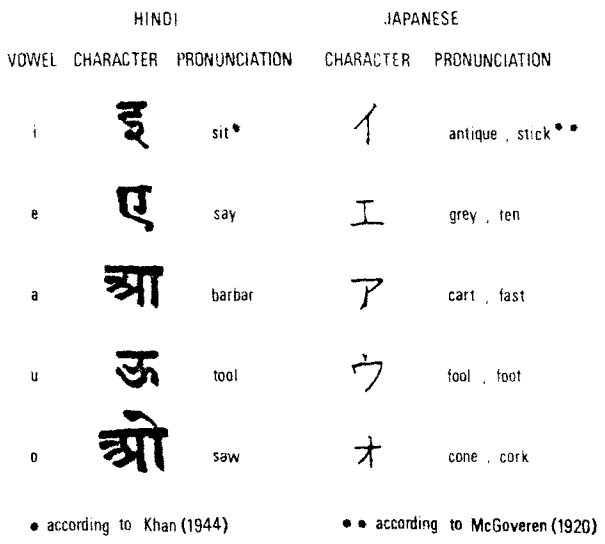

Fig. 1. Orthographic characters from Hindi and Japanese employed in this study, with English words illustrating their pronunciation.

orthographic characters employed as well as English words illustrating their pronunciation. The Hindi characters were copied from Khan (1944, p. XIV) and the Japanese characters from O'Neill and Yanada (1963, p. 7); they appeared on the response sheets in the exact size of their appearance in these books.

Procedure

All the material was compiled in a booklet containing the instructions and the stimulus material. The instructions directed *S*s to pair-compare the five characters of each language with regard to four attributes: magnitude, brightness, hardness, and length. Each of the four pair-comparison tasks appeared on a separate page of the booklet, with the four tasks presented in a random order for each subject. The instructions were presented before the first task and repeated in abbreviated form prior to each of the three remaining tasks with particular reference to the attribute to be judged in each task. The full instructions for magnitude read as follows (translated from Hebrew):

> There are languages in which the magnitude of an object is designated by certain words or symbols. Thus, one word or one sign would indicate that the object is "tiny," another would indicate that it is "small," another would indicate that it is "big," still another would indicate that it is "huge" and so on.
>
> You will be presented with signs from two languages, Hindi and Japanese, which designate different degrees of magnitude. In each case you will find two signs, one designating a relatively small object and the other designating a relatively large object. You are to examine each pair of signs and to judge which of them you feel designates a larger object.
>
> In previous studies it has been found that people are able to guess the meaning of signs from a language they do not know. In order to achieve best sucess in the task, examine the signs and try to get a "feel" for their meaning. For each pair of signs circle that sign which, according to your feeling, appears to designate the *larger* object. Guess and do not skip any pair.

Similar instructions were employed for the other three attributes. The brightness attribute was described in terms of the contrast between bright and dark and the instructions required circling the "brighter" sign. Hardness was presented in terms of the contrast hard *vs.* soft, with the instructions to mark the "softer" sign, and length in terms of the contrast short *vs.* long, with the instructions to mark the "longer" sign.

Following each set of instructions there appeared ten pairs of Hindi characters, followed by ten pairs of Japanese characters. The ten pairs for each language comprised all possible pairings of the five characters. A different random ordering of the pairs and of the members of each pair was employed for each of the pair-comparison tasks and for each of the languages, except that for each set of ten pairs each character appeared equally often on the left- and on the right-hand side.

Subjects

Ninety-two Hebrew-speaking tenth-graders, about half males and half females, took part in this study. The experiment was conducted in class during a regular classroom hour.

RESULTS

The proportion of subjects endorsing a given response was determined for each of the 80 pair-comparison items. Two types of analyses were carried out. In the first, only the responses to the first pair-comparison task

administered were considered; in the second, the results were pooled across all 92 subjects, ignoring order of administration. Since the pattern of the results was practically identical for both types of analyses, only the results of the latter will be reported.

We will first present the results for magnitude, brightness, and hardness, for which a particular ordering of the characters was predicted. Table I presents the proportion matrices for the three attributes for the Hindi and Japanese characters. Each cell contains the proportion of subjects judging the row vowel character to be larger, darker, or softer than the column vowel character. In each matrix the vowels are arranged in increasing order of the rank of their predicted scale values from small to large, from bright to dark, or from hard to soft. In each matrix only the proportion values for the upper diagonal cells are presented since the remaining proportions are redundant. If the symbolic implications of the orthographic characters correspond to those of their phonemic referents, then the following predictions should hold. First, the proportion values in the upper diagonal cells of each matrix should exceed 0.50, and, second, the values should increase the farther away from the diagonal. These two predictions conform to the requirements of weak and strong stochastic transitivity, respectively (Coombs, 1964).

The first prediction is clearly obtained. For each of the three attributes and for each of the two languages, all ten pair comparison proportions are in

Table I. Proportion of Times That the Row Vowel Character Was Judged Larger, Darker, and Softer Than the Column Character, for Hindi and Japanese

		Hindi vowel					Japanese vowel				
	Vowel	*i*	*e*	*a*	*u*	*o*	*i*	*e*	*a*	*u*	*o*
Magnitude	*i*	–	0.61	0.74	0.80	0.86	–	0.56	0.64	0.82	0.60
	e		–	0.72	0.75	0.85		–	0.87	0.90	0.72
	a			–	0.77	0.85			–	0.64	0.67
	u				–	0.85				–	0.62
	o					–					–
Brightness	*i*	–	0.83	0.76	0.56	0.75	–	0.71	0.74	0.62	0.80
	e		–	0.77	0.83	0.81		–	0.74	0.58	0.75
	a			–	0.75	0.74			–	0.58	0.53
	u				–	0.70				–	0.58
	o					–					–
Hardness	*i*	–	0.66	0.74	0.58	0.82	–	0.67	0.59	0.63	0.64
	e		–	0.83	0.71	0.73		–	0.63	0.60	0.63
	a			–	0.74	0.61			–	0.61	0.55
	u				–	0.76				–	0.60
	o					–					–

the predicted direction. Forty-nine of the 60 pertinent proportions are also significant. These results clearly indicate that the five characters of each language are ordered with regard to judgments of magnitude, brightness, and hardness symbolism, and that the order obtained in each case is consistent with that predicted.

The second prediction obtains most clearly for the magnitude judgments of Japanese characters, but does not tend to hold for the data of the remaining five matrices.

The composite-standard method described by Guilford (1954) was followed in obtaining estimates of scale values from the data of each proportion matrix. Figure 2 presents the scale values of the Hindi and Japanese characters on each of the three dimensions–magnitude, brightness, and hardness. It is clear from this figure that the scale separations of the Hindi characters are larger than those obtained for Japanese characters with regard to each of the three symbolic dimensions. The largest scale separations obtain for magnitude judgments of Hindi characters, The magnitude and brightness symbolisms of the Japanese characters yield scale values which approximate but do not entirely replicate the expected order (apparently

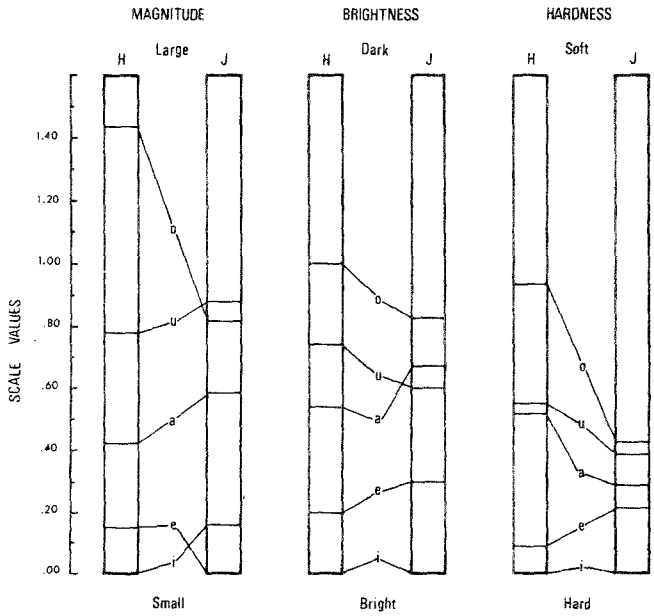

Fig. 2. Scale values of Hindi and Japanese vowel characters for magnitude, brightness, and hardness judgments.

because the corresponding pair-comparison data do not satisfy the requirements of strong stochastic transitivity). For the remaining four scales, the order of the scale values is exactly as predicted.

It was proposed that length symbolic implications of orthographic signs might constitute the best counterpart of magnitude phonetic symbolism, and therefore might yield a more articulate ranking of the orthographic signs from *i* to *o* in order corresponding to their phonetic size connotations. This proposition, however, was not supported by the data. The length scale values of the Hindi characters *i, e, a, u,* and *o* are 0.22, 0.24, 0.26, 0.00, and 0.41. The respective values for the Japanese characters are 0.53, 0.00, 0.63, 0.44, and 0.24.

DISCUSSION

The results of the present study indicate strong parallels between the symbolic connotations of vowel phonemes and the symbolic connotations of their orthographic representations in two natural languages, with regard to the symbolic dimensions of magnitude, brightness, and hardness. These results are consistent with the propositions that sound patterns and visual patterns tend to carry cross-culturally consistent symbolic connotations, and that the symbolic connotations of sounds have come to be embodied in their conventional orthographic signs in natural languages.

While the phenomenon of intersensory visual-auditory associations has often been discussed under the heading of *synesthesia* (Karwosky and Odbert, 1938; Wicker, 1968*a*), the term has commonly been employed to refer to exotic and idiosyncratic experiences such as colored hearing and the like (Brown, 1958), and often implies direct intersensory connections. When culturally shared visual-auditory associations are concerned, however, the results of a number of studies suggest that such associations may be mediated by semantic or affective connotations (Holland and Wertheimer, 1964; Karwosky *et al.*, 1942; Oyama and Haga, 1963). Where this is the case, it would appear more appropriate to apply the term *metaphor*, which denotes the application of a single verbal code to two different referent categories (Brown, 1958). In this sense, the results of the present study—such as the finding that the descriptive labels "large," "dark," and "soft" were judged appropriate to certain sounds as well as to their orthographic representations—can be taken to demonstrate that a metaphorical mode of thinking underlies the invention and/or evolution of orthographic signs designating phonemic stimuli.

Cassirer (1953) distinguished three mental stages in symbolic formation. The first involves a mimetic mode of representation; the second involves the

metaphoric or analogic representation of referents in one modality through referents in another modality; and the third involves symbolic representation. Clearly, the present study illustrates a mode of representation characteristic of the intermediate stage. Orthographic signs, as the results of the present study indicate, do not seem to be freely and arbitrarily chosen to symbolize their phonemic referents, and yet cannot be considered as their mimetic representation, in any strict sense of this term.

It would be interesting to determine the criterial physical attributes of orthographic signs which capture the sound symbolism. It was speculated that since vowel phonemes were most consistently found to differ in terms of magnitude symbolism and since orthographic characters consist of line patterns, length might be such a criterial figural attribute. Pair comparisons of the orthographic characters with regard to length symbolism did not yield promising results. This, however, might be because it is physical length rather than symbolic length which is related to magnitude symbolism. A cursory examination suggests that the physical length of the lines constituting the characters predicts their magnitude symbolism to a moderate extent (even more than it does their length symbolism). Comparison of the orthographic characters in terms of several additional physical attributes, however, suggests that the best single candidate for a criterial attribute might be the visual space occupied by the characters (of which physical length appears to be one component). Thus the characters *o*, *u*, and *a* tend to extend over a larger visual area than the characters *e* and *i*.

One problem which deserves consideration in this connection is whether magnitude, brightness, and hardness symbolisms are all represented in terms of a single figural attribute. Newman (1933) found that though for vowels largeness is associated with darkness, for consonants it tends to be associated with brightness, at least in that the order of consonants when arranged both by increasing largeness and by increasing brightness is as follows: alveolars, labials, palatals. In the light of this observation, the fact that in the present study the figural symbolism of orthographic characters was found to parallel the sound symbolism of their phonemic referents in terms of all three dimensions of magnitude, brightness, and hardness seems all the more impressive, and might suggest that the figural parallel of sound symbolism should be sought in physiognomic or Gestalt-type attributes of the orthographic signs (Kohler, 1947).

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