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A forced-choice paired-comparison test containing 252 items was presented to eight subjects. Each item consisted of two geometric figures chosen systematically from a sample of four ellipses and four triangles. The subjects (six female and two male adults who spoke only English) were asked to decide which of the two figures went best with a monosyllabic nonsense sound presented on audio tape. The results showed a striking orderliness. There was consistency within and between subjects in their ability to match sounds to figures. The existence of the phenomenon of "phonetic symbolism" in adult native speakers of English was supported. (Author/DO)

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PHONETIC SYMBOLISM IN ADULT NATIVE SPEAKERS OF ENGLISH[1]

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A forced-choice paired-comparison test containing 252 items was presented to 8 Ss. Each item consisted of 2 geometric figures chosen systematically from a sample of 4 circles and 4 triangles. Ss were asked to decide which of the 2 figures went best with a monosyllabic nonsense sound presented on audio tape.

The results showed a striking orderliness. There was consistency within and between Ss in their ability to match sounds to figures. The existence of the phenomenon "phonetic symbolism" in adult native speakers of English was supported.

For many years, various investigators have attempted to determine whether there is evidence for the phenomenon known as "phonetic symbolism." Previous work has been done with both natural and artificial languages, most notably by Sapir (1929), Newman (1933), Jespersen (1922), Brown, Black, and Horowitz (1955), and Taylor and Taylor (1962). Thus far, the evidence for phonetic symbolism has been inconclusive.

In the present study, an attempt was made to determine whether adult native speakers of English can agree upon the choice of phonetic labels for visually presented geometric figures.

Procedure

Six female and two male adults, who spoke only English, served as Ss.

A forced-choice paired-comparison test containing 252 items was presented to Ss. Each trial, or item, consisted of two figures chosen systematically from a sample of eight figures. Figure 1 is a representation of the figures used. Four of the figures were elliptical and four were triangular. The four elliptical figures varied from a complete circle to an ellipse with a vertical axis one-eighth the height of the original circle; the two intervening ellipses had vertical axes one-half and one-fourth the height of the original circle. The four triangles also varied along the vertical dimension from an equilateral triangle with the same vertical axis as the circle to triangles having one-half, one-fourth, and one-eighth the height of the first triangle. For all figures, the horizontal dimension remained the same. Thus to each ellipse corresponded a triangle with the same vertical and horizontal lengths. Each of the figures was paired with every other figure and presented on slides to Ss. There were 28 possible pairings of the eight figures.

Ss were asked to decide which of the two figures presented on each trial, left or right, was most like, or went best with, the monosyllabic nonsense sound presented on audio tape.

Nine sounds were used. They were derived from a systematic pairing over vowel and consonant dimensions, using the consonant sounds [w], [d], and [k], and vowel sounds [a], [u], and [i]. The consonant sound [s] was added to the end of each monosyllable to reduce the meaningfulness of the items. Thus the nine sounds presented to Ss were [was], [wus], [wis], [das], [dus], [dis], [kas], [kus], and [kis].[2]

Insert Figure 1 About Here

Each auditory stimulus was paired with each of the 28 pairs of figures presented on slides; the 9 sounds and 28 slides resulted in a total of 252 trials. With the aid of a computer, both auditory and visual stimuli were randomly ordered and paired. The only constraint was that no slide or sound was presented twice in succession. The ordering of figures on individual slides was reversed on one half of the trials to control for right-left preferences.

Each trial was conducted as follows: a 500 Hz tone on audio tape announced the showing of a slide. Two sec. of silence followed. Then came the monosyllabic sound, followed by 4 sec. of silence during which each S indicated whether the sound went best with the figure on the "left" or "right." Then another slide was presented as a beep sounded to start the next trial. Note that each slide was projected during the entire trial. The 252 trials were conducted at a single sitting for all Ss. The Ss were run in a group.

Results

The results show a striking orderliness. There is a consistency within and between Ss in their ability to match sounds to figures. A five-way analysis of variance (See Table 1) found the interactions between vowel and figure size, vowel and figure shape, and consonant and shape all to be significant at the .01 level, and the consonant and size interaction significant at the .025 level. In other words, all the interactions between figures and sounds were significant, figures being separated into shape (triangle vs. ellipse) and size (large vs. small), and sounds being separated into consonants [w], [d], and [k], and vowels [a], [u], and [i].

Insert Table 1 About Here

Moreover, only one significant main effect emerged from the analysis of variance: there was a bias in favor of smaller figures, regardless of what other figures or monosyllables were paired with them.

Figures 2-5 reproduce some of the results. Figure 2 shows the mean percentage for each of the four sizes and vowels chosen and reflects a collapsing across the shape dimension. The left-most point of the abscissa (1,5) stands for the largest triangle and the largest ellipse, the right-most point the smallest triangle and the smallest ellipse. As figure size decreases, the figure is less and less chosen for the vowel [a], and more and more for the vowels [u] and [i]. Large figures are associated with [a] and small ones with [u] and [i].

Insert Figure 2 About Here

Figure 3 is similar to Figure 2 except that it is the consonant sounds that are here plotted. Once again, there is a cross-over, with the [w] consonant being chosen more often and the [d] and [k] consonants less often as the figure size decreases. The effect is not large, however (it was the least significant interaction), and most of the difference comes between the smallest and second-smallest figures. Thus, large figures are slightly preferred for [d] and [k] over [w], and the smallest figures are slightly preferred when paired with [w].

Insert Figure 3 About Here

Figures 4 and 5 give the results across the shape dimension. The mean percentage of triangles and ellipses chosen for each vowel sound is presented in Figure 4. Triangles, regardless of size, are the preferred choice for [i], in slightly greater measure than [a] and in much greater measure than [u]. Ellipses show the opposite results: they are chosen in the presence of [u] more than of [a], and more in the presence of [a] than of [i]. Thus, in the presence of the vowel sound [i], triangles are chosen; in the presence of [u], ellipses are chosen. Neither form is preferred for the sound [a].

Insert Figure 4 About Here

Figure 5 shows the mean percentage of triangles and ellipses chosen for each consonant sound. As with vowels, the shape dimension has an effect on Ss' choices. With triangles, [k] was most preferred and [w] least; with ellipses, [w] was most preferred, [k] least.

Insert Figure 5 About Here

Ss were quite consistent in their responses to the stimuli, as the evident orderliness of the data for any given S shows. Furthermore, there is a strong inter-subject consistency with regard to these orders.

From these data it can be suggested that Ss perferred large ellipses most in the presence of [was] and [das]; they preferred small ellipses in the presence of [wus]. Large triangles went best with [kas], small triangles with [kis] and [dis]. For vowels there appears to be a continuum of size preference from large to small in the order [a] to [u] to [i]. This order corresponds phonetically to the shift from a large to a small oral cavity; in terms of tongue position it corresponds to a shift from low back to high front; and in terms of distinctive features it corresponds to a shift from compact grave to diffuse acute. A similar ordering though not so clear a one, can be made for the consonants.

Discussion

The consonants and vowels were chosen for this study in order to provide such a continuum. The additional constraint, that meaningfulness should be kept low, explains the addition of the final [s] to each monosyllable.

The figures were arbitrarily chosen in an attempt to represent what are often referred to as "round," "sharp," "large," and "small", etc. sounds The triangle and the ellipse seemed to be the simplest figures exhibiting these qualities. The experiment has since been repeated and from preliminary analyses it would appear that the results are the same as those reported here.

Two types of research are now being conducted to see if the effects observed in this study are universal. One approach is cross-cultural. Monolingual French adults and children have been given the same task as Ss in this study and the data are now being analyzed. In addition, steps are being taken to conduct the experiment with Indian, Georgian, and Japanese Ss. The second approach is developmental, and to this end the experiment will be conducted on American children of various ages as well as on children from other cultures.

Thereafter, the effect of the method used will be examined by running the study in various ways, for example by forcing Ss to produce the monosyllable vocally and by reversing the forced-choice situation so that Ss must decide which of two syllables best fits a particular figure. Finally, an attempt should be made to design the figures so that they vary continuously from triangle to ellipse while their area remains constant.

The present study suggests that there are some unrecognized, consistent bases which native English speakers use to respond linguistically to geometric figures. Further examination of these effects with different language samples is needed to explain the results.

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Footnotes

[1]The research reported herein was performed in part pursuant to Contract OEC-3-6-061784-0508 with the U. S. Department of Health, Education, and Welfare, Office of Education, under the provisions of P. L. 83-531, Cooperative Research and the provisions of Title VI, P. L. 85-864, as amended. This research reported is one of several which have been submitted to the Office of Education as Studies in Language and Language Behavior, Progress Report VII, September 1, 1968.

[2]The vowels in these sound groups were pronounced in the following way:
a as in father,
i as in beat,
u as in rule.

Figure Captions

Fig. 1. Phonetic symbolism in adult native speakers of English.

Fig. 2. Figure-size preferences for three vowels.

Fig. 3. Figure-size preferences for three consonants.

Fig. 4. Shape preferences for three vowels.

Fig. 5. Shape preferences for three consonants.

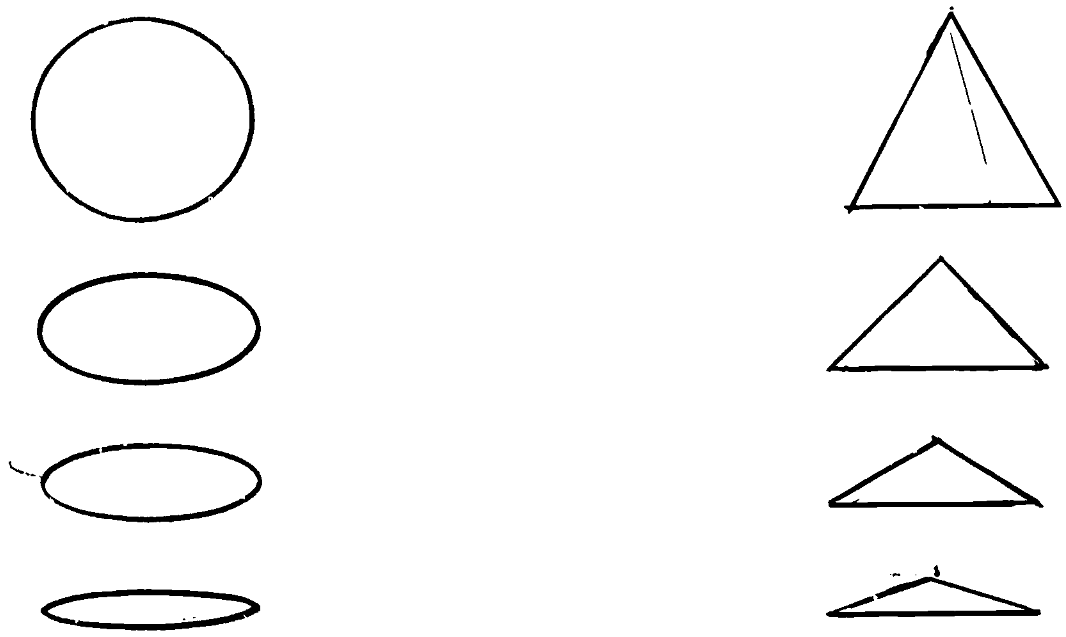
Table 1

	S. V.	S. S.	d.f.	M. S.	F	P
A	(shape, fixed)	2.00	1	2.00	.32	N. S.
AP		43.55	7	6.22	-	
B	(size, fixed)	39.00	1	39.00	5.17	< .05
BP		52.87	7	7.55	-	
C	(consonants, fixed)	0.00	2	0.00	-	
CP		0.00	14	0.00	-	
D	(vowels, fixed)	0.00	2	0.00	-	
DP		0.00	14	0.00	-	
P	(subjects, random)	0.00	7	0.00	-	
AB		10.12	1	10.12	2.25	N. S.
ABP		31.56	7	4.51	-	
AC		188.08	2	94.04	8.00	< .01
ACP		165.70	14	11.84	-	
AD		451.75	2	225.87	28.06	< .01
ADP		112.70	14	8.05	-	
BC		50.19	2	25.10	5.89	< .025
BCP		59.59	14	4.26	-	
BD		689.19	2	344.60	8.83	< .01
BDP		546.60	14	39.04	-	
CD		0.00	4	0.00	-	
CDP		0.00	28	0.00	-	
ABC		10.35	2	5.17	2.03	N. S.
ABCP		35.64	14	2.55	-	
ABD		4.01	2	2.01	1.00	N. S.
ABDP		27.97	14	2.00	-	
ACD		19.92	4	4.98	1.34	N. S.
ACDP		104.22	28	3.72	-	
BCD		38.73	4	9.68	2.31	N. S.
BCDP		117.31	28	4.19	-	
ABCD		4.65	4	1.16	.38	N. S.
ABCDP		86.20	28	3.08	-	

Five-way analysis of variance.

Fixed: Shape (A); Size (B); Consonants (C); Vowels (D). 314

Random: Subjects (P).



28 possible pairings

	a	u	i
w	[was]	[wus]	[wis]
d	[das]	[dus]	[dis]
k	[kas]	[kus]	[kis]

252 (28 x 9) trials per subject

8 subjects

Figure 1

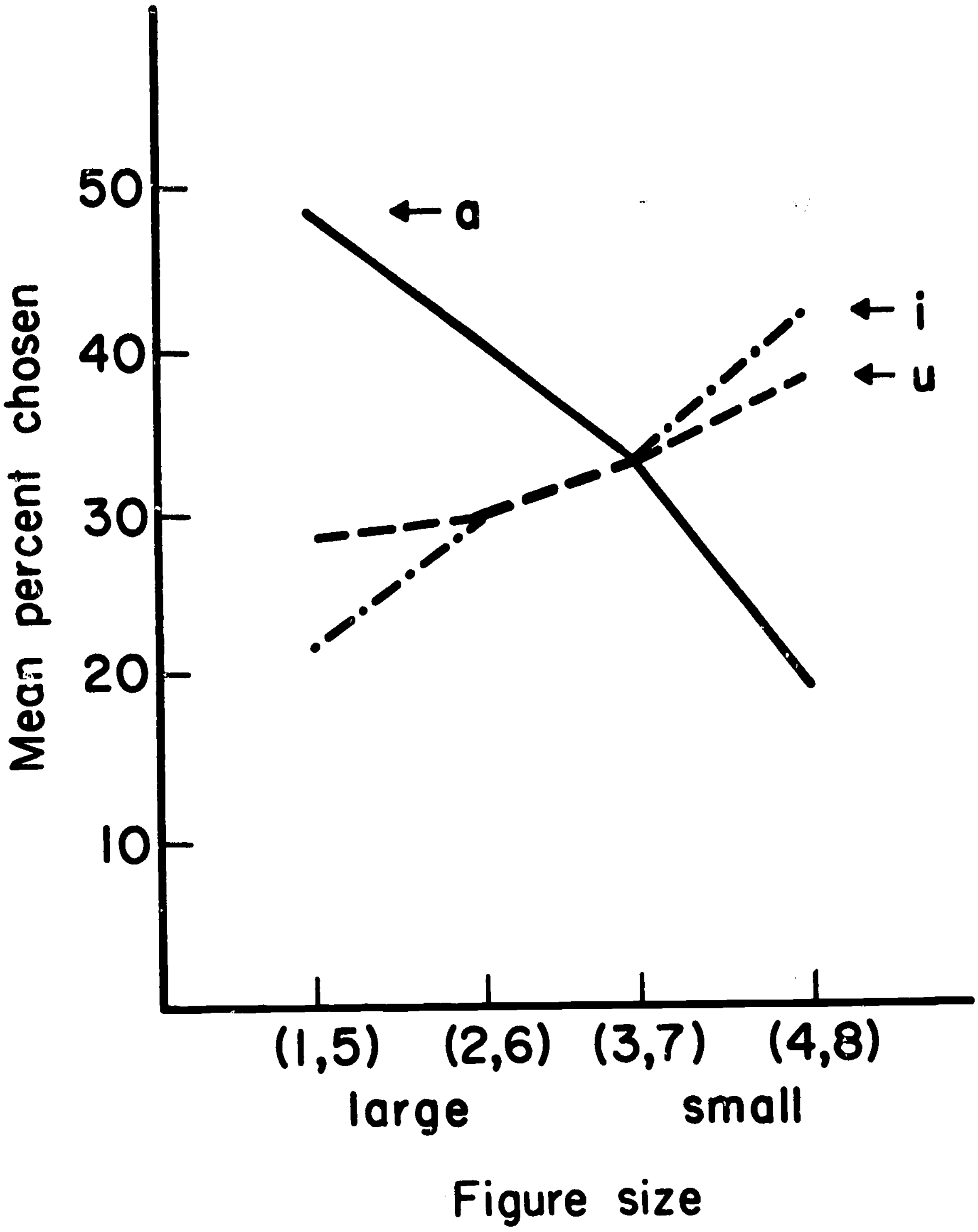

50
40
30
20
10
Mean percent chosen
a
i
u
(1,5)
(2,6)
(3,7)
(4,8)
large
small
Figure size

Figure 2

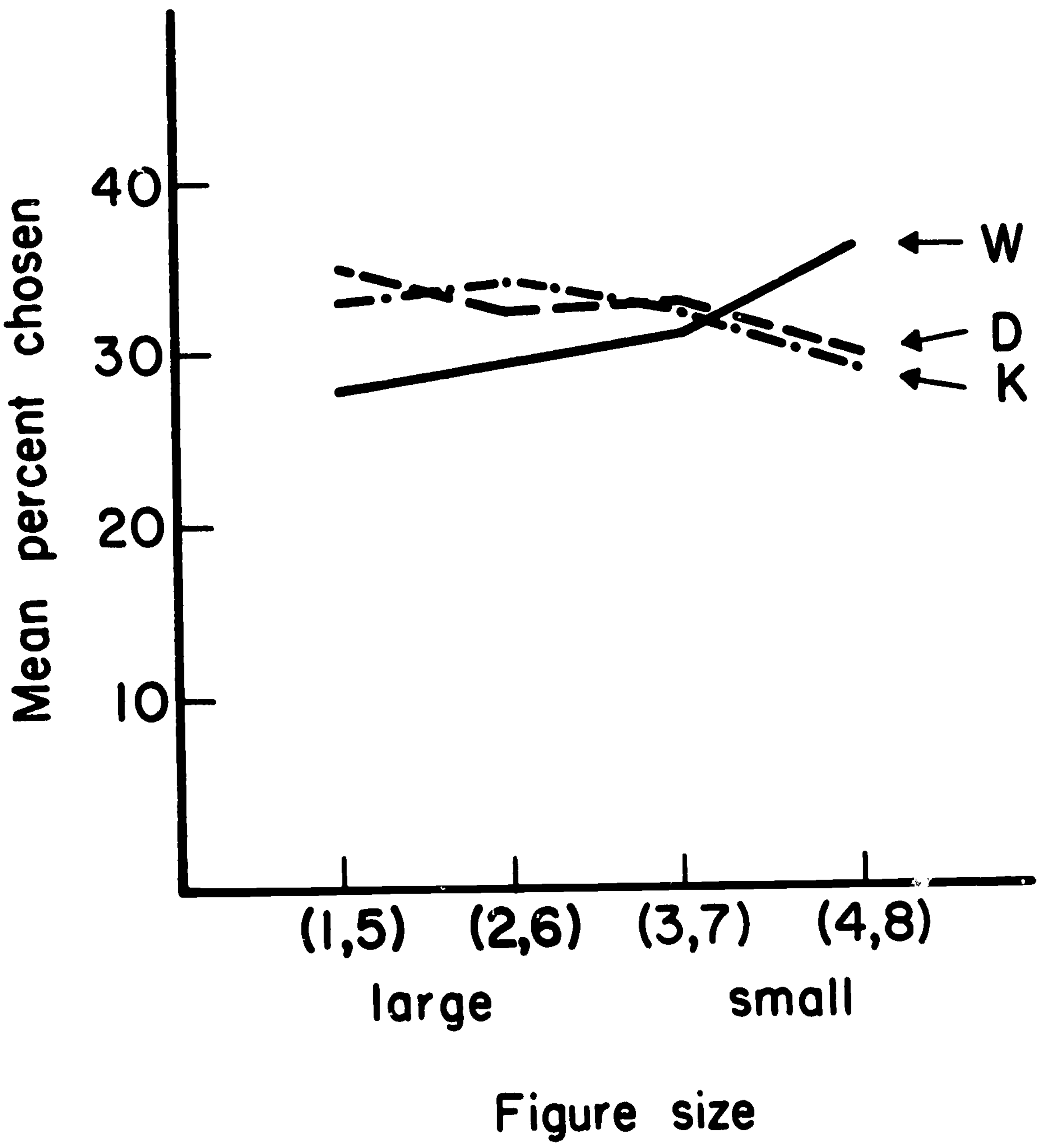

Mean percent chosen
40
30
20
10
W
D
K
(1,5)
(2,6)
(3,7)
(4,8)
large
small
Figure size

Figure 3

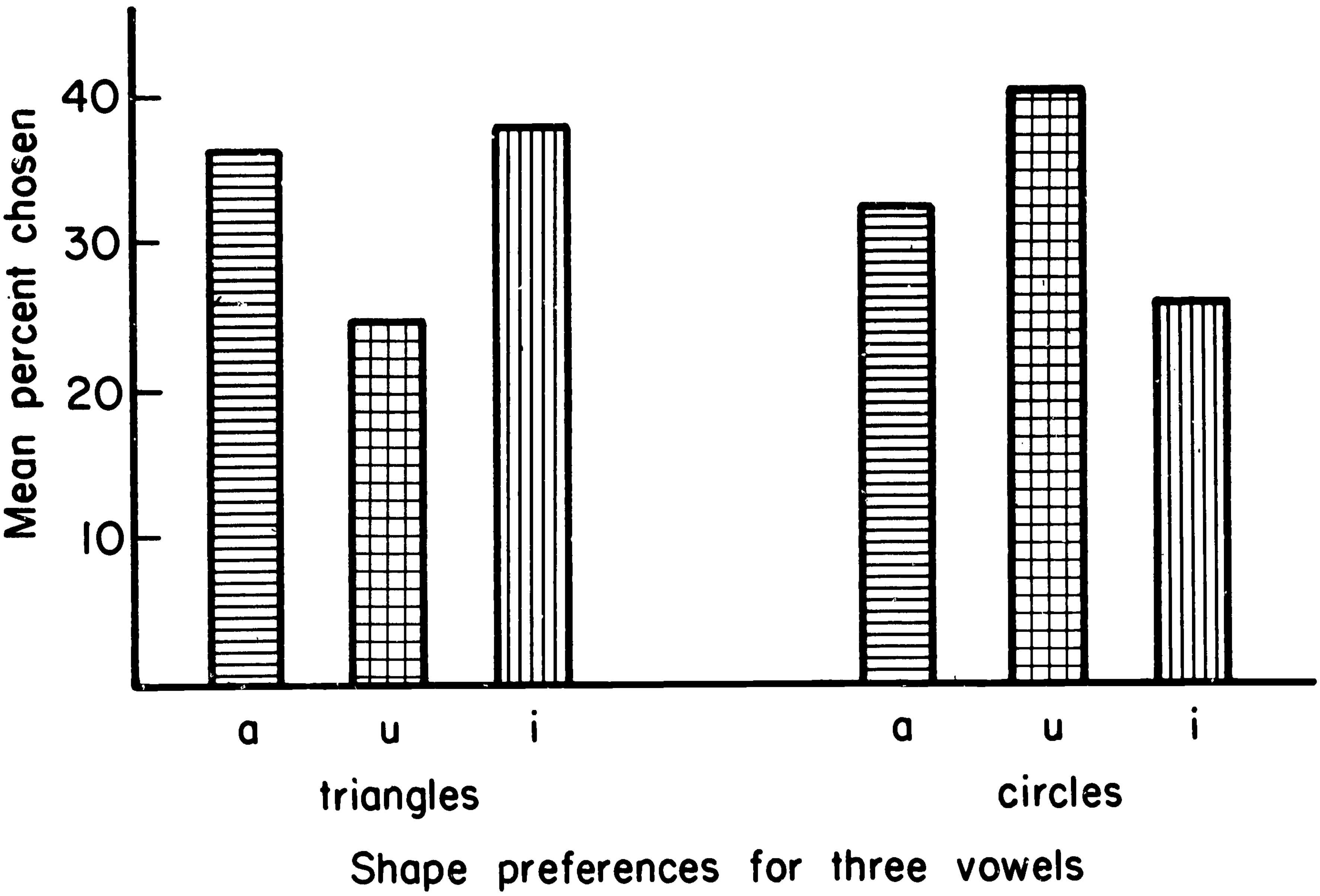

Mean percent chosen
40
30
20
10
a
u
i
a
u
i
triangles
circles
Shape preferences for three vowels

Figure 4

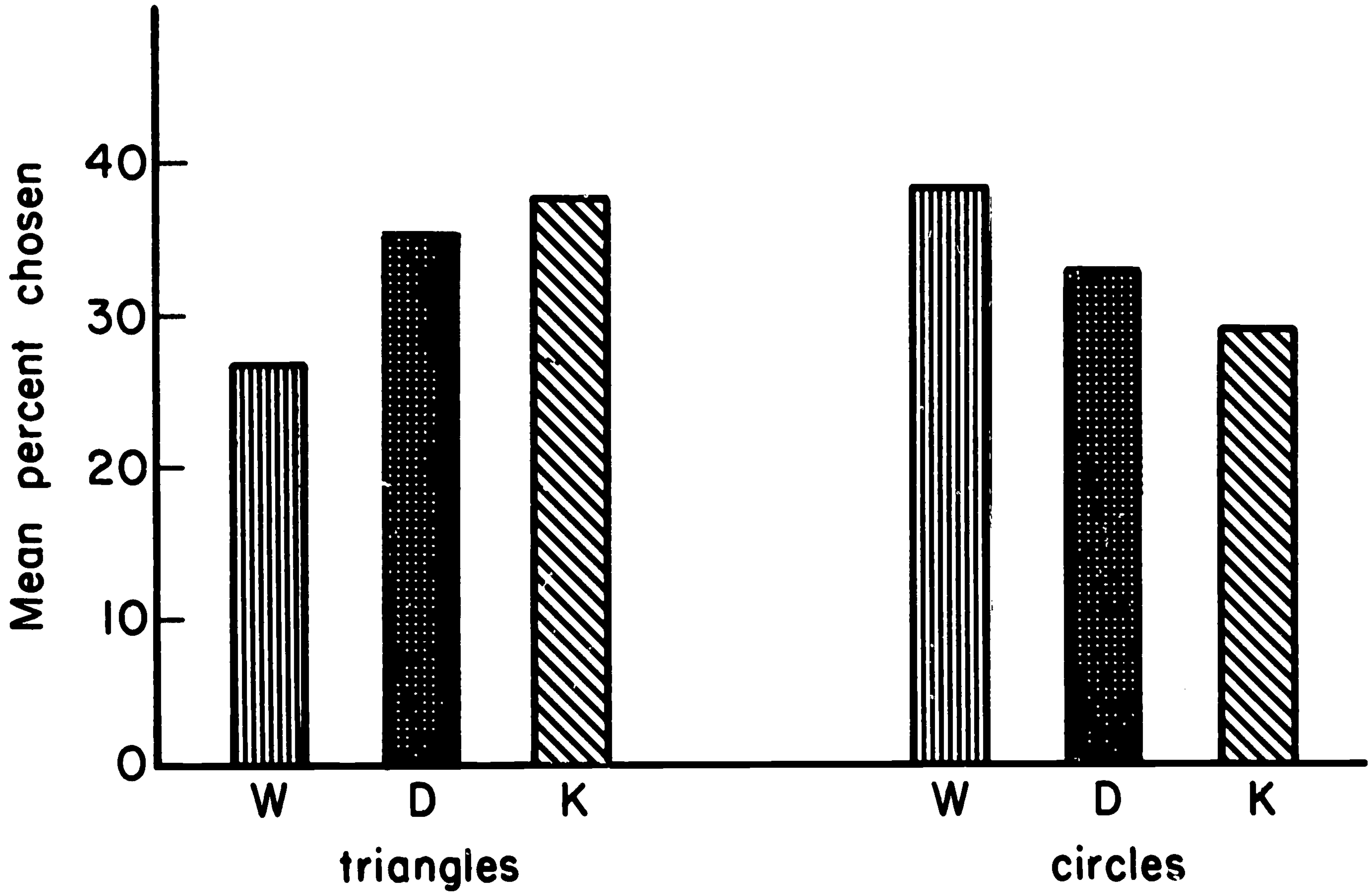


Figure 5