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In the three studies reported here, an attempt was made to determine whether adult native speakers of English can agree on the choice of phonetic labels for visually presented geometric figures. It was the purpose of these studies to obtain evidence in support of the "phonetic symbolism" hypothesis. An initial study and two replications were performed with eight adults who spoke only English serving as subjects in each experiment. The subjects agreed about the relationship between vowel sounds and the size of figure regardless of shape. The sound [a] (as in "father") was more often chosen for large figures while [i] (as in "beat") was more often chosen for small. A less striking but discernible trend was observed for the labelling of figures with vowel sounds. It was tentatively concluded that, for English speakers, there does exist unrecognized yet consistent bases for relating sounds and visual stimuli. (Authors/JD)

PHONETIC SYMBOLISM IN ADULT NATIVE SPEAKERS OF ENGLISH: THREE STUDIES[1]

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Three studies using adult native speakers of English are reported. Each study asked Ss to label elliptical or triangular figures of different size with a CVC trigram. It was the purpose of these studies to obtain evidence in support of the "phonetic symbolism" hypothesis.

Ss agreed about the relationship between vowel sounds and the size of figure regardless of shape. The sound [a] was more often chosen for large figures while [i] was more often chosen for small. A less striking but discernible trend was observed for the labelling of figures with vowel sounds. It was tentatively concluded that, for English speakers there does exist unrecognized yet consistent bases for relating sounds and visual stimuli.

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 using both natural and artificial languages. Most notable are the works of Jespersen (1922), Sapir (1929), Newman (1933), Brown, Black, and Horowitz (1955), and Taylor and Taylor (1962). Thus far the evidence for or against phonetic symbolism has been inconclusive.

In the present studies, an attempt has been made to determine whether adult native speakers of English can agree upon the choice of phonetic labels for visually presented geometric figures. An initial study and two replications have been performed.

Procedure

Eight adults who spoke only English served as Ss in each experiment. 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. 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, with the two intervening ellipses having vertical axes one-half and one-fourth of 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 one-half, one-fourth, and one-eighth of the height of the first triangle. For all figures, the horizontal dimension remained the same. Thus for each ellipse, there was 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 are 28 possible pairings of the eight figures.

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

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

Each auditory stimulus was paired with every one of the 28 possible pairs of figures, with nine sounds and 28 slides, resulting in a total of 252 trials. With the aid of a computer, both auditory and visual stimuli were ordered randomly and then paired randomly. The only constraint on this procedure 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 500cps tone was presented via audio tape at which time a slide was shown; then followed 2 sec. of silence; then the monosyllabic sound was presented 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 tone sounded to signal the start of the next trial. Note that each slide was projected for the entire trial. The 252 trials were conducted at one sitting. 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 was performed on the data of each study using size, shape, consonant, vowel, and Ss as factors.

Study 1. The five-way analysis of variance found the interactions between vowel and figure size (F = 8.83), vowel and figure shape (F = 28.06), and consonant and shape (F = 8.00) all to be significant at less than the .01 level, and the consonant and size interaction (F = 5.89) significant at less than the .025 level. Table 1 presents this analysis of variance summary. 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

Further, the ANOVA resulted in only one significant main effect. There is a bias in favor of smaller figures generally, regardless of what othe. figure or monosyllable was paired with it.

Study 2. The same ANOVA as was used in Study 1 yielded a significant interaction for size by vowel (F = 5.32, $p < .05$), and, surprisingly, a significant shape by size interaction (F = 32.32, $p < .01$). None of the other interactions was significant. Table 2 shows the analysis of variance summary for Study 2.

Insert Table 2 about here

Study 3. This five-way ANOVA (Table 3) resulted in two significant interactions. As in both of the previous studies, the size by vowel interaction was significant (F = 15.36, $p < .01$). In addition, shape by vowel was significant at the .01 level (F = 9.85). It should be noted that in all three studies the size by vowel interactions were significant. Ss paired large figures with [a] and small figures with [i]. No other interaction was consistently significant in all three experiments, although shape by vowel was significant in Studies 1 and 3 at the .01 level of confidence. In those two studies Ss paired ellipses with the sound [u] and triangles with [i].

Insert Table 3 about here

Figures 1 through 4 present a selected portion of the results, the size attribute by sound attribute interactions. Figure 1 shows the mean percentage that each of the four sizes was chosen for each vowel sound. This, of course, means that the shape dimension has been collapsed. The three graphs represent the same dimensions for the three studies. The left points of the abscissae (1, 5) contain the largest triangle and the largest ellipse (circle). The points at the right side of the abscissae represent the smallest triangle and smallest ellipse. In all three experiments, as figure size decreases, the use of [a] as a label also decreases. As figure size decreases, the use of [u] and [i] increases. In other words, large figures are chosen with [a] and small figures are preferred for [u] and [i].

Insert Figure 1 about here

Figure 2 is similar to Figure 1 except that here the plot is for the consonant sounds rather than the vowels. In Studies 1 and 2 there is a crossover, with the [w] consonant increasing and the [d] and [k] consonants decreasing as the figure size decreases. The effect is significant only in Study 1; the trend is present but not significant in Study 2 and the trend is not present in Study 3.

Insert Figure 2 about here

Figures 3 and 4 show the results across the shape dimension, with size collapsed. In Figure 3, the mean percent that triangles and ellipses are chosen for each vowel sound is presented in histogram form for all three studies. Triangles, regardless of size, are the preferred choice for [i]; next most preferred is [a] and last is the sound [u] in all experiments. Ellipses show the opposite results. Ellipses are chosen in the presence of [u] more than [a], and in the presence of [a] more than [i]. Thus in the presence of the vowel sound [i], triangles are preferred; in the presence of [u], ellipses are chosen. Neither triangles nor ellipses are preferred for the sound [a]. This interaction between vowel and shape was significant in Experiments 1 and 3 but not in 2.

Insert Figure 3 about here

Figure 4 shows the mean percent of times that triangles and ellipses were chosen with each of the consonant sounds. In Studies 1 and 3, shape appears to have an effect on Ss' choices, although the effect is significant only in Study 1. In Studies 1 and 3, [k] was most preferred and [w] least in the presence of a triangle. For ellipses, [w] was most preferred; [k] least preferred in Studies 1 and 3.

Insert Figure 4 about here

Discussion

The three studies show a consistency for vowels, but not for consonants. In the three studies cited here, one effect is clearly replicated. The choice of vowel sounds and the size of figures are highly correlated. Native American speakers of English are more likely to assign the vowel sound [a] to the larger figure of our pairs and the sound [i] to the smaller.

The order of preference for assigning vowel sounds to figures was the same in all three studies. Ss most often labelled triangles with [i]; next preferred was [a] and least preferred was [u]. For ellipses the order was reversed in all three studies, that is, [u] was most preferred, [i] least, and [a] was intermediate. This vowel by shape interaction was statistically significant in two of three studies.

The consonants used in these three studies were not consistently related to either figure size or shape. The significant interaction necessary to support a relationship between consonants and figure attributes was found only in Study 1. There was no consistent relationship in the three studies between consonants and figure size or shape. The figures in these studies were chosen in an attempt to represent what various persons have referred to as "round," "sharp," "large," "small" etc. sounds. The triangle and the ellipse seemed to be the simplest figures that exhibited these qualities.

In order to approximate the linguistic continua of large-to-small oral cavity size, low back-to-high front in terms of tongue position, and [compact] [grave] to [diffuse] [acute] in terms of a distinctive features theory, the continua of vowels from [a] to [u] to [i] was chosen. Since the vowel continuum has been related to the size dimension by these data one can assert that the linguistic correlates of the phonetic continuum [a-u-i] are also related for native speakers of English. What is not clear is whether any or all of these factors are most causative in producing these results. Taylor and Taylor (1962) suggest that the morphology of the language system is more important in explaining phonetic symbolism than is the phonology.

The results from these studies support the conclusion that there is some, as yet undetermined, factor which permits monolingual adult native American speakers of English to agree on the assignment of vowel sounds to figures of different size.

It should be clear that these data do not speak to the issue of the universality of phonetic symbolism as a phenomenon. They lend support to the conclusion of Taylor and Taylor (1962) that within a language group phonetic symbolism can be demonstrated. A series of studies have been initiated with French speakers of varying ages to determine the universality of the phenomenon between languages within the same family.

Footnotes

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[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.

References

Brown, R. W., Black, A. H., & Horowitz, A. E. Phonetic symbolism in natural languages. Journal of Abnormal and Social Psychology, 1955, 50, 388-393.

Jespersen, O. Language: It's nature, development, and origin. London: Allen & Unwin, 1922.

Newman, S. Further experiments in phonetic symbolism. American Journal of Psychology, 1933, 45, 53-75.

Sapir, E. A study in phonetic symbolism. Journal of Experimental Psychology, 1929, 12, 225-239.

Taylor, I., & Taylor, M. M. Phonetic symbolism in four unrelated languages. Canadian Journal of Psychology, 1962, 16, 344-356.

Figure Captions

Fig. 1. Mean percent of times vowels are paired with four figure sizes (large to small). Studies 1, 2, and respectively.

Fig. 2. Mean percent of times consonants are paired with four figure sizes (large to small). Studies 1, 2, and 3 respectively.

Fig. 3. Histograms of mean percent that vowels are chosen for shape (triangles and ellipses). Studies 1, 2, and 3 respectively.

Fig. 4. Histograms of mean percent that consonants are chosen for shape (triangles and ellipses). Studies 1, 2, and 3 respectively.

Table 1

Five-Way Analysis of Variance

Study 1

	Source of Variance	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	(Ss, 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	-	

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

Random: Ss (P).

Table 2

Five-Way Analysis of Variance

Study 2

	Source of Variance	S. S.	d.f.	M. S.	F	P
A	(shape, fixed)	10.12	1	10.12	.58	N. S.
AP		121.54	7	17.36	-	
B	(size, fixed)	6.12	1	6.12	.16	N. S.
BP		272.65	7	38.95	-	
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	(Ss, random)	0.00	7	0.00	-	
AB		14.22	1	14.22	32.32	< .01
ABP		3.11	7	.44	-	
AC		68.08	2	34.04	2.05	N. S.
ACP		232.58	14	16.61	-	
AD		75.00	2	37.50	1.75	N. S.
ADP		300.33	14	21.45	-	
BC		1.75	2	.87	.06	N. S.
BCP		199.14	14	14.22	-	
BD		503.58	2	251.79	5.32	< .05
BDP		662.64	14	47.33	-	
CD		0.00	4	0.00	-	
CDP		0.00	28	0.00	-	
ABC		1.36	2	.68	.13	N. S.
ABCP		72.64	14	5.19	-	
ABD		1.69	2	.85	.39	N. S.
ABDP		30.31	14	2.16	-	
ACD		20.92	4	5.23	.83	N. S.
ACDP		176.42	28	6.30	-	
BCD		24.17	4	6.04	1.02	N. S.
BCDP		164.94	28	5.89	-	
ABCD		15.97	4	3.99	1.35	N. S.
ABCDP		82.69	28	2.95	-	

Table 3

Five-Way Analysis of Variance

Study 3

	Source of Variance	S. S.	d.f.	M. S.	F	P
A	(shape, fixed)	107.55	1	107.55	10.78	< .05
AP		69.78	7	9.97	-	
B	(size, fixed)	.01	1	.01	.00	N. S.
BP		319.65	7	45.66	-	
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	(Ss, random)	0.00	7	0.00	-	
AB		10.13	1	10.13	3.67	N. S.
ABP		19.32	7	2.76	-	
AC		94.70	2	47.35	2.43	N. S.
ACP		272.63	14	19.47	-	
AD		402.20	2	201.10	9.85	< .01
ADP		285.80	14	20.41	-	
BC		43.03	2	21.52	1.93	N. S.
BCP		156.31	14	11.17	-	
BD		899.37	2	449.69	15.36	< .01
BDP		409.97	14	29.28	-	
CD		0.00	4	0.00	-	
CDP		0.00	28	0.00	-	
ABC		5.58	2	2.79	1.90	N. S.
ABCP		20.64	14	1.47	-	
ABD		5.32	2	2.66	1.26	N. S.
ABDP		29.56	14	2.11	-	
ACD		23.80	4	5.95	1.46	N. S.
ACDP		113.54	28	4.06	-	
BCD		6.72	4	1.68	0.60	N. S.
BCDP		77.94	28	2.78	-	
ABCD		1.09	4	0.27	0.13	N. S.
ABCDP		59.36	28	2.12	-	

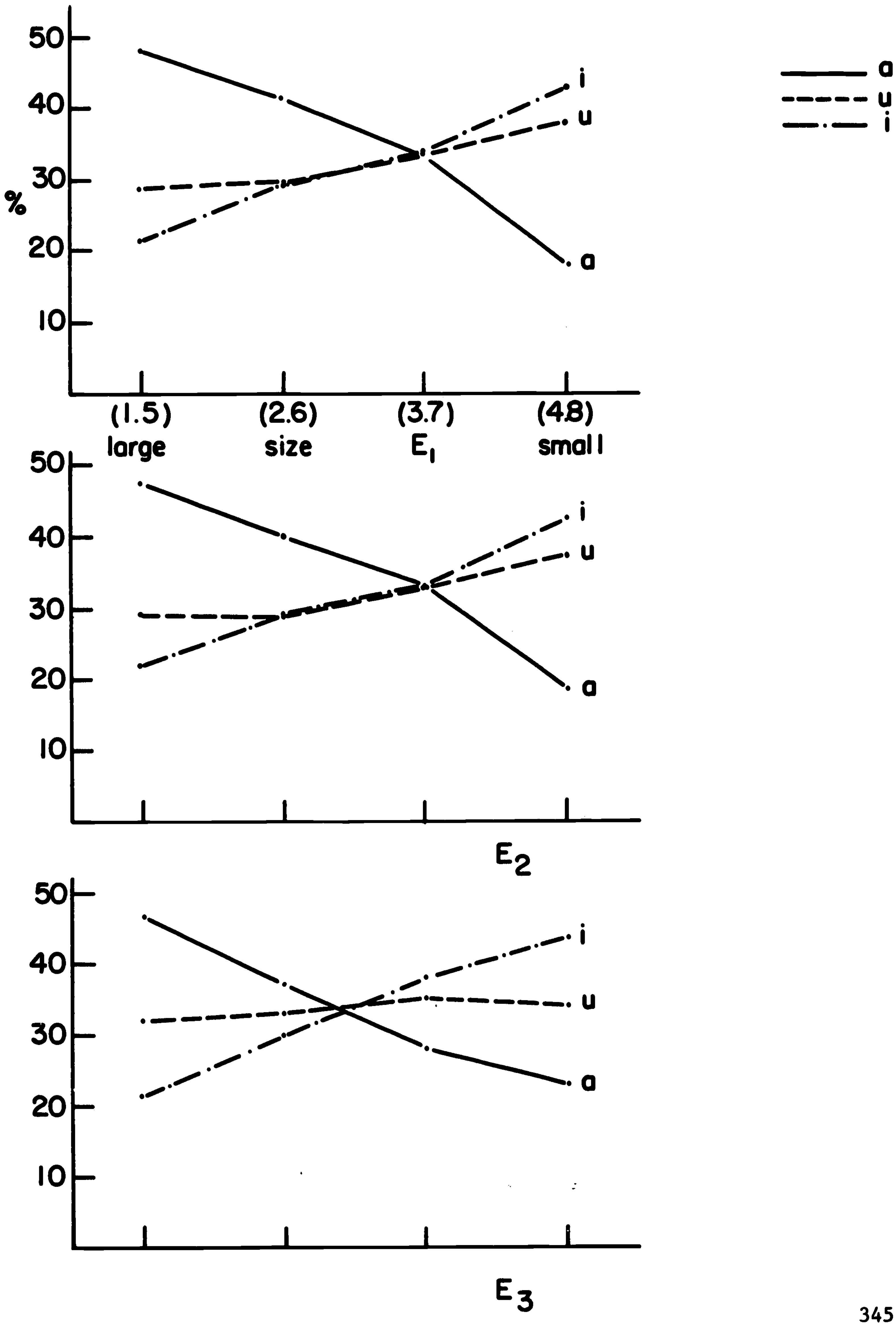
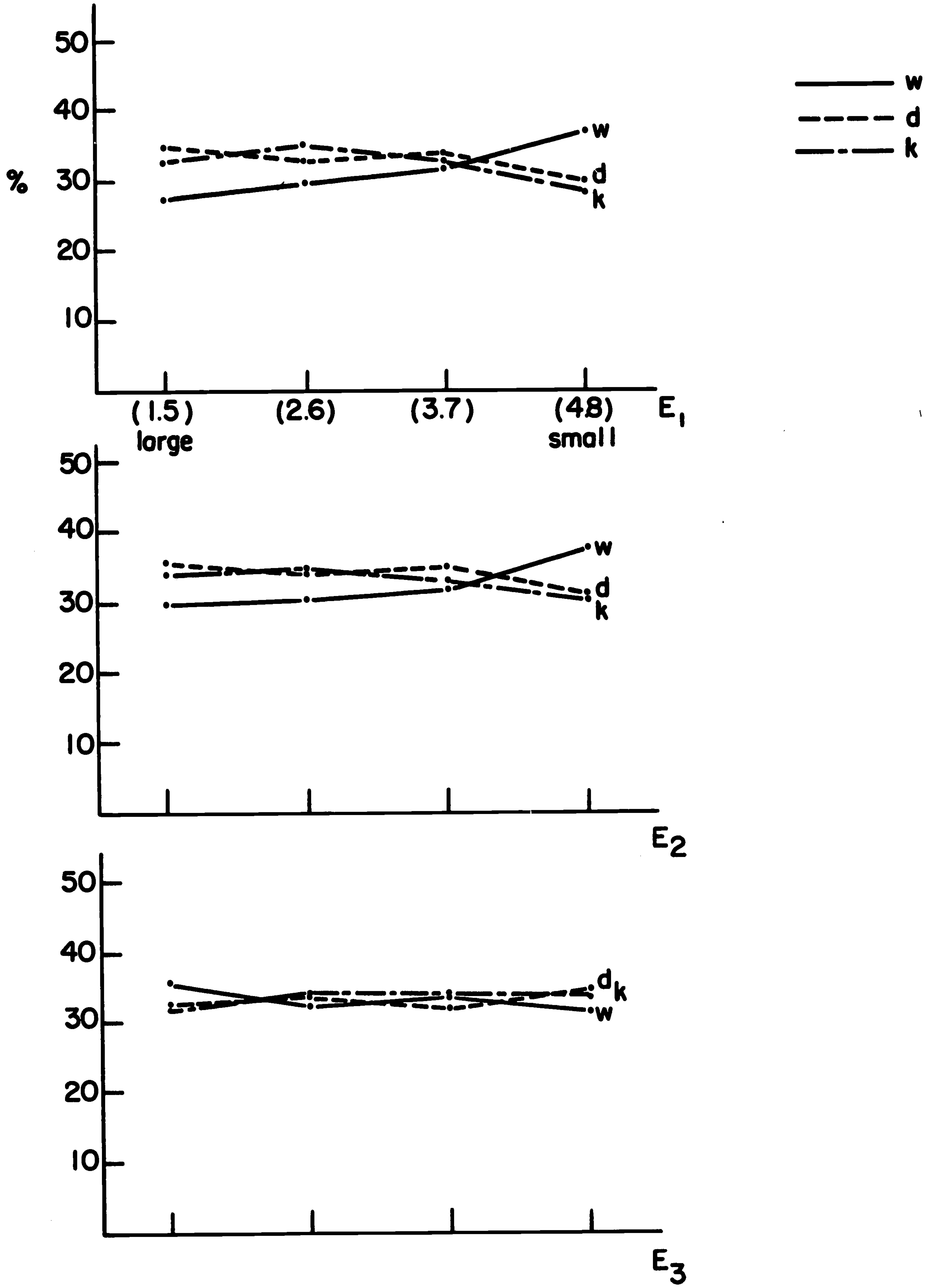


Figure 1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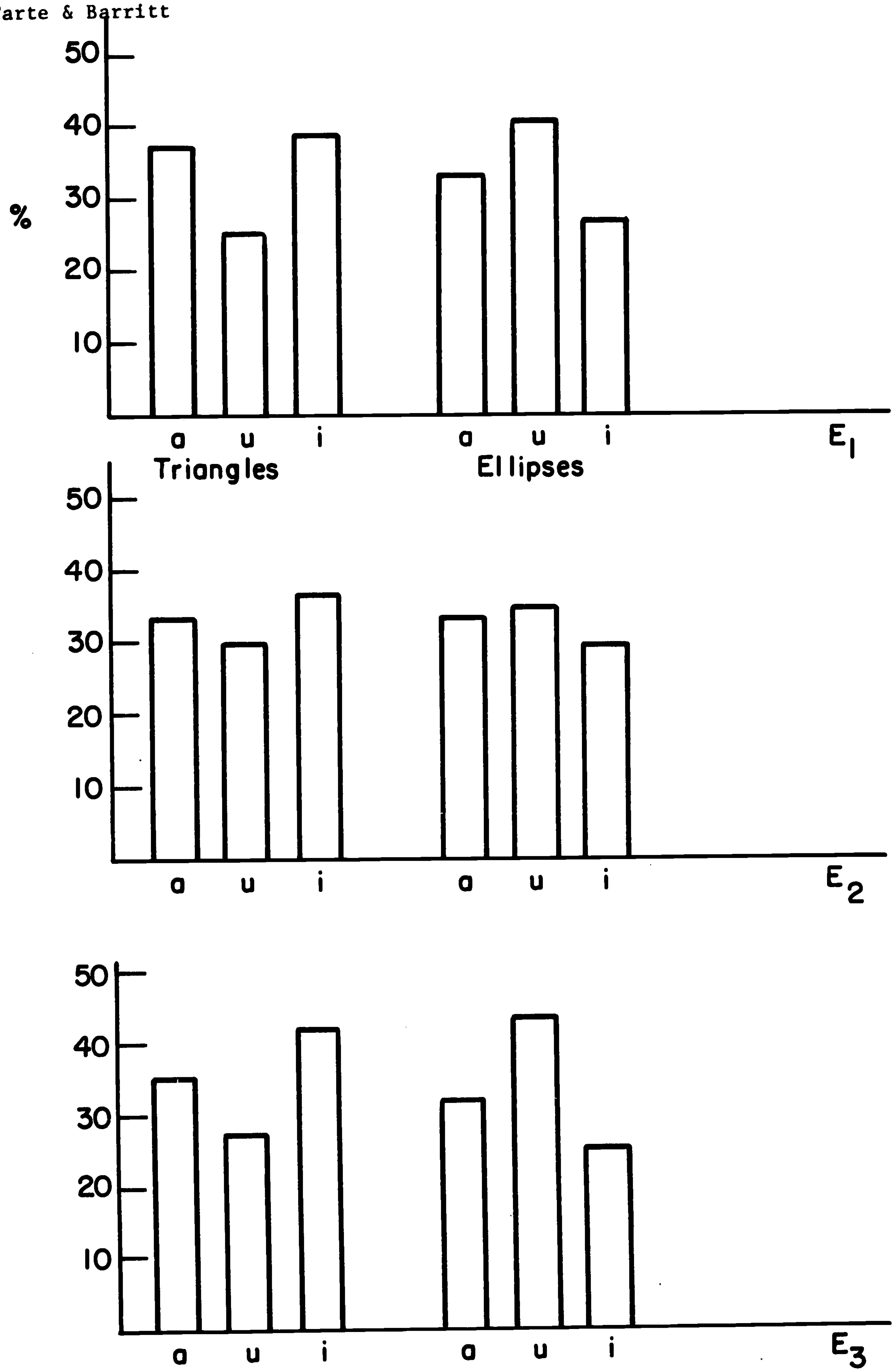
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Figure 3

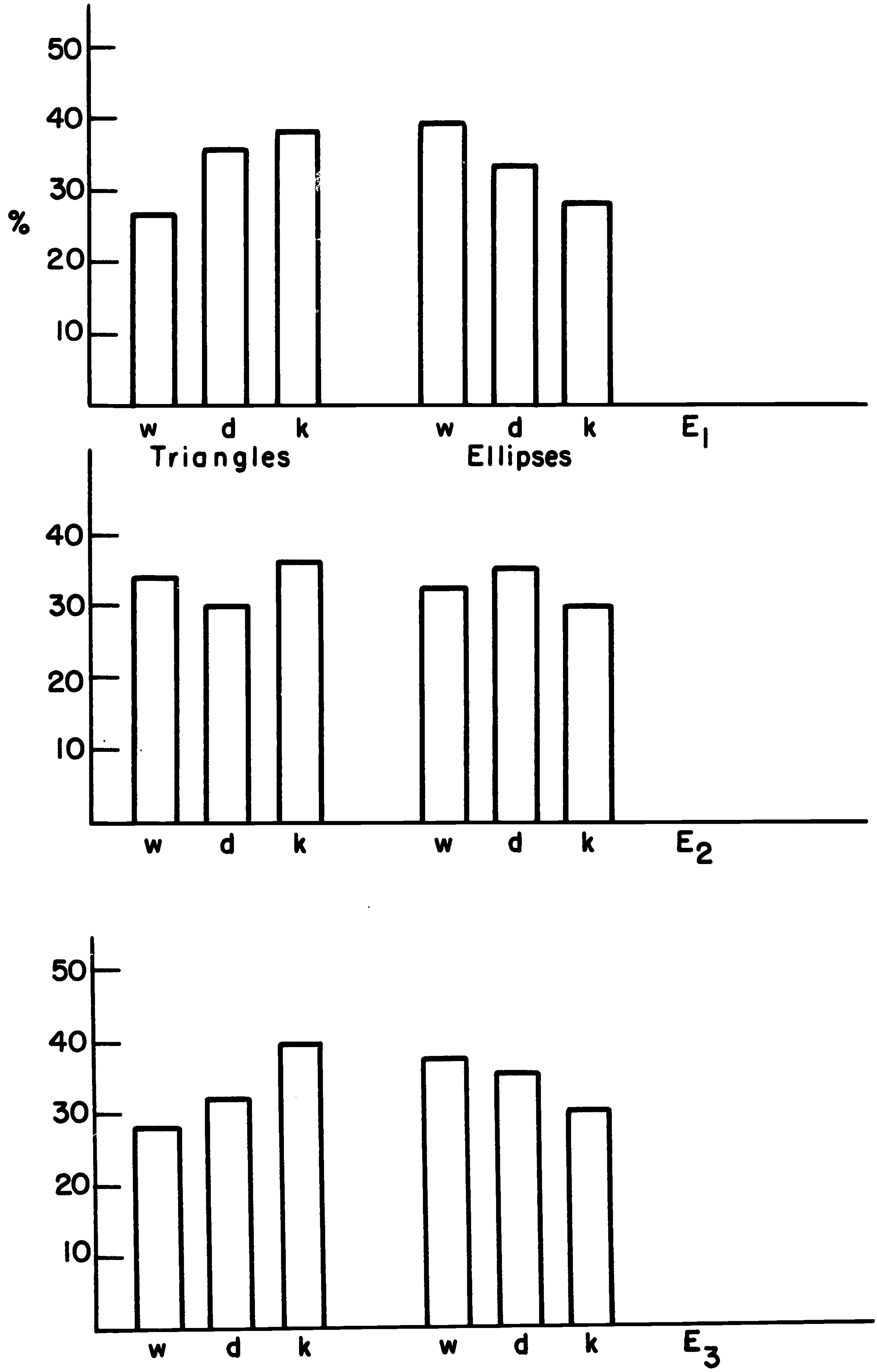
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Figure 4