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Multiplying Values of Intensive Probabilistic, and Frequency Adverbs When Combined with Potency Adjectives

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The stability of the multiplying values of nine intensive, ten probabilistic, and ten frequency adverbs was assessed by comparing previous results, which involved ratings on an evaluative dimension, with results obtained when the ratings were on a potency or strength dimension. Three different groups of over 100 college students made the potency ratings for the three different classes of adverbs in combination with 14 adjectives. The results largely supported the multiplicative function proposed by Cliff (1959) and indicated that the multiplying values were highly similar across these two dimensions.

Several investigators have demonstrated that adverbs alter the meaning of the words they modify in a multiplicative fashion. Cliff (1959) proposed an equation of the form:

$$x_{ij} = a_i s_j + K, \qquad (1)$$

where

x_{ij} = the empirical scale value of the ith adverb combined with the jth adjective;

a_i = the multiplying value of the ith adverb;

s_j = the theoretical scale value of the jth unqualified adjective;

K = an additive constant reflecting the arbitrary zero-point of the empirical scale values.

This model has been substantiated by Cliff (1959), using intensive adverbs (e.g., *very*), Howe (1962), using probabilistic adverbs (e.g., *possibly*), Howe (1966) and Lilly (1968), using frequency adverbs (e.g., *always*).

All previous investigations of the multiplicative model have used adverbs combined with evaluative adjectives. It is well known, however, that the evaluative dimension is only one of several primary dimensions in the domain of affective meaning. Based on work with the Semantic Differential (Osgood, Suci, and Tannenbaum, 1957), there appear to be three primary dimensions; evaluation, potency, and activity. Osgood (1962) has summarized a large variety of studies supporting his conception of the "semantic space."

The purpose of the present study was to test the generality of the Cliff model in another dimension of affective meaning—the potency or strength dimension. By using the same adverbs as previous investigators, the stability of the multiplying value of each adverb could also be assessed. If the Cliff model were accurate, then the multiplying value associated with each adverb should be relatively invariant across any dimension chosen.

METHOD

Questionnaire Construction. The adjectives were selected to encompass a wide range of connotation with respect to strength. The words were also relatively common as judged by the Thorndike and Lorge (1944) word count. There were seven words connoting strength and six connoting weakness. The word *average* was chosen to represent a neutral point on the dimension.

Three different questionnaires were constructed. Questionnaire 1 had the intensive adverbs used by Cliff (1959). The 9 adverbs were combined with the 14 adjectives to produce 126 combinations. In addition each adjective was presented unqualified and there were 20 repeated items. Questionnaire 2 had the 10 probabilistic adverbs used by Howe (1962), while Questionnaire 3 had 10 frequency adverbs used by both

Howe (1966) and Lilly (1968). Questionnaires 2 and 3 had 160 items—the 140 combinations of 10 adverbs with 14 adjectives, 14 unmodified adjectives, and six repeated items. All three questionnaires had 40 items per page and the rating was on a scale from 1 (weakest) to 9 (strongest). The order of the items was randomly determined. The instructions to the *S*s appeared on the first two pages of the questionnaire. These instructions were the same as Cliff's except that the rating was made on the degree of strength or power suggested rather than on the degree of favorableness.

The repeated items mentioned above were included as a reliability check, since it was not known whether or not *S*s could reliably make judgements on the potency dimension.

Subjects and Procedure. The *S*s for this study were from a course in introductory psychology at Kent State University. Research participation was part of the course requirement. The three different questionnaires were administered to three different groups of *S*s. For Questionnaire 1 there were 36 males and 83 females; for Questionnaire 2 there were 15 males and 119 females; for Questionnaire 3 there were 15 males and 89 females. Testing was done in groups of approximately 30. Most *S*s completed the entire questionnaire in 30 min.

Data Analysis. The method of successive intervals (Diedrich, Messick, and Tucker, 1957) was used to transform the categorical ratings to an interval metric.

This scaling method has been used in previous research on words and word combination (Cliff, 1959; Howe, 1962, 1966; Jones and Thurstone, 1955; Lilly, 1968; Mosier, 1941). The computation of the theoretical scale values (the a's and s's) and the additive constant (K) followed Cliff's (1962) factor-analytic procedure.

Results and Discussion

Since the theoretical scale values of the component words are of primary interest, the three tables of empirical scale values will not be presented here.[1] With respect to the reliability of the empirical scale values, it was found that the correlation between the scale values of the 20 repeated items on Questionnaire 1, the intensive adverbs, was .99. The six repeated items on Questionnaires 2 and 3 yielded correlations of .94 and .97, respectively. The correlations among the scale values of the unqualified adjectives provide another index of the stability of the empirical scale values. These correlations were .95, .94, and .98 for the scale values from Questionnaires 1 with 2, 1 with 3, and 2 with 3, respectively. All the above correlations, besides being statistically significant ($p < .01$), clearly indicate that the *S*s as a group were responding in a highly consistent fashion.

Three cross-product matrices were computed—one for each type of adverb. These matrices were computed across the adjectives which resulted in one cross-product matrix of order 10 by 10, for the intensive adverbs, and two cross-product matrices of order 11 by 11 for the probabilistic and frequency adverbs. These matrices were then factored to determine the eigenvalues and eigenvectors. As Gulliksen (1959) has illustrated, the eigenvalues of a matrix are particularly important since they indicate the amount of variance accounted for by each factor. Cliff (1959, 1962) has demonstrated that Eq. 1 implies that two factors should theoretically account for all the variability in the observed data. Another way of stating this fact is that the three cross-product matrices should each be of rank two if the model is correct.

The evidence bearing on the adequacy of a two-factor fit will be presented next. For the intensive adverbs, the first two eigenvalues were 3437.3 and 50.2, while the sum of the remaining eight eigenvalues was 2.4. The first two factors accounted for 99.9% of the variance. For the probabilistic adverbs, the first two eigenvalues were 4600.0 and 109.6; while the sum of the remaining nine eigenvalues was 8.3. The first two factors accounted for 99.3% of the variance. For the frequency adverbs, the first two eigenvalues were 3698.8 and 176.1, while the sum of the remaining nine eigenvalues was 4.4. The first two factors accounted for 99.9% of the variance. These results clearly support the supposition that all the cross-product matrices are of rank two.

[1] Three tables giving the empirical scale values have been deposited with the American Documentation Institute. Order Document No. NAPS-00014 from ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D.C. 20540. Remit in advance $1.25 for photocopies or $1.25 for microfilm and make checks payable to: Chief, Photoduplication Service, Library of Congress.

TABLE 1

SCALE VALUES OF ADJECTIVES AND ADDITIVE CONSTANTS

	Scale values			Additive constants		
	1[a]	2[b]	3[c]	K_1[a]	K_2[b]	K_3[c]
strong	.70	4.62	1.34	4.93	4.14	4.83
powerful	.79	4.75	1.34	4.91	4.16	4.88
vigorous	.52	4.21	1.19	5.09	3.99	4.80
forceful	.61	4.16	1.46	5.01	4.09	4.88
hard	.56	4.47	1.56	4.98	4.23	5.02
energetic	.49	4.19	1.27	5.03	3.90	4.74
robust	.58	3.94	1.29	4.96	4.03	4.89
average	.06	− .83	.15	4.93	5.05	4.93
tired	− .44	.26	−1.15	4.84	3.45	5.07
fragile	−1.49	−1.68	−1.52	5.40	3.60	4.81
soft	− .58	−1.25	−1.15	4.83	3.63	4.95
powerless	− .86	−2.61	−1.91	4.64	4.17	5.04
feeble	− .80	−2.75	−2.24	4.68	4.02	4.62
weak	−1.04	−3.01	−1.96	5.00	4.19	4.89

[a] Derived in the context of intensive adverbs, $\bar{K}_1 = 4.95$.
[b] Derived in the context of probabilistic adverbs, $\bar{K}_2 = 4.05$.
[c] Derived in the context of frequency adverbs, $\bar{K}_3 = 4.88$.

After factor scores for both the adjectives and the adverbs had been obtained, the factors were transformed (rotated) so that theoretical values, the a's and s's, and the additive constant, K, could be found. The least-squares solutions for the adjectives are summarized in Table 1, while the solutions for the adverbs are given in Table 2.

The theoretical scale values of the adjectives are fairly consistent across the three types of adverbs. The correlations among the theoretical scale values in Table 1 are .93 (Questionnaire 1 with 2), .95 (Questionnaire 1 with 3), and .97 (Questionnaire 2 with 3). The last three columns of Table 2 provide another index of the goodness of fit of the model.

TABLE 2

MULTIPLYING VALUES OF THE ADVERBS

Intensive adverbs	Scale value	Probabilistic adverbs	Scale value	Frequency adverbs	Scale value
slightly	.279	doubtfully	.218	always	1.750
somewhat	.447	possibly	.322	continually	1.150
rather	.652	supposedly	.325	frequently	.449
pretty	.814	probably	.421	often	.447
quite	1.160	conceivably	.454	sometimes	.147
decidedly	1.131	apparently	.453	occasionally	.113
unusually	1.652	doubtlessly	.816	infrequently	− .189
very	1.573	certainly	.829	rarely	− .335
extremely	3.261	definitely	1.335	seldom	− .311
		undeniably	1.205	never	− .887

Theoretically, each of these columns should contain the additive constant K, for each set of data. To the extent the values within each column vary, the model is inappropriate. The standard deviations for these three columns indicate those derived in context of the probabilistic adverbs are most variable or least consistent with the proposed model. Both the intensive and frequency adverbs resulted in very good approximations to the model. However, the standard deviations are all similar to those reported by previous investigators.

An additional finding in support of Eq. 1 was that the correlations among the K values across the various types of adverbs were very small, $-.17$, $-.21$, .04, for each pair of columns in Table 1. These correlations suggest there were no systematic departures from the model, as far as the estimation of the K's was concerned. In other words, it seems reasonable to assume from the present data that the adjectives selected share a common origin rather than having unique zero-points.

The data presented in Table 2 give the multiplying values associated with each adverb. Equation 1 predicts that the second column of each rotated factor matrix for the adverbs should consist of a column of One's. The standard deviations of these columns again provide a quantitative index of the goodness of fit of the model. These standard deviations were .02, .07, and .02 for the intensive, probabilistic, and frequency adverbs, respectively. These results clearly indicate that the multiplicative model describes the adverbs very well indeed. Since the fit was judged to be very good, these approximations to columns of One's are not presented in Table 2.

All results reported above clearly support the multiplicative model proposed by Cliff. However, the question of the invariance of the multiplying values of the adverbs across the two dimensions of affective meaning, evaluative and potency, remains to be assessed. To measure the degree of invariance, the multiplying values given by Cliff (1959), Howe, (1962), and Lilly (1968) were compared to those derived in the present study. Correlation coefficients were used as a measure of relationship. For the intensive adverbs the correlation was .92 (Cliff's Wayne State data); for the probabilistic adverbs the correlation was .96, and for the frequency adverbs the correlation was .99. It appears that the multiplying values of the adverbs remain largely constant across the two dimensions studied.

Considering each set of data separately, all the evidence to date suggests that Cliff's multiplicative model adequately describes the manner in which adverbs alter the meaning of adjectives. It does appear, however, that the results of the present study are more variable than the results of previous studies where evaluative ratings were used. Ratings on a potency or strength dimension may be more difficult for *S*s to make than are ratings on an evaluative dimension. In particular, the word *fragile* in the present study appeared to have different connotations for some *S*s, especially when combined with the intensive adverbs. The variance for items in which *fragile* appeared were generally larger than combinations involving other adjectives. The correlations among the sets of theoretical scale values would have been higher if the scale values associated with *fragile* were omitted.

With regard to the stability of the multiplying values associated with the three classes of adverbs, the only striking departure from the results of the previous studies occurred for the adverb *extremely*. The multiplying value reported by Cliff (1.59) was considerably less than that in the present study (3.26). This result suggests that intensive adverbs may not be entirely free of potency connotations. When one considers, however, the time and possible subject differences between the two studies, as well as the different affective dimensions used, the results appear remarkably consistent. The results of comparing the multiplying values of the probabilistic and frequency adverbs are even more consistent, which suggests that these types of adverbs have little evaluative or

potency connotations. The possibility exists, of course, that other dimensions may exist for which the type of adverb would interact with the type of dimension used.

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