AFFECTUAL DYNAMICS IN SIMPLE SENTENCES

DAVID R. HEISE

University of Wisconsin

Original attitudes toward words predict attitudes resulting when the words are combined into simple assertions. For example, attitudes toward "father," "kill," and "uncle" predict how one feels toward all three after the assertion "the father killed the uncle." The prediction equation involves terms for the original subject attitude (S), the original verb attitude (V), and the interaction of V and object attitudes (Q). The level of prediction is high, with original attitudes accounting for two-thirds of the total variance in resultant attitudes. Activity connotations can be predicted in the same way, except that a V × Q interaction term is unnecessary. Potency connotations also appear to be predictable, but the obtained data do not permit firm generalizations.

Recent research by Heider (1967) and Gollob (1965, 1968) has set attitude-balance theory in a linguistic framework, with attitude change being analyzed as a function of attitude combination in sentences. A basic innovation in the approach is recognizing that verbs as well as nouns have attitudinal associations, and so a sentence like "The Senator kissed the baby" is to be analyzed in terms of three attitudes rather than in terms of two attitude objects which are associated or dissociated. The verb attitude enters into attitude dynamics both additively and through a multiplicative interaction with the object. Gollob's research suggests that considering verb attitudes explicitly and quantitatively yields attitude-change predictions of high accuracy.

The present study builds on the insights developed by Heider and Gollob, replicating some of their research and extending it in several directions. Since Gollob's study is the more quantitative, it serves as the more important guideline and comparison standard for analyses here. An effort is made to replicate Gollob's finding that the attitude toward the subject of a sentence can be predicted from the attitudes associated with each word of the sentence. However, in the present study the original word attitudes are measured directly rather than inferred as in Gollob's analyses. In addition, an attempt is made to show that changes in the attitudes toward sentence verbs and objects also can be predicted in terms of the original attitudes that enter into a sentence. Indeed, it is proposed that a single formula is adequate for predicting attitude shifts for subject, verb, and object. Finally, the present study deals not only with evaluation reactions, but also with two other dimensions of affective response—activity and potency (Osgood, 1962).

METHOD

Prediction Models

The procedure in the present study is to postulate several models, or sets of equations, that might be used to predict attitudinal dynamics in sentences. The models range from simple to complex, and the major goal of analyses is to evaluate the different models in terms of their predictive adequacy and their parsimony. The preferred models then are examined further to determine their implications concerning attitudinal dynamics.

Each of the equations given subsequently is a possible basis for predicting the attitudes that result from simple assertions. An equation specifies how measurements of the original attitudes for the words in the sentence are to be processed to estimate the new, or resultant, attitudes that occur as a consequence of the assertion. An "original attitude" is defined here as the average attitudinal rating of a word when the word is placed in a neutral context. A neutral context is a sentence consisting of function words except for the stimulus word, for example: "She is a wife; He kicked it." A "resultant attitude" is defined as the average rating of a word in its non-neutral context, such as: "The wife kicked her husband."

The simple sentences considered here consist of a subject, a transitive verb, and an object. The original attitude associated with the word in the
subject slot is represented subsequently as $S$, and the resultant attitude is $S'$. Similarly, the original and resultant attitudes for the words in the verb and object positions are $V$ and $V'$ and $Q$ and $Q'$, respectively. ($Q$ rather than $O$ is used to avoid later confusion with zero.)

**Model I.** The simplest model for predicting resultant attitudes from original attitudes derives from assuming that attitudes may shift in different sentences, but such shifts are unpredictable from knowing the other attitudes evoked in the same sentence. In such a case, the best quantitative predictor of a resultant attitude for a word is merely the original attitude for that word, which gives the following model:

$$S' = K_a + aS + bO + cQ$$

$$V' = K_b + bV + cQ$$

$$Q' = K_c + cQ$$

(1)

The first formula indicates that the mean rating of the subject word in context ($S'$) is estimated to be some constant ($K_a$) plus the mean rating of the same word in a neutral context ($S$) weighted by a constant factor ($a$). Similarly, the verb resultant ($V'$) is some constant ($K_b$) added to the weighted ($b$) value of the original attitude toward the verb ($V$). The formulas are recognizable as regression-type equations, and, indeed, models are subsequently related to data through regression procedures. Error terms, indicating that the equations predict imperfectly, have been dropped here for simplicity. Model I is of little interest theoretically, but it provides a lower base line for evaluating other models.

**Model II.** Another possibility is that all of the attitudes evoked in a sentence do operate together to produce a resultant, but the resultant is a simple additive function of the original attitudes. This contrasts with Model I by suggesting that to predict, say, $S'$, one should consider not only $S$ but also $V$ and $Q$. It contrasts with later models by postulating the absence of significant interactions. Equations representing the model are as follows:

$$S' = K_a + aS + bO + cQ + dQ(V \times Q)$$

$$V' = K_b + bV + cQ + dQ(V \times Q)$$

$$Q' = K_c + cQ + dQ$$

(II)

Model III. Gollob's work (1968) suggests that Model II can be improved by adding a $V \times Q$ interaction term to the equations in Model II. This also reflects somewhat the stance of traditional balance theories that postulate that the overall configuration of attitudes can be crucial in determining attitude dynamics. The formulas below allow for a $V \times Q$ interaction term as a linear function of the product of $V$ and $Q$. This means that when the verb and object differ in attitudinal direction (one good and the other bad), a decrement occurs in the resultants, whereas if they are both in the same direction (both good or both bad), an increment is added.

$$S' = K_a + aS + bO + cQ + dQ(V \times Q)$$

$$V' = K_b + bV + cQ + dQ(V \times Q)$$

$$Q' = K_c + cQ + dQ$$

(III)

Model IV. Gollob's analyses suggest that the $V \times Q$ interaction is the only interaction term that contributes much to attitudinal resultants. However, it is desirable to see if the finding can be replicated. Accordingly, a Model IV is created in which terms are included for every possible interaction. Since Model IV encompasses all previous models and is more exhaustive than any of the others, it provides a standard for prediction by which the other models can be measured.

$$S' = K_a + aS + bO + cQ + dQ(V \times Q)$$

$$+ a(S \times V) + b(S \times Q) + d(Q(S \times V)$$

$$+ e(V \times Q) + f(Q(S \times V)$$

$$+ g(Q(S \times V)$$

(IV)

**Procedure**

**Stimulus words and sentences.** With a positive or negative word in the subject, verb, and object positions, there are eight types of attitudinal configurations that a simple sentence can present (+++, ++−−, +−++, +−−−, etc.). The basic study design was to create three sentences to represent each pattern. In this way, the variation in types of sentences was maximized and there was maximum opportunity for discovering interactions.

A working vocabulary of noms and verbs was selected from an available dictionary of semantic differential ratings (Heise, 1965). To be included in the vocabulary a word had to have (a) a reported evaluation score above +1 or below −1; (b) relatively low absolute scores on the activity and potency dimensions. The selection procedure insured large variation in the evaluation ratings of the words while minimizing possible contamination effects from the other two dimensions of affective response. The vocabulary words were used then to create a set of plausible sentences in accordance with the study design. That is, three sentences were written to represent each of the eight basic attitudinal configurations (+++, ++−−, +−++, +−−−, etc.) An effort was made to obtain a wide variety of sentence types; for example, some of the sentences were interpersonal in nature ("The man joined his wife"), but others were not ("The prices caused trouble"). Twenty-seven different words were used to construct the sentences: 14 nouns and 13 verbs. Henceforth, these are called the stimulus words. The complete set of stimulus sentences is presented in Table 2 in the Results section.

**Attitudinal ratings.** Attitudinal ratings were obtained using a semantic differential consisting of three scales: nice-awful, sweet-sour, and good-bad. The scales are known to be fairly general in their applicability and they are reasonably pure measures of evaluation (Jakobovits, 1966). A standard format for the scales was used with seven rating positions on each scale, such positions being labeled
“extremely,” “quite,” “slightly,” or “neutral.” In each presentation of the scales, two scales were oriented with their “good” poles on the right side of the page, and the third scale was oriented with its “good” pole on the left.

Ratings of original attitudes were obtained by presenting each word in a neutral sentence, that is, a sentence consisting otherwise of function words only. The ratings of attitudes in a neutral context were obtained from the same subjects and at the same time as other ratings. The ratings of words in non-neutral contexts were obtained by presenting a stimulus sentence, underlining one of its component words, and instructing subjects as follows (previous instruction having already been given on rating with the semantic differential):

Think of the sentence as describing an event—an event unrelated to any of the others described on the same page. Now, taking this event into account, how do you feel toward the person, thing, or act that is underlined. Rate the underlined word on the three adjective scales. Remember, we want to know your feelings, taking this particular event into account.

Each page of a stimulus booklet had seven stimulus sentences on it and seven sets of rating scales. About one-third of each test booklet was devoted to evaluation ratings, the other two-thirds being used to activity and potency stimuli. Pages of the booklets were shuffled so that subjects alternated among evaluation, activity, and potency ratings.

Three different booklets were made up and distributed to three different subject samples so that no subject would rate the same word twice (i.e., no subject rated a word both in a neutral and non-neutral context) and so that no subject would rate more than one word in a single stimulus sentence. The overall allocation of subjects to evaluation stimuli is indicated in Table 1. The design was identical for each evaluation sentence.

**Subjects.** Subjects were summer-session students enrolled either in an introductory sociology course or in an intermediate educational psychology course at a large Midwestern campus. Subjects from all age levels and in both courses were pooled for the analyses. Males and females also were pooled together since previous analyses by Heise (1966) had revealed only small sex differences in mean attitudinal responses to words. The three subsamples (A, B, C, in Table 1) were chosen randomly from the subject pool.

**Coding and preliminary calculations.** Ratings on each scale were coded −3 for extremely negative (bad) to +3 for extremely positive (good), with 0 as the assumed neutral point. The mean rating of a single stimulus by a single rater was obtained by averaging the ratings on the three separate semantic differential scales. The individual mean ratings, in turn, were converted to group mean ratings by averaging over all subjects who rated the particular stimulus.

Words were rated in neutral contexts by different subjects than those who rated them in the contexts of stimulus sentences, and so a simple t test was employed to determine whether context created significant shifts in ratings. Out of 69 comparisons, 41 were significant at the .05 level in a two-tailed test. The tests are not all independent, but this is ample evidence that the stimulus sentences provoked attitude shifts and that the differences are reflected in the overall mean ratings. Henceforth, the unit of analysis is the overall mean rating of a word in a particular sentence context.

**Activity and potency.** Studies to explore the dynamics of activity and potency associations were carried out simultaneously with the study of evaluations described previously. Procedures for the activity and potency studies were completely parallel to those described previously. Additional sentences were created following the same general design, and the activity and potency stimulus-sentences were included in the same test booklets as the evaluation sentences, with the same subjects providing the ratings. (See Table 1 for the allocation of subjects to activity and potency ratings.)

In the activity study, 17 nouns and 9 verbs were used to create 24 stimulus sentences. The semantic differential scales used to obtain ratings were fast—slow, lively—still, and noisy—quiet. In coding, positive values were assigned to the active ends of the scales.

In the potency study, 12 nouns and 8 verbs were used to develop the stimulus sentences. The scales used to obtain potency ratings were powerful—power-
TABLE 2

MEAN EVALUATION RATINGS OF WORDS IN CONTEXT OF NEUTRAL SENTENCES AND STIMULUS SENTENCES

<table>
<thead>
<tr>
<th>Stimulus sentences for evaluation study</th>
<th>Subject ratings</th>
<th>Verb ratings</th>
<th>Object ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neutral</td>
<td>Stimulus</td>
<td>Neutral</td>
</tr>
<tr>
<td>The uncle helped the father.</td>
<td>.99</td>
<td>1.80</td>
<td>2.30</td>
</tr>
<tr>
<td>The enemy surrounded the crowd.</td>
<td>-1.95</td>
<td>-1.86</td>
<td>-.49</td>
</tr>
<tr>
<td>A church protected the thing.</td>
<td>1.04</td>
<td>1.64</td>
<td>1.63</td>
</tr>
<tr>
<td>The problem troubled the uncle.</td>
<td>-1.12</td>
<td>-1.33</td>
<td>-1.52</td>
</tr>
<tr>
<td>The farms used up the land.</td>
<td>.98</td>
<td>-.14</td>
<td>-.13</td>
</tr>
<tr>
<td>The debts united the enemy.</td>
<td>-1.83</td>
<td>-.51</td>
<td>1.69</td>
</tr>
<tr>
<td>The uncle caused the trouble.</td>
<td>.99</td>
<td>-.45</td>
<td>-.44</td>
</tr>
<tr>
<td>The crowd helped the father.</td>
<td>.05</td>
<td>1.78</td>
<td>2.30</td>
</tr>
<tr>
<td>The nation protected the churches.</td>
<td>.48</td>
<td>1.76</td>
<td>1.63</td>
</tr>
<tr>
<td>The prices caused trouble.</td>
<td>-.05</td>
<td>-1.55</td>
<td>-.44</td>
</tr>
<tr>
<td>The gardens saved the enemy.</td>
<td>1.35</td>
<td>-.06</td>
<td>2.18</td>
</tr>
<tr>
<td>The enemy burned the church.</td>
<td>-1.05</td>
<td>-2.40</td>
<td>-1.62</td>
</tr>
<tr>
<td>The father shot the uncle.</td>
<td>1.67</td>
<td>-2.22</td>
<td>-2.11</td>
</tr>
<tr>
<td>The trouble helped the enemy.</td>
<td>-1.67</td>
<td>-1.04</td>
<td>2.30</td>
</tr>
<tr>
<td>The nation destroyed the enemy.</td>
<td>.48</td>
<td>.86</td>
<td>-1.95</td>
</tr>
<tr>
<td>The prices helped the farms.</td>
<td>-.05</td>
<td>1.60</td>
<td>2.50</td>
</tr>
<tr>
<td>The farms saved the nation.</td>
<td>.98</td>
<td>2.15</td>
<td>2.18</td>
</tr>
<tr>
<td>The price troubled the enemy.</td>
<td>-.03</td>
<td>-.80</td>
<td>-.42</td>
</tr>
<tr>
<td>The debts troubled the father.</td>
<td>-1.83</td>
<td>-1.75</td>
<td>-1.52</td>
</tr>
<tr>
<td>The father fixed the trouble.</td>
<td>1.67</td>
<td>2.10</td>
<td>1.31</td>
</tr>
<tr>
<td>The problem united the nation.</td>
<td>-1.12</td>
<td>1.08</td>
<td>1.69</td>
</tr>
<tr>
<td>The church surrounded the garden.</td>
<td>1.04</td>
<td>1.43</td>
<td>-.48</td>
</tr>
<tr>
<td>Gardens hid the enemy.</td>
<td>1.35</td>
<td>-.69</td>
<td>-.39</td>
</tr>
</tbody>
</table>

Adequacy of the samples of sentences. Sentences are the units of analysis in the present study, so each model equation is fitted to data on the basis of 23 observations (24 for activity and potency). The small sample size suggests that the formulas might not be very accurate, but the factor is partly balanced by other considerations. First, since measurements were obtained by averaging across both scales and subjects, the standard errors of measurements are small, and relatively little variance due to measurement error confirms estimations. Second, the sentences were developed within the framework of a factorial design calling for the juxtaposition of fairly intense attitudes in the subject, verb, and object positions and also demanding every combination of positive and negative attitudes. The sentences, therefore, constitute a stratified sample from the domain of all possible attitudinal configurations, so meaningful variance is maximized, and independent effects can be separated with some confidence. Third, the words in each set of sentences, while highly variable on one dimension of affective response, are fairly homogeneous on the other two dimensions; thus, possible contamination of the results by irrelevant dynamics is minimized.

RESULTS

Evaluation

Table 2 presents the 23 stimulus sentences used in the evaluation study, along with the mean evaluation rating for each word in a neutral context and the mean rating of the word in the context of the stimulus sentence. The quantities in Table 2 are the basic data for subsequent analyses.

Each model equation was fitted to the data in Table 2 by means of regression procedures. For example, the empirical form for the first equation in Model I was obtained by regressing $S'$ on the measurements of $S$. The regression equation provided the empirical, least-squares estimates of parameters in the theoretical equation. Similarly, the first equation of Model II was specified by a multiple regression of $S'$ on the $S$s, $V$s, and $Q$s in each sentence. Again, the regression equation provided numerical estimates of the constant and of the weighting factors in the theoretical equation.

The actual regression equations will be presented only for the most successful model. Comparisons and evaluations of the models are conducted in terms of coefficients of determination ($R^2$) which indicate concisely how well a particular equation predicts results. $R^2$ rather than $R$ (the coefficient of multiple correlation) is used, because $R^2$
TABLE 3
SUMMARY STATISTICS ($R^2$) FROM MULTIPLE REGRESSIONS BASED ON VARIOUS MODELS FOR PREDICTING EVALUATION RESULTANTS

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S'$</td>
<td>.20</td>
<td>.56</td>
<td>.70</td>
<td>.71</td>
</tr>
<tr>
<td>$V'$</td>
<td>.48</td>
<td>.59</td>
<td>.75</td>
<td>.77</td>
</tr>
<tr>
<td>$Q'$</td>
<td>.19</td>
<td>.47</td>
<td>.67</td>
<td>.70</td>
</tr>
</tbody>
</table>

Note.—All regression coefficients are statistically significant, $p < .05$.

is conveniently interpretable as "the proportion of variance accounted for."

The summary statistics ($R^2$) from the regressions based on Model I are given in the first column of Table 3. It can be seen that Model I predicts attitudes, but not very effectively. Model I would be of interest only if the other models are not better, so attention shifts immediately to Model II.

The regression results for Models II are given in the second column of Table 3. It is evident that Model II does improve predictions substantially over Model I. Model II accounts for more than twice as much of the variance in $S'$ and $Q'$ as Model I does; the coefficient of determination for $V'$ also is increased substantially. Even though Model II contains more variables (i.e., is less parsimonious), the amount of added effectiveness justifies the greater complexity, and Model I is now discarded. Whether Model II is to be preferred over other models depends on the remaining results.

Model III adds a $V \times Q$ interaction term to each of the equations in Model II, so its equations each have one additional term. The regression results are shown in Column 3 of Table 3. Comparing the results for Models II and III, one again sees a sizable jump in prediction capability. Model III as compared to Model II accounts for an additional 14% of the $S$ variance, an additional 16% of the $V$ variance, and an additional 20% of the $Q$ variance. Thus, the one additional term consistently is justified, as Gollob (1968) indicated, and it seems reasonable to discard Model II in favor of Model III. The absolute levels of prediction obtained with Model III are quite high. However, again, final evaluation of the model depends on remaining results.

The summary statistics of Model IV indicate that including all interactions does not improve predictions significantly beyond those obtained with Model III. Having added in three additional interaction terms, one increases the explained variance in $S$ by 1%, in $V$ by 2%, and in $Q$ by 3%. These are meager differences. Indeed, increases of such order would be expected, because including more terms in the regression analysis causes more chance fluctuations in the sample to be "explained." Thus, Model IV does not serve as a preferred alternative to Model III.

A generalized model. The Model III formulas for predicting resultant attitudes from original attitudes are given below with numerical estimates for the regression constants and $\beta$-weights. It should be noted that the formulas are set up in a form for predicting actual resultant attitudes, not changes in attitude. Also it should be noted that the equations are for converting unstandardized semantic differential ratings of original attitudes into unstandardized estimates of resultant ratings.

\[ S' = -.15 + .37S + .55V + .07Q + .25VQ \quad [1] \]
\[ V' = -.24 + .23S + .60V + .07Q + .25VQ \quad [2] \]
\[ Q' = -.13 + .17S + .40V + .36Q + .30VQ \quad [3] \]

The most striking feature of Formulas 1–3 is the degree of parallelism across formulas. Each formula has a small negative constant, and from there on there is a simple weighted sum of the four basic terms. Even the \(\beta\)-weights are similar across equations if one allows that the original attitude for a word has an effect that is independent of sentence dynamics and so increases the value of one

\[ 4 \text{ In their presentation of congruity theory, Osgood and Tannenbaum (1955) argued that an attitude's impact on other attitudes is weighted by its absolute intensity. To test this notion, a modified version of Model III was developed in which each original attitude measurement was entered into calculations weighted by its polarization (absolute value). The proportions of variance explained ($R^2$) using the revised model were: .65 for $S'$; .71 for $V'$; and .64 for $Q'$. Clearly, no predictive power is gained in the revised model, although considerable parsimony is lost.} \]
of the coefficients in each formula. For example, one might arbitrarily subtract .20 from the \( \beta \)-weight in each formula that is associated with the original attitude for the word being predicted. Then, the \( \beta \)-weights that result are quite similar for Formulas 1, 2, and 3.

The parallelism suggests that there is a single dynamic principle operating here rather than separate dynamics for the subject, the verb, and the object. It appears that attitudes evoked by a sentence all tend to cluster around a single resultant point. From Equations 1–3, one can infer that the formula for this general resultant has the form of Equation 4.

\[
R = K + aS + bV + c(V \times Q) \tag{4}
\]

It was observed previously that the original attitude for a word seems to affect the resultant attitude for the same word in excess of sentence dynamics. Then the expected resultant attitude for any particular word in a sentence should be calculable as:

\[
W' = R + dW \tag{5}
\]

where \( W \) is the original attitude for the word of interest and \( W' \) is the resultant attitude for that word. (If one is predicting the \( S' \) resultant, then \( W = S \); for the \( V' \), \( W = V \); and to predict the \( Q' \), \( W = Q \).)

The parameters in Formulas 4 and 5 were estimated by combining the equations to get:

\[
W' = K + aS + bV + c(V \times Q) + dW \tag{6}
\]

and calculating the multiple regression of all word resultants on the terms in the formula. The data used were the same as before except that now all resultant attitudes were regressed using the same formula so there were \( 3 \times 23 = 69 \) observations. The procedure of pooling the data for \( S' \), \( V' \), and \( Q' \) allows separating out the independent effect of \( W \), because in two-thirds of the cases the predictors \( W \) and \( S \) are different, \( W \) and \( V \) are different, and \( W \) and \( Q \) are different.

The parameter estimates obtained from the regression procedure allow Equations 4 and 5 to be specified as follows.

\[
R = -0.19 + 0.16S + 0.44V + 0.28(V \times Q) \tag{7}
\]

\[
W' = R + 0.24W \tag{8}
\]

Formula 8 predicts 63\% of the variance in all the resultant attitudes, whereas the mean proportion of variance accounted for by using Model III separately for each set of components is .71.

Activity

Summary statistics for predicting activity resultants using different models are presented in Table 4.

Model I predicts \( S' \) rather well, but does only a mediocre job of \( V' \) and \( Q' \). Model II provides a distinct advance in prediction capability over Model I. An additional 14\% of \( S \) variance is explained; an additional 41\% of \( V \) variance; and an additional 30\% of \( Q \) variance. Thus, one can conclude that activity connotations of words do combine in sentences at least in the additive manner indicated by Model II.

Comparing the regression results for Models II and III, one is struck by the almost complete absence of improvement in predictions using Model III. Whereas the \( V \times Q \) interaction was a very important term in predicting evaluation resultants, the term appears to be of negligible importance for activity. This also is verified by the actual regression equations: the weighting constant for the interaction term is about zero in all three formulas.

Regressions based on Model IV include all possible interactions. The summary results presented in Table 3 indicate that the added complexity yields only meager improvements in predictions. The additional variance explained is 3\% for \( S' \), 2\% for \( V' \), and 7\% for \( Q' \).

The conclusion is that the activity connotations of words do combine in sentences,
but not interactively, and the equations of Model II adequately represent activity dynamics.

*Model II formulas.* The Model II formulas for predicting activity resultants are as follows.

\[ S' = .16 + .79S + .29V + .26Q \quad [9] \]
\[ V' = .02 + .44S + .41V + .31Q \quad [10] \]
\[ Q' = .06 + .37S + .18V + .43Q \quad [11] \]

Again, it appears feasible to develop a formula for a general sentence resultant and another formula for predicting the resultant for any particular word in the sentence. The actual equations, with numerical estimates of the parameters, are as follows.

\[ R = .09 + .45S + .24V + .25Q \quad [12] \]
\[ W' = R + .25W \quad [13] \]

The latter equation accounts for 68% of the variance in activity resultants, whereas the mean proportion of variance accounted for by using Model II separately for each set of components is .69.

**Potency**

The desired sampling design for potency sentences failed to materialize in actuality. When the average original potency ratings were calculated, it was found that none of the sentences had a distinct ++ or -- pattern in the V-Q positions. Thus, the potency data do not contain as much meaningful variance as previous sets of data, and they are not representative of the total possible range of sentences. The attenuation of variance leads to attenuation of correlations, so the potency results, presented in Table 5, are not as impressive as those for evaluation and activity.

Regressions based on Model I are notable for predicting V' fairly well, but not at all notable for predicting Q'. This suggests that in potency dynamics, the V remains fairly stable, and Q very unstable.

Although the obtained levels of prediction still are not extremely high with Model II, the model does appear to be an improvement over Model I. The proportions of explained variance increase by .23 for S', .07 for V', and .20 for Q'.

Model III, which adds a V×Q interaction to Model II, appears to afford little gain in prediction efficiency for S' and V', but it increases the explained variance in Q' by 26 percentage points. Including all interactions in predictions (Model IV) seems to yield only minor gains in predictive power for the S and Q. \( R^2 \) increases by .06 for S' and by .02 for Q'. However, the additional terms give a small but noticeable increase of .11 units in \( R^2 \) for the V's.

These results indicate that potency dynamics may be very complex. Subject resultants were predicted fairly adequately using Model II with no interactions; prediction of object resultants seemed to require a V×Q interaction term; and V's were mainly a function of original V ratings, although some variations appeared to be a function of complex interactions.

**DISCUSSION**

**Evaluation Model**

The linguistic model for analyzing evaluation dynamics fits well with traditional attitude-balance theories. In particular, the Verb×Object interaction term yields the same kind of "peculiar" predictions when considering negative attitudes. For example, while beggars, rapists, and slugging are all bad, a beggar who slugs a rapist is raised in esteem because of the strong interaction between verb and object. Perhaps the most notable difference between the linguistic model and traditional balance theories is in the level of quantification. The essence of the linguistic model is a mathematical formula (Formula 8) that can be applied to attitude
measurements for prediction purposes, and results in the present study, and in Gollob's (1968), indicate that predictions using such a formula are quite accurate.

The mathematical formulation reveals some aspects of attitude balance that are not especially evident in verbal theories. First, dissociation from bad objects does not always result in positive evaluation toward the subject. In fact, a subject does not improve an evaluation by being dissociated from a disliked object if: (a) the verb is too intensely negative relative to the object. Verb attitudes have a direct additive impact on the resultant which can counteract the Verb \( \times \) Object interaction. Thus, in personal terms, if a person acts too foul he may debase himself regardless of the object of his action; (b) the object is only slightly disliked. If an object attitude is only slightly negative, a major Verb \( \times \) Object interaction cannot be built up to counterbalance the deevaluation originating in the negative verb. Therefore, negative acts yield positive evaluation only if directed at objects that are fairly reprehensible.

On the other hand, the formula indicates that a positive association with bad objects does not necessarily result in negative evaluation. It appears that the direct impact of a positive verb—or of positive actions—is so strong in attitude dynamics that it counteracts the Verb \( \times \) Object interaction when the object is only mildly disvalued.

Examination of the evaluation-resultant formula reveals that there should be two special instances in which the value of a sentence resultant is a function of the subject only. One of these is when the verb is completely neutral \( (V = 0) \). Under this condition, an object can be chosen that is valued positively or negatively to any degree, and the resultant is not affected. Translated to personal terms, this means that if one acts in a completely neutral manner, it is possible to deal with any object without degrading oneself. The principle seems to have relevance for interpreting the basic codes of conduct and the development of neutralized jargon in law, science, and the healing professions. For example, a judge's reputation might suffer if he "listened to" a murderer, but the judge is unsullied if he "hears" him.

The same kind of condition should occur when the object has a certain negative value: using the parameter estimates in the resultant formula, the peculiar value of \( Q \) is \(-.44/.28 = -1.57\). Theoretically, any verb at all can be used with such objects without affecting the evaluation resultant. This is an unexpected finding, and it gives rise to a new hypothesis: some negatively valued objects exist that may be liked or disliked, nurtured or exterminated, with the attitudinal consequences of all these acts depending only on the initial evaluation of the subject engaging in the action.

It might be noted that the linguistic model for attitude dynamics assumes cognitive processes at several points. First, cognitive factors are involved in the definition of a situation. For example, it makes a difference attitudinally whether one thinks "the police beat up the kids" or "the police beat up the hooligans." In the model, definition of the situation is essentially a matter of selecting among alternative words. Cognitive factors also are involved in the semantic interpretation of assertions. For example, "he destroyed his pot" can create different impressions depending on whether "pot" is interpreted as a container or a drug. The decoding process determines which attitude is entered into dynamic processes. Finally, cognitive factors are involved in syntactical processing of attitudes. For example, "the police beat up the hooligans" is different than "the hooligans beat up the police," and, in general, recognizing the grammatical positioning of words is of critical importance for attitudinal dynamics.

**Activity and Potency Dynamics**

Evaluation appears to be the dominant mode of affective response, so attention has focused primarily on evaluation dynamics. However, numerous studies involving the semantic differential indicate that at least two other dimensions of affective response exist, and thus an effort was made in the present study to examine the dynamics of activity and potency reactions.

Impressions of activity combine in sentences in a simple additive manner. A subject word that normally has associations of
activity tends to create an overall impression of activeness when entered in an assertion, and lively verbs and objects have the same effect. Similarly, inactive subjects, verbs, or objects contribute toward a net impression of stillness. This finding indicates, first, that it is sensible to talk about activity dynamics in sentences: the activity connotations of words do change when the words are combined in assertions. The finding also indicates, however, that activity dynamics are relatively simple. The activity resultant for a sentence is merely an average of the activity associations for the separate words, and there are no interactions to produce peculiar changes, as in the case of evaluation dynamics.

The weighting constants in the formula for activity resultants reveal two interesting properties of activity dynamics. First, while the \( V \) contributes to the resultant, it does not have a substantially greater impact than the \( S \) or the \( Q \). This eliminates a possible common-sense postulate about activity dynamics—that the character of the action is the crucial variable determining activity impressions. Second, the \( S \) does have considerably more impact on the resultant than either the \( V \) or the \( Q \). This could be a primacy effect (the \( S \) always appeared first in the sentences studied), but assuming for now that the effect is not merely due to primacy, it indicates that in transitive sentences the source of action is a key determinant of activity impressions. This can be interpreted as a relation between the \( S \) and \( Q \): the \( S \) affects the \( Q \) more than vice versa, and phrasing in terms of interpersonal events, the liveliness or quietness of an actor is contagious to those he acts upon.

The results dealing with potency connotations suggest that potency dynamics may be exceptionally complicated, with a different resultant formula required for each term in a sentence. The \( S' \) appears to be a simple additive function of original associations, the \( V' \) appears to be relatively unaffected by sentence dynamics, and the \( Q' \) seems to be mainly a function of a \( V \times Q \) interaction that operates such that a powerful act on a potent \( Q \) makes the \( Q \) stronger while a powerful act on a weak \( Q \) makes the \( Q \) more impotent. Another study will have to be conducted to clarify potency dynamics, since the results here were not unequivocal. It might be noted that the topic is of particular interest because a translation of potency dynamics into the psychology of dominance relations seems possible.

### A Theoretical Extension

A major current of recent thought in social psychology has been that attitudes have motivating power when they produce tension by being associated in incongruent ways. Let psychological tension be defined as the total pressure for affectual modification that arises out of a particular sentence or event. Assuming the pressure is directly proportional to the actual amount of change that can be expected, the tension due to evaluation dynamics (\( T_E \)) would be:

\[
T_E = |S-S'| + |V-V'| + |Q-Q'| \tag{14}
\]

Similarly, there would be tension corresponding to expected changes in activity and potency, and the total tension evoked by a sentence or event then would be the sum, \( T_B + T_A + T_P \).

The basic postulate in tension theory is that persons strive to minimize tension. This, however, can be done through a variety of tactics: attitude change, direct action, redefinition of the situation, withdrawal, psychological defenses, etc. Although different tactics of tension reduction exist, one would expect that, in a population, the probability of any tactic appearing should increase when persons are confronted with high-tension sentences or events. Thus, it should be possible to use the formulas presented in the present report to design sentences that evoke defensive tactics, and thereby one is in a position to develop quantitative, controlled experiments dealing with tension theory.

### REFERENCES


(Received June 17, 1968)