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PRIMACY EFFECTS IN PERSONALITY IMPRESSION FORMATION USING A GENERALIZED ORDER EFFECT PARADIGM[1]

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Ss were read a set of personality trait adjectives, and judged how much they would like a person so described. A generalized order effect paradigm was used. Each set consisted of a sequence of high (or low) value adjectives; into this sequence a block of 3 low (or high) adjectives was interpolated at all possible ordinal positions. The results showed a straight-line primacy effect: the net influence of an adjective decreased linearly with ordinal position in the set. It was shown that the response to a set could be described as a weighted average of the scale values of the separate adjectives. This model was related to a previously employed linear model for opinion change. An interpretation of the results in terms of shift in meaning was also discussed.

In a task introduced by Asch (1946), the subject is presented with a set of adjectives that describe a person, and gives his impression of the person so described. If the adjectives are presented in serial order, the response to a given set may depend on the particular order in which they are given. In fact, a primacy, or first impression, effect is usually obtained (e.g., Anderson & Barrios, 1961; Asch, 1946). Its cause is unknown.

It is useful to consider this personality adjective task as serial information processing: as each successive item of information is received, it is, presumably, integrated into the impression built up from the previous items. As a consequence, the impression will change continuously and systematically over the series of items.

The theoretical analysis of impression formation is handicapped by lack of knowledge about this presumed serial buildup of the impression. The fact of primacy shows that, in some as yet poorly defined sense, the later adjectives have less influence than the earlier adjectives, but this conclusion is lacking in precision and detail.

The purpose of the present experiments was to get a more detailed picture of the influence of early and late adjectives. For this purpose, a probe stimulus was interpolated at various points within a set of adjectives. It was anticipated that the relative influence of the probe, as a function of its position of interpolation, would yield the desired picture.

The paradigm employed can most readily be explained by reference to Table 1 which lists two of the four experimental conditions. The symbols, L and H, stand for adjectives of low and high scale value. In Condition (3L)6H, a set of 3 Ls is interpolated at all possible positions within a set of 6 Hs. There are seven possible interpolation positions, and the seven corresponding orderings are shown in the right-hand column of Table 1.

In Condition (3L)3H, a set of 3 Ls is interpolated within a set of 3 Hs. In this case,

TABLE 1

Adjective Arrangements of Conditions (3L)3H and (3L)6H

Interpolation position	Condition	
	(3L)3H	(3L)6H
1. IP_1	LLLHHH	LLLHHHHHH
2. IP_2	HLLLHH	HLLLHHHHH
3. IP_3	HHLLLH	HHLLLHHHH
4. IP_4	HHHLLL	HHHLLLHHH
5. IP_5		HHHHLLLHH
6. IP_6		HHHHHLLLH
7. IP_7		HHHHHHLLL

Note.—Adjectives read to the subject in order listed. H and L stand for adjectives of high and low scale value. The three Ls are interpolated as a unit at various positions within the Hs.

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there are only four interpolation positions, as listed in the left-hand column of Table 1.

In both conditions, the set of 3 Ls is the probe stimulus. If later adjectives influence the impression less than earlier adjectives, the probe will have less influence the later it appears. Thus, the curve relating the impression to the probe position will quantify the influence of an adjective as a function of its ordinal position in the set. As will be seen below, the scheme of Table 1 may also be considered as a generalized order effect paradigm.

Of the two experiments reported here, Experiment I indicated that the generalized order effect paradigm yielded a straight-line primacy effect (Figure 1). Although this result was formally consistent with previous work, it was somewhat surprising. Accordingly, a second experiment was performed, to replicate the first, and to test the applicability of a more precise experimental design.

METHOD

Instructions and Procedure

Individual subjects were read sets of six, or nine, adjectives. They were told that each set of adjectives described a different hypothetical person, their task being to form an impression of that person and to judge how much they would like that person.

Judgments were made verbally on an 8-point rating scale, ranging from 1 (highly unfavorable) to 8 (highly favorable). Each step of the scale was indexed by a verbal label formed from the various combinations of favorable and unfavorable with highly, considerably, moderately, and slightly as modifiers. A card containing the scale lay before the subject throughout the experiment.

Subjects were instructed to think of each adjective of a given set as having been contributed by a different acquaintance of the person being described. Thus, each set might contain both good and bad traits, and the adjectives might occasionally seem inconsistent. It was emphasized that there was no right or wrong response, that the subject's own feelings were what mattered.

The adjectives of each set were read once through at a steady rate allowing slightly over 2 seconds per adjective. The total time per set, including stimulus and response, was 20 seconds for six-adjective sets, and 30 seconds for nine-adjective sets. In Experiment I, four practice sets were given, but no practice was given in Experiment II.

Adjectives

The adjectives used in constructing the sets were the same as had been roughly scaled for use in previous work (Anderson & Barrios, 1961). A list of 48 H adjectives and a list of 48 L adjectives were used. Typical H adjectives were: kind, creative, brilliant; typical L adjectives were: shallow, opinionated, unattractive.

Subjects

Subjects were female volunteers from introductory psychology who were fulfilling a course requirement. The *N*s for Experiments I and II were 60 and 52, respectively. Random assignment was used within each experiment.

Design

The complete procedure for constructing the sets of adjectives was somewhat complicated. However, the specific details, given under the headings Experiment I and Experiment II below, are not necessary for an understanding of the basic design and results. The general idea of the design is given here and in the two following subsections.

The basic idea of the design can be illustrated by considering Condition (3L)6H of Experiment II. First, 3 L and 6 H adjectives were chosen. From these, 7 sets were formed by interpolating the 3 Ls as a unit within the sequence of 6 Hs, at each of the seven possible interpolation positions as illustrated in Table 1. This step was then replicated six more times with newly chosen adjectives, thus yielding 49 sets altogether.

These 49 sets were arranged in seven blocks of 7 sets using a Greco-Latin square so that, within each block, each set of adjectives occurred once, and each interpolation position occurred once. The trial order of the blocks was then balanced over subjects.

In general, the sets received by each subject were chosen to give a reasonable sample of different adjectives, and to balance adjectives and interpolation positions over trials and over subjects. Although the design details are somewhat tedious, they are straightforward and give perhaps the simplest method of satisfying the desired criteria.

Conditions. Both experiments employed the same four main experimental conditions. Conditions (3L)3H and (3L)6H have been illustrated in Table 1 and described in the introduction.

The remaining two conditions were the complements of those in Table 1. In Condition (3H)3L, a sequence of 3 H adjectives was interpolated as a unit at each of the four possible positions within a sequence of 3 L adjectives. In Condition (3H)6L, a sequence of 3 H adjectives was interpolated as a unit at each of the seven possible positions within a sequence of 6 L adjectives.

Condition assignment. In Experiment I, each of 32 subjects judged 32 sets from Condition (3L)3H and 32 sets from Condition (3H)3L. Thus, each of these subjects judged 8 sets at each interpolation position for each condition.

Similarly, each of 28 subjects judged 28 sets from Condition (3L)6H and 28 sets from Condition (3H)6L. Thus, each of these subjects judged 4 sets of each interpolation position for each condition.

In Experiment II, each of 24 subjects judged 16 sets from Condition (3L)3H and 16 sets from Condition (3H)3L. In contrast to Experiment I, separate groups of subjects were used in Conditions (3L)6H and (3H)6L; there were 14 subjects in each, and each subject judged 49 sets.

Experiment I

To illustrate the design, consider first Condition (3L)6H. Here there are seven possible interpolation positions; accordingly, the construction unit was a 7 × 7 Greco-Latin square.

A square was first chosen. Then seven 6-H sets were chosen with the 6 H adjectives arranged in fixed serial order. These seven 6-H sets constituted the columns of the square. Next seven 3-L sets were chosen with the 3-L adjectives arranged in fixed serial order. These 3-L sets constituted the Latin letters of the square. In this way, each cell of the square was assigned a 6-H set and a 3-L set; the latter was then interpolated within the former at the ordinal position indicated by the Greek letter in that cell. A similar square was constructed for Condition (3H)6L, and the columns of these two squares were then interlaced to form a rectangle of 7 rows and 14 columns.

Each row of the rectangle was assigned a different subject. Over a group of seven subjects, each 3-L set was interpolated once into each 6-H set at each interpolation position; similarly each 3-H set was interpolated once into each 6-L set at each interpolation position. No subject judged the same set of nine adjectives twice.

Each row of the rectangle just described contributed one block of 14 trials for each of seven subjects. Three more such rectangles were constructed in the same way, thus yielding a total of four blocks of 14 trials. These four blocks were then arranged in a 4 × 4 Latin square to balance blocks of sets over trials.

For Conditions (3L)3H and (3H)3L, the method of construction was similar. The unit of construction was a 4 × 4 Greco-Latin square since there were only four interpolation positions. As above, each subject served under both conditions. Sets were constructed in blocks of 16, each block being formed from two unit squares from each condition. There were again four such blocks, and these were balanced over trials by a 4 × 4 Latin square.

Experiment II

This experiment was essentially a replication of Experiment I. However, the design details differed somewhat since it was required that each subject judge the same adjectives in each of the interpolation orderings. The design may be illustrated by considering Condition (3L)6H. The basic unit in the construction was again a 7 × 7 Greco-Latin square.

First, seven 6-H sets were chosen with the 6 adjectives arranged in fixed serial order. For each 6-H set, a paired 3-L set was also chosen, with the 3 adjectives arranged in fixed serial order. There were thus seven pairs of sets, each pair consisting of a 3-L set and a 6-H set. These pairs were assigned to the Latin letters of the square. Then, in each cell of the square, the 3-L set was interpolated within the 6-H set at the ordinal position indicated by the Greek letter in that cell. The full 7 × 7 square thus incorporated a sevenfold replication of the paradigm illustrated in the right-hand column of Table 1, each replication based on different adjectives.

To balance sets over trials, the rows of the Greco-Latin square were then considered as the letters of a new 7 × 7 Latin square. One subject was assigned to each row of this Latin square. Each of these seven subjects thus judged all 49 sets represented by the Greco-Latin square. This procedure was replicated with a new choice of adjectives and seven additional subjects served in this replication. The same procedure was employed for Condition (3H)6L.

For Conditions (3L)3H and (3H)3L, the unit of construction was a 4 × 4 Greco-Latin square since there were only four interpolation positions. As in Experiment I, each subject served in both conditions. Sets were constructed in blocks of eight, each block being formed from one unit square from each condition. There were four such blocks, and these were balanced over trials by a 4 × 4 Latin square.

Randomization

Subject to the above conditions, each step in the construction of the sequences of sets was independently randomized whenever a choice was required. In particular, adjectives for each set were chosen at random, with replacement, so that each set was drawn from the same pool of adjectives.

RESULTS

The results are shown in Figure 1 which plots the interpolation curves for each condition. Each curve gives the mean response as a function of the ordinal position at which the probe stimulus was interpolated.

The results are simply summarized. Disregarding some apparent irregularity in Experiment I, the interpolation curves are essentially straight lines, and each shows a continuous primacy effect. The four upward sloping curves represent the LLL probe; the four downward sloping curves represent the HHH probe. Thus, the net influence of the probe stimulus on the overt response decreases linearly as a function of interpolation position.

The primacy may be exhibited in more detail by considering the interpolation curve for Condition (3L)6H. The first two points on this curve correspond to Rows 1 and 2 of Table 1. The two set orders are identical in their last five positions; they differ in the presentation order of the first four adjectives.

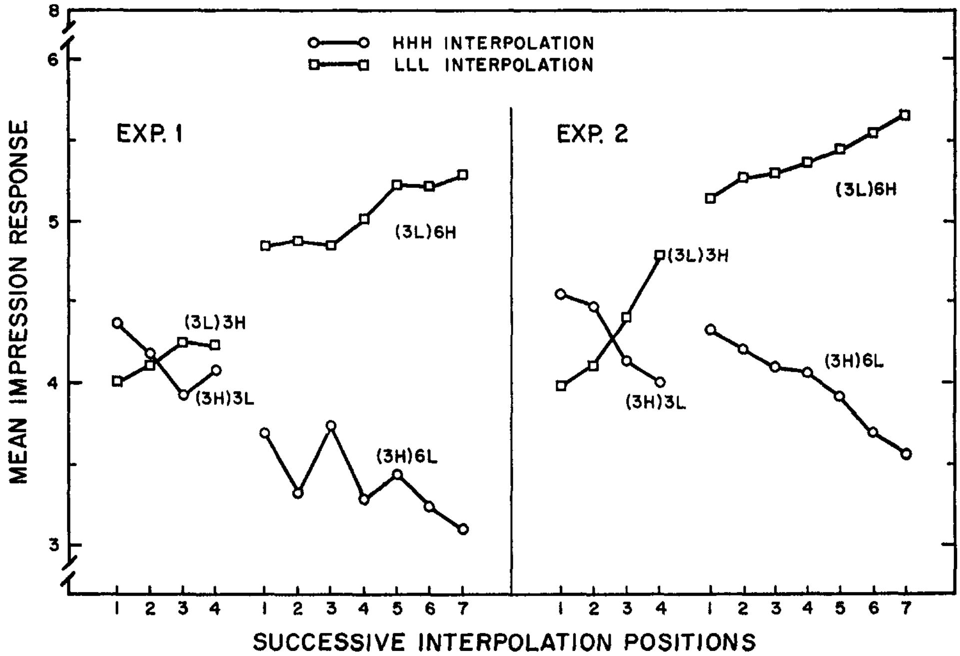

FIG. 1. Mean impression response as a function of interpolation position of the probe stimulus. (Probe stimulus indicated by the notation (3L) or (3H) in the condition designations by each curve. See also Table 1.)

Thus, the difference between the first two points on the curve arises because the first four adjectives at the first point are given in the order, LLLH, whereas the first four adjectives at the second point are given in the order, HLLL. Since the HLLL order produces the higher response, the first two points on the curve display a primacy effect.

The same reasoning applies to the comparison of the second and third points. In Rows 2 and 3 of Table 1, it is seen that the first, and the last four, positions are identical. At the four intermediate positions, the second point is based on the order, LLLH, whereas the third point is based on the order, HLLL. Thus, the second and third points on the curve also display a primacy effect.

This reasoning may be extended to the comparison of any two points on an interpolation curve. In fact, the scheme of Table 1 may be considered as a generalized order effect paradigm. In either column, the first and last rows represent the ordinary, low-high versus high-low, order effect paradigm. Any two successive rows also embed an order effect paradigm of the form, LLLH versus HLLL. For example, the last two rows of Condition (3L)6H are identical in the first five positions, and differ in the stated way over the last four positions. Similarly, Rows 2 and 6 are identical in their first and last positions; the seven intermediate positions give the comparison, LLLHHHH versus HHHHLLL.

The interpretation of these results will be resumed in the Discussion section. At this point, certain irregularities in Figure 1, and the statistical analysis, require attention.

Statistical Analysis

For the most part, the curves of Figure 1 speak for themselves. Accordingly, the statistical analysis will be mainly directed to certain methodological problems, and will be restricted to the data of Experiment II.

To illustrate the method of analysis, consider first a given subject in Condition (3L)6H of Experiment II. The sets judged by this subject formed a 7 × 7 Greco-Latin square. The sums of squares for Interpolation Position, Set, and Trial Block were extracted, leaving a residual on 30 *df*. This residual mean square was taken as an estimate of the within-subject variability for that subject although, of course, it would be expected to overestimate that variability somewhat. This procedure was followed for each subject; the residual mean square, averaged over subjects, is given in the last row of Table 2.

Each Greco-Latin square was based on seven different sets of adjectives, and seven subjects served in each square. These sets and subjects were considered as a 7×7 factorial design, and this was analyzed in the standard way to obtain the sums of squares for Sets, Subjects, and the Sets × Subjects interaction. These sums of squares were pooled over the four Greco-Latin squares, and resulting pooled mean squares are given in Table 2. Similar analyses were made for Conditions (3L)3H and (3H)3L.

The statistical significance of the various sources in Table 2 is, of course, barely relevant. The important question concerns the magnitudes of the variabilities associated with the various sources. For present purposes it suffices to assert, somewhat loosely, that the relative sizes of the mean squares of Table 2 indicate that Sets, Subjects, and Sets × Subjects are all substantial sources of variability.

Two irregularities in Figure 1 may now be considered. Comparison of the experiments shows that in certain cases corresponding curves have considerably different elevations. However, the corresponding curves are based on different sets and different subjects and their differences in elevations are reasonably attributable to Set and Subject variabilities.

It will also be seen that the interpolation curves of Experiment I are considerably less regular than those of Experiment II. In both experiments, the Set and Subject variabilities are excluded from the between-point variability of each curve. The Set × Subject variability is also excluded in Experiment II, but not, however, in Experiment I. Necessarily, therefore, the Experiment I curves are expected to be less regular than the curves of Experiment II.

The above analysis, together with the general agreement in curve shape across the two experiments, lead to a useful recommendation about method. Previous experiments in this series, up to and including the present Experiment I, were designed so that each subject judged a given set of adjectives in one order only. This was done to avoid possible carry-over effects from previous judgments.

In Experiment II, however, each subject judged a given set in all orders. This procedure seems to have yielded essentially the same results as in Experiment I, thus suggesting that memory of previous judgments may not be a serious problem in this task. The advantages of this procedure, in terms of data reliability, have already been pointed out. In addition, the design details tend to be simpler. This procedure is thus the more desirable, and the present results give it some justification.

TABLE 2

SUMMARY ANALYSIS OF VARIANCE, EXPERIMENT II

Source	Number adjectives in set			
	Nine		Six	
	df	*MS*	*df*	*MS*
Sets (A)	24	23.84	21	15.86
Subjects (B)	24	11.53	21	9.23
A × B	144	4.01	147	3.37
Within subjects Variability	840	0.87	288	1.29

DISCUSSION

Primacy

As has been noted, the interpolation curves of Figure 1 represent a generalized order effect paradigm. Any two points on a curve represent an order effect comparison and, disregarding the irregularities in the data of Experiment I, all such comparisons show primacy. Moreover, the primacy appears to be a straight-line function of the interpolation position of the probe stimulus. In other words, the net influence of an adjective decreases linearly with its ordinal position in the set.

For illustrative purposes in the remaining discussion, it will be helpful to consider the last two interpolation positions of Condition (3L)6H in detail. From Table 1, these are:

$$\begin{aligned} IP_6&: \ HHHHH_{p_5}LLL_{p_8}H \\ IP_7&: \ HHHHH_{p_5}H_{p_6}L_{p_7}LL_{p_9}. \end{aligned} \quad [1]$$

The p's denote positions within the sets that will be referred to later.

The response to IP_7 was higher than that to IP_6. Thus, the order effect paradigm defined by the last four adjectives, LLLH versus HLLL, shows a primacy effect. Since both sets have the same first five adjectives, this primacy is not to be explained by any simple appeal to the importance of first impressions.

This result, and more generally, the linearity of the interpolation curves, had not been expected initially. The rationale of that expectation helps illuminate the data, and may be illustrated as follows.

At Position p_5 in either set of Array 1, the subject has integrated five Hs. At Position p_6 in IP_7, a sixth H has been integrated. By a law of diminishing returns, this sixth H should have relatively little effect. Thus, the state of the subject should be approximately the same at Position p_5 in IP_6 and Position p_6 in IP_7. Three Ls follow either position. Hence the state of the subject should be approximately the same at Position p_8 in IP_6 and Position p_9 in IP_7.

At Position p_9 in IP_7, the subject responds. But at Position p_8 in IP_6, there remains one more adjective to be integrated, and this is an H. This terminal H could be expected to have an appreciable effect on any of several grounds: it is fresher in the subject's memory when the response is made since it is received last; its isolation from the other Hs by the intervening Ls could draw extra attention to it; it is to be integrated into an impression depressed by the just preceding Ls and so should be less subject to diminished return than the sixth H of IP_7.

If the terminal H in IP_6 did have an appreciable effect, and if the subject's state were indeed about the same at Position p_8 in IP_6 and p_9 in IP_7, then the response to IP_6 would be higher than to IP_7. In other words, the comparison of Array 1 would show a recency effect.

That primacy is in fact obtained shows, of course, that the above rationale is wrong. However, it is thought that this rationale helps set out the nature of the problem posed by the data. Three interpretations of the data will now be taken up.

Weighted-Average Model

The data can be described by a weighted-average model, in which the response to any set is simply a weighted mean of the scale values of the adjectives of that set. The scale value would index the location of the adjective on a favorableness dimension; the weight would represent the influence or importance of the adjective in the total impression.

Let A_k denote the scale value of the adjective in the kth ordinal position in a given set, and let w_k denote the weight. The equation for the response is then

$$X = \frac{\sum w_k A_k}{\sum w_k}. \qquad [2]$$

In general, the subject may have an initial impression prior to presentation of the first adjective. This possibility would be included in Equation 2 by letting A_0 and w_0 denote the scale value and weight of the initial impression. Unless otherwise stated, however, it will be assumed here that $w_0 = 0$, that is, that the initial impression is nonexistent.

For the present data, it is also assumed that the weights decrease linearly with ordinal position:

$$w_k = a - (k - 1)b, \qquad [3]$$

where k is the ordinal position index. The constants, a and b, whose exact values are not of present concern, represent, respectively, the weight of the first adjective, and the change in weight per ordinal position. For a set of six adjectives, the weights for the successively presented adjectives would then be:

$$a,\ a - b,\ a - 2b,\ a - 3b,\ a - 4b,\ a - 5b. \qquad [4]$$

It will also be assumed that all H adjectives have the same scale value which, for present convenience, will be denoted by H; that all L adjectives have the same scale value, L; and that all adjectives have the same weight except as weight depends on ordinal position. Analogous simplifying assumptions will be made without explicit statement in the two other interpretations as well. These simplifying assumptions are appropriate here because of the balancing in the design, and because only the shape of the interpolation curve will be considered.

This weighted-average model is applied to Condition (3L)3H in Table 3. The weights are given by Array 4, and their sum is $\Sigma w_k = 6a - 15b$. These weights are then used in Equation 2 to obtain the algebraic expressions for the predicted response listed in Table 3.

TABLE 3

PREDICTED IMPRESSIONS FOR CONDITION (3L)3H FROM WEIGHTED-AVERAGE MODEL

Set	Order	Predicted response
1. IP_1	LLLHHH	$[aL+(a-b)L+(a-2b)L+(a-3b)H+(a-4b)H+(a-5b)H]/(6a-15b)$
2. IP_2	HLLLHH	$[aH+(a-b)L+(a-2b)L+(a-3b)L+(a-4b)H+(a-5b)H]/(6a-15b)$
3. IP_3	HHLLLH	$[aH+(a-b)H+(a-2b)L+(a-3b)L+(a-4b)L+(a-5b)H]/(6a-15b)$
4. IP_4	HHHLLL	$[aH+(a-b)H+(a-2b)H+(a-3b)L+(a-4b)L+(a-5b)L]/(6a-15b)$

Note.—H and L denote scale values of H and L adjectives, respectively.

In Rows 1 and 2 of Table 3, the second, third, fifth, and sixth terms are the same in both expressions. These terms cancel when the difference is taken. The difference between the expressions in Rows 1 and 2 then simplifies to $3b(H - L)/(6a - 15b)$. The difference between the predicted response for any two consecutive interpolation positions in Table 3 is found to be the same, $3b(H - L)/(6a - 15b)$. Thus, the model implies that the difference between any two successive interpolation points in the curves of Figure 1 is a constant, or, in other words, that the interpolation curves are straight lines. A parallel argument holds for each of the other experimental conditions. In general, therefore, the weighted-average model, together with the assumption of Equation 3 concerning the change in weights, predicts that the interpolation curves are straight lines.

It should be explicitly noted that the above analysis is ad hoc, and that the present data do not adequately test the model. However, it has at least been shown that the weighted-average model can account for the results.

Moreover, once the model is stated explicitly, it becomes apparent that it makes additional predictions. There are 20 possible orderings of three Ls and three Hs, and 84 possible orderings of three Ls and six Hs. If the model is correct, then it will account for the response to all possible orderings, not just the few used here. These predictions can easily be derived in the manner illustrated in Table 3.

Of the various ways to test a model, parameter-free tests, which do not require estimation of the parameters of the model, are the simplest and most useful in many respects. The above prediction of straight-line interpolation curves is one such parameter-free test. Others may be obtained by appropriate selection among the possible presentation orders. For example, it is straightforward to show that HLHLLH and HLLHHL yield the same predicted response, and this prediction can, of course, be tested directly from the raw data. Similarly, the difference in response to HLHLHL and LHLHLH is $3b(H - L)/(6a - 15b)$, which is equal to the difference between successive points on the interpolation curves. Since these predictions depend on Equation 3, they may, of course, be specific to the present task even though Equation 2 held more generally.

Linear Model

A second interpretation of the data can be made within the framework of a proportional-change, or linear, model that has been applied to opinion change (Anderson, 1959, 1964; Anderson & Hovland, 1957). The basic supposition of this model, as applied to the present task, would be that the impression develops step by step as each successive adjective is presented. More specifically, it is assumed that the impression produced by the kth adjective of a set is given by

$$X_k = X_{k-1} + c_k\ (A_k - X_{k-1}). \qquad [5]$$

Here X_{k-1} is the impression just before, and X_k the impression just after, presentation of the kth adjective. A_k denotes the scale value of the kth adjective, and c_k is here used to denote the proportionality coefficient, or change parameter.

According to Equation 5, the *change* in impression produced by the kth adjective is $c_k(A_k - X_{k-1})$. The amount of change is proportional to the distance, $(A_k - X_{k-1})$, between the adjective presented and the just previous impression. The change parameter, c_k, is a measure of the influence of the kth adjective: the smaller is c_k, the less is the change in the impression.

The main conceptual difference between the weighted-average and the proportional-change models is that the weighted-average formulation considers only the final response, whereas the proportional-change model envisages the final response as the end result of a step-by-step buildup of the impression. In the present task, of course, only the final response is actually observed. Formally, however, Equation 5 may be applied to describe the presumed buildup of the impression. The proportional-change model could then account qualitatively for primacy by assuming that the change parameter showed a sufficiently large decrease over the successive adjectives (Anderson & Hovland, 1957). Here however, the question is whether this model is quantitatively consistent with the primacy effects of the generalized order effect paradigm.

This analysis is not complicated, but will only be outlined here. By successive application of Equation 5, the final impression can be expressed as a function of the initial impression (if any) and of the scale values of the adjectives of the set. This function is in fact a weighted average, with the weights being expressed in terms of the c_k. In other words, the proportional-change model implies the weighted-average model and, since the latter is consistent with the data, so also is the former.

This correspondence between the models can be pushed one step further. In general, it can be shown that

$$w_{k-1}c_k = w_k(1 - c_k)c_{k-1}. \qquad [6]$$

If the w_k are known, then Equation 6 allows one to solve for the c_k.

Equation 6 thus opens up the interesting possibility of tracing out the step-by-step buildup of the impression even though only the final impression is observed. For the present data, with the w_k given by Equation 3, the expression for the c_k obtained from Equation 6 is

$$c_k = \frac{a - (k - 1)b}{w_0 + k[a - \frac{1}{2}(k - 1)b]}. \qquad [7]$$

Change of Meaning Interpretation

The last theoretical interpretation to be considered is one suggested by Asch (1946). In Asch's formulation, the initial adjectives set up a "directed impression" that apparently is considered to change the effective meanings of the later adjectives. Striving for a unified impression, the subject selects out those shades of meaning of the later adjectives that fit in with the directed impression established by the initial adjectives.

For an HHHLLL set, then, the more favorable shades of meaning of the Ls would be selected; for an LLLHHH set, the less favorable shades of meaning of the Hs would be selected. Presumably, therefore, the impression produced by HHHLLL would be more favorable than that produced by LLLHHH; that is, there would be a primacy effect.

For the ordinary order effect paradigm, this qualitative reasoning may suffice. For the generalized order effect paradigm, a more explicit statement of the theory is necessary. A possible attack could be made beginning with a simple (unweighted) average model (Anderson, 1962) in which the predicted response is just the mean of the *effective* scale values of the adjectives.

To illustrate how such a model might be applied, consider Array 1. Assume first that each of the first several Hs has the same scale value, H. Next, the directed impression produced by these Hs will effectively shift the Ls toward more favorable meanings, thus increasing their effective scale values. For simplicity, assume that this new scale value is the same for each L, and denote it by L'. Finally, let H' denote the effective scale value of the terminal H in IP_6. Since the directed impression set up by the preceding five Hs and three Ls will decrease the effective scale value of this terminal H, H' is less than H. The response to IP_6 is then just the mean of $(5H + 3L' + H')$; the response to IP_7 is the mean of $(6H + 3L')$. Since H' is less than H, the predicted response to IP_6 is less than that to IP_7.

With the given assumptions, therefore, the model could account for the primacy over the last two interpolation points. However, considerably more work would be needed to put the model into a realistic and testable form. In particular, the amount of shift in meaning of a given adjective will depend, presumably, both on the solidity and on the scale value of the impression set up by the preceding adjectives. Consequently, the change in scale value of the first interpolated L will depend on the number of preceding Hs; and the three Ls would themselves suffer unequal changes in scale value. A complete analysis will evidently not be simple, but it is questionable whether any reasonable set of assumptions would lead to a prediction of linearity in the interpolation curves.

This shift of meaning interpretation will not be pursued further here, but it should be noted that other treatments of this interpretation are possible, and that Asch favors a rather different orientation (Asch, 1946, pp. 286–287). Nevertheless, the question raised by Asch, whether the meanings of the words change in context, is important in any analysis of impression formation.

Comparisons and Comments

A basic difference between the foregoing interpretations is in the origin ascribed to the primacy effect. The shift of meaning explanation attributes primacy to changes in scale value, whereas the other two explanations attribute primacy to changes in weight or importance of the later adjectives. These two, the weighted-average model and the proportional-change model, have been shown to be consistent with the data, but whether the same can be said of the shift of meaning explanation is problematical.

There is, moreover, independent evidence to support the change in weight interpretation. If the subjects recall the adjectives, in addition to giving the impression response, primacy disappears, and a recency effect may take its place (Anderson & Hubert, 1963). This result was taken to support the idea that the primacy obtained in the standard version of the task results from decreased attention to, and hence lower weights for, the later adjectives. Further support for this idea is given by the results of Stewart (1965) who requested the subject to respond (cumulatively) after each successive adjective of the set. This procedure, which presumably would tend to equalize attention to all the adjectives, also eliminated primacy or induced recency. These results decrease the force of Asch's (1946) argument that primacy implies shift of meaning.

At the same time, there is evidence that argues more directly against the shift in meaning explanation. Primacy is obtained in an impression of meals task, otherwise similar to that used here, and this primacy seems difficult to explain in terms of shift of meaning (Anderson & Norman, 1964). Moreover, some success has been obtained with a simple average model in the personality adjective task with simultaneous presentation (Anderson, 1962) although this model would be incorrect if the adjectives changed meaning from one context to another.

Present evidence, therefore, indicates that the weighted-average model and the proportional-change model formulations are considerably more satisfactory than the change in meaning interpretation. This conclusion is provisional, of course, and certainly common sense indicates that context will affect meaning, at least in certain cases. Nevertheless, there is as yet no satisfactory evidence for such contextual shifts of meaning in impression formation (Anderson & Norman, 1964).

If indeed primacy is caused by decreases in the weights of the later adjectives, the problem then arises of explaining this weight decrease. The attention decrement explanation, although it receives some support from the cited data, is not entirely satisfying and may itself stand in need of further analysis.

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