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Contrast and Accentuation Effects in Category Learning

Joachim Krueger
Max Planck Institute for Human Development and Education
West Berlin, Federal Republic of Germany

Myron Rothbart
University of Oregon

This study examines the accentuation of perceived intercategory differences. In Experiment 1, 2 sets of trait adjectives were presented—a neutral set and a set of either favorable traits or unfavorable traits. Ss estimated the mean favorability of each set. The mean favorability of the neutral set was then increased or decreased by adding new traits. As predicted, the estimated mean favorability of the neutral set changed more when the set became more distinct from a contextual set than when it became more similar. In Experiment 2, estimated category means were displaced away from each other (contrast effect), and they moved even farther apart when new information increased the variability of trait favorability (accentuation effect). This change was illusory because the actual category means remained constant. Experiment 3, in which trait adjectives described members of 2 novel groups, replicated Experiment 2. The relevance of contrast and accentuation effects to the development and maintenance of differentiated intergroup perceptions is discussed.

Categorization processes play an important role in stereotype formation and change. Since the work of Allport (1954) and Tajfel (1969), a burgeoning literature has examined the consequences of categorization to the perception of people. Whereas most of this work has focused on inferences about people (Brewer, 1988; Fiske & Neuberg, 1990; Taylor, 1981), some recent studies have illuminated effects of categorization on the perception of groups (e.g., Campbell, 1956; Rothbart & Lewis, 1988; Weber & Crocker, 1983). One important consequence of categorizing people into groups is the exaggeration of perceived intergroup differences (Rothbart & Taylor, 1990; Wilder & Thompson, 1988). Clarke and Campbell (1955), for example, found that Whites overestimated the differences between the academic achievement of Black and White students. This tendency contributes to unrealistic intergroup attitudes, as it emphasizes differences rather than similarities and may thus exacerbate social conflict.

The goal of this research is to examine the development of the accentuation of perceived intercategory differences. In our earlier research, we sought to determine the minimum conditions for category accentuation (Krueger, in press; Krueger, Rothbart, & Sriram, 1989). When subjects learned that one category was associated with higher (or lower) values on some continuum than was a comparison category, new information that increased intercategory differences was more likely to be incorporated than new information that reduced such differences. Subjects observed two distributions of three-digit numbers in which category membership of each number was indicated by type of font. The distributions of the two sets bordered one another but did not overlap. Thus, the categorization (type of font) was superimposed on the continuous numerical dimension. Periodically, subjects estimated the cumulative means of each category. During the first half of the experiment, during which actual mean differences emerged, subjects' estimates of intercategory differences were quite accurate. During the second half of the experiment, new numbers were presented that changed the cumulative mean of one category toward or away from the comparison category. Subjects were more receptive to difference-enhancing numbers, and perceived changes were greater when intercategory differences were enhanced than when they were reduced. The accentuation of change toward greater intercategory separation was attributable to a biased averaging process because the nonambiguity of the numbers precluded perceptual distortions. Moreover, the numbers did not vary on any meaningful dimension. We reasoned that the results help explain the formation and maintenance of social stereotypes that emphasize between-groups differences. The lack of meaning and the lack of ambiguity of the stimuli, however, make that conclusion speculative.

In the present study, we attempt to replicate and extend our findings on the category-accentuation effect with stimuli that are more representative of those used in impression formation about individuals and groups: trait-descriptive adjectives. Unlike numbers, traits can be perceived in different ways because of their ambiguity.

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Correspondence concerning this article should be addressed to Joachim Krueger, Max Planck Institute for Human Development and Education, Lentzeallee 94, D-1000 Berlin 33, Federal Republic of Germany.

Biases in Trait Perception

The variation of trait terms on the continuous dimension of favorability is similar to the variation of numbers on the numerical scale. As numbers vary from small to large, the favorability of traits ranges from highly negative (e.g., *vile*) to highly positive (e.g., *honest*), and ratings of trait favorability can be averaged. Unlike the invariant value of a number, the favorability of a trait has to be inferred. People agree on the value of numbers but not on the favorability of traits. For example, most people consider *trustworthiness* a favorable characteristic, but they may disagree on its degree of favorability. Judgments of trait favorability vary with the judgmental context. Herr, Sherman, and Fazio (1983) showed that assimilation and contrast effects influence perceptions of ambiguous stimuli. In Asch's (1946) classic study of impression formation, trait assimilation predominated. Traits describing the same person were seen as more similar to one another than were isolated traits. Asch and Zukier (1984) suggested that subjects resolve incongruities between traits by changing individual meanings. When the adjective *generous* was presented with the adjective *vindictive,* it could be concluded that the target person had ulterior motives for being generous. Assimilation effects have been replicated (e.g., Hamilton & Zanna, 1974) and have been shown to increase with greater trait ambiguity (Wyer, 1974).

In the present series of experiments, subjects learn about two categories of traits that differ in favorability, and we hypothesize two effects. First, the judged favorability of each trait is assimilated to its parent category and contrasted away from the comparison category. When these contextually influenced trait ratings are averaged, estimated category means are displaced away from each other. Second, accentuation effects may also emerge (in addition to contrast effects) if those traits that are most different from the comparison category are weighted more heavily during the averaging process. That is, the displacement of mean estimates may be even greater than the average displacement of individual trait ratings.

Contrast and Accentuation Effects

Contrast effects are well documented in the literature on human judgment. They appear when categorization affects either the perception or the reproduction of individual ratings of stimuli (Upmeyer, 1981). Eiser (1971) found that differences between attitude statements varying in permissiveness toward drug use were enhanced when the permissive and the nonpermissive statements were attributed to different sources. In a classic experiment on categorization, Tajfel and Wilkes (1963) had subjects estimate the lengths of eight graded lines. When the four shorter lines were labeled A and the four longer lines were labeled B, the perceived differences between the longest line labeled A and the shortest line labeled B was overestimated. This effect did not appear when the labels were randomly assigned or when no labels were provided. "When a classification is [perfectly] correlated with a continuous dimension, there will be a tendency to exaggerate the differences on the dimension between items which fall into distinct classes" (Tajfel, 1969, p. 83). Tajfel and Wilkes's (1963) subjects did not estimate the average length of the A lines and the B lines, but it seems plausible that intercategory contrast effects result when subjects average biased individual ratings. In this research, we examine this possibility. In addition, we test whether accentuation effects enhance intercategory separation beyond possible contrast effects.

Accentuation effects may require different psychological mechanisms than contrast effects. Whereas contrast effects result from accurate averaging of stimuli whose perception has been biased by context, accentuation effects are due to differential weight given to exemplars that enhance, rather than reduce, intercategory differences. Our previous work suggests that accentuation can occur in the absence of contrast effects. When unambiguous numbers were used as stimuli, no contrast effects were found, and no accentuation was found during the initial phase of average learning. When new information modified the mean in one category, however, numbers that enhanced intercategory differences biased estimated means toward greater accentuation of differences, presumably through enhanced encoding or retrieval (Krueger et al., 1989).

Three experiments are reported here. The first experiment is an attempt to replicate our earlier number study with socially relevant stimuli. Because the stimuli were ambiguous, we predicted contrast and accentuation effects. In the second and the third experiment, we test whether an increase in variability in one category is sufficient to produce the accentuation effect. Even when new information does not change the mean of the distribution, subjects may give greater weight to that tail of the distribution that enhances, rather than blurs, intercategory differences. The third experiment also includes measures of perceived range, as well as perceived central tendency, and includes a recall measure of the traits.

Experiment 1

During the first phase (the category-learning phase) of a two-phase experiment, subjects were shown two distributions of 18 trait adjectives each. On the average, the favorability of the traits in one category (the focal category) was neutral. For half the subjects, all traits of the other category (the contextual category) were favorable, and for the other half, all traits were unfavorable. Trait adjectives were selected on the basis of normative favorability ratings so that the ranges of favorability in the focal category and in the contextual category did not overlap but bordered one another. After each presentation, subjects rated the favorability of the trait and identified its category membership; after every set of 3 focal and 3 contextual traits, they estimated the cumulative mean favorability of each category.

We predicted that traits in the focal category would be rated as more favorable in the presence of an unfavorable contextual category than in the presence of a favorable contextual category (contrast effect) and that contrasted mean estimates would result from these contrasted trait ratings.

During Phase 2 (the category-change phase), subjects were presented with another 18 traits in each category. For the focal category, the additional traits either increased or decreased the cumulative average favorability. For the contextual category, the mean favorability of the additional traits was identical to the mean favorability during Phase 1, so that the cumulative mean remained constant. Subjects continued rating the favorability of each trait, identifying the category membership for each trait, and periodically estimating the cumulative mean favorability of each category.

The direction of change in the focal category and the favorability of the contextual category were manipulated independently, resulting in four experimental conditions. When the focal category became more favorable and the contextual traits were favorable or when the focal category became more unfavorable and the contextual traits were unfavorable, intercategory differences were reduced. When the focal category became more favorable and the contextual traits were unfavorable or when the focal category became more unfavorable and the contextual traits were favorable, intercategory differences were enhanced. Our prediction was that the degree of displacement of trait ratings in Phase 2 would be as large as in Phase 1 and that estimated means would be displaced even further away from the contextual category than in Phase 1 (accentuation effect). That is, when intercategory differences were enhanced, estimated change would be greater than when intercategory differences were reduced.

Method

Subjects and Procedure

Sixty-two male and female undergraduate students at the University of Oregon participated in exchange for credit in introductory psychology courses. All subjects were native speakers of English. They participated in groups of four, and sessions lasted 50 min. The experimenter explained that the study was concerned with the perception of personality attributes and the intuitive formation of impressions about groups of such attributes. Subjects were told that they would see two series of personality-descriptive adjectives. Each adjective would be rated on its favorability, and periodically the average favorability of each series would be estimated. The experimenter pointed out that native speakers have a high level of agreement about the perceived favorability of traits and that intuitive judgments of average can be made with relative ease. Subjects were assured that their judgments of the traits did not constitute a personality test and that the averaging task was not a measure of mathematical ability.

Subjects worked individually on personal computers, which were programmed to present 72 trait adjectives for 3 s each. Each term was an exemplar of one of two categories. Traits in the focal category were presented in uppercase characters; traits in the contextual category were presented in lowercase characters. Before each presentation, the letter *A* or *B* was shown for 500 ms to identify the category membership of the trait. After each presentation, subjects entered a favorability rating. Judgments were made on a scale ranging from *extremely unfavorable* (0) to *extremely favorable* (100). The midpoint of the scale (50) indicated evaluative neutrality. Subjects than identified the category membership of the trait by entering the letter *A* or *B*. This procedure ensured continuing attention to the two stimulus variables, favorability and category. The 72 traits consisted of 12 blocks of 6 adjectives. After each block, subjects estimated the cumulative average favorability separately for each category. Before each of these judgments, they were instructed to consider all the adjectives they had seen so far. Consequently, the task became gradually more difficult as an increasing number of traits had to be considered.

Stimulus Materials and Design

By the end of Block 6, 18 traits had been presented in random order in each category. Trait adjectives were selected from Goldberg's (1973) list of 1,710 traits, an abbreviated version of Norman's (1967) collection of normative data for 2,800 traits. The normative favorability ratings permitted the construction of a neutral focal category and an either favorable or unfavorable contextual category. The distributions of favorability were unimodal and symmetrical. They bordered one another and did not overlap. The focal category consisted of neutral traits with favorabilities ranging from 3.8 to 6.3 and a mean of 5.02 on a scale ranging from 1 to 9. Favorabilities in the positive contextual category ranged from 6.4 to 8.7, with a mean of 7.65; favorabilities in the negative contextual category ranged from 1.4 to 3.6, with a mean of 2.37. All presented trait adjectives are listed in Appendix A.

In Phase 2, 18 new focal traits were randomly intermixed with 18 new contextual traits. For the contextual category, the mean favorability did not change. In the focal category, 6 of the new traits were neutral, and 12 new traits were either favorable or unfavorable. By the end of the experiment, the cumulative mean of the focal category had changed from 5.02 to 4.13 (unfavorable change) or to 5.82 (favorable change). This change in mean favorability resulted in either a reduction or an enhancement of intercategory difference, depending on the favorability of the contextual category. Each of the 4 subjects who participated at the same time was assigned to one of the four conditions, favorable change/favorable context (reduction), unfavorable change/unfavorable context (reduction), favorable change/unfavorable context (enhancement), and unfavorable change/favorable context (enhancement). Figure 1 shows the focal and the favorable contextual distribution at the end of Phase 1 (top). The distributions depicted for Phase 2 show a focal category whose mean has become more negative. In the center panel, the contextual category is favorable (enhancement); in the bottom panel, the contextual category is unfavorable (reduction).

Dependent Variables

The first dependent variable was the computed cumulative means of the focal category, which were based on the subjects' favorability rating for each trait that was made on a scale ranging from *extremely unfavorable* (0) to *extremely favorable* (100). The second variable was the estimates of the cumulative mean favorability of the focal category. Means were estimated six times during each phase. For analyses, estimates were averaged within phases.

Results

Computed Means

The computed means served as a standard of accuracy, indicating what mean favorability subjects should have estimated for the focal category, had they accurately averaged their own favorability ratings. Table 1 shows the cumulative averages and standard deviations.

Contrary to prediction, there was no intercategory contrast effect in Phase 1. Ratings in the focal category were close to the neutral point of the scale, and ratings that were made in the presence of an unfavorable contextual category ($M = 50.81$) were not higher than ratings that were made in the presence of a favorable contextual category ($M = 50.42$), $t(61) = .20$, $p > .50$. That is, individual trait ratings in the focal category were not contrasted away from ratings in the contextual category.

To test whether focal category means were contrasted away from the contextual category in Phase 2, a two-way analysis of covariance (ANCOVA) was performed with direction of change (favorable, unfavorable) and context (favorable, unfavorable) as between-subjects variables and with the average ratings in Phase 1 as the covariate. No contrast effect was found, as the

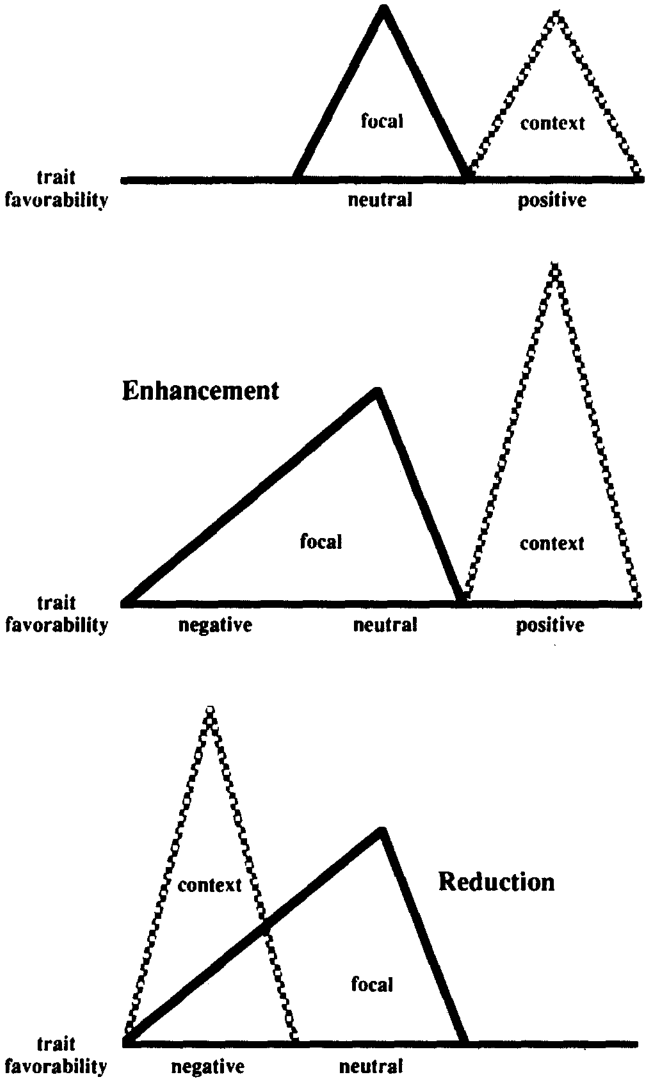

Figure 1. Schematic representation of distributions of trait favorabilities in the focal and the contextual category after Phase 1 (top) and after Phase 2 (center and bottom): Experiment 1.

means in the condition with a favorable contextual category (M = 50.97) were not significantly lower than the means in the condition with an unfavorable contextual category (M = 50.78), $F(1, 60) < 1$. The effect of direction was significant, confirming that trait ratings became more favorable when favorable traits were added (M = 55.98) and became more unfavorable when unfavorable traits were added (M = 45.77), $F(1, 60) = 118.90$, $p < .001$. The interaction term was not significant ($F < 1$).

Estimated Means

The first three estimates of cumulative means in Phase 1 were quite unstable and are not included in the analyses. The remaining three estimates were averaged to obtain a reliable measure of performance during the category-learning phase. For Phase 2, the six estimates were averaged. Table 2 shows the averages and standard deviations in each of the four conditions.

In all conditions, estimates for the focal category in Phase 1 were slightly above the neutral point of the scale. When the contextual category was unfavorable, the estimated mean of the focal category (M = 54.40) was not higher than when the contextual category was favorable (M = 54.04).

In Phase 2, estimated means were expected to be more extreme when intercategory differences were enhanced than when they were reduced (accentuation effect). Table 2 shows that when the direction of change was unfavorable, estimates were lower (M = 44.54) when the context was favorable (enhancement) than when the context was unfavorable (reduction; M = 50.27). When the direction of change was favorable, estimates were lower (M = 60.04) when the context was favorable (reduction) than when the context was unfavorable (enhancement; M = 66.52). That is, estimates of the focal means in Phase 2 were displaced away from the contextual category. A two-way ANCOVA was performed with direction of change and the favorability of the contextual category as between-subjects variables and the estimated means in Phase 1 as the covariate. Indeed, in the presence of an unfavorable context, estimates were higher (M = 58.40) than in the presence of a favorable context (M = 52.92), $F(1, 60) = 6.21$, $p < .02$. There was also a significant effect of direction, $F(1, 60) = 57.82$, $p < .001$, as subjects rated the focal category as more favorable when favorable traits were added (M = 63.28) than when unfavorable traits were added (M = 47.05). The interaction term was not significant ($F < 1$).

The perception that mean changes in the focal category were greater when intercategory differences were enhanced than when they were reduced would result in a magnification of perceived intercategory differences if estimated means in the contextual category remained constant across phases. In three conditions, means did not vary significantly across phases, indicating that subjects accurately perceived the constancy of the contextual means. In one condition, when the focal mean became greater and the distance to the favorable contextual category was reduced, the estimated contextual mean was greater in Phase 2 (M = 81.69) than in Phase 1 (M = 76.76), $t(14) = 2.77$, $p < .02$. This effect was not predicted, but it added to the accentuation effect that was obtained in the focal category.

Discussion

Contrary to prediction, there were no contrast or accentuation effects in Phase 1. Individual favorability ratings, as well as mean estimates, were unaffected by the judgmental context. In Phase 2, however, mean estimates were displaced away from estimates in the contextual category, whereas computed means were not. Estimates changed more when intercategory differences were enhanced than when they were reduced. This result constitutes the predicted accentuation of category change, and it supports the hypothesis that intuitive averaging would be biased toward greater weight for traits that enhanced intercategory distinctions than for traits that reduced such distinctions. These findings extend our first tests of category accentuation with abstract numbers (Krueger et al., 1989) to the domain of ambiguous social stimuli.

Experiment 1 was designed to model situations of intergroup contact in which new information about individual group

Table 1
Experiment 1: Cumulative Averages of Trait Favorability Ratings in the Focal Category in Phase 1 and in Phase 2

	Direction of change in focal category			
	Unfavorable		Favorable	
Favorability of contextual category	Unfavorable (reduction)	Favorable (enhancement)	Unfavorable (enhancement)	Favorable (reduction)
Phase 1				
M	52.77	50.99	49.19	49.85
SD	7.94	6.18	5.98	7.44
Phase 2				
M	46.61	44.93	54.94	57.01
SD	6.44	9.24	4.41	8.27

members gradually becomes available. The generality of this model is limited by the assumption that new information consistently modifies the mean in one direction. Consider Tajfel's (1969) example of perceptions of the height of Scandinavians and Italians. Stereotypes of average Italian height may change with relevant experience, but unless the average Italian is expected to be extremely short, some people will be taller than the expected average, and some will be shorter. In other words, during intergroup contact, a person encounters group members who enhance intergroup differences and members who reduce these differences. Linville, Fischer, and Salovey (1989), for example, reported that during the course of an academic term, increasing familiarity of students with their classmates led to perceptions of greater variability. Experiment 1 suggested that perceptions of changing category means accompany perceptions of increased category variability. If, however, information that enhances intercategory differences carries greater weight than information that reduces such differences, a symmetrical increase in variance around a stable mean alone should produce erroneous perceptions of mean change. Subjects would give greater weight to that tail of the distribution that enhances, rather than reduces, intercategory differences. In Experiment 2, the mean of the focal category was held constant across phases, but the variance of trait favorability of the focal category was increased. We hypothesized that in Phase 2, the focal category means would not be affected by their contextual category.

Experiment 2

Phase 1 in Experiment 2 was identical to Phase 1 in Experiment 1. During Phase 2, the focal category consisted of an equal number of new exemplars at both tails of the distribution, so that one tail of the focal distribution overlapped with the contextual distribution, whereas the other tail extended away from it. The location of the contextual category was again varied. Because of the symmetrical increase in variance, the actual cumulative mean in the focal category remained constant; thus, perceived changes were illusory. On the basis of the findings in Experiment 1, we predicted that estimated focal category means in Phase 2 would be accentuated away from the contextual category beyond the displacements that were due to possible contrast effects.

Method

Ninety-two male and female undergraduates at the University of Oregon participated in exchange for credit in introductory psychology courses. In contrast to Experiment 1, a total of 96 trait terms were presented. During the category-learning phase, subjects saw 24 terms

Table 2
Experiment 1: Average Estimates of Mean Trait Favorabilities in the Focal Category in Phase 1 and in Phase 2

	Direction of change in focal category			
	Unfavorable		Favorable	
Favorability of contextual category	Unfavorable (reduction)	Favorable (enhancement)	Unfavorable (enhancement)	Favorable (reduction)
Phase 1				
M	56.16	56.44	52.65	51.64
SD	13.15	10.71	11.88	11.83
Phase 2				
M	50.27	44.54	66.52	60.04
SD	11.60	14.60	11.93	9.97

in each category (focal and contextual). They rated the favorability of each adjective and entered the category-identifying letter. After each set of 8 adjectives, 4 in each category, subjects estimated the two cumulative means. During Phase 1, the actual mean favorability in the focal category was 5.00 on a 9-point scale. In the favorable contextual category, the actual mean favorability was 7.65; in the unfavorable category, it was 2.35. During Phase 2, 4 neutral traits (M = 5.0), 10 unfavorable traits (M = 2.37), and 10 favorable traits (M = 7.66) were added to the focal category. Hence, the actual cumulative mean remained unchanged, but the range and the variance increased. In contextual categories, the means and variances were constant across the two phases. Figure 2 shows the focal and the favorable contextual distribution in Phase 1 (top) and Phase 2 (favorable context, center; unfavorable context, bottom). All trait adjectives are shown in Appendix B.

Results and Discussion

Computed Means

Average cumulative favorabilities in Phase 1 were computed by averaging trait ratings after Blocks 4–6. Similarly, all ratings from Blocks 7–12 were averaged to provide a measure of the mean cumulative favorability rating in Phase 2. The top half of Table 3 shows the cumulative averages in the two groups in each phase.

Table 3
Experiment 2: Mean Estimates and Computed Mean Trait Favorabilities in the Focal Category in Phase 1 and in Phase 2

	Contextual category	
Rating	Unfavorable	Favorable
Computed		
Phase 1		
M	51.95	46.56
SD	8.02	7.35
Phase 2		
M	51.90	45.97
SD	6.80	5.97
Estimated		
Phase 1		
M	56.51	49.44
SD	12.14	10.89
Phase 2		
M	58.97	47.96
SD	10.95	10.84

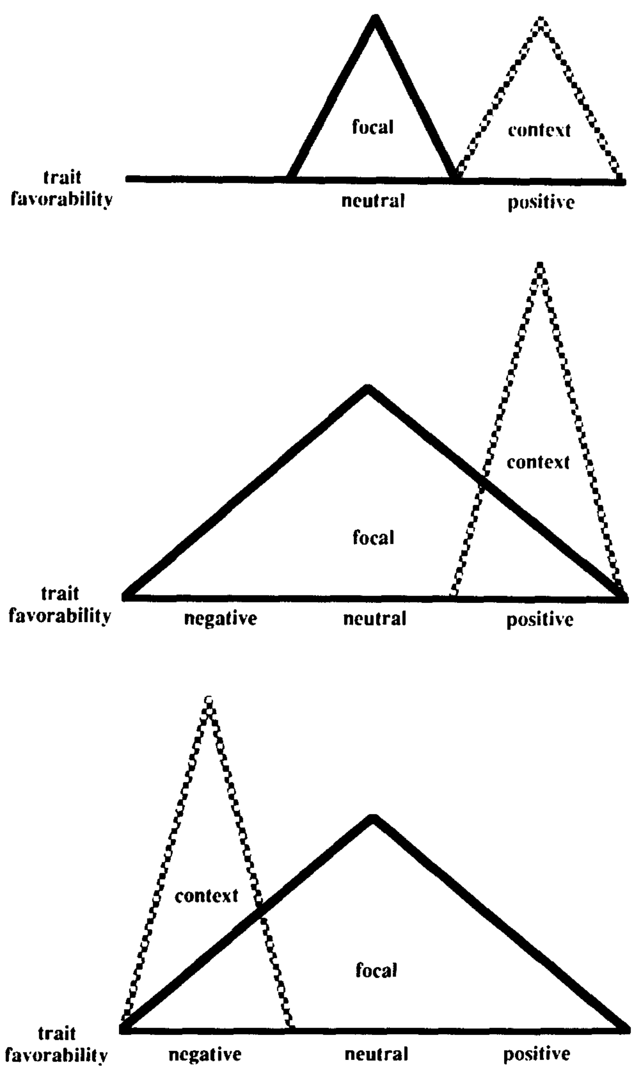

Figure 2. Favorability distributions after Phase 1 (top) and after Phase 2 (center and bottom): Experiment 2.

A two-way analysis of variance (ANOVA; Context × Phase) with repeated measures on the computed means revealed that ratings in the focal category were lower when the contextual category was favorable (M = 46.27) than when it was unfavorable (M = 51.93), $F(1, 90) = 15.61$, $p < .001$. That is, individual ratings of trait favorabilities were contrasted away from the contextual ratings. In Phase 2, the displacement of the means was not greater than in Phase 1. That is, there was no interaction between context and phase, $F(1, 90) < 1$. This finding suggests that an increase in category variance does not increase contrasts in individual ratings.

Estimated Means

The bottom half of Table 3 shows the averages of the estimated means in the focal category in Phase 1 and Phase 2. In Phase 1, estimates were contrasted away from the contextual category. Estimates were higher when the context was unfavorable than when it was favorable, $t(91) = 2.95$, $p < .01$, reflecting the contrast effect. There was no accentuation effect in Phase 1, however, because the degree of displacement was not greater than the displacement found in the computed means.

In Phase 2, the displacement of estimated means was larger than in Phase 1. In an ANOVA with context (favorable vs. unfavorable) as a between-subjects variable and phases (1 vs. 2) as a within-subjects variable, the interaction term was significant, $F(1, 91) = 6.20$, $p < .02$. Mean estimates rose by 2.46 when the context was unfavorable, and they fell by 1.48 when the context was favorable. Both changes were in the predicted direction, and t tests for dependent measures revealed that the first difference was significant, $t(47) = 2.40$, $p < .02$, whereas the second was not, $t(44) = 1.22$, $p < .10$. Because the displacement of computed means did not increase from Phase 1 to Phase 2, the changes in the estimated means constituted the predicted accentuation effect.

The actual means and variances for the contextual categories remained constant across the experiment. *T* tests for dependent measures were performed to test whether estimates were constant as well. Estimates in the unfavorable contextual category remained the same across phases (Phase 1 $M = 28.68$, Phase 2 $M = 28.58$). In the favorable contextual category, estimates in Phase 2 ($M = 77.90$) were higher than estimates in Phase 1 ($M = 74.53$), $t(44) = 2.85$, $p < .01$. This illusory change away from the focal category was not predicted, but it is consistent with the tendency toward accentuated intercategory separation.

Experiment 2 was more representative of situations of intergroup contact than was Experiment 1. Exposure to group members during intergroup contact typically includes information that both enhances and reduces intercategory differences. Although the actual weight of these two kinds of information was identical and true means remained stable, the perceived focal means changed away from the contextual means.

Intercategory contrast effects emerged in Experiment 2 but not in Experiment 1. Procedural differences may have caused this unforeseen discrepancy. The total number of adjectives was larger in Experiment 2 than in Experiment 1 (96 vs. 72), and perhaps more important, in each block of Experiment 2, four traits of each category were presented, whereas the respective number in Experiment 1 was three. This difference seemed of little consequence when the experiments were designed, but it may indicate that larger intervals between successive estimates of cumulative category means reduce accuracy in trait perception. When category means are estimated only once at the end of each phase, contrast effects may be largest. Experiment 3 was conducted to test this possibility.

Experiment 3

Besides limiting the estimation of means to one judgment per phase, we attempted to further narrow the gap between category learning and the acquisition of differentiated intergroup perceptions. Therefore, trait terms were presented as descriptors of members of two novel groups, A and B. On the basis of the trait information, subjects rated the likability of each target person, rather than rating the favorability of the trait itself. In addition, we included a measure of perceived range as well as perceived central tendency, and we also asked subjects to list all the traits they could remember at the end of the experiment. The recall measure was included to test the idea that category-accentuating information is more easily remembered.

Method

One hundred and twenty University of Oregon undergraduate students participated in partial fulfillment of course requirements. With four exceptions, procedures were identical to those of Experiment 2. First, subjects were told that they were taking part in an experiment on impression formation about social groups. They would be presented with a series of personality descriptors that were characteristic of members of two groups of men. Each trait was associated with a person who was either a member of Group A or Group B. On the basis of the trait information, subjects rated the likability of each group member on a scale ranging from *not likable* (0) to *very likable* (100). Second, estimates of the average likability for each group were made only at two times: at the end of Phase 1 and at the end of Phase 2. Third, at the conclusion of the experiment, subjects estimated the highest and the lowest likability rating they had given the members of each group. Fourth, subjects were asked to recall as many traits as possible and list them in the appropriate group: A or B. They had not been told of this recall task at the beginning of the experiment.

Table 4
Experiment 3: Mean Estimates of Favorabilities and Computed Mean Ratings in the Focal Group in Phase 1 and in Phase 2

	Contextual category	
Rating	Unfavorable	Favorable
Computed		
Phase 1		
M	52.25	44.08
SD	10.74	8.45
Phase 2		
M	53.30	45.80
SD	7.12	6.68
Estimated		
Phase 1		
M	64.49	45.47
SD	15.78	17.71
Phase 2		
M	66.73	41.95
SD	11.78	15.35

Results and Discussion

Computed Means

When the contextual group was favorable, means of individual ratings in the focal group were lower than when the contextual group was unfavorable (see top half of Table 4). The contrast effect did not increase in Phase 2. Hence, there was an effect of context, $F(1, 118) = 30.34$, $p < .001$, but no interaction between context and phase, $F < 1$.

Estimated Means

Data on the estimated means are presented in the bottom half of Table 4. In Phase 1, estimated means were higher when the focal group was paired with an unfavorable contextual group than when it was paired with a favorable contextual group, $F(1, 118) = 81.65$, $p < .001$. The magnitude of this difference (19.02 points) indicated a combination of contrast and accentuation because it was larger than the displacement of computed means (8.17 points).

In Phase 2, estimates of mean focal likability increased when the contextual group was unfavorable and decreased when the contextual group was favorable, $F(1, 118) = 4.13$, $p < .044$. The accentuation of mean estimates in Phase 2 may therefore be considered an illusory change because there was neither a change in the actual mean favorabilities nor in the means of the individual likability ratings. There was no effect of phase, $F < 1$.

The increased displacements of the focal means in Phase 2 resulted in the predicted enhancement of intergroup differentiation because the contextual means were not displaced toward the focal group. In fact, estimates for the favorable contextual group became more extreme from Phase 1 ($M = 74.79$, $SD = 16.20$) to Phase 2 ($M = 79.53$, $SD = 11.71$), $t(56) = 3.21$,

Table 5
Experiment 3: Mean Likability Ratings of the Focal Traits Recalled in Phase 1 and in Phase 2

	Contextual category	
Rating	Unfavorable	Favorable
Correct		
Phase 1		
M	58.96	40.56
SD	17.14	17.73
Phase 2		
M	73.43	37.41
SD	14.52	20.58
False		
Phase 1		
M	42.40	67.41
SD	26.07	22.74
Phase 2		
M	27.38	80.14
SD	24.02	19.90

Note. The top panel of the table shows average favorability ratings of those traits that were correctly placed in the focal group. The bottom panel shows the averages for the traits that were falsely recalled as members of the contextual group.

$p < .003$. For the unfavorable group, estimates did not differ significantly between phases, $t(62) = 1.53$, $p < .14$.

Memory for Traits

On the average, 9.1% of the focal traits presented during Phase 1 and 16.4% of the focal traits presented during Phase 2 were recalled and placed correctly in the focal group. The incidental recall task was included at the end of the experiment to examine the possibility that the category-accentuation effect was mediated by the greater availability of traits that enhance rather than reduce intercategory differences. If this were the case, the average favorabilities of the recalled traits would be similar to the estimated category means but not to the computed averages of the individual ratings. That is, there would be an accentuation effect in Phase 2. Table 5 shows the results for the recall of the focal traits that were correctly classified as focals (top half) and for the focal traits that were falsely attributed to the contextual group (bottom half).

Recall in the focal group was biased toward greater accentuation in Phase 1, suggesting that the likelihood of retrieval was increased for those focal traits that were evaluatively contrary to the favorability of the contextual groups. This effect became stronger in Phase 2 because the increase in group variance provided a wider range of positive and negative traits. Errors in recalled group membership were not frequent; but in part, the accentuation effect may have been due to an erroneous placement of focal traits in the contextual group. Specifically, focal traits whose favorability was more representative of the contextual mean than of the focal mean may have been misremembered as contextual traits. Of the Phase 1 traits, 2% were falsely remembered as contextual traits; of the Phase 2 traits, 4.9% were misremembered. As Table 5 shows, trait favorability served as a (occasionally misleading) cue for classification. The favorabilities of the misclassified focal traits resembled the average favorabilities of the contextual categories; this effect was stronger in Phase 2 than in Phase 1.

Perceived Category Boundaries

Ranges of actual and recalled ratings in the focal group provided further support for intercategory accentuation. Means and standard deviations are presented in Table 6. Subjects' estimates of the lowest and highest ratings in the focal group were significantly lower when the context was favorable than when it was unfavorable $F(1, 118) = 24.24$, $p < .001$, as were the actual extreme ratings, $F(1, 118) = 12.58$, $p < .001$. The differences between the high and low values in both measures did not vary with regard to the favorability of the contextual group ($Fs < 1$).

Experiment 3 showed that judgments about the average favorability of groups of people show the same tendency to maximize intercategory differences as judgments about trait categories. Accentuation effects were not limited to estimates of central tendency but also affected the perception and memory of individual exemplars and judgments of category boundaries. The contrast effect became stronger as the number of exemplars prior to obtaining subjects' estimates increased.

General Discussion

The present study yielded strong evidence for the idea that the learning of category information is biased toward intercategory separation. When subjects learned information about two categories, they (a) were more likely to incorporate difference-enhancing rather than difference-reducing information into category knowledge, (b) overestimated mean differences and underestimated intercategory overlap, (c) overestimated differences between individual stimuli belonging to different categories, and (d) were more likely to recall stimuli that enhanced rather than reduced intercategory differences.

The findings stress the importance of distinguishing between two separate phenomena in category learning: contrast and accentuation effects. Contrast effects refer to the displacement of the value of individual stimuli as a function of context; accurate averaging of these displaced values magnifies intercategory differences. Accentuation effects refer to the additional displacement of estimated means that go beyond contrast effects. In our original study (Krueger et al., 1989), with numbers

Table 6
Experiment 3: Highest and Lowest Likability in the Group: Recall and Actual Ratings

	Recall		Actual rating	
Context	Lowest	Highest	Lowest	Highest
High				
M	2.98	84.75	1.68	94.40
SD	5.57	15.05	3.36	6.45
Low				
M	12.73	92.41	4.46	96.27
SD	14.50	16.43	7.30	5.28

as stimuli, we found accentuation effects but no contrast effects. If a single cognitive process were responsible for both effects, both effects should have been found. We suggested that the lack of stimulus ambiguity in the original experiments did not allow contrast effects to emerge. Accentuation effects, on the other hand, may depend on biased encoding, retrieval, or integration of difference-enhancing exemplars.

In the present experiments, in which more ambiguous stimuli were used, the hypothesized relationship between displaced individual trait ratings and contrasted mean estimates was found. In Experiment 1, neither individual ratings nor mean estimates were biased in Phase 1; in Experiments 2 and 3, in which we increased the number of exemplars prior to judgment, judgments of the value of individual stimuli were displaced away from the contextual category, as were group estimates that were based on these individual values. More important, contrasted individual ratings did not account for the accentuation effect in Phase 2, because there was no further enhancement of contrast in the individual ratings. Whereas we favor the perceptual distortion hypothesis for the contrast effect, we see several plausible explanations for the accentuation effect.

Possible Mechanisms of Category Accentuation

The recall data obtained in Experiment 3 suggest that the accentuation effect may in part be due to biased memory processes. In this experiment, accentuation effects were found in both phases. In Phase 1, favorable focal traits were most frequently recalled when the contextual group was unfavorable, and the reverse was true for the unfavorable focal traits. In Phase 2, when the focal variance became larger, the discrepancy in recall was even stronger. Why was recall biased? Regrettably, the present data do not permit a final conclusion about the nature of the memory processes involved, but three possible mechanisms seem promising candidates for further study.

First, as we have suggested previously, initial expectations may have biased recall (Krueger et al., 1989). If subjects formed an expectation about the average intercategory difference in Phase 1, they may in Phase 2 have remembered those traits most easily that indicated category differences, rather than similarity. In a study on memory for stereotype-confirming and stereotype-disconfirming information, for example, Rothbart, Evans, and Fulero (1979) showed that behavior descriptions were best remembered if they confirmed a stereotypic expectation about a group.

Second, the location of the traits on the scale of favorability may have affected recall. Positive or negative focal traits were distinctive and attention catching when they did not overlap with contextual traits. Von Restorff (1933) found that distinctive stimuli are most easily remembered because they appear as figures before a homogeneous ground, and Tversky and Kahneman (1973) showed that people overestimate the frequency of distinctive stimuli. When positive or negative focal traits overlapped with the contextual category, their distinctiveness was reduced. Moreover, these traits may have become confusable with the contextual traits at the stage of recall. The recall data showed that focal traits were erroneously remembered as contextual traits only if their favorability overlapped with the contextual category. Some subjects conceivably used a retrieval heuristic. To minimize confusion, they may have selected a cut-off favorability to decide whether a remembered trait belonged to Category A or to Category B. This possibility could be tested by varying the focal mean and variance without creating overlap of the trait distributions.[1]

Third, subjects' need for structure and predictability may have favored the perception of categories that were maximally distinct. The pattern of selective weighting of new information may be motivationally relevant if subjects wished that categories be maximally distinct. Tajfel (1969) pointed out that perceiving categories as distinct has inferential advantages:

> If it were true that all the Scandinavians were taller than all the Italians, we could have a perfect biserial correlation; and one could predict the class membership of an item from its value on a certain dimension, and vice versa. (p. 82)

Thus, the search for a high biserial correlation between favorability and category may contribute to the category-accentuation effect. A goal of future research should be to test the validity of these alternative explanations.

Implications for Intergroup Perception

We have cast social perceivers in the role of intuitive statisticians who acquire knowledge about categories by abstracting an average from a series of exemplars. Cognitive biases, and particularly accentuation effects, have long been known to contribute to the formation and maintenance of stereotypes (cf. Hamilton, 1981). The accentuation of category change is a cognitive mechanism that serves stereotype maintenance by favoring information that increases, rather than decreases, intercategory differences. The stereotypes of greatest social concern are those that involve pejorative comparisons between groups. Personal contacts between members of two antagonistic groups have been a source of hope for reducing stereotypes (Amir, 1976). Category accentuation presents a barrier to the assimilation of negative outgroup stereotypes to positive in-group stereotypes. To move the perceived average position of the out-group toward the in-group, contacts with group members that blur between-groups distinctions would have to be far more numerous than contacts with members who sharpen between-groups distinctions. Unfortunately, the necessary favorable ratio of stereotype-weakening over stereotype-sharpening contacts may be rare in natural settings, and the reduction of perceived intercategory differences may be therefore difficult to obtain.

Most modern approaches to intergroup contact stress the difficulty of obtaining any stereotype change at all (e.g., Rothbart & John, 1985; Weber & Crocker, 1983), concurring with classical views on this problem. Allport (1954) deplored "the striking fact that in most instances categories are stubborn and resistant to change" (p. 22); Tajfel (1969) charged that "there is good evidence that even when the facts do turn against us and destroy the useful and comfortable distinctions, we still find ways to preserve the general content of our categories" (p. 89). Because conceptions of stereotype rigidity equate change with the reduction of perceived intergroup differences, they neglect

[1] We thank Richard Shiffrin for this suggestion.

the possibility of change that enhances group differences. Our studies on exemplar-based belief change indicate that estimated group averages may on occasion change too much rather than too little and show change even when reality remains stable. The problem with stereotypes may be that when they do change, they change in the direction of enhanced group differences—even when the evidence does not warrant such a change.

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Appendix A

Materials Used in Study 1

Table A1

Trait Adjectives and Favorability Ratings in the Focal Category in Phase 1 and in Phase 2

Phase 1		Phase 2					
Neutral		Favorable		Neutral		Unfavorable	
Adjective	Rating	Adjective	Rating	Adjective	Rating	Adjective	Rating
Worldly	6.3	Sincere	8.7	Carefree	6.2	Gullible	3.5
Autonomous	6.3	Kind	8.5	Proper	5.6	Hardened	3.3
Assertive	6.2	Creative	8.3	Restrained	5.2	Touchy	2.9
Bold	6.0	Diligent	8.1	Rebellious	4.8	Disruptive	2.7
Wary	5.6	Compassionate	7.9	Self-conscious	4.4	Negativistic	2.6
Outspoken	5.3	Enterprising	7.7	Stubborn	3.8	Hard-hearted	2.5
Fanciful	5.2	Sociable	7.5			Irritable	2.3
Authoritative	5.1	Humorous	7.3			Slovenly	2.1
Skeptical	5.0	Adventurous	7.1			Irresponsible	1.9
Prankish	5.0	Astute	7.1			Malicious	1.7
Critical	4.9	Systematic	6.9			Abusive	1.5
Crafty	4.7	Serious	6.7			Insincere	1.4
Complacent	4.5						
Dependent	4.3						
Shy	4.2						
Temperamental	4.0						
Moody	3.9						
Extravagant	3.8						
M	5.02	*M*	7.65	*M*	5.00	*M*	2.37

Note. Favorability ratings as reported by Goldberg (1973), ranging from *very unfavorable* (1) to *very favorable* (9). In Phase 2, 6 neutral traits and either the 12 unfavorable traits or the 12 favorable traits were presented.

Table A2

Trait Adjectives and Favorability Ratings in the Contextual Category in Phase 1 and in Phase 2

Phase 1				Phase 2			
Favorable		Unfavorable		Favorable		Unfavorable	
Adjective	Rating	Adjective	Rating	Adjective	Rating	Adjective	Rating
Honest	8.7	Boisterous	3.5	Dependable	8.7	Cocky	3.6
Friendly	8.5	Domineering	3.3	Understanding	8.5	Aloof	3.2
Conscientious	8.4	Clumsy	3.1	Intelligent	8.4	Loud	3.1
Educated	8.3	Forgetful	3.0	Courteous	8.3	Miserly	2.7
Cheerful	8.2	Callous	2.8	Just	8.2	Haughty	2.6
Confident	8.1	Arrogant	2.7	Warm	8.1	Sneaky	2.5
Patient	8.0	Messy	2.6	Clever	7.9	Cranky	2.2
Resourceful	7.9	Boastful	2.4	Agreeable	7.8	Uncooperative	2.1
Expressive	7.7	Bossy	2.3	Hard-working	7.7	Ill-tempered	2.1
Witty	7.6	Lazy	2.2	Self-controlled	7.6	Impolite	2.0
Active	7.5	Superficial	2.1	Frank	7.5	Narrow-minded	2.0
Cultured	7.4	Intolerant	2.0	Careful	7.4	Undependable	1.9
Optimistic	7.3	Humorless	1.9	Foresighted	7.3	Inconsiderate	1.8
Artistic	7.2	Rude	1.9	Flexible	7.2	Nagging	1.7
Spontaneous	7.1	Unreliable	1.8	Articulate	7.1	Bullying	1.7
Outgoing	6.8	Greedy	1.7	Prudent	6.9	Ill-mannered	1.6
Musical	6.6	Ignorant	1.6	Efficient	6.7	Deceitful	1.6
Obliging	6.4	Dishonest	1.4	Verbal	6.4	Inhumane	1.4
M	7.65	*M*	2.35	*M*	7.65	*M*	2.39

(*Appendix B follows on next page*)

Appendix B

Materials Used in Study 2

Table B1

Trait Adjectives and Favorability Ratings in the Focal Category in Phase 1 and Phase 2

Phase 1		Phase 2					
Neutral		Favorable		Neutral		Unfavorable	
Adjective	Rating	Adjective	Rating	Adjective	Rating	Adjective	Rating
Worldly	6.3	Sincere	8.7	Proper	5.6	Gullible	3.5
Autonomous	6.3	Kind	8.5	Restrained	5.2	Hardened	3.3
Assertive	6.2	Creative	8.3	Rebellious	4.8	Touchy	2.9
Forceful	6.1	Compassionate	7.9	Self-conscious	4.4	Disruptive	2.7
Bold	6.0	Enterprising	7.7			Hard-hearted	2.5
Wary	5.6	Sociable	7.5			Irritable	2.3
Quiet	5.5	Humorous	7.3			Irresponsible	1.9
Outspoken	5.3	Adventurous	7.1			Malicious	1.7
Fanciful	5.2	Systematic	6.9			Abusive	1.5
Cunning	5.2	Serious	6.7			Insincere	1.4
Authoritative	5.1						
Skeptical	5.0						
Prankish	5.0						
Critical	4.9						
Traditional	4.8						
Crafty	4.7						
Complacent	4.5						
Sarcastic	4.4						
Dependent	4.3						
Shy	4.2						
Temperamental	4.0						
Possessive	3.9						
Moody	3.9						
Extravagant	3.8						
M	5.0	*M*	7.66	*M*	5.0	*M*	2.37

Table B2

Trait Adjectives and Favorability Ratings in the Contextual Category in Phase 1 and in Phase 2

Phase 1				Phase 2			
Favorable		Unfavorable		Favorable		Unfavorable	
Adjective	Rating	Adjective	Rating	Adjective	Rating	Adjective	Rating
Honest	8.7	Boisterous	3.5	Dependable	8.7	Cocky	3.6
Friendly	8.5	Domineering	3.3	Understanding	8.5	Immodest	3.3
Conscientious	8.4	Noisy	3.2	Intelligent	8.4	Aloof	3.2
Considerate	8.4	Clumsy	3.1	Trustworthy	8.4	Loud	3.1
Loyal	8.4	Forgetful	3.0	Reliable	8.3	Suspicious	2.9
Educated	8.3	Violent	2.9	Courteous	8.3	Jealous	2.8
Cheerful	8.2	Callous	2.8	Just	8.2	Picky	2.8
Confident	8.1	Arrogant	2.7	Warm	8.1	Miserly	2.7
Patient	8.0	Messy	2.6	Clever	7.9	Haughty	2.6
Resourceful	7.9	Gossipy	2.5	Generous	7.8	Sneaky	2.5
Gentle	7.8	Boastful	2.4	Agreeable	7.8	Cranky	2.2
Expressive	7.7	Bossy	2.3	Hard-working	7.7	Selfish	2.2
Witty	7.6	Lazy	2.2	Self-controlled	7.6	Spiteful	2.2
Active	7.5	Stingy	2.2	Frank	7.5	Uncooperative	2.1
Practical	7.5	Superficial	2.1	Steady	7.5	Ill-tempered	2.1
Cultured	7.4	Intolerant	2.0	Careful	7.4	Impolite	2.0
Optimistic	7.3	Humorless	1.9	Foresighted	7.3	Narrow-minded	2.0
Artistic	7.2	Rude	1.9	Flexible	7.2	Undependable	1.9

Table B2 (*continued*)

Phase 1				Phase 2			
Favorable		Unfavorable		Favorable		Unfavorable	
Adjective	Rating	Adjective	Rating	Adjective	Rating	Adjective	Rating
Spontaneous	7.1	Fraudulent	1.8	Vigorous	7.1	Inconsiderate	1.8
Astute	7.1	Unreliable	1.8	Articulate	7.1	Nagging	1.7
Outgoing	6.8	Greedy	1.7	Prudent	6.9	Bullying	1.7
Candid	6.8	Ignorant	1.6	Analytical	6.8	Ill-mannered	1.6
Musical	6.6	Murderous	1.5	Efficient	6.7	Deceitful	1.6
Obliging	6.4	Dishonest	1.4	Verbal	6.4	Inhumane	1.4
M	7.65	*M*	2.35	*M*	7.65	*M*	2.33

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