

Attribute Scatter and Decision Outcome: Judgment versus Choice

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This paper demonstrates that in multiattribute decisions, the mode of response (judgment vs choice) influences the outcome of decisions. This influence depends on the scatter, or internal variability, of attribute values. In decisions to accept, there is a higher preference towards high scatter profiles in judgment than in choice, while in decisions to reject, there is only a small difference between the two. Moreover, in judgment there is a higher preference toward high scatter profiles in acceptance decisions than in rejection decisions, while in choice there is a lower preference toward high scatter profiles in acceptance decisions than in rejection decisions. The processes that lead to these effects are discussed. © 1995 Academic Press, Inc.

Multiattribute profiles can be described by two parameters, *elevation*, the weighted average of the attribute values (where weights reflect attribute importance), and scatter, the internal variability of the attribute values around the profile mean (Cronbach & Gleser, 1953). While most models of intuitive multiattribute decisions do not take scatter into account (but see Brannick & Brannick, 1989; Ganzach, 1993), this feature of the input information may have an important role in the process of multiattribute decisions.

Scatter may affect the output of multiattribute decisions when people do not rely on linear-compensatory strategy—a strategy in which overall judgment is a weighted average of the attributes' values—but rely on “nonlinear-noncompensatory” strategies (e.g., Einhorn, 1970). In particular, scatter affects decisions when people rely on a conjunctive strategy, a strategy in which decisions are based primarily on one or a few *low* attributes, or on a disjunctive strategy, a strategy in which decisions are based primarily on one or a few

high attributes.¹ As an example of the relationship between scatter and decision strategies, consider an overall evaluation of two job candidates on the basis of two “equally important” test scores. The two candidates have the same mean, but while one has two moderate scores, the other has one high score and one low score. If decisions follow a linear compensatory strategy, the evaluations of the two candidates would be about the same. If decisions follow a conjunctive strategy, the candidate with the higher scatter will receive a lower evaluation. If decisions follow a disjunctive strategy, the candidate with the higher scatter will receive a higher evaluation.

COMMITMENT AND DECISION STRATEGY

When commitment is high, people tend to rely on a more “strict” decision strategy and put more emphasis on the negative aspects of the input information, i.e. they tend to use a conjunctive strategy. On the other hand, when the commitment associated with the decision is not high, people tend to rely on linear, or even disjunctive, strategies (see Einhorn, 1970, for an early discussion of this issue). Recently, Ganzach (in press) provided a direct experimental demonstration of this effect. Student subjects were asked to evaluate hypothetical target students on the basis of multiattribute profiles describing them, under high and low commitment conditions. The results of the study indicated that evaluations were more conjunctive when commitment was high. In the high commitment condition, more than in the low commitment condition, there was a stronger tendency for judgments to become more negative when scatter increased.

¹ Conjunctive (disjunctive) strategy is usually described by the concept of minimum (maximum) threshold. However, the concept of threshold applies primarily to choice, and it is less meaningful in the context of judgment. Our description is applicable for both decision modes, while still retaining the essence of what is meant by conjunction (disjunction) in choice, since it suggests that the attributes with low [high] values play a major role in the decision. In choice, this occurs due to the existence of threshold and in judgment because of the dominance of the attributes whose values are low (high) (see Ganzach and Czaczes, in press).

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JUDGMENT, CHOICE, AND COMMITMENT

An important difference between judgment and choice is that choice involves commitment to a course of action (e.g., Beach & Mitchell, 1978; Janis & Mann, 1977; Einhorn & Hogarth, 1981). People have to live with the outcome of their choices but not with the output of their judgments. For example, in their analysis of the differences between judgment and choice, Einhorn and Hogarth (1981) write: "The conflict inherent in taking action, as distinct from conflict in judgment, occurs because action implies greater commitment. Such commitment induces conflict in several ways . . . Whereas the existence of alternatives implies freedom to choose, the act of choice restricts that very freedom. Hence, keeping "one's options open" is in direct conflict with the need to take action . . . Unlike judgment, actions are intimately tied to motions of regret and responsibility." (p. 74).

These differences between judgment and choice are likely to lead people to be more strict in their choices than in their judgments. Since strictness is associated with increased reliance on conjunctive strategy (Ganzach, 1993), choice is likely to be more conjunctive than judgment. In terms of scatter, this analysis suggests that the relationship between scatter and preference is more negative in choice than in judgment. This hypothesis is examined in Experiment 1.

EXPERIMENT 1: MULTIATTRIBUTE JUDGMENT VS MULTIATTRIBUTE CHOICE

Method

Subjects. Forty-one subjects participated in the experiment. Most of the subjects were executives in financial institutions, while the rest were graduate business students. The experiment was conducted in small groups.

Procedure. Subjects were presented with 27 profiles of multiattribute descriptions of job candidates, organized in nine triplets. The triplets were presented in a booklet, one triplet per page. In the judgment condition, subjects were asked to evaluate their "tendency to accept" each of 27 job candidates on a 9-point scale, while in the choice condition they were asked to indicate which of each triplet they would accept.

The profiles were allegedly obtained from psychological evaluations of candidates for managerial positions in a bank. These psychological evaluations were given on four dimensions—intelligence, motivation, communication skills, and appearance—on a scale ranging from -7 (anchored as very low) to $+7$ (anchored as very high). In each of the nine triplets there were three

types of profiles. Two of the profiles, the "high scatter profile" and the "low scatter profile" had approximately the same weighted average (the weights were derived from the results of Experiment 3), but differed in their scatter. The third profile, the "filler profile", was clearly below the first two profiles. Thus, for example, in one of the triplets, the scale values of motivation, intelligence, communication skills and appearance were $+5$, -4 , $+6$, and -6 for the high scatter profile; $+1$, $+3$, -1 , and -2 for the low scatter profiles; and -7 , -2 , -3 , and 0 for the filler profile.² The full set of profiles used in this experiment is shown in the left part of Table 1 (the filler profiles appear under the heading "inferior profile" in the table).

The design was a within-subjects design. Each subject participated both in the judgment condition and in the choice condition, with 7 days separating the two tasks. Half of the subjects participated in the judgment condition first, while the other half participated in the choice condition first. The order of the presentation of the triplets was randomized across subjects, and the positions in which the three types of profiles appeared was randomized within the stimuli.

Results

The dependent variable in the analysis was Preference toward High Scatter Profiles (PHSP). In the choice condition, this preference was estimated for each subject by dividing the number of high scatter profiles chosen by the subject in the nine triplets by the sum of the low and high scatter profiles chosen by the subject. In other words, if H is the number of triplets in which the high scatter profile was chosen and L is the number of triplets in which the low scatter profile was chosen, then PHSP in this condition is defined as $H/(H + L)$. In the judgment condition, the evaluations were transformed to choices by treating the profile with the highest evaluation as the chosen profile. Triplets in which the evaluation of the high and low scatter profiles were equal were omitted from the analysis. In addition, both in the judgment condition and in the choice condition cases in which the filler profiles were preferred over the other two profiles were treated as errors and omitted from the calculation of PHSP. (The number of errors was very low. The probability of an error was about .008 in the choice condition and .010 in the judgment condition).

Consistent with our hypothesis, the mean PHSP was higher in the judgment condition ($M = .35$, $SD = .29$) than in the choice condition ($M = .26$, $SD = .17$). A 2

² In addition, the triplets varied in the weighted average of the high and low scatter profiles to cover most of the range of possible levels of input information (see Table 2).

TABLE 1
Profiles of Job Candidates

High scatter				Low scatter				Inferior profile				Superior profile			
M	I	C	A	M	I	C	A	M	I	C	A	M	I	C	A
-7	-5	+7	-6	-1	-3	-4	-5	-4	-7	-3	-5	-1	+3	0	-1
+7	-7	-4	-2	-2	-3	+2	-1	-7	-5	-3	+1	+5	+6	0	+5
+7	-7	0	-6	+1	0	-2	-2	-5	-2	-4	-4	+5	+2	+3	-1
+5	-4	+6	-6	+1	+3	-1	-2	-7	-2	-3	0	+4	+5	+3	-1
+4	+7	-7	-5	+1	+2	0	+1	-2	+1	-5	-3	+7	+5	+4	+1
+7	-4	+5	+7	+2	+5	+5	+1	+1	-2	0	+2	+7	+6	+6	0
+5	+7	-5	+6	+3	+3	+6	+2	-1	+4	-2	0	+4	+5	+6	+4
+4	+7	+7	-5	+3	+4	+5	+7	+2	0	+2	-1	+5	+7	+6	-3
+7	+5	+7	-6	+5	+3	+6	+4	+4	+2	+2	-2	+7	+7	+4	+2

Note. M, Motivation; I, Intelligence; C, Communication Skills; A, Appearance.

(decision-mode: judgment vs choice) × 2 (order: judgment-choice vs choice-judgment) revealed a significant effect for decision-mode, $F(1, 39) = 6.6, p < .01$. Neither the main effect for order, nor the interaction between order and framing were significant ($p > .9$ and $p > .2$, respectively).³

Another way to analyze these data is to look at inconsistencies in the responses. There are two types of inconsistencies that are of interest. In the first, the high scatter profile is preferred in the judgment condition while the low scatter profile is preferred in the choice condition. This inconsistency will be labeled $J_H C_L$. In the second, the low scatter profile is preferred in the choice condition while the low scatter profile is preferred in the judgment condition. This inconsistency will be labeled $J_L C_H$ (inconsistencies that involve the filler profile are not directly relevant for the test of our hypothesis).

Our hypothesis suggests that the inconsistencies should be primarily of the $J_H C_L$ type. The data indeed support this hypothesis. Out of the 45 inconsistencies, 35 (78%) were $J_H C_L$ type inconsistencies and only 10 were $J_L C_H$ inconsistencies. To obtain a statistical test for this difference in inconsistencies, we constructed a measure reflecting each subject's tendency toward $J_H C_L$ inconsistencies by subtracting the total number of her $J_H C_L$ inconsistencies from the total number of her $J_L C_H$ inconsistencies. As expected, the mean of this measure was significantly positive, $M = .61, SD = 1.0, t(40) = 3.8, p < .0005$.

³ An examination of the framing effect for each of the triplets individually revealed that PHSP was higher in judgment than in choice for all the 9 triplets. A log-linear analysis revealed that differences between triplets did not affect the results, $\chi^2(8) = 2.0, p > .9$. PHSP in the choice condition was .20, .12, .03, .25, .24, .10, .24, .35, and .61 for the first through the ninth profile, respectively. PHSP in the judgment condition was .26, .14, .10, .35, .33, .11, .42, .50, and .66, respectively.

EXPERIMENT 2: THE FRAMING OF MULTIATTRIBUTE CHOICE

Preference decisions in general, and multiattribute preference decisions in particular, can be framed in terms of acceptance or in terms of rejection. For example, in making decisions about job candidates, one may think in terms of which candidates should be accepted or in terms of which candidates should be rejected. In the experiment reported here, we examine the impact of this type of framing, which may be labeled *goal framing* (Ganzach and Schul, in press), on multiattribute choice.

An Accept choice is likely to entail more commitment than a reject choice. One has to live with the alternative he accepts, but not with the alternative he rejects. Therefore, reliance on conjunctive strategy is likely to be stronger in accept than in reject choices. This implies a stronger preference for high scatter profiles when choice is framed in terms of rejection than when it is framed in terms of acceptance.

Preliminary Study

Unlike the difference between judgment and choice, the difference between accept and reject choices in regard to commitment was not discussed in previous literature. Therefore, we conducted a study to demonstrate that commitment, or importance, is higher in accept than in reject choices. Subjects (undergraduate Business students) received a short questionnaire in which they were asked to assume the role of a manager who has two tasks. In one task he/she has to accept one candidate out of three, and in the other he/she has to reject one candidate out of three. Subjects were told to assume that they have considerable information on which they can base their decision in each of the two tasks, but since they are short on time, they have to

decide which of the two tasks is more important. The results indicated that the large majority of the subjects, 54 out of 76, considered the acceptance task to be more important. (the null hypothesis is rejected on the .001 level, $\chi^2 = 13.5$).

Method

Subjects. Ninety-six first-year Business Administration students participated in the experiment to fulfill a class requirement. The experiment was conducted in groups numbering three to eight.

Procedure. In each condition, subjects were presented with nine triplets of multi-attribute profiles of job candidates, and were asked to choose one from each triplet. In the accept condition they were asked to indicate which candidate from each triplet they would accept, while in the reject condition they were asked to indicate which candidate they would reject.

The triplets in the accept condition were the same triplets that were used in the first experiment. The triplets in the reject condition differed from the triplets in the accept condition in that the filler profile was clearly superior to the high and low scatter profiles. The filler profiles of the reject condition are presented under the heading "superior profile" in Table 1.

The design was a within-subjects design. Each subject participated both in the accept condition and in the reject condition, with 7 days separating the two tasks. Half of the subjects participated in the accept condition first, while the other half participated in the reject condition first.

Results

The dependent variable in the analysis was Preference Toward High Scatter Profiles. In the accept condition, it was calculated in the same way it was calculated in the choice condition of Experiment 1, i.e., by dividing the number of preferences toward high scatter profiles by the sum of preferences toward both low and high scatter profiles. In the reject condition it was calculated by treating the profile that was not chosen as the preferred profile. That is, PHSP was defined as $H/(H + L)$, where H is the number of triplets in which the high scatter profile was not chosen, and L is the number of triplets in which the low scatter profile was not chosen. Again, in both conditions, the choices of the filler profiles were treated as errors and omitted from the calculation of PHSP. (The probability of an error was about .009 in the accept condition and .055 in the reject condition).

Consistent with our hypothesis, the mean PHSP was higher in the reject condition ($M = .31$, $SD = .24$) than

in the accept condition it was ($M = .22$, $SD = .18$). A 2 (framing: acceptance versus rejection) \times 2 (order: judgment-choice vs choice-judgment) revealed a significant effect for framing, $F(1, 94) = 11.0$, $p < .001$. Neither the main effect for order, nor the interaction between order and framing were significant ($p > .5$ and $p > .7$, respectively).⁴

Analysis of inconsistencies revealed similar results. In this analysis, the tendency to accept the *high* scatter profile in the accept condition and reject it in the reject condition ($A_H R_L$ inconsistency), was compared to the tendency to accept the *low* scatter profile in the accept condition and reject it in the reject condition ($A_L R_H$ inconsistency). In agreement with our hypothesis, most of the inconsistencies (62%) were of the $A_L R_H$ type. To test this effect, we calculated for each subject a measure reflecting her tendency towards $A_L R_H$ inconsistencies by subtracting the total number of her $A_L R_H$ inconsistencies from the total number of her $A_H R_L$ inconsistencies. As expected, the mean of this measure was significantly positive, $M = .48$, $SD = 1.77$, $t(103) = 2.8$, $p < .001$.

EXPERIMENT 3: THE FRAMING OF MULTIATTRIBUTE JUDGMENT

While Experiment 2 shows that PHSP is higher in accept decisions than in reject decision, another line of reasoning may suggest that PHSP would be higher in reject decisions than in accept decisions. Changes in judgment frames often lead to changes in the weights of particular aspects of the input information. For example, Snyder and Campbell (1980) found that when people are asked to decide whether a target person is an extrovert, they primarily ask questions associated with extroversion, while when asked to decide whether the target is an introvert, they primarily ask questions associated with introversion (see also Skov & Sherman, 1986; Devine *et al.*, 1990). More recently, Westenberg and Koele (1992) demonstrated in a process tracing experiment that people rely more on frame-compatible attributes than on frame incompatible attributes by showing a stronger tendency to rely on conjunctive strategy in reject than in accept framing.

There are also outcome-based evidence for the dependence of weight on frame. For instance, Tversky

⁴ An examination of the framing effect for each of the triplets individually revealed that PHSP was higher in negative framing than in positive framing for 8 of the triplets. A log-linear analysis revealed that differences between triplets did not influence the effect of scatter on preference towards high scatter profiles, $\chi^2(8) = 6.5$, $p > .5$. PHSP in the accept condition was .21, .09, .07, .17, .25, .13, .22, .51, and .36, for the first through the ninth profile, respectively. PHSP in the reject condition was .36, .17, .10, .21, .28, .20, .20, .52, .52, respectively.

(1977) found that when asked to judge the similarity between two objects, people give a relatively heavier weight to the common features of the objects, while when asked to judge the dissimilarity between the objects, they give a relatively heavier weight to the distinctive features of each object. (See also Tversky *et al.*, 1988; Lehman *et al.*, 1992). Shafir (1993) and Ganzach and Schul (in press) showed similar effects in regard to goal framing. They demonstrated that the weight of discrete positive features is higher in accept decisions than in reject decisions, while the weight of discrete negative features is higher in reject decisions than in accept decisions.

In multiattribute decisions, the dependence of weight on frame may lead to heavier weight for positive attributes in an accept frame than in a reject frame. In terms of scatter, this implies that under certain circumstances, PHSP may be higher in accept decisions than in reject decisions. In particular, higher PHSP in accept than in reject decisions is more likely to occur in judgment than in choice, since in judgment the role of commitment is less important, and therefore less likely to affect preference. Thus, the purpose of this experiment is to examine whether the effect of framing on judgment would be different than the effect of framing on choice.

Method

Subjects. Fifty-three first-year Business Administration students participated in the experiment to fulfill a class requirement. The experiment was conducted in small groups. Subjects were randomly assigned to one of two conditions.

Procedure. The experiment was a *policy capturing* experiment (e.g., Brehmer and Joyce, 1988). Subjects received a booklet containing multiattribute descriptions of 44 job candidates. The candidates were described by four attributes: intelligence, motivation, communication skills, and appearance. The scale values of the attributes were presented on a -7 to $+7$ scale, where $+7$ was anchored as very high and -7 as very low. Scale values were drawn randomly and independently from uniform distribution over the range of the attribute scale. The order of the profiles was randomized across subjects.

About half of the subjects were instructed to evaluate the candidates in terms of "tendency to reject" (the reject condition), while the other half were instructed to evaluate the candidates in terms of "tendency to accept" (the accept condition). Evaluations were made on a 9-point scale. In the reject condition, the scale's anchors were recommend to reject (9) and recommend not to reject (1); in the accept condition, they were

recommend to accept (9) and recommend not to accept (1).

Results and Discussion

The scatter model. The two-attribute/two-candidate example discussed in the introduction demonstrates how the relationship between scatter and judgment can be examined in a simple case in which profiles have the same mean and attributes are equally important, and equally scaled. In the more general case (where profiles differ in their mean, and attributes are not equally important), in order to study the effect of scatter on evaluation, it is necessary to control for elevation, and to standardize the attribute values. The following model allows for examining the net effect of scatter on judgment.

$$Y = a + \sum_{i=1}^k b_i X_i + b_{k+1} \left[\sum_{i=1}^k (Z_i - \bar{Z})^2 \right]^{1/2}, \quad (1)$$

where Y is the judgment, the X_i 's are the attributes (scaled so that higher values of X_i imply higher judgment), the Z_i 's are the standardized values of the attributes (across profiles), and \bar{Z} is the mean Z_i within profile. The last term of the equation is a measure of the profile scatter. The value of b_{k+1} indicates the impact of scatter on judgment, when elevation is controlled (see Brannick & Brannick, 1989, and Ganzach and Czaczkes, in press, for previous work that was based on the scatter model).

Analysis. For the purpose of comparability between the two conditions, the judgments of the reject framing group were transformed by subtracting them from 10. As a result, after the transformation, in both groups, a higher judgment implies higher preference.

Equation (1) was estimated for each subject. The mean scatter coefficient was $-.197$ ($SD = .197$) in the reject condition, and $.050$ ($SD = .179$) in the accept condition. The former was significantly more negative than the latter, $t(51) = 2.85$, $p < .006$.⁵ Thus, in line with our hypothesis, the tendency of judgment to become more negative with increase in scatter is stronger in the reject condition than in the accept condition.⁶

⁵ One subject in the reject condition was omitted from the analysis since he used the reject scale as if it was an accept scale. Note also that the linear model of the judgments of both groups was quite similar. The mean linear R^2 of the rejection and acceptance groups were .69 and .72 respectively. Testing the null hypothesis of no difference between the groups yielded $t(51) = 1.0$, $p > .3$.

⁶ The values of the scatter coefficients in each of the two conditions are not directly relevant to the central issue of the paper, since our hypothesis is about the relative impact of scatter on preference (the

EXPERIMENT 4: THE FRAMING OF MULTIATTRIBUTE JUDGMENT VS THE FRAMING OF MULTIATTRIBUTE CHOICE

The first three experiments examined three of four possible comparisons of a full 2 (decision-mode: judgment vs choice) \times 2 (framing: accept vs reject) design. In this experiment we examine the full design. Based on the first three experiments, the pattern that should be expected is that of an interaction between decision-mode and framing.

Method

Subjects. Seventy-one first-year Business Administration students participated in the experiment to fulfill a class requirement. The experiment was conducted in small groups. Subjects were randomly assigned to one of four conditions.

Procedure. Subjects were asked to assume that they have to select a partner for an important homework assignment. They were given descriptions of potential candidates described by three attributes: intelligence, motivation, and likability (defined as "the extent to which you feel comfortable with the potential partner"). The attributes were presented as bar graphs, the longer the bar, the higher the score of the potential partner. The descriptions were organized in pairs. In the choice-accept [choice-reject] condition, subjects were asked to indicate which partner they would accept [reject] from each of the pairs; in the judgment-accept [judgment-reject] condition, subjects were asked to evaluate their tendency to accept [reject] each of the candidates on a 1 to 9 scale, where 1 was anchored as very low and 9 as very high. Each subject performed only one task, so the design was a between-subjects design.

Stimulus. The stimuli were presented in a booklet. Each page contained three pairs. Figure 1A presents one of the pairs in the judgment condition, and Fig. 1B

difference between positive and negative frame) and not about its absolute impact (its impact within each of the two framing conditions). However, it is interesting to note that judgment decreases (becomes more negative) with scatter in the reject condition (the scatter coefficient in this condition is significantly negative $t(25) = 5.1, p < .0001$) and does not change much in the accept condition (the scatter coefficient in this condition is not significantly different from zero, $t(26) = 1.4$). One explanation for these results is a negativity bias, a general tendency of negative information to be weighted more heavily than positive information (e.g., Skowronski & Carlston, 1989) associated with preference judgments concerning job candidates. In an accept frame, this bias "cancels out" the frame-induced tendency to rely more on the positive attributes, leading to a scatter coefficient close to zero. On the other hand, in a negative frame, the negativity bias "joins forces" with the frame-induced tendency to rely more on negative attributes.

presents the same pair in the choice condition. The order of the pairs was randomized across subjects, and the left-right positions of the high scatter profile in the pairs were randomized within the stimuli.

Each condition contained 12 pairs. The same pairs were used in all conditions. In 9 of the pairs, the two profiles were approximately equal in their weighted average (the attributes' weights were derived from a policy capturing study reported in Ganzach, 1993), but differed substantially in their scatter; that is, each pair included one high scatter profile and one low scatter profile. The other 3 pairs were fillers. In these pairs, the profiles did not differ much in their scatter. Table 2 shows the scale values of the 12 pairs used in the experiment.

Results and Discussion

Table 3 presents the mean PHSP in each of the conditions. The results are consistent with the interaction hypothesis. An analysis of variance revealed neither a main effect for decision mode, nor a main effect for framing ($p > .1, p > .2$, respectively). However, the interaction between these two factors was significant, $F(1, 67) = 6.3, p < .02$.

An analysis of simple main effects revealed two significant effects. First, in the accept conditions, preference toward high scatter profiles is stronger in judgment than in choice, $F(1, 67) = 8.3, p < .005$. Second, in the judgment conditions, preference toward high scatter profiles is stronger in accept framing than in reject framing, $F(1, 67) = 7.3, p < .01$. These findings replicate the findings of Experiments 1 and 3, respectively. On the other hand, the effect of framing on choice that was observed in Experiment 2 was not obtained in this experiment. Two possible reasons are the design of the experiment (between-subject design) and the number of subjects within each condition (18), which make the current experiment less sensitive than Experiment 2 (another possible reason is discussed under General Discussion).

Finally, this experiment does not answer the question of whether, in reject framing, there is a difference between judgment and choice in preference toward high scatter profiles. While the simple main effect associated with this difference was not significant, this may be due to a lack of power in the current experiment. Therefore, we conducted an additional, more sensitive, within-subjects experiment that included 42 subjects. The experiment was similar to Experiment 2, except that both judgment and choice were in accept, rather than reject, frame. The results of the experiment indicated no significant effect for decision mode ($p > .3$). These results are consistent with the notion that choice is associated with more commitment than judgment only in accept framing (see Experiment 2).

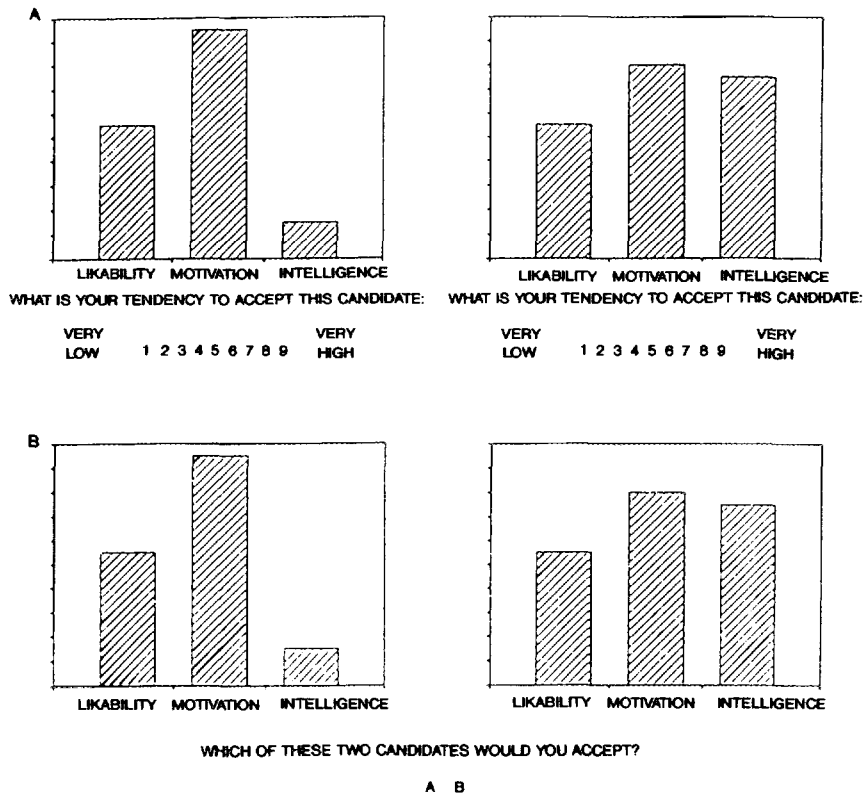


FIG. 1. An example of the experimental stimuli in the accept conditions of Experiment 4. In the reject conditions the word accept was replaced by the word reject.

GENERAL DISCUSSION

Rational decision making requires that preference depends neither on the decision mode (procedure invariance) nor on the framing of the decision problem (description invariance) (Tversky *et al.*, 1988). The four experiments reported in this paper show clear violations of these principles. We find that in multiattribute

decisions, preference depends on the interaction between decision-mode (judgment vs choice) and framing (accept vs reject). We suggest that this effect is due to the frame-dependence and decision-mode-dependence of the weights of positive and negative information.

Four issues are addressed in this section. We discuss an alternative explanation for the data labeled *the two-processes explanation*, we examine some methodological issues, we discuss the study of the differences between judgment and choice on the basis of process data versus the study of these differences on the basis of outcome data, and we conclude with a discussion of some practical and theoretical implications of the experiments.

The Two-Processes Explanation

An alternative explanation for the results of the four experiments is that one process mediates the effect of goal framing on preference toward high scatter profiles in judgment, while another process mediates this effect in choice.

According to this explanation, in judgment, but not in choice, the effect of goal framing on preference towards high scatter profiles is mediated by differences in the weight of frame compatible and frame incompatible attributes (see Experiment 3). This process ex-

TABLE 2
Profiles of Potential Partners

High scatter			Low scatter		
M	I	L	M	I	L
11	19	3	11	16	15
20	8	19	14	15	16
3	5	11	15	5	4
2	12	17	7	5	9
8	5	20	11	5	9
18	7	7	12	16	5
9	1	13	6	4	5
3	5	19	10	11	8
1	8	7	2	4	4
5	17	12	5	8	9
16	7	20	14	11	10
2	10	19	10	6	12

Note. M, Motivation; I, Intelligence; L, Likability. Pairs 3, 6, and 10 are fillers.

TABLE 3
Mean PHSP by Condition in Experiment 4

Decision	Framing	
	Accept	Reject
Judgment	.53 (.27)	.33 (.17)
Choice	.37 (.16)	.39 (.15)

Note. Numbers in parentheses are standard deviations.

plains the finding that in judgment there is a higher preference toward high scatter profile in accept than in reject frame.

In choice, the effect of goal framing on preference toward high scatter profiles is due to two factors. One factor is the influence of scatter on the subjective uncertainty of the input information—the higher the scatter, the higher the subjective uncertainty (see Slovic, 1966; Kahneman & Tversky, 1973; and Ganzach & Krantz, 1991, for previous work about the relationship between scatter and subjective uncertainty).⁷ The other factor is the perception of reject choices in terms of loss and the perception of accept choices in terms of gain. In choice, but not in judgment, goal framing has a psychological impact on decisions

⁷ It is important to emphasize that according to commonly accepted multi-attribute utility models, the decisions performed by the subjects in our experiments do not involve uncertainty, since there is no uncertainty about the attribute values (e.g., Keeney & Raiffa, 1976). Nevertheless, “riskless” multiattribute decisions are quite often associated with subjective uncertainty. For example, Kahneman and Tversky (1973) report an experiment in which subjects predicted grade point average based on four, equally valid, aptitude tests. The tests were organized in two pairs. In one pair, the two tests were highly correlated, while in the other they were not. Normatively, predictive accuracy should be higher for predictions based on the uncorrelated tests. However, subjects were more certain in their predictions from the correlated tests. In this experiment, the higher internal variability of the profiles of the uncorrelated tests is associated with higher subjective uncertainty in predictive accuracy. There are a few explanations for the impact of scatter on subjective uncertainty. One explanation, offered by Kahneman and Tversky (1973), is based on the representativeness heuristic. According to this explanation, the association between scatter and subjective uncertainty is mediated by representativeness. Since scattered profiles are not representative of decision output (they appear to be incoherent), there is increased uncertainty associated with them. Another explanation is based on the idea that ambiguity in subjective weights is the source for the relationship between scatter and uncertainty (see also Kahn & Meyer, 1991). Such ambiguity does not lead to high subjective uncertainty if the attribute values are about the same, but it does lead to high uncertainty when attribute values differ. For example, a person who knows that both intelligence and motivation are important in determining success in a job but is not sure about their relative importance has more uncertainty about the suitability of a candidate with a large gap between intelligence and motivation than the suitability of a candidate with a small gap between the two.

which is similar to the impact of gain-loss framing. Once a choice is made, one gains something (the chosen alternative) and one loses something (the unchosen alternative). Therefore, in choice, accept framing is likely to focus attention on the gains associated with the decision, while reject framing is likely to focus attention on the losses associated with the decision. The question “Which alternative would you accept?” is comparable to the question “What would you gain from the decision?”. Similarly, the question “Which alternative would you reject?” is comparable to the question “What would you lose from the decision?”.

Gain-loss framing was shown to interact with uncertainty (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). When decisions are framed in terms of gain, people have negative attitudes toward uncertainty, while when decisions are framed in terms of loss, they have positive attitudes toward uncertainty. Thus, the assumption that scatter influences subjective uncertainty of the input information and the assumption that goal framing is comparable to gain-loss framing, explain the finding that in choice there is a higher preference toward high scatter profiles in reject than in accept framing.

Finally, the interaction between framing and decision-mode is explained by the higher preference toward high scatter profile associated with accept vs reject frame in judgment and the lower preference toward high scatter profiles associated with accept vs reject frame in choice.

Methodological Considerations

The experiments reported in this paper feature both within-subjects comparisons and between-subjects comparisons. The disadvantage of the within-subjects design is that decisions in a latter session may be affected both by memory of decisions made in an earlier session, and by a transfer of strategy (note, however, that the latter problem was not likely to have occurred in our experiments, since order had no effect either in Experiment 2 or in Experiment 3). Within-subjects comparisons have, however, an important advantage. In addition to controlling for the between-subjects variation in the dependent variable (preference towards high scatter profile), they also control for between-subjects variation in attribute importance (i.e., variation in tastes that are unrelated to the dependent variable).

Another methodological consideration concerns the use of three alternative choice sets (Experiments 1 and 2) versus the use of two alternative choice sets (Experiment 4). This procedural variation may also have some impact on preference towards high scatter profile. First, the problem of “which one of two alternatives should be rejected” is often reframed by people into the problem of “which one of two alternatives should be

accepted." On the other hand the problem of "which one of three alternatives should be rejected" is usually not reframed to an acceptance problem (Shafir, 1993). Therefore, the likelihood of finding frame-dependent differences are higher in three than in two alternative choice sets. Second, in a two alternative set, processing by attribute (i.e., comparing the alternatives on each attribute at a time) may be relatively dominant, while in the three alternative set, processing by alternative (i.e., arriving at an overall evaluation of each alternative, and then comparing the alternatives on the basis of these evaluations) may be relatively dominant. Such differences in information processing may influence the effect of scatter. In particular, processing by alternative may make the choice task more "judgment-like" and thus decrease the difference between choice and judgment. Thus one direction for future research would be to examine the impact of set size on framing effects in choice.

Outcome Data and Process Data in the Study of Judgment versus Choice

An important limit of the present research is that most of the evidence for the mental processes underlying the differences between judgment and choice are indirect. They come from outcome data rather than from process data (see Ford *et al.*, 1989, for a review of methods for obtaining process data). While it could be argued that process data are better suited for the study of mental processes than outcome data, it should be emphasized that process data have difficulties of their own. One difficulty stems from the fact that there is very little explicit evidence that the information obtained in process tracing studies (e.g., verbalization in thinking-aloud protocols) reflect the underlying judgment process (Simon, 1978). Another difficulty stems from the fact that in order to obtain process data, intervention in the course of the decision is required. Such intervention may very well affect not only the natural process of the decision, but also its outcome, since it is likely that preferences are constructed during and influenced by the elicitation method (Payne, 1982; Kahneman & Tversky, 1986; Baron, 1988). Indeed, Billings and Marcus (1983) did not find any convergence between measures of decision processes derived from outcome data and measures derived from process tracing data.

Finally, intervention in the natural course of the decision may be especially problematic in studying the influence of commitment on decision. In particular, while policy capturing experiments indicate that commitment increases reliance on noncompensatory (conjunctive) strategy (Einhorn, 1971; Ganzach, 1993), within the process tracing paradigm it was argued that commitment may lead to increased reliance on com-

pensatory strategies, since it induces more deliberation (Billings & Scherer, 1988; McAllister, Mitchell, & Beach, 1979). Thus, commitment may have two effects on decision, a motivational effect, which is captured in the outcome data, and an information processing effect, which is captured by the process data (see also Ganzach, 1993, p. 436).

Implications

The experimental study of framing and decision-mode effects received much attention in recent research because it has both important practical and theoretical implications. The present studies examine a number of new issues relevant to this stream of research.

While previous research examined either framing effects or decision-mode effects separately (e.g., Tversky & Kahneman, 1981; Loewenstein & Prelec, 1991; Hershey *et al.*, 1982; Tversky *et al.*, 1988; Slovic *et al.*, 1990; Puto, 1987), the current paper examines them jointly and demonstrates a strong interaction between the two. According to our theory, this interaction is due to the fact that the process by which framing influences decision-outcome depends on the mode of the decision, and the process by which decision-mode influences decision-outcome depends on the frame.

This paper contrasts the two most basic decision modes, judgment, and choice. There is much interest in decision research on the similarities and differences between judgment and choice (e.g., Einhorn & Hogarth, 1981; Billings & Scherer, 1988; Tversky *et al.*, 1988) and in particular on their differential effects on decision-outcome. The research on the differential effect of judgment vs choice on decision-outcome was conducted so far primarily within the preference reversal paradigm (Lichtenstein & Slovic, 1971; Tversky *et al.*, 1990), in which judgments (estimation of selling price) and choices of various gambles were compared. The current work advances the study of the effect of judgment vs choice on decision outcome into the domain of multiattribute decisions.

Most real-life decisions are taken within a multiattribute, or multicriteria, framework. The selection of a job candidate, the purchase of a new machine, and the evaluation of a medical treatment are all multicriteria decisions. It is generally believed that systematic identification of the relevant criteria and explicit evaluation of the values the different alternatives have on this criteria will lead to decisions that match a "true" underlying preference. The current research raises some difficult questions about this belief.

REFERENCES

- Baron, J. (1988). *Thinking and deciding*. Cambridge: Cambridge Univ. Press.

- Bazerman, M. H., Loewenstein, G. F., & White, S. B. (in press). Reversals of preference in interpersonal decision making: The difference between judging an alternative and choosing between multiple alternatives. *Administrative Science Quarterly*.
- Beach, L. R., & Mitchell, T. R. (1978). A contingency model for the selection of decision strategies. *Academy of Management Review*, 3, 439-449.
- Bettman, J. & Kakkar, P. (1977). Effects of information presentation format on consumer information acquisition strategies. *Journal of Consumer Research*, 3, 233-240.
- Billings, R. S., & Scherer, L. L. (1988). The effects of response mode and importance on decision-making strategies: Judgment versus choice. *Organizational Behavior and Human Decision Processes*, 41, 1-19.
- Brannick, M. T., & Brannick, J. P. (1989). Nonlinear and noncompensatory processes in performance evaluation. *Organizational Behavior and Human Decision Processes*, 44, 97-122.
- Brehmer, B., & Joyce, C. R. B. (1988). *Human judgment: The social judgment theory view*. North Holland: Elsevier Science Publishers.
- Cronbach, L. J., & Gleser, G. C. (1953). Assessing similarity between profiles. *Psychological Bulletin*, 50, 546-473.
- Devine, P. G., Hirt, E. R., & Gehrke, E. M. (1990). Diagnostic and confirmation strategies in trait hypothesis testing. *Journal of Personality and Social Psychology*, 58, 952-963.
- Einhorn, H. J. (1970). The Use of nonlinear, noncompensatory models in decision making. *Psychological Bulletin*, 73, 221-230.
- Einhorn, H. J. (1971). Use of nonlinear, noncompensatory models as a function of task and amount of information. *Organizational Behavior and Human Performance*, 6, 1-27.
- Einhorn, H. J., & Hogarth, R. M. (1981). Behavioral decision theory: Processes of judgment and choice. *Annual review of Psychology*, 32, 52-88.
- Ford, J. K., Schmitt, N., Schechtman, S. L., Hulst, B. M., & Doherty, M. L. (1989). Process tracing methods: contribution, problems, and neglected research questions. *Organizational Behavior and Human Decision Processes*, 43, 75-117.
- Ganzach, Y. (1993). Goals as determinants of nonlinear noncompensatory judgment strategies: Leniency vs. strictness. *Organizational Behavior and Human Decision Processes*, 56, 422-440.
- Ganzach, Y., & Czaczkes, B. (in press). On detecting nonlinear noncompensatory judgment strategies: Comparison of alternative regression models. *Organizational Behavior and Human Performance*.
- Ganzach, Y. D. H. Krantz (1991). The Psychology of moderate prediction: II. Leniency and uncertainty. *Organizational Behavior and Human Performance*, 48, 169-192.
- Ganzach, Y., & Schul, Y. (in press). The influence of information quantity and goal framing on decision. *Acta Psychologica*.
- Jarvenpaa, S. L. (1990). Graphic displays in decision making: The visual salience effect. *Journal of Behavioral Decision Making*, 3, 247-262.
- Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.
- Jarvenpaa, S. L. (1989). The effect of task demands and graphical format on information processing strategies. *Management Science*, 35, 285-303.
- Kahn, B. E., & Meyer, R. J. (1991). Consumer multiattribute judgment under attribute-weight uncertainty. *Journal of Consumer Research*, 17, 508-521.
- Kahneman, D., & Tversky, A. (1973). On the Psychology of prediction. *Psychological Review*, 80, 237-251.
- Kahneman, D., & Tversky, A. Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263-291.
- Keeney, R. L., & Raiffa, H. A. (1976). *Decisions with multiple objectives: Preferences and value tradeoffs*. New York: Wiley.
- Lehman, D. R., Kronsnick, J. A., West, R. L., & Li, F. (1992). The focus of judgment effect: A question wording effect due to hypothesis confirmation bias. *Personality and Social Psychology Bulletin*, 18, 690-699.
- Levin, I. P., & Gaeth, G. J. (1988). How consumers are affected by framing of attribute information before and after consuming the product. *Journal of Consumer Research*, 15, 374-378.
- Levin, I. P., Johnson, R. D., Russo, C. P., & Deldin, P. J. (1985). Framing effects in judgment tasks with varying amounts of information. *Organizational Behavior and Human Decision Processes*, 36, 362-377.
- Loewenstein, G., & Prelec, D. (in press). Negative time preference. *American Economic Review*.
- Lucas, E. J., & Nielsen, N. R. (1980). The impact of the mode of information on learning and performance. *Management Science*, 26, 982-999.
- Payne, J. W. (1982). Contingent decision behavior. *Psychological Bulletin*, 92, 382-402.
- Puto, C. P. (1980). The framing of buying decisions. *Journal of Consumer Research*, 14, 301-315.
- McAllister, D. W., Mitchell, T. R., & Beach, L. R. (1979). The contingency model for the selection of decision strategies: An empirical test of the effects of significance, accountability, and reversibility. *Organizational Behavior and Human Decision Processes*, 24, 228-244.
- Shafir, E. (1993). Choosing versus rejecting: Why some options are both better and worse than others. *Memory and Cognition*, 21, 546-556.
- Simon, H. A. (1978). Information processing theory of human problem solving. In W. K. Estes (Ed.), *Handbook of learning and cognitive processes* (Vol. 5). Hillsdale, NJ: Erlbaum.
- Skov, R. B., & Sherman, S. J. (1986). Information gathering processes: Diagnosticity, hypothesis-confirmation strategies, and perceived hypothesis confirmation. *Journal of Experimental Social Psychology*, 22, 93-121.
- Snyder, M., & Campbell, B. H. (1980). Testing hypotheses about other people: The role of the hypothesis. *Personality and Social Psychology Bulletin*, 6, 421-426.
- Skowronski, J. J., & Carlston, D. E. (1989). Negativity and extremity biases in impression formation: A review of explanations. *Psychological Bulletin*, 105, 131-142.
- Slovic, P. (1966). Cue consistency and cue utilization in judgment. *American Journal of Psychology*, 79, 427-434.
- Slovic, P., Griffin, D., & Tversky, A. (1990). Compatibility effects in judgment and choice. In R. M. Hogarth (Ed.), *Insights in decision making: Theory and applications*. Chicago: University of Chicago Press.
- Tversky, A. Features of similarity (1977). *Psychological Review*, 84, 327-352.
- Tversky, A., & Kahneman, D. (1981). The framing of decision and the psychology of choice. *Science*, 211, 453-458.
- Tversky, A., Sattath, S., & Slovic, P. (1988). Contingent weighing in judgment and choice. *Psychological Review*, 95, 371-384.
- Tversky, A., Slovic, P., & Kahneman, D. (1990). The causes of preference reversal. *The American Economic Review*, 80, 204-217.
- Westenberg, M. R. M., & Koele, P. (1992). Response modes, decision processes and decision outcome. *Acta Psychologica*, 80, 169-184.