

# Conversational Conventions, Order of Information Acquisition, and the Effect of Base Rates and Individuating Information on Social Judgments

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Numerous studies have shown that people underuse base-rate information in making social judgments and rely instead almost exclusively on individuating information. Seven studies reported here demonstrate that this occurred partly because most past studies gave subjects base-rate information before giving them individuating information. A recency effect in the use of base-rate and individuating information is demonstrated using a set of reasoning problems of varying character. The recency effect is shown to be the result of subjects' inferences (based on conversational conventions) that the experimenter believes that subjects should rely most on the piece of information presented last. Additional evidence discredits the hypothesis that the recency effect is due to heightened availability of more recently acquired information in memory.

One of the most engaging topics of research in social cognition has been the impact of base-rate information on social judgments. Numerous empirical studies have compared the impact of base-rate information with the impact of individuating information about a person on assessments of the person's category membership or likely future behavior. Although early research suggested that individuating information overwhelms base-rate information (e.g., Kahneman & Tversky, 1973; Nisbett & Borgida, 1975), later studies revealed that base-rate information can have substantial impact when the base rate is derived from a representative sample (Wells & Harvey, 1977), when the individuating information lacks credibility (Schwarz, Strack, Hilton, & Naderer, *in press*), when the base rate has strong causal implications (Ajzen, 1977), when people bring a scientific orientation to a problem (Zukier & Pepitone, 1984), or when inferential rules suggesting the use of base rates have been activated (Ginossar & Trope, 1987).

Our focus in this article is on another factor that may regulate the impact of base-rate information: the order in which the base rate and individuating information is acquired by a judge. A majority of the studies that have documented underuse of base rates in social prediction tasks presented subjects with the base-

rate information first and individuating information last (see Ajzen, 1977; Bar-Hillel, 1980; Borgida & Nisbett, 1977; Ginossar & Trope, 1980, 1987; Hewstone, Bunn, & Wilson, 1988; Hinsz, Tindale, Nagao, Davis, & Robertson, 1988; Kahneman & Tversky, 1973; Manis, Dovalina, Avis, & Cardoze, 1980, Experiment 3; Nisbett & Borgida, 1975; Wells & Harvey, 1977; Zukier & Pepitone, 1984; see also Krueger & Rothbart, 1988).<sup>1</sup> Because order effects have been documented in many other areas of social judgment (e.g., Anderson, 1981; Crano, 1977; Krosnick & Alwin, 1987), we suspected that one might occur in this context as well. Specifically, if subjects were to receive individuating information before receiving base-rate information, they may make more use of the base rate than prior studies have suggested. Thus, past studies may have underestimated the degree to which people use base-rate information in making social judgments.

One reason why order of information acquisition may determine base-rate use is that more recently acquired information may be more available in memory and may therefore have more impact on relevant judgments. In most past studies, the more recently acquired information was more likely to have remained in short-term memory at the time of judgment, whereas information acquired earlier had probably already been moved into long-term memory. In addition, the more re-

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<sup>1</sup> Of studies conducted prior to 1980 that presented base-rate and individuating information in only a single order, 63% presented the base rate first (Borgida & Brekke, 1981). Among studies published after 1980 of which we are aware, the vast majority presented the base rate first. We do not include here studies that used within-subjects designs, in which subjects were asked to solve many problems with multiple pieces of base rate and individuating information. These studies are not comparable to between-subjects studies (Birnbaum & Mellers, 1983; Fischhoff, 1977; Fischhoff & Bar-Hillel, 1984; Fischhoff, Slovic, & Lichtenstein, 1979), which are our primary interest.

cently acquired information was likely to be the more salient, because it was figural relative to its immediate context and because it was unexpected in light of the initially presented, usually contradictory initial information (see Fiske & Taylor, 1984). More salient information and information in short-term memory enjoy enhanced impact on social judgments (Feldman, Higgins, Karlovac, & Ruble, 1976; Fiske & Taylor, 1984), so this may explain why individuating information dominated subjects' predictions in prior studies.

A recency effect might also have occurred in previous base-rate studies because of inferences based on the norms and rules that people use to interpret conversation. Grice (1975) argued that speakers and listeners behave according to a set of cooperative principles or maxims. One such maxim asserts that a speaker should say what he or she believes is relevant and informative, and listeners should assume that what is said is relevant and informative. Subjects in prior base-rate studies may therefore have said to themselves: "The first piece of information I was given (i.e., the base rate) has clear implications for my judgment, so it was sufficient. A speaker should only give me additional information if it is highly relevant and informative, so the experimenter must believe that the individuating information should be given special weight in my judgment" (see also Givon, 1982).

In fact, speakers often use conjunctions to indicate this sort of belief. Consider, for example, a conversation in which Bob asks Jim why he decided to buy a Volvo instead of a Saab. Jim might say, "I know a few people who had very bad experiences with Volvos, \_\_\_\_\_ *Consumer Reports* rated Volvos as more reliable than Saabs." It would seem most natural to fill the blank here with a conjunction such as *but* or *however*, which would suggest enhanced credibility of the second piece of information. Filling the blank with *but* would therefore suggest that Jim had decided to buy a Volvo. If instead Jim concluded, "I therefore decided to buy a Saab," most listeners would probably be puzzled, because the conjunction *but* and the order of the two pieces of information do not imply that conclusion.

Of course, if a speaker were to use a conjunction such as *even though* instead of *but*, that would imply enhanced credibility of the first piece of information. However, there is wide agreement among linguists that, according to the "given-new contract" (Clark & Haviland, 1977; Haviland & Clark, 1974), speakers typically place new, more informative and therefore more important information later in utterances, partly to direct listeners' attention to that information. In turn, listeners assume that information presented later is more important and should be the focus of their attention (see also Clark, 1985, pp. 197, 222-224). It is therefore probably far more common for speakers to use a conjunction such as *but* rather than *even though* in cases such as the above Volvo-Saab example, in which two pieces of conflicting information are presented. Furthermore, when hearing a speaker present two contradictory pieces of information leading to a conclusion, listeners are likely to assume that the speaker considers the second one to be the more important, even if the conjunction is not explicitly provided. Therefore, subjects in prior base-rate studies may have inferred that the experimenter placed more weight on the second piece of information, so they should do so as well.

## Previous Studies of Order Effects on Base-Rate Use

### *Studies of Causal Attributions*

A number of studies have experimentally assessed order effects on the use of base rates and individuating information, but their methodologies differed importantly from that used by Kahneman and Tversky (1973). For example, instead of examining probability judgments, two studies explored base-rate impact on causal attributions (Ruble & Feldman, 1976; Zuckerman, 1978). Ruble and Feldman (1976) asked subjects to indicate the cause of a target person's behavior after being given three types of information about the behavior: consensus, distinctiveness, and consistency. Ruble and Feldman found that the consensus information had more effect on attributions when it was presented last than when it was presented first. The impact of the other two types of information did not vary depending on order of presentation. Ruble and Feldman (1976) asserted that the recency effect they observed in consensus information impact occurred because the last cue read was most likely to be in short-term memory (see also Jones & Goethals, 1971), but no evidence was presented in support of this interpretation.

Zuckerman (1978) differentiated actions (completely voluntary behaviors) from occurrences (not completely voluntary behaviors), and found Ruble and Feldman's (1976) recency effect only for attributions regarding occurrences and not for attributions regarding actions. Zuckerman (1978) asserted that this occurred because when a behavior is perceived as voluntary, consensus information is irrelevant to an attribution and is therefore ignored, regardless of whether it is presented first or last. Replicating Ruble and Feldman's finding, Zuckerman found no impact of order on use of consistency or distinctiveness information. And like Ruble and Feldman, Zuckerman (1978) provided no evidence concerning the mechanism of the observed order effect on consensus information use.

Surprisingly, Brekke and Borgida (1988) found just the opposite effect from Ruble and Feldman's (1976) and Zuckerman's (1978). In a study of juror decision making in which subjects were given many pieces of information, Brekke and Borgida discovered that base-rate information had more impact on attributions when it was presented before individuating information than when it was presented afterward. There are at least three reasons why this reversal may have occurred. First, as Brekke and Borgida argued, the base rate could have provoked a change of meaning (Anderson, 1981) of the many varied and sometimes ambiguous pieces of individuating information. This was unlikely in most past base-rate studies, which used simple and straightforward individuating information. Second, the length of time over which subjects gathered and integrated information in Brekke and Borgida's study was much longer than the time interval typical of most base-rate studies, which may have induced a memory-based primacy effect that overwhelmed any recency effect (Bruce & Papay, 1970). And, finally, the information subjects received was not presented by an experimenter but rather was revealed in the course of a simulated courtroom trial. Therefore, subjects were probably unlikely to make inferences using knowledge about conversational

conventions to interpret the meaning of the order in which information was encountered.

### *Studies of Attitudes*

Hamill, Wilson, and Nisbett (1980) examined the effect of information acquisition order on the impact of base rates on attitudes. Subjects in their experiment read statistics about the length of time typical welfare recipients receive public assistance and read a description of a particular welfare recipient. Hamill et al. reported that the order in which these two types of information were given to subjects had a "trivial and nonsignificant" impact on their reported attitudes toward welfare recipients (Hamill et al., 1980, p. 581).

### *Studies of Probability Judgments*

Lyon and Slovic (1976) are the only investigators who have studied the impact of order of presenting base-rate and individuating information on probability judgments. In response to Kahneman and Tversky's (1972) cab problem, subjects' predictions were slightly closer to the base rate when it was presented after the individuating information than when it was presented before the individuating information. However, Lyon and Slovic (1976) did not test the statistical significance of this difference, instead concluding that the order manipulation had no effect.

In an extensive literature review, Borgida and Brekke (1981) considered the impact of presentation order on use of base-rate and individuating information in making nonattribitional judgments. After examining the various studies published up until 1980, Borgida and Brekke reported that "there appears to be no direct relationship between base rate utilization and order of presentation" (p. 73). However, Borgida and Brekke did not perform a formal meta-analysis of these studies.<sup>2</sup>

### *Summary*

Taken together, these studies yield no clear conclusion about a recency effect in use of base-rate and individuating information to make probability judgments. Therefore, more direct and extensive tests of the hypothesis seem warranted.

## The Present Investigation

The studies reported below explored these issues using methods much closer to those used in Kahneman and Tversky's (1973) original study and the many studies modeled after it. We first determined whether order of information presentation affects base-rate and individuating information use, expecting to find a recency effect. In doing so, we were able to assess whether order determines the impact of base-rate information only, individuating information only, or both. We then tested the availability explanation of the order effect by inducing accountability among some subjects (Tetlock, 1983a), by examining the accuracy and order of recall of the base rate and individuating information, and by examining the effect of purging short-term memory before a judgment is made. To test the conversational conventions explanation, we manipulated subjects' interpretations of the presentation order, and we assessed subjects' assumptions about the importance speakers typically place on each of two pieces of contradictory information when a conclusion is derived from them.

## Study 1

The goal of Study 1 was simply to test for an order effect on base-rate and individuating information use. The lawyer/engineer problem was adopted from Kahneman and Tversky (1973) with minor revision, and four independent variables were manipulated: (a) order of information presentation, base rate followed by individuating information versus individuating information followed by base rate; (b) base-rate level, 70% engineers versus 30% engineers; (c) individuating information, stereotypical engineer versus stereotypical lawyer; and (d) prediction question focus, an engineer versus a lawyer. Thus, Study 1 was a  $2 \times 2 \times 2 \times 2$  between-subjects design.

### *Method*

*Subjects.* Two hundred ten undergraduates at The Ohio State University enrolled in an introductory psychology course participated in the study for course credit. Because one subject did not complete the experimental booklet, 209 subjects were used in the analysis. Subjects were randomly assigned to one of the 16 conditions.

*Materials.* Subjects were introduced to the problem with the following sentence: "A panel of psychologists interviewed and administered personality tests to a group of 100 men, some engineers and some lawyers, all successful in their respective fields." The base rate was "Of the 100 people interviewed in this study 70 (or 30) were engineers and 30 (or 70) were lawyers." The stereotypical lawyer target person was described as follows:

Tom W. is of high intelligence, is quite self-confident, and tends to be argumentative, even with people he doesn't know very well. He is very involved in his work, and tends to work long hours. He is generally well dressed, even when not at work. His writing is interesting and creative, and is usually very convincing. He has a strong drive for competence and is rather competitive with others in his field. He is interested in social issues and reads the newspaper daily. He drives a sports car and lives in a suburban upper-middle-class neighborhood. He is not particularly uncomfortable if he lies to someone.

The stereotypical engineer target person was described as follows:

Tom W. is a 45-year-old man. He is married and has four children. He is generally conservative, careful, and ambitious. He shows no interest in political and social issues and spends most of his free time on his many hobbies, which include home carpentry, sailing, and mathematical puzzles.

After exposure to the base rate and individuating information, subjects were asked: "On a scale from 0 to 100, how likely do you think it is that Tom W. is (an engineer/a lawyer)? \_\_\_\_\_%"<sup>3</sup>

*Procedure.* Subjects were run in groups of approximately 35. Each

<sup>2</sup> It might seem reasonable to perform such a meta-analysis in order to assess the impact of information presentation order on use of base-rate information. However, because of the numerous uncontrolled differences between study designs, the results of such an analysis may be misleading. Therefore, we chose to conduct tests with more internal validity, which involved controlled experimental manipulations of presentation order.

<sup>3</sup> Estimates made by subjects whose prediction question asked about the probability that Tom W. was a lawyer were subtracted from 100 so that they would have meaning comparable to the predictions made by subjects whose prediction question asked about the probability that Tom W. was an engineer.

subject received a booklet that presented each piece of information on a separate page so as to control order of information exposure. Subjects were given 30 s to read each page and were told not to turn each page until they were instructed to do so. They were also required not to turn back to previous pages. The time constraint was intended to ensure that subjects spent equal amounts of time on each piece of information. After reading the two pieces of information, subjects estimated the probability that Tom W. was a lawyer or an engineer.

## Results

*Replication of base-rate underuse.* In Kahneman and Tversky's (1973) original study, subjects were presented with the base rate first and the individuating information second. Subjects in our experiment who received information in that order produced results consistent with Kahneman and Tversky's: Subjects' estimates were not influenced by the base rate. The mean estimates were 53.1% when the base rate was 70 and 52.7% when the base rate was 30,  $F(1, 97) = 0.01, p > .9$ .

Also consistent with Kahneman and Tversky's (1973) finding, subjects' predictions were affected by the stereotypical descriptions of the target person. When the individuating information was a description of an engineer, subjects predicted that the target person was likely to be an engineer ( $M = 69.6\%$ ), but when the individuating information provided a stereotypical description of a lawyer, subjects estimated the likelihood that the target person was an engineer to be rather low ( $M = 38.3\%$ ). This difference was highly statistically significant,  $F(1, 97) = 39.81, p < .001$ . Furthermore, the interaction between the base rate (70 vs. 30) and the individuating information (lawyer vs. engineer) was not significant,  $F(1, 97) = 0.48, p > .4$ . Thus, the basic aspects of Kahneman and Tversky's results were replicated here.

*Order effect on base-rate use.* As expected, use of the base rate was increased when it was presented last. A significant Order  $\times$  Base Rate interaction indicated that change of the base rate from 30 to 70 had a different effect on subjects' estimates depending on the order of information presented,  $F(1, 193) = 5.6, p < .02$ . Among subjects who received the base rate second, predictions were substantially smaller when the base rate was 30 ( $M = 39.4\%$ ) than when it was 70 ( $M = 56.7\%$ ),  $F(1, 96) = 10.46, p < .002$ . Thus, the base rate had substantial impact on subjects' probability estimates under these conditions.

*Order effect on individuating information use.* The order of information presentation had a marginally significant effect on use of the individuating information,  $F(1, 193) = 2.79, p < .09$ . When the individuating information was presented first, subjects' predictions were less consistent with the stereotypic implications of the description provided. When Tom W. fit the description of an engineer, subjects considered him likely to be an engineer ( $M = 58.3\%$ ), and when Tom W. fit the description of a lawyer, subjects considered him unlikely to be an engineer ( $M = 38.4\%$ ),  $F(1, 96) = 13.88, p < .001$ . This difference of 19.9% is notably smaller than the 31.2% difference among subjects who received the individuating information second. Thus, it appears that use of the individuating information was also subject to a recency effect.

*Effect of information consistency.* The conversational conventions hypothesis suggests that the recency effect in base-rate use

should only occur when the two pieces of information have conflicting implications. It is under these circumstances that listeners should be likely to infer that the second piece of information is more important. As expected, the consistency of the base rate and individuating information did have a significant effect on the magnitude of the order effect,  $F(1, 193) = 5.34, p < .03$ . The order effect was large when the two pieces of information were inconsistent ( $M = 14.3$ ),  $F(1, 193) = 7.65, p < .01$ , and was invisible when the two pieces of information were consistent ( $M = -2.5$ ),  $F(1, 193) = 0.25, ns$ . This finding lends support to the conversational conventions hypothesis.

*Effect of question wording.* In contrast to Kahneman and Tversky (1973), we found that a manipulation of the wording of the question had a significant effect. Subjects' estimate of the probability that the target person was an engineer was 55.7% when the prediction question asked about whether he was an engineer. After subtraction from 100, the same probability was 45.6% when the prediction question asked about whether he was a lawyer. This difference,  $F(1, 193) = 7.70, p < .007$ , could be evidence of a hypothesis confirmation bias. Because the Base Rate  $\times$  Order  $\times$  Question three-way interaction,  $F(1, 193) = 1.15, p > .28$ , and the Individuating Information  $\times$  Order  $\times$  Question interaction,  $F(1, 193) = 0.15, p > .69$ , did not approach significance, the effects of interest here were consistent across the two question wordings.

*Additional significant effects.* In addition to the effects described above, we identified two other significant ones: an Order  $\times$  Question interaction,  $F(1, 193) = 4.25, p < .05$ , and an Individuating Information  $\times$  Question interaction,  $F(1, 193) = 5.67, p < .02$ . Examination of the cell means did not suggest any theoretically meaningful interpretations of these interactions. No other effects in the Individuating Information  $\times$  Base Rate  $\times$  Order  $\times$  Question analysis of variance (ANOVA) were statistically significant or marginally so.

## Study 2

The goal of Study 2 was to replicate and test the generality of the recency effect observed in Study 1. In that study, the order effect only appeared when the base rate and the individuating information were inconsistent. Therefore, it was not necessary to manipulate the content of the individuating information or the base-rate level in order to study the order effect. Study 2 therefore used a simplified version of Study 1's design, in which the two pieces of information were inconsistent. Furthermore, there were no manipulations of level of base rate, content of the individuating information, or phrasing of the question used to measure the dependent variable. Five problems with various kinds of base rates were used as experimental materials, and subjects were randomly assigned to experimental conditions in a 2 (order of information presentation)  $\times$  5 (problem) between-subjects design.

## Method

*Subjects.* Two hundred seventy-five undergraduates at The Ohio State University enrolled in an introductory psychology course participated in the study for course credit. Because one subject did not complete the booklet, this person's data were excluded from the analyses

reported below. Subjects were randomly assigned to one of the 10 experimental conditions.

*Materials.* Each subject was given one of the following five problems:

1. The lawyer/engineer problem used in Study 1, using only the high base rate (70% engineers), the stereotypical lawyer description, and the question phrasing asking subjects the probability that the target person was an engineer.

2. In the car purchase problem (adapted from Nisbett, Borgida, Crandall, & Reed, 1976), Bill has decided to purchase a car and has narrowed his choice down to two makes, Brand A and Brand B. Subjects were told the following base rate: "Bill looks in a car magazine and finds that, according to a recent survey of its readers, Brand B car has the better repair record." The individuating information was described as follows:

Bill goes to a cocktail party and mentions to a friend who is an auto mechanic that he is trying to decide whether to buy a Brand A or a Brand B car. His friend reacts with disbelief and alarm: "Brand B? You've got to be kidding. I was just working on my brother-in-law's Brand B last week. This car has had one problem after another. First, the fuel injector went out. Next he started having trouble with the brakes. Finally, I had to replace the transmission and the clutch. They're just not well-built cars. If I were you, I certainly wouldn't buy a Brand B. Brand A is clearly the better buy."

After reading both pieces of information, subjects were asked to predict the probability that Brand A is the better car for Bill on a scale from 0 to 100. For the purpose of analysis, these estimates were subtracted from 100 so that they indicated the probability that Bill would buy a Brand B car. Consistent with other problems, higher estimates then reflected greater use of the base rate.

3. In the college choice problem, adapted from Nisbett, Krantz, Jepson, and Fong (1982), subjects were first told that "David L. is a senior in high school and is planning to go to college. He has completed an excellent record in high school and has been admitted to his two top choices: College A and College B. The two schools are about equal in prestige and are equally costly. Both are located in attractive cities, about equally distant from David's home town." The base rate was as follows:

David has several older friends who are attending College A and several who are attending College B. They were all excellent students in high school, like himself, and have interests very similar to his.

His friends at College A all report that they like the place very much and that they find it very stimulating. David's friends at College B reported that they have many complaints on personal, social, and educational grounds.

The individuating information was as follows:

David visited both schools himself for a day. He did not like what he saw at College A: Several people whom he met seemed cold and unpleasant; a professor he met with briefly seemed abrupt and uninterested in him; and he did not like the "feel" of the campus. David did like what he saw at College B: Several of the people he met seemed like vital, enthusiastic people; he met with two professors who took a personal interest in him; and he came away with a pleasant feeling about the campus.

After reading both pieces of information, subjects were asked to estimate the likelihood that College A is the better school for David on a scale from 0 to 100.

4. In the divorce problem, adapted from Zukier and Pepitone (1984), subjects were told that "In 1985, a survey was conducted of a

representative sample of residents in the Oklahoma City area; 1,257 people were interviewed." The base-rate information revealed that "According to this survey, within 3 years of getting married, 27% of the couples are divorced and 73% are still married." Subjects were also given the following individuating information about a target person:

N. got married 3 years ago. He is an airline pilot for TWA and is away from home for 2 weeks each month. Recently, N. put in a request for increased monthly flight time. N. has no children and lives in a suburb of Oklahoma City. He loves to ski and frequently goes on skiing trips with other men from the airline. He is considered to be attractive and adventurous by his friends and co-workers.

After reading both pieces of information, subjects estimated the probability that N. is divorced on a scale from 0 to 100. For the purpose of analysis, these probability estimates were subtracted from 100 so that higher probabilities would indicate greater use of the base rate.

5. In the crime problem, adapted from Zukier and Pepitone (1984), subjects were told that "All of the residents in the apartments on a certain block in New York City were interviewed recently for a study on a crime conducted by Columbia University." The base rate was "According to the interviews, 68% of the apartments on this block were broken into at least once during the last 10 years, and 32% were not." The individuating information stated:

Mr. and Mrs. J. have lived in the same apartment for 10 years, and they are on friendly terms with most of their neighbors. Mr. J. works during the day, and Mrs. J. stays at home and frequently hosts bridge games with her friends. On weekends, they enjoy having friends over for meals, and love showing off their prize-winning Persian cat.

After reading both pieces of information, subjects estimated on a scale from 0 to 100 the probability that Mr. and Mrs. J's apartment was one of those broken into during the last 10 years.

*Procedure.* Questionnaire administration was identical to that in Study 1.

## Results

As expected, we found clear evidence that the probability estimates varied depending on the order of information presentation,  $F(1, 264) = 14.03, p < .001$ . The average probability estimate was substantially higher when the base rate was presented after the individuating information ( $M = 54.2%$ ) than when the base rate was presented before the individuating information ( $M = 44.3%$ ). Thus, the recency effect observed in Study 1 was replicated.

Results for each problem are presented in Table 1. Simple effects analyses revealed that the recency effect was statistically significant for the car purchase problem,  $t(47) = 2.32, p < .03$ , and the college choice problem,  $t(49) = 2.32, p < .03$ ; marginally significant for the lawyer/engineer problem,  $t(44) = 1.95, p < .06$ , and the divorce problem,  $t(40) = 1.73, p < .09$ ; and nonsignificant for the crime problem,  $t(84) = 0.38, p > .70$ .<sup>4</sup> However, because the interaction between order and problem

<sup>4</sup> In the initial experiment, 50 subjects completed the crime problem. Because the order effect was in the expected direction but nonsignificant, we ran an additional 36 subjects so as to increase our statistical power to detect the recency effect. However, the effect remained nonsignificant. We report the results for all 86 subjects in Table 2, and their data are included in the ANOVA reported in the text.

Table 1  
 Study 2: Mean Probability Estimates as a Function  
 of Presentation Order and Problem

Problem	Presentation order		Difference	<i>p</i>	<i>n</i>
	Base rate first	Base rate second			
Lawyer/engineer	42.2	56.4	14.16	<.06	46
Car purchase	35.1	49.9	14.84	<.02	49
College choice	40.0	55.2	15.20	<.02	51
Divorce	42.0	52.9	10.88	<.09	42
Crime	53.3	55.6	2.30	>.70	86

was not significant,  $F(4, 264) = 0.88$ ,  $p > .4$ , the recency effect apparently did not vary meaningfully in magnitude across the five different problems.

### Study 3

Studies 1 and 2 suggest that previous investigations may have underestimated people's use of base-rate information in making social predictions because of a recency effect. However, it is not necessarily appropriate to generalize from the findings of the present studies to previous ones because of a potentially significant aspect of experimental design. To strictly control the order in which subjects acquired the base rate and individuating information, we presented them on separate pages in the questionnaires for Studies 1 and 2. But in most prior studies, these two pieces of information were presented on the same page, which would allow subjects to reread both pieces of information if they wished. We therefore conducted a third study to assess whether the recency effect appears when all of the information is presented on the same page. In this study, we also explored whether the recency effect generalizes to situations in which subjects report their decisions in the form of discrete choices instead of probabilities.

### Method

**Subjects.** Five independent samples of subjects participated in this study. The first two samples were University of Michigan undergraduates taking an introductory psychology course who received course credit ( $Ns = 43$  and  $60$ ). The third sample consisted of 132 undergraduates from introductory social psychology classes at the University of California, Los Angeles (UCLA); these individuals volunteered to participate. The fourth sample was composed of 99 UCLA undergraduates taking introductory psychology who received course credit for their participation. The fifth sample included 207 undergraduates from the University of British Columbia (UBC) taking three different psychology courses who volunteered to participate. Subjects were randomly assigned to receive either the base rate or the individuating information first.

**Materials.** Two problems were used in this study—versions of the college choice problem and car purchase problem used in Study 2, with two primary changes. First, in the college choice problem, the schools were called Hamilton and Bart, and in the car purchase problem, the alternatives were a Volvo and a Saab. Second, instead of reporting probabilities, subjects were asked to indicate which college the person

should go to or which car the person should purchase. In addition, subjects were asked to justify their recommendations.<sup>5</sup>

**Procedure.** Subjects in the first Michigan sample, both UCLA samples, and the UBC sample received the college choice problem. Subjects in the second Michigan sample received the car purchase problem. Subjects were run in groups of between 40 and 70, and each subject received a single page that presented the problem and left room for his or her answer.

In order to be considered to have provided a valid answer, subjects must have made a clear recommendation and must not have misstated the problem information in their justification. This led to the omission of 2 subjects from each of the two Michigan samples, 6 subjects from the first UCLA sample, 5 subjects from the second UCLA sample, and 7 subjects from the UBC sample. For the two Michigan samples and the first UCLA sample, each subject's answer was coded by two independent raters. The two raters agreed on the coding of all responses except one; a third coder resolved this discrepancy. Because intercoder agreement was so high for these samples, only one coder was used for the second UCLA sample and the UBC sample.

### Results

As Table 2 illustrates, the expected recency effect was obtained in all five replications. For the college choice problem, the effect was significant for the Michigan sample,  $\chi^2(1) = 12.89$ ,  $p < .001$ ; the first UCLA sample,  $\chi^2(1) = 6.47$ ,  $p < .02$ ; the second UCLA sample,  $\chi^2(1) = 7.52$ ,  $p < .01$ ; and the UBC sample,  $\chi^2(1) = 5.81$ ,  $p < .02$ . And for the car purchase problem, the recency effect was marginally significant in the Michigan sample,  $\chi^2(1) = 2.86$ ,  $p < .10$ . Thus, the recency effect was obtained even when both the base rate and the individuating information were presented on the same page, and when subjects reported their decisions in the form of discrete choices instead of probabilities.

### Study 4

The purpose of Study 4 was to further test our hypotheses regarding the psychological mechanism underlying this recency effect. We tested the availability hypothesis in two ways. First, we implemented a manipulation that increased accountability among a random subset of the subjects. Accountability is defined as a state in which people feel highly identifiable and believe they will have to justify their decisions to others. Numerous studies have shown that inducing accountability eliminates the perseverance of initial impressions (Tetlock, 1983a), increases integrative complexity of thoughts on controversial social issues (Tetlock, 1983b), increases accuracy of behavioral predictions and the appropriateness of confidence levels (Tetlock & Kim, 1987), increases use of more complex decision strategies (McAllister, Mitchell, & Beach, 1979), and reduces the fundamental attribution error (Tetlock, 1985).

Tetlock and colleagues have argued that accountability produces these effects by leading people to process information more vigilantly: People pay closer attention to all given infor-

<sup>5</sup> A slight wording variation was implemented within the two presentation order conditions for the second UCLA sample and the UBC sample. This manipulation had no effect and is not directly relevant to the hypotheses of present interest, so we do not discuss it here.

Table 2  
*Study 3: Judgment Selections as a Function of Presentation Order, Problem, and Sample*

Problem	Presentation order			<i>p</i>	<i>n</i>
	Base rate first	Base rate second	Difference		
College choice					
Michigan sample	81.0	20.0	61.0	<.001	41
1st UCLA sample	67.2	43.1	24.1	<.02	126
2nd UCLA sample	72.3	44.7	27.6	<.01	94
UBC sample	58.4	41.4	17.0	<.02	200
Car purchase					
Michigan sample	33.3	14.3	19.0	<.10	58

*Note.* Cell entries are the proportion of respondents selecting Bart University for the college choice problem and the proportion of respondents selecting Saab for the car purchase problem. UCLA = University of California, Los Angeles; UBC = University of British Columbia.

mation, analyze it more carefully, are cautious in drawing conclusions, and are more motivated to make unbiased judgments (see also Janis & Mann, 1977). During encoding, information is retained in working memory for longer periods of time. During retrieval, people are more motivated to search their memories thoroughly for information and to integrate it into a coherent, overall impression. Consistent with this reasoning, inducing accountability increases the amount of time people take to make decisions (Ford & Weldon, 1981).

This interpretation of accountability's effects makes it a useful vehicle for testing the information availability explanation of our recency effect. If increased availability explains the recency effect, accountability should invoke effortful cognitive processing and eliminate the recency effect as it has eliminated other "top-of-the-head" phenomena.

We tested the availability explanation in a second way as well—by examining whether recall of the base rate and the individuating information varied depending on order of information acquisition. If the more recently acquired information is the focus of more attention during decision making, this information might be remembered better later. If this is so, it would lend support to the claim that the recency effect is mediated by greater cognitive focus on more recently acquired information as the result of enhanced availability at the time of decision making.

Finally, we tested the conversational conventions explanation by reducing some subjects' tendency to make inferences regarding the experimenter's beliefs about information value based on presentation order. These subjects were told that the order in which they were given the two pieces of information was determined randomly. If inferences based on conversational conventions were responsible for the recency effect, these instructions should cause the recency effect to disappear.

Thus, Study 4 was a 2 (order of information presentation)  $\times$  3 (no instructions vs. accountability instructions vs. conversational conventions instructions) between-subjects design.

### Method

*Subjects.* Ninety undergraduates at The Ohio State University taking an introductory psychology course participated in the study for

course credit. Subjects were randomly assigned to one of the six experimental conditions.

*Materials.* We arbitrarily selected one of the problems that showed a recency effect in Study 2—the divorce problem.

*Procedure.* Each subject received a booklet containing a cover page with the instructions printed on it and the problem on subsequent pages. In the no-instructions condition, subjects' cover page read as follows: "On the attached sheets, you will be given some information and will be asked to make a series of judgments." In the accountability condition, the cover page instructions said:

On the attached sheets, you will be given some information and will be asked to make a series of judgments. Read the information very carefully and take your time making your decision. You will be asked to justify your final judgment by telling us your reasoning. Think carefully about each piece of information and be prepared to defend your decision. Please write your name here

This manipulation of accountability is nearly identical to the manipulations of this construct that Tetlock and his colleagues have used successfully in numerous studies (Tetlock, 1983a, 1983b, 1985; Tetlock & Kim, 1987; Tetlock, Skitka, & Boettger, 1989). Therefore, although we included no manipulation checks in this study, there is good reason to believe that this manipulation succeeded in inducing accountability among the subjects who received it.

In the conversational conventions condition, subjects' cover page read:

On the attached sheets, you will be given some information and will be asked to make a series of judgments. Please keep in mind that the order in which you will read the two pieces of information was determined randomly. We flipped a coin to decide which you read first and which you read second.

Questionnaire administration was identical to Study 1. After subjects made their estimates, they were asked to recall the base rate and individuating information as best they could.

### Results

*The recency effect.* As expected, a significant recency effect was found across conditions,  $F(1, 84) = 10.88$ ,  $p < .01$ . Subjects' estimates were closer to the base rate when it was presented second ( $M = 46.3\%$ ) than when it was presented first ( $M =$

66.0%). Thus, this study replicated the basic recency effect found in Studies 1, 2, and 3.

*Effects of instructions.* The interaction between information presentation order and instructions was not statistically significant,  $F(2, 84) = .74, p > .5$ . This suggests that the recency effect was of comparable magnitude in the no-instructions condition, the accountability condition, and the conversational conventions condition. Thus, it might appear that neither the availability hypothesis nor the conversational conventions hypothesis is correct. However, Rosnow and Rosenthal (1989) have highlighted the dangers of overreliance on such omnibus significance tests and strongly suggested performing within-condition planned comparisons.

Such additional analyses suggest that the strength of the recency effect did, in fact, vary across the three instructions conditions. The recency effect was largest and most significant in the no-instructions condition. Subjects' average estimate was much closer to the base rate when the base rate was presented second ( $M = 38.7%$ ) than first ( $M = 67.1%$ ), difference = 28.4,  $t(28) = 2.95, p < .005$ .

In the accountability condition, the recency effect was somewhat weaker than in the no-instructions condition, but it was nonetheless present. When the base rate was presented first, the average estimate was 65.6%, whereas it was 45.6% when the base rate was introduced second, difference = 20.0%,  $t(28) = 2.01, p < .05$ . Thus, the accountability manipulation did not eliminate the recency effect.

However, in the conversational conventions condition, the recency effect was substantially weakened. Mean estimates made in the two presentation orders were more similar:  $M = 65.3%$  when the base rate was presented first and  $M = 54.7%$  when it was presented second. The difference between these means, 10.6%, was not statistically significant,  $t(28) = .94, p > .35$ . Thus, it seems that the conversational conventions instructions largely eliminated the recency effect.

*Recall of the base rate and individuating information.* The percentage of people who correctly recalled the base rate was not different across presentation orders,  $F(1, 84) = 0.06, p > .8$ , or across instruction conditions,  $F(2, 84) = 0.55, p > .5$ . In addition, the Order  $\times$  Instructions interaction was not significant,  $F(2, 84) = 1.90, p > .1$ . The absolute value of the difference between each subject's recollection of the base rate and the actual value of the base rate was also similar across conditions. The main effect of order,  $F(1, 84) = 2.12, p > .2$ , and the main effect of instructions,  $F(2, 84) = 0.11, p > .8$ , were nonsignificant, as was the Order  $\times$  Instructions interaction,  $F(2, 84) = 2.01, p > .1$ . The number of items of individuating information subjects correctly recalled was also not affected by order of information presentation,  $F(1, 84) = 0.84, p > .36$ , or by instructions,  $F(2, 84) = 0.68, p > .5$ , and the Order  $\times$  Instructions interaction was not significant either,  $F(2, 84) = 0.39, p > .6$ . Clearly, then, a piece of information was not recalled better when it was presented second, which challenges the availability explanation.

### Discussion

In thinking about these findings, it is useful to note two facts. First, a reconsideration of Study 3 reveals that our procedures

are likely to have induced accountability in subjects: They were all asked to report their decisions and to justify them. Despite this, recency effects were apparent in all five samples. This is consistent with the finding in Study 4 that inducing accountability did not eliminate the recency effect.

It is also worth noting that the failure of the accountability instructions to eliminate the recency effect discredits a potential alternative explanation for the effect of the conversational conventions instructions. This explanation asserts that the conversational conventions instructions may have eliminated the recency effect simply by telling subjects to make use of all of the information available to them. But, of course, the accountability instructions in Study 4 did just this: They told subjects twice that they should pay close attention to all of the information they receive before making a judgment. The failure of these instructions to eliminate the recency effect suggests that the conversational conventions instructions did not accomplish this goal simply by calling subjects' attention to all of the information. Although "minimal focusing" of subjects' attention on all presented information enhances base-rate use generally (Fischhoff & Bar-Hillel, 1984), subjects must apparently be told quite specifically that the order of information presentation conveys no information in order to eliminate the recency effect.

### Study 5

Although the results of Study 4 are most consistent with the conversational conventions hypothesis, the key interaction between instructions and order of information presentation did not achieve statistical significance. We therefore set out to replicate the findings of Study 4 regarding the impact of conversational conventions instructions.

We also tested the availability hypothesis in two new ways. If this hypothesis is correct, the more recently presented information should come to mind more readily immediately after the decision-making process. Therefore, in a free recall task, subjects would be expected to output the more recently acquired information first. Also, if the more recently presented information is more available because of its presence in short-term memory, then purging short-term memory immediately before the decision is made should eliminate the recency effect illustrated above. Therefore, Study 5 was a 2 (order of information presentation)  $\times$  3 (no instructions vs. conversational conventions instructions vs. short-term memory purge) between-subjects design.

### Method

*Subjects.* One hundred fifty-one undergraduates at The Ohio State University taking an introductory psychology course participated in the study for course credit. One subject did not complete the experimental booklet and was not included in the analyses reported below. Subjects were randomly assigned to one of the six experimental conditions.

*Materials.* For Study 5, we again used the divorce problem used in previous studies.

*Procedure.* The procedure was exactly the same as that used in Studies 1, 2, and 4. The conversational conventions instructions used in Study 4 were used again here. Subjects in the distraction condition

were asked to spend 2 min completing an additional task after receiving the information and before making their judgment. This task, which was intended to purge short-term memory, involved locating the names of a list of famous psychologists embedded in a matrix of letters.

After making their judgments, subjects in all conditions were asked to write down the information they had initially been given "in whatever order it comes to mind."

## Results

*The recency effect.* A significant recency effect was found here across conditions,  $F(1, 144) = 10.16, p < .01$ . Subjects' estimates were lower when the base rate was presented second ( $M = 41.6%$ ) than when it was presented first ( $M = 53.7%$ ).

*Effects of instructions and distraction.* The interaction between information presentation order and condition was not statistically significant,  $F(2, 144) = 0.86, p > .4$ . This again suggests that the recency effect was of comparable magnitude in the no-instructions condition, the distraction condition, and the conversational conventions condition. However, within-cell planned comparisons again suggest that the strength of the recency effect did vary across the three conditions. Among subjects in the no-instructions condition, estimates were closer to the base rate when the base rate was presented second ( $M = 41.4%$ ) than first ( $M = 54.7%$ ), difference = 13.28,  $t(48) = 1.94, p < .06$ .

In the distraction condition, the recency effect was stronger and more significant than it had been in the no-instructions condition. When the base rate was presented first, the average estimate was 58.4%, whereas it was 40.5% when the base rate was introduced second, difference = 17.9%,  $t(48) = 2.79, p < .008$ . Thus, the distraction manipulation did not eliminate the recency effect.

However, in the conversational conventions condition, the recency effect was substantially weakened. Mean estimates made in the two ordering situations were more similar:  $M = 48.1%$  when the base rate was presented first and  $M = 42.5%$  when it was presented second. And the difference between these means, 5.6%, was not statistically significant,  $t(48) = .84, p > .40$ . This again suggests that the conversational conventions instructions largely eliminated the recency effect.

*Order of recall.* We found no evidence that the more recently encountered information was more available in memory. Instead, the pattern of recall was strongly in the reverse direction: 79.0% of subjects initially recalled the first piece of information they had been given. In contrast, only 21.0% of subjects initially recalled the second piece of information they had been given,  $\chi^2(1) = 52.17, p < .0001$ . Similar patterns appeared in all three conditions, so the more recently encountered information was apparently not more available than the initially encountered information (see also Murdock, 1974, p. 306). Furthermore, the effect of presentation order on probability judgments did not vary in strength depending on which piece of information subjects recalled first,  $F(1, 138) = 2.00, ns$ . All of these findings refute the availability hypothesis.

## Meta-Analysis of Studies 4 and 5

Although both Studies 4 and 5 indicated that giving subjects the conversational conventions instructions reduced the mag-

nitude of the order effect, the interaction between order and instructions was not statistically significant in either study. In this situation, it is appropriate to combine the results of these two studies through meta-analysis to determine whether the interaction is, in fact, reliable (Rosenthal, 1984).

We performed such a meta-analysis using only the no-instructions condition and the conversational conventions instructions condition from Studies 4 and 5. This analysis revealed that the interaction between order and instructions was marginally significant ( $z = 1.54, p < .07$ ). Thus, when taken together, these two studies indicate that the conversational conventions instructions apparently reduced the impact of information acquisition order on use of the base rate, the individuating information, or both.

## Study 6

In Study 1, the order effect occurred only when the base rate and individuating information had conflicting implications, just as the conversational conventions hypothesis suggests. However, one aspect of Study 1's results is potentially problematic in light of this hypothesis. This hypothesis suggests that presentation order should affect use of both individuating information and base rates. Although a significant order effect on base-rate use was found in Study 1, the order effect on individuating information use was weaker and only marginally significant.

To further explore whether presentation order affects use of individuating information, we conducted Study 6. In this study, we repeated most of the full design of Study 1, minus the question wording variation. Half of the subjects were given no special instructions, and half were given the conversational conventions instructions used in Studies 4 and 5. This provided us with another opportunity to examine whether these instructions reduced the magnitude of the order effect. The lawyer/engineer problem was again used, and four independent variables were manipulated: (a) order of information presentation, base rate followed by individuating information versus individuating information followed by base rate; (b) base-rate level, 70% engineers versus 30% engineers; (c) individuating information, stereotypical engineer versus stereotypical lawyer; and (d) instructions, none versus random presentation order. Thus, Study 6 was a  $2 \times 2 \times 2 \times 2$  between-subjects design.

## Method

*Subjects.* Five hundred forty undergraduates at The Ohio State University and the University of British Columbia enrolled in psychology courses participated in the study, some for course credit and others as part of a classroom exercise. Because one subject did not complete the experimental booklet, 539 subjects were used in the analysis. Subjects were randomly assigned to one of the 16 conditions.

*Materials and procedure.* The materials and procedure were identical to those used in Study 1.<sup>6</sup>

<sup>6</sup> The vast majority of subjects in this study were asked to indicate the probability that Tom W. was an engineer. Because of a clerical error, a small number of subjects were asked the probability that he was a lawyer. These subjects' predictions were subtracted from 100% to make them comparable to the other subjects' estimates for analysis. This question wording variation did not interact with any of the experimental effects.

## Results

*Recency effect on base-rate use under no instructions.* When the base rate was presented first, subjects' estimates were marginally significantly influenced by the base rate. The mean estimates were 52.5% when the base rate was 30 and 60.6% when the base rate was 70, a difference of 8.1,  $F(1, 263) = 3.54, p < .07$ . However, when the base rate was presented second, it had a more substantial effect; predictions were much smaller when the base rate was 30 ( $M = 41.6\%$ ) than when it was 70 ( $M = 57.5\%$ ), a difference of 15.9,  $F(1, 263) = 15.74, p < .0001$ . Although the difference between the two presentation orders was not quite marginally significant,  $F(1, 523) = 1.90, p < .17$ , its direction and magnitude replicate the expected order effect on base-rate use.

*Recency effect on individuating information use under no instructions.* As in Study 1, the individuating information had a substantial effect when it was presented first. When Tom W fit the description of an engineer, subjects considered him likely to be an engineer ( $M = 61.4\%$ ), and when he fit the description of a lawyer, subjects considered him unlikely to be an engineer ( $M = 39.1\%$ ), a difference of 22.3%,  $F(1, 263) = 31.22, p < .0001$ . And again, the impact of the individuating information increased when it was presented second. When Tom W fit the description of an engineer, subjects considered him likely to be an engineer ( $M = 70.9\%$ ), and when he fit the description of a lawyer, subjects considered him unlikely to be an engineer ( $M = 40.1\%$ ), a difference of 30.8%,  $F(1, 263) = 59.53, p < .0001$ . Although the Order  $\times$  Individuating Information interaction was not quite marginally significant,  $F(1, 263) = 2.68, p < .11$ , it seems again that there was a recency effect on individuating information use.

*Effect of information consistency.* Again consistent with the conversational conventions hypothesis, the recency effect only occurred when the two pieces of information had conflicting implications,  $F(1, 523) = 5.87, p < .02$ . The order effect was large when the two pieces of information were inconsistent ( $M = 10.7$ ),  $F(1, 523) = 3.17, p < .08$ , and was invisible when the two pieces of information were consistent ( $M = 0.9$ ),  $F(1, 523) = 0.01, ns$ .

*Effect of instructions.* As expected, when the random order instructions were given to subjects, the recency effect on base-rate use was smaller ( $M = 4.4$ ),  $F(1, 523) = 0.57, p > .45$ , than when no instructions were given ( $M = 7.8$ ),  $F(1, 263) = 1.90, p < .17$ . Also as expected, the recency effect on individuating information was zero when the random order instructions were given ( $M = 0.0$ ),  $F(1, 263) = 0.0, ns$ , whereas it was substantial when they were not ( $M = 8.5$ ),  $F(1, 263) = 2.68, p < .11$ . Although the Order  $\times$  Base Rate  $\times$  Instructions interaction was not statistically significant,  $F(1, 523) = 0.02, ns$ , nor was the Order  $\times$  Individuating Information  $\times$  Instructions interaction,  $F(1, 523) = 1.35, ns$ , they seem likely to be robust when viewed in light of the meta-analysis of Studies 4 and 5 reported above.

## Meta-Analysis of Studies 1 and 6

The conversational conventions hypothesis suggests that order of information acquisition should affect use of both the base rate and individuating information. The means in Studies

1 and 6 consistently revealed recency effects on base-rate use and on individuating information use when subjects were given no special instructions. However, the only instance in which this recency effect was clearly statistically significant involved base-rate use in Study 1. The recency effect on individuating information use was marginally significant in Study 1, and the recency effects on both base-rate and individuating information use were not quite marginally significant in Study 6. Thus, it is not fully clear that these effects are reliable.

To assess whether these recency effects were, in fact, reliable, we conducted a meta-analysis of the data from all subjects in Studies 1 and 6 who received no special instructions. This meta-analysis revealed that the recency effect on base-rate use was reliable when the two studies were combined,  $F(1, 740) = 4.58, p < .04$ , as was the recency effect on individuating information use,  $F(1, 740) = 7.37, p < .007$ . These results further reinforce our confidence in the robustness of both recency effects and in the conversational conventions hypothesis.

## Study 7

To establish even more securely the validity of the conversational conventions hypothesis, we conducted one final test. According to this hypothesis, listeners believe that when a speaker offers two pieces of conflicting information before stating a conclusion drawn from them, the second piece of information is usually the one the speaker considers most informative. In some utterances, this is indicated explicitly by joining the two pieces of information with a conjunction such as *but* or *however*, but listeners presumably make such an inference even when no conjunction is used. To test this claim, we provided the text of the car purchase problem in conversational form and asked subjects to fill in a conjunction between the two pieces of conflicting information and to state the most likely conclusion. Two versions of the problem were presented to subjects, one presenting the base rate first and the other presenting the base rate second.

## Method

*Subjects.* Thirty-seven undergraduates at The Ohio State University taking an introductory psychology course participated in the study for course credit. Each subject was randomly assigned to one of the two presentation orders.

*Materials.* All subjects began by reading the following instructions:

The following is a conversation between Bill and his friend, Mike, about buying a car. When you are reading through the paragraphs, you will notice that there are two blanks. Please fill in the blanks with the word or words that you think best fit what Bill would probably have said.

When subjects in the individuating information first condition turned the page, they saw the following:

Bill: "Mike, I finally decided to buy a new car."

Mike: "Really? What kind?"

Bill: "Well, after looking at all the features of different cars, I decided that the only two that would suit my needs are a Volvo and a Saab.

"My brother-in-law has had one problem after another with his Saab \_\_\_\_\_ a car magazine survey found Saabs have a better

repair record than Volvos. Considering all this, I decided to buy a \_\_\_\_\_. I think that is the better choice."

For subjects in the base-rate first condition, the last paragraph read instead:

"A car magazine survey found Saabs have a better repair record than Volvos \_\_\_\_\_ my brother-in-law has had one problem after another with his Saab. Considering all this, I decided to buy a \_\_\_\_\_. I think that is the better choice."

*Procedure.* Subjects completed the questionnaires in one large group.

## Results

*Conjunction.* Eighteen subjects (48.6%) wrote either "but" or "however," whereas only four subjects (10.8%) wrote "although" or "even though." The remaining 15 subjects (40.6%) wrote something that accorded equal credibility to the two pieces of information, such as "and," "in addition," or nonconjunctions such as "transmission" or "2-door." This pattern was equally apparent when subjects in the two conditions were examined separately. Thus, the overwhelming majority (81.8%) of subjects whose conjunctions implied unequal credibility accorded the greater credibility to the more recently presented information.

*Car selection decision.* Among subjects who filled in the first blank with "but" or "however," a recency effect was clearly apparent in their filling in of the second blank. In the individuating information first condition, 66.6% filled the blank with "Saab," whereas in the base-rate first condition, only 22.2% filled the blank with "Saab,"  $\chi^2(1) = 3.74, p = .053$ . This recency effect is consistent with that documented in Studies 1–6 above.

Among subjects who filled in the first blank with something other than "but" or "however," no recency effect appeared. In the individuating information first condition, 20.0% of subjects filled the second blank with "Saab," and in the base-rate first condition, none of the subjects filled the second blank with "Saab,"  $\chi^2(1) = 0.45, p = .50$ . This lends additional credibility to the claim that the recency effect in judgments is the result of subjects assuming that a *but* or *however* conjunction would naturally be used to link the two pieces of conflicting information in the problems they confronted.

## Discussion

This study has shown that when two pieces of conflicting information are presented in a conversational format, most listeners tend to assume that the second piece of information is intended to be the more important. This validates an important assumption underlying our explanation of the recency effects we observed. Of course, we would not expect every individual confronted with a base-rate problem to make inferences based on conversational conventions. However, Study 7 indicates that among those subjects who do make such inferences, the overwhelming tendency will be to accord greater weight to the second piece of information, and the proportion of people who do so will certainly be large enough to account for the recency effects observed in Studies 1–6.

## General Discussion

Taken together, these seven studies demonstrate a pervasive effect of order of information acquisition on use of base-rate and individuating information in making social judgments. This recency effect appeared in various types of judgment tasks: in category membership judgments (e.g., the lawyer/engineer and divorce problems), in behavior predictions (e.g., the car purchase and college choice problems), when the base rate was presented in numerical form, when the base rate was presented in categorical form, when the judgment was a probability, and when the judgment was a discrete choice. Thus, the effect appears to be relatively robust across problem types.

These findings are consistent with previous studies that found recency effects in the impact of base-rate information on causal attributions (Ruble & Feldman, 1976; Zuckerman, 1978). Furthermore, our results suggest that the trend toward a recency effect in Lyon and Slovic's (1976) study of base-rate impact on probability judgments probably represented a real effect. However, our findings go beyond those of previous studies because we have identified the likely mechanism of the observed recency effect—*inferences based on conversational conventions*. This conclusion is consistent with Bar-Hillel's (1980) claim that base rates were typically underused in past studies because subjects perceived them to be irrelevant to the judgment to be made. Our work has identified the source of subjects' beliefs about irrelevance. Specifically, these beliefs seem to evolve from the "given-new contract": Speakers normally present the more informative of two pieces of contradictory information second before expressing a conclusion drawn from that information. Furthermore, we have identified a new technique for making the first piece of information appear to be relevant to the judgment: instructions informing subjects that the order of information presentation is random. Simply telling subjects to pay close attention to both types of information was not enough to eliminate the recency effect in Study 4; it was necessary to tell them explicitly that the order of presentation did not have any meaning.

These findings are important partly because they provide a new explanation for subjects' failure to fully use base-rate information in many past studies. If these studies had first given subjects individuating information and then given them a base rate, use of this latter information would have been substantially increased. It is therefore appropriate to view our results as identifying a methodological artifact that could and should have been controlled for in these earlier studies.

This artifact can rightly be considered an experimental demand characteristic. Demand characteristics are "the totality of cues which convey an experimental hypothesis to the subject" (Orne, 1962, p. 779). In most prior base-rate studies, the experimental hypothesis of interest was that people underuse base rates, and the order of information presentation enhanced the likelihood that this hypothesis would be supported. The many past confirmations of this hypothesis are therefore similar to other findings produced partly by demand characteristics: They are created by the confluence of subjects' inferences about the experimenter's beliefs or expectations and subjects' desire to conform to those beliefs or expectations (e.g., Orne,

1969). The difference between experimenter and subject in terms of power and knowledge (Riecken, 1962) presumably enhances the likelihood of the recency effect observed here, just as it enhances the impact of demand characteristics. Most prior base-rate studies and the present studies did not include any precautions against the influence of demand characteristics (see e.g., Aronson, Ellsworth, Carlsmith, & Gonzales, 1990, pp. 295–304), which may have enhanced the likelihood of a recency effect as well.

The recency effect we identified and other effects like it may be inherent in laboratory experiments in which subjects are given information by an experimenter and are asked to make judgments. Therefore, experimenters should be on the lookout for effects of inferences based on conversational conventions and should guard against misinterpreting these effects as indications of some other judgmental process.

In addition to highlighting this methodological artifact, our findings illuminate interesting substantive psychological processes. Specifically, we have identified a new way in which order of information acquisition is an important determinant of information weight in decision making. Numerous previous studies of social judgment processes have identified a variety of different types of order effects in impression formation (Anderson, 1981), persuasion (Crano, 1977), question answering in surveys (Krosnick & Alwin, 1987; Krosnick & Schuman, 1988), and memory (Bruce & Papay, 1970). But the natures of these order effects vary from context to context; some are primacy effects and others are recency effects. And the psychological mechanisms underlying these order effects vary from differential rehearsal (Rundus, 1971) to differential elaboration (Krosnick & Alwin, 1987), attention decrement (Crano, 1977), change in meaning (Anderson, 1981), and argument decay in memory (Miller & Campbell, 1959). The recency effect due to inferences based on conversational conventions is a new order effect to be added to this list.

Our findings also add to the growing body of literature illustrating the impact of inferences based on conversational conventions on social judgment processes. This is a relatively new topic of research in social psychology, but a number of studies have identified such effects. For example, Hilton (1990) showed that subjects' inferences about an experimenter's preexisting knowledge and subjects' attempts to avoid redundancy in communication affect the attributional statements subjects make. Similarly, Strack, Martin, and Schwarz (1988) showed that attempts to be informative and to avoid redundancy regulate the impact of priming effects on responses to survey questions. Finally, Schwarz et al. (in press) found that conversational conventions led the instructions used in previous studies of base-rate use to enhance the apparent value of the individuating information. Our findings further reinforce the validity of the notion that conversational conventions govern social discourse, and we have illustrated a new effect of such conventions.

Normative theories of judgment and reasoning suggest that order of information acquisition should not determine the weight attached to pieces of information in decision making. It might therefore seem that the recency effect we have identified is a "shortcoming" of human judgment processes. We believe instead, however, that this recency effect is the result of a very

practical and sensible strategy that people often use to guide their own conversational utterances and their interpretations of others' utterances. As long as speakers and listeners adhere to the conversational convention identified here, it will save them time and effort by avoiding the necessity of explicitly stating relative information value. Thus, we would view this judgmental strategy as efficient and adaptive. The designs of previous base-rate studies, which did not take conversational conventions into account, probably contributed to the appearance of a judgmental shortcoming. This view is consistent with Funder's (1987) recent argument that although judgmental "errors" identified in the laboratory represent misjudgments of narrowly defined, artificial stimuli and departures from normative models, they may often be the result of unrealistic aspects of experimental settings.

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