# Adult Egocentrism: Subjective Experience versus Analytic Bases for Judgment

COLLEEN M. KELLEY

Macalester College

AND

# LARRY L. JACOBY

#### New York University

The influence of memory on the subjective experience of later problem solving was investigated in two experiments. Study of the solution words to anagrams in the first phase of the experiments lead to faster solution of those anagrams in a second phase. Participants interpreted their easy solution of old anagrams as due to characteristics of the anagrams and judged them as easier for others to solve, relative to new anagrams. When participants were deprived of the subjective experience of solving the anagrams by presenting the solution with the anagram, they switched to an alternative basis for judgment such as a theory or rules, which lead to a different ordering of items according to judged difficulty (Experiment 1). Requiring participants to recognize whether solution words had been presented in the first phase did not eliminate the effect of prior presentation on judged difficulty, but requiring recognition judgments and warning participants of the nature of the effect did eliminate it (Experiment 2). We discuss the usefulness of the distinction between judgments based on subjective experience versus theory, introduce ways to diagnose when different bases for judgment. © 1996 Academic Press, Inc.

The memory illusion we explore in this paper results from the misinterpretation of what is actually an effect of the past in ways that alters one's subjective experience of a current situation. Such misinterpretations or misattributions of effects of the past are consequential because we often predict for others based on our own experience. For example, people attempt to predict whether readers understand the ideas in a manuscript, whether students will be able to solve problems on an exam, or whether consumers will buy a new version of a soft drink. Whereas Piaget argued that the ability to take another's perspective was a

This research was supported by a grant to Larry Jacoby from the National Science and Engineering Research Council of Canada. Thanks to Ann Hollingshead for testing the participants and for her help on the analyses. Address reprint requests to Colleen Kelley, Department of Psychology, Macalester College, 1600 Grand Avenue, Saint Paul, MN 55105. E-mail: kelley@macalstr.edu. milestone of cognitive development, we suggest that the use of subjective experience in social prediction is a pervasive form of judgment even in adults. However, subjective experience can be spoiled as a basis for judgment for others because of the effects of specific past experiences on one's performance. People display a form of adult egocentrism when they fail to realize that their subjective experience of the difficulty of a problem, the comprehensibility of a text, or the ease of learning a task may not generalize to other people's experience.

In contrast to judgments based on subjective experience are judgments based on a theory, or more minimally, a collection of rules. Judgments that derive from the application of a theory afford more conscious control over the factors that enter into the judgment. In particular, use of a theory should allow people to escape the effects of prior experience on judgments. The major purpose of this paper is to investigate the phenomenon of how past experience can invalidate subjective experience as a basis for judgment and what people do when they attempt to escape those effects. A second purpose is to explore the power and general applicability of the distinction between theory-based and subjective experience-based judgments. We will illustrate the distinction between theory and subjective experience as bases for judgment with a set of experiments on how people judge the difficulty of anagrams. These experiments set up diagnostic tools for revealing different bases for judgments.

# SUBJECTIVE EXPERIENCE AS A BASIS FOR JUDGMENT

Extending one's own subjective experience to predictions for others should be a useful heuristic, with accuracy dependent upon the extent to which people's experience is similar. For example, because people have essentially equivalent sensory and perceptual systems they can accurately judge how others will experience sensory stimuli along dimensions such as loudness or brightness. The consensus regarding such judgments masks the fact that people are making an inductive leap from their own experience to predict the experience of others. The judgments may be experienced as objective judgments of the stimulus, rather than an extension of "how it appears to me." Only when people try to predict for people who are significantly different from them in some way does it (sometimes) become apparent that they are using their own experience as a basis for judgment, as when older people insist that it is too dim in a room to read and thus believe that their children should turn on more lights before they "ruin their eyes."

Cognitive experiences have an immediacy and compelling quality that make them appear as objective as basic perceptual experiences such as loudness or brightness. For example, people treat their own understanding as an objective indicator of the comprehensibility of a message and so overestimate how well an audience will understand their message. Goranson (1985) demonstrated the overestimation

of communication effectiveness by having participants play a game of "Password." On each trial a participant generated three clue words that would allow the audience to generate a target word, and then estimated the percentage of the audience that would correctly guess the word. Participants overestimated their percentage of successful communication by 20%. Similar overestimation occurred in a study where university instructors attempted to fill out a quiz "as an average student in vour class will perform." Nickerson, Baddeley, and Freeman (1987) found that people gave higher estimates for the percentage of people who would know the answer to specific general knowledge questions when they knew the answer themselves relative to when they did not know the answers. Our interpretation is that participants in these experiments made their estimations based on their own knowledge and feelings of familiarity.

## THE ANALYTIC ALTERNATIVE

Whereas subjective experience is nonanalytic and global, a well-specified theory provides an analytic basis for judgments (Jacoby & Brooks, 1984). When one uses a theory to make judgments, particular factors can be given more or less weight or can be considered irrelevant and ignored entirely. Such analytic judgments give people control over the information that will enter into their decisions. The ability to control irrelevant factors and consistently apply rules to escape the vagaries of attention can lead to the superiority of actuarial over intuitive or nonanalytic judgments (Dawes, Faust, & Meehl, 1989).

An analytic alternative to teachers' use of their own understanding as a basis for predicting for students would be a theory that specifies the difficulty of constructs. For example, a formal model of text comprehension (van Dijk & Kintsch, 1983) could be an objective basis for judging comprehensibility. Such a theory would allow teachers to avoid the problem of overestimating their student's knowledge. Unfortunately, such models do not exist in many domains, and those that do exist are laborious to apply. A collection of rules such as "the concept of a sampling distribution of means is always hard" and diagnostic cues such as questions and glazed eyes could also enter into a more analytic prediction of student understanding. However, to develop and use a good theory, people must know the relation between diagnostic cues and the criterion variable, and be able to recognize those diagnostic cues. An excellent theory also needs to properly weight and combine relevant factors.

## FLUENCY AS A CONSTITUENT OF SUBJECTIVE EXPERIENCE

To understand the role of subjective experience in judgment, we need to understand the component processes that give rise to particular experiences. One important constituent of subjective experience is the ease or speed with which people accomplish a task. The availability heuristic (Tversky & Kahneman, 1973) is a prominent example: people judge the frequency of events based on the ease with which they can think of instances of the event. However, ease or fluency of processing is a component in a variety of experiences. Fluency of perceptual and conceptual processing influences the subjective experiences of duration (Witherspoon & Allan, 1985), truth (Begg, Anas, & Farinacci, 1992), loudness (Jacoby, Allan, Collins, & Larwill, 1988), pleasantness (Bornstein & D'Agostino, 1994; Whittlesea, 1993), confidence in answers to questions (Kelley & Lindsay, 1993), the feeling of knowing (Koriat, 1993), and even remembering (Jacoby & Whitehouse, 1989; Whittlesea, Jacoby, & Girard, 1990; Whittlesea, 1993).

The use of ease of processing as a basis for the experiences cited above may be a generally valid cue. One major effect of past experience is to make later processing faster, so fluent perception might be a quite good cue that one is remembering rather than encountering someone or something for the first time (Jacoby, Kelley, & Dywan, 1989). People's use of fluent processing as a basis for truth could be learned from repeated experience with fluency as a valid cue, given that true statements should be more often repeated and hence more familiar than false statements. Similarly, sentences against a softer background noise are easier to understand and words presented for a longer duration are easier to see, so ease of perception is a generally valid cue for loudness and duration. However, because ease of processing plays such a critical role in both the subjective experience of remembering and in the subjective experience of structural aspects of stimuli, people are open to misattributions. Misattributions produce illusions of memory when ease of processing is subtly manipulated by changing structural characteristics of the situation (Jacoby & Whitehouse, 1989; Whittlesea et al., 1990; Whittlesea, 1993). Conversely, past experiences can alter the subjective experience of the present (Witherspoon & Allan, 1985; Begg et al., 1992; Jacoby et al. 1988; Bornstein & D'Agostino, 1994; Kelley & Lindsay, 1993; Whittlesea, 1993) For example, if one judges the quality of a paper in terms of how easily one is able to follow it, the quality of the writing often seems to improve with each rereading. Arguments that were originally difficult to follow now seem easy to grasp and sentences that were awkward to parse now seem smooth. After the first reading, comprehension has been pervasively altered, and attempts to ignore the previous reading of the paper will not enable one to recapture the experience of a naive reader.

What strategies are available when subjective experience as a basis for judgment has been spoiled by past experience? When people recognize that their experience has been altered by past experiences not shared by the audience for whom they are predicting, they may attempt to compensate or correct for those effects. In the example of judging whether a paper is well-written, one might subtract a constant value from the rating for each time a paper has been read. However, that sort of correction may be relatively crude-it is unlikely that changes in comprehension due to prior reading of a paper operates in an additive fashion. Instead, the effect of prior experience on later comprehensibility is probably more complicated and interactive, such that it contributes more to the comprehensibility of some sections of a paper than to others.

## SEPARATION OF SUBJECTIVE EXPERIENCE FROM ANALYSIS

One purpose of our experiments was to document that subjective experience and theory serve as qualitatively different bases for predicting the performance for others. The paradigm we used is best illustrated with an example. How difficult would it be for people to solve the anagram *fscar*? Most of our participants answered that question by first solving the anagram and then answering on the basis of whether they found it easy or difficult to solve. Consider what would happen if we asked people to judge the difficulty of an anagram with the answer present, for example, scarf fscar. The solution word blocks one from directly experiencing how difficult it is to come up with the solution to the anagram because the solution is already in mind. Presenting the solution deprives one from using subjective experience as a basis for predicting the performance of others. We suggest that with the solution present, one is forced to judge the difficulty of the anagram on the basis of some theory about anagrams, or rules such as "low frequency words would be harder to generate."

We predicted that judgments based on subjective experience would be made more rapidly than would those based on a theory. We also predicted that using the subjective experience of difficulty (New Anagram Alone items) would lead to a different pattern of judgments for others than would theory-based judgments (Anagram with Solution items). If subjective experience is a different basis for judging difficulty than is a theory, then particular anagrams should yield different judgments under the two conditions (Rubin, 1985). That is, predicted item difficulty should be reordered between the conditions. The two bases for judgments would produce the same ordering of anagrams in their predicted difficulty only if people had a theory that made predictions equivalent to those based on subjective experience. To do this, the theory would have to specify the factors influencing the difficulty of anagrams and would also have to specify how those factors interact.

We arranged a third condition to investigate possible effects of prior experience on subjective experience of anagram difficulty. In that condition, the solution words appeared in an earlier phase of the experiment. In the earlier phase, participants simply read a list of words, half of which appeared later in the experiment as anagrams to be solved. We predicted that prior reading of the solution words would lead to faster solution times for the anagrams (Dominowski & Ekstrand, 1967). However, would participants be aware of that influence on their performance and so discount their subjective experience when judging for others? If so, they might shift to theory-based predictions and produce a pattern of results similar to the Anagrams with Solution condition. However, participants could be unconsciously influenced by prior experience, either because they failed to remember having read a solution word or failed to understand its influence on their later solving of an anagram (cf. Bowers, 1984). If participants in the Old Anagrams Alone condition were influenced unconsciously by the prior presentation, they would rely on their subjective experience and produce a pattern of judgments similar to that of participants in the anagram-alone condition.

#### EXPERIMENT ONE

## Method

*Participants.* The participants were 72 volunteers from an introductory psychology course at McMaster University who served in the experiment for course credit. Participants were randomly assigned to one of three between-subject experiment conditions: Old Anagrams Alone, New Anagrams Alone, and Anagrams with Solution. Participants were tested individually.

*Materials and design.* A pool of 200 fiveletter medium frequency words (from 10 to 49 occurrences per million; as indexed by Thorndike & Lorge, 1944) were used as stimuli. The letters of each of these words could be rearranged to form an anagram with only one solution. The anagrams were formed using the rule that one letter within the word, picked randomly, was moved (e.g., bench/ enbch).

From this pool, words were divided into three sets of 60 words each, with an equal distribution of word frequency. One set was always presented in the test phase for all conditions. For the old Anagrams Alone condition these were the old items and for the other two conditions (New Anagrams Alone and Anagrams with Solution) they were new items. The terms "alone" or "with solution" refer to whether or not an anagram is presented with or without its solution word in the test phase. The remaining 20 words from the pool were also always presented during the test phase as new baseline items for all conditions, which resulted in an 80-word test list.

In the study phase, a 120-word list was presented. For the New Anagrams Alone and Anagrams with Solution conditions, this list was made up of the other two sets of 60 words. For the Old Anagrams Alone condition, the list consisted of one of the sets of filler items presented to the other two conditions along with the set of 60 words to be presented during the test phase as old anagrams. Both of the sets used in the other two conditions were used equally often in the Old Anagrams Alone condition in the study phase. This resulted in two different study lists for the Old Anagrams Alone condition. Two orders of presentation were constructed for both the study and test lists which resulted in four different list combinations for the New Anagrams Alone and Anagrams with Solution conditions and eight different lists for the Old Anagrams Alone condition because of the set rotation in the study phase. Each combination for all conditions was used equally often. Within these list presentations, items were presented randomly.

An additional six medium frequency fiveletter nouns selected with the same restrictions as the previous words were employed as practice items for the test phase.

Procedure. In the study phase of the experiment all participants were required to read aloud words presented on the computer screen at a 2-s rate. In the test phase, participants in the two anagram-alone conditions were told that they would be required to solve anagrams and that they would have a maximum of 20 s to solve each one. As soon as they had solved the anagram presented, they were to say the solution word aloud. If they were correct, the experimenter would press a key to go on but if they were incorrect, they were informed and could continue to try to solve it. If they did not solve the anagram within the time allotted, they were told the solution word. After they solved the anagram or were given the solution word, the experimenter pressed a key and the anagram reappeared with a rating scale several lines below. Participants were then required to rate how difficult they thought the anagram would be for other students to solve. Participants rated the anagram difficulty for others by using a game paddle to move a pointer along a scale labeled on the left "VERY EASY" and on the right "VERY HARD." and pressing an enter button to record their responses. The locations on the pointer were then recorded within the data file on a scale from 1 ("very easy") to 255 ("very hard").

The participants in the Anagrams with Solution condition were advised that they would be presented with anagrams along with their solution words and that they would be required to rate the difficulty of solving the anagrams for other students. The participants were first presented with a solution word which they were to read aloud. After the participant had read the word, the experimenter pressed a key and the anagram for the word appeared with the solution word several lines above it and the rating scale at the bottom of the screen. The procedure for entering their ratings was the same as it was for the other two groups. The next trial followed immediately. Participants in all conditions were not informed about the overlap of items between the study phase and the test phase.

#### TABLE 1

Measure	Condition and item type					
	New Anagrams Alone		Old Anagrams Alone		Anagrams with Solution	
	Critical	Baseline	Critical	Baseline	Critical	Baseline
Mean RT to solve	10498	11167	7546	10936	_	_
Difficulty ratings	93.4	96.7	84.0	109.1	99.9	97.0
Mean r						
RT to solve $\times$ rating	.76	.75	.75	.75	_	_
Mean RT to judge	2503	2649	2349	2992	4027	4107

**RESULTS OF EXPERIMENT 1** 

*Note.* RT to solve and RT to rate are in ms. Difficulty was rated on a 255-point scale, from very easy to very difficult. Baseline items are new anagrams for all conditions, critical items are old in the Old Anagrams Alone condition and new in the other conditions.

A practice phase consisting of six trials was presented prior to the main test list in all conditions.

## Results

Speed of solution. Reading the solution word in the earlier phase of the experiment spoiled RT as a basis for judgment, in that old items were solved more quickly than new items on the test (see Table 1). We compared the speed of solving critical versus baseline items for participants in the Old Anagrams Alone condition versus the New Anagrams Alone condition. The interaction of condition and item type was significant. F(1,45) =27.32, MSE = 1589479.8. Simple effects analyses revealed a condition effect on the critical items, with participants in the Old Anagrams Alone condition solving anagrams significantly faster than participants in the New Anagrams Alone condition, F(1,45) = 26.82, MSE = 3812866.3. There was no condition effect on the new baseline items, F < 1. Simple effects analyses also showed that participants in the Old Anagrams Alone condition solved the old critical items faster than the new baseline items, F(1,45) = 86.73, MSE 1589479.8, whereas participants in the New Anagrams Alone condition did not solve the new critical items faster than the new baseline items, F(1.45) = 3.25, p < .08.

Difficulty ratings. We compared the ratings of critical versus baseline items for participants across the three conditions using a mixed-model analysis of variance. The interaction of condition and item type (critical items versus baseline) was significant, F(2,69)= 18.75, MSE = 136.6. As predicted, simple effects analyses revealed that critical items were rated as easier than new baseline items only in the Old Anagrams Alone condition (where critical items were old) F(1,69) = 55.23, MSE = 136.6, but not in the New Anagrams Alone, F(1,69) = 1.18 or Anagrams with Solution condition.

Correlations between RT to solve and ratings. As an index of the use of subjective experience as a basis for judgments, the correlations between RT to solve anagrams and rating of difficulty for others were calculated for each participant for critical items and for baseline items and analyzed in a mixedmodel analysis of variance, with condition (Old Anagrams Alone versus New Anagrams Alone) as the between-subjects factor and item type (Critical versus Baseline) as within-subjects factor. Participants the given the opportunity to solve an anagram before rating its difficulty for others appeared to use their own subjective experience of item difficulty as a basis for judgment. The average correlation between RT to solve anagrams and the rating of difficulty for others was substantial (mean r = .75) and did not vary between the Old Anagrams Alone versus New Anagrams Alone condition or between critical and baseline items, all F's < 1.

Correlations between difficulty ratings and criterion difficulty. The performance of participants in the New Anagrams Alone condition is the criterion for prediction in all conditions: that is, the reaction time to solve anagrams in the New Anagrams Alone condition is exactly what participants in all three conditions were trying to predict. Item analyses of difficulty ratings were compared to this criterion of actual difficulty for the three conditions, by computing the average rating of each item across participants in a condition. The correlation was very high for the New Anagrams Alone condition, r(58) = .96. However, the correlation between actual difficulty and the item analysis of ratings made by participants in the Old Anagrams Alone condition is also high, r(58) = .89, albeit significantly lower than in the New Anagrams Alone condition, Z = 2.80. In contrast, participants who were prevented from using their own experiences solving the anagrams as a basis for judgments, that is, participants in the Anagrams with Solution condition, did not predict the rank ordering of item difficulty as well as the other two conditions, r(58) = .69. The three correlations are not equal, V(3) = 34.4 (a test of whether the three sample correlations represent populations with equal correlations; see Hayes (1981).

Judgment latency. Participants in the Anagrams with Solution condition appeared to use a different basis for difficulty judgments than participants in the two anagram-alone conditions, as reflected by significant differences in the time to rate anagrams, F(2,69) = 14.32, MSE = 1441883. Newman–Keul's analysis revealed that participants in the Anagrams with Solution condition made their ratings more slowly than participants in either of the two anagram-alone conditions and that the latter two conditions did not differ.

Rank ordering of items according to difficulty ratings. To further investigate whether

participants in the Anagrams with Solution condition used a different basis for difficulty judgments than participants in the two anagram-alone conditions, we collapsed difficulty ratings across participants in each condition. and compared the rank-ordering of item difficulty across conditions. If participants in the Old Anagrams Alone and New Anagrams Alone conditions used their experience of difficulty as a basis for judgments and participants in the Anagrams with Solution condition used a different basis for judgments, such as rules, then the difference in processes should be revealed by more similar orderings of item difficulty ratings between conditions that share a process (the New Anagrams Alone condition and the Old Anagrams Alone condition) compared to the ordering of item difficulty ratings between conditions that rely more on different processes (the correlation of item difficulty between either of the Anagrams Alone conditions and the Anagrams with Solution condition). The correlation of rated item difficulty between the Old Anagrams Alone and New Anagrams Alone conditions was significantly higher, r(58) = .90, than the correlation between the Anagrams with Solution and New Anagrams Alone conditions, r (58) = .69, Z = 3.34, and significantly higher than the Anagrams with Solution and Old Anagrams Alone conditions, r(58) = .62, Z =3.99. The correlation of Anagrams with Solution and New Anagrams Alone does not differ from the correlation of Anagrams with Solution and the Old Anagrams Alone (Z = .66).

## Discussion

Our interpretation of the pattern of results is that participants in the New Anagrams Alone condition used their subjective experience of anagram difficulty as a basis for judging for others, as indexed by the correlations between speed of solving and rated difficulty. In contrast, when participants' direct experience of the difficulty of solving an anagram was blocked by the presence of the solution word, they were forced to use a different basis for judgment. We diagnosed the presence of two bases for judgments in several ways. First, participants took longer to judge anagram difficulty in the Anagrams with Solution condition compared to the New Anagrams Alone Condition, as we would expect if they were applying rules and analysis to make their judgments rather than simply generalizing from their own experience of difficulty. Second, the rank ordering of the items differed between the Anagrams with Solution condition and the New Anagrams Alone condition, which suggests some lack of overlap in the processes underlying the judgments (Rubin, 1985). Finally, participants who based their judgments on subjective experience better predicted the rank ordering of actual item difficulty than did participants who were unable to experience solving the anagrams because of the blocking effect of the solution word.

We argue that presenting the solution word prior to the anagram does indeed block the subjective experience of anagram difficulty. People often solve anagrams by pronouncing parts of the anagrams and using the phonemic information as a cue for retrieving the solution (Fink & Weisberg, 1981). In line with that analysis, the prior reading of the solution words made the solutions more accessible during cued retrieval and so decreased the latency to solve the anagrams. Participants may experience arriving at the solution as a sudden, allor-none process (Metcalfe, 1986; Weisberg, 1992), because they cannot predict whether a cue will retrieve a solution. When the solution word is presented immediately prior to reading the anagram, the effectiveness of the anagram as a retrieval cue cannot be directly experienced, and so participants must base their judgments of difficulty on other information.

We suggest that when deprived of the direct experience of attempting to solve the anagram, participants in the Anagrams with Solution condition were forced to use a more analytic basis for judgment. We did not obtain direct evidence that participants used rules about anagram difficulty to judge Anagram with Solution items, although participants in pilot tests often spontaneously reported reasoning such as "I would have never have been able to come up with such a weird word." Alterna-

tively, participants in the Anagrams with Solution condition may have applied an effortful (although perhaps implausible) algorithm to simulate how difficult it would be to solve particular anagrams. That is, they might imagine moving the first letter to the second position, then third position, and so forth, followed by moving the second letter through all positions, and so forth, until they moved the right letter to create the solution word. Or participants may have tried to imagine solving the anagram according to some heuristic even though they knew the solution word. Future research could investigate these judgment processes with a protocol analysis (cf. Ericsson & Simon, 1993). However, our focus is on the qualitative distinction between judgments based on subjective experience and more analvtic alternatives.

The subjective experience of item difficulty was lowered for participants who read the solutions to items in the first phase and so their subjective experience of difficulty was spoiled as a basis for predicting for others. According to the diagnostic indicators of theory-based versus subjective experience-based judgments outlined above, participants in the Old Anagrams Alone condition nonetheless continued to use subjective experience as a basis for judgment: They rated old anagrams as easier for others than the new baseline items; they showed a substantial correlation between their own solution time and rated difficulty; they made their judgments relatively quickly, as did participants in the New Anagrams Alone Condition; and their rank ordering of item difficulty (collapsed across participants) was more similar to the ordering of items produced by participants in the New Anagrams Alone condition than that produced by participants in the Anagrams with Solution Condition.

One effect of reading the solutions to anagrams was to increase the solution rate in the Old Anagrams Alone condition, from .65 to .74. Thus, participants in the New Anagrams Alone condition more often experienced failures to solve anagrams compared to participants in the Old Anagrams Alone condition, and to participants in the Anagrams with Solution condition who never experienced failures (or successes). However, this difference in failure rate did not create the differences among conditions. Subanalyses that excluded solution failures in the Old Anagrams Alone and New Anagrams Alone conditions revealed patterns of results that were identical to the overall analyses in terms of lowered difficulty ratings for old items, faster RT to solve old items, and equivalently high correlations between speed of solution and ratings for old and new anagrams.

Although we describe the subjective experience of anagram difficulty as "spoiled" by reading the solutions to anagrams in the first phase of the experiment, it continued to be a useful and easy-to-use heuristic for judging difficulty. Although mean difficulty ratings were lower for old anagrams than new anagrams, judgments based on subjective experience nonetheless captured the relative difficulty of the items quite well, far better than the theory-based judgments of participants in the Anagrams with Solution condition, and only slightly worse than participants whose subjective experience was not affected by prior reading of the solution words.

# EXPERIMENT TWO: DEBIASING USE OF SPOILED SUBJECTIVE EXPERIENCE

Fluent processing in a perceptual, conceptual, or motor task is an ambiguous cue: It may indicate prior experience and contribute to the experience of remembering, or it may reflect characteristics of the current situation such as the intensity of a stimulus or the difficulty of a problem. This ambiguity regarding the source of fluent processing can lead to misattributions of the effects of the past as shown in the lowered difficulty ratings for old anagrams in the present experiment. What, then, determines the interpretation that participants give to their fluent processing?

One major determinant is people's orientation. If they are focused toward the past as a source of variation in processing, they will experience fluent perceptual processing as familiarity. However, if they are focused on other judgments, such as stimulus intensity, duration, pleasantness, or difficulty, they may interpret variations in speed of processing as variations in those other dimensions. By this attributional account of illusory effects of past experience (Jacoby et al., 1989), the misattributed effect of past experience could disappear if participants become aware of its source in past experience. As an example, Jacoby and Whitehouse (1989) varied the ease with which words on a recognition memory test were perceived in an attempt to create memory illusions. Participants studied a list of words and then took a recognition test. Immediately prior to the presentation of each word on the recognition test, the same word (match), a different word (mismatch) or a string of x's and o's was briefly flashed on the screen, so that participants were unaware of their presentation. For both old and new words on the recognition memory test, a matching context word increased the probability of judging an item "old," whereas a mismatching word decreased the probability of judging the item "old." The matching word facilitated perceptual processing of the following test word and so increased participants' feeling of familiarity. In the case of new words, the brief presentation of a matching context word created an illusion of memory.

An important control condition in the Jacoby and Whitehouse study illustrates how the illusions of memory depended upon an inference or an attribution about the source of easy perceptual processing. In a second condition, the matching or mismatching context words were presented for much longer, such that participants were fully aware of them. When participants were aware of the context words, they were actually less likely to call either an old or new recognition test word "old" when the context word matched the test word than when no context word or a mismatch context word was presented. When they were unaware of the context word, people mistakenly attributed their enhanced processing of the test word to having studied it, and so judged it old. In contrast, when aware of the context word, people correctly attributed their enhanced processing of the test word to having just read it as a matching context word. In fact, participants in the aware condition tended to overcorrect for the effect of the matching word and so were less likely to judge the test word old than if no context word had been presented. Similarly, Whittlesea et al. (1990) found that illusions of memory created by adjusting the clarity of visual presentation were eliminated when participants were informed of the clarity manipulation.

The illusory effect of prior reading of the solution to an anagram on the later subjective experience of difficulty may be eliminated when participants are made aware that items were presented in the first phase, parallel to the aware condition of Jacoby and Whitehouse. However, the experience that old anagrams are easy anagrams could be similar to a perceptual illusion such as the Muller-Lyer illusion, which does not disappear even when the source of the illusion is described. The illusion that the background noise on a tape is softer when old sentences are presented compared to new sentences (Jacoby et al., 1988) persists even when one is aware that the sentence is old. Jacoby et al. speculated that participants were unable to separate the effects of memory from the physical stimulus when judging loudness.

In Experiment 2, we explored the nature of the effect of prior reading of solution words on later ratings of anagram difficulty by manipulating whether participants were aware that they had read the solution word in the first phase. Participants in the Uninformed condition solved old and new anagrams and rated the difficulty for others, whereas participants in the Recognition condition were required to attempt to recognize whether each solution had been presented in the first phase of the experiment prior to rating the anagram's difficulty. Participants in a third condition (Informed plus Recognition) solved old and new anagrams, attempted to recognize whether the solution word had been presented in a first phase, and were told that prior presentation would make those anagrams easier to solve. Furthermore, they were cautioned to attempt to avoid those effects in their difficulty ratings.

## Method

*Participants.* The participants were 48 volunteers from an introductory psychology course at McMaster University who served in the experiment for course credit. Participants were randomly assigned to one of three between-subject experiment conditions: Uninformed, Recognition, and Informed Plus Recognition. Participants were tested individually.

*Materials and design.* The words and single solution anagrams used were selected from the ones used in Experiment 1. Five items that participants in Experiment 1 found particularly difficult were replaced. From this pool, words were divided into two sets of 40 words each with each set used equally often as old or new words on the test. Each set had an equal distribution of word frequency within the medium-frequency range.

A 40-word list was presented in the study phase. Two orders of presentation were constructed, which when combined with the rotation of items through the old/new experimental conditions resulted in four different list combinations during study. The test phase consisted of 80 trials of anagrams presented to be solved, 40 New Anagrams and 40 Old Anagrams (items whose solutions were presented in Phase 1). Two test orders were constructed. The presentation orders of items for both study and test lists were random with the restriction that not more than three items representing the same condition could be presented in a row.

An additional six medium-frequency fiveletter nouns selected with the same restrictions as the pool of 80 words were used as practice items in the test phase.

*Procedure.* As in Experiment 1, all participants in the study phase were required to read aloud words presented on the computer screen at a 2-s rate. Ratings of anagram difficulty at test were made using the game paddle as in Experiment 1. At test, participants in the Uninformed Condition first saw an anagram to be solved and were given a maximum of 20 s to solve it. If they could not solve it in that time,

the experimenter told them the solution. The rating line then appeared on the screen and participants entered their rating with the game paddle, from "very easy" to "very hard."

Participants in the Recognition Condition were told that they had read the solution word to some of the anagrams and were asked to make recognition judgments about the anagram solutions prior to rating the difficulty of each anagram. They first attempted to solve the anagram. The anagram was cleared from the screen and the question "Old or New?" appeared. Participants were told to respond with their recognition decision which the experimenter keyed in. The rating line then appeared and participants entered their rating of the difficulty of the anagram. Participants in the Informed Plus Recognition condition were also required to make recognition judgments prior to rating each anagram. Furthermore, they were informed about the effect of reading the answers on later solving of the anagrams and were cautioned to attempt to avoid the effect of prior reading of the anagram solutions in their ratings of anagram difficulty.

A practice phase consisting of six trials of new items was presented prior to the main test list in all conditions.

## Results

Speed of solution. The mean reaction time for solving anagrams was analyzed in a mixed-model analysis of variance, with condition (Uninformed, Recognition, and Informed plus Recognition) as the between-subjects factor and item type (old anagrams versus new anagrams) as the within-subjects factor. As in the previous experiment, prior reading of solution words speeded the solution of anagrams relative to new baseline anagrams, F(1,45) = 157.43, MSE = 1135588 (see Table 2). The effect of condition was not significant, F(1,45) = 2.335, MSE = 4637862, p < .11, nor was the interaction between condition and item type, F(2,45) = 1.95.

*Recognition.* The proportion of items judged "old" by participants in the Recognition Condition and the Informed Plus Recognition Condition was analyzed in a mixed-

model analysis of variance, with condition as the between-subjects factor, and old versus new anagrams as the within-subjects factor. Participants recognized .78 of the old items and produced false alarms to .31 of the new items, F(1,30) = 4.79, MSE = .009. The condition effect was not significant, F(1,30) =1.66, MSE = .026, although there was a significant interaction between item type and condition: Participants in the Recognition condition made more false alarms (.36) than did participants in the Informed Plus Recognition condition (.26), F(1,30) = 4.79.

Difficulty ratings. Given that studying the answers to anagrams made those anagrams easier to solve, were participants in the conditions who recognized items as old able to correctly attribute the ease of solution of old anagrams to prior experience, and so escape the problem of spoiled subjective experience of anagram difficulty? A mixed-model analysis of variance of the difficulty ratings revealed a significant interaction between condition and item type, F(2,45) = 8.16, MSE = 86.00. Simple effects analyses revealed that for participants in the Uninformed Condition, anagrams for which the solution words had been studied were estimated as less difficult for others than were new anagrams, F(1,45) = 46.98, MSE =86.00. Similarly, even participants who were required to recognize items as presented on the earlier list showed the same pattern of estimating old anagrams as less difficult, F(1,45)= 36.00. However, the effect of prior study of solutions did not lead to a significant decrease in item difficulty ratings made by participants who attempted to recognize each item before making their difficulty ratings and who were informed of the effect, F(1,45) = 2.36, p < .13.

Correlation between RT to solve and ratings. How did participants in the Informed Plus Recognition condition overcome the effects of prior experience reading anagram solutions on later judgments of anagram difficulty? Certainly one option was to shift to another basis for judgments, such as rules, as was argued above. If so, one would expect a lower average correlation between time to

#### TABLE 2

Condition and item type Informed Plus Uninformed Recognition Recognition Measure Old New Old New Old New Mean RT to solve 6551 9812 7291 10008 6388 8598 Proportion "old" .78 .78 .36 .26 Difficulty ratings 74.6 97.1 76.4 96.0 96.4 101.5 Mean r .80 RT to solve  $\times$  rating .74 .64 .68 .57 .61 Mean RT to judge 2425 3001 2535 2643 3009 2901

Note. RT to solve and RT to rate are in ms. Difficulty was rated on a 255-point scale, from very easy to very difficult.

solve anagrams and rating of anagram difficulty for participants in the Informed Plus Recognition Condition compared to participants in the other two conditions. The individual correlations between time to solve anagrams and difficulty ratings were analyzed in a mixed-model analysis of variance. There was a significant condition effect, F(2,45) =3.77, MSE = .069, and a Newman-Keuls analysis revealed that the average correlation was lower for participants in the Informed Plus Recognition Condition (mean r = .59) than the Uninformed Condition (mean r =.77). The mean correlation for the Recognition Condition fell midway between the other two conditions and did not differ significantly from either one of them, mean r = .66. This supports the notion that participants in the Informed Plus Recognition Condition were less likely to rely on subjective experience of anagram difficulty as a basis for judging difficulty for others. The average correlation was lower on old (mean r = .65) than on new anagrams (mean r = .70), F(2,45) = 4.06, MSE = .013, and there was no interaction between condition and item type, F < 1.

Judgment latency. There was no effect of condition on judgment latency (F < 1). There was, however, a significant difference between old and new anagrams, F(1,45) = 13.19, MSE = 66782, such that old anagrams

were rated slightly more quickly than new items, although this effect was qualified by an interaction of item type and condition, F(2,45) = 14.66. Judgment latency differed for old and new items only in the Uninformed Condition.

Rank ordering of items according to difficulty ratings. A second indication that participants shifted away from reliance on subjective experience as a basis for anagram difficulty in the Informed Plus Recognition Condition is a comparison of the ranked order of difficulty ratings for old anagrams, collapsed across participants in each of the three conditions. This analysis was performed on the 75 items that overlapped between experiments 1 and 2. The correlation between the ordering given by the participants in the Uninformed Condition with the ordering in the Recognition Condition was r(73) = .79, which was marginally higher than the correlation between the Uninformed Condition and the Recognition Plus Informed Condition, r(73) = .65, Z = 1.78, and than the correlation between the Recognition and the Informed Plus Recognition Condition, r(73) = .64, Z = 1.88.

Correlation between difficulty ratings and criterion difficulty. As an estimation of the validity of the ordering of the ratings, we collapsed the ratings of the old anagrams across participants within conditions and computed a correlation between average rating and the criterion average RT to solve the items obtained from participants solving new anagrams in Experiment 1. The correlation was r(73) = .77 for the Uninformed Condition, r(73) = .67 for the Recognition Condition, and r(73) = .67 for the Informed Plus Recognition Condition. The three correlations do not differ significantly.

## Discussion

Orienting participants toward the past by requiring recognition judgments prior to rating anagram difficulty did not eliminate the effect of reading solution words on later ratings of difficulty. Only by additionally informing participants of the nature of the effect of prior study of the solution words and warning them to avoid that effect in their difficulty ratings did the difference between ratings of old and new anagrams diminish. There was more similarity in the rank ordering of difficulty ratings made by the Uninformed and Recognition Conditions than those made by the Informed Plus Recognition Condition, which suggests more of an overlap in the bases for judged difficulty for the former two conditions.

One interpretation of the continued reliance on subjective experience, even when recognition is required, is that the attributions for fluency are not mutually exclusive; that is, an anagram can be both old and easy. People may be unable to disentangle the effects of past experience on anagram difficulty from characteristics of the anagrams. Similarly, perceptual illusions such as the moon illusion are effective even when one is aware of its source. Alternatively, participants who recognized the anagrams as old may not have comprehended the nature of the influence of prior reading of the anagram and so did not attempt to correct for that influence or shift to a different basis for judgment (Bowers, 1984). A third alternative is that participants who recognized the item as old nonetheless based their difficulty judgments on subjective experience because it is a much easier basis for judgment than shifting to a theory of anagram difficulty, and better captures the ordering of item difficulty, as noted in Experiment 1.

In Experiment 1, depriving participants of the subjective experience of difficulty by presenting the solution word with the anagram led to considerably slower judgment latencies as one might expect if participants were applying rules to judge difficulty. However, judgment latencies in Experiment 2 were uniformly fast. The Recognition instructions, and even the Informed Plus Recognition instructions, did not necessarily lead to a change in the subjective experience of the difficulty of old anagrams. Participants in all three conditions in Experiment 2 solved the anagrams, and in so doing, may have had such a compelling subjective experience of difficulty that they used it as a basis for judging for others even when they were forced to recognize items and informed about the nature of the effect. Participants in that condition may have anchored their judgments based on subjective experience and then attempted to adjust for the effect of prior study of the anagrams simply as a result of the demand characteristics induced by the instructions exhorting participants to avoid those effects. We will address these issues in more detail later.

#### GENERAL DISCUSSION

We argue that the studies presented here illustrate the use of subjective experience versus theory as a basis for judgments and also illustrate how specific past experiences can alter subjective experience. The high correlations between participants' own time to solve anagrams and ratings of the difficulty of those anagrams for others are in line with our contention that the ratings are based on subjective experience. In contrast, when participants were prevented from experiencing the difficulty of solving the anagrams by reading the solution word before the anagram, they were forced to switch to an alternative basis for judgment. We assume (and conversations with participants concur) that the alternative basis for judgment consisted of analysis of the structure of the anagram and rules such as "unusual words would be hard to solve."

These experiments identified several differences in performance that can serve as diagnostic tools for determining whether participants are using subjective experience or theory as a basis for judgment. Judgments based on subjective experience were made more quickly than judgments based on theory and led to a different ordering of the rated difficulty of the items than did judgments based on theory. Also, in this domain at least (and within this range of items) participants did not appear to have a particularly good theory about anagram difficulty: the average ratings made by participants relying on subjective experience better predicted the true ordering of item difficulty than did the average ratings made by participants relying on rules.

Subjective experience as a basis for judgment can be spoiled by irrelevant factors, in particular by specific prior experience. Although reading the answers to a set of anagrams decreased the solution time, participants misattributed their easy solution of old anagrams to qualities inherent in the anagrams. Participants continued to use their subjective experience as a basis for judgment, as shown by the continued high correlation between solution time and rated difficulty and by the more rapid ratings relative to the condition where anagrams were read with their solutions (which prevented the use of subjective experience). Consequently, the anagrams for which the solution word had been read earlier were rated as easier for others than were new anagrams. However, even these judgments based on spoiled subjective experience correlated better with the criterion (the ranking of average solution times on new anagrams) than did judgments based on rules.

In Experiment 2, we explored whether the misattribution of the effect of prior experience on anagram judgments would be eliminated when participants were required to recognize the items as old. Recognition judgments did not affect the size of the old/new difference in difficulty ratings, although it somewhat attenuated the size of the correlation between participant's own solution times and rated difficulty. Only by informing participants of the nature of the old/new effect and requiring recognition judgments did we diminish the old/ new effect on difficulty ratings.

We suggest that the distinction between judgments based on subjective experience and judgments based on theory is important in a number of domains. We will first discuss the nature of the differences between these two bases for judgments. Next, we discuss the conditions under which subjective experience can be spoiled as a basis for judgment, and finally, we explore the generality of subjective experience as a basis for judgments.

#### Subjective Experience versus Theory

Subjective experience as a basis for judgment is nonanalytic and uncontrolled. People are likely to be unaware of the factors that contribute to a particular subjective experience, and so are vulnerable to factors such as specific past experiences. Nisbett and Wilson (1977), Greenwald and Banaji (1995), and Wilson and Brekke (1994) review a variety of cases in which people's judgments are influenced by factors of which they are unaware, such as halo effects or the sex or race of a target person. As Wilson and Brekke note, people's experience is the final product—a subjective experience of "this is a good paper" rather than the separate influences of factors such as sex, race, or attractiveness.

Wilson and Brekke focus on the negative consequences of unconscious influences on judgment, which they refer to as "mental contamination." Yet the use of subjective experience as a basis for judgment may be a generally valid heuristic. Just as the availability heuristic is normally a useful way of judging frequency, one's own experience of the difficulty of a problem may be a good indicator of how others will do on the problem. Arkes (1991) holds that a variety of judgmental biases in the laboratory are actually the result of very adaptive systems. He classifies the availability heuristic, explanation bias, hindsight bias, and representativeness heuristic as consequences of an adaptive associationistic memory system that will occasionally produce errors.

Hoch (1987) analyzed the accuracy of people's predictions of the attitudes of several target groups (e.g., the general public's attitude regarding whether "[t]he government should exercise more control over what is shown on television,") and found that people projected their own attitudes on the targets. As we discuss below, this projection may be another case of subjective experience being interpreted as objective reality. However, a majority of participants in Hoch's experiment could have increased their predictive accuracy by projecting even more. Hoch noted that predictive accuracy depends on two factors: First, the similarity between the participant and target, and second, the predictive validity of the information that the participant can use in addition or instead of his or her own positions. For Hoch's items, people seemed to have little alternative information-a substantial portion of the participants would have been more accurate in their predictions for others if they had simply reported their own positions. Analogously, in our paradigm when people base their judgments for others on their own subjective experience, they need not be aware of the influence of a factor in order to exhibit a sensitivity to that factor in their judgments for others, nor do they have to be aware of any metric for combining important cues. In that sense, the heuristic value of judgments based on subjective experience can be high and should be matched only by a very sophisticated theory.

A distinction similar to our contrast between theory and subjective experience as a basis for judgments is the reason versus affect contrast of Wilson and Schooler (1991). They studied the effects of requiring participants to list reasons for their judgments when predicting preferences for themselves and for others and found that translating affective reactions into reasons can be disruptive. For example, one experiment had participants taste and rate the quality of five different brands of strawberry jam. The Wilson and Schooler criterion measure of "goodness of ratings" was the rank-ordering of the jams by a panel of experts who had rated the jams on 16 dimen-

sions for Consumer Reports. When participants were asked simply to taste the jams and rank them their rankings correlated fairly well with the experts' rankings. However, when participants in another condition were asked to provide reasons for their judgments, their rankings of the quality of the jams was less like that of the experts. Wilson and Schooler argued that forcing their participants to think about why they liked or disliked each jam turned an affective response into a more cognitive one, and in this case the cognitive judgments did not capture the experts' ranking of quality. People's analysis of what makes a jam good may be based on a bad theory. Perhaps unanalyzed affect captures more important dimensions or weights the dimensions more appropriately than a cognitive analysis. Our analysis of subjective experience versus theory as a basis for judgment suggests that in addition to affect, other qualities of subjective experience are used in judgment, in particular ease of processing, and that they can be excellent bases for social predictions.

# The Attribution of Fluency and Debiasing Attempts

Illusions of memory are sometimes eliminated when participants are made aware of the source of the effects (Whittlesea et al., 1990; Jacoby et al., 1988, but see Lindsay & Kelley, this issue). Similarly, Bornstein and D'Agostino (1990) found that the mere exposure effect on pleasantness or liking judgments is smaller under conditions when participants realize that past experience is actually the source of perceptual fluency occurring during the pleasantness judgments. However, pointing out to participants that some anagram solutions had been studied did not eliminate the solutions' influence on judged difficulty. This effect, then, parallels the perceptual judgments that are affected by prior experience even when participants are aware of the old/new status of items at test.

Fluency is not necessarily in a "trading relationship" (Whittlesea, 1993) among various attributions and misattributions. Whittlesea (1993, Experiment 6) found that fluency can

simultaneously be misinterpreted as pleasantness and as familiarity. He manipulated conceptual fluency by varying whether test words were preceded by a predictive context (The stormy seas tossed the BOAT) or a neutral context (He saved up his money and bought a BOAT). Participants first studied a short list of briefly presented words, then made pleasantness ratings for each word, followed by recognition memory judgments. Predictive contexts led to higher pleasantness ratings and an increased probability of calling an item old relative to those items presented in neutral contexts. The pleasantness judgments and repetition judgments were actually positively correlated rather than in a trading relationship. Similarly, in the Recognition memory condition of our Experiment 2, recognition of an item did not usurp the misattribution of fluency as due to an item's being easy.

One important dimension of whether awareness of the study episodes is important for alterations of subjective experience may be the availability of an alternative basis for responding. The illusion of memory experiments altered participants' subjective experience of familiarity. Rajaram (1993) found that presenting masked prime words in the procedure used by Jacoby and Whitehouse increased recognition judgments of "knowing" that an item had been studied, but did not influence judgments of "remembering" details of the study experience. Participants in Jacoby and Whitehouse's aware condition could have shifted to the more analytic "remembering" basis for recognition judgments to avoid the illusions of familiarity. In contrast, in the case of perceptual judgments such as loudness there are no alternatives to subjective experience as a basis for judgment. An analogous illusion is that we often experience speech in an unknown foreign language as extremely rapid compared to speech in a known language, yet the impression persists even though we know that the "pauses" we hear in our native language are illusory. There may be no alternative basis for judging the speed. In line with this argument, when judging anagram difficulty, theories and rules, although available, were apparently regarded as an unsatisfactory basis for judgment. Participants in an earlier within-participants version of Experiment 1 (reported in Jacoby & Kelley, 1987) clearly preferred to experience solving the anagrams, and in fact several participants attempted to cover up the solution words with their hands on the Anagrams with Solution items.

The fact that the subjective experience of anagram difficulty continued to dominate judgments in the Recognition Condition of Experiment 2 may indicate that it is simply a compelling and salient basis for judgments. Just as people are prone to discount intellectual explanations of perceptual illusions and continue to experience the illusion, they may find it hard to discount their subjective experience of a problem being difficult. Similarly, teachers may find it hard to reject the belief that their lectures are models of clarity but their students are dull-witted. Subjective experience that is informed by prior experience or privileged knowledge could nonetheless be felt as an accurate depiction of external reality.

Arkes (1991) reviewed evidence that debiasing manipulations such as increased incentives work when people's errors stem from their use of suboptimal strategies, strategies that take little effort but are somewhat effective (cf. Chaiken's distinction between heuristic and systematic information processing). In contrast, he argued that "association-based" errors are not affected by incentives or exhortations because those effects occur automatically and it would be difficult for participants to stop being affected by associations. We think the spoiling of subjective experience by specific prior episodes is an automatic effect that typically occurs without awareness. However, people can shift to more demanding theory-based judgments and that strategy will be effective to the extent that their theory is a good one.

## Relation to Other Phenomenon

Subjective experience in communication. Effective communication requires us to take the perspective of the other and because we

tend to rely on our own subjective experience of a situation to predict for others, we make errors. Fussell and Kraus (1992) found that participants gave higher estimates for the percentage of people who would know the name of a public figure given a picture when they knew the name themselves relative to when they did not know the name. In a referential communication task about the public figures, participants used those estimates to model their partner's understanding: The amount of information participants used to refer to pictures of the public figures varied inversely with the perceived identifiability of the target. Clearly, such knowledge could be privileged or biased by recent experiences, just as when reading an answer to a question increases the likelihood of later being able to answer the question (Kelley & Lindsay, 1993).

Keysar (1994) demonstrated how the failure to account for privileged knowledge can lead to poor predictions regarding people's detection of sarcasm and irony. Participants read about a person who received a recommendation from another person regarding a restaurant for a special dinner. He followed the recommendation but the dinner was a disaster. The next day, the recommender asked "How did you like the restaurant?" and he replied "It was great." Participants were asked to predict whether a person listening to that final exchange would detect the sarcasm in "It was great." They predicted that the sarcasm would be readily apparent, even though it was only apparent to the participants themselves because of their privileged knowledge that the restaurant was bad.

The false consensus bias. Our demonstration of the use of subjective experience as a basis for judgments for others is similar to the false consensus effect (Ross, Green, & House, 1977; Goethals, Allison, & Frost, 1979). People who hold a particular opinion or attitude or chose one behavioral option over another think that their position or choice is relatively more common than people who make an alternate choice. The false consensus effect has been interpreted as reflecting a motivation to appear normal or rational, or as a result of

selective exposure to people who are like oneself. Perhaps the false consensus effect derives from a process similar to our experiments on judging problem difficulty—subjective experience appears to be an objective representation of the situation. In line with this interpretation, Gilovich, Jennings, and Jennings (1983) found that the false consensus effect is smaller when people are directed to make personal attributions rather than situational attributions for their choices. Furthermore, items that elicit personal attributions (would vou rather watch gymnastics or track and field?) show smaller false consensus effects than items that elicit situational attributions (e.g., would you rather heat with wood or oil?). When asked to rate the difficulty of problems, estimate the difficulty of a test, or assess the comprehensibility of a manuscript, people may be particularly prone to regard their subjective experience as an index of objective characteristics of the task rather than focus on the effects of their own abilities and prior experience.

Gilovich (1990) also found that the false consensus effect in social judgment occurs to a greater extent when there is more latitude for construing the options in different ways. Participants in false consensus experiments are asked questions such as "Which color do you like better, aqua or tan?" and then try to estimate the proportion of college students who would make the same choices. The participant has to make a particular interpretation of what is meant by "aqua" and "tan" and then choose between the two. However, participants who interpret such questions may not realize the degree to which their particular construal of the elements of the choice is idiosyncratic; that is, they might imagine a particularly ugly aqua and a pleasing tan, choose tan, and assume that most right thinking people would make a similar choice. When the choices are not open to different construals, as when specific paint chips are used, the false consensus effect disappears. Griffin and Ross (1991) suggest that much human misunderstanding may stem from people's failure to appreciate the degree to which their construal of a situation differs from that of others.

Recent prior experiences can bias construals or interpretations of ambiguous features and so lead to different judgments whether one is judging nonanalytically or analytically. Brooks and his colleagues (Brooks, Norman, & Allen, 1991; Allen & Brooks, 1990) found that training on particular exemplars of a category such as dermatologic lesions can alter the interpretation of ambiguous features on similar new exemplars up to 1 week later. The training examples affected the interpretation of features as well as the attention to and weighting of features in subsequent diagnoses. Brooks has found that such categorizations are often made on the nonanalytic basis of similarity to prior instances. However, even if people were using a theory to categorize items such as dermatologic lesions, prior experiences could affect judgment by changing how features are interpreted. Similarly, in the current experiments, even if participants use a rule such as "low frequency words would be harder to generate," they need to estimate frequency of words, and that estimation itself may be altered by recent experience. Analytic processing will be susceptible to unconscious biases if the cues that enter into analysis are biased (see also Trope, 1986).

## SUMMARY AND CONCLUSIONS

The present experiments add to a body of research that finds that our subjective experience of the present is altered by the past in ways that we may not comprehend. Specifically, past experience leads to more fluent processing, and that fluent processing enters into the construction of our subjective experience in a variety of domains. The social consequences of these effects are widespread, as people base social judgments on their own subjective experience. Theories provide an analytic alternative to judgments based on subjective experience, but that basis may be more time-consuming and effortful and may not necessarily be as finely tuned to the factors that influence what we aim to predict.

#### References

- ARKES, H. R. (1991). Costs and benefits of judgment errors: Implications for debiasing. *Psychological Bulletin*, **110**, 486–498.
- BEGG, I., ANAS, A., & FARINACCI, S. (1992). Dissociation of processes in belief: Source recollection, familiarity, and the illusion of truth. *Journal of Experimental Psychology: General*, **121**, 446–458.
- BEGG, I., ARMOUR, V., & KERR, T. (1985). On believing what we remember. *Canadian Journal of Behavioral Science*, **17**, 199–214.
- BORNSTEIN, R. F., & D'AGOSTINO, P. R. (1994). The attribution and discounting of perceptual fluency: Preliminary tests of a perceptual fluency/attributional model of the mere exposure effect. *Social Cognition*, **12**, 113–128.
- BOWERS, K. S. (1984). On being unconsciously influenced and informed. In K. S. Bowers & D. Meichenbaum (Eds.), *The unconscious reconsidered* (pp. 227– 273). New York: Wiley.
- BROOKS, L. R., NORMAN, G. R., ALLEN, S. W. (1991). Role of specific similarity in a medical diagnostic task. *Journal of Experimental Psychology: General*, 120, 278–287.
- CHAIKEN, S., LIBERMAN, A., & EAGLY, A. H. (1989). Heuristic and systematic information processing within and beyond the persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 212–252). New York: Guilford Press.
- DAWES, R. M., FAUST, D., & MEEHL, P. E. (1989). Clinical versus actuarial judgment. *Science*, 243, 1668– 1674.
- DOMINOWSKI, R. L., & EKSTRAND, B. R. (1967). Direct and associative priming in anagram solving. *Journal* of Experimental Psychology, **74**, 84–86.
- ERICSSON, K. A. & SIMON, H. A. (1993). Protocol analysis: Verbal reports as data (Rev. ed.). Cambridge, MA: MIT Press.
- FINK, T. E., & WEISBERG, R. W. (1981). The use of phonemic information to solve anagrams. *Memory* and Cognition, 9, 402–410.
- FUSSELL, S. R., & KRAUSS, R. M. (1992). Coordination of knowledge in communication: Effects of speakers assumptions about what others know. *Journal of Personality and Social Psychology*, **62**, 378–391.
- GILOVICH, T. (1990). Differential construal and the false consensus effect. *Journal of Personality and Social Psychology*, **59**, 623–634.
- GILOVICH, T., JENNINGS, D., & JENNINGS, S. (1983). Causal focus and estimates of consensus: An examination of the false-consensus effect. *Journal of Personality and Social Psychology*, **45**, 550–559.
- GOETHALS, G. R., ALLISON, S. J., & FROST, M. (1979). Perception of the magnitude and diversity of social support. *Journal of Experimental Social Psychology*, 15, 570–581.
- GORANSON, R. E. (1985). Studies of communication effectiveness. Unpublished manuscript.

- GREENWALD, A. G., & BANAJI, MAHZARIN, R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, **102**, 4–27.
- GRIFFIN, D. W., & ROSS, L. (1991). Subjective construal, social inference, and human misunderstanding. In M. Zanna (Ed.), Advances in experimental social psychology Vol. 24, pp. 319–359. New York: Academic Press.
- HASHER, L., GOLDSTEIN, D., & TOPPINO, T. (1977). Frequency and the conference of referential validity. *Journal of Verbal Learning and Verbal Behavior*, 16, 107–112.
- HAYES, W. L. (1981). *Statistics*. New York: Holt, Rinehart, and Winston.
- HOCH, S. J. (1987). Perceived consensus and predictive accuracy: The pros and cons of projection. *Journal* of Personality and Social Psychology, 53, 221–234.
- JACOBY, L. L, ALLAN, L. G., COLLINS, J. C., & LARWILL, L. K. (1988). Memory influences subjective experience: Noise judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14, 240–247.
- JACOBY, L. L., & BROOKS, L. R. (1984). Nonanalytic cognition: Memory, perception, and concept learning. In G. H. Bower (Ed.), *The Psychology of learning and motivation: Advances in research and theory* (Vol. 18, pp. 1–47). New York: Academic Press.
- JACOBY, L. L., & KELLEY, C. M. (1987). Unconscious influences of memory for a prior event. *Personality* and Social Psychology Bulletin, 13, 314–336.
- JACOBY, L. L., KELLEY, C. M., & DYWAN, J. (1989). Memory attributions. In H. L. Roediger III and F. I. M. Craik (Eds.), Varieties of memory and consciousness: Essays in honour of Endel Tulving (pp. 391-422). Hillsdale, NJ: Erlbaum.
- JACOBY, L. L., & WHITEHOUSE, K. (1989). An illusion of memory: False recognition influenced by unconscious perception. *Journal of Experimental Psychol*ogy: General, **118**, 126–135.
- KELLEY, C. M., & LINDSAY, D. S. (1993). Remembering mistaken for knowing: Ease of retrieval as a basis for confidence in answers to general knowledge questions. *Journal of Memory and Language*, **32**, 1– 24.
- KEYSAR, B. (1994). The illusory transparency of intention: Linguistic perspective taking in text. *Cognitive Psychology*, 26, 165–208.
- KORIAT, A. (1993). How do we know that we know? The accessibility model of the feeling of knowing. *Psychological Review*, **100**, 609–639.
- LINDSAY, D. S., & KELLEY, C. M. (1996). Creating illusions of knowing in a cued recall remember/know paradigm. *Journal of Memory and Language*, 35, 197–211.
- METCALFE, J. (1986). Premonitions of insight predict impending error. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, **12**, 623–634.

- NICKERSON, R. S., BADDELEY, A., & FREEMAN, B. (1987). Are people's estimates of what other people know influenced by what they themselves know? *Acta Psychologica*, 64, 245–259.
- NISBETT, R. E. & WILSON, T. O. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84, 231–259.
- RAJARAM, S. (1993). Remembering and knowing: Two means of access to the personal past. *Memory and Cognition*, 21, 89–102.
- Ross, L., GREEN, D., & HOUSE, P. (1977). The "false consensus" effect: An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, **13**, 279–301.
- RUBIN, D. C. (1985). Memorability as a measure of processing: A unit analysis of prose and list learning. *Journal of Experimental Psychology: General*, **114**, 213–238.
- THORNDIKE, E. L., & LORGE, I. (1944). The teachers' word book of 30,000 words. New York: Columbia Univ.
- TROPE, Y. (1986). Identification and inferential processes in dispositional attributions. *Psychological Review*, 93, 239–257.
- TVERSKY, A., & KAHNEMAN, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5, 207–232.
- VAN DIJK, T. A., & KINTSCH, W. (1983). Strategies of discourse comprehension. San Diego, CA: Academic Press.
- WEISBERG, R. W. (1992). Metacognition and insight during problem solving: Comment on Metcalfe. *Journal* of Experimental Psychology: Learning, Memory, and Cognition, 18, 426–431.
- WHITTLESEA, B. S. A. (1993). Illusions of familiarity. Journal of Experimental Psychology: Learning, Memory, and Cognition, 19, 1235–1253.
- WHITTLESEA, B. W. A., JACOBY, L. L., & GIRARD, K. A. (1990). Illusions of immediate memory: Evidence of an attributional basis for feelings of familiarity and perceptual quality. *Journal of Memory and Language*, **29**, 716–732.
- WILSON, T. D., & BREKKE, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin.* 116, 117–142.
- WILSON, T. D., & SCHOOLER, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality* and Social Psychology, **60**, 181–192.
- WITHERSPOON, D., & ALLAN, L. G. (1985) The effects of prior presentation on temporal judgments in a perceptual identification task. *Memory and Cognition*, 13, 101–111.

(Received June 27, 1995)

(Revision received January 5, 1996)