

Biased Predecision Processing

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Decision makers conduct biased predecision processing when they restructure their mental representation of the decision environment to favor one alternative before making their choice. The question of whether biased predecision processing occurs has been controversial since L. Festinger (1957) maintained that it does not occur. The author reviews relevant research in sections on theories of cognitive dissonance, decision conflict, choice certainty, action control, action phases, dominance structuring, differentiation and consolidation, constructive processing, motivated reasoning, and groupthink. Some studies did not find evidence of biased predecision processing, but many did. In the Discussion section, the moderators are summarized and used to assess the theories.

Biased predecision processing occurs when decision makers restructure their mental representation of the decision environment to favor one alternative before making a choice. Biased predecision processing may involve selective information search, which favors one alternative, or reevaluation of alternatives, in which one alternative is bolstered and/or the others denigrated until the choice becomes obvious.

The question of whether biased predecision processing occurs has been a point of controversy for more than 40 years. Festinger (1957) maintained on theoretical grounds that cognitive dissonance does not occur before a decision, and he (Festinger, 1964) believed that without cognitive dissonance biased predecision processing would not occur. Probably because of Festinger's prominence in social psychology, his prediction that biased processing would not occur before a decision seems to have been accepted by many social psychologists. Yet, in the subsequent 4 decades, researchers have compiled an impressive collection of work suggesting that biased processing can occur before a decision. In this article I review the major theoretical and empirical contributions to this debate.

I begin with the early American theories. In the first section I describe Festinger's (1957, 1964) theory of cognitive dissonance, which may be the most influential early perspective on biased predecision processing. In the second and third sections I describe two theories that were developed contemporaneously with dissonance theory: Janis and Mann's (1977) conflict theory and Mills's (1968) choice certainty theory.

Next, I continue with some more recent perspectives from Europe; in the fourth and fifth sections I describe two theories that

are concerned with how people choose and implement actions: Kuhl's (1984) action control theory and Gollwitzer's (1990) action phase theory. In the sixth and seventh sections I describe two theories that were developed together to address the issue of biased predecision processing: Montgomery's (1983) search for dominance structure (SDS) theory and Svenson's (1992) differentiation and consolidation theory. In connection with SDS theory, I describe Tyszka and colleagues' research on biased predecision processing (Englander & Tyszka, 1980; Tyszka, 1985, 1986, 1998; Tyszka & Wielochowski, 1991) and review Holyoak and Simon's (1999; Simon, Pham, Le, & Holyoak, 2001) research on legal decision making.

Later I discuss how some more general theories address the issue of biased predecision processing; in the eighth section I describe the constructive processing approach to behavioral decision making, including prospect theory (Kahneman & Tversky, 1979), adaptive cost–benefit trade-offs (Payne, Bettman, & Johnson, 1993), and reason-based choice (Shafir, Simonson, & Tversky, 1993), and in the ninth section I use Kunda's (1990) view of motivated reasoning to interpret research on wishful thinking (Hogarth, 1987) and review Russo and colleagues' marketing research (Russo, Medvec, & Meloy, 1996; Russo, Meloy, & Medvec, 1998; Russo, Meloy, & Wilks, 2000).

In the tenth section I describe how groupthink (Janis, 1983) may affect processing in decision making groups. Finally, in the Discussion section I draw on the literature reviewed to answer the question of whether biased predecision processing occurs, summarize the factors that moderate its occurrence, and assess the contribution each theory makes to the field's understanding of biased predecision processing.

Cognitive Dissonance Theory

Festinger's (1957) theory of cognitive dissonance focuses on the relationships among cognitive elements and on the impact that those relationships can have on behavior. Cognitive elements represent people's knowledge, opinions, and beliefs about their selves, behavior, and environment. Festinger (1957) suggested that cognitive elements may be irrelevant to each other; they may have a consonant relationship, or they may have a *dissonant* relationship. Festinger (1957) explained that "*two elements are in a*

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dissonant relation if, considering these two alone, the obverse of one element would follow from the other. To state it a bit more formally, x and y are dissonant if not- x follows from y " (p. 13). Dissonance is unpleasant (Elliot & Devine, 1994), so people reduce the intensity of dissonance by changing elements so that they become less dissonant with each other, or they reduce the proportion of dissonant links by searching for new information that is not dissonant with other elements.

In an obscure but pivotal passage of his 1957 book (pp. 39–40), Festinger analyzed the relationships between cognitive elements before a choice between two alternatives. Festinger (1957) identified four discrete (clusters of) cognitive elements in a predecision situation corresponding to the positive aspects of Alternative A, the negative aspects of Alternative A, the positive aspects of Alternative B, and the negative aspects of Alternative B. Then, defining *conflict* as the feeling of being pushed in two opposite directions, he explained that conflict exists in the predecision situation because the cognitive elements representing the positive aspects of Alternative A and the negative aspects of Alternative B push the decision maker toward choosing Alternative A, whereas the cognitive elements representing the positive aspects of Alternative B and the cognitive elements representing the negative aspects of Alternative A push the decision maker toward choosing Alternative B. However, Festinger (1957) maintained that dissonance does not exist in the predecision situation because there is no pair of (clusters of) cognitive elements about which it can be said that the opposite of one follows from the other.

After a decision is made, a new cognitive element representing the decision is introduced. Festinger (1957) suggested that at this point the decision maker is no longer in conflict because having made a decision and thereby committed to one alternative, it can no longer be said that the decision maker is being pushed in two opposite directions. However, Festinger (1957) explained that the decision maker experiences dissonance at this point because the cognitive element representing the choice he or she has made is dissonant with the cognitive elements representing the negative aspects of the chosen alternative and the cognitive elements representing the positive aspects of the foregone alternative.

Festinger did not repeat his analysis of the decision situation in his 1964 book, but as editor he did include reports of three experiments conducted under his supervision to test whether predecision conflict causes biased processing of alternatives. Davidson and Kiesler (1964) asked participants to rank the importance of eight attributes for the choice of a corporate executive and then asked them to consider a hypothetical choice between two candidates for vice president of their own imaginary company. Davidson and Kiesler slowly gave participants cards containing information about how the candidates compared on the eight attributes, warning them against making decisions before they had obtained all of the information. Participants in one condition were given 1 min to think about their first information card and 2.5 min to consider each successive card, whereas participants in another condition were given only 5 s between cards. Finally, all participants ranked the importance of the attributes for an executive a second time, either before making their own choice or after choosing. Davidson and Kiesler (1964) found that rankings of attributes favoring the chosen alternative increased from baseline to pre-choice measurement among participants in the longer deliberation time condition, and the increase was significant "at about the 2 per

cent level" (p. 16). However, the magnitude of reevaluation of alternatives was so much greater after the choice that the amount of predecision reevaluation seemed trivial to Festinger (1964).

Jecker (1964a) reported another study of reevaluation of alternatives, in which predecision conflict and postdecision dissonance were manipulated independently. Initially, all participants (female high school students) rated the extent to which they would like to have each of 15 records. Then, the experimenter manipulated conflict by explaining that all participants would receive at least one record as a gift for their participation and that, because there were extra records, a random procedure would be used to select some participants to receive two records. Participants randomly assigned to the high-conflict condition were told that only 1 out of 20 participants would receive two records, whereas participants assigned to the low-conflict condition were told that 19 out of 20 participants would receive two records. The experimenter then presented two records to the participant as the pair she would get if she got two records and asked her to choose which one she wanted in case she only got a single record. After the participant made her decision, the experimenter manipulated dissonance by awarding participants one or both of their choice alternatives. Participants randomly assigned to the dissonance condition were given the record they had chosen, whereas participants assigned to the no-dissonance condition were given both alternatives. Finally, participants rated the extent to which they would like to have each of the 15 records. Jecker (1964a) found that in the dissonance conditions, evaluations of the alternatives spread apart from the first rating to the second rating, but in the no-dissonance conditions, evaluations of the alternatives did not spread apart to any significant degree, suggesting that predecision conflict is not sufficient to cause reevaluation of alternatives.

Considering the possibility that the high-conflict manipulation did cause reevaluation of alternatives but the subsequent no-dissonance manipulation somehow reversed that reevaluation, Jecker (1964a) conducted a follow-up study. To test the effects of predecision conflict, Jecker (1964a) created two experimental conditions in which participants rated 15 records, were given the same high- or low-conflict treatments used in his earlier study, made their decisions, and finally rated the 15 records a second time. To provide a comparison group, Jecker (1964a) also included a post-decision dissonance condition in which participants rated the albums, made their choices without being told anything about a possibility of receiving both alternatives, and finally rated the albums again. Jecker (1964a) found that participants in the post-decision dissonance condition spread evaluations of their alternatives apart, but participants in the high- and low-conflict conditions did not, once again suggesting the predecision conflict is not sufficient to cause reevaluation of alternatives.

Jecker's (1964a) experiments have been criticized for their pretest–posttest design, which provides only indirect evidence of processes occurring before the decision (Janis & Mann, 1968, 1977). Nevertheless, when Festinger (1964) saw the results of these experiments, he concluded that biased processing does not occur before a decision:

Although there are some theoretical ambiguities in interpreting the Davidson and Kiesler result by itself, these ambiguities vanish when one considers both experiments together. One may regard the theoretical question as settled. There is a clear and undeniable difference

between the cognitive processes that occur during the period of making a decision and those that occur after the decision has been made. Re-evaluation of alternatives in the direction of favoring the chosen or disfavoring the rejected alternative, or both, is a post-decision phenomenon. (pp. 30–31)

Later in the same book, Festinger (1964) included another experiment reported by Jecker (1964b), which examined selective exposure to information before a decision. Participants were told that they could choose between 2 confederates to be their partner in a subsequent war game, and they were allowed to freely inspect information about each confederate's personality, either before making their choice, after making their choice, or when they had made a choice but were uncertain whether their choice would be honored. Jecker (1964b) recorded the amount of time that participants spent reading information that supported or did not support their choice and then computed an index of preference for supporting information over nonsupporting information.

Jecker (1964b) did not find any preference for supporting information when he included data from the entire experimental session, but when he limited data analysis to an initial scanning period at the beginning of the session, he found a preference for supporting information in the postdecision condition but not in the predecision condition or the uncertain condition. These results reveal selective information search only after a consequential choice, though the lack of a preference for supporting information during initial predecision scanning does not indicate whether a preference for supporting information appeared near the end of the predecision period.

At the end of his book, Festinger (1964, pp. 155–156) pointed out that Jecker (1964a, 1964b) only found evidence of biased processing after a decision if the decision involved commitment and consequences. That is, in the follow-up study to Jecker's (1964a) first experiment, participants in the high-conflict condition did not reevaluate their alternatives, even though they had made noncommitting, nonconsequential decisions. Similarly, participants in the uncertain condition of Jecker's (1964b) second experiment did not show a significant preference for supporting information even though they had made noncommitting, nonconsequential decisions. On the basis of these findings, Festinger (1964) concluded that biased processing does not occur before a decision, or even after a decision if there is no commitment and consequences, but only after a decision that carries commitment and consequences.

Gerard also published a couple of dissonance experiments that allowed him to assess biased processing before a decision. Using another pretest–posttest design, Gerard, Blevans, and Malcolm (1964) did not find any evidence of predecision reevaluation of alternatives, though it is unclear when participants had an opportunity to reevaluate their alternatives before choosing because the key manipulation was introduced “either immediately before or immediately after the choice” (p. 401). Gerard (1967) recorded the amount of time that participants spent looking at each of their alternatives and found that in the predecision phase, participants spent more time looking at the alternative they eventually rejected than the alternative they eventually chose. To explain his unexpected finding of predecision selective information search, Gerard (1967) suggested that early in the decision making process decision makers develop an “initial inclination” toward one alternative

and turn their attention to the other alternative to make sure they do not want it. When satisfied about “having sufficiently resolved the problem associated with giving up the alternative he intends not to choose, [the subject] finally commits himself to his initial inclination” (Gerard, 1967, pp. 104–105).

The notion of an early favorite emerging in the predecision period was also suggested by Jecker (1968). He proposed a revision to Festinger's (1957) analysis of the decision situation, suggesting that an early favorite is likely to emerge before a decision is reached. Jecker (1968) suggested that because the early favorite is represented by a cognitive element like an actual choice, dissonance can occur within the predecision period. That is, the element representing “I'm leaning toward A” is dissonant with the negative aspects of A just like the element “I have chosen A.” However, Jecker (1968) thought the dissonance produced by a weak, tentative stand would be reduced in the easiest manner: switching to another tentative favorite. The dissonance caused by the second tentative favorite would then be reduced by switching to yet another tentative favorite, and so on, so that the predecision situation would remain fluid and there would never be enough dissonance reduction in one direction to be detected by dependent variables in experiments.

Over the years, dissonance theory has become synonymous with the position that biased predecision processing does not occur, but dusting off the original sources reveals that the question of whether biased processing occurs before a decision was never clearly settled, even within the dissonance literature. Festinger's (1964) conclusion that biased predecision processing does not occur rested primarily on two experiments in which Jecker (1964a, 1964b) failed to find evidence of biased processing before a decision involving commitment and consequences, but other experiments conducted within the dissonance tradition did obtain predecision reevaluation of alternatives (Davidson & Kiesler, 1964) and selective information search (Gerard, 1967). Considering that the issue of biased predecision processing was left unresolved by dissonance researchers, I proceed to review other theoretical perspectives to see whether they found evidence of biased processing before a committing, consequential decision.

Conflict Theory

Janis and Mann developed a number of different conceptual schemes (e.g., Janis, 1959; Janis & Mann, 1968) that were later combined in their 1977 tome on decision making. Their complete model is structured as a rather complex decision tree, so here I only outline the branches that touch on biased predecision processing.

At the first stage of the decision making process, decision makers may be exposed to information that suggests that their current course of action involves serious risk. If they accept that there is risk associated with the way they are going, they enter the second stage, at which point they search for other alternatives and consider whether those are associated with serious risk. If the new alternatives are also risky, decision makers find themselves in decision conflict, favoring and disfavoring each alternative and experiencing physiological arousal. They then consider whether they have hope of finding a better solution, and if not, resort to the response mode of *defensive avoidance*. In defensive avoidance, decision makers first try to procrastinate and put the decision off until later; if that is impossible, they try to shift responsibility for

making the decision to someone else, and if that does not work, they bolster the least objectionable alternative.

Janis and Mann (1977) explained that bolstering the least objectionable alternative can involve increases in the attractiveness of the chosen alternative or decreases in the attractiveness of the nonchosen alternatives. They went on to list six bolstering tactics, three of which bear directly on the perceived advantage of the chosen alternative: exaggerating its favorable consequences, minimizing its unfavorable consequences, and denying the unpleasantness of its disadvantages. Three other bolstering tactics involve ways of hiding from the problem so that decision makers may convince themselves that no action will be required for a long time, that no one will know about their decision, or that they are not really responsible for their decision.

Conflict theory's decision tree structure specifies a set of necessary conditions for biased predecision processing: When decision makers are in danger of experiencing negative consequences due to risks associated with two or more alternatives (i.e., are in conflict), have no hope of finding a better solution, and cannot delay or defer the decision, they can be expected to conduct selective information searches or report spreading evaluations of the alternatives. These steps are illustrated in a study reported by Mann, Janis, and Chaplin (1969). Mann et al. offered participants a choice between two kinds of aversive stimulation (conflict) and took repeated predecision ratings of the alternatives. Participants who were told that they would receive information about side effects of each kind of stimulation before choosing (no loss of hope) did not report significant spreading of evaluations before the choice (bolstering), but participants who were told they would not receive more information before they would have to choose (loss of hope) reported spreading evaluations of the alternatives. Mann et al. also found that arousal (heart rate) increased during decision making, but arousal was not significantly moderated by loss of hope.

Janis and Mann (1977) also suggested that decision makers who experience anticipated regret or expect to have to make a commitment, process information in a more careful, less biased manner. They specified five conditions that they thought would affect the likelihood of decision makers experiencing anticipated regret. They predicted greater anticipated regret (and hence less bolstering) when there is more than one attractive alternative, when negative consequences can be expected to materialize more quickly, when the decision involves greater social importance (or commitment), when more information is expected (similar to no loss of hope), and when there is no social pressure to decide quickly.

Mann and Taylor (1970) attempted to demonstrate the effects of anticipated commitment on predecision bolstering. Mann and Taylor offered participants a difficult choice between closely matched attractive alternatives (high conflict) or an easy choice between disparate attractive alternatives (low conflict) and told them either that they could (no commitment) or that they could not (commitment) change their minds after the choice. As expected, only participants who had a difficult choice between closely matched alternatives reported spreading evaluations of alternatives before the choice. However, participants who thought that they could not change their minds actually spread evaluations of alternatives slightly (nonsignificantly) more than those who thought that they could change their minds.

Disappointed by the failure of their commitment manipulation to reduce predecision bolstering, Mann and Taylor (1970) conducted a follow-up study, offering participants a choice between closely matched alternatives and telling them that they would not be able to change their minds after choosing and that they would also have to write a 200-word essay justifying their choice. Mann and Taylor found that participants in this new high-commitment condition did not spread evaluations of the alternatives any more than participants in a no-choice control group, consistent with their prediction that commitment would reduce predecision bolstering.

Mann and Taylor's (1970) research does not provide a clear picture of the effects of commitment because it was the expectation of having to justify the choice that finally reduced the spreading of evaluations in the follow-up study, and the expectation of having to justify may not be the same thing as commitment. Nevertheless, the spreading of evaluations of alternatives in the difficult choice conditions of their main study provide further evidence that biased processing can occur before a choice.

Choice Certainty Theory

Mills's (1968) choice certainty theory proposes that decision makers want to be certain that they choose the best of their alternatives. Therefore, before making a decision, decision makers try to increase, and avoid decreasing, their certainty that their choice is better than their other alternatives. Of course, biased processing, which spreads evaluations of the alternatives apart, is a way to maximize feelings of certainty about a prospective choice.

Some of the earlier research inspired by choice certainty theory looked at the effects of certainty maximization on selective exposure to information (Mills, 1965; Mills & Jellison, 1968). Participants were presented a choice between two household items and asked to read an advertisement for an electric shoe shine kit before choosing. Participants spent more time reading the advertisement when it was irrelevant to the choice or when it could help them increase their certainty about the choice (i.e., the shoe shine kit was one of two closely matched alternatives) than when it could only decrease their certainty about the choice (the shoe shine kit was clearly the worse of their alternatives).

Other choice certainty research focused on reevaluation of alternatives. In one series of experiments (Mills & O'Neal, 1971; O'Neal, 1971; O'Neal & Mills, 1969), participants were given 16 photos of 16 target people and asked to rank the people in the photos on eight positive personality traits. But before they began the ranking task, they were shown that the 16 photos were marked as belonging to two sets of eight photos. One set of eight photos was a choice set because participants were told that after ranking all 16 photos they would be asked to choose four photos out of the eight in that set. In two experiments (Mills & O'Neal, 1971; O'Neal & Mills, 1969) participants were told that the people in the photos were students at another university and the choice task would involve identifying which ones had sought counseling, and in a third experiment (O'Neal, 1971) they were told that the people in the photos were also participants and the choice task would involve selecting partners for a subsequent space flight exercise. The other set of eight photos was a no-choice set because it was not going to be used for a choice task after the ranking task.

Mills and O'Neal (1971; O'Neal, 1971; O'Neal & Mills, 1969) measured intercorrelations of trait rankings within the choice set

and within the no-choice set by computing coefficients of concordance for each set of photos (Kendall's W ; Kendall, 1948). Higher intercorrelations of trait rankings indicated that some alternatives were rated high on many traits whereas other alternatives were rated low on many traits, a pattern that suggests that evaluations of alternatives have spread apart. In all of their experiments they found that the mean W was greater in the choice set than in the no-choice set, which suggests that evaluations of alternatives that are part of a choice task spread apart more than evaluations of alternatives that are not part of a choice task (Mills & O'Neal, 1971; O'Neal, 1971; O'Neal & Mills, 1969).

In addition, O'Neal (1971) found a greater difference between the W in the choice set and the W in the no-choice set when the task was more important (participants were told that their choice of partners for the space flight exercise would definitely be honored) than when it was less important (they were told that there was only a 10% chance that their choices would be honored). O'Neal also found a greater difference between the W in the choice set and the W in the no-choice set when participants were aroused but did not know why (they had been given a caffeine pill mislabeled as a vitamin) than when they knew why they were aroused or were not aroused.

In later research Mills and colleagues (Brounstein, Ostrove, & Mills, 1979; Mills & Ford, 1995) compared private and public reevaluation of alternatives. On the basis of choice certainty theory, they suggested that private evaluations spread apart as decision makers progressively bolster one of their alternatives to increase their certainty about the choice. On the basis of reactance theory, they suggested that public evaluations converge together as decision makers equalize their evaluations of the alternatives in order to avoid commitment to one alternative and maintain freedom to switch between alternatives (cf. Wicklund, 1970).

In these experiments, participants were allowed to choose which of two interviewers from the fictitious National Foundation for Opinion Research would interview them. In their first study, Brounstein et al. (1979) found that private evaluations diverged before a choice, but public evaluations tended to converge before a choice (compared with no-choice conditions). In their second study, Brounstein et al. found that private ratings diverged more when participants thought they were closer to the time for choice, but public evaluations tended to converge more when participants thought they were closer to choosing (3 min compared with 10 min). In addition, Mills and colleagues found that private divergence and public convergence were stronger when participants did not expect to receive more information (Brounstein et al., 1979) and when the choice was more important (because the interview would cover personal issues; Mills & Ford, 1995).

More recently, Mills (1999; Mills & Ford, 1995, their Footnotes 5 and 7) attempted to reconcile dissonance theory with the evidence of predecision reevaluation of alternatives in choice certainty experiments. Festinger (1957, pp. 30–31, 268–271) speculated that people may avoid deciding to avoid the dissonance that could arise after the decision. Building from that point, Mills (1999; Mills & Ford, 1995) suggested that avoidance of dissonance could also account for private divergence and public convergence in evaluations of alternatives before a decision. For private evaluations, decision makers increase their certainty before deciding to avoid dissonance after deciding by spreading apart their evaluations of the alternatives. For public evaluations, decision makers

who fear postdecision dissonance avoid committing themselves to one alternative by equalizing their reported evaluations of the alternatives. Thus, in this formulation Mills (1999; Mills & Ford, 1995) used anticipated postdecision dissonance to explain predecision biased processing.

Action Control Theory

Kuhl (1984) assumed that people are motivated to perform actions that have high expected value,¹ but he suggested that for an action to be performed, a motivation to act has to be transformed into an intention to act, and the intention has to be maintained despite competing motivations. Kuhl described action control processes, which may be used to bolster an intention. Action control processes include selectively attending to or encoding information that supports the intended action, directly increasing the expected value of the intended action, managing one's emotions or environment to create the optimal conditions for maintaining the intention, and ending processing before a competing motivation can be strengthened. Kuhl also described state and action orientations, which affect the use of action control processes. In a state orientation potential actors ruminate on their current state and are less likely to use action control processes, but in an action orientation they focus on ways to implement intended actions and are more likely to implement action control processes.

Kuhl's (1984) language makes an intention sound like a decision and the bolstering of an intention sound like a postdecision process, but Beckmann and Kuhl (1984) maintained that an intention is only an emerging preference and that the bolstering of an intention is a predecision process. They suggested that after identifying an alternative with high expected value, decision makers form an intention to choose it and then use action control processes to bolster their intention until they are ready to actively choose it.

Beckmann and Kuhl (1984) presented participants with chronic state or action orientations a list of apartments with information on the apartments' attributes and asked them to rate the attractiveness of each apartment. Then they gave participants information on the number of people on the waiting list for each apartment and asked them to make a tentative decision about which apartments they would be interested in (to create an intention). Finally, they asked participants to rate the apartments again and make a final decision about which apartments they wanted. As expected, they found that the difference between the ratings of the alternatives that were chosen and the ratings of the alternatives that were not chosen increased from the first rating time to the second rating time among participants with action orientations but not among participants with state orientations.

Beckmann and Kuhl's (1984) results are interesting because they show evaluations of alternatives spreading apart before a committing consequential decision and because the finding that

¹ The expected value of a multiattribute alternative is calculated by means of the weighted additive rule (Bettman, Luce, & Payne, 1998; Luce, Bettman, & Payne, 1997; Payne et al., 1993). First, each attribute's value is assessed. Second, each attribute is assigned a weight expressing its importance (often the weight reflects the probability that the attribute's value will be realized). Third, each attribute's expected value is determined by multiplying its value by its weight. Fourth, the alternative's expected value is determined by adding up the expected values of all its attributes.

only participants with an action orientation spread evaluations of alternatives apart suggests individual differences in the tendency to conduct biased predecision processing. The introduction of waiting list information between ratings could have been problematic if some alternatives were rated higher at the second rating time because they were more readily available, but that seems unlikely because Beckmann and Kuhl noted that waiting list information did not affect attractiveness ratings.

Action Phase Theory

Gollwitzer (1990; Gollwitzer & Bayer, 1999) suggested that people go through four action phases as they choose and implement an action and that each action phase involves a task to be completed. The action phase that is relevant to this review is the predecision phase, and the task associated with the predecision phase is choosing a course of action to pursue. In choosing an action, people consider the desirability and feasibility of each action alternative. The desirability of an alternative is its expected value (see Footnote 1) and the feasibility of an alternative concerns whether it can be implemented. Gollwitzer also suggested that people adopt mind-sets that help them accomplish the tasks associated with each action phase. To choose the alternative that is most desirable and feasible, he suggested that they adopt a deliberative mind-set characterized by nonselective exposure to information and nonbiased processing of information.

Gollwitzer and his colleagues (e.g., Beckmann & Gollwitzer, 1987; Gollwitzer, 1990) have conducted a number of studies testing whether biased processing occurs before a choice. They have used measures of selective attention and recall to see whether decision makers give fair consideration to each alternative during predecision deliberation. Gollwitzer (1990; Beckmann & Gollwitzer, 1987) made the interesting suggestion that spreading evaluations of alternatives may merely reflect a decision maker's nonbiased evolving reactions to the merits of the alternatives and thus reevaluation of alternatives may not be a reliable measure of biased processing. Therefore, Gollwitzer has not studied reevaluation of alternatives in his own work and is skeptical about other researchers' reports of biased processing if they are based on evidence of spreading evaluations of alternatives.

Beckmann and Gollwitzer (1987) tested recall of information learned about alternatives either before or after a choice. Participants were told that they would choose which of two women they would later meet and interact with for 30 min. Participants were provided photos of the two women and personality questionnaires that the women had supposedly completed earlier. Participants in the *pre-pre* condition inspected the photos and questionnaires, then were tested for recall of information in the questionnaires (free and cued recall), and finally made their choices. Participants in the *pre-post* condition inspected the photos and questionnaires, made their choices, and then were tested for recall. Participants in the *post-post* condition were initially given only the photos, made their choice on the basis of the photos alone, and then inspected the questionnaires and were tested for recall. Beckmann and Gollwitzer found a recall advantage for the chosen alternative over the rejected alternative when the information had been encoded after the choice (*post-post* condition) but not when it had been encoded before the choice (in the other two conditions). They also found that the chosen alternative was recalled better in the *post-post*

condition than in the other two conditions, but the rejected alternative was recalled worse in the *post-post* condition than in the other two conditions.

Beckmann and Gollwitzer's (1987) failure to find a recall advantage for the chosen alternative when the information was processed before the choice seems to suggest that selective attention did not occur before the choice. However, it is important to remember that biased processing can involve denigrating the rejected alternative as well as bolstering the chosen alternative (cf. Gerard, 1967). That is, if Beckmann and Gollwitzer's participants attended to the alternative they eventually rejected in order to make sure they did not want it as much as they attended to the alternative they eventually chose to make sure they did want it, they might have been expected to report equivalent recall for both alternatives. Indeed, Gollwitzer (1990) acknowledged that "a partial analysis may be conducted even when the attention paid to choice alternatives (as measured in terms of encoding time or recall performance) is about equal" (p. 74).

In other research, Gollwitzer and his colleagues (Gollwitzer & Heckhausen, 1987, as cited in Gollwitzer, 1990; Gollwitzer & Hammelbeck, 1998, as cited in Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995) examined retrospective reports of thought processes in the deliberative mind-set. Participants entered a deliberative mind-set by thinking of a personal problem that they had not resolved (e.g., switching one's major) and thinking about it until they reached a decision. Participants then completed a thought sampling questionnaire in which they wrote their most recent thought, their second most recent thought, their first thought during deliberation, and then the rest of their thoughts during deliberation. Gollwitzer and colleagues (Gollwitzer & Heckhausen, 1987, as cited in Gollwitzer, 1990; Gollwitzer & Hammelbeck, 1998, as cited in Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995) found that participants in a deliberative mind-set reported an equal number of positive and negative thoughts and that their positive and negative thoughts alternated, suggesting that the participants were comparing the pros and cons of their alternatives in a nonbiased manner.

Gollwitzer (Gollwitzer & Heckhausen, 1987, as cited in Gollwitzer, 1990; Taylor & Gollwitzer, 1995) cited Ericsson and Simon's (1980) article on the use of verbal reports as the basis for their retrospective thought sampling technique. Although the thought sampling methodology is reasonably justified by that early article, Ericsson and Simon (1993) were less optimistic about the usefulness of such retrospective reports in their later book. Ericsson and Simon (1993) generally advised against using nonspecific prompts to elicit retrospective accounts, as is done in thought sampling. Ericsson and Simon (1993) also maintained that short-term memory can only provide retrospective accounts from the last 10 s of processing, making it likely that Gollwitzer and colleagues (Gollwitzer & Heckhausen, 1987, as cited in Gollwitzer, 1990; Gollwitzer & Hammelbeck, 1998, as cited in Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995) were actually sampling thoughts from long-term memory. Concern about inaccurate retrieval or reconstruction from long-term memory seems warranted in the case of Gollwitzer and colleagues' research because participants may have been motivated to present themselves as rational decision makers giving fair consideration to each alternative before reaching a decision (Montgomery & Willen, 1999).

SDS Theory

Montgomery (1983, 1989, 1993, 1994; Montgomery & Willen, 1999) described the process of making a decision as a search for a dominance structure. A dominance structure is the perception that one alternative dominates the others because it is superior to all other alternatives on at least one attribute and is not inferior to any other alternative on any attribute.

SDS theory specifies four phases of decision making. In the pre-editing phase, decision makers identify the alternatives and attributes that they will consider in the decision making process, including only alternatives that have some chance of becoming dominant and screening out attributes that are not important. In the second phase, decision makers survey their alternatives, looking for one that may be dominant: a promising alternative. This promising alternative might have been noticed because it is more attractive than other alternatives on an important attribute, and it is considered a "hypothesis about the choice" (Montgomery, 1989, p. 28). In the dominance-testing phase, decision makers test their hypotheses about the promising alternative, examining it to make sure that it is superior to all other alternatives on at least one attribute and not inferior to any other alternative on any attribute. If they find that the promising alternative is truly dominant they choose it, but in most cases the promising alternative falls short of full dominance, so they proceed to the dominance-structuring phase.

In the dominance-structuring phase, decision makers try to restructure the situation to achieve a dominance structure. Dominance structuring can involve bolstering the positive aspects of the promising alternative and the negative aspects of the other alternatives and deemphasizing the negative aspects of the promising alternative and the positive aspects of the other alternatives. If decision makers successfully create a dominance structure they choose the newly dominant alternative; if they are unable to achieve dominance they return to an earlier phase and begin the process again with another alternative.

Montgomery has not elaborated on the factors that may cause dominance structuring to occur, but he has dealt extensively with the ways in which dominance structuring may occur. Originally, Montgomery (1983) emphasized the role of decision rules, specifying the dominance rule as a superordinate guide to the decision-making process and assigning supporting instrumental roles to other decision rules. Later, Montgomery (1989) suggested that the early stages of decision making involve anchoring on a promising alternative and then making adjustments. Montgomery (1989) also suggested that the decision situation may be represented by a semantic network with causal links (which might map onto a causal schema or script) and that the decision maker can achieve a dominance structure by selectively altering paths between units to redirect the way activation spreads through the network. More recently, Montgomery (1994; Montgomery & Willen, 1999) described the implications of perspective theory for decision making. An alternative that is perceived from an inside perspective is perceived to be incorporated into the self, and its positive attributes are perceived to be in the foreground. Conversely, an alternative that is perceived from an outside perspective is perceived to be independent of the self, and its negative attributes emerge into the foreground. Dominance structuring can then be seen as a process

of taking an inside perspective on a promising alternative and an outside perspective on other alternatives.

Montgomery and his colleagues have reported evidence that a promising alternative emerges early in the decision-making process, receiving more attention and more positive evaluations than the other alternatives, and is bolstered until it is chosen. In two studies, participants inspected information about homes until they were ready to choose one they would like for themselves. Montgomery and Svenson (1983) asked participants to think aloud while they inspected booklets containing detailed descriptions of five houses. Dahlstrand and Montgomery (1984) asked participants to inspect computerized information grids containing information about five flats rated on eight attributes. Each time participants activated a cell in the information grid they rated the attractiveness of the information in that cell, and after inspecting 10 cells they rated the chance that they would choose each alternative. In both of these studies, the eventually chosen alternative received the most attention and was evaluated more positively than the other alternatives throughout the decision-making process. Moreover, the chosen alternative's advantage in terms of selective attention and positive evaluation grew larger as the decision-making process continued.

To create a dominance structure, the promising alternative should not only be bolstered relative to the other alternatives in terms of global evaluations, it should emerge as superior to all other alternatives on at least one attribute and not inferior to any other alternative on any attribute. To test for dominance structuring, Montgomery and Svenson (1983) examined how positive and negative evaluations of the chosen alternative and the most-attended nonchosen alternative changed from the first half of the session to the second half of the session. They found that the chosen alternative's advantage over the nonchosen alternative became more complete over time such that the chosen alternative's negative evaluations became less negative (its positive evaluations did not change) and the nonchosen alternative's positive evaluations became less positive (its negative evaluations did not change).

Montgomery (1994) later revisited Montgomery and Svenson's (1983) data to see whether alternatives were viewed differently depending on whether they were eventually chosen or rejected. Montgomery (1994) found that for each alternative, participants who chose it directed more positive evaluations than negative evaluations toward its attributes, but participants who rejected it directed more negative than positive evaluations toward its attributes. Montgomery (1994) also found that the difference between the proportion of positive and negative evaluations increased later in the procedure for both choosers and rejecters. Once again, these findings suggest an increasing tendency for participants' prechoice evaluations of their alternatives to support their eventual choice.

The prominence effect occurs when the more important attribute has a greater effect on choice than on judgment tasks (Tversky, Sattah, & Slovic, 1988). Montgomery, Selart, Garling, and Lindberg (1994) suggested that one explanation for the prominence effect may be that dominance structuring operates during choice but not during judgment. To test their idea, Montgomery et al. presented participants with problems involving alternatives rated on a more important attribute and a less important attribute and asked them to either choose one alternative or make evaluative

ratings of each alternative. Consistent with their reasoning, they found that participants who thought aloud while they considered the alternatives awarded more attention and positive evaluation to the preferred alternative than to the nonpreferred alternative before choosing but not before making evaluative judgments. However, they found prominence effects in both choice and judgment conditions (the alternative that was stronger on the prominent attribute was most likely to be chosen and also received the highest ratings); thus, dominance structuring did not appear to be a cause of the prominence effect.

Tyszka and Colleagues' Research

Tyszka and colleagues have reported biased predecision processing in several studies, often using clever methodological innovations and usually describing their work in terms of SDS theory. Tyszka (1985) used incomplete information boards to demonstrate selective information search favoring a promising alternative. Participants considered choices involving information boards displaying six alternatives with six attributes, but the information was incomplete because some cells were hidden, and participants had to specify which bits of hidden information they wanted to see. Tyszka (1985) found that participants selectively searched for additional information on the most promising alternatives (those with exclusively positive information or nearly all positive information) and avoided the least promising alternatives (those with negative or hidden information on important attributes).

Concerned that prepared information boards lack external validity, Englander and Tyszka (1980) introduced the open decision paradigm, in which participants are free to ask "experts" any questions they want about the available alternatives. Using the open decision paradigm, Tyszka and colleagues showed that decision makers selectively attend to the alternative which they eventually choose. Englander and Tyszka's participants asked a greater number of questions about the chosen alternative than the nonchosen alternative, and their questions addressed more attributes of the chosen alternative than the nonchosen alternative. Tyszka (1986) asked participants to think aloud in an open decision experiment and found that their questions, descriptive statements, and evaluative statements all tended to focus on the alternative which they eventually chose.

Tyszka and Wielochowski (1991) took advantage of the structure of Polish boxing matches to show how evaluations of a promising alternative may be bolstered before a decision. They explained that boxing matches have three rounds, and each contestant is automatically awarded 20 points at the end of each round. However, at the end of each round the boxing judges deduct one point from each contestant's score for every three punches the contestant received. Tyszka and Wielochowski suggested that at the beginning of a boxing match, the judges speculate about which contestant is likely to win, and the contestant considered most likely to win gains the status of a promising alternative. Judges then proceed to bolster the promising alternative throughout the match so that "the gains of the tentative winner are exaggerated, and his losses are minimized" (Tyszka & Wielochowski, 1991, p. 285).

Tyszka and Wielochowski (1991) asked participants to judge a videotaped boxing match, stopping after each round to complete

evaluation cards like those used to judge actual boxing matches. In the videotaped match, the blue corner contestant won two rounds (W1 and W2) and the red corner contestant won a single round (L). Tyszka and Wielochowski manipulated the sequence of the rounds on the videotape so that one third of the participants saw the blue corner contestant lose the first round (L-W1-W2), another third of the participants saw him lose the second round (W2-L-W1), and the rest saw him lose the third round (W2-W1-L).

Tyszka and Wielochowski (1991) found evidence suggesting that participants identified a favorite contestant and proceeded to bolster their evaluations of his performance. First, participants' early impressions of the blue corner contestant colored their later perceptions of his performance so that they were more likely to perceive him as winning a particular round when they had not seen him lose an earlier round than when they had seen him lose an earlier round. Second, a more consistent early pattern affected later impressions to a greater degree than a less consistent early pattern such that the blue corner contestant won the match by a larger margin when the round he lost appeared later in the match. Third, a fairly large proportion of participants (up to 55%) bolstered their favorite contestant throughout the process, judging the winner as not having lost any rounds.

Tyszka (1998) suggested that the relative strengths of two conflicting motivational systems jointly determine the extent to which decision makers conduct biased predecision processing. On the one hand, decision makers want to have good reasons for their choices, and this desire for a well-justified choice creates a motivation to make a promising alternative appear distinct from the others, which leads decision makers to conduct biased processing. On the other hand, decision makers want to make accurate choices, where accuracy involves choosing the alternative that they most prefer. This accuracy motive causes decision makers to anticipate regretting an inaccurate choice, which could occur if biased processing leads them to misjudge their preferences. To avoid regretting an inaccurate choice, decision makers refrain from artificially bolstering one alternative or denigrating the others. Tyszka (1998) suggested that factors that determine the relative strengths of the two competing motivational systems moderate the extent to which decision makers conduct biased predecision processing.

Tyszka (1998) reported a series of experiments testing the effects of three moderating variables on the extent to which evaluations of alternatives spread apart before a decision. Each experiment involved two sessions conducted a week apart; in each session participants thought freely about their alternatives one at a time, pressing plus and minus buttons to express positive and negative evaluations as they came to mind, and at the end of the second session they chose one alternative. Tyszka (1998) examined the proportion of positive evaluations given to each alternative, operationalized as the number of plus button presses divided by the total number of plus and minus button presses.

The first experiment tested the effects of the similarity of the alternatives and found that evaluations of the alternatives spread apart from the first session to the second session when participants chose between closely matched alternatives but not when they chose between disparate alternatives. The second experiment tested the effects of the importance of the decision and found that evaluations of the alternatives tended to spread apart before a decision involving smaller stakes (choosing a magazine for a free

issue) but not before a decision involving larger stakes (choosing a magazine for a free subscription).

The third experiment tested the effects of expecting to justify the decision to others, but the results were ambiguous. When participants did not expect to justify their decision, the data pattern showed a clear tendency for evaluations of the chosen alternative to be greater than evaluations of the nonchosen alternatives and for evaluations of the chosen and nonchosen alternatives to spread apart. When participants did expect to justify their decision, evaluations of the chosen alternative did not change much over time, whereas evaluations of the nonchosen alternatives started out slightly higher than evaluations of the chosen alternative and then decreased significantly to become slightly lower than evaluations of the chosen alternative. Tyszka (1998) pointed out that statistically, there was greater evidence for spreading evaluations in the justification condition because evaluations of the nonchosen alternatives decreased significantly. However, it seems difficult to call the pattern of data in the justification condition a better example of spreading evaluations of alternatives, because the difference between the alternatives was never any greater than the difference between the alternatives in the first session of the no-justification condition.

Holyoak and Simon's Research on Legal Decision Making

Holyoak and Simon (1999; Simon et al., 2001) studied biased processing in legal decision making. Their ideas are based on principles of consistency maintenance from neural network modeling (e.g., Bechtel & Abrahamsen, 1996), but their work resembles dominance structuring because they showed that evaluations of all attributes may support a promising alternative.

Holyoak and Simon (1999; Simon et al., 2001) suggested that when legal decision makers consider their alternatives (often a verdict favoring a plaintiff or a defendant), a promising alternative emerges early in deliberation and is eventually chosen. In addition, Holyoak and Simon suggested that legal decision makers' evaluations of the attributes of their alternatives (often evidence or legal arguments) change during deliberation to be consistent with the emerging decision. For example, if jurors are leaning toward a verdict favoring the plaintiff, they would be more likely to agree with the plaintiff's arguments (perhaps, that the defendant intended to harm the plaintiff) than the defendant's arguments (that the defendant did not intend to harm the plaintiff). Finally, Holyoak and Simon's neural network approach suggests that a promising alternative emerges and that evaluations of attributes become consistent with the emerging decision any time people think about a case.

Simon et al. (2001) conducted a series of studies to determine whether attributes (attitudes on legal issues) become consistent with an emerging decision before a committing consequential decision is made (verdict) or even with mere thought. In the first phase of each study, participants completed a pretest designed to assess their attitudes toward six different issues. On the pretest, participants read paragraphs describing various issues and rated their agreement with opposing attitudes toward each issue (participants were told the issues were unrelated and should be considered independently). For example, one paragraph explained why Internet bulletin boards may be considered to be like a telephone,

and participants rated the extent to which they agreed or disagreed that Internet bulletin boards should have the legal status of a telephone. Another paragraph explained why Internet bulletin boards may be considered to be like a newspaper, and participants rated the extent to which they thought that Internet bulletin boards should have the legal status of a newspaper.

In the second phase of each study, participants read a detailed summary of a legal case. The summary explained that Smith was a stockholder in a software company named *Quest*. Smith posted a pessimistic message about Quest's prospects on an Internet bulletin board, Quest's stock subsequently crashed, and then Quest sued Smith for libel. The Quest case involved the same six issues raised in the pretest, combining them into a single story, with Quest and Smith arguing opposing positions on each issue. For example, Quest argued that Internet bulletin boards should have the legal status of a newspaper, which is subject to libel law, and Smith argued that Internet bulletin boards should have the legal status of a telephone, which is not subject to libel law.

After reading the Quest case, participants were told that they would eventually be asked to role-play a judge and render a verdict in the Quest case, but they were advised to refrain from reaching a verdict until they heard a forthcoming verdict in a similar case. In the meantime, participants completed an interim test designed to measure their attitudes toward the six issues now that the issues had been embedded in a single story but before participants had reached decisions. On the interim test, participants rated the extent to which they agreed with each of Quest's arguments and each of Smith's arguments. After completing the interim test, participants indicated their preliminary leaning toward a verdict favoring Quest or Smith.

In the third phase of each study, participants were told that they would not hear the verdict in the other case, then reported their own verdict in the Quest case, and finally completed a posttest. Rendering a verdict required participants to make a decision, and the posttest measured their attitudes toward the six issues after a decision. On the posttest, participants rated the extent to which they agreed with each of Quest's arguments and each of Smith's arguments.

In this paradigm, responses to all attitude items (on the pretest, interim test, and posttest) were scored in terms of the extent to which they support Quest's position (*Q scores*). In their first study, Simon et al. (2001) found that among participants who eventually decided in favor of Quest, *Q scores* on each item increased from the pretest to the interim test, but among participants who eventually decided in favor of Smith, *Q scores* on each item dropped from the pretest to the interim test. These results indicate that when participants expect to reach a decision later on, their attitudes become more consistent with the decision they eventually reach than they had been at baseline.

After providing evidence that attitudes on issues related to a decision change before the decision is made, Simon et al. (2001) went on to demonstrate the same reevaluation of attributes even when participants did not expect to make a decision. In the second phase of Simon et al.'s second study, participants read the Quest case, completed the interim test, and reported preliminary leanings, all without being told to role-play a judge or that they would eventually render a verdict. Instead, they were told that the experiment involved memory and that they should try to remember the Quest case. Once again, Simon et al. found that among participants

who eventually decided in favor of Quest, Q scores increased from the pretest to the interim test, but among participants who eventually decided in favor of Smith, Q scores dropped from the pretest to the interim test.

In their third study, Simon et al. (2001) introduced two more conditions in which participants would not expect to make decisions. In the second phase of Simon et al.'s third study, one group of participants read the Quest case expecting to communicate the arguments to someone else, a second group read the case expecting to receive additional arguments from someone else, and a third comparison group expected to role-play a judge and reach a verdict. The pattern of results was the same whether participants expected to communicate information, receive information, or make a decision. Collapsing across those conditions, Simon et al. found that among participants who eventually decided in favor of Quest, Q scores increased from the pretest to the interim test, but among participants who eventually decided in favor of Smith, Q scores dropped from the pretest to the interim test.

Differentiation and Consolidation Theory

Svenson (1992, 1996, 1999) suggested that decision makers spread evaluations of alternatives apart before as well as after making a decision: In the predecision phase they differentiate a promising alternative until it emerges as a sufficiently superior alternative, and in the postdecision phase they continue to consolidate the chosen alternative's advantages over the rejected alternatives.

Svenson has discussed some of the ways in which a promising alternative may be differentiated from the other alternatives before a decision. Svenson (1992, 1996, 1999) suggested that differentiation may involve changes in the perceived structure of the decision situation (structural differentiation) so that the perceived attractiveness or importance of attributes may change, or the representations of facts may change, even to the point of generating new attributes or alternatives. Such structural changes assist in the strategic application of decision rules to differentiate a promising alternative from the other alternatives (process differentiation). Some decision rules involve eliminating alternatives on the basis of whether they meet certain criteria (e.g., satisficing); thus, differentiation by means of those decision rules may involve adjusting decision criteria.

Svenson has also discussed some of the factors that may motivate predecision differentiation. Initially, Svenson (1992) suggested that differentiation is motivated by fear of postdecision regret over a weak decision which should have been differentiated to a greater extent. Svenson (1999) later suggested that decision makers are "driven" (p. 187) to spread the alternatives apart to match their psychological representation of the situation to an ideal form (gestalt) and to maximize the safety and stability of the choice.

Svenson and Hill (1997) reported a study of differentiation and consolidation in a real-life decision. Participants were students choosing a topic of in-depth study for their third year in a university program. Participants rated the attractiveness of their alternatives and four attributes of their alternatives, twice before making a decision and twice after deciding. Svenson and Hill found that the eventually chosen alternative remained the most preferred alternative throughout the decision-making process, but some par-

ticipants' evaluations of the attributes changed over time. For these participants, on the first questionnaire, ratings of the three less important attributes favored the chosen alternative, but ratings of the most important attribute were in the opposite direction. On successive administrations of the questionnaire, ratings of the most important attribute grew less negative and finally became favorable to the chosen alternative, whereas ratings of the other attributes grew less favorable to the chosen alternative.

Svenson and Hill's (1997) experiment does not provide strong evidence for predecision reevaluation of alternatives, because most of the changes in evaluations of attributes occurred only after the choice. Yet, it is worth noting that their examination of evaluations of individual attributes revealed bolstering that did not appear in the overall ratings of alternatives (i.e., the increasing tendency of the most important attribute to favor the chosen alternative). As Svenson (1996) pointed out, one reason some researchers have been unable to find evidence that evaluations spread apart before a choice (e.g., Jecker, 1964a) may be that they only measured global ratings of the alternatives, which are not sensitive to changes in evaluations of individual attributes.

Phillips (2002) used materials patterned after those of Simon et al. (2001) to test whether differentiation involves adjustment of a decision criterion as well as reevaluation of attributes. In the first phase (pretest), participants rated their attitudes on four issues relevant to auditing an unspecified company's finances, including whether the company was acting proactively or reactively, whether the company should proceed with its plans, whether the company was financially viable, and how serious doubts about a company's viability need to be for an auditor to report them (decision criterion). In the second phase, participants were told that they would be asked to role-play auditors, reviewing the finances of a specific company and deciding whether to report doubts about its viability. Participants read the case of a company experiencing financial difficulties, were cautioned not to make a decision about whether to report doubts about the company's viability until they heard the outcome of a similar case, and then rated their attitudes toward the same four issues in relation to the case they had just read (interim test). In the third phase, participants were told that they would not hear the outcome of the other case after all, made their own audit decisions about whether to report doubts about the company's viability, and then rated their attitudes toward the same four issues in relation to the case they had just decided (posttest).

Phillips (2002) found that attitudes on the first three issues changed from the pretest to the interim test in a direction consistent with the decision, suggesting that differentiation may involve reevaluation of attributes. For example, among participants who decided to report doubts about the company's viability, ratings of the company's viability decreased from the pretest to the interim test. However, ratings on the fourth issue, decision criterion, did not change from the pretest to the interim test, suggesting that differentiation may not always involve adjusting the decision criterion.

Ratings on the decision criterion, but not ratings on the first three issues, changed significantly from the interim test to the posttest. It would appear that, at least in Phillips's paradigm, differentiation is conducted in a different manner than consolidation such that differentiation primarily involves reevaluation of attributes, whereas consolidation primarily involves adjusting the decision criterion.

Constructive Processing in Behavioral Decision Research

Early theorists of decision making assumed that people made decisions in a highly rational manner; conducting a thorough search for information on all alternatives, using a weighted additive rule to compute the expected value of each alternative, and choosing the alternative with the highest expected value (see Footnote 1). However, subsequent research has revealed numerous violations of rationality, leading many theorists to conclude that preferences are constructed differently before different choices (Payne, 1982; Payne, Bettman, & Johnson, 1992; Slovic, 1995). As researchers attempted to account for the ways task and context variables affect the construction of preferences during decision making, they described some theoretical mechanisms and reported some empirical evidence consistent with biased predecision processing.

The constructive processing approach suggests that decision makers may actively alter the information in the problem space. Kahneman and Tversky (1979) suggested that decision makers may use editing operations to simplify the problem space before applying a modified version of the weighted additive rule to make their choice. They specified several editing operations, including setting the reference point for gains and losses, combining redundant information, segregating and canceling common attributes, rounding attribute values, and eliminating dominated alternatives. Payne, Bettman, and Johnson (1992, 1993; see also Payne, Bettman, Coupey, & Johnson, 1992) suggested that information editing may occur at any point in the decision-making process and that editing operations may be used in the service of dominance structuring. Russo and Doshier's (1983) verbal protocols revealed information editing during decision making, and Coupey (1994) showed that decision makers restructure their problem space by editing (eliminating attributes and rounding values) and transforming (rearranging, standardizing, and relabeling) information, but these researchers did not specifically address biased processing.

Another important part of the constructive processing approach concerns cost-benefit trade-offs in decision making. Payne and his colleagues (Bettman et al., 1998; Payne, Bettman, Coupey, & Johnson, 1992; Payne et al., 1993) have argued that decision makers flexibly adjust their mode of processing to minimize local costs and maximize benefits during decision making. (Beach's, 1998, image theory includes a similar model, but the empirical work does not relate to biased processing.) Although Payne and colleagues (Bettman et al., 1998; Payne, Bettman, Coupey, & Johnson, 1992; Payne et al., 1993) acknowledged the existence of many different costs and benefits, they have focused on effort (measured in terms of mental operations like reading and comparing bits of information) as the main cost of decision making and accuracy (defined in terms of choosing an alternative with high expected value) as the main benefit available in decision making. Thus, they theorized that people use whatever decision rules or elements of decision rules allow them to make the most accurate decision (obtain an alternative with high expected value) for the least effort (requiring the fewest mental operations).

The cost-benefit framework accounts for many findings in the decision-making literature, some of which appear to involve bolstering a favored alternative. For instance, assuming that it costs more cognitive effort to search for the same amount of information on all alternatives, some researchers have predicted that decision

makers would conduct selective information search across alternatives, especially when the task is made more difficult by having more alternatives or attributes to inspect. Along these lines, Payne (1976) examined search strategies of participants choosing either between 2 or among 6 or 12 apartments and found that participants choosing among a greater number of alternatives conducted more selective information searches than participants choosing among a smaller number of alternatives. Moreover, Payne (1976) found that most participants choosing among 6 or 12 alternatives focused their selective information searches specifically on the alternative they eventually chose. Similarly, Johnson, Meyer, and Ghose (1989) asked participants to choose between 2 or among 8 apartments with attributes that were negatively correlated, positively correlated, or not correlated and recorded their search strategies. Johnson et al. found that information search focused on the chosen alternative to a greater extent when there were more alternatives, when attributes were negatively correlated, and in later stages of decision making.

More recently, Bettman et al. (1998) portrayed effort minimization and accuracy maximization as separate goals and described two additional goals that may also affect processing during decision making. For one, they suggested that decision makers have a goal of minimizing negative affect associated with the choice. Luce et al. (1997) conducted a series of experiments exploring how decision makers' attempts to reduce negative affect associated with the choice may affect decision processing. Luce et al. found evidence suggesting that choices involving more difficult trade-offs induced more negative affect and that participants making decisions involving unpleasant difficult trade-offs were more likely to search by attributes in the early stages of information search. They suggested that decision makers facing choices with more difficult trade-offs may begin searching by attributes because attribute-based search allows them to compare their alternatives without directly confronting unpleasant difficult trade-offs. Luce et al. also found that participants (regardless of trade-off difficulty) finished their information searches by focusing on the alternative they were about to choose. They suggested that a pattern of early search by attribute, allowing decision makers to check and possibly bolster all aspects of an alternative without confronting unpleasant difficult trade-offs, followed by later focus on the chosen alternative, allowing them to verify the superiority of a promising alternative, was consistent with dominance structuring.

Bettman et al. (1998) also suggested that decision makers have a goal of making choices that are justified and supported by reasons. Shafir et al. (1993) discussed such reason-based choices, showing that various anomalies in the decision-making literature can be easily explained if it is assumed that decision makers choose the alternative that they can most easily provide reasons to justify choosing. One example of reason-based choice is the case of the asymmetrically dominating alternative. When decision makers consider a difficult choice between two alternatives, each of which is better on a different attribute, they may not show a strong preference for either alternative. If a third alternative is added to the choice set, and the new alternative is clearly inferior to (dominated by) one of the original alternatives, decision makers show a strong preference for the newly dominating alternative, being more likely to choose it than they were before the dominated alternative was introduced. This finding is puzzling from the perspective of rational decision theory, which requires that preference for one

alternative not be affected by the presence of other alternatives; however, a constructive processing approach involving choice based on reasons explains that decision makers are more likely to choose an alternative when it is in a dominating position because they have more reasons justifying choosing it.

A reason-based analysis may predict when decision makers are more likely to conduct biased predecision processing. Simonson (1989) conducted an experiment demonstrating the asymmetric dominance effect. As expected, participants were more likely to choose a dominating alternative than a nondominating alternative. Simonson also asked a group of participants to think aloud while they made their choices and found that those participants who chose a nondominating alternative were less likely to consider both the advantages and the disadvantages of their chosen alternative than participants who chose a dominating alternative. This finding suggests that decision makers may be more likely to conduct biased processing when their favored alternative is not well justified than when it is well justified.

A reason-based analysis may also provide insights on the way biased predecision processing is conducted. If decision makers are motivated to choose alternatives that are justified by reasons, then biased predecision processing may involve justification of a promising alternative by generation of reasons. Thus, decision makers may think of more reasons that favor their promising alternative and fewer reasons that favor other alternatives as a means of bolstering the promising alternative (a tactic that might be called *rationalizing*).

Motivated Reasoning

Kunda (1990) argued that motivation may affect reasoning in a variety of contexts. She suggested that people who are motivated to reach a particular conclusion may ask themselves directional questions that help them access cognitive elements that support the conclusion they want to reach. Kunda interpreted a broad sample of research as suggesting that people who are motivated to believe something (e.g., that a prospective date is witty) use selective memory search and creative reasoning to convince themselves that it is so (e.g., "Wasn't his joke funny?").

Boiney, Kennedy, and Nye (1997) examined the implications of motivated reasoning for biased predecision processing. They asked participants to play the role of a marketing manager in a company that was considering whether to manufacture new products. Participants were to estimate the potential first year sales of each proposed product and decide whether to recommend manufacturing each product. They also asked participants to base their sales estimates on the estimates of four "experts," one of whom gave a much higher estimate than did the other three. Boiner et al. calculated the extent to which the discrepant expert's estimate influenced participants' sales estimates and found that participants who were motivated to adopt a new product (i.e., who had been told that the company had lost several good opportunities to launch new products) bolstered alternatives (by giving higher sales estimates that were more influenced by discrepant information) to a greater extent than participants who had not received motivating instructions.

Boiney et al. (1997) also found that motivated decision makers bolstered alternatives to a greater extent if they needed to do so to meet their goal of adopting a new product but bolstered alterna-

tives to a lesser extent if they would have had to use unreasonable information. In one experiment, they found that motivated participants' sales estimates were more influenced by discrepant information when products had to have higher first year sales to be adopted than when they could be adopted with lower first year sales. In another experiment, they found that participants' sales estimates were less influenced by an unreasonably discrepant expert estimate (four standard deviations higher than the others) than a reasonably discrepant expert estimate (two standard deviations higher than the others).

Wishful Thinking

Another line of research has shown that people overestimate the probability that positive outcomes will occur (Hogarth, 1987; Yates, 1990). For example, Olsen (1997) found positive correlations between professional investment managers' ratings of the desirability and probability of various economic events. Assuming that people are motivated to obtain positive outcomes, such *wishful thinking* (see Hogarth, 1987) suggests that people may bolster prospects promising positive outcomes by making them seem more likely to deliver on their promise.

Cohen and Wallsten (1992) provided experimental evidence that people may overestimate the probability of events associated with reward. The task involved judging which of two spinners was more likely to land on white (instead of red). For each spinner, participants were given a rough estimate of the probability that it would land on white (with a pie chart depiction or a descriptive phrase). Each spinner also had a point value so that if participants judged it to be more likely to land on white, they would win or lose 500 or 0 points if it actually did land on white. Although participants did estimate that spinners associated with a higher probability of landing on white were more likely to land on white, they also estimated that spinners promising a 500-point payoff if they landed on white were more likely to land on white than spinners threatening a 500-point loss if they landed on white.

Slovic (1966) showed that people may underestimate the probability of costly events as well as overestimate the probability of rewarding events. Participants watched the experimenter draw red and blue chips from a bag of 100 chips, stopping periodically to estimate the probability that there were 30, 40, 50, 60, or 70 red chips in the bag. Compared with a control group whose outcomes were not dependent on the number of red chips in the bag, participants who expected to lose money if there were fewer than 50 red chips and win money if there were more than 50 red chips underestimated the probability that there were 30 or 40 red chips and overestimated the probability that there were 60 or 70 red chips in the bag.

Russo and Colleagues' Marketing Research

Russo et al. (1996) conducted an experiment designed to test whether a prior preference for one alternative would produce distortion of information (spreading evaluations of attributes of alternatives) before a choice. In one condition, they created a prior preference for one of the alternatives before the decision-making process began. This was done by giving one alternative an endowment at the beginning of the session by asking participants to imagine scenarios designed to make it more attractive than the

other alternative. In a second condition no alternatives were endowed (no-endowment choice condition), and in a third condition participants completed the same procedure but did not expect to make a choice (no-choice control condition). Participants received information about pairs of alternatives one attribute at a time. After the presentation of each attribute, participants rated the extent to which the attribute favored one alternative or the other, on a seven-point scale anchored by *strongly favors Alternative A* and *strongly favors Alternative B*. Participants stopped the procedure and made their choices whenever they were ready.

Distortion of information in the choice conditions was measured by subtracting ratings of the extent to which attribute information favored an alternative in the choice conditions from the same ratings in the no-choice condition. In the endowed choice condition, there was significant distortion of information on the first attribute in favor of the endowed alternative. Russo et al. (1996) did not find significant distortion on the second attribute, though they had not expected any because participants who took the endowment most seriously were likely to have stopped the procedure early. In the no-endowment choice condition, there was not any significant distortion of information on the first attribute, but there was significant distortion on the second attribute in favor of the alternative that had been rated higher on the first attribute. On subsequent attributes, information continued to be distorted in favor of the leading alternative (i.e., the one that had received higher ratings on all previous attributes).

Russo et al. (1996) had predicted that information would be distorted before a choice when one of the alternatives had been endowed, and they were surprised to also find distortion before a choice when there had been no endowment. Russo et al. (1998, Study 1) then considered the possibility that information might be distorted even when participants do not expect to make a choice. They reasoned that even when participants are not expecting to make a choice, a favorite alternative might emerge during the decision-making process. A desire for consistency between this emerging favorite and the mental representations of the attributes of the alternatives might then cause distortion of the mental representations of the attributes in favor of the leading alternative.

To test their ideas, Russo et al. (1998, Study 1) conducted another experiment, including the same endowment choice, no-endowment choice, and no-choice conditions and adding a new control condition. The new control condition was designed to prevent the emergence of a favorite alternative; the alternatives were relabeled for each comparison so that participants thought they were rating a new pair of alternatives for each attribute. To trace the development of a favorite alternative in the choice conditions, Russo et al. (1998, Study 1) introduced two new dependent variables. Each time participants rated the extent to which an attribute favored one alternative or another, they were also asked to identify which alternative was leading and to rate their confidence in the leading alternative. To help prevent the identification of a leading alternative from being viewed as a decision, the question was posed with a horse race analogy. For example, when participants were choosing between backpacks they were told, "We'd like you to think about this decision process as a horse race, and the two backpacks as horses in the race . . . Which of the backpacks would you consider to be in the lead at the current time?" (Russo et al., 1998, p. 442).

Distortion of information in the endowment choice, no-endowment choice, and no-choice conditions was measured by subtracting ratings of the extent to which attribute information favored an alternative in one of those conditions from the same ratings in the new control condition. In the endowment choice condition, Russo et al. (1998, Study 1) found a significant amount of distortion on the first attribute in favor of the endowed alternative, replicating their earlier (Russo et al., 1996) finding that information is distorted to support a prior preference for one of the alternatives. Once again, Russo et al. (1998, Study 1) did not expect distortion of information in the endowment condition on subsequent attributes, and none appeared. In the no-endowment choice condition there was not any significant distortion on the first attribute, but when ratings of the second attribute were pooled with ratings of subsequent attributes, Russo et al. (1998, Study 1) found significant distortion in favor of the alternative last leading the horse race. This result replicates their earlier (Russo et al., 1996) finding that information is distorted to support an emerging preference even when there is no prior preference. Finally, in the no-choice condition Russo et al. (1998, Study 1) found significant distortion of information in favor of the leading alternative (the one with higher ratings on previous attributes), demonstrating that distortion of information occurs even when participants do not expect to make a decision.

Russo et al. (1998, Study 2; 2000) extended their paradigm to examine how some variables might moderate the extent to which participants distorted information before a choice (in these studies all participants expected to make choices, and no alternatives were endowed). In their earlier work, Russo et al. (1996, 1998, Study 1) had used pilot sessions to make sure that attribute information did not favor any alternative, but in a second experiment Russo et al. (1998, Study 2) created attributes that were unbalanced (seeming more favorable to one alternative or the other) to varying degrees and found that participants distorted information to a greater extent when the information was more balanced than when it was less balanced.

Russo et al. (2000) tested whether decision makers distort information to a smaller degree when they make choices that are relevant to their profession or when they expect to justify their choice to someone. On a nonprofessional decision (between dry cleaners) professionals distorted information as much as students, and on profession-specific decisions (between clients to visit and restaurants for a business dinner) professionals continued to distort information, though one group of professionals (salespersons) distorted more than the other group of professionals (auditors). Expecting to justify a professional choice marginally reduced the degree to which one group of professionals distorted information (salespersons), but it had no effect on another group of professionals (auditors, possibly a floor effect). At the end of the session Russo et al. (2000) asked participants to complete a set of exploratory measures, and they found that salespersons who reported more positive dispositional mood distorted information before professional decisions to a greater degree than salespersons who reported less positive dispositional mood.

Groupthink

Janis (1983; Janis & Mann, 1977) described groupthink as a syndrome in which members of a decision making group maxi-

mize concurrence within the group at the expense of making optimal decisions. Janis (1983; Janis & Mann, 1977) named several antecedent conditions that might increase concurrence seeking in a group, including higher group cohesiveness, insulation from outside influences, a directive leader, lack of methodological decision-making procedures, homogeneity of group members' backgrounds and ideologies, lower state self-esteem, and decision conflict. Janis (1983; Janis & Mann, 1977) suggested that the more group members seek concurrence within their group, the more they display several symptoms of groupthink, which in turn lead them to conduct more extensive biased decision processing.

Schulz-Hardt, Frey, Luthgens, and Moscovici (2000) tested the basic question of whether members of decision-making groups conduct more extensive biased processing than individual decision makers. In addition, given Janis's (1983) suggestion that homogeneity of group members' ideas would increase biased processing, Schulz-Hardt et al. tested whether members of more homogeneous groups conduct more extensive biased processing than members of less homogeneous groups. Schulz-Hardt et al. first asked participants to consider a decision problem and make individual decisions. They used those individual decisions (a) to assemble homogeneous (unanimous) groups, (b) to assemble heterogeneous groups with a majority favoring one alternative and a minority favoring another alternative, or (c) to assign individuals to work alone. Then they had participants make preliminary group or individual decisions and told them that they would later make a final group or individual decision. Finally, they offered groups and individuals information supporting each alternative to help them arrive at their final decision and recorded the type of information that groups and individuals requested. Schulz-Hardt et al. found that participants in all conditions preferred information supporting their preliminary decision, but that the preference for supporting information was significantly stronger in homogeneous groups than in heterogeneous groups or among individuals, and it tended to be stronger in heterogeneous groups than among individuals.

The stronger preference for information favoring an earlier favorite in groups than among individuals suggests that group processes can increase biased predecision processing. Although the initial individual decisions used to assign participants to conditions may have rendered the later individual information search postdecisional, the selective information search conducted by groups is more likely to have been a predecision process because groups only made a preliminary decision before conducting their information search. If the group information search can be considered predecisional, Schulz-Hardt et al. (2000) demonstrated that group predecision information search can be more selective than individual predecision (or possibly individual postdecision) information search. The stronger preference for information favoring an earlier favorite in homogeneous groups than in heterogeneous groups is consistent with Janis's (1983) prediction. However, the reason Janis (1983) expected homogeneous groups to conduct more extensive biased processing was that he thought they would focus discussion on their shared point of view, and unfortunately Schulz-Hardt et al. did not examine how participants discussed the decision problem.

Discussion

The question at issue is whether people conduct biased predecision processing, restructuring their mental representation of the

decision environment to favor one alternative before making their choice. In the discussion below, I draw on the literature reviewed to answer the basic question of whether biased predecision processing occurs, identify the variables that moderated the extent to which biased predecision processing occurred, and assess the theories that address biased predecision processing.

Does Biased Predecision Processing Occur?

Festinger (1964) considered the possibility that biased processing may occur before a decision, and on the basis of the empirical evidence available to him at the time, he concluded that biased processing does not occur before a decision carrying commitment and consequences. However, a considerable amount of subsequent research did find evidence of biased processing before a committing consequential decision, including selective information search (Dahlstrand & Montgomery, 1984; Englander & Tyszka, 1980; Gerard, 1967; Johnson et al., 1989; Luce et al., 1997; Mills, 1965; Mills & Jellison, 1968; Montgomery et al., 1994; Montgomery & Svenson, 1983; Payne, 1976; Schulz-Hardt et al., 2000; Simonson, 1989; Tyszka, 1985, 1986) and reevaluation of alternatives (Beckmann & Kuhl, 1984; Boiney et al., 1997; Brounstein et al., 1979; Cohen & Wallsten, 1992; Dahlstrand & Montgomery, 1984; Davidson & Kiesler, 1964; Holyoak & Simon, 1999; Mann et al., 1969; Mann & Taylor, 1970; Mills & Ford, 1995; Mills & O'Neal, 1971; Montgomery et al., 1994; Montgomery & Svenson, 1983; O'Neal, 1971; O'Neal & Mills, 1969; Russo et al., 1996, 1998, 2000; Simon et al., 2001; Tyszka, 1998; Tyszka & Wielochowski, 1991).

One problem with studies that only demonstrate biased processing before a committing consequential decision is the existence of the possibility that participants might have reached personally meaningful decisions earlier in the procedure. That is, if participants could have privately made a decision before officially reporting their choice to the experimenter, any evidence of biased processing before the overt choice could actually have resulted from postdecision processes. Yet, two sets of studies boast designs that allow one to be more confident that participants did not make private decisions before reporting committing consequential decisions. First, it is less likely that participants made private decisions before reporting committing consequential decisions if they were not initially told that they would be asked to make a decision, as in Russo et al.'s (1998) no-choice condition and in Simon et al.'s (2001) second and third experiments. Second, it is less likely that participants made private decisions before reporting committing consequential decisions if they were able to end the decision-making process whenever they were ready to make a decision, as was the case in several studies (Boiney et al., 1997; Cohen & Wallsten, 1992; Dahlstrand & Montgomery, 1984; Englander & Tyszka, 1980; Luce et al., 1997; Montgomery et al., 1994; Montgomery & Svenson, 1983; Payne, 1976; Russo et al., 1996, 1998; Simonson, 1989; Tyszka, 1986).

Gollwitzer (1990; Beckmann & Gollwitzer, 1987) pointed out that evidence of predecision spreading evaluations does not necessarily indicate that biased processing has occurred, because nonbiased evolving appraisals could also cause evaluations of alternatives to spread apart before a decision. Although in some studies reevaluation of alternatives could reasonably be attributed to nonbiased evolving appraisals, in other studies the extent to

which evaluations of alternatives spread apart before a decision was affected by experimental manipulations, suggesting that re-evaluation of alternatives before a decision can be caused by factors other than the mere evolution of appraisals (Boiney et al., 1997; Brounstein et al., 1979; Cohen & Wallsten, 1992; Davidson & Kiesler, 1964; Mann et al., 1969; Mann & Taylor, 1970; Mills & Ford, 1995; O'Neal, 1971; Russo et al., 1996, 1998, 2000; Tyszka, 1998; Tyszka & Wielochowski, 1991).

Some of the studies covered in this review failed to find evidence of biased processing before a decision. A couple of earlier experiments did not find that evaluations of alternatives spread apart before a decision (Jecker, 1964a; Gerard et al., 1964). However, those studies can be criticized for their use of pretest–posttest designs, which do not provide direct evidence on predecision processes (Janis & Mann, 1968, 1977), and for assessing global evaluations, which may mask bolstering of attributes (Svenson, 1996; Svenson & Hill, 1997). Jecker (1964b) did not find a preference for supporting information over nonsupporting information during an initial scanning period, though a preference for information supporting a leading alternative would be expected to develop only during the latter part of the predecision period. Beckmann and Gollwitzer (1987) did not find a recall advantage for the chosen alternative when information had been encoded before the choice. However, similar recall for both alternatives only suggests equal attention to both alternatives in the prechoice period, which may reflect efforts to spread evaluations of the alternatives by denigrating the disfavored alternative as well as bolstering the favored alternative. Gollwitzer and colleagues (Gollwitzer & Heckhausen, 1987, as cited in Gollwitzer, 1990; Gollwitzer & Hammelbeck, 1998, as cited in Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995) found that participants reported giving fair consideration to each of their alternatives in an earlier deliberation period. However, the retrospective verbal reports obtained in those studies were more likely to have been retrieved

from long-term memory than from short-term memory and therefore were vulnerable to faulty retrieval and reconstructive processes.

In summary, although some studies did not find evidence of biased predecision processing, many others did, suggesting that biased processing can occur before a decision, at least under some conditions. Many studies found biased processing before a committing consequential decision, and some found it under conditions in which participants were unlikely to have reached earlier private decisions, such as when they did not expect to make a choice or could end the decision making process whenever they wanted.

After citing evidence that biased processing can occur before a decision, it may be possible to replace the controversy over whether biased predecision processing occurs with a more constructive analysis of its moderators and mechanisms. As Miller (1968) commented years ago,

The whole issue . . . is probably another of those silly instances where theoretical preferences force polar predictions in so-called crucial experiments. . . . The more important empirical task lies in specifying the conditions which heighten or exaggerate the amount of tension, dissonance, or regret experienced both before and after the decision. (p. 592)

In the next section I detail the variables that affected the extent to which biased predecision processing occurred, and in the following section I assess the theories that attempt to explain how biased predecision processing may be conducted and what may motivate its occurrence.

Moderators

The variables that moderated the extent to which biased predecision processing occurred are outlined in Table 1 and further

Table 1
Effects of Moderating Variables on Extent of Biased Predecision Processing

Variable	Extent of biased predecision processing	
	Greater	Lesser
Decision making	Making a decision	Not making a decision
Unattractive consequences ^a	Higher consequences	Lower consequences
Attractive consequences ^a	Lower consequences	Higher consequences
Justifying the decision	Not expecting to justify	Expecting to justify
Similarity of alternatives	Similar in attractiveness	Dissimilar in attractiveness
Attribute trade-offs	Trade-offs	No trade-offs
Number of alternatives	More than two alternatives	Two alternatives
Stages of decision making	Later stages	Earlier stages
Time to decision	Less time to decision	More time to decision
Expecting information	Not expecting information	Expecting information
Privacy	Private evaluations	Public evaluations
Deliberation time	Longer time	Shorter time
Arousal	Unattributed arousal	Unaroused, explained arousal
Action vs. state orientation	Action orientation	State orientation
Reasonableness	Reasonable information	Unreasonable information
Instrumentality	Need more bolstering	Need less bolstering
Positive mood	More positive mood	Less positive mood
Group context	Homogeneous group	Heterogeneous, individual

^a These effects seem likely but require further study.

detailed in this section. At the end of the section, some general trends are summarized.

Decision making. Several researchers compared processing in one condition in which participants expected to make a decision with processing in another condition in which participants performed a similar task without expecting to make a decision (Brounstein et al., 1979; Mills & O'Neal, 1971; Montgomery et al., 1994; O'Neal, 1971; O'Neal & Mills, 1969; Russo et al., 1996). Although in many cases there was biased processing even when participants did not expect to make a decision, the findings of greater biased processing when participants did expect to make a decision suggest that the expectation of making a decision itself can increase biased processing.

Consequences of decision. Some researchers have examined how biased predecision processing would be affected by the consequences of the decision. Two experiments (Mills & Ford, 1995; O'Neal, 1971) found that evaluations of alternatives spread apart to a significantly greater extent when the decision involved greater consequences than when it involved lesser consequences, but a third experiment (Tyszka, 1998) found that evaluations of alternatives tended to spread apart when the decision involved lesser consequences but not when it involved greater consequences.

It is not initially clear why Tyszka's (1998) results are so different from those obtained by Mills and Ford (1995) and O'Neal (1971), but one factor that may help explain the difference is the valence of the consequences. Notice that reevaluation of alternatives increased with unattractive or uninvolved consequences. For instance, Mills and Ford asked participants to choose an interviewer and found that private evaluations spread apart to a greater extent when participants were choosing a prying interviewer who would ask about "personal or serious issues such as even your own sexual practices" (p. 258) than when they were choosing an interviewer who would conduct a short and superficial interview. Similarly, O'Neal asked male participants to choose the male students they wanted to work with in a required laboratory exercise and found greater reevaluation of alternatives when participants had been told that their choice would definitely be honored than when they had been told that there was only a 10% chance that their choice would be honored. In contrast, reevaluation decreased with attractive or interesting consequences. Specifically, Tyszka (1998) asked female participants to choose a women's magazine and found that their evaluations of the alternatives tended to spread apart when they expected to receive a free issue of their chosen magazine but not when they expected to receive a free 6-month subscription to their chosen magazine.

Justifying the decision. Decision makers who are told that they will have to justify their decision to someone else appear to be less likely to spread evaluations apart than decision makers who are not given justification instructions, though the effects of justification instructions may not be very strong. Mann and Taylor (1970) found that adding justification instructions to commitment instructions significantly reduced bolstering, and Russo et al. (2000) found that introducing justification instructions marginally reduced distortion among salespersons. Russo et al.'s (2000) justification instructions did not reduce distortion among auditors, but those authors noted that auditors generally displayed so little distortion that the failure of the justification instructions may have been a floor effect.

Tyszka's (1998) findings on this issue are ambiguous. In the justification condition, evaluations of the nonchosen alternative started out slightly higher than evaluations of the chosen alternative and then decreased to a statistically significant degree so that they were slightly lower than evaluations of the chosen alternative. Yet, the difference between evaluations of the alternatives in the justification condition was never any greater than the difference between evaluations of the alternatives in the first session of the no-justification condition, which showed a clear tendency to spread apart in the second session.

Similarity of alternatives. Participants were more likely to spread apart evaluations of alternatives that they had previously rated as similar in overall attractiveness than alternatives that they had previously rated as dissimilar in overall attractiveness (Mann & Taylor, 1970; Tyszka, 1998). They were also more likely to distort information that was balanced than information that was more favorable to one alternative than the other (Russo et al., 1998).

Attribute trade-offs. Decision makers have to make trade-offs when one alternative is stronger on one attribute but another alternative is stronger on a different attribute (so that attributes are negatively correlated), and the trade-offs may be more difficult when the decision involves more highly valued attributes. Johnson et al. (1989) found that participants making decisions involving negatively correlated attributes focused information search on the chosen alternative to a greater extent than participants making decisions involving uncorrelated attributes. Luce et al. (1997) also found that participants making decisions involving negatively correlated attributes focused information search on the chosen alternative near the end of the decision-making process. In the beginning of decision making, they found that participants making decisions involving more difficult trade-offs were more likely to search by attributes than participants making decisions involving less difficult trade-offs.

Number of alternatives. Participants were more likely to focus information search on the chosen alternative when there were more than two alternatives than when there were only two alternatives (Johnson et al., 1989; Payne, 1976).

Stages of decision making. Participants were more likely to focus information search on the chosen alternative when they were in the later stages of decision making than when they were in the earlier stages of decision making (Johnson et al., 1989; Luce et al., 1997).

Time to decision. Brounstein et al. (1979) found that participants who did not expect to obtain more information about their alternatives spread private evaluations of alternatives apart to a greater extent if they thought they would make their choice in 3 min than if they thought they would make their choice in 10 min.

Expecting information. Participants who did not expect to receive more information before choosing spread evaluations of alternatives apart to a greater extent than participants who did expect more information (Brounstein et al., 1979; Mann et al., 1969).

Privacy. Research has shown that the public or private nature of evaluations can affect predecision reevaluation of alternatives, with private evaluations diverging and public evaluations converging as the time for decision approaches, though the convergence effect has been difficult to obtain at statistically significant levels (Brounstein et al., 1979; Mills & Ford, 1995).

Deliberation time. Davidson and Kiesler (1964) found that rankings of attributes favoring the chosen alternative increased from baseline to prechoice measurement when participants were given a longer amount of time to think about the information but not when they were given a shorter deliberation time.

Arousal. O'Neal (1971) found a significantly greater difference between intercorrelation of trait rankings in a choice set and a no-choice set when participants were aroused but did not know why (they had been given a caffeine pill mislabeled as a vitamin) than when participants knew why they were aroused or were not aroused.

Action versus state orientation. Beckmann and Kuhl (1984) found that participants with an action orientation spread evaluations of the alternatives apart over time but participants with a state orientation did not.

Reasonableness. Boiney et al. (1997) found that participants estimating the first year sales of proposed products relied less on unreasonably high expert estimates than on more reasonable expert estimates. This finding suggests that decision makers may be less likely to conduct biased processing when they would have to distort information to an unreasonably high degree.

Instrumentality. Boiney et al. (1997) found that motivated participants gave more weight to discrepant information in their first year sales estimates when a new product would need greater first year sales to be adopted than when it could be adopted with lower first year sales. This finding suggests that decision makers may conduct more extensive biased processing when an alternative needs more bolstering for it to be chosen.

Positive mood. Russo et al. (2000) found that salespersons who reported more positive dispositional mood distorted information on professional decisions to a greater degree than salespersons who reported less positive dispositional mood.

Group context. Schulz-Hardt et al. (2000) found that both groups and individuals selectively searched for information supporting an earlier preliminary decision, but homogeneous groups showed a stronger confirmation bias than heterogeneous groups or individuals.

Summary of general trends. One general trend in the literature suggests that biased processing increases as the importance of the task increases. Though people may conduct biased processing even when they merely think about a set of alternatives, they conduct more extensive biased processing when they expect to choose one of the alternatives, and biased processing increases again when the alternatives involve more negative consequences. However, there may be exceptions to the general trend of greater biased processing with greater task importance. First, although biased processing may increase when there are greater negative consequences associated with the alternatives, it may decrease when there are greater positive consequences associated with the alternatives. Second, decisions that will have to be justified to others may be considered more important (Tyszka, 1998) and seem to decrease biased processing.

A second trend in the literature suggests that biased processing increases as the difficulty of the decision increases. Decisions involving alternatives that are more similar, trade-offs between alternatives, and a greater number of alternatives are all associated with more extensive biased processing and may all be considered more difficult (albeit for different reasons, as I discuss below).

A third trend suggests that biased processing increases as temporal proximity to the decision increases. Process tracing studies found that information search was more likely to be focused on the chosen alternative in the later stages of decision making, which is consistent with studies that found more biased processing when participants thought they were closer to the time for decision or did not expect to obtain more information.

A fourth issue concerns the social nature of the decision-making task. Individual evaluations of alternatives seem more likely to spread apart when they are private than when they are public, such as when they are given to the experimenter in a public manner or when participants expect to justify their decision to others. Yet, when decision making occurs in a group setting, group members are more likely to selectively search for information favorable to a preliminary favorite than individuals making private decisions.

Assessing the Theories

Having detailed the variables that moderated the extent to which biased predecision processing occurred in the studies reviewed, I now return to the theories, using the empirical evidence to assess them. The different theories have different areas of emphasis—some focus on the motivational factors that may cause biased processing to occur, the conditions under which biased processing is most likely to occur, or the different ways in which biased processing may occur, and still others do not explicitly address biased processing at all. Thus, in many cases the theories cannot be directly compared. Therefore, in most cases I draw on the evidence reviewed to see which aspects of each theory received the strongest support.

Dissonance. It is well known that aside from addressing the empirical question of whether biased processing occurs before a decision, Festinger (1957) maintained a theoretical position that cognitive dissonance could not occur before a decision. Festinger's (1957) reason, which does not seem to be as well known, was that he defined dissonance as inconsistency between cognitive elements, and in his analysis of the decision situation there was no pair of cognitive elements present before the decision that could have been inconsistent with each other.

A short time later, Jecker (1968) presented a new analysis of the decision situation in which he recognized that if a promising alternative would emerge before a decision, it could be dissonant with other elements present before the decision, such as its own negative attributes or the positive attributes of other alternatives. As it turns out, research has shown that attention and information search focus on the chosen alternative and that evaluations change to be consistent with the chosen alternative within the predecision period (Dahlstrand & Montgomery, 1984; Englander & Tyszka, 1980; Johnson et al., 1989; Luce et al., 1997; Montgomery et al., 1994; Montgomery & Svenson, 1983; Payne, 1976; Phillips, 2002; Russo et al., 1996, 1998; Schulz-Hardt et al., 2000; Simon et al., 2001; Tyszka, 1985, 1986), suggesting that in many cases a promising alternative does emerge within the predecision period and that predecision dissonance is possible.

Although Jecker (1968) recognized how dissonance could occur before a decision, he maintained that reduction of predecision dissonance would not cause measurable attitude change. Subsequent authors argued that reduction of inconsistency between a promising alternative and attributes of the alternatives could cause

biased predecision processing (Holyoak & Simon, 1999; Russo et al., 1998). The best evidence that reduction of inconsistency could cause biased predecision processing comes from studies in which participants who thought about their alternatives without expecting to make a decision progressively distinguished a promising alternative (Russo et al., 1998; Simon et al., 2001). The logic is that when people think about a set of alternatives without expecting to make a decision, and one of those alternatives emerges as a favorite, there is likely to be dissonance between their preference for that alternative and its negative attributes or the positive attributes of other alternatives. Meanwhile, because they are not expecting to make a decision, many of the other mechanisms postulated to cause biased predecision processing (e.g., choice certainty, dominance structuring) are less likely to be active. Therefore, if they conduct biased processing, it would appear that they were most likely doing so to reduce unpleasant predecision dissonance.

After Festinger's (1957) original statement of dissonance theory, subsequent authors suggested revisions in the definition of what dissonance is and when it can affect attitudes (Harmon-Jones & Mills, 1999). Nevertheless, when those reformulations are applied to the predecision situation, it still seems likely that dissonance can occur before a decision and cause biased processing. One reformulation continues to view dissonance as inconsistency between cognitions but argues that such inconsistency affects attitudes only when one of the cognitions relates to the self-concept (Aronson, 1999; Thibodeau & Aronson, 1992). Applying this self-concept reformulation to the predecision situation suggests that the inconsistency between a cognitive element representing the self as a person who makes good decisions and a cognitive element representing the self as leaning toward a poor alternative could constitute predecision dissonance and could be expected to cause biased predecision processing.

Another reformulation suggests that dissonance "has precious little to do with the inconsistency among cognitions per se" (Cooper & Fazio, 1984, p. 234); instead, dissonance involves feeling responsible for causing foreseeable negative consequences, even if those consequences have not yet occurred (Cooper, 1999; Cooper & Fazio, 1984). Applying this new look at dissonance to the predecision situation suggests that decision makers who are leaning toward an alternative that has negative attributes and who are aware that choosing an alternative with negative attributes could produce negative consequences could be expected to experience predecision dissonance. Furthermore, evidence that decision makers were more likely to conduct biased processing when the decision involved more important negative consequences (Mills & Ford, 1995; O'Neal, 1971) suggests that concern about producing negative consequences in the form of being stuck with a poor alternative can cause biased predecision processing.

Conflict. Several authors have discussed the concept of decision conflict, offering somewhat different descriptions of what decision conflict is and how it may affect processing during decision making. Festinger (1957) described conflict as a feeling of being pushed in two opposite directions at once, because the positive and negative attributes of different alternatives suggest different choices. Janis and Mann (1977) described conflict as a kind of stress experienced when each of the alternatives is attractive but also involve risk of negative consequences. Behavioral decision researchers suggested that decision makers experience

conflict when their alternatives have similar overall expected value but each has unique advantages and disadvantages, such as if one bet promises a higher payoff while another bet has a higher probability of paying off (Luce et al., 1997; Tversky & Shafir, 1992). Considering these definitions together, it appears that decision conflict involves a kind of ambivalence toward a set of alternatives that have similar overall value but different strengths and weaknesses. In other words, decision makers are expected to experience conflict when they have to make trade-offs between alternatives with negatively correlated attributes.

Conflict theorists assumed that decision conflict would be unpleasant and that decision makers would conduct biased processing in order to relieve their unpleasant conflict (Janis & Mann, 1977; Shepard, 1967). Actually, it was only recently that Luce et al. (1997) reported direct evidence that decision makers experience greater negative affect when making choices between alternatives with negatively correlated attributes than when making choices between alternatives with positively correlated attributes. Decision makers experiencing unpleasant conflict focus information search on the alternative they will eventually choose, particularly near the end of the decision-making process (Johnson et al., 1989; Luce et al., 1997). Decision makers experiencing higher degrees of conflict may initially search by attributes to avoid confronting their intense conflict (Luce et al., 1997), and they spread evaluations of alternatives apart to a greater extent than decision makers experiencing lower degrees of conflict (Mann & Taylor, 1970; Russo et al., 1998; Tyszka, 1998).

In addition to making the point that decision conflict would motivate biased predecision processing, Janis and Mann (1977) discussed factors that they thought would determine whether decision makers experience anticipated regret, expecting anticipated regret to signal decision makers to slow down and process in a less biased manner. Actually, the effects of anticipated regret on biased predecision processing have been controversial in the literature. Like Janis and Mann (1977), Tyszka (1998) suggested that anticipated regret would decrease biased predecision processing. But Svenson (1992; Svenson, Rayo, Andersen, Sandberg, & Svahlin, 1994) characterized anticipated regret as a major cause of biased predecision processing, and in a similar manner, Mills (1999; Mills & Ford, 1995) suggested that avoidance of postdecision dissonance would motivate biased predecision processing.

Janis and Mann (1977) specified five conditions under which they thought anticipated regret would be most likely to occur. Although the connection between those conditions and anticipated regret has not been shown directly, the ones that have been tested have been associated with reduced biased processing. As predicted, participants who expected to receive more information, thought they were further from the time for making their choice, or were in the earlier stages of decision making were less likely to conduct biased predecision processing (Brounstein et al., 1979; Johnson et al., 1989; Luce et al., 1997; Mann et al., 1969). Although participants who expected to be committed to their choice were not less likely to bolster their chosen alternative, participants who expected to be committed and to have to justify their choice to others were less likely to bolster their chosen alternative (Mann & Taylor, 1970). Janis and Mann (1977) did not discuss expecting to justify a decision, but it does seem likely that participants who expect to have to justify their choice might imagine trying to defend each alternative's weak points and then

experience anticipated regret, and expecting to justify a decision has been associated with reduced biased processing in other research (Russo et al., 2000).

Choice certainty. Choice certainty theory makes the simple point that people want to be certain about their choices. The idea that people want to be certain about their choices seems to imply that a kind of need for certainty operates as a motive in decision making, but there is no direct evidence that people have a need for certainty in decision making or that it increases biased processing. Nevertheless, the idea that people want to be certain about their choices has served as a useful heuristic, allowing choice certainty researchers to predict many of the conditions under which people are more likely to conduct biased predecision processing.

Choice certainty theorists predicted that decision makers would be more likely to reevaluate alternatives when they expected to make a choice (Brounstein et al., 1979; Mills & O'Neal, 1971; O'Neal, 1971; O'Neal & Mills, 1969) and when the choice involved greater (negative) consequences (Mills & Ford, 1995; O'Neal, 1971). Choice certainty researchers appear to have assumed that greater consequences would always increase biased processing, but choice certainty theory could probably explain the effects of consequences on biased predecision processing even if they were moderated by the valence of the consequences. Of course, more negative consequences would be expected to increase need for certainty because a poor choice could have unpleasant outcomes, but more positive consequences may be expected to decrease need for certainty because even choosing the worse alternative would leave the decision maker with a pleasant outcome. Choice certainty theory also was used to predict that decision makers would be more likely to conduct biased processing when they thought they were closer to the time for decision and when they did not expect more information (Brounstein et al., 1979); thus, it could predict that decision makers would be more likely to conduct biased processing in later stages of decision making (Johnson et al., 1989; Luce et al., 1997).

Choice certainty theory predicted greater re-evaluation of alternatives when participants experienced unexplained arousal (O'Neal, 1971). Mann et al. (1969) had previously shown that a difficult decision was accompanied by arousal, but O'Neal (1971) showed that participants who had been artificially aroused conducted more extensive biased processing than participants making the same choice who were not aroused or who could attribute their arousal to a pill, suggesting that awareness of unexplained arousal can trigger biased processing mechanisms. O'Neal suggested that unexplained arousal may increase biased processing because it signals that certainty is low—though once again, unexplained arousal might just as well signal dissonance, conflict, or some other distress associated with decision making.

It was choice certainty authors who delineated the distinction between public and private evaluations, suggesting that private evaluations diverge but public evaluations converge within the predecision period (Brounstein et al., 1979; Mills & Ford, 1995). Despite the elegance of the distinction between private divergence and public convergence in the choice certainty literature, some ambiguity remains as to just how public evaluations need to be for divergence to be replaced by convergence. Many studies obtained divergence of alternatives even though participants were not assured of anonymity (Beckmann & Kuhl, 1984; Dahlstrand & Montgomery, 1984; Mann et al., 1969; Mann & Taylor, 1970;

Mills & O'Neal, 1971; O'Neal, 1971; O'Neal & Mills, 1969; Russo et al., 1996, 1998, 2000; Tyszka, 1998; Tyszka & Wielochowski, 1991), and choice certainty researchers were often unable to obtain significant convergence even in their public conditions, suggesting that the convergence effect may be limited to evaluations made in an extremely public manner. However, some of the studies that originally introduced the convergence effect do not mention that evaluations were made with the kind of public display that occurred in the public conditions of the choice certainty studies, yet they still obtained convergence of evaluations (Linder & Crane, 1970; Linder, Wortman, & Brehm, 1971).

Action control and action phases. Kuhl's (1984) action control theory and Gollwitzer's (1990) action phase theory are both concerned with how people choose an action to perform, but they offer very different perspectives on biased predecision processing. The important theoretical difference between them seems to involve their views on the goals of processing during decision making and the role that biased processing can play in the decision maker's attempts to achieve those goals.

Kuhl—according to Beckmann and Kuhl (1984)—portrayed predecision processing as an effort to transform a motivation into an intention and to maintain the intention through decision making into action, and he suggested that action control processes could be called on to help bolster a weak intention. Although there may be some difficulties in Beckmann and Kuhl's experimental design, most of the research reviewed supports their prediction that biased processing can occur before a decision. Moreover, their finding that people with an action orientation were more likely to conduct biased processing than people with a state orientation provided the first evidence for individual differences in the tendency to conduct biased predecision processing. Russo et al. (2000) later found that among participants who distorted information to a fairly high degree (salespersons), more positive dispositional mood was associated with more extensive predecision distortion of information.

In contrast, Gollwitzer (1990) suggested that the goal of the predecision period is to make an optimal choice, and that biased processing would interfere with achieving that goal. Expecting decision makers to process in an optimal manner, he predicted that they would use a deliberative mind set, characterized by an absence of biased processing.

Gollwitzer's (1990) predictions, then, were based on the assumption that decision makers would do what they should do to make an optimal decision. For example, notice the repeated use of the word *should* in the following passage:

The mind-set that clearly facilitates the task of the predecisional phase (i.e., to choose the most desirable wish that is also feasible) should evidence the following characteristics. First, there should be cognitive tuning toward information relevant to the issues of feasibility and desirability. Second, there should be an orientation toward accurate and impartial processing of such information. And finally, there should be an open-mindedness or heightened receptivity to information in general. (Gollwitzer, 1990, p. 65)

The rather prescriptive nature of Gollwitzer's theorizing—expecting decision makers to adopt what is, in his view, an optimal mode of processing—seems to have been misplaced. Although it was certainly reasonable for Gollwitzer to assert that decision makers should avoid biased predecision processing, the empirical evidence suggests that they often do conduct biased predecision processing;

thus, it does not appear realistic to expect them to spontaneously enter a deliberative mind-set when making decisions.

SDS theory. Montgomery's (1983, 1989, 1993, 1994; Montgomery & Willen, 1999) SDS theory is a model of decision making that views biased processing as an integral part of decision making. SDS theory was used to predict that people would be more likely to conduct biased processing when they expected to make a decision than when they did not expect to make a decision (Montgomery et al., 1994), and it could have been used to predict that decision makers would conduct more extensive biased processing when their alternatives were initially more similar (so that there was a greater need to distinguish them) or later in the decision making process (when a promising alternative had already been identified).

The main focus of SDS theory, however, is not on the conditions in which biased processing is more likely to occur but on the ways in which biased processing may be conducted. Montgomery (1983, 1989, 1993, 1994; Montgomery & Willen, 1999) has delineated stages of decision making and detailed tactics that may be involved in bolstering and denigrating, always emphasizing that biased processing not only differentiates a promising alternative but also builds a dominance structure so that the promising alternative appears superior to all other alternatives on at least one attribute and not inferior to any other alternative on any attribute.

The classic evidence for dominance structuring comes from Montgomery and Svenson's (1983) think aloud protocols. Montgomery and Svenson found that early evaluations not favoring the choice that was made (negative evaluations of the chosen alternative and positive evaluations of the nonchosen alternative) changed over the course of the decision-making process to become more favorable to the choice that was made. By using the same data set, Montgomery (1994) found that attributes of chosen alternatives received more positive evaluations than negative evaluations, and attributes of nonchosen alternatives received more negative evaluations than positive evaluations.

To determine whether the chosen alternative was favored in such a thorough manner in other research, it is necessary look at studies that analyzed evaluations of individual attributes. One such study was reported by Russo et al. (1996; no-endowment condition), who asked participants to evaluate their alternatives one attribute at a time and found that on the second and subsequent attributes information was distorted to favor the leading alternative. Other evidence for reevaluation of attributes comes from studies in which participants rated their attitudes toward issues related to a decision problem, which found that participants' attitudes toward each issue changed within the predecision period, becoming more consistent with the decision they eventually made (Phillips, 2002; Simon et al., 2001). Simon and colleagues called the synchronized shifting of attitudes to be consistent with a decision *coherence* because it allows participants to achieve an internally consistent (or coherent) understanding of the issues related to their decision.

Differentiation and consolidation theory. Svenson's (1992, 1996, 1999) differentiation and consolidation, or diff-con, theory is also a model of decision making that views biased processing as an inherent part of decision making. Svenson (1992, 1996, 1999) suggested that predecision differentiation is motivated by anticipated regret, but as discussed earlier, it now appears that anticipated regret is more likely to decrease biased predecision

processing. Otherwise, diff-con theory is primarily descriptive, emphasizing the ways in which biased processing can occur over the conditions when it is more likely to occur.

Diff-con theory suggests several ways in which the perceived structure of a decision set may change so that a promising alternative is differentiated. For one, diff-con theory suggests that the attractiveness of attributes may change, and when participants evaluated attributes of alternatives separately, the perceived advantage of the chosen alternative increased within the predecision period (Dahlstrand & Montgomery, 1984; Mills & O'Neal, 1971; Montgomery et al., 1994; Montgomery & Svenson, 1983; O'Neal, 1971; O'Neal & Mills, 1969; Phillips, 2002; Russo et al., 1996, 1998, 2000; Simon et al., 2001; Tyszka, 1998). In addition, diff-con theory suggests that the importance of attributes may change, and Davidson and Kiesler (1964) found that when participants had sufficient deliberation time, rankings of importance of attributes favoring the chosen alternative increased within the predecision period. Finally, diff-con theory suggests that perceptions of facts may change; on that point, researchers have found that attitudes about facts (e.g., whether a company would survive through the end of the year, whether the Internet is like a telephone or a newspaper) became consistent with decisions within the predecision period (Phillips, 2002; Simon et al., 2001) and that perceptions of events (the number of punches a boxing contestant has received) were distorted to support a promising alternative (Tyszka & Wielochowski, 1991).

Svenson (1992, 1996, 1999) suggested that changes in the perceived structure of a decision set would facilitate use of decision rules to differentiate a promising alternative and pointed out that such use of some decision rules could be expected to involve adjustment of a decision criterion. However, Phillips (2002) found that participants adjusted the criterion for auditing decisions (i.e., how significant doubts about a company's viability need to be in order for an auditor to report them) only after making their own auditing decision, but not before making their own decision. As Phillips noted, his results suggest that biased processing is conducted in a different manner before a decision than it is conducted after a decision. It would appear that before a decision, biased processing serves to find an alternative that is good enough to be chosen and operates by differentiating a promising alternative from the other alternatives, but after a decision, biased processing serves to maintain confidence in the choice that has been made and operates by adjusting the decision criterion to make the chosen alternative look better.

Constructive processing. The constructive processing approach to behavioral decision research, which suggests that preferences are constructed during decision making, seems highly compatible with the notion of biased predecision processing, which suggests that a promising alternative is differentiated from the other alternatives. It is surprising, then, that researchers who take a constructive processing approach seldom discuss biased predecision processing. Nevertheless, some of their work is consistent with biased predecision processing.

Research on editing and restructuring of information has not looked for evidence of biased processing (Coupey, 1994; Russo & Doshier, 1983), but Payne and colleagues suggested that editing and restructuring operations could be used to conduct biased processing (Payne, Bettman, & Johnson, 1992). Payne, Bettman, and Johnson (1992) also suggested that effort-accuracy trade-offs

would affect processing during decision making, and though they did not discuss biased processing, they did find selective information search focusing on the chosen alternative within the predecision period. Payne and colleagues predicted that decision makers choosing among larger numbers of alternatives would be more likely to save cognitive effort by conducting more variable information search across alternatives (Payne, Bettman, & Johnson, 1992), and in some studies they found that variable information search focused specifically on the alternative that was eventually chosen (Johnson et al., 1989; Payne, 1976).

Reason-based analyses of decisions have been used to explain many findings in the decision making literature (Shafir et al., 1993), and the assumption that decision makers are motivated to make well-justified choices can help explain why decision makers were more likely to conduct biased processing in some conditions than in others. For instance, if decision makers are motivated to make well-justified choices, they might be expected to use biased processing to make a favorite alternative seem more justifiable, particularly when the favorite alternative was not initially well justified. Indeed, participants whose eventually chosen alternative was not initially well justified, either because it was one of several closely matched alternatives (Mann & Taylor, 1970; Tyszka, 1998) or because it was dominated by another alternative (Simonson, 1989), were more likely to conduct biased predecision processing. Although decision makers react to low justifiability by conducting biased processing to maximize the justifiability of their choice, increasing the salience of justifiability concerns by warning participants that they may have to justify their decision to others appears to decrease biased processing (Mann & Taylor, 1970; Russo et al., 2000).

The findings that decision makers react to low justifiability by increasing biased processing but react to justification warnings by decreasing biased processing may suggest that the motive to maximize justifiability does not necessarily increase or decrease biased processing but rather interacts with the decision task in more complex ways. Alternatively, the finding that decision makers react to low justifiability by increasing biased processing suggests the possibility that the motive to maximize justifiability increases biased processing whereas justification warnings activate other processes, such as anticipated regret, that signal decision makers to decrease biased processing. Assuming that the distinction between private divergence and public convergence is reliable, justification warnings and public evaluations may both activate similar processes (possibly anticipated regret or reactance) that counter factors that motivate biased predecision processing (such as justifiability maximization, dissonance minimization, etc.).

Considering the ability of the constructive processing approach to account for several findings in the biased predecision processing literature, it is disappointing that researchers who take a constructive processing perspective seldom discuss biased processing or test their data in a manner that might reveal biased predecision processing. Many more process tracing studies have examined variable information search during decision making without reporting whether variable information search focused on (or avoided) the chosen alternative (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Payne, Bettman, & Johnson, 1992). Perhaps settling the controversy over whether biased predecision processing occurs would help open the topic for research and increase its recognition as part of constructive processing in decision making.

Motivated reasoning. Kunda (1990) suggested that people who are motivated to believe something selectively search their memory for supporting information and construct their beliefs to support the conclusion they initially wanted to reach. A straightforward application of motivated reasoning to decision processing occurs when decision makers who have a prior motivation to favor one or more alternatives bolster those alternatives before making their decision. As reviewed earlier, researchers have found that decision makers who were motivated to choose one or more alternatives were more likely to perceive alternatives as meeting the selection criteria (Boiney et al., 1997), that decision makers who were motivated to choose a particular alternative distorted attribute information to be more favorable to that alternative (Russo et al., 1996), and that participants estimated that more valuable alternatives were more likely to pay off (Cohen & Wallsten, 1992; Olsen, 1997; Slovic, 1966). In addition, other researchers have found that participants who initially preferred one alternative avoided information advertising another alternative (Mills & Jellison, 1968) and that groups were more likely to request information favoring their earlier preliminary decision than information opposing their preliminary decision (Schulz-Hardt et al., 2000).

Boiney et al. (1997) went beyond showing that a prior motivation caused bolstering of preferred alternatives to showing that preferred alternatives were bolstered to a greater extent when they needed more bolstering to meet a decision criterion. Other evidence that bolstering may be invoked as needed comes from studies that found that participants were more likely to conduct biased processing when they expected to make a decision, when alternatives were not as easily distinguished (because they were similar in attractiveness or attributes were negatively correlated), and when they thought they would have to make a decision sooner or would not receive more information.

More generally, motivated reasoning should be able to affect predecision processing in different ways, depending on the decision maker's motivations. For instance, Kunda (1990) recognized that people may be motivated to form accurate impressions and that a motivation for accuracy could induce more accurate reasoning. Similarly, Tyszka (1998) suggested that decision makers who are motivated to accurately evaluate their alternatives are less likely to conduct biased predecision processing. Although process tracing studies have looked at the effects of accuracy goals on decision processing (e.g., Creyer, Bettman, & Payne, 1990; Payne, Bettman, & Luce, 1996), they have not addressed biased processing, leaving the effects of accuracy motivation on biased predecision processing an interesting direction for future research.

Groupthink. Janis (1983) named several antecedent conditions that he thought would increase concurrence seeking in decision-making groups, and he suggested that concurrence seeking in decision-making groups would lead to symptoms of groupthink, which in turn would increase biased decision processing. Consistent with Janis's (1983) predictions, Schulz-Hardt et al. (2000) found that groups conducted more selective information searches than did individuals, suggesting that group processes (such as groupthink) can increase biased processing. Schulz-Hardt et al. also found that homogeneous groups conducted more selective information searches than did heterogeneous groups, suggesting that the increase in biased processing associated with groups may

be partly due to group composition (one of Janis's [1983] antecedent conditions).

Research on group processes is seldom connected to research on biased predecision processing, but the two fields seem to have much to offer each other. On the one hand, Janis (1983) predicted that the symptoms of groupthink would lead to increased biased decision processing, but most groupthink research appears to have focused on the symptoms of groupthink rather than the consequent biased decision processing (see Esser, 1998), leaving biased decision processing an interesting direction for further groupthink research. On the other hand, researchers who study biased predecision processing usually focus on individual decision making without considering the effects group processes may have on biased processing in decision making groups, leaving the antecedent conditions of groupthink a promising direction for research on the moderators of biased predecision processing.

On the Question of Rationality

One major issue in behavioral decision research concerns whether decisions are made in a rational manner (a presumption being that rational decisions are better decisions; Abelson & Levi, 1985). Traditionally, the rationality of decision processing has been determined by comparison to the standard set by the model of rational decision making. As noted earlier, rational decision making involves exhaustively searching the information as given, using the weighted additive rule to compute the expected value of each alternative (see Footnote 1), and choosing the alternative with the highest expected value. Viewed from that perspective, biased predecision processing, which involves editing and restructuring information, selective information search, and reevaluation of attributes and alternatives, clearly falls outside the bounds of rationality.

Some authors have questioned the value of classically rational decision making (Abelson & Levi, 1985; March, 1978), allowing decision processing to be compared to other standards. March (1978) argued that choices and preferences often meet standards of alternative kinds of rationality when, for example, they are adaptive or help decision makers achieve their goals. Certainly, biased predecision processing fares much better when compared to standards of alternative rationality—say, an adaptive view of rationality. In many cases, if the best choice is not immediately obvious, then more than one of the available alternatives would probably suffice, and thus prolonged decision making aimed at carefully weighing the value and probability of all attributes of all alternatives only wastes valuable resources. In those cases, biased processing allows decision makers to save time, effort, and emotional resources by differentiating a promising alternative until the choice becomes easy—so they can make their choice and move on to other important tasks.

Conclusion

Biased processing can occur within the predecision period. Research has shown that people may restructure their mental representation of the decision environment to favor a promising alternative before making a committing consequential decision, and even before reaching an implicit, private decision. Therefore, it is time to replace the debate over whether biased predecision

processing occurs with a more constructive analysis of when and why it is most likely to occur. Over the past 40 years, researchers have outlined some of the conditions when biased predecision processing is more likely to occur and have discussed some of the cognitive and motivational factors that may be involved. In the coming years, researchers are likely to continue to sharpen our understanding of biased processing as an important part of the decision making process.

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