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THE EFFECT OF RESPONSE MODE AND AFFECTIVE STATE
ON MULTIATTRIBUTE DECISION-MAKING

A Thesis

Presented to the

Department of Psychology

and the

Faculty of the Graduate College

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

University of Nebraska at Omaha

by

Robert Jason Weiss

May 1996

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THESIS ACCEPTANCE

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Abstract

Response mode research shows that participants under a judgment response mode demonstrate more compensatory processing than participants under a choice mode. Research on affect and choice reveals that positive-affect participants display more noncompensatory examination of information than negative-affect participants. In the present study, participants viewed a film clip to induce positive or negative affect and made judgments or choices for a series of candidates for a university professor's position. Results indicate a powerful effect for response mode across all dependent variables whereby judgment participants took more time, looked at more information, and showed less search variability than choice participants. The influence of affect, however, was undetectable, and several hypotheses are advanced to account for this finding.

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This thesis is dedicated to my late brother Erik.

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The Effect of Response Mode and Affective State on Multiattribute Decision-Making

For any decision to be made, there are a number of ways of locating a satisfying solution. Consider a personnel manager attempting to fill a sales position. Applicant "A" may spend his or her life on the road, making sales every day of the year but Christmas. This applicant, however, is known in the industry as somewhat negligent with paperwork and fairly hostile toward direction from management. Applicant "B", however, is moderate in all ways. "B" is competent and easy-going, though unremarkable in any facet of the job.

Which applicant the personnel manager chooses depends on the type of decision process employed. If asked merely to choose an applicant, it is perfectly reasonable to consider sales ability the most important aspect of the job and remove from consideration all applicants not meeting a certain cut score. Such a process would no doubt result in selecting applicant "A". However, if the personnel manager rated applicants based on all attributes weighted equally, applicant "B" would likely be hired. The ultimate decision depends on the form of response required, even though the field of alternative choices remains the same.

Research on this "response mode" effect has found it robust. Further, research on the process of multiattribute decision-making suggests that different response modes result in the use of different decision strategies. Response modes are not the only such influence, however. Recent research demonstrates that affective state also guides decision strategies (Forgas, 1989, 1991; Isen & Means,

1983). The present study will explore the relationship between affect and response mode in multiattribute decision-making.

This topic is especially germane to industrial/organizational psychology. Many aspects of this field focus on making decisions among several alternatives. One example relating to employee selection was given above. Other types of multiattribute decisions include the choice of selection instruments or compensation and benefits packages. Interestingly, these decisions are open to variation simply due to the format of the response desired. As will be discussed in detail below, decision-makers required to evaluate all alternatives before making a selection (judgment) are likely to use a different combination of decision processes from those required only to select an alternative outright (choice).

The first section of this paper discusses the decision processes studied here, along with an examination of the methods by which they are assessed. The second section examines response mode effects. Next, affective influences on decision making are reviewed. A summary of the research appears next, followed by hypotheses for the relationship of response mode and affect. Finally, the proposed design and execution of the experiment are delineated.

Assessing Decision Processes

Before discussing decision processes in detail, it is necessary to describe the terms and paradigm used here. A decision problem is one in which the subject must evaluate a series of alternatives and select one. An alternative is a unique solution

within a decision problem. Each alternative is described by a set of attributes. In the example above, candidates “A” and “B” are alternatives, while the sales record and rating for paperwork management are examples of attributes.

Techniques for Inferring Decision Behavior

Two general methods for studying decision behavior are policy capturing and process tracing. Policy capturing relies on the combination of input cues and the final decision to infer the underlying decision process (Billings & Marcus, 1983). It has been criticized as focusing solely on the final decision to the detriment of insights on the process of coming to that decision (Payne, 1976). A related criticism concerns its insensitivity to the range of different cognitive operations which may result in similar final decisions (Abelson & Levi, 1985). Given the availability of more sensitive indicators of the decision process, the present study will not employ policy capturing.

Process tracing refers to a group of methods which focus on participants’ acquisition and processing of information prior to making a choice (Abelson & Levi, 1985). These methods include recording eye movements, analysis of verbal protocols, and the use of information boards. All of these methods rely on some form of matrix presentation of alternatives and attributes.

Eye movement. Several forms of eye movement may indicate information acquisition and processing. These include duration, fixation density, and the sequence of fixations (Abelson & Levi, 1985). While this is a remarkably subtle indication of information processing, it is impractical for the present experiment.

Verbal protocols. When verbal protocol analysis is employed, participants are instructed to “think aloud” while examining and processing information. Transcripts of the verbal reports are then broken down and coded by decision process (Abelson & Levi, 1985). Although enticing, this method suffers from the requirement of a large investment of time and resources, both for collecting and analyzing the data. As a result, verbal protocols will not be employed in the present study.

Information boards. An information board is generally a board containing cards or envelopes (with cards inside) organized in an alternative x attribute matrix (e.g., Billings and Scherer, 1989, 1991; Payne, 1976). More recent research employs computerized presentation of the information, allowing for instantaneous and completely accurate recording of information search activity (e.g., “Mouselab”; Payne, Bettman, & Johnson, 1993).

Several assumptions underly the use of information boards as indicators of decision processes. The fundamental assumption is that the pattern of search for information indicates the subject’s decision processes (Svenson, 1979). Related to this, it is understood that examination of a given piece of information is driven by a deliberate decision making strategy (Abelson & Levi, 1985; Svenson, 1979). Finally, prolonged attention to a piece of information denotes the use of more complex cognitive processes (Abelson & Levi, 1985; Svenson, 1979).

Abelson and Levi (1985) note that validation of these assumptions requires information boards to be paired with other methods. Payne (1976) employed

information boards and verbal protocols together in two experiments and found them compatible. Billings and Marcus (1983) compared the information board and policy capturing models and found that both reflected a representative range of decision processes. However, the methods did not converge. The authors explained the differences as a result of different task requirements for the two models. Ford, Schmitt, Schechtman, Hults, and Doherty (1989) performed a review of studies employing verbal protocols and information boards. Their review indicated that information boards were employed twice as often as verbal protocols, with a small proportion of experiments using both. The researchers included no substantive comparison of the two methods. However, the ongoing popularity of information boards suggests that the underlying assumptions are acceptable. As a result, given its superior ratio of benefits to problems, the information board technique will be employed in the present experiment.

Information Evaluation Models

Although there are many ways in which to categorize decision behavior, the present study is concerned with how decision-makers combine and evaluate attribute information in order to make their decisions. When participants combine information across attributes for comparison to a criterion, they are said to be using a compensatory evaluation model (Abelson & Levi, 1985). The term "compensatory" is used because high scores on one attribute compensate for low scores on another. As a result, a poor showing on a given attribute does not necessarily remove the

alternative from consideration. Noncompensatory evaluation models assume that each attribute is compared separately.

The distinction between compensatory and noncompensatory models is important due to the belief that better decisions result from consideration of more evidence. By definition, compensatory models presume the use of more available relevant information than do non-compensatory models. As such, they are more likely to locate the alternative with the highest overall utility. This does not necessarily mean that compensatory models are always superior to non-compensatory models, nor is it intended to imply that non-compensatory models are not systematic. One can easily imagine situations in which non-compensatory models result in superior decision performance. For example, time pressure is likely to lead to better decisions resulting from non-compensatory models.

In information board research, there are two variables used to determine the type of evaluation model (Payne, 1976). The first variable is the depth of information searched. It is calculated as the amount of information examined as a percentage of the total information available. A high depth of information searched suggests that the subject is attempting to get as complete a view of the various alternatives as possible. The most likely reason for such behavior is that the subject is employing a compensatory decision model and ensuring that the alternative ultimately chosen is the one with the highest overall utility.

The second variable that would indicate the use of compensatory strategies is the variability of search. This is calculated as the standard deviation of the number of items searched per alternative within a given decision problem. Participants examining more information for some alternatives over others would therefore have a high variability of search, while those studying a constant amount of information across alternatives have a minimal (or zero) search variability. Low search variability suggests a compensatory model in that participants appear to be integrating a wide range of information for each alternative prior to choice. High search variability, therefore, denotes a noncompensatory decision model. One notable exception arises when a decision-maker looks at only one attribute. In this case, compensatory processing has obviously not occurred, but search variability is zero. An easy way to compensate for this is to ensure that each alternative shares any given attribute value with one or more other alternatives.

Search variability is a more intuitive indicator of compensatory or noncompensatory evaluation than is search depth. This is mainly because it provides evidence of the consistency with which information is combined. Following from previous research (e.g., Payne, 1976; Westenberg & Koele, 1992), search variability is used here as the main gauge of the information evaluation model used.

Information Search Patterns

In addition to the evaluation models outlined above, it is also educational to determine whether the decision-maker is searching by alternatives (e.g., different job

candidates) or attributes (e.g., sales record). The information search pattern illustrates whether alternatives or attributes are the focus of examination (Svenson, 1979).

Search pattern is calculated as the number of moves from one attribute to another within an alternative minus the number of moves from one alternative to another, all of which is divided by the sum of the two types of moves (Payne, 1976). A positive pattern index represents alternative-wise search, while a negative pattern index reflects attribute-wise search.

An alternative-wise search suggests that the decision-maker moves from attribute to attribute within a given alternative. For example, the personnel manager would study first the sales record and then the personal references for the first candidate. An attribute-wise search suggests that the decision-maker inspects information for a given attribute one alternative at a time. For example, after looking at the first applicant's sales record, the personnel manager would look at the sales record for the second applicant.

Decision Rules

Although a number of decision rules have been proposed (e.g., Svenson, 1979), four main rules have been examined in research using information boards (Abelson & Levi, 1985; Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Westenberg & Koele, 1992). Payne (1976) suggested consideration of these particular rules for their implications about the processes involved in their use. Each rule corresponds to a unique combination of evaluation model (compensatory or

noncompensatory) and information search pattern (attribute-wise or alternative-wise). These rules are detailed below and presented in Table 1.

A compensatory evaluation model using attribute-wise search reflects the use of a linear decision rule (Payne, 1976). The decision-maker determines a utility score for each attribute of a given alternative and then sums the utilities to create a grand score for that alternative. Summing utilities across attributes indicates a compensatory evaluation model. In terms of information board variables, the linear decision rule is reflected by low search variability (compensatory evaluation model) and a positive pattern index (alternative-wise search).

A compensatory evaluation model using alternative-wise search indicates an additive difference rule (Tversky, 1969). According to this rule, the decision-maker compares the utilities of different alternatives on the same attribute. The utility differences for the set of attributes considered are then combined to determine the overall evaluation. As above, this strategy employs a compensatory evaluation model because the utility differences are combined across attributes. The additive difference rule is understood when participants demonstrate low search variability (compensatory evaluation model) and a negative pattern index (attribute-wise search).

Elimination-by-aspects (Tversky, 1972) involves a non-compensatory evaluation model and alternative-wise search. Using this rule, cut scores are

Table 1

Decision Rules by Evaluation Model and Information Search Pattern

	Information Search Pattern	
	Attribute-wise	Alternative-wise
Compensatory Evaluation		
Decision Rule	Linear	Additive Difference
Pattern Index	Positive	Negative
Variability	Low	Low
Noncompensatory Evaluation		
Decision Rule	Conjunctive	Elimination by Aspects
Pattern Index	Positive	Negative
Variability	High	High

established for each attribute. Starting with the most important attribute, alternatives not meeting the cut score are eliminated from further consideration. This process continues down the line of attribute importance until only one alternative remains. In information board research, elimination-by-aspects is represented by high search variability (noncompensatory evaluation model) and a positive pattern index (alternative-wise search).

Finally, use of a non-compensatory evaluation model with attribute-wise search indicates a conjunctive decision rule. As in the elimination-by-aspects rule, the decision-maker establishes a set of criteria for each attribute. Each alternative is examined, and failure of any attribute to meet the criterion results in the rejection of the alternative (Svenson, 1979). The conjunctive decision rule is symbolized by high search variability (noncompensatory evaluation model) and a negative pattern index (attribute-wise search).

A literature review by Ford et. al (1989) noted that all of the above decision rules were observed in at least some of the research. The researchers also noted, however, that participants tended to prefer noncompensatory evaluation models. This may be due to the increased cognitive effort required by compensatory evaluation (e.g., Beach & Mitchell, 1978; Payne, 1982).

Response Modes

The response modes under study here are judgment and choice. Although research has been performed with other response modes such as grouping and

rejecting alternatives (e.g., Westenberg & Koele, 1992), judgment and choice appear most frequently in the non-gambling literature (Payne, Bettman, & Johnson, 1993). Judgment tasks are those in which the subject assigns a rating to each alternative prior to making a choice. Choice tasks refer to tasks requiring the decision maker to select the best alternative without requiring explicit evaluation of each alternative (Billings & Scherer, 1988; Payne, 1982).

Response modes influence the adoption of decision rules. A choice mode allows free selection of the strategies used to make a decision. Judgment, however, necessarily implies at least some use of compensatory evaluation. A judgment task requires an overall evaluation of each alternative. This is unlikely to be accomplished without at least some combination of utilities for attributes within alternatives. Combining utilities, as mentioned above, defines compensatory evaluation. As discussed immediately below, response mode research supports the greater role played by compensatory evaluation under a judgment mode.

Response Mode Research

Billings and Scherer (1988) examined the role of decision importance and response mode on decision strategy. They reviewed research suggesting that important decisions require more careful and thorough processing. Important decisions should therefore lead to more compensatory evaluation than less-important decisions. The researchers hypothesized an interaction of decision importance and response mode such that processes underlying judgment (compensatory evaluation

and interdimensional search) will occur for participants in a choice response mode who are led to believe that the decision they are making is important. In other words, they hypothesized that participants would use compensatory evaluation in both high and low importance conditions under judgment and in the high importance condition under a choice response mode.

Billings and Scherer (1988) employed a residence-advisor selection task whereby they presented participants (who were living in residence halls at the time) with eight boards listing six candidates for residence hall advisors. Each board displayed a matrix of eight attributes for the six candidates. Each element of the matrix was presented in an envelope. Participants opened envelopes at will, read the contents, and turned them around within the envelope so that the information remained visible. Participants worked with only one board of candidates at a time and could not progress to a subsequent board without making a judgment or choice for the current board.

The authors reported several interesting findings. First, they found a main effect for response mode on the amount of information searched. Participants under judgment looked at 82.5% of the pieces of information while those under choice looked at only 56.7%. This is well in line with the idea that participants under judgment use more compensatory models and therefore examine more information than participants under choice. The researchers also found a significant interaction between response mode and importance on information search. Simple effects

analyses revealed that, as expected, significantly more information was sought in the high-importance condition under choice than in the low-importance condition under choice (29.9 vs. 24.5), while no significant differences appeared between importance conditions under judgment.

Analysis of variance (ANOVA) was also performed for both variability of search and pattern of search. Both analyses revealed significant main effects for response mode such that judgment resulted in a lower standard deviation of attributes searched than choice and also more interdimensional (within alternative) search than choice.

Log-linear analyses were performed to verify use of the four decision rules outlined above. Results revealed that elimination-by-aspects was more likely under choice than under judgment and more likely under low importance than under high importance. This finding is well in line with the theory suggested above. Elimination-by-aspects is a non-compensatory rule and is therefore more likely to occur under choice and, with respect to the interaction of response mode and importance, more likely under low importance. This was due to the high-importance condition resulting in more compensatory evaluation.

Billings and Scherer (1991) examined the effects of response mode on decision processes and outcomes, as well as postdecision regret. Their first hypothesis concerned the effect of response mode on quantity of information searched, information search variability, and search pattern. This was essentially to

replicate Billings and Scherer (1988). Their second hypothesis was that the judgment and choice would result in different alternative choices. They also hypothesized that selecting an optimal alternative under choice is more likely to occur when explicit judgments are required about the alternatives. Finally, they hypothesized that choice will lead to less satisfaction with the decision, more postdecisional regret, and more revocation of the decision.

Participants performed two tasks. The first task required them to rate the desirability of 81 jobs, each of which was described on five different dimensions. The second task was a computerized version of the information board described above. Participants went through four sets of displays in which they made choices or judgments about five jobs, each of which was described on five dimensions.

Results supported hypothesis one in the same manner as Billings and Scherer (1988) and need not be reiterated. Hypothesis two was only partially supported due to the overwhelming effect of the job salary attribute. Response mode did not affect the choice of optimal alternatives, thus hypothesis three was not supported. Finally, postdecisional regret and dissatisfaction were unaffected by response mode. However, participants in the choice mode were significantly more likely to want to go back and pick a lower-paying job than were participants in the judgment mode.

Westenberg and Koele (1992) attempted to distinguish the source of response mode effects from three competing hypotheses. The prominence hypothesis (Slovic, 1975) suggests that choice is based on the selection of the alternative superior on the

most important attribute, whereas judgment requires more compensatory evaluation. By selecting such an alternative in choice, one can avoid the mental strain of performing any compensatory evaluation and can still justify one's choice to one's self and others. The compatibility hypothesis (Lichtenstein & Slovic, 1973) suggests that attributes expressed in a manner similar to the format required for the response will be weighted more in processing. Two reasons support this hypothesis. First, the importance of compatibility may be highlighted by the response mode. Second, converting a set of attributes to a format useful for compensatory evaluation requires additional mental effort.

Westenberg and Koele advanced a third hypothesis which suggests that response modes lie on an information processing continuum with judgment and compensatory evaluation at one end and choice and non-compensatory evaluation on the other. They go on to suggest, in line with Beach and Mitchell (1978) and Payne (1982), that response mode effects result from attempts to minimize effort where possible. This can be done in choice, and so simpler strategies are selected. Judgment tasks require explicit evaluation of each alternative. They therefore offer less opportunity to minimize effort and use simple strategies, hence the response mode effect.

Westenberg and Koele (1992) examined the effect of a set of response modes (selecting/choice, rejecting, classifying, and ranking/judgment) and information load (high vs. low) on the use of decision rules as reflected by process tracing. Since

judgment and choice are of paramount concern here, the other response modes will be excluded from discussion.

Results indicated no effect for response mode on depth of search. Curiously, all participants looked at a very high proportion of information. Response mode resulted in a main effect on variability and pattern of search, both in the expected directions. Analysis of the decision strategies revealed that participants in the choice mode with low information load used compensatory evaluation models more than in the high information load. For both types of information load, however, judgment resulted in more use of compensatory evaluation models than did choice. The researchers interpreted the results as supporting their hypothesis of a response mode continuum.

Taken as a set, the studies reported above illustrate powerful effects for response mode on decision processes. When asked to make a choice, participants tend toward quicker, non-compensatory processes (Billings & Scherer, 1988, 1991; Westenberg & Koele, 1992). When asked to make a judgment, however, decision-makers must employ some degree of compensatory evaluation, depending on the number of alternatives under consideration (Westenberg & Koele, 1992).

Response mode research offers clear implications for organizational decision-makers. Selecting employees under choice is unlikely to result in consistently offering jobs to the most valuable applicants. Since judgment requires consideration of more data, the most valuable applicants will probably be uncovered. Given that these

outcomes are a function of task instructions, the implications for organizations should be quite clear. Requiring explicit evaluations of each applicant for a job will ultimately maximize the organization's utility, at practically no cost other than decision time.

Influences on Decision Strategies

The results presented above provide compelling evidence that the effects of response mode on decision-making are robust. It is particularly interesting that decision strategy can be affected by something so innocuous as a simple change in instructions. Payne (1982) and Ford et al. (1989) list several categories of influences on decision processes. Task effects, such as response mode, focus on the structural characteristics of the problem. Context effects pertain to the values inherent in the objects of the decision or their attributes. Finally, person characteristics, such as affective state, are likely to play a role, although Ford et al. (1989) noted a paucity of relevant research.

The former two influences listed above imply easily manipulated variables and therefore have been researched extensively. Person characteristics, however, represent a more subtle effect. Recent work in the study of affect suggests that decision strategies are influenced by a subject's affective state (Forgas, 1989, 1991; Isen & Means, 1983; Mano, 1992). Further, several researchers have suggested that mild, naturally occurring affective states such as pleasantness have fairly predictable, pervasive effects on decision processes (Isen, 1984, 1987; Lewinsohn & Mano, 1993;

Mano, 1992). As will be shown, these effects are not unlike those of response modes.

Affective State Theory

Unfortunately, little theory directly relates affective states to multiattribute decision-making. However, several theorists have advanced claims relevant to this discussion. Lewinsohn and Mano (1993) and Mano (1992) suggested that two processes underlie affective influences in decision making. First, they posited that participants experiencing positive affect use more elaborate strategies because they perceive the decision task as something to enjoy. In contrast, Isen (1987) suggested that persons who are feeling good may be more likely to use heuristics in order to maintain their good mood. The type of decision appears to play an important role here. One would probably spend more time selecting a gift to receive than choosing among brands of laundry detergent. Second, Lewinsohn and Mano (1993) and Mano (1992) stated that high arousal restricts attention and prevents the use of mental processing resources on the decision task.

Affective State and Problem Solving

Problem solving research indicates significant affective influences on cognitive processes. In a set of experiments, Isen, Daubman, and Nowicki (1987) found that participants experiencing positive affect were more likely to find creative solutions to problems than participants experiencing neutral affect (Experiments 1, 2, and 3) or negative affect (Experiment 2). The authors interpreted their results as suggesting that

positive affect defocuses the participants' attention enough to allow them to see more possible connections between stimuli. Green and Noice (1988) performed a similar study of problem solving with adolescents and also found facilitative effects for affective state on problem solving.

Kavanagh (1987) asked participants to imagine vivid happy or sad occasions in their lives while playing them selections of music to help evoke the associated affective states. A third group of participants listened only to a tape of instructions. Participants then performed an anagram-solving task. Happy participants persisted at the anagram task longer and found more solutions than did sad participants. This research provides further support for a facilitative role of affect in problem solving.

Knapp and Clark (1991) reported a pair of studies in which participants experiencing happiness, sadness, anger, or no emotion performed a resource dilemma task. In this task, participants gained credit for fish taken from a pool over a series of trials. The stock of fish regenerated in proportion to the number remaining. Negative moods (sadness and anger) led participants to cash in more fish in early trials than the pool could support. The authors interpreted this as indicating that negative affect results in an inability to delay gratification. As a result, participants make suboptimal decisions.

Taken as a whole, then, these studies show a fairly reliable influence for affect on problem solving. Positive affect facilitates problem solving, while negative affect results in less inspired behavior.

Affective State and Decision Processes

Isen and Means (1983) reported a seminal study on affective state and decision processes. This experiment attempted to determine whether participants experiencing positive affect try to maintain their good moods by using more simplifying strategies in multiattribute decision-making. Further, the researchers assessed the quality of these decisions compared to those made by control participants.

Participants in this experiment first performed an ostensibly unrelated perceptual-motor task and received either no feedback (control) or bogus highly positive feedback (positive affect group). They then performed an automobile selection task using an information board containing nine attributes each for six cars and were told to choose a car. The experimenters collected verbal protocols while the subject performed the task.

Results produced by this experiment were striking. Positive-affect participants took significantly less time to come to a decision than did neutral-affect participants. Furthermore, they looked at less information overall and at significantly fewer classes of attributes than did neutral-affect participants. Examination of sample verbal protocols confirms that participants in the positive affect group appear to have relied on a non-compensatory evaluation model. Further, neutral affect group strategies appear much more compensatory. The researchers examined decision quality as

degree of similarity to a personally optimal choice and found it equal across affective states.

The overall pattern of results suggests that the experience of positive affect creates an almost-exclusive preference for non-compensatory decision strategies typical of the choice response mode. As in Westenberg and Koele's (1992) low information load and choice mode condition, neutral participants tended to use a balanced assortment of compensatory and non-compensatory decision processes. Taken together, positive and neutral affect bear an arresting resemblance to choice and judgment response mode effects on decision strategies.

Forgas (1989) evaluated the effect of mood (happy, neutral, or sad, induced by false feedback) and personal relevance of the decision (relevant or irrelevant) on decision-making strategies in choosing a partner. As in Isen and Means (1983), participants in a positive mood finished significantly faster than those in a negative or neutral mood. Sad participants eliminated fewer units, requested information more frequently, and considered more information of low relevance than did those in the happy or neutral conditions. Analysis of decision strategy revealed that happy participants more often used elimination by alternatives (a noncompensatory rule) than did sad participants. Mood did not influence decision strategy when the decision was personally relevant, a finding similar to Billings and Scherer's (1988) effect for decision importance.

Forgas (1991) replicated the research described above on the effect of affect on speed of processing. He also found that, for impersonal decisions, all participants tended to use noncompensatory decision strategies (Experiment 2), similar to the effect of the choice mode. However, in Experiment 3, participants in positive moods employed compensatory evaluation models less than participants in negative moods, as in Isen and Means (1983).

Negative Versus Neutral Affect

Isen (1987) suggested that cognitive effects due to negative affect are not necessarily exact opposites of those for positive affect. However, research by Forgas (1989, 1991) supports the assumption that positive and negative affect do indeed lead to opposite effects on the type of task employed here. The role of neutral affect, in comparison, is more enigmatic. Isen and Means (1983) found a significant difference between positive and neutral affect for decision time and information search. Forgas (1989, 1991, Experiments 2 and 3) found that participants in negative or neutral moods (control participants) did not differ in amount of time taken to reach a decision. However, participants in negative moods reexamined information they had previously seen more often than positive- or neutral-mood participants, with the latter groups showing no significant difference (Forgas, 1989). Finally, both positive and negative affect participants differed significantly in decision strategy (Forgas, 1989). Neither group differed significantly from the neutral affect participants, however. It is difficult to predict the role of neutral affect. Previous

research, however, shows clear effects for positive and negative affect. For this reason, the proposed experiment employs only positive and negative affect conditions.

Summary of Affect and Decision Making

The above studies illustrate a powerful influence for affect on decision processes. Participants experiencing positive affect appear to rush through the decision, confident in their ability to select the best alternative (Forgas, 1989, 1991; Isen & Means, 1983). Participants experiencing neutral (Isen & Means, 1983) or negative affect (Forgas, 1989, 1991), tend to be more careful and compensatory, if not overly efficient, in their decision making.

Forgas (1989, 1991) found that personal relevance of the decision somewhat reduced effects due to affective state. Assuming personal relevance is analogous to a broader construct of decision importance, it appears that even ecstatic personnel managers are likely to give due consideration to an employee selection decision. On the other hand, while the role of affect in decision processes was mitigated, it still had a noticeable effect. Therefore, concluding that personnel managers are likely to consider their decisions so important as to circumvent affective influences would be ill-advised.

The role of affect in decision-making appears to run counter to its role in problem solving, as outlined above. Most notably, participants experiencing positive affect persist at problem solving tasks, but rush through decision making tasks. This

conflict is probably due to differences in the underlying tasks. Participants probably found the problem solving tasks more engaging than the decision making tasks. The fact that Sunday newspapers generally contain a page of problems to solve (such as anagrams) and not a page of decisions to make attests to this. Further, Isen (1987) suggested that participants experiencing positive affect tend to rely greatly on heuristics. Use of such heuristics speeds processing in the choice problems outlined above, but may provide less assistance in the problem solving tasks where insight is necessary.

Summary and Hypotheses

From the research presented above, two trends are clear. First, response modes are robust in their effects on decision strategies. The judgment mode necessarily leads to extensive use of compensatory processes. The choice mode may result in the employment of compensatory or non-compensatory evaluation models, subject to other environmental or personal constraints or facilitators.

Strong variations in decision processes are unlikely to occur when task or context cues encourage high-quality decisions. In such cases, compensatory processes will be used. The judgment response mode, for example, forces a higher quality decision because participants must evaluate all alternatives. Context cues related to decision importance (Billings & Scherer, 1988) or personal relevance (Forgas, 1989, 1991) also result in compensatory decision processes in a choice

mode, because it is intuitively understood that better decisions result from consideration of all relevant information.

When there are no such task constraints and a choice is solicited, decision processes are open to influence by personal variables, such as affect. According to Forgas (1989, p. 211), the non-compensatory nature of happy participants' decision strategies arises from "the greater self-confidence and boldness of people to ignore or 'skip' information seen as less important." A task demand such as a judgment response mode should at least partially overcome the tendency of happy participants to choose non-compensatory decision strategies. Previous research delineated affective influences in choice. However, no research yet has examined affective influences in judgment. The present experiment, then, breaks new ground by examining the combined effects of response mode and affective state on decision processes.

Hypotheses

Information evaluation models. Based on the arguments presented immediately above, response mode and affective state should interact as follows. Participants experiencing positive affect under a choice response mode will exhibit the least amount of compensatory information evaluation. Hypothesis 1a, then, is that search variability will be highest for participants in the positive affect-choice mode condition. Hypothesis 1b is that depth of search will be lowest for participants in the positive affect-choice mode condition.

Time. Forgas (1989, 1991) and Isen and Means (1983) found participants experiencing positive affect completed choice tasks significantly faster than participants in other conditions. As noted above, this effect likely stems from these participants' predominant use of non-compensatory information evaluation. Since non-compensatory evaluation is also endemic to the choice response mode, Hypothesis 2 is an interaction between response mode and affective state such that participants in the positive affect-choice mode condition will spend the least amount of time on the task.

Information search patterns. No formal hypotheses are advanced for information search patterns. However, when search pattern index is combined with search variability, participants' decision rules may be examined. It would be instructive to examine participants' use of decision rules relative to the experimental condition to which they belong. Exploratory Question 1 is to explore decision rule use across conditions.

Redundant information searched. As noted above, Forgas (1989) found that participants experiencing negative affect reexamined information they had already seen more often than did other participants. Redundant information search has not, to the knowledge of the author, previously appeared in information board research. Given the limits of working memory, redundant information search may offer some alternate indication of information evaluation models and is therefore included for exploratory purposes as Exploratory Question 2.

Pilot Study 1

Method

As noted above, the variability of number of items of information searched and the depth of information searched play key roles in determining a participant's information evaluation model. Both variables will assume constant values if participants' curiosity leads them to examine all available items of information prior to making their decisions. In such cases, search variability would be zero and search depth would be 100%. These variables would therefore be of no use in distinguishing differences in information evaluation models across conditions.

Two methods are available for reducing this behavior. Either additional trials may be employed (e.g., Billings & Scherer, 1988), or the load of information available to the participants may be increased (e.g., Olshavsky, 1979). The former strategy assumes that participants will eventually tire of examining all of the information. The latter strategy forces participants to consider at the outset that there may be more information to examine than they wish.

The first pilot test examined the efficacy of using a high information load to prevent a ceiling effect of search depth. The high information load strategy was employed for several reasons. First, sessions in the Billings and Scherer (1988) experiment lasted 75 minutes. Given that the manipulation of affect requires some time, the addition of trials might make the experimental sessions last an inordinately long time. Second, the point at which participants determine that it is no longer

worthwhile to look at every item of information is a question for empirical study.

Because the placement of the affect manipulation depends on this assurance, it is simpler to raise the information load and avoid conducting an additional pilot study.

Participants and Design

This experiment employed 50 undergraduates participating for course credit. Participants were randomly assigned by the computer to either the choice or judgment response mode conditions (explained in detail below). In all, 17 participants were assigned to the judgment mode and 33 participants were assigned to the choice mode.

Task

The task employed was to choose a professor using a computerized information board similar to that described by Payne, Bettman, and Johnson (1993) and Westenberg and Koele (1992). Each information board contained 8 possible professors, each of which was described by a set of 16 ratings similar to those used for evaluating instructors. The ratings were derived so that no professor dominated any other on all attributes. The attributes and attribute levels are reproduced in the Appendix.

To obtain information on an attribute of a particular alternative, the subject placed the mouse cursor over the box in the grid where the attribute and the alternative intersect and clicked a mouse button. The desired information appeared onscreen for the duration of time that the mouse button remained depressed.

Participants in the choice response mode were instructed to type the initials of the professor they would choose in a box on the right side of the screen. Participants in the judgment response mode had to type in an overall rating from 1 to 100 (where 100 is the top rating) for each professor in a box at the bottom of the screen, as well as choose a professor.

Procedure

After entering the test area, the purpose of the experiment and the nature of the task was explained to the participants. They were then seated at computers in individual rooms. A short tutorial screen prior to the main task helped ensure that participants had a basic understanding of the task. Participants performed six trials separated by a break after the third trial in which they viewed a short film clip.

Results and Discussion

Search depth was calculated for each trial as a proportion of the amount of information examined to the total amount of information available. Table 2 displays the search depth means for participants across trials. Consultation of Table 2 illustrates that no ceiling effect is evident. These results suggest that a high information load successfully discouraged participants from capriciously examining all available items of information.

Table 2

Mean Search Depth by Response Mode and Trial

Response Mode	Trial					
	1	2	3	4	5	6
Judgment	.66	.50	.39	.38	.35	.31
Choice	.20	.17	.14	.15	.16	.14

Note. Search depth expressed as a percentage of total information available

Pilot Study 2

Method

Prior research details a number of manipulations of affect, including the Velten technique (e.g., Lewinsohn and Mano, 1993), false test feedback (e.g., Forgas, 1991, 1993; Isen & Means, 1983), and film clips (e.g., Isen & Daubman, 1984; Isen, Daubman, & Nowicki, 1987). The film clip method was chosen due to its ease of implementation and prior success (e.g., Isen, Daubman, & Nowicki, 1987; Kraiger, Billings, & Isen, 1989). The present pilot study was performed to determine which films should be used to induce positive and negative affect. Measurement of affect was accomplished using a questionnaire devised by Scherer, Butler, Reiter-Palmon, and Weiss (1994), which is described in the primary study below.

Participants

Fifty-eight undergraduates participated in this experiment for course credit.

Materials

Clips from four films were tested. The films expected to induce positive affect were Ferris Bueller's Day Off and Groundhog Day. The films believed to bring about negative affect were Midnight Express and Old Yeller. The duration of the film clips ranged from 12 to 14 minutes.

Procedure

Upon entering the testing area, the participant was greeted and the purpose of the study was explained. After entering some demographic information onto the

response sheet, participants viewed the assigned film clip. At the conclusion of the film clip, participants responded to the affect questionnaire.

Results and Discussion

Five subscale scores were developed for each participant based on the aforementioned factor analysis. Reliability analyses led to the deletion of five items due to unreliability. Cronbach's alpha for the subscales were .96 for negative arousal, .77 for positive arousal, .88 for elation, .69 for fear, and .54 for boredom.

One-way analysis of variance (ANOVA) was performed on each of the five subscales. In addition, four a priori comparisons were specified such that each positive-affect film was compared with each negative-affect film for each of the five subscales. Two participants were deleted from further analyses due to extreme response patterns that resulted in threats to the assumption of homogeneity of variance. One subject was deleted because of a lack of clarity as to which film was viewed. The remaining cell sizes were 13 for "Ferris Bueller's Day Off", 15 for "Groundhog Day", 14 for "Midnight Express", and 13 for "Old Yeller". Due to the unequal cell sizes, the multiple comparisons employed separate variance estimates in calculating the t-tests.

The crucial subscales to consider are negative arousal, positive arousal, fear, and elation. Of all combinations of positive-affect and negative-affect films, only "Ferris Bueller's Day Off" and "Midnight Express" elicited the desired combination of scores. "Ferris Bueller's Day Off" elicited less negative arousal than "Midnight

Express" ($M = 38.461$ and 63.286 , respectively; $t(51) = 4.993$, $p < .001$), more positive arousal ($M = 11.231$ and 16.385 , respectively; $t(50) = 3.157$, $p < .005$), more elation ($M = 16.923$ and 37.231 , respectively; $t(50) = 7.188$, $p < .001$), and less fear ($M = 16.000$ and 19.786 , respectively; $t(50) = 2.069$, $p < .05$). A significant difference for boredom across films would suggest that participants found one film less engaging than the other. This would clearly be an undesirable situation. No significant difference appeared between "Ferris Bueller's Day Off" and "Midnight Express" on the boredom subscale ($M = 13.769$ and 15.500 , respectively; $t(51) = 1.225$, $p > .05$). Given this encouraging patterns of results, these films were selected for the present research.

Note that arousal differences across the two films suggest that any differences achieved in the present study may be attributable to arousal, instead of affect. Indeed, few of the studies reviewed above paid any attention to separating the effects of arousal and affect. Correlations between the dependent variables and the affect endurance check (described below) will provide an indication of the nature of these effects.

Primary Study

Method

Participants and Design

The present experiment employed a 2×2 (Response Mode x Affective State) between-participants design. One hundred undergraduate psychology students

participated in the present experiment and were randomly assigned to conditions. Given a “large” effect size of .40 (Cohen, 1988), a sample size of 100 results in an acceptable level of power at .80. Similar response mode research (e.g., Billings & Scherer, 1988; Westenberg & Koele, 1992) used a comparable sample size and found statistical significance. As a result, a sample size of 100 participants appeared suitable. Participants were given course credit for their participation.

Task

The task employed was the “selecting a professor” task described in Pilot Study 1. To reiterate, participants were presented with a computerized grid of information to view in order to make their decisions. The grid contained eight alternatives (the professors), each of which was described by sixteen attributes. Participants viewed information by clicking a mouse button on the intersection of the alternative and the attribute. Choices of professors were recorded in a box on the right side of the screen. Ratings of professors (for participants in the judgment response mode only) were entered in boxes at the bottom of the screen, beneath a professor's name.

Manipulation of Independent Variables

Response mode. In the choice condition, participants were told to select the applicant they felt would perform the best as a professor. In the judgment condition, participants were told to rate all applicants and then select the best candidate. This followed from Billings and Scherer (1988) and ensured that the only difference

between the two response modes is that one group of participants must make explicit judgments of the alternatives.

Affect. Affect was manipulated by having participants view a short film clip. Participants in the positive affect condition viewed a clip from “Ferris Bueller’s Day Off.” Participants in the negative affect condition viewed a segment from “Midnight Express.” These films were selected based on Pilot Test 2. As a check on affective state endurance, participants filled out a 42-item semantic differential scale described below.

Dependent Variables

Affect endurance check. Affect was measured using an affect questionnaire employed in previous research (Scherer, Butler, Reiter-Palmon, & Weiss, 1994). The questionnaire consists of 42 affect adjectives in a semantic differential format. Factor analysis revealed five main factors underlying the scale: negative arousal (original $\alpha = .90$), positive arousal (original $\alpha = .63$), elation (original $\alpha = .74$), fear (original $\alpha = .86$), and boredom (original $\alpha = .80$). The pair of films to be chosen were those which demonstrated the greatest discrepancies in the appropriate scales. For example, the film used in the positive affect condition should induce greater positive arousal and elation than the one used to induce negative affect. Similarly, the film used for negative affect should result in more negative arousal and fear than the positive affect film.

Information evaluation models. Compensatory evaluation suggests that participants are combining information across attributes in order to make their decisions (Abelson & Levi, 1985). Under noncompensatory evaluation, attributes are compared independently. With the information board technique, two variables are related to information evaluation, variability of search and depth of search (Payne, 1976).

Variability of search was calculated as the standard deviation of the number of items searched per alternative for a given trial. Low search variability suggests that participants integrate a constant range of information for each alternative, indicating compensatory evaluation. High search variability, then, reflects noncompensatory processing.

Depth of search was calculated as the amount of information examined as a percentage of the total amount of information available. High search depth indicates compensatory evaluation, since it appears that the participant is attempting to get as complete a view of the alternatives as possible. Low search depth, then, implies noncompensatory search.

Information search pattern. Search pattern is an attempt to classify participants' information search as alternative-based or attribute-based (Svenson, 1979). It was calculated as the number of moves from one attribute to another within an alternative (alternative-wise search) minus the number of moves from one alternative to another (attribute-wise search), all divided by the sum of the moves

(Payne, 1976). A positive pattern index indicates more information sought within alternatives, while a negative pattern index reflects more information examined by attribute. The information search pattern is calculated for each trial, for each participant.

Time. Search time was calculated as the total amount of time in seconds that a subject spends examining information per trial.

Redundant information searched. Redundant information was counted as the total units of information that a subject requests to see after having previously viewed them.

Procedure

Participants were tested individually in a session lasting approximately 60 minutes. After participants entered the test area, the experimenter explained the purpose of the experiment and the nature of the task. They then sat down at the computer and viewed a tutorial demonstration to give them a basic understanding of the task. The tutorial demonstration also included the response mode manipulation. Next, participants performed a sample trial of the task. Upon completion of this trial, the affect manipulation was administered, followed by the two experimental trials. After completing the experimental trials, the participants completed the affect endurance check. Finally, they were debriefed and thanked for their participation.

The reasoning behind the placement of the affect manipulation is as follows. Interviews with several participants in Pilot Study 1 suggest that the task was highly

engaging. Although the tutorial demonstration is complete, it is apparent that participants need a full practice trial before they are comfortable with the task. For this reason, the affect manipulation could not come before the first experimental trial, lest it be “washed away” by participants' attempts to learn the task.

Data Analysis

Analysis of variance (ANOVA) was employed to test hypotheses 1a, 1b, 2, and 4. Hypothesis 3, which concerns analysis of the composition of decision rules across groups, was analyzed using the chi-square statistic.

Results

To recap, this experiment was conducted to verify an hypothesized interaction between response mode and affective state such that participants experiencing positive affect and a choice mode will demonstrate less effortful decision making than participants in other conditions. This tendency will be reflected in standard process tracing variables, including search variability, search depth, and trial time. To simplify discussion of the results, participants in the judgment and choice conditions will be referred to as “judgment participants” and “choice participants,” respectively.

Hypothesis 1a: search variability. This hypothesis suggested an interaction between response mode and affective state such that choice participants experiencing positive affect will exhibit higher search variability relative to

participants in other conditions. Table 3 displays the means and standard deviations for search.

variability for the experimental trials. Table 4 shows the results of the ANOVA for these trials, which are also displayed graphically in Figures 1 and 2.

Review of Tables 3 and 4 reveals highly significant main effects for the response mode manipulation across both experimental trials. Choice participants varied more in the amount of information they examined per alternative than did judgment participants, regardless of the manipulated affective state. As a result, hypothesis 1a is not supported.

Hypothesis 1b. This hypothesis proposed an interaction of response mode and affective state where depth of search will be lowest for choice participants in the positive affect condition. Table 5 reveals the means and standard deviations, and Table 6 shows the ANOVA results for the experimental trials. Unfortunately, the homogeneity of variance test reveals significant differences in within-cell variance across cells for Experimental Trial 2 (Cochran's $C_{(24,4)} = .68, p < .001$). As a result, conclusions based on this analysis should be made with caution. However, the pattern of results is similar to Experimental Trial 1. Figures 3 and 4 depict in graphic form the relationships between the means.

As with Hypothesis 1a, only the main effect of response mode achieved significance. Judgment participants examined a significantly higher proportion of the available information than did those participants called upon merely to choose

Table 3

Search Variability as a Function of Response Mode and Affect

	Affect Manipulation	
	Positive	Negative
Experimental Trial 1		
Judgment Mode		
<u>M</u>	1.84	1.80
<u>SD</u>	1.54	1.78
Choice Mode		
<u>M</u>	3.41	3.14
<u>SD</u>	1.76	1.81
Experimental Trial 2		
Judgment Mode		
<u>M</u>	2.43	2.10
<u>SD</u>	1.84	1.79
Choice Mode		
<u>M</u>	4.02	4.41
<u>SD</u>	1.91	1.88

Note. The values represent the standard deviation of the number of items searched per alternative.

Table 4

Analysis of Variance of Search Variability

Source	df	F	
		Experimental Trial 1	Experimental Trial 2
Response Mode (RM)	1	27.59***	17.75***
Affect (A)	1	.01	.21
RM x A	1	.95	.10
Error	96	(3.45)	(2.97)

Note. Mean square errors enclosed in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1. Mean search variability in experimental trial 1 as a function of response mode and affect manipulations.

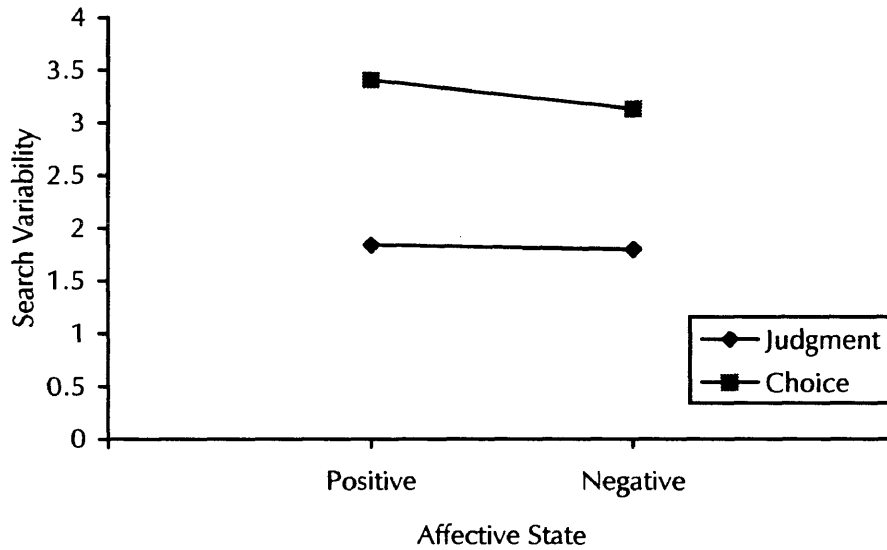


Figure 2. Mean search variability in experimental trial 2 as a function of response mode and affect manipulations.

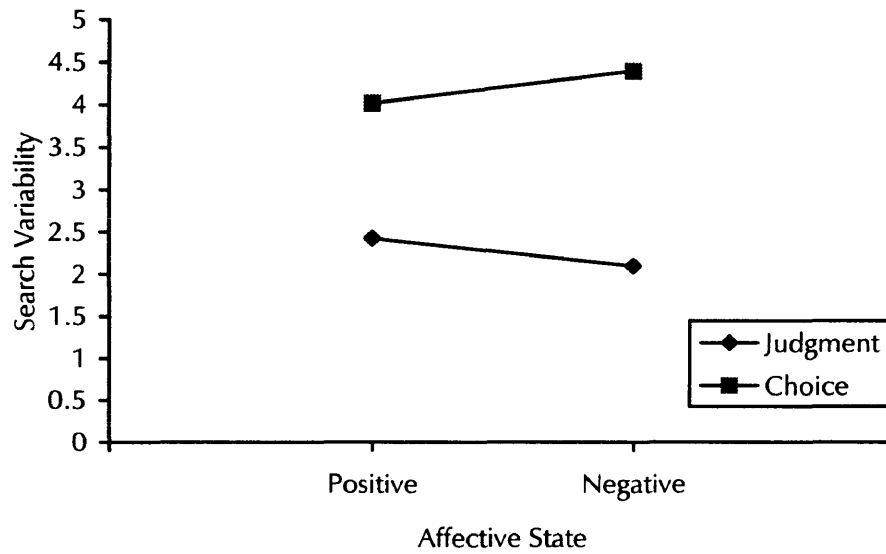


Table 5

Search Depth as a Function of Response Mode and Affect

	Affect Manipulation	
	Positive	Negative
Experimental Trial 1		
Judgment Mode		
<u>M</u>	.63	.65
<u>SD</u>	.19	.19
Choice Mode		
<u>M</u>	.48	.21
<u>SD</u>	.48	.19
Experimental Trial 2		
Judgment Mode		
<u>M</u>	.56	.65
<u>SD</u>	.23	.53
Choice Mode		
<u>M</u>	.41	.35
<u>SD</u>	.18	.21

Note. The values represent the amount of information examined as a percentage of the total amount of information available.

Table 6

Analysis of Variance of Search Depth

Source	df	F	
		Experimental Trial 1	Experimental Trial 2
Response Mode (RM)	1	15.32***	12.55***
Affect (A)	1	.03	.07
RM x A	1	.03	1.32
Error	96	(.04)	(.10)

Note. Mean square errors enclosed in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 3. Mean search depth in experimental trial 1 as a function of response mode and affect manipulations.

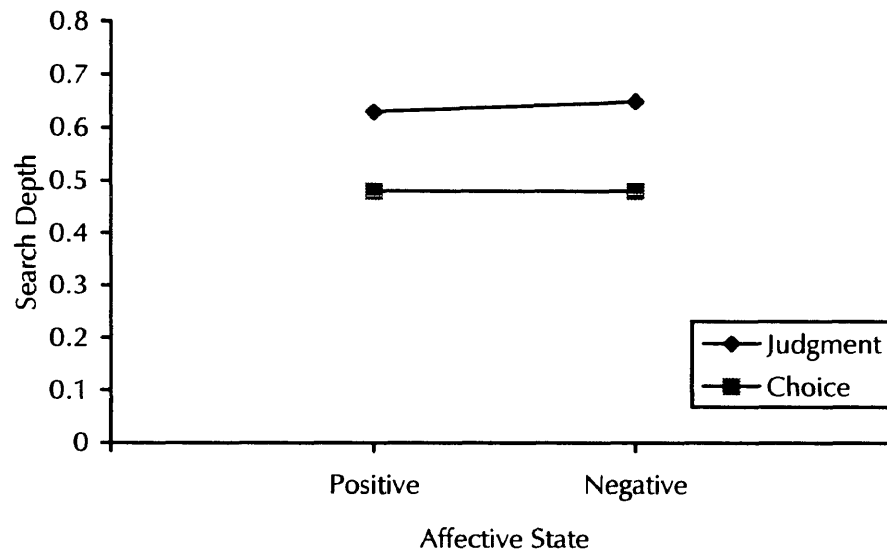
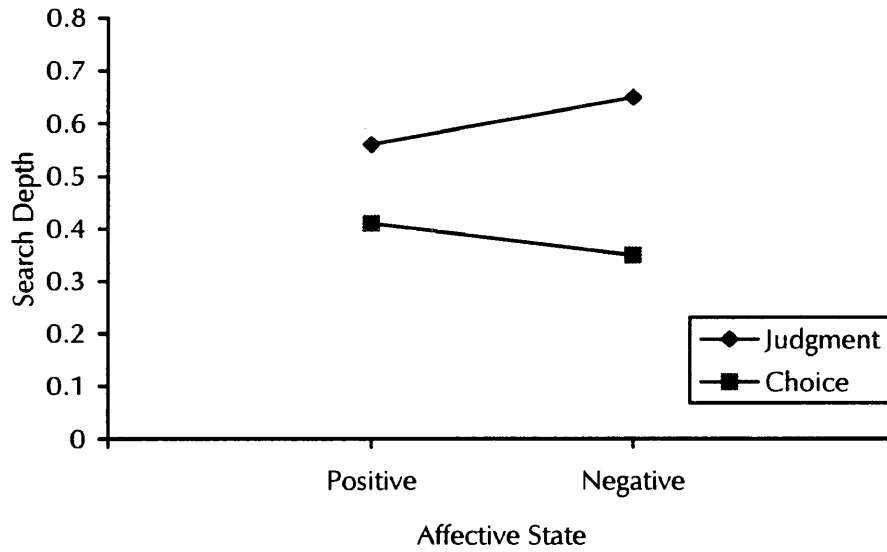


Figure 4. Mean search depth in experimental trial 2 as a function of response mode and affect manipulations.



among the alternatives. Again, manipulated affect held no sway. The lack of interaction between the independent variables results in no support for hypothesis 1b.

Hypothesis 2. The present hypothesis proposed an interaction such that choice participants in the positive affect condition would spend the least amount of time on the task. Means and standard deviations are presented in Table 7. Table 8 reflects ANOVA data relevant to this hypothesis. The relationships are depicted graphically in Figures 5 and 6.

Once again, the main effect for response mode was the only one to reach significance. Judgment participants took significantly longer to make their decisions than participants in a choice mode. Hypothesis 2, therefore, is not supported.

Exploratory Question 1. Information search patterns are presumed to reflect decision-makers' thought patterns and strategies. The original intent was to examine the differences between search patterns across experimental conditions. However, further investigation of the data reveals that information search patterns were remarkably invariant across experimental conditions. Participants overwhelmingly preferred noncompensatory search patterns. Across all conditions, the greatest proportion of compensatory search patterns was found in experimental trial 1, in which they were employed by 15% of participants. Given the lack of variability of search patterns and that an exploration of alternative- vs. attribute-wise search

Table 7

Trial Time as a Function of Response Mode and Affect

	Affect Manipulation	
	Positive	Negative
Experimental Trial 1		
Judgment Mode		
<u>M</u>	471.24	500.84
<u>SD</u>	174.55	260.65
Choice Mode		
<u>M</u>	343.24	282.96
<u>SD</u>	230.82	110.77
Experimental Trial 2		
Judgment Mode		
<u>M</u>	409.32	395.96
<u>SD</u>	150.80	213.81
Choice Mode		
<u>M</u>	282.44	270.76
<u>SD</u>	148.53	159.55

Note. The values represent the amount of time spent, in seconds, per trial.

Table 8

Analysis of Variance of Trial Time

Source	df	F	
		Experimental Trial 1	Experimental Trial 2
Response Mode (RM)	1	18.24***	13.64***
Affect (A)	1	.14	.13
RM x A	1	1.23	.00
Error	96	(40988.79)	(28817.72)

Note. Mean square errors enclosed in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 5. Mean trial time for experimental trial 1 as a function of response mode and affect manipulations.

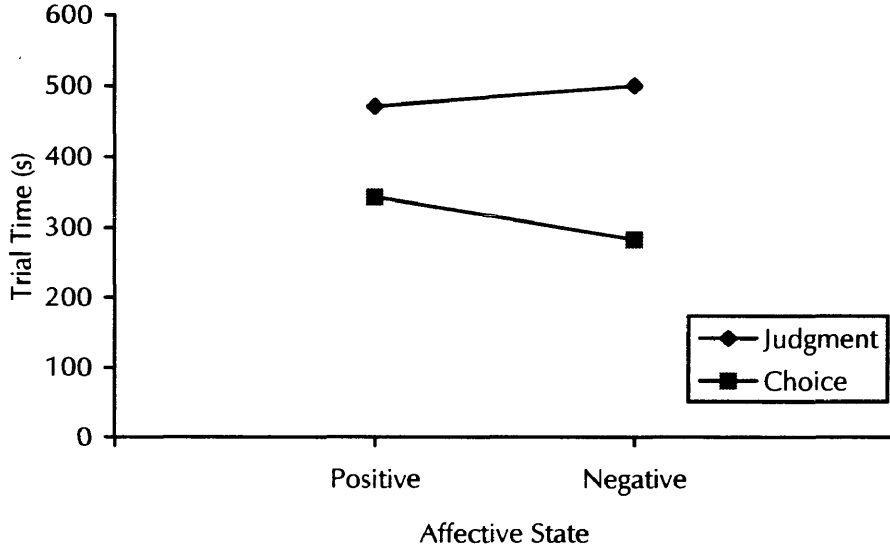
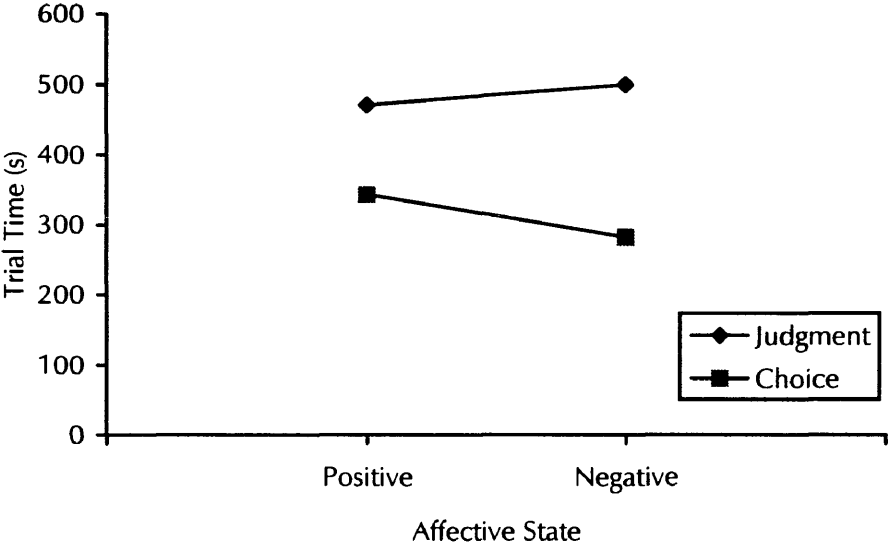


Figure 6. Mean trial time for experimental trial 2 as a function of response mode and affect manipulations.



patterns is unlikely to be very educative, no further exploration of Exploratory Question 1 is warranted.

Exploratory Question 2. It was felt initially that the amount of redundant information searched might provide some alternate indication of the influence of response mode and affective state on information evaluation models. Only the affect manipulation appeared to have any influence here. Consultation of the cell means (Table 9) and ANOVA results (Table 10) reveals a significant main effect for affect in Experimental Trial 2. The homogeneity of variance test failed for Experimental Trial 2 (Cochran's $C_{(24,4)} = .56, p < .001$), reflecting a great disparity between the within-cell variances. The analysis of variance, however, is relatively robust to violations of the assumption of homogeneity of variance (Pagano, 1990). The result of the F test should therefore be interpreted with caution, noting that the pattern of results is similar to that of Experimental Trial 1.

The results are displayed graphically in Figures 7 and 8. While the main effect was not significant in experimental trial 1, the means were in a similar direction. In both trials, participants under negative affect examined fewer redundant items of information than did participants under positive affect. Neither the response mode main effect nor the interaction of response mode and affective state were significant.

Exploration of Low F Values

In calculating an analysis of variance with data that meet all the assumptions of the statistic, one should calculate an F of 1 if there is, in fact, no effect. Review of the

Table 9

Redundant Information as a Function of Response Mode and Affect

	Affect Manipulation	
	Positive	Negative
Experimental Trial 1		
Judgment Mode		
<u>M</u>	47.52	48.68
<u>SD</u>	49.47	46.93
Choice Mode		
<u>M</u>	59.12	37.08
<u>SD</u>	59.77	33.19
Experimental Trial 2		
Judgment Mode		
<u>M</u>	33.36	18.88
<u>SD</u>	30.58	16.26
Choice Mode		
<u>M</u>	38.00	22.96
<u>SD</u>	45.28	20.81

Note. The values represent the number of unique items of information viewed more than once.

Table 10

Analysis of Variance of Redundant Information

Source	df	F	
		Experimental Trial 1	Experimental Trial 2
Response Mode (RM)	1	.00	.52
Affect (A)	1	1.17	5.92*
RM x A	1	1.44	.00
Error	96	(2331.04)	(920.62)

Note. Mean square errors enclosed in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 7. Mean of redundant information for experimental trial 1 as a function of response mode and affect manipulations.

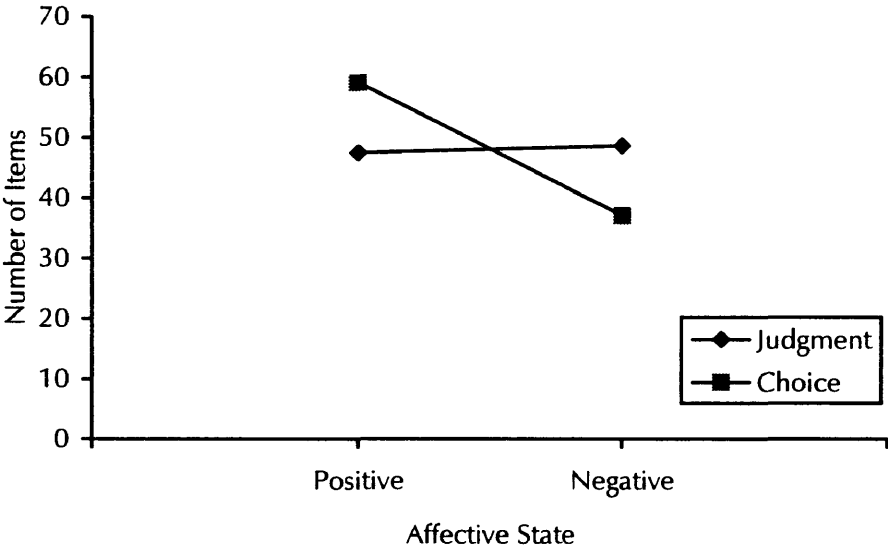
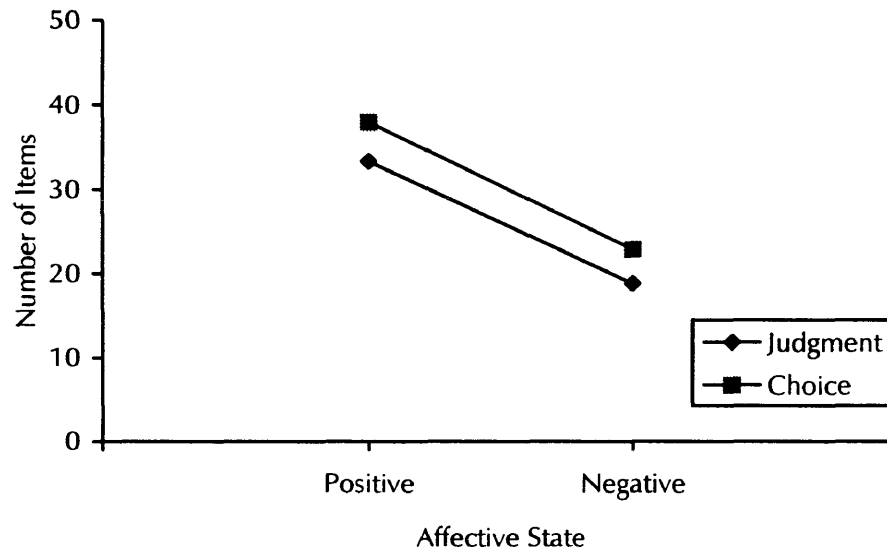


Figure 8. Mean of redundant information for experimental trial 2 as a function of response mode and affect manipulations.



statistics calculated above reveal a number of F values which seem to be rather less than 1. Shine (1982) notes that these F ratios can be tested by taking their reciprocal and testing the resulting value as an F with the degrees of freedom swapped. A significant result in this latter test indicates an invalidity in the data or the model. Since all ANOVA's calculated above have 1 and 96 degrees of freedom, testing the left tail of the F distribution would result in a critical $F_{96,1}$ of 253, the reciprocal of which is 0.004. As a result, any F values in the present research which are less than or equal to 0.004 are suspect. No such values were located.

Discussion

The present experiment attempted to demonstrate an interactive influence of response modes and affective states on decision processes measured via process tracing. Instead, response mode main effects dominated the analyses across hypotheses. The judgment mode resulted in longer trial times, greater search depth, and lower search variability across trials. Taken together, these findings suggest quite clearly, and in line with previous research, that the judgment mode leads to more effortful decision making than the choice mode.

Since the response mode manipulation was robust, the question then becomes, what happened to the influence of affect? Since pretests showed that the two films intended to influence affect had significantly different effects in the appropriate directions, the lack of significant findings for affect can be interpreted several different ways.

Interpretation of Results

The engaging task hypothesis. In designing the experiment, it seemed natural that making the task more interesting would encourage participants to pay more attention to making their decisions. The “selecting a professor” task was chosen for its relation to decisions commonly made by university students, thereby inferring some intrinsic interest. According to comments offered by a number of participants following the present experiment, the task was captivating indeed, and many wished that such an information board (with real professors) was available prior to course selection.

The selection of an engaging task followed from Billings and Scherer (1988), who used a resident advisor-selection task with participants who lived in the residence halls at the Ohio State University. Participants in that experiment uniformly rated the decision task as important, even when led to believe that their responses would not be used outside of the experimental context.

In contrast, information board-based tasks in previous research appear to be of less interest to participants. For example, participants in the Isen and Means (1983) study chose between fictitious cars, while those in the Lewinsohn and Mano (1993, Study 1) experiment chose between brands of soft-sided luggage. Objectively, these tasks are not particularly likely to captivate participants culled from a university subject pool. As a result, factors external to the task, such as affective states, were more likely to play a significant role in their behavior.

By this logic, it is possible that the task in this experiment was too engaging. The lack of variance across affect manipulations could then be attributable to the exertion required for the task “drowning out” the influence of affect, to some degree. In this scenario, participants became so focused on the task that their interest quickly drowned out any effects from the affect manipulation.

Another unintended effect likely due to the large information load is a reduced tendency for participants to engage in compensatory processing. Although a compensatory decision process would be indicated by participants examining as few as two attributes per alternative, it is rather unlikely that they would be so economical. However, given the large number of alternatives and attributes, any effort at a compensatory decision search would be very difficult beyond the first few attributes examined. As a result, the minimal amount of compensatory processing found in the present study appears attributable to the high information load placed on participants.

The effortful task hypothesis. To avert the possibility of participants examining every possible item of available information, this experiment employed a high information load. Specifically, the information boards contained 8 alternatives, each described by 16 attributes, for a total of 128 items of viewable information per board. As Table 2 shows, the high information load was effective in preventing participants from consistently examining the entire board. Across all experimental trials and

conditions, participants viewed a mean of 49.25% of all possible information, or approximately 63 items of information.

However, making more information available in order to discourage viewing it all may cause other, unintended effects. In particular, it does not appear unseemly to hypothesize that making more information available to participants will encourage them to be willing to consider more information in making their decisions. If one must choose a car given only the attributes of price, color, and fuel economy, then one can make such a decision in fairly good conscience. If, however, one is given a greater number of attributes for use in making such comparisons, one will likely be inclined to browse extensively. An increase in information considered naturally leads to a concomitant increase in cognitive resources allocated to the task. The net result is that participants concentrate on the task to such a degree that most if not all of their cognitive resources are allocated to the task such that other influences on their behavior are ignored.

The vanishing affect hypothesis. A third possibility in line with the first two is that the influence of the affective manipulation was not strong enough to remain robust through the experimental trials. Affect manipulations seem to be fairly short-lived in their effects. For example, Frost and Green (1982) found that participants' moods had significantly improved only 10 minutes after a manipulation inducing depression. Within the same time frame, the influences of a positive affect manipulation had vanished completely. Interestingly, participants spent the 10-

minute interval sitting quietly. If affect manipulations decay so quickly in the absence of a task, it is very likely that the presence of a task requiring a maximum of cognitive resources will hasten the process further. If this is so, there should be no differences in affect across cells by the end of the experiment, for participants will have been reduced to a neutral affective state by the combination of affect manipulation decay and task demands.

All three of the above hypotheses are viable and may operate in tandem. Data culled from the present experiment allow for some testing of them. It is quite clear that manipulated affect had no discernable influence on decision processes. However, this is not to say that affective state was not influential. It is quite possible that, independent of the affect manipulation, participants' affect influenced their decision processes. If the engaging task or effortful task hypotheses were to be supported, then there would be no relationship between the affect subscales and measures of the decision processes. However, if affect did indeed influence decision processes in a systematic way, there would be significant correlations between scores on the affect subscales and key measures of the decision process, such as search depth, search variability, trial time, and redundant information viewed. In fact, no consistent correlations were found across trials between scores on the affect subscales and the key process-tracing measures, lending support to the engaging and effortful task hypotheses. Since these two hypotheses have similar effects, it is not possible to distinguish further between them.

The vanishing affect hypothesis proposed that the manipulated affective state would quickly decay and be replaced by a neutral affective state. Analyses conducted on the affect scales completed following participation revealed significant differences in post-trial affect across cells. As a result, it appears that the vanishing affect hypothesis is unsupported, for participants were not experiencing similar affect at the end of the experiment.

To conclude, it appears that the task invited too much concentration to permit the subtle influence of affect, at least as manipulated through movie viewing, to enter. While this finding is to be taken into account in future research using information boards, it is certainly educational regarding the strength of affective influences in decision making. As noted above, most experiments examining affective influences on decision making employ tasks that are not particularly challenging or engaging. In these contexts, it is appropriate to suggest that affect will influence decision making, but with the caveat that the decision must not be one requiring a great deal of cognitive resources. Certainly, most decisions are of this nature. It's easy to see that one's affective state will influence decision processes in a choice of laundry detergents. However, decisions requiring more cognitive resources, such as a choice of plastic surgeons, appear from this study to be less susceptible to the whim of affect.

Limitations

In general, this study attempted to verify that affect influences decision making in the context of a task permitting variations in effort and decision strategy.

However, where the task demands a thoughtful, thorough approach to decision making, affective influences were hypothesized to be weakened or neutralized altogether. The present study used an information board as the basic task paradigm because it permits quantification of key aspects of information evaluation.

Additionally, an engaging task, selecting professors, was chosen to keep participants interested. The affect manipulation, Hollywood film clips, was chosen for its success in previous research. Though the above aspects of the experimental design were chosen for their appropriateness to the research question, each carries with it certain limitations to the type and breadth of conclusions that can be drawn from the results. The following discussion expands further upon these limitations.

Information boards. As noted above, the information available to the participants was structured into information boards to better track the patterns by which they examine it. This technique was made popular by Payne (1976) and is widely employed in a manner similar to that described here (e.g., "Mouselab", Payne, Bettman, & Johnson, 1993). However, the technique also presumes that information boards integrate into a natural decision process. This assumption is questionable.

While information boards function well as an aid in multiattribute utility calculations, their use presumes such a structured approach to the task. Indeed, by using such a technique to examine the processes by which participants make decisions, the experiment forces participants to adopt such processes themselves. Post-experiment comments by the participants indicated some unfamiliarity with such a structured approach to the task. Generally, those participants expressing opinions about the information boards noted that it seemed like a good way to make decisions and felt they had learned something in that regard.

The information board is therefore not a “transparent” way to track decision processes. While information boards enable researchers to systematically evaluate how people make decisions regarding multiple alternatives, they also force participants, to some degree, to make their decisions in a manner compatible with the information board. Conclusions about decision processes based solely on such studies are therefore unwarranted due to the confusion of task and process measure.

Engaging Task. The task employed in the present study, selecting a professor, was based on the author’s experience at another educational institution. At the beginning of each semester, the student council published a list of the professors, their overall teaching ratings, and the distribution of grades in their classes. Most students paid attention to the information presented in these publications, and undoubtedly this led to some hasty course and section changes each year. The

general idea of selecting a professor based on various criteria was then adapted and expanded to include a wide range of information to assist in the evaluation process.

While students at the present institution are not privy to the types of information described above, it seemed logical that they might still engage in some sort of informal polling of their fellow students as they selected their courses. Hence, it was believed that the participants in this experiment would find it a familiar, somewhat interesting task. Instead, the task appeared to engender rather more interest than it really warranted, as noted above. The concern here is that the interest generated by the task likely led participants to “explore” the available information instead of simply searching for the information necessary to make the decision. Presumably, a less-interesting task, such as a choice between brands of soft-sided luggage (e.g., Lewinsohn & Mano, 1993, Study 1), would lead to more systematic decision behavior.

Affect manipulation. The intent of the present study was to assess decision processes under common “day-to-day” positive and negative affective states. The manipulation of affect involved viewing evocative film clips from Hollywood movies—certainly nothing to pose an extraordinary emotional burden on the participant. As it turned out, the affect manipulation was overwhelmed by the difficulty or engaging aspect of the task, leading to the unfortunate conclusion that this experiment permits few inferences to be drawn about the role of affect in decision processes.

The affect manipulation used here strikes a difficult middle ground between more forceful or personal manipulations and no manipulations at all. In the former case, previous research has used more evocative films, such as depictions of Nazi concentration camps (e.g., Isen & Daubman, 1984), or more subjectively relevant manipulations, such as falsified task performance feedback (e.g., Forgas, 1989, 1991). Although professional issues prevented the use of such manipulations, their forcefulness may have been beneficial in the present experiment as a counterbalance to the strong task effect.

Alternately, a better test of the influence of “day-to-day” affect on decision processes would be simply to have no affect manipulation at all. In this scenario, participants would be divided into positive and negative affect groups based on their responses to the affect questionnaire. However, concerns about obtaining an adequate distribution of affect prevented such a quasi-manipulation. Also, given the demanding nature of the task, this latter strategy is unlikely to have worked, anyway, although it would have circumvented concerns that the manipulation was insufficiently powerful or enduring.

Lack of affect manipulation check. In designing the Primary Study, it was felt that including a manipulation check following the affect manipulation would sensitize the participants to the intent of the study. Given that the participant pool remained the same across the two experiments, the effects of the affect manipulation as measured in Pilot Study 1 were assumed to hold true for the Primary Study as well.

However, since the results of the affect endurance check only partially matched those of the affect manipulation check from Pilot Study 1, there is reason to regret the lack of a manipulation check in the Primary Study.

Additional helpful measures. As noted above, there are no data available to distinguish between the engaging and effortful task hypotheses. In hindsight, scales to measure these constructs would have been very helpful. The present author will make sure to include such measures in future research employing the paradigm described above.

Suggestions for Future Research

Information load. The lack of influence for the affect manipulation in the present experiment was partially attributed to the high information load placed upon participants. Although the loss of the affect manipulation prevented a true test of the hypotheses presented above, the discovery that a suitably high information load can help obliterate the influence of affect is intriguing in and of itself. This suggests a complex interplay between the task and other factors, such as contextual effects and characteristics of the decision maker.

Several possible follow-up studies spring to mind. The most obvious is a study identical to the present one, but employing a reduced information load. Should significant interactions be found in the hypothesized directions, the information load hypothesis for the lack of such effects in the present study would be supported. Further, such a finding would lay the groundwork for further exploration of possible

interactions between task factors (such as information load) and factors outside of the task, including affect.

Another follow-up study could address the information-board issue discussed in the limitations section above. One likely reason that participants were able to integrate so much information into their decisions was that the information was organized in an optimal manner for multiattribute decision making. Rarely in civilian life is information ever organized so conveniently. If participants were given a disorganized jumble of information (on a set of shuffled cue cards, for example) that was identical in content to the present study, they would probably have a more difficult time making their decisions. Indeed, they would likely look at less information, take less time, and display more non-compensatory processing, simply because there is a higher cost in effort to get that information. Similarly, their affective state would have more opportunity to play a role in their decision making because the task is not conducive to intense concentration. This study, too, would illustrate the interplay of task and extra-task factors.

Task changes. As discussed above, the “selecting a professor” task used in the present study is problematic. It was chosen in an attempt to strike a balance between internal and external validity—to study a decision typically made by the participants in a manner permitting observation and recording of many aspects of the decision process. However, since students at the present institution appear not to make such informed choices in the manner portrayed here, the link to external validity seems

weak. As well, since participants expressed such interest in the content of the task and likely spent some time exploring the information available, the internal validity of the experiment appears threatened as well. These problems could be easily overcome by changing to a less-engaging, but still somewhat personally relevant task, such as a choice of vacation destinations, and re-running the experiment.

Improved research methods. Since the present study was begun, further research into information boards has resulted in improvements to the paradigm. For example, Böckenholt and Hynan (1994) report that the Payne index (Payne, 1976) as employed in the present study misrepresents random information selection strategies as systematic, especially where the number of alternatives and attributes are not identical. They present an alternative methodology based on the chi-square statistic, and show how it improves on the Payne index. Use of such improved methodologies in future research can only enhance our ability to track and understand participants' decision behavior.

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Appendix: Attributes and Attribute Levels in the "Selecting a Professor" Task

Number of top ratings

10 students in last class gave professor highest overall rating

15 students in last class gave professor highest overall rating

20 students in last class gave professor highest overall rating

25 students in last class gave professor highest overall rating

Pages of reading per class

400 last semester

550 last semester

700 last semester

850 last semester

Number of courses taught

2

4

6

8

Years of experience

1

2

3

4

Average pages of notes

3.0 per class hour for a typical student

5.0 per class hour for a typical student

7.0 per class hour for a typical student

9.0 per class hour for a typical student

Average exam mark

90.0%

80.0%

70.0%

60.0%

Average reading per week

1.0 chapters

2.0 chapters

3.0 chapters

4.0 chapters

Average exams per course

2.0

2.5

3.0

3.5

Penalties for late essays

None

Minor

Moderate

Major

Grading style

Very easy

Easy

Moderate

Difficult

Distributes lecture notes

Never

Rarely

Sometimes

Regularly

Course pace

Very slow

Moderately slow

Moderately fast

Very fast

Types of visual aids used

Chalkboard with colored chalk

Overhead projector

Photocopied handouts

Computerized presentation

Class participation

Generally not encouraged

Mainly before exams

Only to ask or answer questions

Detailed discussion and debate

Typical student comment

Dull lectures and dull textbook

Good lectures but the textbook was tough to read

Learned almost everything from the textbook

Good lectures and good text

Attitude toward job

Can't wait for retirement to stop teaching

Doesn't mind teaching but prefers outside interests

Finds teaching somewhat enjoyable

Takes great pleasure in teaching