Motivational influences on the evocation of search patterns in causal analysis.

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MOTIVATIONAL INFLUENCES ON THE EVOCATION
OF SEARCH PATTERNS IN CAUSAL ANALYSIS

by

© Shirley Ethel Masi Vollick

A Thesis
submitted to the
Faculty of Graduate Studies
through the Department of Psychology
in Partial Fulfillment of the
Requirements for the Degree
of Master of Arts at the
University of Windsor

Windsor, Ontario, Canada
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ABSTRACT

The effects of motivation on evoking three information search strategies was investigated: (1) parallel search, (2) serial search, and (3) truncated serial search. One hundred and fifty introductory psychology students served as subjects and were randomly placed into either a high or low motivation condition. They were then told about an event, three non-exclusive possible causes of that event, and given a fact which implicated one of the possible causes as being involved in the event, or an irrelevant fact which implicated none of the possible causes, or no fact at all. Following the task, each subject completed a motivation assessment inventory (MAI) to determine their perceived level of motivation. Although an ANOVA on the MAI produced significant effects for motivation, no significant effects were found for this variable in the causal attribution task. Subjects in both conditions preferred to choose information indicative of a serial search pattern more often than they chose information suggesting their use of a parallel search strategy. Several post hoc analyses, attempting to relate the subjective level of motivation (MAI) to the type of strategy used, also failed to produce significant results. It was concluded that the motivation manipulation failed to work and several reasons for this failure were discussed. Indications that both groups perceived themselves as being highly motivated were found. In addition, the perceived task difficulty level
may not have been great enough for the high motivation group. However, evidence was found that suggested that factors such as uncertainty, ambiguity, saliency, retrievability and availability may have influenced the evocation of particular information search patterns in this study. Suggestions for future research in this area were proposed.
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CHAPTER I
INTRODUCTION

Research in causal analysis has mainly focussed on the conclusions drawn from specific information configurations and, more recently, on strategies of pre-attribution information acquisition. However, a recent study by Namikas and Vollick (1984, June) has shown a need for exploring some of the factors that determine which search schema is activated; an area that has, so far, been neglected. The intent of the following section, therefore, is to demonstrated the need for further research in this area.

A. Historical Perspective of Attribution Theory and Causality

We seem to be inevitably drawn to search for the causes of perceived events, especially when they are the actions of other people. Hastie (1984) suggests that the tendency to learn more about the intentions and motives of another person may be part of our adaptive behavioral repertoire. He contends that there are four types of conditions that elicit extensive causal reasoning: (1) explicit questions, asking "why" the event occurred (e.g., instructions in an attribution task asking subjects to evaluate a target person's dispositional qualities); (2) unexpected events (e.g., character-discrepant actions; a sports event in which the underdog wins); (3) outcome dependency, wherein the individual is
dependent on another person for relevant outcomes (e.g., an individual about to go on a blind date); (4) task failure (e.g., the perceiver fails to satisfactorily perform some well-defined task).

Heider (1958, p. 79) states that individuals attempt to predict and control their environment by developing organized, meaningful perspectives about everyday events. Operating much like quasi-scientists, people often logically and analytically attempt to determine the connections between various effects and their possible causes. Heider points out that many times, however, people make causal attributions on the basis of inadequate information, inadequate analysis of information, or information that is distorted by psychological needs and motivations.

Kelley (1967) has suggested that laypersons collect, organize and interpret cause and effect data in much the same way as if they were using an analysis of variance (ANOVA) to analyze data patterns. That is, people engage in a simultaneous investigation of all possible causal agents before judging the role of any. Kelley (1972a) notes, however, that the ANOVA model is not descriptive of most attributional work. In everyday situations, people often do not have time for complete causal analyses even when warranted by the situation. Kelley says that in such cases, experientially-gained causal schemata, stored in memory, are accessed by environmental cues. These schemata consist of a
repertoire of ideas about causal factors in terms of their operations and interactions, providing a framework within which the attributor fits bits of relevant data in order to make reasonably relevant causal inferences. The best known of Kelley's schemata is probably the Multiple Sufficient Cause (MSC) schema, which entails simultaneously considering a set of two or more possible alternative causes, each of which could be sufficient.

Typically, most events in the real world have multiple sufficient causes that are not mutually exclusive. For example, the burners on an electric stove may be deactivated by turning the burner switch to 'off', by pulling the main switch on the fuse box, or by a power failure. Any one of these causes would be sufficient to produce the event, but the effect could also be caused by an interaction of two or more of these events.

Research on causal attribution involving MSCs has typically involved asking subjects to judge the likelihood that cause 'B' is present after they have been informed that cause 'A' is either present or absent. When a given cause is known to be tenable, subjects rarely consider alternate causal explanations (Jones & Davis, 1965; Jones & McGillis, 1976; Jones & Nisbett, 1972; Kelley, 1972a, 1972b; Kun, Murray & Sredl, 1980; Kun & Weiner, 1973; Smith, 1975). Potential causal attributors apparently strongly tend to search for sufficient causes.
Kelley (1972b) has accounted for this tendency in terms of a "discounting principle". "The role of a given cause in producing a given effect is discounted if other plausible causes are also present" (p. 8). Kelley contends that the causal attributor can make confident causal judgements when only one possible cause is present, but his or her uncertainty increases when alternate causes, which make the role of any one cause highly ambiguous, are present.

Smith's (1975) study, however, demonstrated that a lower likelihood judgement may actually reflect decreased uncertainty about the causal agent, rather than increased uncertainty, as Kelley (1972b) suggests. Smith used an illustrated story-pair technique, asking his subjects to make causal attributions in a way that called for the use of Kelley's MSC schema. Subjects were presented with a pair of stories in which a child chose between two toys. In one story (Condition A) the child (A) was alone and therefore the single sufficient cause present was intrinsic motivation or desire. In the other story (Condition B), however, the child (B) was accompanied by another person (C) who pressed 'B' to make a particular choice. In Condition B the child's behavior, which was identical to the choice-behavior of child 'A', had two possible sufficient causes. He or she may have simply wanted that particular toy (intrinsic influence) or his or her choice could have been influenced by the behavior of 'C' (extrinsic influence). Following the
choice-task, Smith's subjects were asked a series of questions to determine whether or not they were using the MSC schema. Using the schema implies an initial uncertainty about the contributory effect of a specific potential cause on a given event because, by definition, the subject must simultaneously search all potential causal agents before making a causal judgement. Therefore, subjects using this schema were expected to be more certain that 'A's behavior was due to the intrinsic cause and less certain that 'B's was. Further, it was expected that subjects using the MSC schema would be uncertain about the cause of 'B's behavior. Smith was surprised to find that the greater proportion of older subjects (all second-graders and fourth-graders, and many of the college students) reported no uncertainty about the cause of 'B's behavior, unequivocally attributing it to the extrinsic cause. Smith suggests that subjects might have been making use of a partial schema, wherein they did not jointly consider the alternative possibilities, but instead considered the possibilities one at a time.

Turning to Piaget's (Inhelder & Piaget, 1958) work on cognitive development, Smith attempted to gain some theoretical perspective on the use of the MSC (parallel) and the partial (serial) schemata. He states that a reading of Piaget's work on formal thinking clearly shows that the individual who has attained the level of "formal operations" has the capacity to use causal schemata, including the MSC
schema. One of the defining characteristics of formal thought is the capacity to systematically recognize all alternative possibilities that may underlie an event in real life. According to Piaget's theory, individuals who have difficulty attempting to deal with two or more possible causative agents simultaneously would be considered more developmentally primitive, cognitively operating at the "concrete operational" level. The use of a serial or partial schema would be characteristic of concrete thinking, suggests Smith. He tentatively hypothesizes that pre-attribute processes may be different for older grade-school children (serial processing) and college students (MSC schema). A post hoc examination of his data slightly supports this view, states Smith, placing the two hypothetical schemata into a developmental framework. However, he admits that his study is inconclusive with regard to the exact pre-attribute processes.

The Pre-attribute Information Acquisition Process

Research focusing specifically on the pre-attribute information acquisition process has been undertaken by several consumer decision-making studies (Jacoby, 1977; Jacoby & Chestnut, cited in Major, 1980; Jacoby, Chestnut, Weigle & Fisher, 1976). Conducted within the framework of Kelley's covariation model of the attribution process, this research has shown that potential consumers demonstrate pre-purchase information acquisition that is not consistent with Piaget's
(Inhelder & Piaget, 1958) concept of formal cognitive operations. Using a process-descriptive technique, subjects are presented with an organized array of information from which they sequentially select information in any order they wish. They have the option to continue or truncate the information acquisition process at any time. This method reveals the order, amount and type of information that subjects acquire. These studies consistently found that people generally seek only a fractional amount of the information available to them before making purchasing decisions based on the attribution process.

Major (1980) also investigated the proportion of available information acquired by people. Using the process-descriptive procedure developed by Jacoby and his colleagues, she conducted two experiments in order to examine pre-attribution information acquisition. Major's findings were consistent with Jacoby et al.'s results. Subjects in the first experiment acquired about one third of the available information prior to making attributions. In the second experiment, Major found a substantial reduction in the total amount of pre-attribution information acquired by subjects who, on the average, asked for less than 25% of the available information. She did, however, point out that these results may have been influenced by the redundancy of the material. Based on the type of problems confronting the perceiver, Major found information search processes varied
widely. These results led her to suggest that attributions for complex, interpersonal events as opposed to attributions of simple, impersonal events, may be better accounted for by Kelley's (1967) model.

More recently, Shaklee and Fischhoff (1982) conducted a series of five experiments designed to investigate strategies of information search used by potential attributors. The three strategies investigated were parallel search (analogous to Kelley's 1972b MSC schema), non-parallel serial search (analogous to Smith's, 1975, idea of a partial schema) and truncated serial search both of which are consistent with methods in which judgements are made on the basis of partial information.

In the first three experiments an attempt was made to distinguish between parallel and serial (non-parallel) search strategies. Subjects were told about an event which had several possible causes. In one condition, subjects were given a relevant fact which directly implicated one possible cause and then asked to choose the information they would most like to have in order to attribute causation of the event. It was believed that parallel searchers would demonstrate no preference for knowing about fact-implicated causes, but continue to search for information relevant to all possible causes. Conversely, it was expected that serial and truncated searchers would want to clarify the role of the fact-implicated cause rather than continue to be interested in
all possible causes. The results of these experiments consistently indicated that the non-parallel search strategy was preferred. Moreover, in a fourth experiment, subjects demonstrated a preference for questions which were consistent with a truncated information search. These results are congruent with findings that suggest people prevalently choose to make attribution judgments on the basis of limited amounts of available information being accessed.

Namikas and Vollick (1984, June) questioned the validity of the results found by Shaklee and Fischhoff (1982) on the grounds that their experimental procedure allowed for the potential intrusion of two confounding factors. The first design problem concerned the fact versus no-fact information input to the subjects. The relevant fact, which was presented to the experimental group may have focused attention on one particular cause, weighting that cause relative to the remaining two causes. This factor could direct the subject's choice toward the question related to the possible cause directly implicated by the fact. Thus, we have two factors which may have influenced the results independently or interactively: namely, the situation in which 'something' as opposed to 'nothing' is given to the subject, and the situation in which something that is relevant is given as opposed to something which is irrelevant. A second control group, consisting of a condition that provided an irrelevant 'fact' would presumably provide 'something' that was 'irre-
levant', thus eliminating potential confounding.

The second design problem concerned the output factor; that is, the format of the questionnaire utilized by Shaklee and Fischhoff (second experiment). First, the format forced the subject to choose only one bit of information from a possible three bits. Conceivably, if the subject were to have options available whereby he or she could choose to have information about two or three possible causes simultaneously, instead of having to decide between them, the results may not necessarily demonstrate a preference for the non-parallel search strategy. Secondly, the questionnaire format may have somehow influenced subjects to believe that the three possible causes were mutually exclusive by asking them to choose only one bit of information from a set of three options. If this was true, then providing subjects with an 'unlimited' choice of the three options, any combination of the three choices, or the choice of selecting no information whatsoever, would eliminate potential confounding which may have resulted from the subjective belief that the causes were mutually exclusive and/or the possibility that the format forced subjects to choose the answer to the question most indicative of a non-parallel search strategy (that is, the question related to the fact-implicated cause).

In an attempt to replicate the original findings, while at the same time eliminating potential contamination of the results, Namikas and Vollick (1984, June) introduced
two major modifications into the Shaklee and Fischhoff (1982) experimental design for their second experiment: namely, a second control condition in which subjects were given an irrelevant 'fact', and a relatively more unlimited questionnaire format. Namikas and Vollick found that, when conditions were relatively identical to the original experimental condition, subjects preferred a truncated serial search strategy, as they did in the Shaklee and Fischhoff study. However, the addition of the irrelevant 'fact' and 'unlimited' questionnaire format influenced the results significantly. The limited format was shown to constrain significantly more subjects to choose the type of information that is indicative of a serial or truncated serial search strategy. Additional analyses clearly showed, however, that the 'unlimited' format still produced a significantly greater proportion of subjects who predominately chose the type of information indicative of serial processing.

The addition of the 'no further information' option in the modified questionnaire format provided a clear index of a truncated search strategy, which the original format did not. This factor enabled Namikas and Vollick to conclude that the non-parallel processors were predominantly truncated searchers.

The addition of the second control group, namely the irrelevant 'fact' condition, clearly demonstrated that the relevant fact biases subjects to choose the type of
information indicative of the use of serial searching. Irrelevant fact subjects chose to acquire information about multiple causes significantly more often than subjects in the relevant fact condition.

Interestingly, the addition of the irrelevant 'fact' gave a somewhat clearer picture of the potential attributor's information-gathering strategies; in particular, a fuller understanding of the way that uncertainty influences the activation of a particular search schema. The irrelevant 'fact' provided subjects with a bit of additional information that, unlike the relevant fact, was highly ambiguous. Subjects were confronted with the problem of not understanding the relevance or meaning of the so-called fact. In addition to the degree of initial uncertainty they experienced, as to which of the three possible causes was responsible for the event, subjects also experienced the additional uncertainty that was presumably produced by the inclusion of the irrelevant 'fact'. It would seem that the higher level of uncertainty and/or the confusion caused these subjects to access the search strategy that enabled them to gain the most comprehensive array of information available in order to clarify the causal situation: namely, the parallel search strategy. Vollick (1983) contends that when people are confronted with a highly ambiguous situation, wherein no evidence exists enabling them to formulate a tentative causal hypothesis (i.e., no relevant
information is given), and the information that is given generates additional uncertainty, they tend to require the most comprehensive type of information in order to attribute causation. More simply, it would seem that as the degree of uncertainty increases, the preference for a full parallel search pattern also increases.

The Competence versus Performance Distinction

The "increased uncertainty" factor appears to play a determining role in governing the type of information search schema that is accessed by the subject in a causal analysis situation. It may be that even though a specific schema, such as the MSC schema (Kelley, 1972a) and its related parallel search schema (Namikas & Vollick, 1984, June; Shaklee & Fischhoff, 1982), is within the individual's competence system, the schema may not necessarily be accessed and used in a given situation, as Namikas and Vollick suggest. There is evidence that supports this hypothesis.

Several researchers have made the distinction between 'having' a specific cognitive competence and 'using' it to perform a particular task (Cole & Bruner, 1971; Dasen, 1977; Flavell & Wohlwill, 1969; Scribner, 1971; Wason & Johnson-Laird, 1972). These authors write that we cannot infer a deficit in competence from a deficit in performance, on the grounds that a different situation may instance the cognitive process of interest. They further contend that, as there are an unlimited number of possible situations, it is theoreti-
ally impossible to demonstrate a lack of competence. In other words, the task performance may not reflect the individual's 'true' level of reasoning (i.e., underlying competence). The individual simply may not be willing or able to transfer or generalize a specific search schema to all tasks or situations in which it may be an effective or even optimal tool.

The Impact of Motivational Properties of Tasks on Performance

In addition to the "increased uncertainty" factor, found by Namikas and Vollick (1984, June), other determining factors may play an important role in the accessibility of information acquisition strategies. If, for example, the presumably more sophisticated thought processes said to be involved in "formal operations" (Inhelder & Piaget, 1958) 'cost' more, in terms of time and effort, than the comparatively more simplified "concrete operational" thinking processes (Inhelder & Piaget), it may be that subjects in the typical psychological experimental condition (i.e., Introductory Psychology students) judge the 'cost' of using a full parallel search strategy in causal attribution tasks as too great a 'price' to pay for the 'gains' they receive. (In the Namikas & Vollick study, for example, subjects were 'motivated' to perform a causal attribution task by rewarding them with a single point, worth less than one percent, which could be credited to their final Introductory Psychology course grade.)
Several authors (Herzberg, 1968; Staw, 1976; Steers & Nowday, 1977) have shown that the motivational properties of tasks have a significant positive impact on the quality of task performance: namely, the challenge to skills and abilities, the experienced meaningfulness of a task, the perceived task significance (i.e., the impact on other's lives), the sense of accomplishment about the consequence of a task, the perceived degree of individual responsibility for the results, the sense of achievement, recognition for achievement, and responsibility for the achievement, the perceived prestige of the task, recognition, and task interest. All of these task characteristics are presumed to be ego-involving.

On the basis of the preceding evidence, one suspects that the motivational properties of a causal attribution task may be one of the determinants governing the instancing of a specific search schema.

Study to Investigate Motivational Influences on the Evocation of Search Patterns in Causal Analysis

The present study therefore attempted to incorporate the above-listed motivational characteristics into the identical experimental task used by Namikas and Vollick (1984, June). The prevalence of three information acquisition search patterns explored first by Shaklee and Fischhoff (1982) and later by Namikas and Vollick, were investigated in terms of the motivational factors that determine their accessibility by potential attributors to explain MSC events. The search
schemata of interest were: (1) the parallel search schema, whereby information concerning all possible causal agents is searched simultaneously, prior to making a causal judgement. This schema is analogous to Kelley's (1972a) MSC schema and presumably available to those persons who have attained Piaget's (Inhelder & Piaget, 1953) cognitive stage of "formal operations"; (2) the serial search schema, whereby information concerning only one possible cause is pursued and clarified before continuing the search for additional possible causation. This strategy is analogous to Smith's "partial schema". If followed through to its conclusion, this serial approach would allow the potential attributor to arrive at the decision-making process with the same amount of information as the parallel searcher; (3) the truncated serial search schema, whereby the role of only one possible causal agent is clarified and all other possible causal agents are not investigated. The truncated search is consistent with much of the research cited earlier and apparently reflects the potential attributor's preference for making causal judgements on the basis of incomplete information.

The subjects were tested under identical experimental conditions as used by Namikas and Vollick (1984, June). In addition, half the subjects were placed in a high-motivation condition, incorporating the motivational task properties mentioned earlier.
Hypothesis.

Subjects in the relevant fact group choosing to know the answer to none or one question would suggest their preference for a non-parallel truncated serial or serial search strategy, respectively. On the other hand, subjects electing to know the answer to two or more questions simultaneously would suggest their preference for a parallel search strategy.

It was expected that those subjects in the high motivation condition would prefer to acquire information implicating their use of a parallel search strategy significantly more often than those subjects in the normal motivation condition, who would prefer to utilize one of the non-parallel schemata.
CHAPTER II
METHOD

Subjects

One hundred and seventy two volunteer Introductory Psychology students acted as subjects. The nature of the experiment dictated that subjects be fluent in English. Therefore, a criterion of English as the native language was implemented by asking subjects to indicate whether English was their native language (which they did on the face page of their task booklet). Consequently, the data from 22 subjects was eliminated, as these subjects failed to meet the language criterion. The remaining 150 subjects were randomly assigned to 6 experimental conditions, with 25 persons in each condition.

Materials and Procedure

Ten items, each consisting of a sentence describing an event and three potentially sufficient possible causes of that event were used (see Appendix A for a complete description of these items). These items are identical to the 10 three-cause items used in the original study (Namikas & Vollick, 1984, June). A relevant fact, which implicates one of the possible causes as having a contributory effect on the event, was listed for each item in one condition. In a second condition, an irrelevant 'fact' was listed for each item (see Footnote 1 for details concerning the generation and testing of the irrelevant 'fact'). No fact was listed
for each item in a third condition. For example, "Event: Joe got 95% correct on his history final. Possible Cause A: The final was easy. Possible Cause B: Joe is particularly good at history. Possible Cause C: Joe had studied very hard for the final. Fact (Relevant): Getting a good grade on that exam was critical to getting off probation; Fact (Irrelevant): Joe likes to drink chocolate malts; or, (no fact given.)"

For each of these three possible causes a question is listed which asks for information relevant to that cause.

Half the subjects (75) were assigned to the high motivation condition, consisting of a pre-task briefing by the experimenter in which subjects were given presumably ego-involving information. They were told that the results of their problem-solving performance would be used to set-up tables of norms for future research on gifted university students. They were also told that there was only one correct answer for each problem, and were encouraged to do their best in attempting to discover which was the 'right' answer. Finally, these students were reminded of the importance of this research (see Appendix B for the verbatim briefing).

The remaining 75 subjects were assigned to the normal motivation condition, which consisted of subjects simply being told that they were participating in research on the intellectual abilities of university students (see Appendix C for the verbatim briefing).
There were three fact-related conditions within each motivation condition: relevant fact, irrelevant fact, and no fact. All subjects in each fact condition received 10 identical items with regard to an event, three possible causes of that event, and three questions they may ask. The sequence of these 10 items was randomly ordered within each of the booklets, with the restriction that a particular order may occur only once. The order of the 3 questions for all 10 items was counterbalanced to ensure that they occurred in all possible combinations with respect to the order of their related possible cause. Causes were also counterbalanced with respect to which cause was listed as A, B, or C.

All subjects received modified questionnaire format, as devised by Vollick (1983), whereby subjects are given a choice of any one of the three questions, a combination of any two of the questions, all three questions, or, they may choose to ask no question.

Booklets containing the 10 task items were sequentially distributed to the class in such a way that no student was seated next to a student in the same fact condition. The printed instructions and practice example on the first page of the booklet were read aloud by the experimenter to all subjects after the initial briefing. Following the task completion, each subject completed the 15-item Motivation Assessment Inventory (MAI), developed by Vollick to determine each subject's self-reported level of motivation during
the task. The MAI consists of questions which were designed
to measure the motivational task properties discussed earlier.
(See Appendices D and E for the two MAI forms used.)

Instructions

The following instructions were listed on the face page
of each 10-item booklet and are identical to those used in
the original research (Namikas & Vollick, 1984, June), with
the exception that the fact item was omitted. (See Appendix F
for an example of the complete face sheet used in all three
fact conditions.)

"Each of the problems in this booklet describes an
event and several possible causes of that event. Your task
is to explain why the event occurred.

PLEASE COMPLETE THIS PRACTICE EXAMPLE

Event: Jim was arrested for speeding.
Possible Cause A: He has a penchant for fast driving.
Possible Cause B: He was late.
Possible Cause C: He was framed.

"After each event, three questions about that event are
listed. For example, for the above item you might have
questions:

Question 1: What's Jim's past speeding record?
Question 2: was the arresting officer short on the number of
traffic citations he'd given that night?
Question 3: When was Jim supposed to be at his destination?

Question 1
Question 1&3
"Your task is to identify which of those questions you would most like to have answered in trying to explain why Jim was arrested for speeding. In the space provided for each item, check (✓) the choice you would most like to have answered to help you explain the event."

**Debriefing**

Immediately following the completion of the experimental task and the MAI, all subjects were debriefed (see Appendix G for the verbatim debriefing used for all subjects). In addition, subjects in the high motivation condition underwent a further debriefing with regard to the motivational experimental manipulation within one week following the experiment (see Appendix H for the verbatim additional debriefing).
CHAPTER III
RESULTS

Initially, the Motivation Assessment Inventory (MAI) analysis will be presented. The MAI results should provide us with some information regarding the success of the experimental manipulation of the motivation variable. Next, the task performance analyses will be presented in order to ascertain the effects of motivation on task performance. Finally, several post-hoc analyses will be presented.

Motivation Assessment Inventory Analysis

As the major variable of interest was motivation, an analysis of variance (ANOVA) was carried out on the MAI in order to discover whether the two motivation groups perceived themselves as being motivated differentially. The score for each MAI item was coded in such a way that a rating of one indicated very low motivation while a rating of five indicated very high motivation. Scores for the 15 items were then totalled for each subject, the potential range being 15-75. The mean score was then computed for each fact group. The analysis, performed on the MAI means, yielded a significant effect for motivation, \( F(1, 144) = 4.51, p<.05 \), demonstrating that subjects in the high motivation condition rated themselves as being more highly motivated on the MAI. No other effects were found to be statistically significant. (App. I shows the ANOVA summary & means for motivation groups.)
Task Performance Analyses

For each subject, the frequency of choice of questions, and of "No" questions was recorded across the 10 items. The potential range for each of these categories was 0-10.

The frequency scores were initially subjected to separate ANOVAs. Two different types of information-gathering approaches were looked at, based on a preference for either multiple-cause or single-cause information. Variables of interest were motivation and types of fact.

The first analysis involved the data which indicated a choice of information related to multiple causes; that is, of two questions (Q1&2, Q1&3, Q2&3), or of three questions (Q1,2&3). These data were assumed to be an index of the use of a parallel processing strategy. (The parallel processing strategy was defined as simultaneously investigating all possible causal sources before ascribing causation.) The ANOVA yielded a significant main effect for fact, $F(2, 144) = 11.40, p < .0001$. Unexpectedly, the variable of greatest interest, motivation, was not significant. (Appendix J contains the ANOVA summary table.) Tukey’s honestly significant difference (HSD) test was applied to elucidate the difference in fact levels (3). As shown in Table 1, the relevant and irrelevant fact groups, and the relevant and no-fact groups differed significantly ($p < .05, p < .01$ respectively). The difference between the irrelevant and no-fact groups was not significant.
TABLE 1

Mean Frequency of Choice of
Multiple-cause Information for each Fact Condition

<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>4.00a</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>5.43b</td>
</tr>
<tr>
<td>No-fact</td>
<td>6.38b</td>
</tr>
</tbody>
</table>

Note. Means having the same subscript do not differ significantly.
\(^{1}n = 50\) for each group.

The second ANOVA was carried out on the frequency data related to a single-cause strategy; that is, the choices of Q1, Q2, or Q3, and the "no further information needed" choice ("No"). (The serial processing strategy was defined as investigating only one possible causal source; either fully or partially, before ascribing causation.) Once again, the ANOVA failed to yield a significant motivation effect. A significant effect for fact was produced, \(F(2, 144) = 11.66, p<0.001\). (Appendix K contains the ANOVA summary table.) Table 2 shows that Tukey's HSD test yielded a significant difference between the relevant and irrelevant groups, as well as the relevant and no-fact groups (\(p<0.01\)). The other
group-wise comparison yielded no significant results.

TABLE 3
Mean Frequency of Choice of
Single-cause Information for each Fact Condition

<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>6.00a</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>4.53b</td>
</tr>
<tr>
<td>No-fact</td>
<td>3.62b</td>
</tr>
</tbody>
</table>

Note. Means having the same subscript do not differ significantly.

The best evidence of a truncated serial search approach were the "No" choices. The subjects who choose to acquire no additional information are presumed to be willing to base a causal judgement on the partial information already at their disposal and, therefore, are truncating their search at this point. An ANOVA performed on the frequency of "No" choices showed, again, no effect of the motivation variable. A significant effect for fact, \( F(2,144) = 3.52, p < .03 \), was found. (Appendix L contains the ANOVA summary table.) Table 3 contains the fact means and shows that the only significant difference found when the HSD test was applied was between the relevant and no-fact groups \( p < .05 \).
TABLE 3

Mean Frequency of Choice of "No" for each Fact Condition

<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>1.86a</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>1.28ab</td>
</tr>
<tr>
<td>No-fact</td>
<td>0.94b</td>
</tr>
</tbody>
</table>

Note. Means having the same letter in their subscript do not differ significantly.

An ANOVA was then carried out on the purest measure of a parallel information search approach, the multiple-choice of Q1,2&3. (Subjects choosing information on all three possible causes simultaneously are presumed to be unwilling to assign causation until all potentially relevant information is acquired and processed. The choice Q1,2&3 best supplies this information.) This analysis produced a significant F ratio for fact, $F(2, 144) = 5.93, p < .003$, but did not yield a significant F ratio for motivation. (Appendix M contains the ANOVA summary table.) As seen in Table 4, the HSD test yielded two significant pair-wise comparisons: the relevant and irrelevant fact groups ($p < .01$) and the relevant and no-fact groups ($p < .05$).
TABLE 4
Mean Frequency of Choice of "1,2&3" for each Fact Condition

<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrelevant</td>
<td>2.10a</td>
</tr>
<tr>
<td>No-fact</td>
<td>1.88a</td>
</tr>
<tr>
<td>Relevant</td>
<td>1.02b</td>
</tr>
</tbody>
</table>

Note. Means with the same subscript do not differ significantly.

The ANOVA was next performed on the two-cause choices (Q1&2, Q1&3, Q2&3), as representing a partial-parallel strategy. That is, although subjects do not wish to acquire information on all three possible causes, they still prefer to make a causal ascription on the basis of seeking information related to two possible causes. Therefore, while they cannot be considered to be complete parallel processors, neither are they serial information processors. A significant effect for fact was found, $F(2, 144) = 8.22, p < .0004$. The motivation variable did not attain significance. (Appendix N contains the ANOVA summary table.) Table 5 contains the means and shows that two significant group-wise comparisons were found: the relevant and no-fact
groups, and the irrelevant and no-fact groups ($p < .01$).

**TABLE 5**

Mean Frequency of Choice of Two-cause Information for each Fact Condition

<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>2.98&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>3.32&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>No-fact</td>
<td>4.50&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

**Note.** Means with the same subscript do not differ significantly.

Finally, an ANOVA was carried out on the one-cause choices (Q1, Q2 or Q3). These data represent the best evidence of a serial search strategy that is not truncated. That is, subjects carried out a search for information related to a single cause. The ANOVA produced significant results for fact, $F(2, 144) = 5.17$, $p < .006$, but not for motivation. (Appendix 0 contains the ANOVA summary table.) As shown in Table 6, there was a significant HSD difference between the relevant and no-fact groups ($p < .01$). The other group-wise comparisons did not attain significance. As a convenience, Figure 1 compares the fact means in each of the six task performance analyses so far discussed.
<table>
<thead>
<tr>
<th>Fact</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>4.14a</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>3.30ab</td>
</tr>
<tr>
<td>No-fact</td>
<td>2.68b</td>
</tr>
</tbody>
</table>

Note. Means with the same letter in their subscript do not differ significantly.
Figure 1. A summary of mean frequency of choice of (1) single-cause and "No"; (2) single-cause; (3) "No"; (4) multiple-cause; (5) two-cause; and the (6) "1,2&3" choices.
Post Hoc Analyses

Because the MAI produced a significant effect for motivation that was not found in the task performance analyses, the question was raised as to whether there was too much overlap between the high and low motivation groups. That is, even though the difference that was found between the motivation groups, as reported in the MAI, was significant, was this difference great enough to differentially affect the task performance scores? Specifically, the question of interest was, could the difference in reported subjective motivation level be related to the type of search strategy used? This question suggested that post hoc analyses be carried out. Therefore, two further analyses were performed. In the first of these, two groups of subjects were formed based on their MAI total score. Approximately the top quartile (ensuring equal ns for each fact group) of MAI subjects formed the high motivation group, while approximately the lowest quartile (again, ensuring equal ns for each fact group) formed the low motivation group. (For the high motivation group, the mean MAI score was 62.9 and the SD was 3.00. For the low motivation group, the mean MAI score was 43.6 and the SD was 3.35.) The two motivation groups consisted of 30 subjects each, 10 subjects within each fact condition. The frequency scores of these subjects were then subjected to ANOVAs of the same type that were carried out earlier. That is, ANOVAs were performed on the: (1) choice of multiple-
cause information (Q1&2, Q1&3, Q2&3, or Q1,2&3); (2) choice of single-cause (Q1, Q2, or Q3) or "No" information; (3) choice of three-cause information (Q1,2&3); (4) choice of "No" information; (5) choice of two-cause information (Q1&2, Q1&3, Q2&3); and (6) choice of one-cause information (Q1, Q2, or Q3). These results demonstrated only negligible differences when compared to the six ANOVAs in the original analyses. That is, the motivation variable was not significant, while significant differences were found for type of fact, except in one instance. As seen in Appendix S, fact was not significant in the ANOVA for the one-cause information. (Appendixes P, Q, R, S, T, & U contain the ANOVA summary tables for the six post hoc ANOVAs.)

A correlation analysis was next undertaken in order to discover whether scores on the MAI were related to the type of information chosen. Since the strongest index of parallel processing strategy was considered to be the choice of Q1,2&3, that is, asking for information on all three possible causes, it was hypothesized that subjects scoring higher on the MAI should make more such choices. Alternatively, they were expected to make fewer "No" choices. The obtained Pearson product moment correlation coefficient for the "No" data (r = -0.03, p = .22) and for the Q1,2&3 data (r = -.027, p < .29) were not statistically significant. (Appendixes V and W contain the correlation matrices for both these analyses.)
CHAPTER IV
DISCUSSION

In this section we will initially look at two possible reasons for the failure of this study to produce evidence of the influence of motivation on the evocation of specific information search patterns. Next, we will consider certain factors that do influence the evocation of specific causal schemata. Then we will determine whether the previous study (Vollick, 1983) was replicated with regard to the type of fact effect. Finally, we will look at two important factors that should be considered when undertaking further research in this area.

The primary objective of the present research was to examine the influence of motivation on calling forth various specific schemata from the individual's repertoire of causal search schemata. Clearly, this objective was not reached. Why was this? Two plausible reasons come to mind: (1) for some reason, the experimental manipulation of the motivational variable did not succeed; and (2) motivation is not a factor in the evocation of specific causal search schemata. Reasons Why the Experimental Manipulation of Motivational Level May Have Failed to Succeed

There are three possible reasons for the manipulation of the motivational variable failing to succeed: (1) too
great an overlap between the two motivation groups; (2) the perceived task difficulty level may have been too low; or (3) the interaction of both the above factors.

**Intergroup motivational overlap.**

Although the MAI data did produce a significant difference between the two motivation groups, a closer inspection of these data yielded some rather surprising information. Means for the MAI were 55.01 for the high motivation condition and 52.60 for the low motivation condition. This range demonstrates that most subjects rated themselves as being relatively highly motivated, regardless of motivation condition. Therefore, the question is raised as to whether these two groups, representing high and low levels of motivation were, in fact, both highly motivated; the "high motivation" group being significantly more highly motivated, as the MAI ANOVA showed? There is some evidence in the motivation literature that supports this idea. Estes (1976) contends that the very fact a subject accepts a task is assumed to show that he or she will become ego-involved in the task, and consequently "deeper layers of ego-motivation are contacted" (p. 256). This statement suggests that even those subjects in the "low motivation" group were relatively highly motivated and, in fact, this is exactly what the MAI self-ratings show.

**Task difficulty level may have been too low.**

The present study was designed to induce a sense of
achievement in the high motivation group and to challenge
the skills and abilities of these subjects. Atkinson (1964)
states that the strength of the achievement motive in a given
situation is affected by three interacting variables: (1) the
motive for success (or, need for achievement); (2) the ex-
pectancy of successful performance at that activity (defined
as the subjective probability of successfully reaching the
task goal); (3) the incentive value of the success (i.e.,
the anticipated amount of pride in the successful accompli-
ishment of the task). According to Atkinson, the incentive
value of success ($I_s$) is related to the probability of suc-
cess ($P_s$) thus: $I_s = 1 - P_s$. In other words, the more diffi-
cult the task is perceived, the greater the sense of accompli-
ishment in successfully completing it. Atkinson's formula
suggests that one way to increase the challenge to skills
and abilities, then, is to make a task appear to be difficult.

In the present research, the pre-task briefing for both
motivation groups contained no information about the diffi-
culty level of the causal task. Based on Atkinson's assump-
tions, one could justifiably conclude, therefore, that the
causal attribution task failed to challenge the high moti-
vation subjects sufficiently.

As we have seen, both the intergroup motivational over-
lap and the perceived level of task difficulty, could have
conceivably affected the results of the motivation variable
either separately or interactively.
Is Motivation a Factor in the Evocation of Specific Causal Schemata?

The second plausible reason why the motivation variable did not produce significant results may be that motivation is not a factor in calling forth specific causal schemata.

We know that factors such as intelligence, skill, ability, and opportunity can explain the variability in behavioral responses of the type elicited in this research. However, when people are relatively similar across these dimensions (as we assume college students who served in this experiment to be) we usually require motivational analysis to help explain behavioral differences to the same external stimuli.

There are two broad interrelationships between motivation and cognition; both are relevant to the present study. The first is the influence of motivation on cognitive processes, and includes such questions as whether the range of information that the highly motivated individual searches for, registers, processes and uses is enhanced or restricted as compared to the less motivated person? The second of these relationships is the arousal of motivation by cognition (Estes, 1976).

The influence of cognition on motivation level.

With regard to the latter relationship, the arousal of motivation by cognition; we addressed this relationship earlier, in the task difficulty subsection. Briefly, it was stated that informing subjects that the task was diffi-
cult should raise the incentive value of the task and consequently the motive for achievement can be assumed to increase. This is something that the present experimental procedure failed to do.

The influence of motivation on cognitive processes.

With regard to the relationship between motivation and cognition, namely, the influence of motivation on cognitive processes, there is simply too much evidence showing the significant positive impact that motivation has on task performance, to deny this factor (see Herzberg, 1968; Staw, 1976; Steers & Mowday, 1977 for examples of this research). Admittedly, no research has, so far, specifically claimed to demonstrate a relationship between motivation and the evocation of particular information search patterns. However, this is not a reason to assume that causal attribution tasks are significantly different from other types of cognitive tasks, with regard to their sensitivity to motivational influences.

The results of this study should not, therefore, be taken as evidence that motivation level does not effect the calling forth of particular causal schemata. It seems more reasonable to conclude that the manipulation of motivational level in the present study failed to succeed, as discussed earlier.

Some Factors that do Influence the Evocation of Specific Causal Schemata.

Even though the present research failed to produce evi-
dence of motivational influence on the evocation of search schemata, I nevertheless do have some evidence in this study to speculate that certain factors do call forth specific schemata. But first, let me explicate certain assumptions that have been made in this study: the fundamental assumption is that various schemata activate various specific schemata-related information-gathering strategies, and further, that by observing the type of information search evoked, we can identify the particular causal schema employed.

Briefly reviewing the results, we know that with the addition of a relevant, cause-related fact, more serial choices and fewer parallel choices were made (see Figure 1). We also know that with the addition of irrelevant information, more full parallel choices were made (see Figure 1, graph of "1,2&3 choice"); and that with no additional information being given, more partial-parallel choices were made (see Figure 1, graph of two-cause choices). With this information we can reasonably speculate that circumstances such as the presence of ambiguity or a particularly salient cue may provide the impetus for setting aside the assumptions embodied in the schema initially evoked, and carrying out a more or less informed analysis than would be the case had the original schema been retained and used. In other words, let us assume for a moment that MSCs do activate the MSC schema, as Kelley (1972a) contends. One might then reasonably expect that the experimenter's pre-task briefing, during which she
clearly explained that the event could be produced by any one of three causes, or a combination of two or more of these causes, called forth the MSC schema. Now, what happens when a relevant fact is introduced? Based on the evidence of several researchers (Mynett, Doherty & Tweney, 1977; Schustak & Sternberg, 1981; Wason & Johnson-Laird, 1972) the relevant fact may evoke a confirmation strategy or schema. The newly-evoked schema may displace the MSC schema in some individuals. The cognitive weight or salience of the relevant fact, added to the weight of the information contained in its related cause, may form a tentative causal hypothesis which could then either be confirmed or disconfirmed by gathering additional data about that cause through use of a serial search pattern. In this case, the schema would permit either an ambiguous (if the search terminates in indicating more than one cause was involved) or unambiguous (if the search eliminates two of the causes as being contributory) judgement. On the other hand, the causal hypothesis could become the inference and thus the search process would be truncated, permitting only an unambiguous causal judgement.

There is also a second option or possibility. Introduction of a relevant fact may evoke the availability schema, or "rule of thumb", in some individuals. The availability heuristic leads the attributor to judge the importance of a given event in terms of its availability; that is, its saliency and retrievability (Tversky & Kahneman, 1973, 1973;
Taylor & Fiske, 1978). This heuristic or 'mini-schema' could override the MSC schema in some individuals and subsequently or concurrently evoke its related serial or truncated serial search schema.

If an irrelevant fact is introduced after the MSC schema is initially evoked, the ambiguity factor may increase. That is, the initial uncertainty caused by the presence of three possible causes may be enhanced by the additional uncertainty produced by a bit of irrelevant and ambiguous information. Increased ambiguity may cause some individuals to continue to use the MSC schema and the consequent evocation of its related parallel search strategy.

Thus, we have seen that knowledge of MSCs, uncertainty, ambiguity, saliency, retrievability, and availability are all factors that can be reasonably presumed to influence the evocation of particular information search schemata in causal analysis.

Replication of the Vollick (1983) Research

Generally, the results of the present study replicate Vollick's (1983) findings, with regard to the fact variable. However, there was one difference. As Table 7 shows, in both the single-cause (Q1, Q2, Q3, or "No) and multiple-cause (Q1&2, Q1&3, Q2&3, or Q1,2&3) analyses, the no-fact
### TABLE 7

Mean Frequency Scores in Single-cause and Multiple-cause Analyses in each Fact Condition in Vollick (1983) and Vollick (1986)

<table>
<thead>
<tr>
<th>Studya</th>
<th>Irrelevant</th>
<th>No-fact</th>
<th>Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single-cause information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vollick (1983)</td>
<td>4.84</td>
<td>5.92</td>
<td>6.84</td>
</tr>
<tr>
<td>Vollick (1986)</td>
<td>4.58</td>
<td>3.62</td>
<td>6.00</td>
</tr>
<tr>
<td></td>
<td>Multiple-cause information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vollick (1983)</td>
<td>5.16</td>
<td>4.08</td>
<td>3.16</td>
</tr>
<tr>
<td>Vollick (1986)</td>
<td>5.42</td>
<td>6.38</td>
<td>4.00</td>
</tr>
</tbody>
</table>

aN = 150 for each study.
subjects in the present study clearly departed from the trend found in the previous study. Note, as we move across the table from the irrelevant to the relevant fact condition, the means increase (in the single-cause analyses) and decrease (in the multiple-cause analyses) sequentially in Vollick's (1983) results. However, this same sequential trend is not seen in the present results. In fact, while the means for the irrelevant and relevant fact groups are comparable with the earlier study, means for the no-fact group have clearly departed from what might be expected, based on the previous results. In the single-cause analysis, the no-fact means are lower, while in the multiple-cause analysis they are higher, than might be expected. Thus, the earlier results (Vollick, 1983) showed that with the addition of the irrelevant fact, more parallel choices were found, while with the addition of a relevant fact or no fact, more serial information choices were found. However, the findings in the present study, reported in Table 7, clearly demonstrate that while the irrelevant and relevant fact still evidenced the same type of information preference as these same facts did in the previous study, the no-fact condition now evidences parallel information preferences rather than serial information preferences.

Does this same comparative difference in trends hold when we look at the purest indicators of parallel (Q1, 2&3) and serial ("No") search patterns? Looking at Table 8, we note that the pattern of means for the "No" choices are
comparable to the pattern of means for the serial choices in the present study, as shown in Table 7. However, the same does not hold for the Q1,2&3 choice (see Tables 7 and 8). Here, we see that the two-cause information has been masking the same trend that was first evident in Vollick's (1983) study; the irrelevant fact still produces the greatest number of full parallel choices. This is important, because in the original study, Vollick contends that this particular pattern of results had provided crucial information contributing to a fuller understanding of information search patterns in causal analysis. Vollick states that the addition of an irrelevant fact caused the subject's initial uncertainty level to increase. In other words, the uncertainty level initially produced by the knowledge that three MSCs could have contributed to the event had increased with the addition of highly irrelevant and ambiguous information. Vollick concluded that, "...as the degree of uncertainty increases, the preference for a full parallel search strategy also increases" (p. 34). This conclusion still holds, and is further supported by the results obtained when the masking effect of the partial parallel choices (i.e., two-cause choices) was eliminated. The fact that the serial analyses in the present study departed from this trend need not pose a problem, in view of the fact that Vollick (1983) found a significant difference between the fact groups (irrelevant and no-fact) while the present study did not.
### TABLE 8

Mean Frequency Scores for Analyses of the Q1, 2&3 and "No" Choices for each Fact Condition in Vollick (1983) and Vollick (1986)

<table>
<thead>
<tr>
<th>Study</th>
<th>Fact</th>
<th>Irrelevant</th>
<th>No-fact</th>
<th>Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;No&quot;/truncated serial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vollick (1983)</td>
<td>0.40</td>
<td>0.92</td>
<td>2.52</td>
<td></td>
</tr>
<tr>
<td>Vollick (1986)</td>
<td>1.28</td>
<td>0.94</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q1, 2&amp;3/full parallel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vollick (1983)</td>
<td>2.12</td>
<td>1.64</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td>Vollick (1986)</td>
<td>2.10</td>
<td>1.88</td>
<td>1.02</td>
<td></td>
</tr>
</tbody>
</table>

\(n = 150\) for each study.
Considerations for Further Research

In the present study, an attempt was made to challenge the skills and abilities of the high motivation group of subjects. Based on Atkinson's (1964) assumptions (i.e., that the greater the perceived task difficulty, the greater the sense of achievement), we earlier concluded that the causal attribution task may have been perceived as being too easy. One way, therefore, to increase the challenge to skills and abilities is to make the attribution task appear to be relatively more difficult. On the other hand, the task must not appear as too difficult, as subjects must be able to expect to successfully complete it.

One way to make the causal task appear more difficult would be to inform the subjects, during the pre-task briefing session, that although the task may appear deceptively easy, in reality it is more difficult than it seems. This manipulation involves the arousal of achievement motivation by cognition.

The motive for success, or, need for achievement (nAch) was one variable that was not specifically taken into account in the present study. A reading of the research in this area (Atkinson, 1964; Feather, 1967; Weiner, 1972, 1976) shows nAch to be an integral part of achievement motivation (as discussed earlier in the subsection on task difficulty). The tendency to achieve is always greater in the person labeled as strong in motivation (Atkinson, 1964). This sug-
gests that taking nAch into account might be particularly expedient in assigning subjects to high and low motivation groups. That is, those individuals measuring high in nAch would be placed in a condition that would include a cognitive motivational manipulation identical to the present study, but with the addition of the task difficulty modification, as just discussed. This group would be labeled as the high motivation group. Subjects measuring low in nAch would be designated as the low motivation group and placed in a condition identical to that in the present study.

The Thematic Apperception Test (TAT) devised by Murray (Murray & Morgan, 1935) would likely provide the means for differentiating high from low nAch subjects (McLelland, 1971).

Further research, with the two procedural modifications incorporated, may well provide conditions that would facilitate and enhance the observation of motivational effects on information search in causal analysis.
APPENDIX A

TEN ITEMS IN THE TASK BOOKLET

1. Event: Louise called long distance to her mother.
   Possible Cause A: It was her mother's birthday.
   Possible Cause B: She didn't have the time to write.
   Possible Cause C: She had just been accepted to graduate school and wanted to share the good news.
   Fact [Relevant]: It was the busiest time of the year for her.
   Fact [Irrelevant]: Louise had a wall phone.
   Question 1: Had Louise taken a heavy course load at school?
   Question 2: How long ago did Louise apply to graduate school?
   Question 3: Did Louise call her mother on her last birthday?

2. Event: Joe got 95% correct on his history final.
   Possible Cause A: Joe had studied very hard for the final.
   Possible Cause B: The final was easy.
   Possible Cause C: Joe is particularly good at history.
   Fact [Relevant]: Getting a good grade on that exam was critical to getting off probation.
   Fact [Irrelevant]: Joe likes to drink chocolate malts.
   Question 1: How did the other students do on the final?
   Question 2: How much in advance did he begin to prepare for it?
   Question 3: Does Joe like history?
3. Event: Ernest moved out of his apartment building and into a house.

Possible Cause A: He wanted a yard where he could plant a garden.
Possible Cause B: He wanted to get away from his noisy neighbors.
Possible Cause C: He had moved many times in the previous year.

Fact [Relevant]: The apartment housed mainly students.
Fact [Irrelevant]: Ernest's house has a built-in garage.

Question 1: Had Ernest enjoyed gardening in the past?
Question 2: Did his neighbors tend to party much?
Question 3: Did Ernest tend to have poor relationships with his landlords?

4. Event: Tom sold his downhill skis and boots.

Possible Cause A: He needed money for tuition.
Possible Cause B: Downhill skiing was getting too crowded for him to enjoy.
Possible Cause C: He was planning to buy downhill skiing equipment.

Fact [Relevant]: He also sold his stereo.
Fact [Irrelevant]: A beginning skier should practice on the easier slopes.

Question 1: How old were the skis and boots?
Question 2: How much money did he get for them?
Question 3: Does Tom like cross-country skiing?
5. Event: Tim advertised for a roommate to share his apartment.

Possible Cause A: The crime rate in Tim's neighborhood had been increasing.
Possible Cause B: Tim had been feeling lonely and wanted company at home.
Possible Cause C: Tim's rent was too much for him to continue paying alone.

Fact [Relevant]: Tim's scholarship had recently been cut back due to university budgetary problems.
Fact [Irrelevant]: His apartment has ceramic tile in the bathroom.

Question 1: Had other apartments in Tim's building been burglarized?
Question 2: How much is Tim's rent?
Question 3: Does Tim have very many friends?

6. Event: John spent the afternoon helping Gary paint his house.

Possible Cause A: Gary had lots of painting to do and really needed help.
Possible Cause B: John had time on his hands.
Possible Cause C: Gary had done him a similar favor recently.

Fact [Relevant]: John was an unemployed painter.
Fact [Irrelevant]: They painted the house white.

Question 1: Had John been involved in a big work project recently?
Question 2: Was John bored?
Question 3: Was Gary remodeling his house?

7. Event: Bill and Mary postponed their plans to camp for a couple of weeks.
   Possible Cause A: They hadn't saved up enough money yet.
   Possible Cause B: The weather was too cold to enjoy spending much time outside.
   Possible Cause C: Bill had a backlog of work to complete before he could take time off.
   Fact [Relevant]: Over the winter they had had to replace their car.
   Fact [Irrelevant]: Bill and Mary took turns cooking when camping.

Question 1: What month of the year was it?
Question 2: How much would this trip cost?
Question 3: Would Bill have more time in a couple of weeks?

8. Event: Jim's car swerved out of control on the freeway.
   Possible Cause A: Jim had drunk enough alcohol to impair his driving.
   Possible Cause B: The car had been hit from behind.
   Possible Cause C: The car had a blowout.
   Fact [Relevant]: It had been months since he'd had his car in the shop to be looked over.
   Fact [Irrelevant]: His car uses unleaded gasoline.

Question 1: How old were Jim's tires?
Question 2: Was the car behind Jim following too closely?
Question 3: How quick were Jim's reflexes?

9. Event: Margaret took in a stray kitten.
Possible Cause A: Her own kitten seemed to need company.
Possible Cause B: It resembled a kitten she had had when she was young.
Possible Cause C: It was an affectionate kitten.
Fact [Relevant]: The kitten had followed her home.
Fact [Irrelevant]: She trained it to use the litter box.
Question 1: Does Margaret own any other animals?
Question 2: Does the kitten like to be petted?
Question 3: Did Margaret grow up with animals?

10. Event: Matt decided to stop eating meat.
Possible Cause A: He had just read Sinclair's "The Jungle", an exposé of meat packing.
Possible Cause B: Meat prices had risen beyond the range of his food budget.
Possible Cause C: He thought he might be healthier on a vegetarian diet.
Fact [Relevant]: Most of his friends were vegetarian.
Fact [Irrelevant]: He listens to soft background music while he eats.
Question 1: How much money did Matt have to spend on food?
Question 2: Had Matt been feeling less than healthy?
Question 3: Was Matt interested in consumer protection issues?
APPENDIX B

BRIEFING FOR THE HIGH MOTIVATION CONDITION

"I'm Shirley Vollick, a graduate student working on a Ph.D. in psychology. At the present time I'm conducting research on the intellectual abilities of university students.

"As you probably know, most of the research in psychology is carried out using introductory psychology students as subjects. This means that researchers have gradually gathered a lot of data on the average university student's intellectual capacity, from which we've been able to set-up tables of norms. Having these tables means that we have a standard with which to compare the performance of other average students on various intellectual tasks. But we have a problem when we want to study university students with above-average intelligence, because we have no tables of norms to use as a comparative standard. And this is where you can help me out.

"The problems I've chosen to give you today are good indicators of intellectual ability: that is, these problems measure a person's reasoning and decision-making skills, and these are the types of skills that we look for in intelligence tests.

"If you look at the first page of your booklet, you'll see a practice example of the type of problems in the rest of the book. There are 10 of these problems and you'll probably finish in about 15 minutes. When everyone is finished, I'll hand out a short questionnaire which will take
you about 5 minutes to complete."

The experimenter will now read over the practice example, asking the class to make only a single check-mark for each problem.

"Please print your name clearly on the face page of each booklet, printing your last name first.

"Each of these 10 problems has a best answer out of several possibilities. So, take your time and do your best. As you can see, you're involved in a rather important study, so try to get the right answers.

"Good luck!"
APPENDIX C

BRIEFING FOR THE NORMAL MOTIVATION CONDITION

"I'm Shirley Vollick, a graduate student working on a Ph.D. in psychology. At the present time I'm conducting research on the intellectual abilities of university students.

"As you probably know, most of the research in psychology is carried out using introductory psychology students as subjects. This means that researchers have gradually gathered a lot of data on the average university student's intellectual capacity, from which we've been able to set-up tables of norms. Having these tables means that we have a standard with which to compare the performance of other average students on various intellectual tasks. But we always need up-to-date data and this is where you can help me out.

"If you look at the first page of your booklet, you'll see a practice example of the type of problem in the book. There are 10 of these problems and you'll probably finish in about 15 minutes. When everyone is finished, I'll hand out a short questionnaire which will only take you about 5 minutes to complete."

The experimenter will now read over the practice example, asking the class to make only a single check-mark for each problem.

"Please print your name clearly on the face page of each booklet, printing your last name first."

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APPENDIX D

MOTIVATION-ASSESSMENT INVENTORY: FORM A

FORM A

ASSESSMENT INVENTORY

NAME: __________________________ (please print)
Assessment Inventory

Below are some questions for you to answer that will help establish your level of participation in this research. On a scale of 1-5, please circle the number for each question that most accurately describes you.

1   2   3   4   5
strongly agree cannot disagree strongly disagree
agree decide disagree

1. Most of the items in the booklet challenged my intellectual skills.
   1  2  3  4  5

2. I was not highly motivated to answer the items in the booklet.
   1  2  3  4  5

3. It makes no difference to me that I was chosen to participate in this study.
   1  2  3  4  5

4. I was not concerned about doing my best in answering the items in the booklet.
   1  2  3  4  5

5. Taking part in this research had meaning for me.
   1  2  3  4  5

6. My level of concentration during the task was high.
   1  2  3  4  5

7. If other people realized how important this research was, my prestige would increase if they found out that I had taken part in it.
   1  2  3  4  5

8. I feel a sense of achievement in having participated in this study.
   1  2  3  4  5
9. The efforts of myself and the other participants in this study may have some impact on future psychological research.
   1 2 3 4 5

10. Tables of norms do not contribute much to psychological knowledge.
    1 2 3 4 5

11. My contribution to this research will probably make no difference to the results of this study.
    1 2 3 4 5

12. Participating in this research was interesting.
    1 2 3 4 5

13. I feel a sense of accomplishment in having taken part in this study.
    1 2 3 4 5

14. I was not thoughtful about my responses to the items in the booklet and did not care about whether I completed them correctly.
    1 2 3 4 5

15. I would like to participate in another study like this one.
    1 2 3 4 5

Thank you!
APPENDIX E

MOTIVATION ASSESSMENT INVENTORY: FORM B

FORM B

ASSESSMENT INVENTORY

NAME:________________________________________(please print).
Assessment Inventory

Below are some questions for you to answer that will help establish your level of participation in this research. On a scale of 1-5, please circle the number for each question that most accurately describes you.

1 strongly agree 2 agree 3 cannot decide 4 disagree 5 strongly disagree

1. Participating in this research was boring.
   1 2 3 4 5

2. I am pleased to have been selected to participate in this study.
   1 2 3 4 5

3. Taking part in this study had no meaning for me.
   1 2 3 4 5

4. I tried my best to complete the items in the booklet.
   1 2 3 4 5

5. My contribution to this research will make some difference to the results of this study.
   1 2 3 4 5

6. Even if other people realized how important this research was, they wouldn't care one way or another if they found out that I had taken part in this study.
   1 2 3 4 5

7. I would not like to participate in another study like this one.
   1 2 3 4 5

8. Taking part in this study gave me no felt sense of accomplishment.
   1 2 3 4 5
1 strongly agree
2 agree
3 cannot decide
4 disagree
5 strongly disagree

9. Participating in this study did not give me a felt sense of achievement.
   1 2 3 4 5

10. It is important to have accurate tables of norms for psychological research.
    1 2 3 4 5

11. My level of concentration while completing the task was high.
    1 2 3 4 5

12. I was thoughtful about my response to the items in the booklet and tried to complete each item correctly.
    1 2 3 4 5

13. I could not concentrate very well on the task.
    1 2 3 4 5

14. Most of the items in the booklet were too easy for me and presented no challenge to my intellectual skills.
    1 2 3 4 5

15. The efforts of myself and the other students in this study will not make a difference to future psychological research.
    1 2 3 4 5

Thank you!
APPENDIX F

FACE PAGE OF TASK BOOKLET

Booklet No. __________

Name: ___________________________ (please print).

Sex: M____ F____ Age:

Have you taken a course in logic or philosophy? YES____ NO____

Is English your native language? YES____ NO____

INSTRUCTIONS:

Each of the problems in this booklet describes an event and several possible causes of that event. Your task is to explain why the event occurred.

PLEASE COMPLETE THIS PRACTICE EXAMPLE

Event: Jim was arrested for speeding.

Possible Cause A: He has a penchant for fast driving.
Possible Cause B: He was late.
Possible Cause C: He was framed.

After each event, three questions about that event are listed. For example, for the above item you might have questions:

Question 1: What's Jim's past speeding record?

Question 2: Was the arresting officer short on the number of traffic citations he'd given that night?

Question 3: When was Jim supposed to be at his destination?

____ Question 1  __________ Questions 1 & 3

____ Question 2  __________ Questions 2 & 3

____ Question 3  __________ Questions 1, 2 & 3

____ Questions 1 & 2  ___ No question: I already have sufficient information

Your task is to identify which of those questions you would most like to have answered in trying to explain why Jim was arrested for speeding. In the space provided for each item, check (✓) the choice you would most like to have answered to help you explain the event.

STOP!

PLEASE WAIT FOR FURTHER INSTRUCTIONS
APPENDIX G

STANDARD DEBRIEFING FOR ALL CONDITIONS

"The purpose of the research you participated in today is to learn more about how people go about gathering the information they need in order to explain an event. That is, we want to explore the different ways in which people arrive at making decisions about the causes of events.

"Let's say that an event occurs that may be the product of several causes. For example, one of the problems we looked at today, "Jim's car swerved out of control on the freeway." Now, what caused this to happen? Was it because Jim had been drinking? Because someone hit him from behind? Or, because his tire blew? Any one of these causes was sufficient to cause the accident. But the cause of the accident could actually be a combination of two or more of these causes. That is, perhaps Jim had been drinking and his tire blew after his car was hit from behind.

"Now, how do we go about finding out what actually caused the accident? There are different ways we can do this. One way is to simultaneously search out and review all the evidence about all three possible causes and then pass judgement on the role of each. We call this strategy of information gathering the parallel search strategy. Piaget, a developmental psychologist, tells us that people from 11 years and up have the capacity to use this kind of
strategy. He calls it the cognitive level of "formal operations".

"Another search strategy or search schema we could use is called a serial search strategy. As you might expect from the name, if we were to use this schema we would search out all the information concerning only one of the possible causes before we would begin to look for information concerning any other possible cause. Piaget tells us that people who operate at this level of cognition are "concrete operational", which is characteristic of people under the age of 11 who can utilize this strategy but not the parallel strategy. Now, if after the role of one possible cause is clarified, we continue to look for other avenues of causation, then eventually we are going to know as much about the cause or causes of the event as the person who uses the parallel search strategy. And, by using either method we would probably make a relatively accurate judgement on the cause of the accident. But, if we use the serial search strategy and break-off the search prematurely, after clarifying the role of only one causal agent, then we will probably make a wrong judgement about the cause of the event.

"In an experiment I conducted a year ago with Dr. Namikas, we found that a significant number of the subjects preferred the truncated serial search strategy. That is, they preferred to make causal judgements on the basis of very incomplete information and therefore run a high risk of
being wrong. Other researchers have found the same thing. I thought this was unusual—after all, we presume that people who are intelligent enough to get into university are able to process information in the more sophisticated manner, if they wish to. So, why don't they? I decided to find out.

"Several researchers have shown that the motivational properties of tasks have a significant positive impact on the quality of task performance; motivational factors, like the challenge to skills and abilities, a person's sense of accomplishment and achievement, the experienced meaningfulness of the task, and so on. So, I devised a questionnaire to measure these factors; that's what you filled out after you finished the experimental task. Now, I'm going to analyze these questionnaires and attempt to find out what kinds of things caused you to use the particular search strategy that you did. Did those of you who chose to use the less sophisticated strategy do so because you were bored, or because you didn't think that this task was meaningful? It will be interesting to discover the answer. Thanks for helping out."
APPENDIX H

ADDITIONAL DEBRIEFING FOR THE HIGH MOTIVATION GROUP

Your class was one of several classes that were in the the experimental condition (as opposed to the control condition), therefore, I could not give you this additional information until all classes completed the experiment--people in the other classes might have learned about this information and it may have affected the way they performed their problem solving tasks, contaminating the results.

Earlier, I mentioned that I was interested in the factors that determine whether people used a search strategy that allowed them to make causal inferences on the basis of complete information, or, a strategy by which they seemed satisfied to make a decision based on only partial information. I also mentioned that researchers had found that motivational properties of tasks had considerable impact on how people performed those tasks. I hypothesized that those subjects who were sufficiently motivated would use the more sophisticated search strategy in attempting to gain the most information before making a causal decision, and that subjects who were not motivated would be satisfied to use the less sophisticated search strategy even though it meant that they were making a causal judgement on the basis of incomplete information, thus increasing their chance of coming to an erroneous conclusion.

What I couldn't tell you the other day was that in order
to test my hypothesis, I had to have two groups of people who were motivated differently: One group I called the high motivation condition. The normally motivated people consisted of classes who were simply told that they were participating in research on the intellectual abilities of university students and their data would be used to update tables of norms for average university students. This is the identical information that all subjects were given in an earlier experiment I conducted last year. But your group received additional information because you were part of the high motivation group. I told you that I was interested in studying university students with above-average intelligence and setting up tables of norms for these gifted persons. I implied that if you answered the problems correctly this would mean that you had above-average intelligence. I did this hoping to get you more involved in the experimental task; i.e., to challenge your intellectual skills and abilities and to make the task more meaningful to you. I hypothesized that if you did actually have the more sophisticated search strategy in your repertoire that you would use it in attempting to arrive at the correct answer. However, there was no correct answers per se—there were only answers that showed me whether you were using a parallel search strategy (asking for the answers to two or more questions), a serial search strategy (asking for the answer to only one question), or a truncated search strategy (asking for no
answers).

After I analyze the data, I'll know whether or not your group used the more sophisticated search pattern. If you did, I'll have some evidence that supports my idea that most university students do have the more sophisticated search schema within their repertoire, but only those students who are sufficiently motivated will use it in a given situation.

If there are any questions or comments you'd care to make, call me at 1-351-0978 or see me in my office in Room 271 WH.

Thanks again for your help in this research.
APPENDIX I

SUMMARY TABLE FOR THE ANOVA
ON THE MOTIVATION ASSESSMENT INVENTORY

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MAI MEANS & SD

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APPENDIX J

SUMMARY TABLE FOR THE ANOVA
ON THE CHOICE OF MULTIPLE-CAUSE INFORMATION

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APPENDIX K
SUMMARY TABLE FOR THE ANOVA
ON THE CHOICE OF SINGLE-CAUSE OR "NO" INFORMATION

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APPENDIX L

SUMMARY TABLE OF THE ANOVA ON THE CHOICE OF "NO" INFORMATION

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### APPENDIX M

**SUMMARY TABLE OF THE ANOVA OF THE CHOICE OF "1,2&3"**

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APPENDIX N
SUMMARY TABLE OF THE ANOVA
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APPENDIX O
SUMMARY TABLE OF THE ANOVA
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APPENDIX P

SUMMARY TABLE OF THE POST HOC ANOVA ON THE CHOICE OF MULTIPLE-CAUSE INFORMATION

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76
**APPENDIX Q**

**SUMMARY TABLE OF THE POST HOC ANOVA ON THE CHOICE OF SINGLE-CAUSE OR "NO" INFORMATION**

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### APPENDIX R

**SUMMARY TABLE OF THE POST HOC ANOVA ON THE CHOICE OF TWO-CAUSE INFORMATION**

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<td>0.1250</td>
<td>1.07</td>
<td>0.3056</td>
</tr>
<tr>
<td>Fact</td>
<td>2</td>
<td>1.7100</td>
<td>7.32</td>
<td>0.0015</td>
</tr>
<tr>
<td>Mot. X Fact</td>
<td>2</td>
<td>0.0433</td>
<td>0.19</td>
<td>0.8313</td>
</tr>
</tbody>
</table>
APPENDIX S

SUMMARY TABLE OF THE POST HOC ANOVA ON THE CHOICE OF ONE-CAUSE INFORMATION

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>F</th>
<th>PR&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>1</td>
<td>0.1250</td>
<td>0.60</td>
<td>0.4406</td>
</tr>
<tr>
<td>Fact</td>
<td>2</td>
<td>1.2211</td>
<td>2.95</td>
<td>0.0609</td>
</tr>
<tr>
<td>Mot. X Fact</td>
<td>2</td>
<td>0.5433</td>
<td>1.31</td>
<td>0.2778</td>
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</tbody>
</table>
**APPENDIX T**

**SUMMARY TABLE OF THE POST HOC ANOVA ON THE CHOICE OF "NO" INFORMATION**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>F</th>
<th>PR &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>1</td>
<td>0.0067</td>
<td>0.02</td>
<td>0.8919</td>
</tr>
<tr>
<td>Fact</td>
<td>2</td>
<td>3.2433</td>
<td>4.53</td>
<td>0.0151</td>
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<tr>
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<td>2</td>
<td>1.3233</td>
<td>1.85</td>
<td>0.1672</td>
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</table>
APPENDIX U

SUMMARY TABLE OF THE POST HOC ANOVA
ON THE CHOICE OF "1, 2&3"

<table>
<thead>
<tr>
<th>Source</th>
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<th>SS</th>
<th>F</th>
<th>PR &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
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<td>0.0067</td>
<td>0.03</td>
<td>0.8547</td>
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<tr>
<td>Fact</td>
<td>2</td>
<td>2.2533</td>
<td>5.72</td>
<td>0.0056</td>
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<tr>
<td>Mot. X Fact</td>
<td>2</td>
<td>0.3733</td>
<td>0.95</td>
<td>0.3941</td>
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</tbody>
</table>
APPENDIX V

CORRELATION BETWEEN TASK PERFORMANCE
AND THE MAI ON THE CHOICE OF Q1,2&3

<table>
<thead>
<tr>
<th>Variable</th>
<th>MAI</th>
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<tbody>
<tr>
<td>Task Performance</td>
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</tr>
<tr>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
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<td>1.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

Note. Statistics within parenthesis are the probability levels.
APPENDIX W

CORRELATION BETWEEN TASK PERFORMANCE
AND THE MAI ON THE CHOICE OF "NO"

<table>
<thead>
<tr>
<th>Variable</th>
<th>MAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Performance</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>-0.032</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
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<td>(0.218)</td>
</tr>
<tr>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

**Note.** Statistics within parenthesis are the probability levels.
FOOTNOTES

1 Preceding the Vollick (1983) study, 20 irrelevant 'facts' were generated by the experimenter. In a pilot study, 40 volunteer Introductory Psychology students were asked to identify the relevance or irrelevance of each 'fact'. The 10 irrelevant 'facts' retained were those generating the highest degree of consensus (at least 90%).
REFERENCES


VITA AUCTORIS

Shirley E. Vollick was born on May 7, 1937 in Hamilton, Ontario. In January, 1980 she enrolled at the University of Windsor. She graduated with the Bachelor of Arts (Honours, Psychology) degree in October, 1983. Since September, 1983 she has been enrolled in the Master's programme in clinical psychology at the University of Windsor.