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Personal Involvement and Strategies for Making Contingency Judgments: A Stake in the Dating Game Makes a Difference

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To examine the relation between degree of involvement in a task and the complexity of strategy a subject applies to the task, we randomly assigned 48 female university volunteers to either a dating condition (high-involvement) or one of two (low-involvement) control conditions. These subjects performed a covariation judgment task for which the likelihood of their using simple or complex strategies was calculated. High-involvement subjects used more complex strategies and tended to be more accurate. These data are discussed in terms of the functionality of human information processing, heuristic analyses of inference strategies, and the importance of considering level of personal involvement in analyses of task performance.

There are often many ways to solve a problem. Whether the problem entails choosing a mate, buying a car, isolating x on one side of an equation, attributing a cause, deciding whether two variables covary, or skinning the proverbial cat, multiple routes to solution exist. Furthermore, not all tasks are equally involving or engaging; saving a drowning child would be a far more involving problem (for most people) than would the problem of deciding where to purchase lunch. If in fact the degree to which a task is involving or engaging does channel and influence the particular strategies people choose to solve their problems, then wide-ranging implications follow. To predict adequately a person's choice of strategy, the predictor would require some knowledge about the subject's level of involvement, in addition to information about the framing of the task (Tversky & Kahneman, 1981), which knowledge structures were activated (Hastie, Park, & Weber, 1984), and which heuristics might be implicated (Kahneman, Slovic, & Tversky, 1982; Kahneman & Tversky, 1973).

Recent work[1] suggests that involved subjects pay more attention to the content of information presented, process this information more systematically, and are less likely to rely solely on simple heuristics. In persuasion, for example, Chaiken (1980) found that subjects involved with an issue are more likely to process message arguments in a systematic manner than are less involved subjects. For low-involvement subjects, persuasion was mediated by simpler decision rules. In addition, Petty, Cacioppo, and Goldman (1981) found that high-involvement subjects are more responsive to the quality of the message arguments, whereas low-involvement subjects are more influenced by such peripheral cues as the qualifications of the communicator. Moreover, Borgida and Howard-Pitney (1983) showed that more involved subjects were again more responsive

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[1] Interest in motivational effects on task performance has a long and honorable tradition in psychology. For example, Clark Hull's theoretical work, which occupied stage center for many psychologists of the 1940s and 1950s, was initially based on Perin's (1942) classic demonstration that hungrier rats run faster to food. Another early example is the work of Kurt Lewin's student Zeigarnik (1927), who demonstrated greater memory for unfinished tasks. She presumed that the mnestic advantage was due to unresolved tension associated with the interrupted task. Replication of Zeigarnik effects has since proven to be uneven (Van Bergen, 1968).

to the message content, whereas less involved subjects were more susceptible to perceptual salience effects, or "top-of-the-head" processing.

Showers and Cantor (1985) contended that involvement empowers forms of information processing that are quite complex:

> Under some circumstances, especially when central goals, mood or expertise are engaged by events in the situation, people show flexibility in
> (a) adjusting interpretations in response to situational features;
> (b) taking control of their thoughts and their plans;
> (c) seeing multiple alternatives for interpreting the same event or outcome; and
> (d) changing one's own knowledge repertoire by adding new experiences and reworking cherished beliefs, values, and goals. (p. 277)

Although it appears that higher levels of involvement direct attention to content and potentiate the use of more complex strategies of information processing and less involvement betokens the use of more simple heuristic solutions to problems, no previous research has demonstrated this link between involvement and strategy use. For example, although Chapman and Chapman (1967) offered to pay their most accurate subject $20, they did not track their subject's solution strategies. They examined only the ultimate accuracy of their subjects.

We conducted our investigation to examine the link between involvement and the complexity of solution strategies. People ought to use more complex strategies when they are more involved because it is, in general, functional to match one's cognitive expenditure to the importance of the problem one is facing. This follows if there is some *modest* positive correlation, in natural task environments, between the complexity of strategies used and the quality of answers those strategies generate. In general, very good answers require rather more complex solution strategies than do poor answers. However, the correlation, at best, is only modest. Some very baroque strategies can yield answers that are quite poor, and some elegantly simple strategies can yield answers that are functionally equivalent to more complex mathematically optimal approaches (Thorngate, 1980). Finally, sometimes nature is quite simple, and the optimal solution is therefore a simple one. Previous investigations, such as the classic work by Chapman and Chapman (1967), have not demonstrated the link between involvement and strategy choice because their dependent variable, ultimate accuracy, is only very loosely coupled with our dependent variable, strategy complexity.

In our investigation, we manipulated involvement in a covariation task because covariation problems are recurrent in daily life and because there exist methods that render it possible to track the solution strategies of the subjects. Deciding whether data support the judgment that a relation exists between two variables often carries adaptive significance and is ubiquitous as a general task structure (Alloy & Tabachnik, 1984).

In addition to its importance and ubiquity, covariation is a task ideally suited for an investigation of the influence of involvement on strategy choice because it has been well demonstrated that at the "evidence integration stage" (Crocker, 1981) there is a wide range of strategies available (Arkes & Harkness, 1983; Jenkins & Ward, 1965; Shaklee & Mims, 1982; Shaklee & Tucker, 1980; Ward & Jenkins, 1965). The strategies of information integration from which subjects may choose range from simple, rudimentary strategies, in which large segments of important information are neglected, to highly complex strategies, in which all relevant information is taken into account.

In reporting on a series of investigations into the types of strategies subjects choose for the solution of covariation problems, Arkes and Harkness (1983) speculated that for low-involvement tasks, "people might tend to select strategies that place very little demand for time or thought (or may choose not to analyze contingency at all)." But for high-involvement tasks, "they may shift to complex and costly strategies. Such strategies may yield no better answers than simple, cognitively cheap approaches, however" (p. 133).

Thus in our research we wanted to observe human judges working on a task widely recognized to have important implications for human thought and action, and we wanted to vary the stakes the subject had in the task in some important way. We chose *outcome dependency* (Berscheid, Graziano, Monson, & Dermer, 1976) as the way of manipulating the degree of involvement in the covariation task. In our research, we arranged conditions so that some of our subjects believed they would be dating someone for a period of 3 to 5 weeks. Thus a fictional dating partner would come to assume for our subjects some perceived degree of psychological control over their outcomes (e.g., the amount of fun, the level of boredom, the degree to which they will feel defensive, the sexual opportunities). As a result, dating-condition subjects should experience greater involvement than should nondating controls.

The experiment compared three major conditions: Some subjects believed they were examining covariation information about a person they would be dating (*dating condition–person information*). In a second condition, the subjects believed they were examining covariation information about a person; however, they did not believe they would be dating the person (*nondating condition–person information*). The third major condition in the study consisted of subjects who, like those in the second condition, did not believe they were going to be dating anyone. However, they differed from both the other groups in that they did not believe the information they were examining pertained to the behaviors or choices of another person. Instead, they believed that the information they were examining constituted the stimuli of an abstract judgment task. This was called *nondating condition–abstract information.*

Our dependent variable was an index of the complexity of the strategy chosen to solve the covariation problem, computed for each participant. On the basis of our three major conditions, we expected the following:

1. Subjects in the dating condition should choose strategies of greater complexity than both groups of nondating-condition subjects. This hypothesis follows from the greater level of involvement that the dating manipulation ought to produce.

2. If involvement is the crucial variable in altering the strategy, then both nondating groups (both person information and abstract information) ought to yield approximately equivalent levels of complexity.

3. Subjects should spend greater amounts of time at a task in which they have greater involvement.

Method

Overview

Our experiment involved three major conditions: dating condition–person information (high involvement) and two low-involvement control conditions, nondating condition–person information and nondating condition–abstract information. These three major conditions were crossed with two alternative material sets to form a 3 × 2 between-subjects design.

An account of our method for the two person-information conditions entails describing three distinct sets of individuals: (a) the women who were our real subjects, (b) a fictitious character called Tom Ferguson, and (c) fictitious women whose files Tom supposedly reviewed. Actual subjects in both person-information conditions were told that the information they received about Tom was derived from Tom's perusal of the files of the fictitious women. According to our story, Tom had examined the personality files of 50 women and he had decided which of them he wanted to date. Real subjects in person-information conditions were told that they were examining samples of Tom's decisions to date or not date women, which were based on whether those women had certain attributes such as high intelligence, a good sense of humor, or physical attractiveness. Thus subjects in the person-information conditions believed they were making judgments about which factors affected Tom Ferguson's decisions. In addition, the women in the dating condition believed they would be dating Tom. The actual subjects in both person-information conditions were led to believe that both Tom and the 50 fictitious women were real. Subjects in the abstract-information condition were not told of Tom Ferguson or the 50 fictitious women.

Subjects

Volunteer students from the University of Minnesota introductory psychology course participated in a "questionnaire" study. In the course of this study, participants filled out several personality instruments and were solicited for a variety of experiments. One sheet read "University of Minnesota Dating Study" and contained a request to write down their name and phone number if they were willing to participate in a dating study lasting from 3 to 5 weeks. All of our eventual 48 subjects were women called from the list of those willing to participate. These subjects were randomly assigned to one of six conditions that we created by crossing the three major conditions with two alternative sets of materials (these are subsequently explained as the ascending set and the descending set). The subjects were given extra course credit for their participation.

Materials: Covariation Matrices

The materials and procedures used in our study were similar in structure to those used by Shaklee and Tucker (1980) and Arkes and Harkness (1983, Experiments 4 and 5). Each time we asked our subjects to decide whether two factors were related, we supplied them with four different types of information. In Figure 1 we show the four types of information possible with two dichotomous variables. The four types of information are represented as cells of a 2 × 2 matrix. Thus if Factor 1 were whether Tom decides to date a woman and if Factor 2 were whether the woman has a particular trait, then a Cell A datum would represent an occasion in which the woman has the trait and Tom decides to date her. Cell C would represent an instance in which Tom decides to date her but in which the woman does not have the trait. All the pieces of information given to our subjects in this experiment can be conceived of as fitting into one of the four cells of a covariation matrix.

Each subject solved seven such covariation problems; therefore, the task can be conceptualized as presenting the information that could be summarized in seven 2 × 2 matrices to the subjects. It is important to note, however, that subjects were given raw information, not summary matrices. For example, the dating subjects saw 24 sentences of the form "the woman had (did not have) the trait, and Tom decided (did not decide) to date her." These sentences were presented sequentially. The reason subjects were given seven covariation problems to solve is that the pattern of judgment that emerges over a series of problems allows us to match the choices of the observed subject to the template of the behavior of a hypothetical subject precisely following a particular strategy. Thus, from the pattern of a subject's responses over a series of problems, one is able to make inferences about the strategy the subject is most likely pursuing in solving the covariation problems.

Previous researchers have found four main strategies that are frequently used by subjects solving covariation problems (see, e.g., Arkes & Harkness, 1983; Nisbett &

		Factor 1 Tom wants to date woman Yes	 No
Factor 2	Woman has good sense of humor	**Cell A** Factor 1: present Factor 2: present Example: Eight women had a good sense of humor and Tom wanted to date them	**Cell B** Factor 1: absent Factor 2: present Example: Four women had a good sense of humor and Tom did not want to date them
	Woman does not have good sense of humor	**Cell C** Factor 1: present Factor 2: absent Example: Eight women did not have a sense of humor and Tom wanted to date them	**Cell D** Factor 1: absent Factor 2: absent Example: Four women did not have a good sense of humor and Tom did not want to date them

Figure 1. The four kinds of information possible in a two dichotomous variable covariation task, with an example of hypothetical frequencies of date types based on Tom's dating decisions and fictitious women's traits.

Ross, 1980; Shaklee & Mims, 1982; Shaklee & Tucker, 1980; Smedslund, 1963; Ward & Jenkins, 1965). We describe these strategies in order of increasing complexity. First, some subjects base their judgments on the preponderance of Cell A information. Thus the major factor affecting their covariation judgments tends to be the frequency count of the pieces of information that fit into Cell A; this is called the *Cell A strategy.* When Cell A observations predominate, the subject decides that the two factors are related. Otherwise, the subject decides the factors are unrelated. A subject using the Cell A strategy is required to make only an ordinal comparison between the A cell and all other cells. She needs only to ask, "Does Cell A have the greatest frequency, or is it tied for the greatest frequency?" No further integration or manipulation of the information is required of the Cell A practitioner.

In a second strategy found to occur with some frequency, subjects compare the frequency of Cell A observations with the frequency of Cell B observations. If the Cell A count minus the Cell B count is different from zero, the subject decides that the two factors are related; if A − B equals zero, the subject decides that the factors are unrelated. This is called the *A − B strategy.* A user of the A − B strategy needs only to subtract the Cell B sum from the Cell A sum and compare the difference with zero. Again, little information integration or algebraic treatment of the raw data occurs with an A − B approach.

One who uses a third, more complex strategy like the sum-of-diagonals strategy must actively use the frequency counts in all four cells of the 2 × 2 matrix, add the Cell D sum to the Cell A sum (this is the number of confirming cases), and compare that with the sum created by adding the Cell C sum to the Cell B sum (this is the number of disconfirming cases) and, finally, check this difference of the diagonal sums against zero. If the two sums are equal, then the subject concludes that the two factors are unrelated. If the sum of the confirming cases does not equal the sum of the disconfirming cases, then a subject using such a strategy concludes that there is a relation between the two factors.

Finally, some subjects use a *conditional probability strategy.* These subjects must actively use all four cells. They judge the factors to be related if the ratio of cells A/(A + C) is not equal to B/(B + D). If these two ratios are equal, then the user of the conditional probability strategy concludes that the two factors are unrelated. Thus the four strategies differ in the degree of information integration required to reach a covariation judgment.

Ascending and Descending Sets of Materials

Two different sets of seven covariation problems were constructed. In the first set, Problems A through G, as shown in the top half of Table 1, the number of related judgments ascends as more complex strategies are used. In the other set of seven covariation problems, H through N, shown in the bottom half of Table 1, the number of related judgments descends as more complex strategies are implicated. Half the subjects in each major condition received the ascending series problems, and half of the subjects received the descending series problems. If the dating manipulation merely resulted in a bias to give one response over another (e.g., to say "related" more often than "unrelated"), then the strategies implicated by the ascending series would tend to be complex ones, whereas in the descending series, the inferred strategies would tend to be simple. However, if both ascending and

Table 1
Covariation Problems

		Responses[a]			
Problem	Matrix	Cell A	A − B	Sum of diagonals	Conditional probability
		Ascending series			
A	$\begin{bmatrix} 10 & 4 \\ 8 & 2 \end{bmatrix}$	R	R	U	R
B	$\begin{bmatrix} 3 & 3 \\ 3 & 15 \end{bmatrix}$	U	U	R	R
C	$\begin{bmatrix} 2 & 11 \\ 7 & 4 \end{bmatrix}$	U	R	R	R
D	$\begin{bmatrix} 2 & 2 \\ 2 & 18 \end{bmatrix}$	U	U	R	R
E	$\begin{bmatrix} 3 & 7 \\ 7 & 7 \end{bmatrix}$	U	R	R	R
F	$\begin{bmatrix} 3 & 3 \\ 15 & 3 \end{bmatrix}$	U	U	R	R
G	$\begin{bmatrix} 7 & 7 \\ 7 & 3 \end{bmatrix}$	R	U	R	R
No. related strategies for each judgment		2	3	6	7
		Descending series			
H	$\begin{bmatrix} 12 & 4 \\ 6 & 2 \end{bmatrix}$	R	R	R	U
I	$\begin{bmatrix} 4 & 8 \\ 4 & 8 \end{bmatrix}$	U	R	U	U
J	$\begin{bmatrix} 9 & 9 \\ 3 & 3 \end{bmatrix}$	R	U	U	U
K	$\begin{bmatrix} 8 & 4 \\ 8 & 4 \end{bmatrix}$	R	R	U	U
L	$\begin{bmatrix} 8 & 8 \\ 4 & 4 \end{bmatrix}$	R	U	U	U
M	$\begin{bmatrix} 7 & 7 \\ 7 & 3 \end{bmatrix}$	R	U	R	R
N	$\begin{bmatrix} 11 & 2 \\ 10 & 1 \end{bmatrix}$	R	R	U	R
No. related strategies for each judgment		6	4	2	2

Note. R = related; U = unrelated.
[a] If given strategy were used.

descending series implicated similar strategies, this would be much stronger evidence than either series alone.

Procedure

All subjects were contacted by phone. The dating-condition–person-information subjects were reminded of their earlier expression of interest in the dating study. They were told that they would be asked to make a series of judgments both before and after meeting a dating partner that we would assign to them for three to five weekly dates.

Subjects in the other conditions were called from the same pool of individuals who had earlier expressed an interest in dating. Each was told that her name had been obtained from the introductory psychology subject pool. They were invited to participate in a judgment study.

Preparation of materials before each subject's arrival. For subjects in the person-information conditions, the covariation problems were of the form shown in Figure 1. One factor was always presented as "Tom's decision to date or not date a woman." The other factor changed for each problem. This other factor took the form of attributes the woman either did or did not have. For the seven covariation problems, the seven attributes of the woman for Factor 2 were as follows: sense of humor, being outgoing, being jealous, being athletic, being liberal, having high intelligence, and being attractive. Before the arrival of the subject, the experimenter randomized the pairing of attributes with matrices and recorded the resultant pairing for later interpretation. The subjects were given the information on individual sheets of paper so that if Problem A were paired with "jealous," then the subject would receive 10 sheets of paper indicating Tom decides to date women who were jealous (Cell A), 4 sheets indicating he did not date jealous women (Cell B), 8 sheets indicating he dated nonjealous women (Cell C), and 2 sheets indicating he did not date nonjealous women (Cell D). Before the arrival of the subject, the experimenter also randomized the order of the 24 sheets of paper required for each of the seven problems.

For the nondating-condition–abstract-information group, the two factors were simply referred to as Factor 1 and Factor 2.

Instructions to the subjects. When the dating-condition–person-information subjects arrived, they were given these instructions:

> This is a dating study. If you agree to participate, for 3 to 5 weeks you will be going out with a person we assign to you. Please read the consent form very carefully. If you consent, please sign it. [At this point, subjects were given a consent form.]
>
> Our interest is in how judgments change, how our feelings change about people from the time we first hear about a person to the time when we actually meet a person to the time we have actually gone out with that person for some time. That is the basic idea behind this study. Okay?
>
> From our dating pool we selected a sophomore named Tom Ferguson, and he was randomly selected to be your dating partner. In about half an hour you and Tom will get together and plan your schedules for the 3 to 5 dates that will last approximately one hour each. Of course, they can last longer but that's up to you.
>
> However, before you meet Tom, we want you to make some judgments about him, which we can compare to some later judgments we will ask you to make about him, okay?
>
> Let me explain about the information I'm going to give you on Tom. Earlier in the quarter, all of the men selected for this study saw 50 folders similar to this sample folder. [Subjects were then shown a "sample folder" of the type supposedly seen by the "men in the dating pool."]
>
> As you can see, each of the folders contains a wide variety of information about the woman. There is some personality information, attitude information, and a photograph. After the men in the study reviewed all of the information in the folder, we asked them to make a decision as to whether or not they would like to date the woman described in each folder. Only a few of the men were finally selected to actually be in the dating pool because they represented a wide variety of responses. The others were told that this was not a dating study and were dismissed.
>
> We looked at seven traits the women either had or did not have. The traits were such things as whether she was jealous or not, liberal or conservative, attractive or unattractive, and so on. So what we did was classify the woman as either having a particular trait or not and then we compared that with the men's decisions to date her or not. We have recorded these comparisons on sheets such as these. [Subjects were shown a sample of the pieces of paper that indicate a Cell A, B, C, or D piece of information.]
>
> Now for each of the seven traits we selected 24 of Tom's most typical responses. What we want you to do for Tom is to look through each trait folder [subjects were shown the trait folders] and decide whether his desire to date was, in general, influenced by that trait or not, and record your decision on the sheet.

Subjects were then shown the response sheet and the experimenter explained how judgments were to be recorded.

The nondating-condition–person-information subjects were told that a fellow named Tom had seen 50 women's folders and had made decisions about whether he would like to date each one. The subject was shown a sample woman's folder. Then the final three paragraphs of the preceding instructions were read to these subjects.

The nondating-condition–abstract-information subjects were asked to solve the same covariation problems (either matrices A to G or H to N); however, they were told that it was a pure "judgment problem." An example of a Cell C datum presented to a nondating-condition–abstract-information subject would be "Event 1 did occur and Event 2 did not occur."

Dependent variables. As soon as each subject began to solve the problems, the experimenter began timing them unobtrusively by stopwatch. Each subject was provided a response sheet on which they indicated, for each of the seven problems they solved, whether they believed one factor influenced (was related to) the other factor or whether they believed one factor did not influence (was unrelated to) the other factor.

On completing the task, dating-condition subjects were then asked if they had any suspicions or hunches about the nature of the experiment.[2] After that, they were debriefed; they were told it was not a dating study. The rationale was explained to them along with a request that they not discuss this with other subjects. All subjects were then asked to write down anything they had heard in advance about the study.

Results

Assessing Strategies

To gauge the degree of strategy complexity brought to bear on the covariation problem, the following scoring procedure was used. Consider Matrix A on the top half of Table 1. When asked whether Event 1 and Event 2 were related, a hypothetical subject could respond, "Yes, related" or "No, unrelated." Imagine that this hypothetical subject responded, "Related." By examining the response pattern part of the top of Table 1, we see that a judgment of "related" could be indicative of the Cell A strategy, the A − B strategy, or the conditional probability strategy. In our scoring system we would award the subject one vote for each of these three strategies for Matrix A. Conversely, if the subject had responded, "Unrelated," we would have awarded her one vote for the sum-of-diagonals strategy.

Next, consider Matrix B in Table 1, and imagine that our hypothetical subject believes that the events represented in this matrix are unrelated. Again, by examining the response pattern part of this table, we can see that a judgment of "unrelated" could have arisen from the use of the Cell A strategy or the A − B strategy. Thus for Matrix B we would award the subject one vote for the Cell A strategy and one vote for the A − B strategy. Overall, then (i.e., after responding "Related" to the first and "Unrelated" to the second matrix), the subject has accumulated two votes for the Cell A strategy, two votes for the A − B strategy, and one vote for the conditional probability strategy.

We continued the use of this scoring procedure for all seven matrices, so that for each subject we recorded a certain number of votes for each of the four strategies, each number representing the sum of votes over all seven matrices. For each subject the strategy accumulating the highest number of votes was declared the "winning" strategy. For

Table 2
Frequencies of Winning Strategies by Condition

Involvement condition	Cell A	A − B	Sum of diagonals	Conditional probability
Dating–person information	0	0	9	2
Nondating–person information	4	2	4	1
Nondating–abstract information	6	1	3	1
Totals	10	3	16	4

Note. In each condition, there were 5 subjects who tied for the winning strategy.

example, we concluded that the subject was probably using the A − B strategy and it was declared the winning strategy[3] if the scoring procedure produced the following results: Cell A, 4 votes; A − B, 5 votes; sum of diagonals, 1 vote; conditional probability, 1 vote. The frequencies of winning strategies for each condition are presented in Table 2.

[2] Our subjects took the dating manipulation quite seriously; viewed from behind a one-way mirror, grooming and primping behavior occurred only with dating condition subjects. One dating subject needed two debriefings. After the first debriefing, in which she was clearly told that the dating manipulation was a fiction, she said, "Okay, but when do I get to go out with him?" Only after a repeat debriefing did reality finally sink in.

[3] For a 7-item test, the matrix procedure has good reliability properties. For each subject, we assigned a score for each of the seven matrices, using a scoring procedure similar to the one described in the Method section. For example, if one subject, for Matrix A in Table 1, said, "Related", she would receive a score of 1 (for evidence of the Cell A heuristic) + 2 (for evidence of the A − B strategy) + 4 (for evidence of the conditional probability approach) all divided by 3, or 2.33. We did this for each subject for all seven matrices; thus each subject had seven scores, and because these scores are essentially scores on seven test items, they could be submitted to an internal consistency analysis. Therefore we computed the coefficient alpha, which sets the lower limit on reliability, for these data. The average alpha, combined for both the ascending and descending matrix orders, was .35. The resulting signal to noise ratio of .54 is not consistent with the notion that subjects respond randomly to the matrices. Although the Spearman-Brown formula suggests that having, for example, 50 matrices would yield an alpha of .794, the large number of judgments necessitated would have made it extremely difficult to "sell" our involvement manipulation. Nevertheless, detecting the effect with a small number of items argues eloquently for the strength of the effect.

Table 3
Complexity Index

Involvement condition	Matrix type[a] Ascending	Descending	M[b]
Dating–person information	3.00	3.06	3.03
Nondating–person information	2.00	2.65	2.32
Nondating–abstract information	1.65	2.62	2.13

Note. Higher scores indicate the use of a more complex strategy.
[a] $n = 8$ per cell. [b] $n = 16$ per cell.

Because no subjects in the dating condition had Cell A or A − B as winning strategies, direct nonparametric analyses of these data are inappropriate.

To derive an index of strategy complexity, we awarded subjects 1 point if Cell A was the winning strategy, 2 points if A − B was the winner, 3 points if sum of diagonals accumulated the most votes, and 4 points if conditional probability was the most likely.[4] In case of a tie, the average was taken. Thus, in essence, each subject received a score on a 1–4 scale of complexity; higher scores indicated the use of a more complex strategy. In Table 3 we present the mean complexity scores.

Data Analysis

We performed a 3 × 2 (Major Condition × Material Set) analysis of variance on the complexity scores. This analysis revealed a statistically reliable main effect for major condition, $F(2, 42) = 5.32$, $p < .01$, suggesting that overall the complexity of the strategies used by subjects did indeed vary as a function of their involvement with the stimulus materials. To investigate our a priori hypothesis, we performed the following contrast. A weight of 1 was assigned to the mean overall complexity index for subjects in the dating condition, collapsed over material type, and weights of −.5 were assigned to the mean overall complexity indexes for both nondating-condition–person-information subjects and nondating-condition–abstract-information subjects, again collapsed over material type. This contrast was significant, $t(42) = 3.17$, $p < .01$, indicating that subjects in the dating condition were more likely to have used a complex strategy to solve the covariation problem than were subjects in the two control conditions.

A finding of no significant difference between the two control conditions on the overall index would be consistent with our second a priori hypothesis. The contrast with a zero weight on the dating-condition–person-information subjects' data, a −1 weight for nondating-condition–person-information subjects' data, and a 1 weight for nondating-condition–abstract-information subjects' data produced a $t(42)$ of .65, *ns.* This contrast was computed collapsing across the two material sets.

Recall that we included two sets of matrices in this study, an ascending order and a descending order, to investigate the possibility that dating-condition–person-information subjects, perhaps because of a stronger need for information, might be biased to respond "Related" to the covariation problems. This might occur if a subject's "need to know" something about the dating partner were translated into a tendency to make dispositional attributions (in this case, "related" judgments). If this was indeed occurring, then within the dating condition those subjects who received the *ascending series* of matrices would have been diagnosed as using relatively complex strategies (a preponderance of related judgments is indicative of a complex strategy with this series). By contrast, dating subjects who received the *descending series* of matrices would have been diagnosed as using relatively simple strategies (a preponderance of related judgments is indicative of a simple strategy with this series) when compared with subjects in other conditions. Thus if differences in

[4] Ratings of expert judges suggested that this was a conservative metrification of the strategies in terms of complexity. Ten graduate students in psychology (who had not read about or participated in this research) read descriptions of the four heuristics we tracked in this study. They independently rated the strategies on scales for which 1 = *very simple* and 7 = *very complex.* The means for the Cell A, A − B, sum-of-diagonals, and conditional probability strategies were 1.2, 2.3, 4.8, and 6.2, respectively. Significance tests indicated that all means differed from each other.

strategy votes were actually the result of differential tendencies to make "related" judgments, then the resultant strategy choices ought to vary for ascending versus descending materials over the conditions; thus this rival hypothesis is predictive of a two-way interaction. However, the absence of a reliable two-way interaction, $F(2, 42) = 1.28$, *ns*, clearly indicates that this did not occur.[5]

Accuracy Scores

The groups did differ in accuracy. The mean number of votes cast for the conditional probability strategy is readily interpretable as an accuracy index for each group. Each subject could receive a score ranging from 0 (*no responses indicative of the conditional probability strategy*) to 7 (*every response indicative of the conditional probability strategy*). For each subject, then, we have their standing on a 0–7 scale of accuracy. In Table 4 we present the mean accuracy scores for subjects in the three major conditions. To investigate whether subjects in the dating condition were any more accurate than subjects in the other two conditions, we performed the following planned comparison. A weight of 1 was assigned to the mean accuracy score for subjects in the dating condition and weights of −.5 were assigned to the mean accuracy scores for the nondating-condition–person-information subjects and the nondating-condition–abstract-information subjects. The contrast was significant, $t(45) = 2.43$, $p < .05$; this indicates that the involved dating condition subjects were more likely to be using the optimal conditional probability strategy.

Time Analysis

We had predicted that the dating-condition–person-information subjects would take longer to complete their seven covariation judgments than would their counterparts in either of the control nondating conditions. An examination of the data revealed that the means in each condition were proportional to the variances in each condition, suggesting that a transformation of the data was appropriate (Kirk, 1982); a square root transformation was used.[6] In Table 4 we present the mean transformed time scores for the three major conditions.

Table 4
Mean Accuracy and Transformed Time Scores

Involvement condition	Accuracy	Transformed time[a]
Dating–person information	4.25	26.34
Nondating–person information	3.19	26.26
Nondating–abstract information	3.44	31.37

Note. $n = 16$ for each group.
[a] Time measured in root seconds.

To test our time hypothesis, we used the following planned comparison. A weight of 1 was assigned to the dating-condition–person-information mean time and weights of −.5 were assigned to the control nondating-condition–person-information and nondating-condition–abstract-information mean times. This contrast proved to be nonsignificant, however, $F(1, 45) = 2.10$. Thus subjects in the dating condition did not take significantly longer to complete the task than did subjects in the nondating conditions.

[5] We also investigated the alternative hypothesis that the involvement manipulation engaged a differential use of implicit personality theories, which in turn may have influenced our results. For each trait we wanted to make sure that the dating-condition–person-information subjects were not more likely to have endorsed certain traits as having influenced Tom's decisions than were the nondating-condition–person-information subjects. To investigate that possibility, we analyzed the responses subjects made to the trait labels. For example, a given subject might have said, "related" for the trait *liberal*, "unrelated" for *high intelligence*, "related" for *attractive*, and so on. We coded each "related" judgment as 1 and each "unrelated" judgment as 0. Thus *trait* became a within-subject factor with seven levels. For each group, the mean for each trait is the proportion of persons making a "related" judgment. In a mixed 2 × 7 (Dating vs. Nondating Person Information Conditions, between subjects × Trait, within subjects) analysis, a differential endorsement rate would show up as a significant Condition × Trait interaction. However, this interaction was clearly nonsignificant $F(6, 168) = .49$, strongly suggesting that dating-condition–person-information subjects were no more likely than were nondating-condition–person-information subjects to believe that certain traits influenced Tom's decision.

[6] To choose the appropriate transformation, we used a procedure suggested by Kirk (1982). The transformation resulting in the smallest maximum/minimum time ratio is considered the most appropriate, and in our case the square root transformation was selected.

Discussion

Subjects who experienced higher levels of involvement used more sophisticated strategies for assessing the contingency between variables. Subjects in the dating condition, the subjects who had a stake in accurately accumulating information about the fictitious dating partner, tended to use the more complex class of strategies: the sum-of-diagonals and conditional probability approaches. The involved subjects not only used more complex strategies, but were also more likely to use strategies that led to accuracy than were subjects in the less involving conditions. In these particulars, our predictions were confirmed. Because the differences emerged between the dating and the two nondating control conditions, and because differences did not emerge between the two control conditions with person information and abstract information, we have increased confidence that the observed effects were not due to the functioning of implicit personality theories or the functioning of methodological artifacts. Rather, as predicted, motivational variables must be taken into consideration if strategies are to be predicted accurately.

Our prediction that greater expenditure of time on the task would flow from greater involvement was not confirmed. Instead, it appears that involved subjects are more efficient: They execute strategies of greater complexity than do less involved subjects, even though subjects in conditions representing both levels of involvement used statistically comparable amounts of time.

The popular computer metaphor for human cognition easily accommodates the notion of priority in task selection. Our data point to some elaborations of that metaphor. Specifically, we suggest that not only can the priority of tasks and the focus of attention be changed by importance, but that also there can be a shifting to fundamentally different strategies on the basis of the importance of the task mediated by the subject's involvement.

What are these mechanisms by which involvement "works"? Erber and Fiske (1984) demonstrated shifts in attention that were based on changing levels of involvement (also manipulated by outcome dependency). When more is at stake interpersonally, people pay more attention to inconsistencies about other people. Our research adds to Erber and Fiske's findings in that we clearly demonstrate that involvement alters the actual analytic strategies, or the techniques adopted at the "evidence integration stage" (Crocker's 1981 term). Thus the methods people use to combine pieces of information is transformed in fundamental and predictable ways when real involvement occurs. These findings also build on recent research by Borgida and Howard-Pitney (1983), who demonstrated that motivational differences in the subject's involvement can shift the subject's approach to a task. Under low involvement, subjects are more susceptible to perceptual effects such as the visual salience of a message's source; with greater personal involvement comes a reduced susceptibility to such effects. Our current findings fill out the picture: A person who is observed to function at a task with only rudimentary heuristic strategies at one level of involvement may, at a different level of involvement, display quite sophisticated strategies.

Our findings also have strong implications for the way in which the human thinker is viewed. From a rather flattering set of metaphors in the 1950s and 1960s (e.g., the lay scientist metaphor central to attribution theories), our species suffered an ego-deflating loss of estimated intelligence; the human has been pictured at times as "mindless" and rudimentary in strategy choice (these fluctuations are documented by Markus & Zajonc, in press). Although the current picture might be characterized as a bit more optimistic, it is definitely more complex. Indeed, the human can be "mindless' and rudimentary, but the human can also be "mindful" and complex in the use of strategies. The current findings go beyond this intriguingly to suggest that humans can be quite mindful in deciding when to be mindless; they can be quite rational in deciding when to be irrational. However, even though the assignment of cognitive capacity to tasks can occur in a way that appears quite reasonable, the upper levels of strategies people choose may still be suboptimal in mathematical terms. Kahneman and Tversky's (1973) now classic conclusions about heuristic processing still hold with our data set. Even highly involved subjects were choosing as a modal strategy the mathematically suboptimal sum-of-diagonals approach. In other words, although their "accuracy" was significantly better than that of the less involved subjects, the mean votes cast by dating subjects for the mathematically suboptimal sum-of-diagonals strategy was also elevated (for conditional probability, $M = 4.25$; for sum of diagonals, $M = 4.81$). In sum, even though assignment of cognitive capacity to tasks as assessed by complexity of information integration appears quite reasonable, the subjects remain handicapped unless they have the knowledge of appropriate ways to combine information. Thus either involvement without knowledge or appropriate knowledge without sufficient involvement represent crucial combinations of circumstances leading to suboptimal performance. However, it should be noted that suboptimal performance on a trivial task may be a marker of intellect.

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