WHAT THE PUBLIC WANTS FROM THEIR PROFESSIONAL: ATTITUDES TOWARD DECISION MAKING STRATEGIES

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What the Public Wants From Their Professional:

Attitudes Toward Decision Making Strategies

By

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Abstract

Attitudes toward four types of decision making strategies (clinical/fully-rational, clinical/heuristic, actuarial/fully-rational, and actuarial/heuristic) were examined. Participants (N = 80) were randomly split between a legal or medical decision making scenario and asked to judge, on a 7-point rating scale, each strategy in terms of (a) preference, (b) accuracy, (c) fairness, (d) ethicalness, and (e) similarity to how legal and medical professionals actually render decisions. Results showed that the clinical/fully-rational strategy was rated the highest across all attitudinal judgments, whereas the actuarial/heuristic strategy received the lowest ratings across all judgments. Considering the two strategy-differentiating factors separately, clinically-based strategies were always rated higher than actuarially-based strategies and fully-rational strategies were always rated higher than heuristic-based strategies. The potential implications of the results for professional decision makers and those affected by their decisions are discussed.

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1.0 Introduction

Within the judgment and decision making (JDM) literature, there are two important debates regarding whether professional decision makers should: (1) use subjective and human based (i.e., clinical) or objective and formula based (i.e., actuarial) strategies and (2) combine all available information in a statistically optimal fashion (i.e., fully-rational) or use shortcuts that ignore some of the available information (i.e., heuristics). Many empirical studies have demonstrated the superiority of actuarial methods over clinical methods in producing accurate decisions (see Grove & Meehl, 1996), and, despite recent developments, fully-rational strategies have generally been shown to produce more accurate decisions than heuristics (see Kahneman, Slovic, & Tversky, 1982). Accordingly, this research has resulted in a prescription for professionals to use decision making strategies that maximize predictive accuracy. Notwithstanding the need for professionals to make highly accurate decisions, relatively little research has considered the layperson's perceptions of the decision processes. Consequently, the current research examines people's attitudes toward various decision strategies.

The introduction is divided into three sections. First, the history of the clinical versus actuarial debate is reviewed. Second, a summary of the various aspects of the fully-rational versus heuristic debate is provided. Third, previous research that has assessed people's attitudes toward decision making strategies is discussed, and the purpose of the current research is outlined.

1.1 *Clinical versus Actuarial Decision Strategies*

The debate regarding whether clinical or actuarial (i.e. formulaic) decision strategies produce more accurate decisions can be traced back to an exchange between

Max Freyd (1925) and Morris Viteles (1925), who argued the relative merits of each approach when selecting personnel. Viteles argued that a judgment about whether an individual is suited for a position should involve the subjective interpretation of information using scientific knowledge of human behaviour, and therefore the judgment should be made by a skilled psychologist and not a statistician. He used an example of a medical laboratory, where an assistant may gather a variety of objective data about a patient (e.g., pulse, blood pressure), but the final diagnosis is made by a trained physician using his training and experience. Freyd replied that the role of a psychologist in personnel selection is strictly as a scientist. He stated that any factors that a psychologist believes useful in forecasting the success of an applicant should be made explicit and empirically tested to assess its predictive validity. The influence of subjective interpretations, with their associated prejudices, could then be eliminated by incorporating the empirically validated factors into an objective rating scale. Freyd raised the question "Is there any reason to believe that a psychologist can select men more accurately by adding his scientific knowledge of human behavior than a capable and experienced employment manager who is also in the possession of the test results and is aware of their significance?" (p. 352). Eight decades of research has subsequently attempted to answer this question.

The first empirical comparison of clinical versus actuarial methods of decision making was conducted by sociologist Robert Burgess. He compared two psychiatrists against a simple statistical formula on their ability to predict the parole success of 1000 offenders (Burgess, 1928). The same information was made available to both the psychiatrists and the actuarial method. His results showed that the psychiatrists were

more accurate in predicting parole success than the actuarial method (83% vs. 76%), but were inferior in predicting failure (41% vs. 69%). Burgess also noted that the psychiatrists had an advantage because the actuarial method made judgments in all cases, whereas the psychiatrists had the option of leaving cases undecided.

Similarly, a few years later Sarbin (1943) compared a group of counsellors against a two-variable (college aptitude test score and high school grades) statistical formula on their ability to predict first year college grades. In addition to the two variables, the counsellors also had access to other information (e.g., interview notes, additional aptitude tests, and achievement tests). Even with this supposed advantage, the counsellors' performance was comparable to the formula when predicting first year college grades for female students and significantly lower when predicting first year college grades for male students.

In 1954, Paul Meehl published a seminal book that contained a review of all the available prediction literature. He reviewed 20 studies that had quantitatively compared clinical decision making methods against actuarial decision making methods and found that actuarial methods either equalled or outperformed the clinical method, regardless of the type of actuarial method that was employed. This systematic summary of the field stimulated a wealth of research that compared the performance of clinical and actuarial decision strategies (e.g., Goldberg, 1965; Hiler & Nesvig, 1965).

Twelve years after Meehl's book was published, Sawyer (1966) reviewed a total of 45 published studies that compared the relative accuracy of the two methods in predicting outcomes such as parole success, improvement during therapy, freshman grades, and length of hospitalization. Of the 75 comparisons between the two methods,

Sawyer found that the predictive accuracy of the actuarial method was comparable to the clinical method in 47 of them and superior to the clinical method in the remaining 28 comparisons. Because there were a variety of methodological issues with the reviewed research (e.g., uncontrolled differences between studies in level of clinical expertise, amount of cross-validation of actuarial methods, type of actuarial methods employed), Sawyer hesitated to make any firm conclusions regarding the superiority of the actuarial method in making predictions.

In a recent meta-analysis of all studies that had compared the predictive accuracy of clinical methods against actuarial methods, Grove, Zald, Lebow, Snitz, and Nelson (2000) further confirmed the superiority of actuarial methods. Of the 136 studies included in the meta-analysis, 63 (47%) notably favoured actuarial prediction, 65 (48%) showed equal performance, and 8 (6%) favoured clinical prediction. The authors did not find any systematic difference between the 8 studies that favoured the clinical approach and the remaining 128 studies. Although not significant, there was a trend toward a greater advantage for the actuarial method in medical and forensic settings. There was no effect of moderating variables (e.g., amount of training, level of experience, amount of information) on the results. According to Morera and Dawes (2006) "this [Meehl's] book started a ''horserace'' comparing pure clinical judgment with pure actuarial judgment (based on the same input) in predicting important human outcomes. That particular race is over and actuarial judgment has won" (p. 410).

1.1.1 *Why are actuarial methods more accurate?*

The overwhelming superiority of actuarial methods over clinical judgments has led to the question of why actuarial methods are consistently more accurate than clinical

methods. The primary answer to this question appears to be due to the clinical methods' low level of reliability (e.g., DeDombal, Leaper, Staniland, McCann, & Horrocks, 1972; Goldberg, 1968; Goldberg & Werts, 1966; Werner, Rose, & Yesavage, 1983). Clinicians[1] appear to recognize the important cues, but do not use them in a consistent manner across judgments. This lack of reliability leads to a decrease in the accuracy of their judgments.

At least two reasons have been provided to explain why clinicians display low levels of reliability. One reason relates to the different ways that the clinical and actuarial methods understand, accept, and deal with error (Einhorn, 1986). According to Einhorn, those who espouse the clinical viewpoint believe that prediction error is due to a current lack of complete knowledge, and that perfect predictability is seen as a difficult, but achievable, goal. Thus, individuals who use a clinical method do not believe that predictive situations contain error that cannot be accounted for, and attempt to combine information in a specific and unique way for each case to achieve perfect predictability. On the other hand, Einhorn argues that advocates of the actuarial method do not believe that perfect predictability is a realistic goal and readily accept error as inherent in the predictive situation. Individuals who rely on actuarial methods consistently use the most valid cues across all cases, and they accept the fact that a certain number of predictions will be incorrect. This difference in dealing with error leads to the lowered level of consistency, and therefore reliability, of those employing the clinical method.

A second reason for low reliability relates to the inherent limitations and biases present in the human condition. Goldberg (1970) pointed out that humans are subject to boredom, fatigue, illness, and situational and interpersonal distractions. All of these

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[1] For the purpose of the current document, the term "clinician" is used in a broad sense to refer to human decision makers in a variety of fields (legal, medical, etc.).

factors serve to lower the reliability of their judgments. A more systematic limitation of the human condition is the inability of the human mind to process a large amount of information in an optimal fashion (e.g., Tversky & Kahneman, 1974). The inability to consider and process all available information in an optimal way has been blamed for lowering the reliability and accuracy of clinical judgments (see Kahneman et al., 1982).

1.1.2 *Why are clinical judgments still used?*

As early as 1956, Paul Meehl suggested that "the clinical interpreter is a costly middleman who might better be eliminated" (p. 271). Indeed, the demonstrated superiority of actuarial methods over clinical methods in prediction produces an important question: Why are clinical methods of prediction still heavily relied upon in fields ranging from medicine to psychology to law? Although no empirical studies have been performed to answer this question, at least six reasons have been suggested:

(i) *Poor education and ignorance.* One reason that has been suggested is that many clinicians are simply unaware of the findings in this area, or are unaware that a debate even exists (Dawes, Faust, & Meehl, 1989; Meehl, 1986). Furthermore, according to Dawes et al. (1989), many of those that do recognize that a controversy exists still believe that clinical judgment has not been studied fairly, despite the overwhelming evidence to the contrary.

(ii) *Deluded self-confidence.* Kleinmuntz (1990) proposed that clinicians avoid using statistical formulas because they remain confident in their own expertise and predictive abilities. This over-evaluation of cognitive abilities has been labelled cognitive conceit (Dawes, 1976). Arkes, Dawes, and Christensen (1986) showed that the willingness of clinicians to use an actuarial tool depended on whether they believed they

had expertise in the field, and not on the accuracy of the method. Those that believed that they had expertise in a given field were less likely to use the actuarial tool. Interestingly, they performed worse on prediction tasks than non-experts using the actuarial tool.

(iii) *Uniqueness of the situation.* Pritchard (1980) stated that actuarial methods are only concerned with predictions in the long run and for the "average" client. Therefore, clinicians feel obligated to review the accuracy and reliability of the actuarial decision in order to produce a decision about a particular person. He argues that the idiographic approach allows the clinician to consider the unique features that may be present in each individual situation, and therefore attempt to make the best decision for each case.

(iv) *Costs and availability.* According to Meehl (1957), actuarial tools are not always used because they may not always be available in the area where the prediction is being made. There are a number of steps included in the process of designing an actuarial tool, including specifying the appropriate variables, obtaining sufficient data to test the variables, and then cross-validating the tool on another large number of cases. Furthermore, any actuarial tool would need to be constantly updated as new information becomes available, and must be re-tested any time it is applied to a population outside that which was used to compose it. As can be seen, composing an actuarial tool can be a time-consuming and expensive enterprise (Kleinmuntz, 1990).

(v) *The dehumanizing and unethical nature of the approach.* Researchers have also suggested that clinicians feel it is dehumanizing or unethical to simply plug numbers into a formula or "reduce those being judged to a number" (Dawes, 1980; Dawes et al., 1989; Meehl, 1986).

(vi) *Fear of technological unemployment.* Finally, it has been suggested that clinicians with years of training and experience dislike the idea that a relatively naive statistician can outperform them in prediction tasks. As Meehl (1986) stated "if PhD psychologists spend half their time giving Rorschachs and talking about them in team meetings, they do not like to think that a person with a MA in biometry could do a better job at many of the predictive tasks" (p. 374).

As can be seen, the justifications for the continued reliance on clinical methods all focus on the attitudes and beliefs of the clinician, with little consideration of the attitudes of the general public. Given that clinicians believe such justifications are sufficient to ignore the potential advantage of actuarial methods, it is likely that people in general will hold some of the same views as clinicians (e.g., believe actuarial methods are dehumanizing), leading to a preference for clinically-based strategies.

In sum, a consistent body of empirical findings has shown that actuarial methods match or outperform clinical methods when making predictions. The poor predictive ability of clinicians is related to their lack of reliability, which is due, at least in part, to their beliefs about error and limited cognitive abilities. Despite the overwhelming evidence for the superiority of the actuarial method, professionals still prefer to rely on their interpretation and assessment of the available information to make predictions (Grove & Meehl, 1996). A number of reasons for this preference have been suggested, and given that practitioners use such seemingly logical justifications, it is anticipated that people in general will use similar reasoning to arrive at a preference for clinically-based strategies.

1.2 *Fully-rational versus Heuristic Decision Strategies*

The fully-rational versus heuristic (i.e., fast and frugal) debate can be traced back to the work of philosophers such as Condorcet, Poisson, and Laplace, who viewed common sense as equivalent to probability theory. For example, according to Laplace (1814/1951), "the theory of probability is at bottom nothing more than good sense reduced to a calculus which evaluates that which good minds know by a sort of instinct, without being able to explain how with precision" (p. 196). Because human decision making was viewed as probabilistic in nature, decision processes were described using complex mathematical and statistical formulae (see Daston, 1981, for a comprehensive review of the origins of the fully-rational debate).

Following in this tradition, some contemporary decision making theorists developed a theoretical model of human decision making labelled *homo economicus* (i.e., economic man; see Edwards, 1954). Economic man is assumed to have complete information about all available courses of action and their potential outcomes, and the computational ability to calculate which of the available courses of action will allow him to reach the highest point on his preference scale (Edwards, 1954; Simon, 1955). This assumption means that economic man always chooses the best available alternative, otherwise known as seeking maximum utility. A variety of strategies and statistical formulas that people may intuitively rely on to achieve maximum utility have been proposed (e.g., Bayes' theorem, maximization of subjectively expected utility), all of which involve probabilistically combining all of the available information in order to arrive at the "best" decision (for a description of various probabilistic models, see

Edwards & Fasolo, 2001). The ability and motivation of human decision makers to consider all the available information and combine it to achieve maximum utility has been called full rationality. Full rationality has been viewed as the ideal approach to decision making, with the hallmark of a "good" decision being its adherence to the full rationality approach (Edwards & Fasolo, 2001; Miljkovic, 2005).

In order to empirically test the rationality of human decision makers, researchers designed laboratory studies to assess the decision making strategies that people actually use. These studies generally involved asking people to make a decision regarding the likelihood of an event for which prior probabilities are known, and then comparing the participants' answers against a normative standard produced by a complex probabilistic formula, such as Bayes' rule (e.g., Kahneman & Tversky, 1973; Phillips & Edwards, 1966; Tversky & Kahneman, 1973). Perhaps the most robust finding from this research has been that people do not follow the calculus of chance or statistical theories of prediction, that is, they are not fully-rational decision makers (see Tversky & Kahneman, 1974). Instead, people appeared to often be relying on a limited number of judgmental heuristics, or simple mental shortcuts, which ignore much of the information that is available to the decision-maker. In recent years, research has discovered that even highly trained and experienced professionals, such as judges and doctors, appear to rely on heuristics when arriving at decisions (e.g., Dhami, 2003; Dhami & Harries, 2001; Kee et al., 2003; Lerner, 2005).

The reliance of decision makers on simple mental strategies led to a line of research that attempted to identify the heuristics people were using, as well as the subsequent biases that arise as a result of deviating from a fully-rational approach (see

Kahneman et al., 1982). Tversky and Kahneman (1974), for instance, identified three main heuristics: representativeness (i.e., judge probability of an object belonging to a group by evaluating how closely the object resembles the group), availability (i.e., judge probability of an event by the ease with which instances can be brought to mind), and anchoring (i.e., make estimates by starting from arbitrary initial value that is adjusted to yield the final answer). Because these heuristics ignore important probabilistic principles such as attending to base rates and prior probabilities, they were claimed to lead to severe, systematic, and predictable errors (Tversky & Kahneman, 1974). For example, in a classic scenario used to demonstrate the representativeness heuristic, participants were presented with brief personality descriptions, allegedly randomly drawn from a group of a 100 professionals – engineers and lawyers (Kahneman & Tversky, 1973). For each description, participants were asked to judge the probability that the description belonged to either an engineer or a lawyer. Participants were told that the descriptions were drawn from either a pool of 70 engineers and 30 lawyers or a pool of 30 engineers and 70 lawyers. In sharp violation of the Bayes' rule, participants in both conditions produced essentially the same probability judgments. This suggested that participants ignored the available base rates and prior probabilities, and instead relied exclusively on the degree to which each description was representative of the stereotype of an engineer or lawyer when making their judgments. Similar examinations using the other two heuristics (i.e., availability, anchoring) produced similar deviations from normative standards, and this held despite participants being repeatedly encouraged to be accurate and given rewards for correct answers (Kahneman & Tversky, 1972; Tversky & Kahneman, 1973). It was generally concluded that human decision makers appear unwilling or unable to behave in

a fully-rational manner, and this use of heuristics leads to systematic errors in decision outcomes.

In the 30 years since Tversky and Kahneman began their program of research, evidence has continued to accumulate demonstrating the fallibility of heuristics (see Myers, 2002 for a list of the many documented heuristic-led biases). In order to counter people's tendency to rely on heuristics, researchers have designed statistical training programs and decision aids to help people make decisions that match the fully-rational ideal. For example, Kahneman, Slovic, and Tversky (1982) dedicated an entire section of their seminal book on heuristics and biases to corrective procedures, including a five-step procedure for decision makers to use to produce properly regressive predictions. Many other books in the judgment and decision making area have provided similar procedures and suggestions for correcting peoples' cognitions (e.g., Hammond, Keeney, & Raiffa, 2002; Moody, 1988). Decision aids have also been constructed, and their use strongly advocated, in a variety of predictive situations, such as whether to admit patients to coronary care units (Green & Mehr, 1997).

Within the past decade, however, a body of research has begun to challenge the conclusion that heuristics lead to poor decisions (e.g., Gigerenzer, Todd, & the ABC Research Group, 1999). According to Gigerenzer and his colleagues, the proper test of heuristics is not whether they match normative standards, but whether they can make reasonable inferences about the real social and physical world. Because they felt that the previous heuristics outlined by Tversky and Kahneman (1974) were too vague and poorly defined to be properly tested, Gigerenzer and his colleagues outlined a new set of heuristics that could be computationally modeled and empirically tested in real-world

environments (see Gigerenzer et al., 1999 for a description of how these new heuristics were constructed).

A handful of studies have attempted to assess the predictive accuracy of these new heuristics in real-world decision tasks. For example, Czerlinski, Gigerenzer, and Goldstein (1999) compared two heuristics (i.e., Take The Best and Minimalist) against two complex statistical formulas (i.e., multiple regression and Dawes' rule) on 20 tasks ranging from predicting high school dropout rates to predicting fish fertility. Take The Best selects cues in order of their predictive validity, compares the two options or objects under consideration on their values for the each cue in descending order until a cue is found on which the options differ, and then chooses the option which has the higher cue value (Minimalist is identical to Take The Best except it checks the cues in random order). Although the heuristics only used a third of the available cues (the complex formulas considered all the available information), they were nearly as accurate. In the second part of the study, the strategies were compared on their ability to generalize to a new set of data (i.e., cross-validation). Results of the cross-validation showed that Take The Best actually outperformed multiple regression in overall predictive accuracy by three percentage points, despite using less than a third of the cues used by the more complex approach. Research using similar heuristics (e.g., recognition heuristic), has found that they are accurate in decision tasks such as picking stocks (Borges, Goldstein, Ortmann, & Gigerenzer, 1999), predicting city size (Goldstein & Gigerenzer, 1999), and predicting National Hockey League greatness (Snook & Cullen, 2006).

The reason why heuristics are able to outperform more complex strategies has been attributed to their ability to avoid overfitting and exploit the structure of the

information in the environment (Todd & Gigerenzer, 2000). Overfitting occurs when a decision strategy has too many free parameters and tries to make sense of every piece of information it encounters. Because of the noise inherent in many cues, complex strategies that assume every detail of information in the training set is of utmost importance often perform poorly when predicting using novel data. Heuristics avoid overfitting by only focusing on "swamping forces" reflected in the most important cues, cues that are likely to remain important in changing environments (Todd & Gigerenzer, 2003). The accuracy of the heuristics also stems from their exploitation of the structure of information in the environment. For example, the recognition heuristic works because recognition is often correlated with the criterion under consideration, such as city size. Because in general we hear more about large cities than small cities, using the recognition heuristic to decide which of two cities is larger will often yield the correct answer (Gigerenzer et al., 1999).

Although the research assessing the accuracy of heuristics is accumulating, the majority of judgment and decision making literature still favours fully-rational strategies. This preference for fully-rational strategies has been attributed to the more-is-better ideology, which is a belief that "the more laborious, computationally expensive, and nonheuristic the strategy, the better the judgments to which it gives rise" (Gigerenzer & Todd, 1999, p. 20). Given that this ideology dominates much JDM research as well as evaluative judgments about what is good and bad decision making (Gigerenzer et al., 1999), it is expected that people will prefer fully-rational strategies to heuristic-based ones.

In sum, the fully-rational ideal has been established as the benchmark for assessing the accuracy of decisions. Empirical studies have demonstrated that people do

not follow a fully-rational approach, but instead often use heuristics to make decisions. Because heuristics deviated from the norms of full rationality, they were believed to be prone to systematic biases and errors, and attempts were made to construct decision aids to assist people in achieving fully-rational decisions. Despite recent challenges by Gigerenzer and his colleagues to the "heuristics are bad" conclusion, the majority of evidence supports the argument that fully-rational strategies lead to more accurate decisions than heuristics. Given the assumption that the best decisions are made using laborious, computationally expensive, and non-heuristic strategies (i.e., the more-is-better ideology; Gigerenzer et al., 1999), it is anticipated that people will prefer professionals who use fully-rational strategies over those who use heuristics.

1.3 *What Decision Making Strategies do People Prefer?*

A number of studies have assessed the attitudes toward clinical and actuarial strategies held by people in professional decision making roles. Poythress (1981), for example, examined trial judges' ratings of the importance of various types of evidence in reaching fair and accurate verdicts. He found that of the eight types of evidence considered by the judges, actuarially-based evidence was rated the lowest in importance. A survey of judges, prosecutors, and defence attorneys by Redding, Floyd, and Hawk (2001) also found that legal professionals consider clinically-based expert evidence to be more important than actuarially-based expert evidence. Similarly, research has found that jurors are more convinced by clinically-based expert testimony than by actuarially-based expert testimony (Krauss & Lee, 2003; Krauss & Sales, 2001), and rate clinically-based expert witnesses higher than actuarially-based experts on perceived competence,

usefulness, and professionalism (Gelinas & Alain, 1993). Similar findings have been reported in other domains (e.g., King, 1999).

Despite the research on professionals' attitudes toward decision strategies, only two studies appear to have assessed the type of strategies that are preferred by people who may be affected by the outcome of decisions. The first was conducted by Sjoberg (2001), who surveyed people regarding their preferences for analytical versus intuitive decision making strategies in various contexts (e.g., a stockbroker has to decide how to invest in the stock market, police officer has to decide whether a driver is intoxicated, etc.). An intuitive strategy was defined as one "without certain explicit decision rules. Instead, the decision maker uses his or her feeling about what is a correct decision", and an analytical strategy was defined as being "made in accordance with certain rules, or sometimes laws, and they involve integrating information in a certain way, with the help of calculations, perhaps, or the listings of advantages and drawbacks, etc." (Sjoberg, 2001, p. 22). For each of 28 decision situations, participants were asked to rate whether the decision should be made using an intuitive or analytical approach. Sjoberg concluded that people prefer intuitive decision making strategies when making personal decisions in non-professional roles (e.g., consumer choices), and proposed that this result may be due to the fact that people believe that their own decisions are more likely to lead to desired results. It is important to note that the intuitive and analytical decision strategies defined by Sjoberg cannot be classified according to the two debates of interest to the current research. Both approaches in his study use human judgments and no reference is made to the amount of information used, making interpretation of his findings as they relate to the current research difficult.

The second study was conducted by Promberger and Baron (2006), who performed two experimental studies which measured peoples' willingness to accept medical recommendations that came from either a clinical or actuarial approach. Participants were given a set of symptoms and the recommendation from either a physician or computer program, and then had to decide whether or not to have a specific operation (e.g., coronary bypass). They found that participants were more likely to follow a recommendation that came from a physician, and participants trusted the recommendation of a computer program less than that of a physician. This preference for a clinical approach appeared to be due to reduced feelings of personal responsibility when relying on a physician's diagnosis (i.e., felt doctor could be held accountable for decision outcome while a computer could not) and lack of trust in the ability of computers to make good recommendations. Currently, no study appears to have examined people's attitudes toward heuristic and fully-rational decision making strategies.

1.4 *The Current Research*

The goal of the current research is to assess peoples' opinions regarding decision strategies that professional decision makers could utilize when making a decision about them. Based on the two debates discussed above, four broad types of decision strategies were constructed: (1) clinical/fully-rational, (2) clinical/heuristic, (3) actuarial/fully-rational, and (4) actuarial/heuristic. Along with overall preference ratings, people will be asked to rate their beliefs regarding the accuracy, fairness, and ethicalness of each strategy, as well as how similar they believe each strategy is to those actually used by professionals. Based on the judgment and decision literature, it is expected that people

will be most positive toward professionals who use a clinical/fully-rational strategy and will be the least positive toward those who use an actuarial/heuristic strategy. Because the clinical/heuristic and actuarial/fully-rational strategies have the preferred component from one of the two dimensions, little difference in attitudes is expected toward these two strategies. Findings from this research are important, as they will add to the limited research on attitudes toward clinical and actuarial strategies and provide the first assessment of peoples' attitudes toward heuristic and fully-rational decision strategies. This knowledge will help identify any misperceptions people may have about decision strategies, as well as informing decision makers regarding what strategies will likely be accepted by the general public.

2.0 Method

2.1 *Sample*

Participants ($N = 80$) were undergraduate students from Memorial University of Newfoundland. The sample consisted of 25 men (mean age = 18.9, $SD = 1.4$) and 55 women (mean age = 18.7, $SD = 1.9$). The average year of study for participants was 1.4 ($SD = .8$).

2.2 *Materials*

An experimental booklet was constructed which contained, in the following order: (a) an informed consent form; (b) a title page including contact information; (c) an experiment information and instructions page; (d) one of two scenarios regarding an applied decision making situation; (e) descriptions of the strategies that each of four professionals employ when making a decisions; (f) instructions for participants to rate their preference for each decision strategy using a 7 point scale (1 = *do not prefer at all*; 7 = *highly prefer*); (g) an open-ended question that asked participants to record the decision strategy that they most and least preferred and reasons for their decisions; (h) instructions for participants to rate each decision strategy, using a 7 point scale, on its perceived accuracy, fairness, and ethicalness; (i) instructions for participants to rate each decision strategy, using a 7 point scale, on its perceived similarity to how professionals actually make decisions; (j) a series of demographic questions; and (k) a debriefing form (see Appendix A for copy of booklets).

The experimental booklets presented either a medical or legal decision making scenario. The two scenarios presented to participants were:

(i) *Medical.* Imagine you have begun exhibiting symptoms that you believe are consistent with cardiovascular (heart) disease. Lipid-lowering drugs help lower the level of bad cholesterol in the bloodstream, and have been shown to be extremely successful in reducing heart attacks in true cases of cardiovascular disease. However they are also very expensive, have potentially serious side effects, and once started must be taken for life. Therefore, an accurate diagnosis of your condition and subsequent decision on whether to prescribe a lipid-lowering drug is very important. There are four doctors that could potentially review your symptoms and make a prescription decision. Each doctor is identical in years of experience and knowledge of medical practices. Each doctor, however, has a different strategy for making a diagnosis of your symptoms.

(ii) *Legal.* Imagine you are accused of a crime and are waiting for a decision on whether you will be granted bail (i.e., be released until your trial date). Being successfully granted bail means you do not have to spend time in prison while awaiting your trial. There are four judges that could potentially hear your case and make the decision on whether to grant you bail. Each judge is identical in years of experience and knowledge of the law. Each judge, however, has a different strategy for deciding whether you will be granted bail.

These two scenarios were chosen because previous research has established that judges and doctors use heuristics when making decisions (e.g., Dhami, 2003; Dhami & Harries, 2001) and actuarial models have been shown to outperform clinicians in these fields (e.g., Boom et al., 1988; Hall, 1988). Furthermore, the use of multiple scenarios allows an assessment of whether attitudes remain stable across different situations.

The strategies that each of the four professional decision makers employed when making a diagnostic decision were then outlined. The four decision strategies were constructed so that they each represented one of the four possible ways that the clinical-actuarial and heuristic-fully-rational dichotomies could be combined: 1) clinical/heuristic (decision made by intuitively combining a few pieces of information); 2) clinical/fully-rational (decision made by intuitively combining all available information); 3) actuarial/heuristic (decision made by formulaically combining a few pieces of information); and 4) actuarial/fully-rational (decision made by formulaically combining all available information). The order in which the decision strategies were presented in the booklets was randomized to eliminate potential order effects.

2.3 *Procedure*

Participants were recruited using the department of psychology participant pool and contacted via telephone regarding their willingness to participate. Participants were met in the Bounded Rationality and Law laboratory and asked to read and sign an informed consent form. Once participants had read the instructions, confirmed they understood them, and agreed to take part in the experiment, they were randomly assigned to either the medical ($n = 40$) or legal ($n = 40$) scenario group and presented with the appropriate experimental booklet. They were then asked to complete it in a testing cubicle in the laboratory, and informed that a researcher was available at all times to answer any questions. Upon completion of the booklet, participants were thanked for their participation and given a debriefing form that detailed the purpose of the present research. The study took approximately 30 minutes to complete and participants were paid $3.50 for their time.

2.4 *Coding and Inter-rater reliability*

The reasons provided for participants' choice of the most and the least preferred strategy were coded through a typical grounded approach to categorising written text, which involved an iterative refinement and modification of the content dictionaries until they reflected all of the reasons provided by the participants (Glaser & Strauss, 1967; Krippendorff, 1980). Each variable was dichotomously coded and defined to avoid discrepancies in category assignment (see Appendix B for content dictionaries).

Reliability of the coding was assessed by having a trained research assistant independently code 10% of the narratives. The reliability of coding, measured using Cohen's Kappa (Cohen, 1960), was 0.63 for the "most preferred" question, 0.76 for the "least preferred" question, and .69 overall, thus suggesting an acceptable level of agreement between the coders (Fleiss, 1981).

2.5 *Confidence Intervals and Effect Size calculations.*

As the current research was primarily concerned with practical rather than statistical significance (Kirk, 1996), the use of effect sizes and their associated 95% confidence intervals (*CI*s) was emphasized. Confidence intervals contain all the information provided by significant testing, and, instead of making a dichotomous yes/no decision, they give a range of differences within which the true difference is likely to lie (Kirk, 1996). Although different guidelines for interpreting *CI*s have been given, according to Cumming and Finch (2005) a "CI is a range of plausible values for μ. Values outside the CI are relatively implausible" (p. 174). *CI*s also provide information about the precision of the estimate of μ; wider *CI*s indicate greater uncertainty (Cumming & Finch, 2001). The judgment of the degree of width leading to a conclusion of

uncertainty depends on what researchers in the field define as relevant (Smithson, 2003). For the purpose of the current research, *CI*s with a width greater than 10% of the range of possible values were defined as imprecise; thereby suggesting that replication of the results is required.

Pearson correlation coefficients (r) were calculated for each comparison between decision strategies to assess the magnitude of the effects. Effect sizes were assessed by examining the r values and their respective 95% *CI*s for each comparison. According to Cohen (1992), $r = .1$ is a small effect, $r = .3$ is a medium effect, and $r = .5$ is a large effect.

3.0 Results

Due to the similarity in results (i.e., *CI*s overlapped between the two scenarios for all attitudinal judgments), the data from the medical and legal decision making scenarios were combined for the purpose of the current analysis. The mean preference rating, along with associated *CI*s, for each of the four decision strategies are shown in Figure 1. As can be seen, the clinical/fully-rational strategy received the highest mean preference rating ($M = 6.1$, $SD = 1.1$, $CI = 5.9$ to 6.4). This was followed by clinical/heuristic ($M = 4.2$, $SD = 1.4$, $CI = 3.9$ to 4.6) and actuarial/fully-rational ($M = 3.8$, $SD = 1.7$, $CI = 3.5$ to 4.2), with actuarial/heuristic receiving the lowest preference rating ($M = 2.5$, $SD = 1.3$, $CI = 2.2$ to 2.8). The only comparison that produced overlapping *CI*s was between clinical/heuristic and actuarial/fully-rational. The *CI*s for all four strategies were narrower than or equal to .70, thus suggesting an acceptable level of precision.

In order to measure the magnitude of the difference between preferences for strategies, a Pearson's r was calculated for each possible comparison between strategies. These values are displayed in Table 1. Reading from the left, the effect size for the comparison between clinical/fully-rational and actuarial/heuristic strategies was $r = .84$, indicating a large effect. With the exception of the comparison between clinical/heuristic and actuarial/fully-rational strategies, all other comparisons produced medium or large effect sizes.

The result of collapsing the strategies across the clinical/actuarial dichotomy is shown in Figure 2. Professionals who used fully-rational strategies received a higher mean preference rating ($M = 4.99$, $SD = 1.8$, $CI = 4.7$ to 5.3) than those who used heuristic strategies ($M = 3.37$, $SD = 1.6$, $CI = 3.1$ to 3.6).

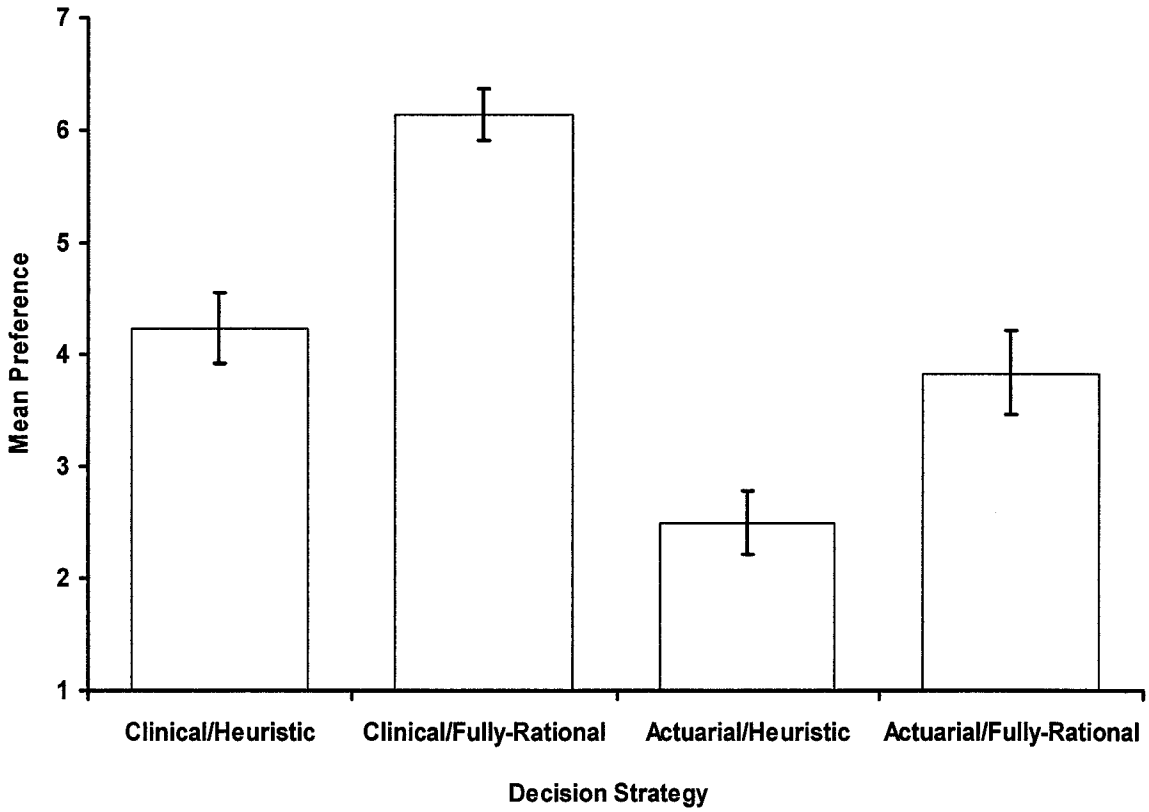

Figure 1. Mean preference rating for each strategy. *Note*. Vertical lines indicate 95% confidence intervals.

Table 1.

Effect Sizes for Preference

Comparison	*r*
Clinical/Fully-Rational vs. Actuarial/Heuristic	.84
Clinical/Fully-Rational vs. Actuarial/Fully-rational	.63
Clinical/Fully-Rational vs. Clinical/Heuristic	.60
Clinical/Heuristic vs. Actuarial/Heuristic	.53
Clinical/Heuristic vs. Actuarial/Fully-Rational	.13
Actuarial/Fully-Rational vs. Actuarial/Heuristic	.41
Fully-Rational vs. Heuristic	.43
Clinical vs. Actuarial	.53

Note. r = Pearson correlation coefficient for each comparison.

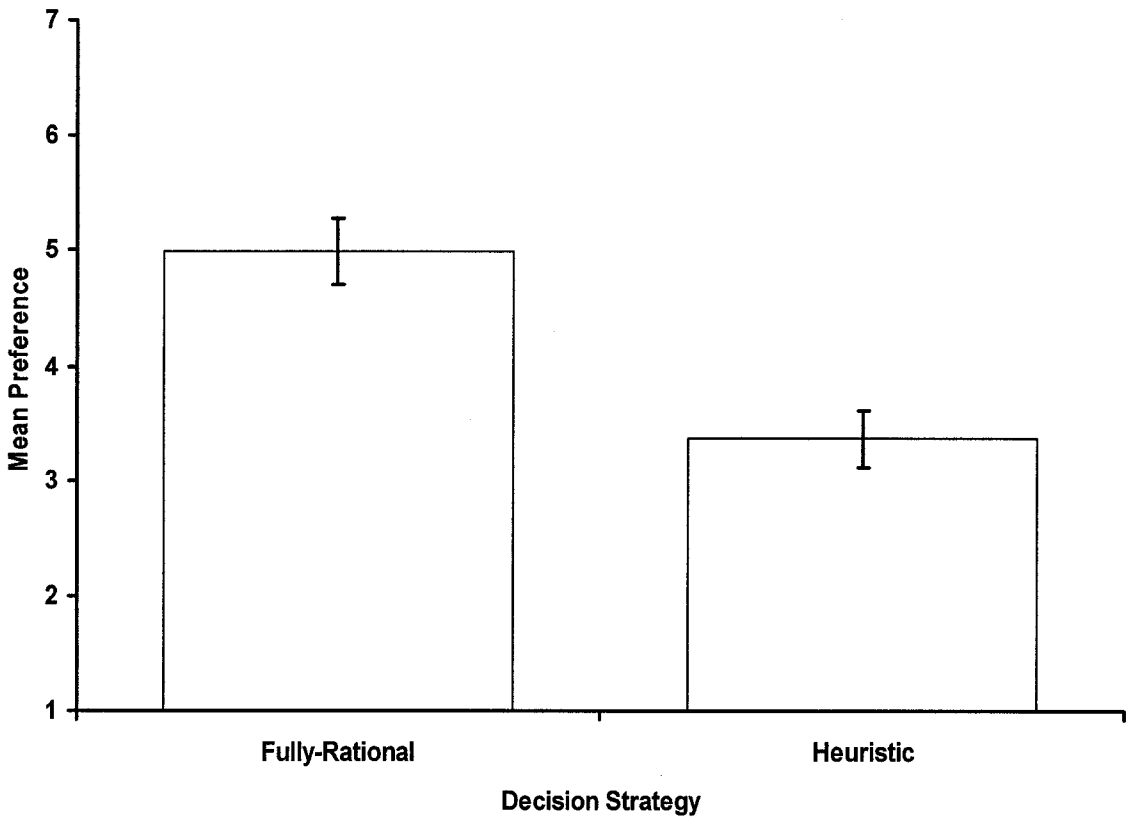

Figure 2. Mean preference rating for fully-rational and heuristic strategies. *Note*. Vertical lines indicate 95% confidence intervals.

The *CI*s do not overlap, and the *CI*s for both strategies were narrower than .70, suggesting an acceptable level of precision. The effect size for the comparison between fully-rational and heuristic strategies in preference rating was $r = .43$, indicating a medium effect (Table 1).

Collapsing across the heuristic-fully-rational dichotomy showed that the preference for the clinical strategies ($M = 5.19$, $SD = 1.6$, $CI = 4.94$ to 5.43) was stronger than the preference for actuarial strategies ($M = 3.17$, $SD = 1.6$, $CI = 2.91$ to 3.42) (see Figure 3). The *CI*s for this comparison also did not overlap, and both were narrower than .70. As can been seen from Table 1, the effect size for the comparison between clinical and actuarial strategies in preference ratings was $r = .53$, indicating a large effect. The interacting effect of the clinical/actuarial versus fully-rational/heuristic dichotomies was assessed and resulted in $r = .07$.

Seventy-nine percent of participants most preferred the clinical/fully-rational strategy, followed by actuarial/fully-rational (13%), clinical/heuristic (8%), and actuarial/heuristic (1%) (some participants nominated more than one most and least preferred strategy, thus the overall average for the two questions exceed 100%). Participants indicated that the primary reasons for most preferring the clinical/fully-rational strategy were because it used all the information (78%), used personal knowledge and experience (62%), and treated every person as a unique individual (32%). Seventy-three percent of participants stated that they least preferred the actuarial/heuristic strategy, followed by clinical/heuristic (19%), actuarial/fully-rational (10%), and clinical/fully-rational (1%). The most frequently cited reasons for least preferring the actuarial/heuristic strategy were because it did not use all the available information

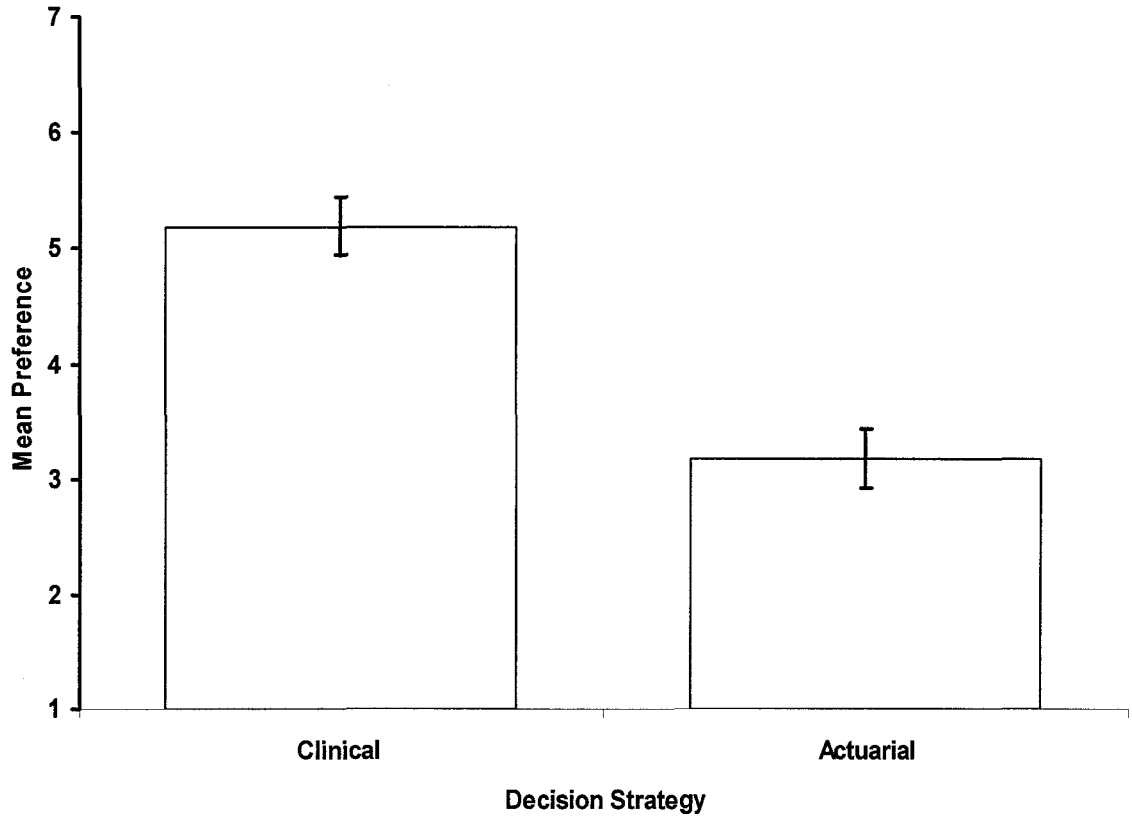

Figure 3. Mean preference rating for clinical and actuarial strategies. *Note*. Vertical lines indicate 95% confidence intervals.

(91%), relied on a computer or formula (69%), and does not treat every case as unique (40%).

The mean ratings, along with their associated *CI*s, of the four decision strategies in terms of accuracy, fairness, and ethicalness are shown in Figure 4. As was seen for preference, across each judgment, participants rated the clinical/fully-rational strategy the highest and rated the actuarial/heuristic strategy the lowest. The rank order of the ratings for the clinical/heuristic and actuarial/fully-rational strategies varied across the judgments. Across the 18 possible comparisons among the four decision strategies, only three comparisons had *CI*s that overlapped: the clinical/heuristic strategy and the actuarial/fully-rational strategy on ratings of accuracy, fairness, and ethicalness. With the exception of ratings of fairness and ethicalness for the actuarial/fully-rational strategy and ratings of ethicalness for the clinical/heuristic strategy, the *CI*s for all strategies were equal to or less than .70.

The result of collapsing the decision strategies across the clinical/actuarial dichotomy for the judgments of accuracy, fairness, and ethicalness is shown in Figure 5. The fully-rational strategies were rated higher than heuristic strategies across all three judgments, and none of the comparisons had overlapping *CI*s. The widths of the CIs were all narrower than .70. Collapsing across the heuristic-fully-rational dichotomy showed that clinical strategies were rated higher than actuarial strategies across all three ratings (see Figure 6). None of the comparisons had overlapping CIs, and all CIs were narrower than .70.

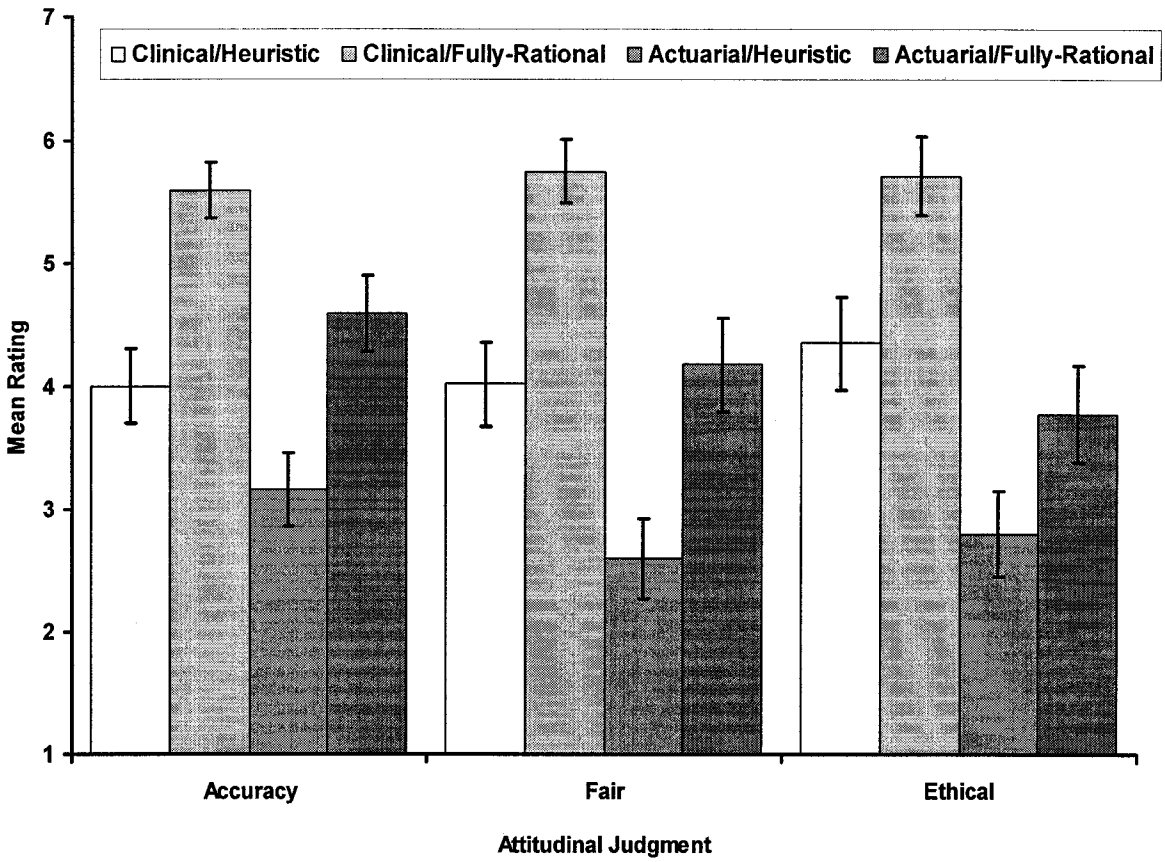

Figure 4. Mean accuracy, fair, and ethical ratings for each decision making strategy.

Note. Vertical lines indicate 95% confidence intervals.

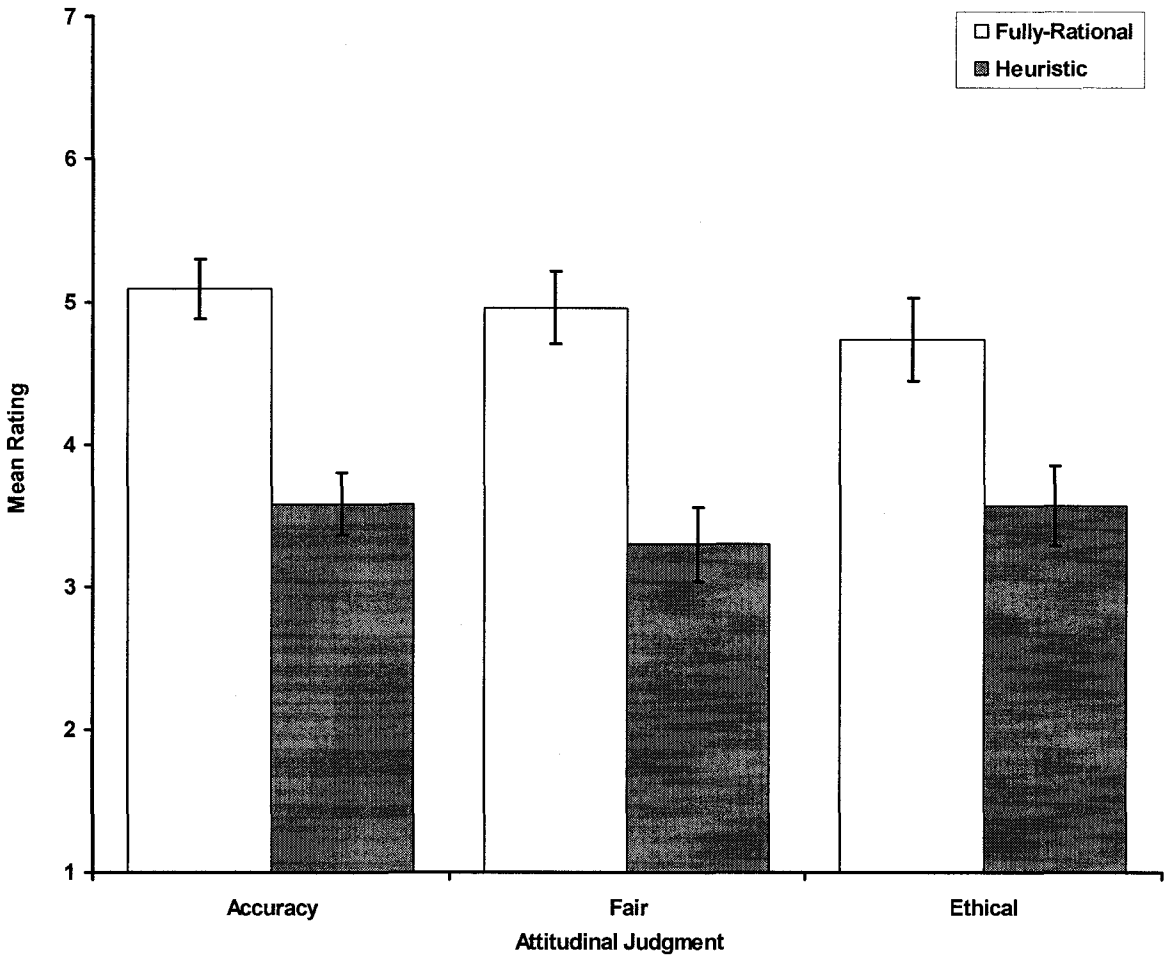

Figure 5. Mean accuracy, fair, and ethical ratings for fully-rational and heuristic strategies. *Note*. Vertical lines indicate 95% confidence intervals.

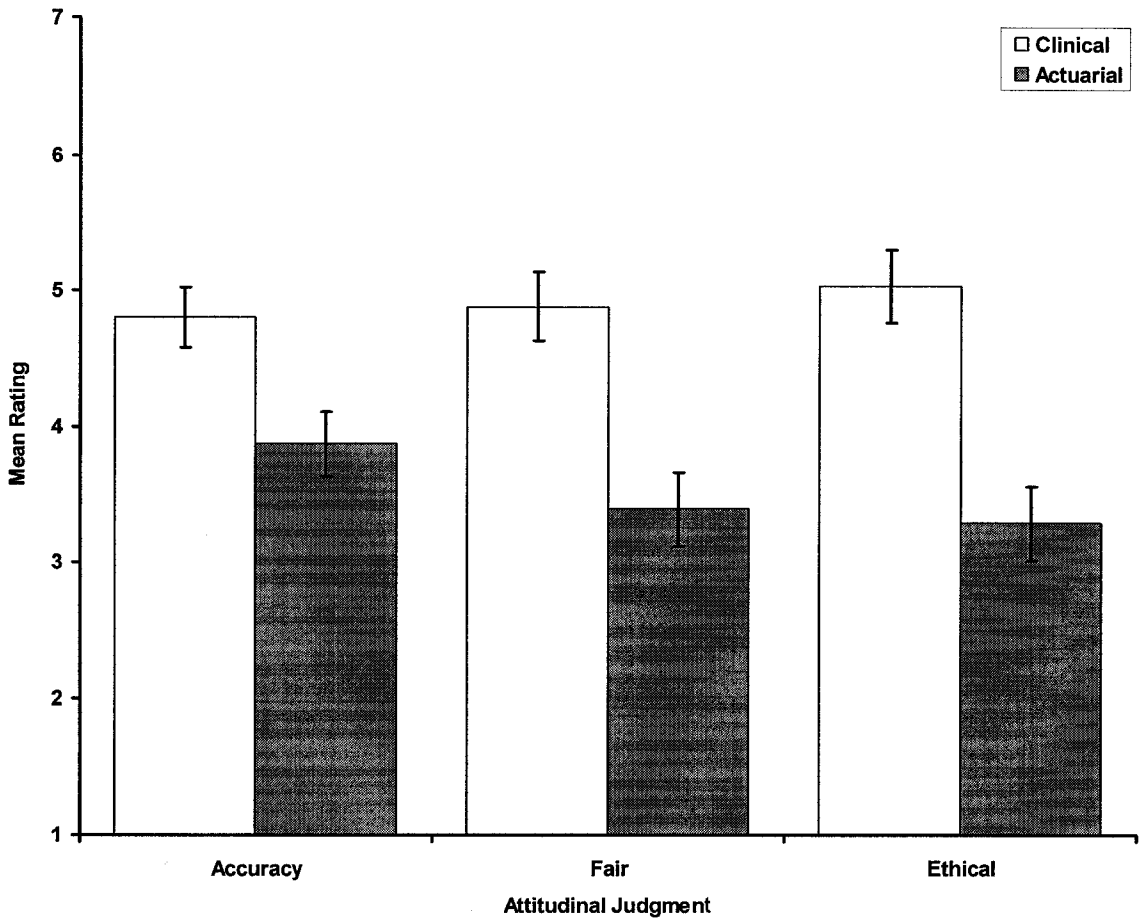

Figure 6. Mean accuracy, fair, and ethical ratings for clinical and actuarial strategies. *Note*. Vertical lines indicate 95% confidence intervals.

Table 2 contains the overall effect size of preference, accuracy, fairness, and ethicalness for each decision strategy. These judgments were combined in order to achieve an overall indication of people's attitudes towards strategies (note that similarity was not included as it did not measure attitudes towards strategies, but beliefs about what strategies are used). Reading from the left, the comparison between clinical/fully-rational and actuarial/heuristic strategies produced a mean effect size of $r = .76$ ($SD = .06$, $CI =$ .66 to .85), indicating a large effect. The remaining five comparisons, with the exception of the comparison between clinical/heuristic and actuarial/fully-rational strategies, produced medium or large effect sizes. However, with the exception of the comparison between clinical/fully-rational and actuarial/heuristic strategies, all *CI*s were wider than .20, indicating the need for replication.

The decision strategies were also collapsed across the dichotomies, which produced a mean effect size for all four ratings of $r = .42$ ($SD = .08$; $CI = .29$ to .54) for fully-rational versus heuristic and $r = .42$ ($SD = .10$; $CI = .27$ to .58) for clinical versus actuarial (see Table 2). The interacting effect of the clinical/actuarial versus fully-rational/heuristic dichotomies was assessed and resulted in $r = .03$, $r = .02$, and $r = .05$ for ratings of accuracy, fairness, and ethicalness, respectively (mean effect size, including preference, was $r = .04$).

The mean rating of the similarity that participants perceived between each of the four decision making strategies and how professionals actually make decisions is shown in Figure 7. Results showed that participants rated the clinical/fully-rational strategy as the one professionals most likely use ($M = 5.8$, $SD = 1.2$, $CI = 5.6$ to 6.1), followed by the clinical/heuristic strategy ($M = 4.9$, $SD = 1.6$, $CI = 4.5$ to 5.2), actuarial/fully-rational

Table 2.

Mean Effect Sizes for Preference, Accuracy, Fair, and Ethical

Comparison	Mean *r* (*SD*)	95% CI_r
Clinical/Fully-Rational vs. Actuarial/Heuristic	.76 (.06)	.66 to .85
Clinical/Fully-Rational vs. Clinical/Heuristic	.52 (.09)	.39 to .66
Clinical/Fully-Rational vs. Actuarial/Fully-Rational	.50 (.10)	.34 to .67
Clinical/Heuristic vs. Actuarial/Heuristic	.42 (.10)	.26 to .57
Clinical/Heuristic vs. Actuarial/Fully-Rational	.01 (.17)	-.27 to .28
Actuarial/Fully-Rational vs. Actuarial/Heuristic	.40 (.08)	.27 to .53
Fully-Rational vs. Heuristic	.42 (.08)	.29 to .54
Clinical vs. Actuarial	.42 (.10)	.27 to .58

Note. Mean *r* (*SD*) = mean Pearson correlation coefficient for each comparison with standard deviations in parentheses; 95% CI_r= confidence intervals about *r*.

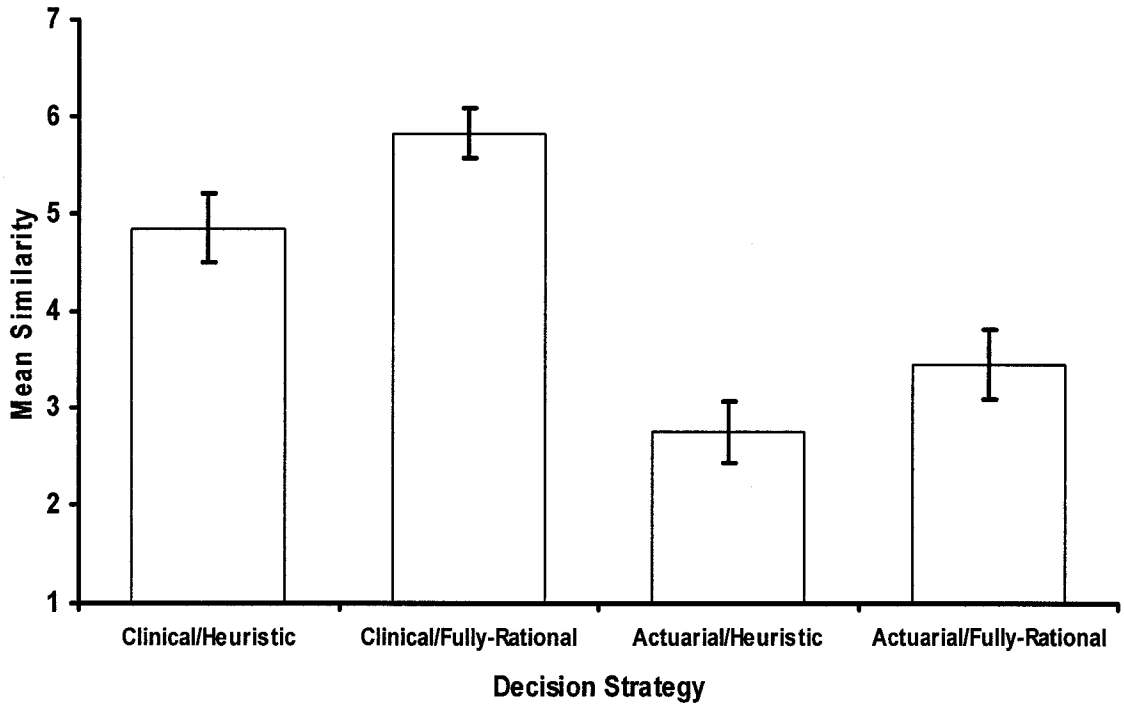

Figure 7. Mean similarity rating for each decision making strategy. *Note.* Vertical lines indicate 95% confidence intervals.

strategy ($M = 3.5$, $SD = 1.6$, $CI = 3.1$ to 3.8), and the actuarial/heuristic strategy ($M = 2.8$, $SD = 1.4$, $CI = 2.4$ to 3.1). Of all the six possible comparisons between the four strategies, the only one that resulted in overlapping CIs was between actuarial/fully-rational and actuarial/heuristic.

4.0 Discussion

The current research examined peoples' attitudes toward four decision strategies, which were composed using the four possible combinations of the clinical versus actuarial and fully-rational versus heuristic strategies (i.e., clinical/fully-rational, clinical/heuristic, actuarial/fully-rational, and actuarial/heuristic). Results demonstrated that people have the most positive attitude toward professionals that rely on their intuition and experience and consider and weigh all available information when making decisions. Conversely, people appear to have the least positive attitudes toward professionals that use a computer-based statistical formula and only consider some of the available information. When the strategies were collapsed across the two debates, clinically-based strategies were rated higher than actuarially-based ones across all judgments, and fully-rational strategies were rated above heuristic-based ones. People displayed similar attitudes toward professionals who intuitively process a few bits of information and those who use a mechanical aid that processes all available information; likely because each of those strategies contained only one of the preferred components (i.e., clinical or fully-rational).

Collapsing across the fully-rational/heuristic dimension showed that people preferred clinically-based strategies over actuarially-based ones. The *CI*s for mean preference ratings were small and did not overlap, and a comparison between the two types of strategies produced a large effect size. This strong preference for clinically-based methods matches the results from Promberger and Baron's (2006) study, which found that people preferred recommendations from a physician over those produced by a computer program. Along with overall preference ratings, people also believed that

professionals use clinically based methods when making real-world decisions. This belief is consistent with the research demonstrating that many professional decision makers continue to rely on their intuition instead of actuarial tools (e.g., Kleinmuntz, 1990).

Although people appear to be aware of the status of professional decision making practices, they also believe that clinically-based strategies are the most accurate, which is inconsistent with the research establishing actuarial tools as generally having higher predictive accuracy (e.g., Grove et al., 2000). Given that professionals appear to be relatively unaware of this research on predictive accuracy (Dawes et al., 1989), it is unsurprising that the participants in this study, and arguably the general public at large, would be unfamiliar with the literature in the area. Participants also rated clinically-based strategies higher on fairness and ethicalness, which matches Meehl's (1986) suggestion that clinicians hesitate to use actuarial tools because they feel they are dehumanizing and unethical. Peoples' judgments of the accuracy, fairness, and ethicalness of clinically-based judgments suggest that they are relying on the same justifications used by professionals to form their attitudes.

Collapsing across the clinical/actuarial dimension showed that people preferred fully-rational strategies over heuristic-based strategies. The *CI*s for the mean preference ratings were small and did not overlap, and a comparison between the two types of strategies produced a medium effect size. Results also showed that participants generally believed that professional legal and medical decision makers use all available information when making a decision. This belief that professionals use fully-rational decision strategies is in contrast with research demonstrating that people, including judges and doctors, rely on heuristics to make decisions (e.g., Dhami, 2003; Dhami & Ayton, 2001;

Dhami & Harries, 2001; Smith & Gilhooly, 2006). Participants also rated fully-rational strategies as more accurate than strategies that only used some of the available information. Although this belief is consistent with the majority of JDM research regarding predictive accuracy (e.g., Kahneman et al., 1982), it is in contrast with recent findings showing that heuristics can match, and sometimes exceed, the accuracy of fully-rational methods (see Gigerenzer et al., 1999). Given that the fully-rational versus heuristic debate remains unsettled, making conclusions about the validity of peoples' assumptions regarding accuracy is premature. Results of preference, similarity, and accuracy judgments, combined with the fact that participants rated fully-rational strategies as the most ethical and fair, demonstrate that participants are holding to the more-is-better ideology when arriving at their attitudes toward fully-rational strategies.

Given the aforementioned preference for fully-rational and clinically-based strategies, it was not surprising that the strategy that combined these two factors was the most preferred of the four decision strategies used in the current study. Likewise, the least preferred strategy (heuristic/actuarial) combined the two least preferred components of each debate. Through responses to the open-ended questions, participants indicated that their reasons for the most and least preferred strategies primarily pertain to the amount of information used, how the information was processed, and level of analysis (i.e., nomothetic or idiographic approach). These reasons are able be interpreted within the scope of the same theoretical frameworks used above to explain the preferred option within each of the two debates (i.e., more-is-better ideology and justifications employed by professionals).

The current research has several limitations which should be considered when interpreting the results. Firstly, the sample consisted of undergraduate psychology students, which limits the ability to generalize the results to the general population. In order to gauge the true measure of peoples' preferences, a more representative sample is needed. Secondly, the current research only used two scenarios from the medical and legal domains. Until scenarios from a variety of domains (e.g., education, law enforcement) are tested, the findings from the current research cannot be assumed to be stable across all situations. Thirdly, the current research was low in realism because the provided scenarios may not be relevant to the majority of participants (i.e., most participants had probably never experienced a bail hearing or exhibited symptoms of cardiovascular disease). Research using participants for which the scenarios hold relevance (e.g., heart attack victims, arrestees) would help increase the external validity of the experiment. Thus, replication and expansion of the current research is needed before firm conclusions can be made.

In sum, when a decision is being made about them, people appear to want decision makers to consider all possible information and combine the information using their personal knowledge and experience. Unfortunately, such an expectation is often unattainable (i.e., fully-rational) and would likely lead to less accurate decisions (i.e., clinically-based). Conversely, people dislike it when professionals only use some of the available information and combine it using an actuarial approach, which is ironic given that actuarial/heuristic strategies would appear to be the most attainable and potentially accurate strategies. Indeed, researchers have begun developing heuristically-based actuarial tools which retain the accuracy of an actuarial approach while recognizing the

constraints inherent in real-world decision making environments (e.g., Fischer et al., 2002; Gardner, Lidz, Mulvey, & Shaw, 1996; Green & Mehr, 1997). However, results from the current research suggest that people would be reluctant to accept such an approach.

In conclusion, the findings of the current research reveal a large gap between what is known about professional decision making and the expectations of the general public. Future research should attempt to assess the plausibility of closing this gap by addressing issues such as: Would people change their attitudes if they were made aware of the findings regarding the performance of decision strategies? Would people display different attitudes if presented with less consequential scenarios or scenarios directly relevant to themselves? And do people believe that the decision process is as important as the outcome? Attempts should also be made to educate the public regarding the fact that heuristics can be used to make effective decisions and that actuarial tools usually produce the most reliable and accurate outcomes for consequential, real-world decisions.

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6.0 Appendix A

INFORMED CONSENT FORM

The purpose of an informed consent form is to ensure that you, as the participant, understand the purpose of the study as well as the nature of your involvement.

Research title: Attitudes toward decision making strategies

Research personnel: For questions or concerns about this study please contact Joseph Eastwood (Department of Psychology, Memorial University of Newfoundland, 709-737-3101). The proposal for this research has been approved by the Interdisciplinary Committee on Ethics in Human Research at Memorial University. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 737-8368.

Purpose: The purpose of this study is to measure attitudes regarding prescription-making strategies employed by doctors.

Task requirements: The first stage of this study involves a scenario where you are exhibiting certain symptoms and are seeking a decision from four potential doctors, all of whom employ different decision making strategies, whether to begin taking lipid-lowering drugs. You then answer a set of questions regarding your attitudes toward each of the doctor's diagnosis-making strategy. Finally, you will be asked to provide the reasoning behind some of the decisions you have made for some of the questions and fill out a brief questionnaire.

Duration: This study should take no longer than 30 minutes to complete.

Potential risks: You are under no obligation to continue the study if you experience discomfort or anxiety during any part of it, or if you feel uncomfortable to do so.

Benefits: Your participation in this study will be contributing toward the current body of literature on beliefs regarding decision making while simultaneously giving you the opportunity to learn about the research process.

Anonymity and confidentiality: The data collected in this study are coded with a number that is not associated with your name and therefore all data are anonymous. The data will be used only by researchers associated with this project for the purpose of research publications, conference presentations, or teaching material. The data that is obtained from this research will be stored on a computer indefinitely. To ensure anonymity, please do not write your name anywhere on the questionnaires. As well, the informed consent forms will be kept separate from your questionnaires once returned.

Right to withdraw: Your participation in this study is entirely voluntary. Participation in this experiment is NOT a course or university requirement. At any point during the study you have the right to not answer any questions or to withdraw with no penalty whatsoever.

Signatures: I have read the above description and I understand that the data in this study will be used in research publications or for teaching purposes. My signature indicates that I agree to participate in this study.

Participant's name: _____ Participant's signature: _____

Date: _____

Attitudes Toward Doctors' Prescription Decision-Making Strategies

Researchers:

Joseph Eastwood and Dr. Brent Snook
Faculty of Science
Department of Psychology
Principal Contact: Joseph Eastwood
eastwooj@gmail.com

Information About This Study

Thank you for agreeing to participate in my study. Before you begin I would like to provide you with some details of what you will be doing.

This booklet presents a scenario where you have been exhibiting symptoms of cardiovascular (heart) disease, and are seeking a decision from one of four potential doctors regarding whether you should be prescribed lipid-lowering drugs (which lower cholesterol and reduce chance of heart attack). All doctors are equal in equal in knowledge of medical practices and years of experience. However they all employ different strategies when making prescription decisions.

The specifics of each doctor's prescription-writing strategies are outlined on an insert page, which you can remove and consult as you complete the questions.

After reading and considering each doctor's prescription-writing strategy, proceed through the booklet and answer the questions provided. You will also be asked to explain a couple of your decisions. In addition, it is important that once you make a decision you do not go back and change it at a later time.

Lastly, you will be asked to provide some anonymous information about yourself.

If you do not have any questions, please begin.

Prescription Scenario

Imagine you have begun exhibiting symptoms that you believe are consistent with cardiovascular (heart) disease. Lipid-lowering drugs help lower the level of bad cholesterol in the bloodstream, and have been shown to be extremely successful in reducing heart attacks in true cases of cardiovascular disease. However they are also very expensive, have potentially serious side effects, and once started must be taken for life. Therefore, an accurate diagnosis of your condition and subsequent decision on whether to prescribe a lipid-lowering drug is very important. There are four doctors that could potentially review your symptoms and make a prescription decision. Each doctor is identical in years of experience and knowledge of medical practices. Each doctor, however, has a different strategy for making a diagnosis of your symptoms.

[TEAR OUT]

Doctors' Prescription Decision Making Strategies

Each doctor is provided with all of the information regarding your age, gender, weight, cholesterol level, family history of heart disease, evidence of arteriosclerosis, smoking habits, drinking habits, and whether you have hypertension or diabetes. The decision to prescribe the lipid-lowering drugs will be based on the result of the decision making process outlined below.

Decision Making Strategies

Doctor Q: This doctor makes decisions intuitively, that is, uses personal and medical experience when making prescription decisions. This doctor uses 2-3 pieces of information that are believed to be important in predicting whether lipid-lowering drugs should be prescribed when making a prescription decision for you.

Doctor F: This doctor makes decisions intuitively, that is, uses personal and medical experience when making prescription decisions. This doctor considers all of the information provided, rank-orders the importance of the information, and integrates it all into a decision on whether to prescribe you the lipid-lowering drug.

Doctor S: This doctor uses a statistical formula that is based on scientific research when making prescription decisions. This formula uses 2-3 pieces of information which have been found to be good at predicting of whether lipid-lowering drugs should be prescribed. This information is entered into a computer program that produces a score for you. The doctor's prescription decision is based on this score.

Doctor G: This doctor uses a statistical formula that is based on scientific research when making prescription decisions. This formula uses all of the available information. All the information is entered into a computer program which rank-orders the importance of the information, and integrates it all to produce a score for you. The doctor's prescription decision is based on this score.

Your Views on Doctors' Prescription Decision Making Strategies

Rate your PREFERENCE for each doctor's decision making strategy: (please circle a number indicating your rating for each doctor)

Doctor Q	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Doctor F	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Doctor S	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Doctor G	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*

Which decision making strategy do you MOST prefer? Please explain why.

Which decision making strategy do you LEAST prefer? Please explain why.

How ACCURATE do you think each doctor is in their prescription decisions? (please circle a number indicating your rating for each doctor)

Doctor Q	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Doctor F	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Doctor S	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Doctor G	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*

How FAIR do you think each doctor's prescription decision making strategy is? (please circle a number indicating your rating for each doctor)

Doctor Q	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Doctor F	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Doctor S	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Doctor G	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*

How ETHICAL do you think each doctor's prescription decision making strategy is? (please circle a number indicating your rating for each doctor)

Doctor Q	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Doctor F	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Doctor S	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Doctor G	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*

How SIMILAR do you think each doctor's prescription decision making strategy is to the strategy ACTUALLY USED by practicing physicians? (please circle a number indicating your rating for each doctor)

Doctor Q	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Doctor F	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Doctor S	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Doctor G	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*

Please answer the following questions about yourself. (Note: please do not include your name).

1. **Age**_____
2. **Gender**_____**(Male/Female)**
3. **Year of Study**_____

DEBRIEFING FORM

We would like to thank you for your participation in this study. This form will provide you with some information about our study and why we are interested in examining these sorts of issues. This study is following up research that suggests that people are more likely to prefer human-based methods over computer based ones. People also seem to prefer complex and deliberate decision making strategies compared to simple strategies. This preference exists although other research has shown that simple strategies are as accurate as complex ones in making decisions in a variety of contexts. Further, computer and statistical methods have been shown to consistently outperform human reasoning in accuracy of decision making. Therefore, we expected that this research would show the same preferences experienced in prior research.

The second goal of the study was to explore the reasoning behind the decisions that you made in the study. Although some general suggestions have been made regarding why the human/complex preference is shown, little empirical research has been performed to examine this area. It is hoped that the findings generated by this study will greatly increase our knowledge of why people prefer various decision making strategies.

The results from such studies may have important implications. The results will improve our knowledge of beliefs regarding various decision making strategies, as well as the reasoning behind these beliefs. This knowledge will be helpful in future decision making situations; it will also suggest future research needs to be conducted in this area.

If you wish to further follow up on the results of this study you may contact the principle investigator: Joseph Eastwood, Department of Psychology, Memorial University of Newfoundland, St. John's, NL, A1B 3X9, Canada. Email: eastwooj@gmail.com. Phone: (709) 737-3101, Fax: (709) 737-2430. Please note that individual results are not available.

INFORMED CONSENT FORM

The purpose of an informed consent form is to ensure that you, as the participant, understand the purpose of the study as well as the nature of your involvement.

Research title: Attitudes toward decision making strategies

Research personnel: For questions or concerns about this study please contact Joseph Eastwood (Department of Psychology, Memorial University of Newfoundland, 709-737-3101). The proposal for this research has been approved by the Interdisciplinary Committee on Ethics in Human Research at Memorial University. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 737-8368.

Purpose: The purpose of this study is to measure attitudes regarding decision making strategies employed by judges.

Task requirements: The first stage of this study involves a scenario where you are accused of a crime and are applying for bail before four potential judges, all of whom employ different strategies when deciding whether to grant bail. You then answer a set of questions regarding your attitudes toward each of the judges' decision making strategy. Finally, you will be asked to provide the reasoning behind some of the decisions you have made for each of the questions and fill out a brief questionnaire.

Duration: This study should take no longer than 30 minutes to complete.

Potential risks: You are under no obligation to continue the study if you experience discomfort or anxiety during any part of it, or if you feel uncomfortable to do so.

Benefits: Your participation in this study will be contributing toward the current body of literature on decision making while simultaneously giving you the opportunity to learn about the research process.

Anonymity and confidentiality: The data collected in this study are coded with a number that is not associated with your name and therefore all data are anonymous. The data will be used only by researchers associated with this project for the purpose of research publications, conference presentations, or teaching material. The data that is obtained from this research will be stored on a computer indefinitely. To ensure anonymity, please do not write your name anywhere on the questionnaires. As well, the informed consent forms will be kept separate from your questionnaires once returned.

Right to withdraw: Your participation in this study is entirely voluntary. Participation in this experiment is NOT a course or university requirement. At any point during the study you have the right to not answer any questions or to withdraw with no penalty whatsoever.

Signatures: I have read the above description and I understand that the data in this study will be used in research publications or for teaching purposes. My signature indicates that I agree to participate in this study.

Participant's name: _____ Participant's signature: _____

Date: _____

Attitudes Toward Judges' Bail Decision Making Strategies

Researchers:

Joseph Eastwood and Dr. Brent Snook
Faculty of Science
Department of Psychology
Principal Contact: Joseph Eastwood
eastwooj@gmail.com

Information About This Study

Thank you for agreeing to participate in my study. Before you begin I would like to provide you with some details of what you will be doing.

This booklet presents a scenario in which you are accused of a crime and will be applying for bail before one of four potential judges. All judges are equal in experience and knowledge of the law. However they all employ different strategies when deciding whether to grant you bail.

The specifics of each judge's decision making strategy are outlined on an insert page, which you can remove and consult as you complete the questions.

After reading and considering each judge's decision making strategy, proceed through the booklet and answer the questions provided. You will also be asked to explain some of your decisions. In addition, it is important that once you make a decision you do not go back and change it at a later time.

Lastly, you will be asked to provide some anonymous information about yourself.

If you do not have any questions, please begin.

Bail Scenario

Imagine you are accused of a crime and are waiting for a decision on whether you will be granted bail (i.e. be released until your trial date). Being successfully granted bail means you do not have to spend time in prison while awaiting your trial. There are four judges that could potentially hear your case and make the decision on whether to grant you bail. Each judge is identical in years of experience and knowledge of the law. Each judge, however, has a different strategy for deciding whether you will be granted bail.

[TEAR OUT]

Judges' Bail Decision Making Strategies

Each judge is provided with all of the information regarding your age, gender, ethnicity, type of crime you have committed, previous convictions, community ties, and employment status. The decision about whether you will be granted bail will be based on the result of the decision making process outlined below.

Decision Making Strategies

Judge Q: This judge makes decisions intuitively, that is, uses personal and legal experience when deciding bail cases. This judge uses 2-3 pieces of information that are believed to be important in predicting whether granting bail will be successful when making your bail decision.

Judge F: This judge makes decisions intuitively, that is, uses personal and legal experience when deciding bail cases. This judge considers all of the information provided, rank-orders the importance of the information, and integrates it all into a decision on whether to grant you bail.

Judge S: This judge uses a statistical formula that is based on scientific research when deciding bail cases. This formula uses 2-3 pieces of information, which have been found to be good at predicting of whether granting bail will be successful. This information is entered into a computer program that produces a score for you. The judge's bail decision is based on this score.

Judge G: This judge uses a statistical formula that is based on scientific research when deciding bail cases. This formula uses all of the available information. All the information is entered into a computer program which rank-orders the importance of the information, and integrates it all to produce a score for you. The judge's bail decision is based on this score.

Your Views on Judges' Bail Decision Making Strategies

Rate your PREFERENCE for each judge's bail decision making strategy: (please circle a number indicating your rating for each judge)

Judge Q	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Judge F	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Judge S	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*
Judge G	1 *Do not prefer at all*	2	3	4 *Neutral*	5	6	7 *Highly prefer*

Which decision making strategy do you MOST prefer? Please explain why.

Which decision making strategy do you LEAST prefer? Please explain why.

How ACCURATE do you think each judge is in their bail decisions? (please circle a number indicating your rating for each judge)

Judge Q	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Judge F	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Judge S	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*
Judge G	1	2	3	4	5	6	7
	Very inaccurate			*Neutral*			*Very accurate*

How FAIR do you think each judge's bail decision making strategy is? (please circle a number indicating your rating for each judge)

Judge Q	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Judge F	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Judge S	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*
Judge G	1	2	3	4	5	6	7
	Very unfair			*Neutral*			*Very fair*

How ETHICAL do you think each judge's bail decision making strategy is? (please circle a number indicating your rating for each judge)

Judge Q	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Judge F	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Judge S	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*
Judge G	1	2	3	4	5	6	7
	Very unethical			*Neutral*			*Very ethical*

How SIMILAR do you think each judge's bail decision making strategy is to the strategy ACTUALLY USED by appointed judges? (please circle a number indicating your rating for each judge)

Judge Q	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Judge F	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Judge S	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*
Judge G	1	2	3	4	5	6	7
	Very dissimilar			*Neutral*			*Very Similar*

Please answer the following questions about yourself. (Note: please do not include your name).

4. **Age**_____
5. **Gender**_____**(Male/Female)**
6. **Year of Study**_____

DEBRIEFING FORM

We would like to thank you for your participation in this study. This form will provide you with some information about our study and why we are interested in examining these sorts of issues. This study is following up research that suggests that people are more likely to prefer human-based methods over computer based ones. People also seem to prefer complex and deliberate decision making strategies compared to simple strategies. This preference exists although other research has shown that simple strategies are as accurate as complex ones in making decisions in a variety of contexts. Further, computer and statistical methods have been shown to consistently outperform human reasoning in accuracy of decision making. Therefore, we expected that this research would show the same preferences experienced in prior research.

The second goal of the study was to explore the reasoning behind the decisions that you made in the study. Although some general suggestions have been made regarding why the human/complex preference is shown, little empirical research has been performed to examine this area. It is hoped that the findings generated by this study will greatly increase our knowledge of why people prefer various decision making strategies.

The results from such studies may have important implications. The results will improve our knowledge of beliefs regarding various decision making strategies, as well as the reasoning behind these beliefs. This knowledge will be helpful in future decision making situations; It will also suggest future research to be conducted in this area.

If you wish to further follow up on the results of this study you may contact the principle investigator: Joseph Eastwood, Department of Psychology, Memorial University of Newfoundland, St. John's, NL, A1B 3X9, Canada. Email: eastwooj@gmail.com. Phone: (709) 737-3101, Fax: (709) 737-2430. Please note that individual results are not available.

7.0 Appendix B

Coding Guide – Most Preferred

1. **Strategy**: Which strategy did they most prefer
2. **All Info**: Strategy used all the available information
3. **Human Error/Biases**: Strategy is not subject to human errors or biases
4. **Involvement**: Strategy has less personal involvement
5. **Personalized**: Strategy is personalized for each individual, treats every situation as unique
6. **Rank Order**: Strategy rank orders the important information
7. **Personal Knowledge/Experience**: Strategy uses personal legal or medical knowledge
8. **Intuitive Accurate**: Doctor or judge more accurate or outperforms other strategy
9. **Reliable/Consistent**: Strategy is more reliable or consistent
10. **Top Predictors**: Strategy picks and/or uses only the top predictors
11. **Trust Actuarial**: Don't trust computers or formula
12. **Scientific Research**: Strategy is based on scientific research
13. **Importance**: Need to use strategy because of the importance of the decision
14. **Actuarial Accurate:** Computer or formula more accurate
15. **Prefer Intuitive:** Prefer intuitive or human-based decisions
16. **Sway:** Easier to sway judge or doctor (intuition)
17. **Ethical:** Judge or doctor (intuition) more ethical

Coding Guide – Least Preferred

18. **Strategy**: Which strategy did they least prefer
19. **Not All Info**: Strategy did not use all the available information
20. **Experience**: Strategy based on personal experience or viewpoint
21. **Not Personalized**: Strategy not personalized, does not treat each case as unique, doesn't consider outside cues
22. **Intuition**: Strategy based on personal judgment or intuition
23. **Reliability/Validity:** Strategy is not reliable or valid
24. **Computer Reliant:** Strategy relies on computer or formula
25. **Miss Predictors**: Strategy may miss important predictors
26. **Past Cases**: Strategy is based on past cases and other people
27. **Competence**: Strategy questions doctor or judges competence
28. **All Info Not Needed**: Computer doesn't need all information
29. **Human Error**: Strategy is subject to human error
30. **Sway**: Strategy is harder to sway
31. **Intuition Accurate**: Judges or doctors more accurate
32. **Biased**: Strategy is biased
33. **Can't Handle Info**: Strategy can't handle all the information
34. **Lack of Info**: Strategy needs more than 2-3 pieces of information
35. **Feel Better**: Strategy makes patient/offender feel better