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What People Want From Their Professionals: Attitudes Toward Decision-making Strategies

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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 across three studies. In Study 1, undergraduate students were split randomly between legal and medical decision-making scenarios and asked to rate each strategy in terms of the following: (i) preference; (ii) accuracy; (iii) fairness; (iv) ethicalness; and (v) its perceived similarity to the strategies used by actual legal and medical professionals to make decisions. Studies 2 and 3 extended Study 1 by using a more relevant scenario and a community sample, respectively. Across the three studies, the clinical/fully rational strategy tended to be rated the highest across all attitudinal judgments, whereas the actuarial/heuristic strategy tended to receive the lowest ratings. Considering the two strategy-differentiating factors separately, clinically based strategies tended to be 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 professionals' and those affected by their decisions are discussed. Copyright © 2011 John Wiley & Sons, Ltd.

KEY WORDS clinical; actuarial; heuristics; full rationality; decision making; attitudes

Two ubiquitous debates in the judgment and decision-making (JDM) literature pertain to whether professionals should use clinically or actuarially based strategies and fully rational or heuristic-based strategies. A wealth of empirical research has shown that actuarially based methods outperform clinically based methods (Grove, Zald, Lebow, Snitz, & Nelson, 2000) and, to a lesser extent, fully rational strategies outperform heuristics (Gilovich, Griffin, & Kahneman, 2002). This JDM research therefore suggests that professionals attempting to achieve high levels of predictive accuracy should use fully rational, actuarially based strategies and avoid making heuristic-led clinical decisions. However, notwithstanding the need for professionals to make highly accurate decisions, relatively little research has considered people's perceptions of professionals' decision-making strategies.

Since the initial debate between Viteles (1925) and Freyd (1925) concerning the relative merits of clinical versus actuarial methods for selecting personnel, a great deal of research has attempted to determine which of the two produces the most accurate decisions. Clinical methods involve processing data mentally by using personal experience and knowledge (i.e., intuitively), whereas actuarial methods involve processing data through the use of mathematical or statistical models (Kleinmuntz, 1990). In the first comprehensive review of this research, Meehl (1954) found that actuarial methods equalled or outperformed clinical methods in all 20 instances. His review ignited extensive research comparing the two methods across a range of domains (e.g., Boom et al., 1988; Dunnette, Kirchner, Erickson, & Banas, 1960; Goldberg, 1965). Subsequently, a meta-analysis by Grove et al. (2000) of 136 studies found that 47% favored actuarial predictions, 48% yielded equal performance, and only 6% favored clinical predictions. It has generally been established that actuarial methods outperform clinical judgments (Dawes, Faust, & Meehl, 1989; Gough, 1966; Marchese, 1992; Sawyer, 1966).

The superior performance of actuarial tools has resulted in the prescription for their use in professional practice. Despite this recommendation, clinically based methods continue to be used widely in situations where actuarial tools are available (e.g., Kleinmuntz, 1990). Professionals' apparent preference to use their heads instead of formulas appears to be due to, *inter alia*, confidence in their ability to make better decisions than actuarially based methods and the belief that actuarial tools are dehumanizing and unethical or unfair in nature (Dawes, 1992; Dawes et al., 1989). Considering that practitioners use such seemingly logical justifications, we hypothesize that laypersons will use similar reasoning to arrive at a preference for clinically based strategies (i.e., hold a "human-is-better" attitude).

The fully rational versus heuristic debate can arguably be traced back to studies showing peoples' inability to meet the standards of fully rational decision making,[1] the hallmark of optimal decision making (e.g., Edwards & Fasolo, 2001; Kahneman & Tversky, 1973; Miljkovic, 2005; Phillips & Edwards, 1966). Instead, it has been demonstrated consistently that people rely on mental shortcuts (i.e., heuristics), presumably because of the cognitive limitations associated with information processing (Kahneman, Slovic, & Tversky, 1982; Todd & Gigerenzer, 2003). Discouragingly, these heuristics were found to produce numerous systematic errors and biases when compared with the output of probabilistic models (i.e., coherence criteria; see Tversky & Kahneman, 1974). By contrast, recent research has shown that simple heuristics can match, and sometimes exceed, the performance of more computationally expensive decision strategies when tested for their ability to produce accurate decisions in ecologically valid

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[1] Full rationality, initially conceived by 19th century philosophers, assumes that people have complete information about all available courses of action and the computational ability to process that information to make an optimal decision (Daston, 1981; Edwards, 1954; Simon, 1955).

settings (i.e., correspondence criteria; Borges, Goldstein, Ortmann, & Gigerenzer, 1999; Czerlinski, Gigerenzer, & Goldstein, 1999; Goldstein & Gigerenzer, 1999). Although evidence supporting the effectiveness of heuristics has grown over the past decade, at present, the majority of JDM literature appears to favor the use of fully rational or optimal strategies.

A natural response to the research showing that people fail to make optimal decisions has been to implement training programs to help people reach normative benchmarks and/or develop decision aids that ensure that all available information is considered. In other words, this prescribed goal of improving decision making necessitates a shift toward fully rational strategies (e.g., Kahneman et al., 1982), where the use of more information and computation is assumed to lead to more accurate decisions. According to Gigerenzer, Todd, and the ABC Research Group (1999), this "more-is-better" ideology dominates both JDM research and the laypersons' beliefs about what is good and bad decision making. Given the apparent pervasiveness of this ideology, we anticipate that people will prefer professionals who use fully rational strategies over those who use heuristics.

Although much research has focused on improving decision-making accuracy, comparatively, little research has considered the perceptions of professionals' decision processes. Of the available research on attitudes toward decision strategies, almost all has concentrated on how professionals view clinical and actuarial strategies, leading to the general finding that professionals prefer to use clinically based methods. For example, trial judges' have been found to rate actuarially based evidence (e.g., statistical crime data) as less important than clinically based evidence (e.g., mental health expert's testimony) for reaching fair and accurate verdicts (Poythress, 1981). Similarly, medical and legal professionals consider expert evidence derived from a clinically based approach as more useful than that derived from an actuarial tool and are reluctant to utilize outputs from such actuarially based tools (e.g., Corey & Merenstein, 1987; Redding, Floyd, & Hawk, 2001; but see Medow, Arkes, & Shaffer, 2010 for an exception).

The limited amount of research that focused on the attitudes people have toward the decision-making strategies that can potentially be used to make decisions about them has also revealed a preference for clinically based methods. Promberger and Baron (2006), for example, examined peoples' willingness to accept medical recommendations that came from either a clinical or actuarial approach. Participants were given a set of symptoms and a recommendation derived from either a physician's experience or a computer program and were asked to decide whether they would proceed with the recommended surgical procedure (e.g., coronary bypass). As predicted, they found that participants were more likely to follow and trust recommendations that came from a physician as opposed to those provided by a computer program. A similar study by Arkes, Shaffer, and Medow (2007), which measured people's beliefs regarding the use of actuarial decision aids by doctors, showed that participants considered doctors who relied on a decision aid to have lower diagnostic ability than doctors who used their experience and intuition. Outside of the medical realm, senior business students have also been found to rely more on advice from a human expert rather than a statistical method when predicting stock prices (Önkal, Goodwin, Thomson, Gönül, & Pollock, 2009). Currently, no study appears to have examined people's attitudes toward heuristic and fully rational decision-making strategies.

In this paper, we conduct three studies that examine people's attitudes toward four decision-making strategies that are based on a combination of the clinical/actuarial and fully rational/heuristic dimensions. The findings from these studies are important given the potential impact peoples' attitudes may have on both their professionals and their own actions in seeking out professionals and will also help identify the gaps between attitudes about different types of decision strategies and what we know about the effectiveness of those strategies. In Study 1, we test our hypotheses regarding the "human-is-better" and "more-is-better" effects with a sample of undergraduate students using legal and medical decision-making scenarios.

STUDY 1

Method

Participants

Participants were 80 undergraduate students from the Memorial University of Newfoundland. The sample consisted of 25 men ($M_{age} = 18.88$, standard deviation (SD) = 1.42) and 55 women ($M_{age} = 18.69$, $SD = 1.94$). The average year of study for the participants was 1.36 ($SD = 0.78$). The participants were split randomly between medical ($n = 40$) and legal ($n = 40$) decision-making tasks.

Materials and design

The booklet used in this study was organized to create a $2 \times 2 \times 2$ mixed factorial design, with type of decision-making scenario as a between-participants variable and the clinical/actuarial and fully rational/heuristic approaches as the within-participants variables. The booklet contained, on separate pages, the following: (i) an informed consent form; (ii) contact information; (iii) study information and instructions; (iv) one of two scenarios regarding an applied decision-making situation; (v) descriptions of the information available to the decision maker and four possible strategies used to process the information; (vi) instructions for the participants to indicate their preference for each strategy by using a 7-point scale (1 = *do not prefer at all*; 7 = *highly prefer*) and record their most and least preferred strategy; (vii) instructions for the participants to rate each decision strategy, using a 7-point scale, on its perceived accuracy, fairness, and ethicalness; (viii) instructions for the participants to rate each decision strategy, using a 7-point scale, on its perceived similarity to the strategies actually used by professionals to make decisions, followed by a series of demographic questions; and (ix) a debriefing form.

The two applied decision-making scenarios were as follows:

1. Medical

   Imagine you have begun exhibiting symptoms that you believe are consistent with cardiovascular (heart) disease.

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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. 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.

2. 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.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.

The decision strategies were constructed so that each represented one of the four possible ways that the clinical/actuarial and fully rational/heuristic dichotomies could be combined. Below is the wording of the four decision strategies that were presented to the participants:

1. Clinical/fully rational

   This [doctor/judge] makes decisions intuitively, that is, uses personal and [medical/legal] experience when [making prescription decisions/deciding bail cases]. This [doctor/judge] 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/grant you bail].

2. Clinical/heuristic

   This [doctor/judge] makes decisions intuitively, that is, uses personal and [medical/legal] experience when making [prescription/bail] decisions. This doctor uses 2–3 pieces of information that are believed to be important in predicting whether to [prescribe you the lipid-lowering drug/grant you bail].

3. Actuarial/fully rational

   This [doctor/judge] uses a statistical formula that is based on scientific research when [making prescription decisions/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 doctor's [prescription/bail] decision is based on this score.

4. Actuarial/heuristic

   This [doctor/judge] uses a statistical formula that is based on scientific research when making [prescription/bail] decisions. This formula uses 2–3 pieces of information which have been found to be good at predicting of whether to [prescribe you the lipid-lowering drug/grant you bail]. This information is entered into a computer program that produces a score for you. The doctor's [prescription/bail] decision is based on this score.

The presentation order of the decision strategies was counterbalanced within the booklets to eliminate potential order effects, and the booklets were presented to the participants randomly.

Procedure

The participants, recruited using the department of psychology participant pool, were asked to read and sign an informed consent form. Once the participants had read the instructions and confirmed they understood them, they completed the study in a private testing cubicle. Upon completion of the study, the participants were given a one-page debriefing form that detailed the purpose of the research. The participants took approximately 20 min to complete the study, and they were paid for their participation.

Results

A 2 (medical scenario versus legal scenario) × 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) mixed-design analysis of variance (ANOVA) was conducted for preference, with type of scenario as a between-participants factor and the remaining two being within-participant factors. The results showed no significant difference for type of scenario $F_{(1,78)} = 3.76$, $p = 0.056$. Clinical strategies were rated significantly higher than actuarial strategies, $F_{(1,78)} = 86.03$, $p < 0.001$, and that fully rational strategies were rated significantly higher than heuristic strategies, $F_{(1,78)} = 145.35$, $p < 0.001$. There was also a significant interaction between the two within-participant factors, $F_{(1,78)} = 7.77$, $p = 0.007$, where the difference in preference ratings between clinical and actuarial-based strategies is larger when all information is considered (fully rational) compared with when just a couple of pieces of information are considered (heuristic). None of the remaining interactions reached significance.

Because of the lack of a between-participant effect, the mean preference ratings for the four decision-making strategies were collapsed across the two scenarios and are

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shown in Figure 1. As can be seen, the most preferred decision-making strategy was the clinical/fully rational strategy ($M = 6.14$, $SD = 1.06$), followed by the clinical/heuristic strategy ($M = 4.24$, $SD = 1.44$), the actuarial/fully rational strategy ($M = 3.84$, SD 1.67), and the actuarial/heuristic strategy ($M = 2.50$, $SD = 1.30$). Approximately 78% of the participants indicated that the clinical/fully rational strategy was the most preferred, whereas 73% indicated that the actuarial/heuristic strategy was the least preferred.

As was the case for ratings of preference, across each of the remaining attitudinal judgments, the participants rated the clinical/fully rational strategy the highest and the actuarial/heuristic strategy the lowest. A 2 (medical scenario versus legal scenario) × 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) mixed-design ANOVA was also conducted for each of the remaining ratings. The clinical strategies were rated higher than actuarial strategies for accuracy ($F_{(1,78)} = 23.64$, $p < 0.001$), fairness ($F_{(1,78)} = 42.90$, $p < 0.001$), and ethicalness ($F_{(1,78)} = 43.67$, $p < 0.001$). The results also showed that the fully rational strategies were rated higher than the heuristic strategies for accuracy ($F_{(1,78)} = 151.10$, $p < 0.001$), fairness ($F_{(1,78)} = 114.33$, $p < 0.001$), and ethicalness ($F_{(1,78)} = 77.56$, $p < 0.001$). For the type of scenario, a significant result was found for ratings of fairness ($F_{(1,78)} = 4.85$, $p = 0.03$) and ethicalness ($F_{(1,78)} = 4.20$, $p = 0.04$). None of the interactions reached significance.

A mixed-design ANOVA for similarity ratings showed no significant differences for scenario type, $F_{(1,78)} = 2.71$, $p = 0.10$. The participants rated clinical strategies as more similar to how actual professionals make decisions than actuarial strategies, $F_{(1,78)} = 103.49$, $p < 0.001$, and fully rational strategies as more similar to how actual professionals make decisions than heuristic strategies, $F_{(1,78)} = 36.09$, $p < 0.001$. The interaction effect was non-significant.

Discussion

The findings from the current study suggest that people have the most positive attitudes toward professionals who make decisions by intuitively processing every piece of available information. Conversely, people appear to have the least positive attitudes toward those who use actuarially based methods that only consider a few pieces of the available information. Our results showed that people viewed clinically based strategies more favorably than actuarially based ones and rated fully rational strategies above heuristic-based ones. As predicted, peoples' attitudes toward professionals who intuitively process a few bits of information and professionals who use a mechanical aid that processes all available information are similar, likely because each of those strategies contains only one of the preferred components (i.e., clinical or fully rational).

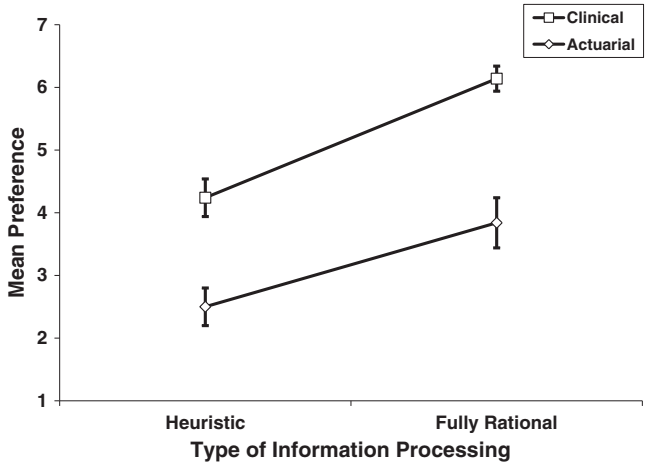

Figure 1. The mean preference rating, and associated 95% confidence intervals, for each of the four decision-making strategies in Study 1

The observed preference of clinically based strategies over actuarially based ones, which we refer to as the "human-is-better" effect, is consistent with the finding of Promberger and Baron (2006) that people preferred recommendations from a physician over those produced by a computer program, with the finding of Arkes et al. (2007) that people believed doctors who used an actuarial decision aid have lower diagnostic ability than those who do not, and with the finding of Önkal et al. (2009) that business students relied more on clinical methods compared with actuarial methods when predicting stock prices. Furthermore, the finding that people believe professionals use a clinical approach to make real-world decisions is also consistent with what is known about how actual professionals make decisions (e.g., Kleinmuntz, 1990). By contrast, the belief that clinically based strategies are the most accurate is inconsistent with the research establishing actuarial tools as generally having higher predictive accuracy (e.g., Grove et al., 2000). The fact that clinically based strategies were rated as more ethical and fairer suggests that our participants are using the same justifications that professionals use to form their attitudes toward clinically based strategies (Dawes et al., 1989; Meehl, 1986).

We suspect that the observed preference for fully rational strategies over heuristic-based strategies is due to the seductiveness of the "more-is-better" ideology. Some support for this speculation comes from the finding that fully rational strategies were rated as more ethical and fairer than the ones that use a few pieces of information. In addition, the participants rated fully rational strategies as the most accurate. Although such an attitude corresponds with the majority of JDM research regarding predictive accuracy when coherence criteria are used to measure performance (e.g., Kahneman et al., 1982), it disagrees with recent findings showing that heuristics often match, and sometimes exceed, the accuracy of fully rational methods when correspondence criteria are used (Gigerenzer et al., 1999). Given that the fully rational versus heuristic debate remains unsettled, it is currently premature to make any definitive conclusions about whether peoples' assumptions regarding accuracy are valid. Beyond attitudinal judgments, people also reported that fully rational strategies are currently being employed by the professionals in the medical and legal fields. This idealized conception of professional practitioners integrating all available information, however, is inconsistent with knowledge about the limits of the computational abilities of the human mind (Tversky & Kahneman, 1974) and research demonstrating that

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people, including judges and doctors, actually use heuristics to make decisions (Dhami, 2003; Dhami & Harries, 2001; Kee et al., 2003).

There are at least two limitations in this study. First, the decision-making scenarios that were used in the study may not be directly relevant to those being asked to make attitudinal judgments about the decision makers in those scenarios. For example, a typical undergraduate student would likely have limited knowledge and experience with the cholesterol issues or bail decisions. As such, the ecological validity of this study may have been limited. Second, the sample used in the current study consisted of only undergraduate students. The sole reliance on undergraduate students limits the generalizability of our results to the general public. Despite these limitations, the current study represents an important first step in assessing attitudes toward decision-making strategies.

In order to address the limitation pertaining to relevance, we conducted a second study that contained a scenario that was directly relevant to the participants. Specifically, undergraduate students were presented with a scenario regarding scholarship committee members' decision-making processes.

STUDY 2

Method

Participants

Participants were 75 undergraduate students from the Memorial University of Newfoundland. The sample consisted of 34 men ($M_{age} = 22.85$, $SD = 4.83$) and 41 women ($M_{age} = 21.02$, $SD = 2.31$). The average year of study for the participants was 3.39 ($SD = 1.36$).

Materials and design

The booklet used in this study was organized to create a 2×2 within-participants design, with the clinical/actuarial and fully rational/heuristic approaches as the two independent variables. The booklet contained, on separate pages, the following: (i) an informed consent form; (ii) contact information; (iii) experiment information and instructions; (iv) a scenario describing a student-relevant applied decision-making scenario; (v) descriptions of the information available to the decision maker and four possible strategies for processing the information; (vi) instructions for the participants to indicate their preference for each strategy by using a 7-point scale (1 = *do not prefer at all*; 7 = *highly prefer*); (vii) instructions for the participants to rate each decision strategy, using a 7-point scale, on its perceived accuracy, fairness, ethicality, and similarity to the strategies actually used by professionals to make decisions; (viii) instructions for the participants to indicate by free response their most and least preferred strategy overall; and (ix) a debriefing form.

The applied decision-making scenario used in the study read as follows:

> Imagine that you have applied for a University scholarship. Receiving this scholarship would ensure that you do not have to worry about finances while you are attending Memorial University. There are four different members on the scholarship committee who could potentially judge your application and decide if you are to be awarded the scholarship. Each committee member is identical in terms of experience and knowledge of the scholarship application process. Each committee member, however, has a different strategy for deciding if you will be given the scholarship. In this scenario, each Committee Member is provided with all of the information regarding your current university Grade Point Average (GPA), high school marks, work experience, letters of reference, extracurricular activities, and community involvement. The decision whether or not to grant you the scholarship will be based on the result of the decision-making process outlined below.

As in Study 1, the decision strategies were constructed so that each represented one of the four possible ways that the clinical/actuarial and fully rational/heuristic dichotomies could be combined. Below is the wording for each of the four strategies:

1. Clinical/fully rational

   This committee member makes decisions intuitively, that is, uses personal knowledge and experience when making a decision. This committee member considers all of the information provided and rank-orders the importance of the information, then mentally processes this information to make a scholarship decision.

2. Clinical/heuristic

   This committee member makes decisions intuitively, that is, uses personal knowledge and experience when making a decision. This committee member uses the 2 to 3 pieces of information that they have found to be most important for awarding scholarships, and then mentally processes this information to make a scholarship decision.

3. Actuarial/fully rational

   This committee member uses a statistical formula that is based on scientific research when making a decision. This formula uses all of the information provided and rank-orders the importance of the information. This information is entered into a computer program that produces a score, which the committee member uses to make a scholarship decision.

4. Actuarial/heuristic

   This committee member uses a statistical formula that is based on scientific research when making a decision. This formula uses 2 to 3 pieces of information that have been found to be the most important for awarding scholarships. This information is entered into a computer program that produces a score, which the committee member uses to make a scholarship decision.

The presentation order of the decision strategies was counterbalanced within the booklets to eliminate potential order effects, and the booklets were presented to the participants randomly.

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Procedure

The participants, recruited using the department of psychology participant pool and via voluntary sign up from several psychology classes, were asked to read and sign an informed consent form. When the participants had confirmed they understood the purpose of the study and the instructions, they completed the experiment in a private testing cubicle. Upon completion of the experiment, the participants were given a one-page debriefing form that detailed the purpose of the research. The participants took approximately 20 min to complete the study.

Results

The mean preference ratings for the four decision-making strategies are shown in Figure 2. As can be seen, the most preferred decision-making strategy was the clinical/fully rational strategy ($M = 5.79$, $SD = 1.12$), followed by the clinical/heuristic strategy ($M = 4.32$, $SD = 1.60$), the actuarial/fully rational strategy ($M = 4.33$, SD 1.66), and the actuarial/heuristic strategy ($M = 3.19$, $SD = 1.51$). Sixty-four percent of the participants indicated that the clinical/fully rational strategy was the most preferred, whereas 55% indicated that the actuarial/heuristic strategy was the least preferred.

A 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) repeated measures ANOVA was conducted for preference ratings. The results showed that clinical strategies were rated significantly higher than actuarial strategies, $F_{(1,74)} = 29.42$, $p < 0.001$, and that fully rational strategies were rated significantly higher than heuristic strategies, $F_{(1,74)} = 58.88$, $p < 0.001$. There was also a significant interaction between the two factors, $F_{(1,74)} = 4.05$, $p = 0.05$.

As was the case for ratings of preference, across each of the remaining attitudinal judgments, the participants rated the clinical/fully rational strategy the highest and the actuarial/heuristic strategy the lowest. A 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) repeated measures ANOVA was also conducted for each of the remaining ratings. The fully rational strategies were rated higher than the heuristic strategies for accuracy ($F_{(1,74)} = 32.74$, $p < 0.001$), fairness ($F_{(1,74)} = 36.48$, $p < 0.001$), and ethicalness ($F_{(1,74)} = 30.55$, $p < 0.001$). The clinical strategies were not rated higher than actuarial strategies for accuracy ($F_{(1,74)} = 2.15$, $p = 0.15$), fairness ($F_{(1,74)} = 0.69$, $p = 0.41$), and ethicalness ($F_{(1,74)} = 2.30$, $p = 0.13$). A significant interaction was found between the factors for ratings of fairness, $F_{(1,74)} = 7.14$, $p = 0.009$. All other interactions were not statistically significant.

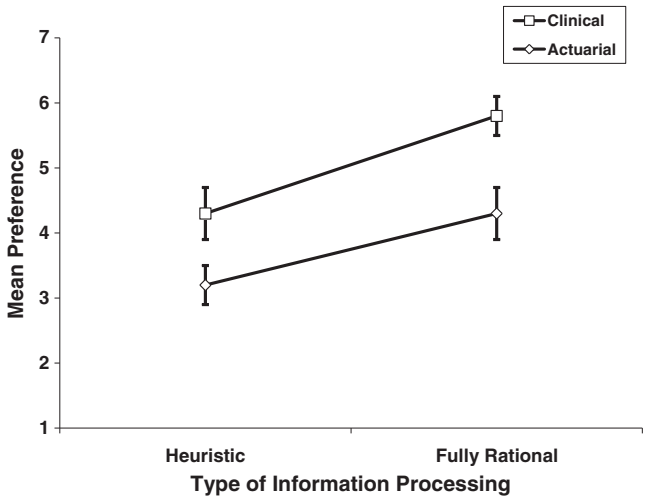

Figure 2. The mean preference rating, and associated 95% confidence intervals, for each of the four decision-making strategies in Study 2

A repeated measures ANOVA revealed that the participants thought clinical strategies were more similar to how actual professionals make decisions than actuarial strategies, $F_{(1,74)} = 11.05$, $p = 0.001$, and that fully rational strategies were more similar to how actual professionals make decisions than heuristic strategies, $F_{(1,74)} = 5.28$, $p = 0.02$. The interaction effect did not reach significance.

Discussion

Similar to the findings from Study 1, undergraduate students who were having decisions made about them regarding the success of their scholarship application most preferred the human decision maker who mentally processed all the information that was available about them. Similarly, the students disliked the decision maker who employed an actuarial system that used just a couple pieces of information. When considering the two main effects independently, the participants showed a stronger preference for clinical and fully rational strategies. Thus, the preferences seen in Study 1 remained when a scenario that was presumably more relevant to the participants was used (i.e., a scholarship application). The findings from the first two studies suggest that the students hold "human-is-better" and "more-is-better" attitudes toward decision-making strategies and that these preferences remain consistent across various situations.

As was the case in Study 1, this "more-is-better" effect held up across all attitudinal judgments made by the participants, as they rated fully rational strategies higher across the judgments of accuracy, fairness, and ethicality. However, in contrast to Study 1, the "human-is-better" effect did not hold up, as clinical strategies were not rated as more accurate, fairer, or more ethical than actuarial strategies. One potential reason why actuarial approaches were considered to be equal to human judges in Study 2 but not in Study 1 may be due to differences in university experience. Students in Study 2 were in a university, on average, two more years than those in Study 1 (3.4 years vs. 1.4 years, respectively). The likely increased exposure to scientific methods may have reduced their fear of cold and calculating statistical formulas and/or increased their appreciation for the ability of statistics to make accurate decisions. A second explanation relates to the potential difference in knowledge and familiarity with the various scenarios. It might be the case that the students' lack of familiarity with the medical and legal scenarios led them to believe that those scenarios require a certain level of human expertise to make an accurate, fair, and ethical decision. By contrast, the fact that most students have experience with a scholarship application process (and the variables that tend to be used to make such decisions, such as grade point average) may have resulted in a lack of perceived need of

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human expertise. Regardless of the reason, it is interesting that—despite not being rated as more accurate, fairer, or more ethical—clinical strategies remained the most preferred by the participants.

Across the two studies, it appears that the rated preference for clinically based decision-making strategies that use all of the available information occurs regardless of whether or not the scenario is directly relevant to the participants. As in Study 1, there remains an issue of the generalizability of the results to the general public. In order to address this limitation, we conducted a third study that elicited attitudes from consumers at a local shopping mall regarding doctors' decision-making processes.

STUDY 3

Method

Participants

Participants were 80 individuals recruited from a local shopping mall in St. John's, Newfoundland. The sample consisted of 18 men ($M_{age} = 31.56$, $SD = 10.17$) and 62 women ($M_{age} = 33.56$, $SD = 12.60$). Seventy-four of the participants (94%) classified themselves as Caucasian, two as African American, and one as Asian, one as Middle Eastern, and one as other. One participant did not report his or her ethnicity. With regard to the highest level of education completed, 30% of the participants indicated high school, 36% indicated college, 28% indicated a bachelor's degree, 5% indicated a master's degree, and 1% indicated a PhD. Of the 78 people who reported their annual personal income, 30% reported a salary of less than $20 000, 35% reported between $20 000 and $40 000, 28% reported between $40 000 and $60 000, 1% reported $60 000 and $80 000, and 6% reported greater than $80 000. The average rating (out of seven, with seven being very concerned) about their concern regarding actual risk for heart disease was 5.05 ($SD = 1.63$); approximately 66% reported a rating of five or higher.

Materials and design

The booklet used in this study was organized to create a 2×2 within-participants design, with the clinical/actuarial and fully rational/heuristic approaches as the two independent variables. The booklet was adapted from Study 1 and contained, on separate pages, the following: (i) a medical decision-making scenario and descriptions of the information available to the four doctors; (ii) four possible decision strategies for processing the information, instructions for the participants to indicate their preference for each strategy by using a 7-point scale (1 = *do not prefer*; 7 = *highly prefer*), and instructions for the participants to indicate by free response their most and least preferred strategy overall; (iii) instructions for the participants to rate each decision strategy, using a 7-point scale, on its perceived accuracy, fairness, ethicality, and similarity to the strategies actually used by professionals to make decisions; and (iv) demographic information and a question regarding their concern about their actual risk for heart disease. A separate debriefing form was also used.

The applied decision-making scenario used in the study read as follows:

> Imagine that you have discovered that you have high cholesterol. Lipid-lowering drugs have been shown to be extremely successful in reducing heart attacks in true cases of heart disease. However they are also very expensive and have potentially serious side effects. Therefore, an accurate diagnosis of your condition and 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 treatment decision. 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 doctors are identical in years of experience and knowledge of medical practices; however each doctor has a different strategy for making a diagnosis of your symptoms.

As in studies 1 and 2, the decision strategies were constructed so that each represented one of the four possible ways that the clinical/actuarial and fully rational/heuristic dichotomies could be combined. Below is the wording for each of the four strategies:

1. Clinical/fully rational

   This doctor uses personal knowledge and experience when making a decision. This doctor considers all of the information provided and rank-orders the importance of the information, then mentally processes this information to make a prescription decision.

2. Clinical/heuristic

   This doctor uses personal knowledge and experience when making a decision. This doctor uses the 2 to 3 pieces of information that they have found to be the most important for prescribing lipid-lowering drugs, then mentally processes this information to make a prescription decision.

3. Actuarial/fully rational

   This doctor uses a statistical formula that is based on scientific research when making a decision. This formula uses all of the information provided and rank-orders the importance of the information. This information is entered into a computer program that produces a score, which the doctor uses to make a prescription decision.

4. Actuarial/heuristic

   This doctor uses a statistical formula that is based on scientific research when making a decision. This formula uses the 2 to 3 pieces of information that have been found to be the most important for prescribing lipid-lowering drugs. This information is entered into a computer program that produces a score, which the doctor uses to make a prescription decision.

The presentation order of the decision strategies was counterbalanced within the booklets to eliminate potential

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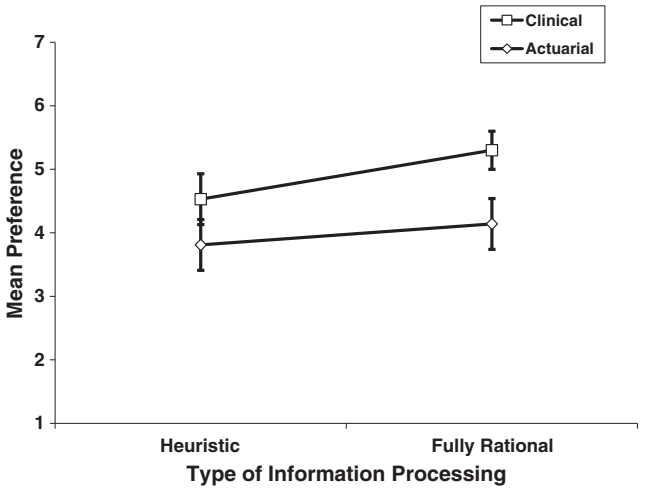

Figure 3. The mean preference rating, and associated 95% confidence intervals, for each of the four decision-making strategies in Study 3

order effects, and the booklets were presented to the participants randomly.

Procedure

A recruitment booth was set up at a local shopping mall. Individuals who approached the booth were asked to participate in the current study. After being provided with study details and giving verbal consent, the participants were given the study booklet to complete and return to the booth. Upon returning the booklet, the participants were given a mall voucher and a one-page debriefing form that detailed the purpose of the research.

Results

The mean preference ratings for the four decision-making strategies are shown in Figure 3. On average, the most preferred decision-making strategy was the clinical/fully rational strategy ($M = 5.30$, $SD = 1.53$), followed by the clinical/heuristic strategy ($M = 4.53$, $SD = 1.61$), the actuarial/fully rational strategy ($M = 4.14$, SD 1.81), and the actuarial/heuristic strategy ($M = 3.81$, $SD = 1.65$). Sixty percent of the participants indicated that the clinical/fully rational strategy was the most preferred, whereas 49% indicated that the actuarial/heuristic strategy was the least preferred.

A 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) repeated measures ANOVA was conducted for preference ratings. The results showed that clinical strategies were rated significantly higher than actuarial strategies, $F_{(1,76)} = 12.81$, $p = 0.001$, and that fully rational strategies were rated significantly higher than heuristic strategies, $F_{(1,76)} = 11.90$, $p = 0.001$.[2] There was no significant interaction between the two factors.

As was the case for ratings of preference, the participants rated the clinical/fully rational strategy the highest and rated the actuarial/heuristic strategy the lowest across each of these attitudinal judgments. A 2 (clinical versus actuarial) × 2 (fully rational versus heuristic) repeated measures ANOVA was also conducted for each of the remaining ratings. The clinical strategies were rated significantly higher than actuarial strategies for accuracy ($F_{(1,78)} = 7.85$, $p = 0.006$), fairness ($F_{(1,79)} = 6.68$, $p = 0.01$), and ethicalness ($F_{(1,79)} = 7.20$, $p = 0.009$). The fully rational strategies were rated significantly higher than the heuristic strategies for accuracy ($F_{(1,78)} = 21.93$, $p < 0.001$), fairness ($F_{(1,79)} = 12.55$, $p = 0.001$), and ethicalness ($F_{(1,79)} = 9.08$, $p = 0.003$). None of the interactions reached significance.

A repeated measures ANOVA revealed that the participants thought clinical strategies were more similar to how actual professionals make decisions than actuarial strategies, $F_{(1,77)} = 21.61$, $p < 0.001$, but did not think that fully rational strategies were more similar to how actual professionals make decisions than heuristic strategies, $F_{(1,77)} = 2.48$, $p = 0.12$. The interaction effect did not reach significance.

Discussion

We found that people had the most positive attitude toward the clinically based decision maker who mentally processed all of the information that was available about them. By contrast, people expressed the least positive attitude toward the decision maker who used a statistical formula that incorporated two to three pieces of information. We also found that, when collapsing across the two dichotomies (i.e., clinical versus actuarial and fully rational versus heuristic), the most positive attitudes were expressed toward human decision making and for all rather than some information. Thus, the generally positive attitudes seen in the previous two studies remained when a scenario that was relevant to the participants (i.e., determined by their self-reported level of concern regarding heart disease) was presented to a sample more representative of the general public. These findings suggest that the general public also endorses the "human-is-better" and "more-is-better" attitudes toward decision-making strategies.

As was the case in studies 1 and 2, the hypothesized "more-is-better" effect held up across all attitudinal judgments, as the participants rated fully rational strategies higher across the judgments of accuracy, fairness, and ethicality. Similar to Study 1, the hypothesized "human-is-better" effect also held up across all judgments. Despite the significant findings, we must acknowledge that the effect sizes were smaller than in the two previous studies. It is possible that this finding is due to the lack of control over testing conditions. For instance, there may have been group discussions prior to the participants' ratings, distractions in the testing environment, and individual differences across the participants that were not measured in the study (e.g., eyesight, reading ability). Of course, it is also possible that the lower effect sizes were due to the greater variability in the attitudes held by a more heterogeneous sample—perhaps due to a greater variety in actual experience with doctors and understanding of the decision strategies.

[2]The degrees of freedom across the analyses in this study are not equal due to several participants not providing a rating for one or more of the strategies in their booklets. Specifically, two participants did not provide a preference rating for the clinical/heuristic and actuarial/fully rational approaches or a similarity rating for the actuarial/fully rational approach. One preference rating was also not provided for the actuarial/heuristic approach, and one accuracy and similarity rating was not provided for the clinical/heuristic approach.

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GENERAL DISCUSSION

Across the three studies using a variety of decision-making scenarios, we found that people had an affinity for the "human-is-better" and "more-is-better" ideologies. That is, the participants tended to express more positive attitudes toward the decision-making strategies that involved a human decision maker (compared with the actuarial system) and more positive attitudes toward the decision-making strategies that considered all available information (compared with one that used only a couple pieces of information). The most preferred strategy was the one that combined these two methods; that is, the human decision maker who considers all available information. The participants generally thought that this fully rational human decision maker was also the most accurate, fairest, and most ethical. Conversely, the participants indicated that they were less comfortable having decisions made about them by strategies that incorporated either a statistical formula or only used a couple pieces of information, with the strategy that included both methods being disliked the most. These findings highlight the divide between what people want from their professional and the realities of what professionals should do (actuarial) and are doing (heuristic).

Past research has demonstrated that actuarial methods tend to outperform clinical methods across a range of domains. Despite this evidence, professionals have been reluctant to use existing actuarial methods for a variety of reasons (Kleinmuntz, 1990). Chief among the reasons stated by professionals for such reluctance is confidence in their ability to make accurate decisions through an individualized consideration of the information at hand and the dehumanizing nature of statistical formulas. Interestingly, these same justifications (i.e., clinically based strategies rated as more accurate and ethical than actuarially based strategies) were reflected by the general public to arrive at a preference for clinical methods when a professional is making a decision about them. This particular finding adds a layer of difficulty in attempts to have practitioners ensure their decision-making strategies are in line with the best practices. In other words, our findings suggest that it will become even more difficult for clinically oriented practitioners to start using actuarial methods, and as such, a shift may be received negatively by their clients.

Likewise, research has shown that heuristics are an intrinsic part of human cognition, as is evidenced by the numerous studies showing that both laypersons and professionals use the fast and frugal strategies when making decisions (e.g., Dhami, 2003; Snook & Mercer, 2010; Tversky & Kahneman, 1974). There appears, however, to be an underlying notion in society that the more information that an individual processes about decision alternatives, the better the subsequent decision will be. In line with this "more-is-better" ideology, we found that participants invariably preferred the human decision maker who considered all available information. Conversely, the participants reported consistently that the human decision maker who used just a couple of pieces of information was viewed as less accurate, less ethical, and less fair. These findings suggest that the decision-making strategy that considers selected information somehow lacks the completeness, thoroughness, and rigor that are expected of professionals.

The apparent schism between decision-making ideals and empirical realities requires solutions for increasing the appreciation for actuarial systems and reducing the fear of heuristics. In order to increase the use of actuarial systems for those who currently rely on their heads, we suspect that a fruitful approach maybe is to attempt to educate the general public about its benefits. Given that professionals have historically been reluctant to move away from using clinical methods, an educated public who is aware of the benefits of actuarial systems may be able to influence its professionals to adopt the best practices. A second alternative would be to attempt a compromise by using decision strategies that integrate both clinical knowledge and statistical formula (e.g., like the structured professional judgment used in risk assessments, such as the widely used HCR-20; Webster, Douglas, Eaves, & Hart, 1997), thereby reducing concerns about the dehumanizing effects of actuarial approaches while maintaining high levels of accuracy and reliability. Perhaps the most straightforward method to decrease the fear of heuristics is to educate professionals and the public that less information is not always detrimental. This education would involve informing the public that clinically based and actuarially based decisions made using only a subset of the available information can lead to highly accurate decisions (e.g., Gigerenzer et al., 1999; Breiman, Friedman, Stone, & Olshen, 1984).

An interaction between the two main effects also occurred in studies 1 and 2, whereby a larger difference in preference between clinical-based and actuarial-based strategies was seen when all the available information was being considered versus when just a few pieces of information were being considered. One potential explanation for this unanticipated interaction is that people are less concerned about how professionals integrate information when only some of the available information is used compared with when all of the available information is used. In other words, the participants may have reasoned that both a doctor and a statistical formula are relatively limited when working with only two to three pieces of information, whereas the possibilities of what a doctor versus a statistical formula can do when working with all the available information is much greater. The interaction was only marginally significant in Study 2 and disappeared in Study 3, however, so it may also simply be a statistical anomaly.

The three studies contained in this paper represent one of the first illustrations of the "human-is-better" and "more-is-better" attitudes held by people who are getting a decision made about them. Future research is needed to determine the generalizability of these attitudes under varying conditions and in different situations. One interesting avenue of future research would be to explore the possibility of altering attitudes to match empirical realities through education about the merits of various decision-making strategies. We suspect that informing people about the superior predictive ability of actuarial tools will increase the preference for them. Having said this, if people maintain their view of them as unfair and unethical, actuarial approaches may still remain less preferred than clinical approaches. Similarly, informing the participants of the ability of heuristics to produce accurate decisions in certain domains should increase preference for such approaches in those domains, but concerns regarding

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the fairness and the ethicalness of heuristic approaches may lead people to still prefer fully rational approaches.

The scenarios in the current research also assumed that none of the constraints faced by real-world decision makers were in effect (e.g., limited time, missing information). It is possible that people will be more accepting of heuristic approaches when presented with situations where a decision must be made quickly and information is scarce or difficult to obtain (e.g., fireman deciding whether or not to enter a burning house). In addition, informing people regarding the difficulty of implementing certain decision strategies (e.g., fully rational/clinical) may lower preferences for those strategies because they are not seen as feasible. Such research will ultimately help establish the boundaries of the "human-is-better" and "more-is-better" effects observed in the current study.

Although professionals presumably use decision strategies based primarily on the level of accuracy they produce, the desires of their clients also have the potential to influence the strategy that is ultimately chosen. At this juncture, it appears that people want their professionals to intuitively process all the information that is available about them and are uncomfortable with statistical formulas that only incorporate a few pieces of information. The burden is therefore on researchers and professionals to try to inform the public about the efficiency and the accuracy of different approaches, which will ultimately allow people to get both what they want and what they need.

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