INTUITIONS ABOUT INTUITIVE INSIGHT AND INTUITIVE CHOICE

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A long tradition in Western thought has enshrined reasoning as the surest way to reach a sound decision, although the opposing point of view, that sees intuition as a superior basis of many decisions, has had many advocates throughout history. But how do people actually balance intuition and reason when making decisions? I report nine studies that indicate that people use features of the choice (Studies 1-3) or features of their mental states (Studies 4-8) as cues when deciding whether to follow intuition or reason. That is, features of the choice and the chooser's mental state are matched to the characteristics of rational or intuitive processing to determine whether to follow intuition or the dictates of a more deliberate, reasoned analysis. Choices that are seen as objectively evaluable (Study 1), complex (Studies 2a and 2b), or important (Study 3) elicit a preference for choosing rationally, as do mental states of carefulness and caution (Studies 4, 5, and 6). Conversely, mental states involving vividly pictured choices (Study 7) or persistent intuitions (Study 8) elicit an increased preference for choosing intuitively.

BIOGRAPHICAL SKETCH

Yoel Inbar was born in California and attending the University of California at Berkeley, where he earned a Bachelor of Arts in Psychology. After taking a few years to explore other interests, he came to Cornell University to pursue a Ph.D. in social and personality psychology. Yoel will be moving on to a post-doctoral position at the Harvard Kennedy School of Government.

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CHAPTER ONE:

INTRODUCTION

What should you do when intuition tells you one thing and rational analysis another? How should you choose, in other words, when there is a conflict between your head and your gut? Since the dawn of the Enlightenment it has generally been agreed, in scholarly circles at least, that the head should be sovereign. Logic and reason have long been thought to be the surest guides to the truth and to effective action, and as safeguards against the wayward influence of emotion and unaided intuition. But recently the Enlightenment call has not been sounded as often or as loudly, and it can be hard to hear among all of the advice to heed intuition. People are now bombarded with the message that they should trust their intuitions and "go with their gut." In popular culture, individuals are told "not to overthink," to "listen with your heart," and, of course, to let "the force" be with them. Popular translations of the scholarly literature on intuition and judgment and decision-making tend to reinforce this advice (Gigerenzer, 2007; Gladwell, 2005; Klein, 1998) as does much of the scholarly literature itself (Bargh, 1997; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Wilson & Schooler, 1991).

The grounds for such advice are not hard to discern. The psychological literature contains numerous examples of spectacular accuracy and insight attributable to intuition (Ambady, Bernieri, & Richeson, 2000; Bargh, 1997; Dijksterhuis et al., 2006; Dunning & Stern, 1994; Ellis, 1984; Hay, Young, & Ellis, 1986; Wilson & Schooler, 1991) as well as a large number of erroneous judgments and disastrous decisions that can be blamed on faulty rational analysis (Hall, 1980; Baron, 1988). But support can be found for all sorts of claims, even the most highly questionable, and the issue is hardly settled. Indeed, the psychological literature also contains countless examples of spectacularly faulty intuitive assessments (Denes-Raj & Epstein, 1994;

Gilovich, Griffin, & Kahneman, 2002; Tversky & Kahneman, 1982), and the very existence of modern technological society is a compelling argument for the power of analytic thinking.

In reality, not much is known about precisely when one should follow one's gut instincts and when one should obey the dictates of a rational analysis. One bankable principle is that one's intuitions can only be trusted when they have been "tuned" in an informative environment (Hogarth, 2001). The associative connections that are the core of intuition are almost certain to be misleading if they were formed in an environment containing largely unrepresentative information; this is what gives rise, for example, to a number of unwarranted stereotypes (Levine & Campbell, 1972; Ross, Amabile, & Steinmetz, 1977). Exposure to films and television shows in which members of a particular ethnic group engage in a level of criminality that is disproportionately high relative to real-life crime statistics is likely to lead to a strong gut feeling that members of that group are dangerous. Such gut feelings can be overcome through the effortful exercise of conscious will (Devine, 1989; Fiske, 1989; Kawakami, Dovidio, & van Kamp, 2005), but note that it is the mind's rational faculties that compel one to reject the stereotype. More generally, it is one's rational faculties that discern whether the pertinent data are tainted and whether an intuitive conclusion based on these data should therefore be rejected.

Another principle that may have merit is that the parallel processing of the intuitive system can give it an edge when the judgment or decision calls for the integration of a great many input cues (Dijksterhuis, 2004). In other words, to the extent that the judgment or decision resembles the task of face recognition, which requires the simultaneous, rapid processing of an unfathomably large number of cues, one may be well served by honoring one's intuitions. One may be well served by

doing so, that is, when there isn't (or one isn't aware of) an appropriate algorithm for solving the judgment or decision problem analytically.

More generally, Hammond (1996) has observed that just as thinking can be ordered on a *cognitive continuum* from rational to intuitive, tasks can likewise be ordered on a continuum from those amenable to rational thought to those amenable to intuition. On Hammond's (1996) *task continuum*, features of "intuitive" tasks include multiple intercorrelated cues; less-than perfect cue reliability; lack of an organizing principle or algorithm to integrate cues; and limited time (p. 163). For example, a task in which many redundant cues are simultaneously presented visually is considered more intuitive, while a task in which a few non-correlated cues are presented numerically is considered more rational. Hammond and colleagues (Hammond, Hamm, Grassia, & Pearson, 1987) showed that when one's position on the cognitive continuum matches the task's position on the task continuum, task performance is at its highest. In other words, thinking intuitively enhances performance on tasks that are "intuition-like," and thinking rationally enhances performance on tasks that are "rationality-like."

Beyond these guiding principles, there is little to go on when deciding how to trade off between intuitive and rational approaches to decision-making. This presents a problem, because most theorists regard intuition and reason as two co-existing modes of thought which operate complementarily and in parallel (e.g., Epstein, 1994; Kahneman & Frederick, 2002; Sloman, 1996). Thus, for any given problem decision-makers might choose to rely on intuition, rational analysis, or a combination of the two (Hammond, Hamm, Grassia, & Pearson, 1987). Worse, intuitive and rational processes can sometimes produce diametrically opposed responses to the same problem (Sloman, 1996). How, then, do people typically resolve this conflict? How do they determine whether an intuitive or rational approach is best suited to a specific

decision, and how do they reconcile conflicting results produced by intuitive and rational thought? What variables affect whether they tend to favor intuition or to obey the dictates of their rational faculties?

Strategy cueing

Hammond, Hamm, Grassia, and Pearson (1987) showed that experts made more accurate judgments when their cognitive style was matched to the features of the task. That is, more intuitive thinking increased accuracy when the task was "intuition-like," while more rational thinking increased accuracy when the task was "rationality-like." Hammond et al. recommended that one "maximize the probability of accurate judgments by adapting…cognitive activity to the (unalterable) display features of the task." There is no doubt that this recommendation has a great deal of merit for expert decision-makers confronted with a decision task in which inputs can be precisely identified, and correct responses can be formally defined. However, many of the choices that people make are more difficult to subject to this sort of formal analysis. Imagine deciding whether to continue dating an exciting but unreliable partner; whether to attend a prestigious college far from one's home or a less well-known institution closer to one's friends and family; whether to buy the sensible brown sedan or the sporty red coupe; or even whether to have the pecan fudge brownie or the boysenberry pie for dessert—all of these choices might very well evoke a conflict between one's rational analysis and one's intuitive preferences. When confronted with this sort of dilemma, what do people do?

Task cues. I propose that when deciding whether to favor intuition or reason, people may be cued by a resemblance between features of the task and features of intuitive or rational processing. That is, people may be inclined to think that they should follow their intuitions whenever the characteristics of the judgment or decision resemble the characteristics of intuitive processing, and that they should follow the

dictates of a rational analysis whenever the characteristics of the judgment or decision resemble the characteristics of rational processing. As one example, people tend to think of rational analysis as precise and objective and so they might be inclined to think they should follow their head when the choice problem they confront is one in which the rightness or wrongness of the decision can be precisely and objectively defined. Intuitive processes, in contrast, are thought of as relatively inexact and subjective, and so people may be inclined to think that they should follow their gut instincts when the choice they confront is one that cannot be so precisely or objectively evaluated. The main feature of the choice problem (how precisely it can be evaluated) is matched to a prominent feature of intuitive versus rational processing (the precision of its output).

State cues. Features of a choice task—or, as I will call them, *task cues*—are one type of information that might be matched to the features of intuition and reason. Another type of information that might prove to be just as important is one's internal mental state. Just as people may be cued to process intuitively or rationally by features of a choice, they may also look to features of their current mental or emotional experience. For example, reason (as I will argue) is seen as more effortful than intuition, and so experiencing effort makes people more likely to engage in rational analysis (Alter, Oppenheimer, Epley, & Eyre, 2007). Conceptually, state cues are similar to the idea of affect as information (Shwartz & Clore, 1983), and to the notion of metacognitive fluency (Oppenheimer, 2006). In all three cases, people look to their current mental state to answer the question at hand: When people are asked how satisfied they are with life in general, they look to their current mood; when they are asked to evaluate an essay's quality, they look to how difficult it was to read; and when they need to decide whether to approach a problem rationally, they look to how rational they feel. It is important to note that this is not something that people do

explicitly and deliberatively—in fact, drawing people's attention to these types of cues generally eliminates their influence on judgment.

I have argued that features of a task (*task cues*) or of one's mental state (*state cues*) can cue intuitive or rational choosing. But what are the features of intuitive or rational thought that might serve as cues? This question is addressed in the next section.

Characteristics of intuitive and rational thought

Thus far, I have not formally defined the terms *intuitive* and *rational*. Most people know what intuitive and rational thinking "feel like," and can readily summon to mind examples of both kinds of thinking. However, the idea of strategy cueing requires a more detailed account of the specific features of rational and intuitive thinking that might be matched to features of a task or of one's mental state.

The idea that people employ two qualitatively different modes of thought has a long history in social psychology—indeed, James (1890/1950) distinguished between *associative thought*, which he held to be based on associations established by past experience, and *reasoning*, which alone is capable of analyzing new information. More recently, a great number of *dual-process* theories of reasoning have been proposed (Chaiken & Trope, 1999), all premised on the idea that thinking proceeds in one of two modes: one is relatively slow, controlled, and effortful; and the other is relatively quick, automatic, and easy. Among the most influential are the theories of Epstein (1994), Sloman (1996), and Kaheman (2003), all of which use different terminology to distinguish what I am calling rationality and intuition. Epstein (1994) called the first kind of thinking *rational* and the second *experiential*; Sloman distinguished between a *rule-based system* and an *associative system*; and Kahneman (2003), following Stanovich and West (2001), used the more generic terms *System 2*

and *System 1*. Though the theories differ in some details and in what features of intuitive or rational processing are emphasized, they also share a large amount of overlap. In particular, the four distinctions listed in Table 1 are common across theories:

Table 1. Characteristics of intuitive and rational thought.

	Rational	Intuitive
1.	Slow	Quick
2.	Effortful	Effortless
3.	Rule-based	Associative
4.	Abstract, general	Concrete, vivid, specific

I am not claiming that these distinctions are an exhaustive list of the characteristics that distinguish intuitive and rational thinking. Rather, they are a subset chosen on the basis of a) widespread agreement between different descriptions of intuitive and rational processing, and b) the fact that they might plausibly "match" to features of a decision problem or of a person's mental state, cueing intuitive or rational choosing as suggested earlier. The way in which each distinction has been understood to be characteristic of intuition or rationality is briefly described below.

Distinctions 1 & 2: Slow vs. quick & Effortful vs. effortless. This pair of distinctions is drawn from the distinction between automatic and controlled processing, whereby automatic processing is seen as fast and effortless, controlled processing is relatively slower and more effortful (Shiffrin & Schneider, 1977; Schneider & Shiffrin, 1977). Similarly, intuitions seem to come to mind effortlessly and immediately, whereas rational processing is slower and requires some effort. For example, consider the following problem, discussed in Kahneman (2003), "A bat and

a ball cost $1.10 in total. The bat costs $1 more than the ball. How much does the ball cost?" Many people find that the intuitively appealing (and wrong) answer of "10 cents" comes to mind almost instantly and effortlessly. It is only with more time, effort, and the application of rules of arithmetic that the correct answer (5 cents) can be produced.

Distinction 3: Rule-based vs. associative. Psychologists since William James have distinguished between thinking that is associative and based on past experience, and thinking that involves the application of rules and formal logic. More recent theories distinguishing between intuitive and rational thought view associative thinking as the primary mode of operation of intuitive thought, whereas rational thought is viewed as consisting of the application of explicitly available rules and principles. One of the most well-known examples of this distinction is the "Linda problem" (Tversky & Kahneman, 1983). In this problem, participants read the following description of Linda:

"Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations." (p. 297)

They were then asked to rank-order the likelihood that eight statements about Linda were true, including the statements "Linda is a bank teller" and "Linda is a bank teller and active in the feminist movement." Many people find that the second statement (that Linda is both a bank teller and a feminist) intuitively feels more plausible than the first (that Linda is just a bank teller), because the description of Linda seems most typical of a feminist bank teller (Gould, 1988). Thus, an associative process of feature matching leads to an intuitive preference for the description that includes the term "feminist." In contrast, a rational, deliberative application of the

rules of probability leads to a preference for the first statement, as the probability of both A and B being true cannot be greater than the probability of A being true.

This view of rational thought as rule-based implies that rational thinking would excel at the application of normative (i.e., culturally prescribed) rules or standards. Although it is possible in principle to rationally apply an internally consistent but completely idiosyncratic set of rules, in practice the rules of rational thinking are generally culturally transmitted. In describing experiments investigating departures from rationality, Sloman (1996) stated that "rule-based reasoning…reflects cultural knowledge (probability theory, class-inclusion logic, etc.) imparted by the experimenter to the participant." For example, research in the heuristics and biases tradition (Gilovich, Griffin, & Kahneman, 2002), has defined rationality as the accurate application of statistical or logical rules, such as Bayes' Theorem.

In contrast, the associative nature of intuitive thought is commonly seen as giving rise to affectively based preferences derived from personal experience (Sloman, 1996). Intuitive affective evaluations can underlie a wide variety of seemingly disparate reactions to a stimulus (Slovic et al., 2002). For example, consider both the risks and benefits of nuclear power. A rational analysis might well show both high benefits (e.g. greater energy independence, reduced carbon emissions) and high risks (e.g. environmental hazards from nuclear waste, the risk of a catastrophic reactor meltdown). However, intuition, based on one's initial affective response to the idea of "nuclear power," would instead suggest a view of nuclear power as all good (low risk, high benefit) or all bad (high risk, low benefit). And, indeed people view riskier activities and items as less beneficial, and vice versa (Alhakami & Slovic, 1994; Finucane, Alhakami, Slovic, & Johnson, 2000), suggesting that judgments of risks and benefits are both derived at least partially from an underlying intuitive judgment of an object as good or bad.

Distinction 4: Abstract and general vs. concrete, vivid, and specific. Another implication of the view of rational thought as based on the application of rules or algorithms, and of intuitive thought as based on affect and personal experience, is that rational thought involves a greater emphasis on abstraction and general principles, while intuition emphasizes concrete, vivid, and specific images or experiences. This is not to say that intuitive thought is not capable of representing abstract categories (cf. Sloman, 1996, p. 16), but rather that concrete, vivid stimuli are much more central in intuitive than in rational thought. One example of this is the ratio-bias paradigm, developed by Epstein and colleagues (Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992). In this paradigm, participants choose to draw a random jelly bean from one of two bowls in the hopes of receiving money if a winner is drawn. The smaller bowl contains one winner and 9 losers, while the larger contains 10 winners and 90 losers. In this paradigm, many people experience a compelling intuition that the larger bowl is better, despite knowing that statistically they are equally likely to draw a winner from either bowl. Epstein and colleagues argue that intuition responds to the concrete, vivid reality that there are more winners in the larger bowl, while rational analysis uses the general principles of probability to determine that the two bowls are actually equivalent. The influence of intuition in this situation can be hard to ignore—many participants were willing to pay money in order to draw from the larger bowl (Kirkpatrick & Epstein, 1992), and a majority preferred to draw from the larger bowl even when it contained 9 winners and 91 losers, and was thus statistically inferior to the smaller bowl (Denes-Raj & Epstein, 1994).

Outline of the current research

In this dissertation, I report nine studies testing the idea that features of choices, or of the chooser's mental state, are matched to features of intuition or reason, cueing intuitive or rational decision-making. I examine the effect of strategy cues both

on people's stated preference for an intuitive or rational decision strategy when considering hypothetical choices, as well as people's use of intuition or reason when making an actual choice. This approach bolsters ecological validity in two ways: First, by asking people about a wide variety of different choices, I minimize the possibility that cueing only occurs for a particular, unusual kind of choice. Second, by examining people's actual choices in addition to their stated preferences in hypothetical situations, I eliminate the possibility that cueing only influences what people *think* they should do and not how they really act. As will become apparent, the results across real and hypothetical choices converge nicely.

In the next chapter, I report four studies that examine how features of a task (*task cues*) prompt either rational or intuitive decision-making. In Chapter Three, I report five studies that examine the effects of features of the chooser's mental state (*state cues*).

CHAPTER TWO:

TASK CUES

In this chapter, I examine three task features that I expected to cue intuitive or rational choosing: the objective evaluability of the outcome (Study 1), the complexity of the choice options (Studies 2a & 2b), and the importance of the choice (Study 3). Rational thought is well suited to the application of normative rules and criteria, and so I expected that objectively evaluable outcomes, which allow this sort of analysis, would cue rationality. Complex and important choices are associated with effort, a hallmark of rational thinking, and so I expected that complexity and importance would similarly cue rationality. In Studies 2b and 3, I also examine whether chronic inclinations to process rationally or intuitively moderate the effects of task cues.

Study 1: The Objectivity of Evaluation

Rational thought is well suited to the application of normative rules and to the ranking of alternatives according to explicit criteria, whereas intuitive thought often reflects idiosyncratic, subjective preferences. This implies that choices with objectively evaluable outcomes—that is, choices for which normative standards can be applied to determine whether a choice was good or bad—should cue a preference for rationality. In contrast, subjectively evaluable choices—that is, choices where the standard of evaluation is personal and idiosyncratic—should cue a preference for intuition.

Method

I created a list of 25 choice dilemmas, which ranged from relatively trivial ("Selecting an entrée") to extremely consequential ("Choosing a college to attend"). Twenty respondents, recruited on and around the Cornell University campus, first read a brief introduction stating that some decisions are "made mainly on the basis of 'intuition,' or by consulting our 'gut'" while others are made "mainly on the basis of

'reason,' or through rational analysis." They then rated each choice dilemma on "the extent to which [it] should be based on intuition versus reason," using a 9-point scale anchored by "Should be based exclusively on 'intuition'" (1) and "Should be based exclusively on 'reason'" (9).

A separate group of twenty respondents, recruited in a similar fashion, read a different set of instructions stating that "for some decisions, one can objectively quantify whether the decision worked out well or poorly, whereas for others whether or not it worked out well or poorly is a matter of personal taste." They were then asked to rate each of the 25 choices in terms of the extent to which evaluation of the outcome was "an objective or subjective determination." These ratings were made on a 9-point scale anchored by "mainly a subjective matter" and "mainly an objective matter."

Results

For each choice dilemma, I computed the median rating of how much the decision should be based on intuition versus reason (with higher numbers indicating a stronger preference for rational choice), and the median rating of the objectivity with which the outcome could be evaluated (with higher numbers indicating more objectively evaluable outcomes). I based my analyses on these median ratings, with choice dilemma as the unit of analysis.

Not surprisingly, there was considerable variability across choice dilemmas in participants' preference for deciding on the basis of intuition versus reason. The median ratings ranged from a low of 2 ("Selecting a dessert at the end of a meal at a restaurant") to a high of 9 (choosing "one of two suggested medical treatments," "a stock in which to invest," and "one of two cities in which to locate a toxic waste dump"). The mean of these scores across the 25 choice dilemmas was 6.12, significantly higher than the scale midpoint of 5, $t(24) = 2.63$, $p < .02$, $d = 1.07$. Thus, there was something of an overall preference for choosing rationally.

More noteworthy, however, was the extent to which the variability in participants' responses across the different choice dilemmas was captured by the extent to which the different choices were thought to be objectively evaluable. Consistent with the strategy cueing hypothesis, the more participants thought that the outcome of a decision was objectively evaluable, the more they were inclined to believe it should be based on rational analysis, $r(25) = .73$, $p < .001$ (see Figure 1).

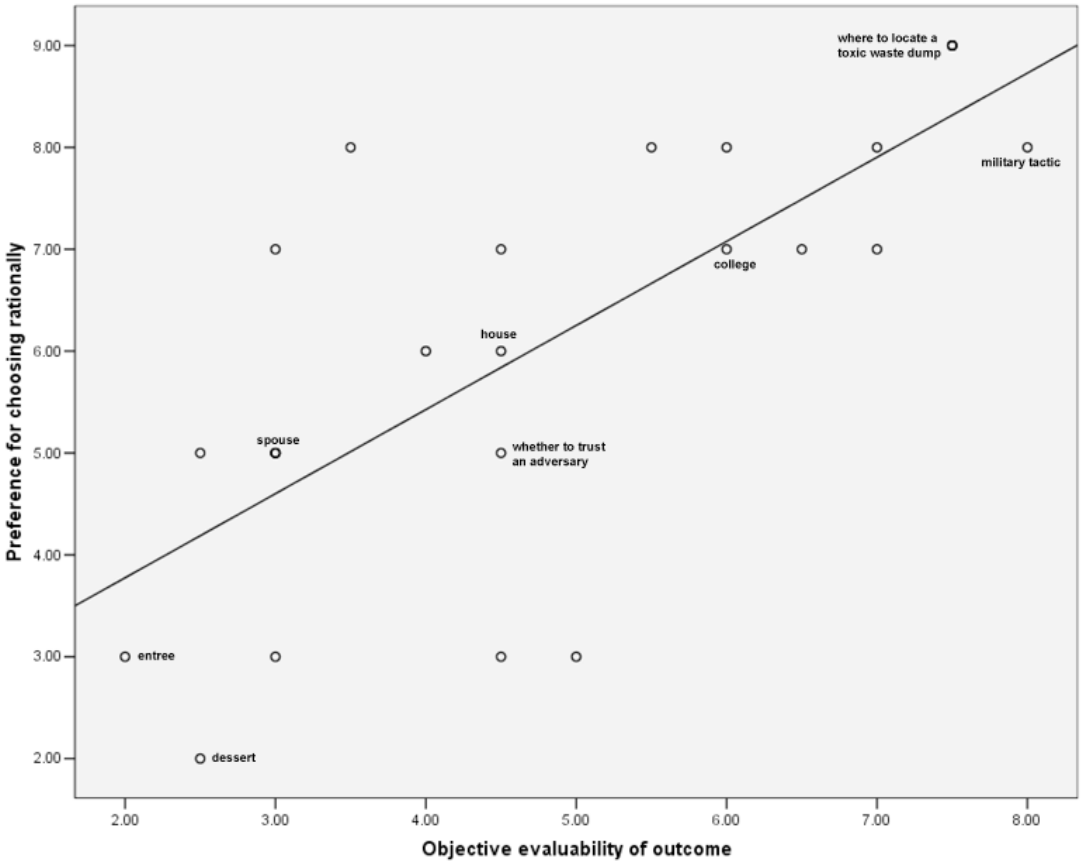

Figure 1. Scatterplot of data from Study 1 with regression line fitted.

I tried to include choice dilemmas that varied orthogonally in importance and objective evaluability. However, to the extent that I did not succeed in doing so, it is possible that the correlation between objective evaluability and a preference for choosing rationally is simply the result of the more important choices being seen as

both more objectively evaluable and more apt to be resolved on the basis of rational analysis. To test this alternative explanation, I asked an additional group of 20 respondents to rank the 25 choices from most to least important. I then reverse-scored these rankings, so that higher numbers indicated more important choices, and computed a median importance ranking for each choice. Although importance was significantly correlated with a preference for choosing rationally, $r(25) = .41$, $p < .05$, controlling for importance left the association between objectively evaluable outcomes and a preference for rational choosing virtually unchanged, $r(22) = .71$, $p < .001$.

Discussion

The results strongly support the strategy cueing hypothesis: the more a choice was seen as objectively evaluable, the more a rational approach was seen as the appropriate choice strategy. Thus, the match between a feature of the choice (objective evaluability) and a feature of rational thought (the application of normative criteria) cued rationality. Similarly, a match between subjective choice outcomes and the idiosyncratic, subjective nature of intuitive thought cued intuition.

Study 2a: The Complexity of the Choice Options

Rational thought is experienced as relatively effortful, whereas intuitive thought is experienced as relatively effortless or automatic. Thus, attributes of a choice that suggest effort or difficulty should cue rationality, whereas features that suggest ease should cue intuition. For example, presenting text in a font that is difficult to read prompts people to process that text more effortfully and rationally (Alter, Oppenheimer, Epley, & Eyre, 2007). Another attribute that suggests effort is *complexity*: More complex choices should be seen as more demanding of effort, and hence of more rational analysis, while simpler choices should be seen as more amenable to intuition.

Dijksterhuis and colleagues have presented evidence that what they refer to as "nonconsious" thought results in better decision making than conscious thought when the decisions involve choosing between highly complex, multi-attribute alternatives (Dijksterhuis et al., 2006). Thus, the cueing hypothesis leads to the prediction that people's intuitions about when to choose on the basis of intuition or reason (when the alternatives are complex, it's best to choose rationally) is precisely the opposite of what the most pertinent evidence on the subject might suggest (i.e., that when the alternatives are complex, it's best to choose intuitively).

Method

To test this variant of the cueing hypothesis, I used a list of 40 consumer products, developed by Dijksterhuis et al. (2006), as my choice objects. These items were designed to vary in both price and complexity. Djiksterhuis et al. calculated a complexity score for each product by asking respondents how many aspects of the product they would take into account when making a purchase decision. Objects ranged from quite complex (e.g. "computer," "car") to moderately complex (e.g. "curtains," "dress") to relatively simple (e.g. "brush," "toothpaste").

I showed 25 Cornell students who were recruited on campus the same brief description of rational and intuitive decisions used in Study 1 and then asked them to rate each product for how much they thought "the choice of what to buy should be based on intuition versus reason" using the same nine-point scale as before. I then used these ratings to compute the median preference for choosing rationally for each product.

Results

As in Study 1, there was considerable variability across choice items in the extent to which participants thought it best to choose on the basis of intuition versus reason. The median preference-for-rationality scores varied from a low of 3 ("book")

to a high of 8 (“car,” “cell phone,” “computer,” and “plane ticket”). Overall, there was a preference for choosing on the basis of reason over intuition, reflected in an overall mean across the 40 product items of 5.9, significantly above the scale midpoint of 5, $t(39) = 4.32$, $p < .0001$, $d = 1.38$.

Also consistent with Study 1, there was considerable support for the matching hypothesis. Product complexity (as reported by Djiksterhuis et al., 2006) correlated significantly with a preference for choosing on the basis of a rational analysis over intuition, $r(40) = .46$, $p < .01$ (see Figure 2). To examine the artifactual explanation that more expensive products were seen both as more complex and more demanding of rational choice, I asked 21 volunteer participants to indicate what they thought the typical price of each product was. I then computed the median perceived price for each item. Although perceived complexity was positively correlated with perceived price, $r(40) = .40$, $p = .01$, the relationship between product complexity and preference for choosing rationally remained significant when controlling for perceived price, $r(37) = .39$, $p < .05$.

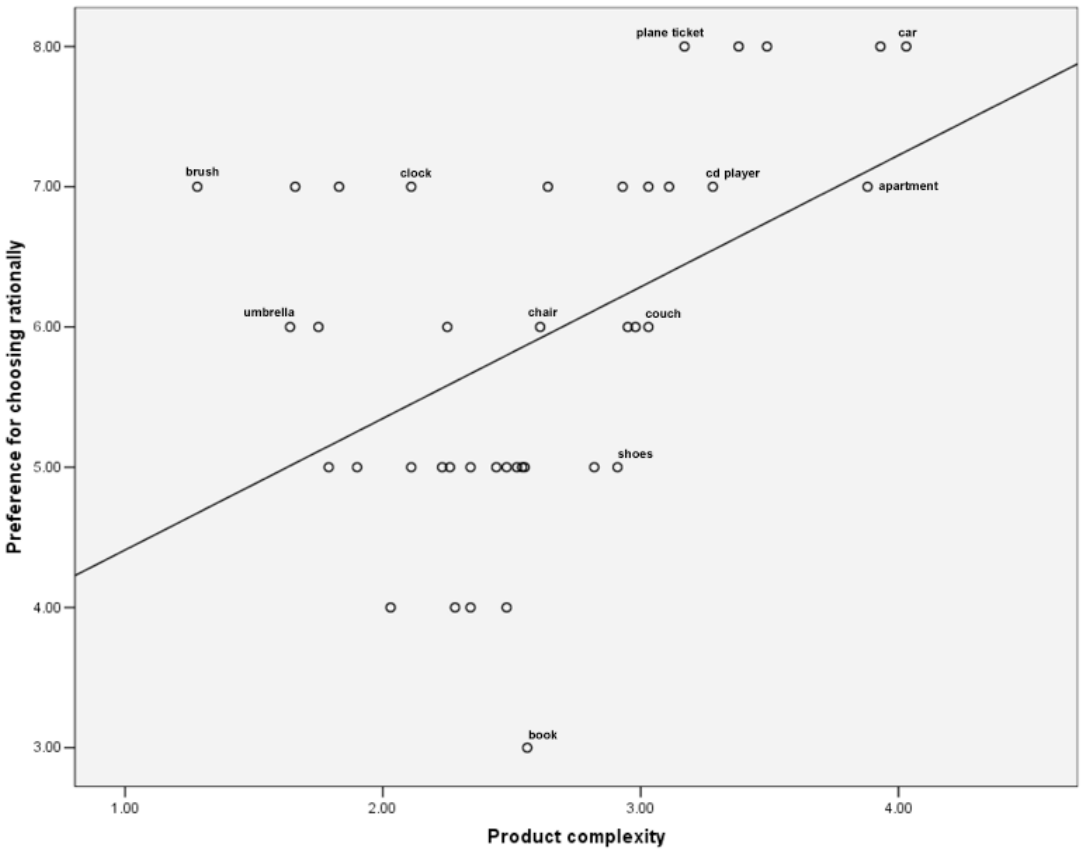

Figure 2. Scatterplot of data from Study 2a with regression line fitted.

Discussion

Again, the results provide strong support for the strategy cueing hypothesis. More complex products produced a preference for choosing rationally, whereas simpler products were associated with an increased preference for choosing intuitively. This relationship held when controlling for the perceived price of the choice objects, a possible confound. Once again, features of the task (in this case, complexity) were matched to features of rational vs. intuitive thought (in this case, effort), cueing an increased preference for rationality when complexity was high. Interestingly, this intuition on the part of our participants runs exactly counter to the position advocated by Djiksterhuis et al. (2006), who argued that when choices are complex, intuition produces better choices than does rational analysis.

Study 2b: The Complexity of the Choice Options Revisited

Study 2a demonstrated that across 40 different choices, more complex choices cued a preference for rationality, whereas simpler choices cued a preference for intuition. Although this design had the desirable feature of allowing me to examine whether cueing occurs across a variety of choices, it also had two shortcomings: first, because all the choices were hypothetical, it is possible that cueing produced a stated preference for rationality or intuition but would not affect actual choices. Second, because I used choice as the unit of analysis, it was not possible to examine whether individual differences in preferences for intuition or rationality moderate the cueing effect. I sought to address both these shortcomings in the current study.

For the choice task, I turned to the ratio-bias paradigm developed by Denes-Raj and Epstein (1994). In this paradigm, which I briefly described in the introduction, participants choose to draw a random token from one of two bowls, both of which are labeled with the probability of a winning token being drawn. One bowl contains a higher percentage of winning tokens, while the other contains a higher absolute number of winners. Thus, this task pits the intuition that the bowl with more winners is better against the rational analysis that one should choose the bowl with the better statistical odds. The intuitive preference for the bowl with more winners can be quite strong—Denes-Raj and Epstein reported that 23% of participants chose to draw from a bowl with 5 winners and 95 losers over a bowl with one winner and nine losers. In other words, nearly a quarter of these participants passed up the bowl that would have doubled their chances of winning.

I adapted the ratio-bias task to create both a simple and complex version. In the simple version, participants chose one of two bowls, as in Denes-Raj and Epstein (1994). In the complex version, participants chose between two sets of three bowls each, with the bowl used for the drawing selected randomly from the chosen set (the

composition of each set will be explained below). Thus participants had to consider six bowls instead of two when making their choices, and further had to consider that any one of the bowls in the set they chose might be used for the drawing.

The design of this study also allowed me to examine individual differences as a potential moderator of the cueing effect. In particular, Epstein and colleagues (Epstein, Lipson, Holstein, & Huh, 1992; Epstein, Pacini, Denes-Raj, & Heier, 1996; Pacini & Epstein, 1999) have argued that people differ in the extent to which they prefer to process rationally and intuitively. The Rational-Experiential Inventory (REI; Epstein, Pacini, Denes-Raj, & Heier, 1996; Pacini & Epstein, 1999) measures these chronic inclinations. It consists of two subscales, one assessing rationality and one assessing experientiality (this subscale is also called *Faith in Intuition*, or *FI*). Theoretically, rationality and experientiality are thought to be orthogonal (Pacini & Epstein, 1999), and the two subscales are usually not significantly correlated. This implies a number of possible hypotheses regarding the moderation of task cues by rationality and experientiality. Those participants who are especially inclined to process rationally might choose the statistically superior bowl (or set) regardless of presentation format, leading to an interaction between rationality and condition, such that the effects of condition would be stronger for those lower in rationality. Similarly, those participants who are especially inclined to process intuitively—those who show high faith in intuition—might choose the bowl (or set of bowls) with more winners regardless of complexity, due to their especially strong intuitive inclination towards those bowls. This would lead to an interaction between FI and condition, such that the effects of condition would be stronger for those lower in FI. Or both interactions might occur simultaneously. Given the number of potential kinds of moderation that might occur, I tested main effects and interactions involving both faith in intuition and rationality.

Method

Seventy Cornell undergraduates (45 female) participated in exchange for the opportunity to win up to $8 (some also received course extra credit for their participation). Participants were told that they would be playing two different gambles during the study, which would be explained in turn. After each gamble was explained, participants would decide how to play. Finally, after decisions for both gambles had been made, both gambles would be played.

The experimenter first explained that for each drawing, she would randomly draw a marble from one of two bowls, each of which contained both red and clear marbles. If a red marble was drawn, the participant would win $4, but if a clear marble was drawn, the participant would win no money for that drawing. Participants were then presented with either the *simple* or *complex* lottery.

In the simple lottery, participants were shown two bowls: One contained nine winning marbles and 91 losing marbles, while the other contained one winning marble and nine losing marbles. Thus, the larger bowl contained more winning marbles but was statistically inferior to the smaller bowl, which had a higher probability of a winning marble being drawn (10% vs. 9%). The experimenter explained that the larger bowl contained 100 marbles total, that the smaller contained ten, and that the number of winning marbles in each bowl was indicated on a label placed in front of it. The participant's task was to choose which bowl should be used for the drawing. Participants were asked to choose a bowl before moving on to the next lottery.

In the complex lottery, participants were shown two sets of three bowls. All bowls in the first set contained 10 marbles, but the bowls differed in how many winners they contained: the first bowl contained a single winner, the second two winners, and the last three. In the second set, all bowls contained 100 marbles, but the bowls again differed in how many winners they contained: the first bowl contained

nine winners, the second 19, and the last 29.[1] Thus, the second set contained more winning marbles but a lower average probability of a winning marble being drawn (19% vs. 20%). The experimenter explained that each bowl in the first set contained 10 marbles, each bowl in the second set contained 100, and that the number of winning marbles in each bowl was indicated on a label placed in front of it. The participant's task was to choose one of the two sets, following which the experimenter would roll a die to determine which of the three bowls in that set to use for the drawing. Participants were then asked to choose their set before continuing.

Every participant encountered both the simple and complex drawing, in counterbalanced order. After participants had made a choice for each drawing, the experimenter performed both drawings, rolling a die to determine which bowl of the chosen set to draw from for the complex lottery. Participants were paid $4 for each winning marble drawn. Participants who were participating for money only (i.e., they were not receiving course extra credit) received a $3 consolation prize if they did not win either drawing.

Participants then completed a few short filler questionnaires, followed by the 24-item short form of the REI (REI-S; Norris & Epstein, 2003). They were then thanked, debriefed, and dismissed.

Results

Neither gender nor whether participants received extra credit affected responses, and so all analyses collapse across these factors.

[1] Initially, the large bowls contained 8 winners in the simple case, and 8, 18, and 28 winners in the complex case. After 28 subjects, this was increased to 9 winners in the simple case, and 9, 19, and 29 winners in the complex case. I controlled for the number of winners in all analyses, and though there was a main effect of number of winners on choices (as would be expected) there were no interactions involving this factor.

REI. I computed participants' faith in intuition by combining the 12 items comprising the FI subscale ($\alpha = .86$), and computed rationality scores by combining the 12 rationality subscale items ($\alpha = .82$).

Between-subjects analysis. For the purposes of between-subjects analysis, I split the sample into those who encountered the simple drawing first (N = 36) and those who encountered the complex drawing first (N = 34). I then examined choices for the first drawing. This analysis is equivalent to a between-subjects design with type of drawing varied between participants. To examine the full spectrum of possible hypotheses involving individual differences in faith in intuition and rationality, I first fit a logistic regression model with choice as the dependent variable and type of drawing, faith in intuition, rationality, and all higher-order (i.e. two-way and three-way) interactions as predictors to the data. No main effects or interactions involving rationality emerged (all *p*s > .20), but there were significant effects of type of drawing, likelihood-ratio $\chi^2 = 4.20$, $p = .04$, and of the interaction of type of drawing and faith in intuition, likelihood-ratio $\chi^2 = 8.46$, $p = .004$. Therefore, I simplified the model, dropping rationality as a predictor (and dropping the interaction terms involving rationality as well). The simplified model regressed choices on type of drawing, faith in intuition, and their interaction. This analysis revealed a main effect of type of drawing: significantly more participants chose the statistically superior but intuitively less appealing 10-marble bowl when the drawing was complex (82%) than when it was simple (64%), likelihood-ratio $\chi^2 = 3.87$, $p < .05$. This main effect was qualified by a significant interaction with faith in intuition, likelihood-ratio $\chi^2 = 7.55$, $p < .01$. Simple slopes analyses (Aiken & West, 1991) revealed that at one standard deviation above the mean of faith in intuition, the type of drawing did not affect choices, B = .799, Wald $\chi^2 = .79$, $p = .38$. At one standard deviation below the mean of faith in intuition, the type of drawing significantly affected choices, B = -3.302, Wald $\chi^2 =$

7.009, p =.008. In other words, participants with low faith in intuition were influenced by the type of drawing, while those with high faith in intuition were not (see Figure 3).

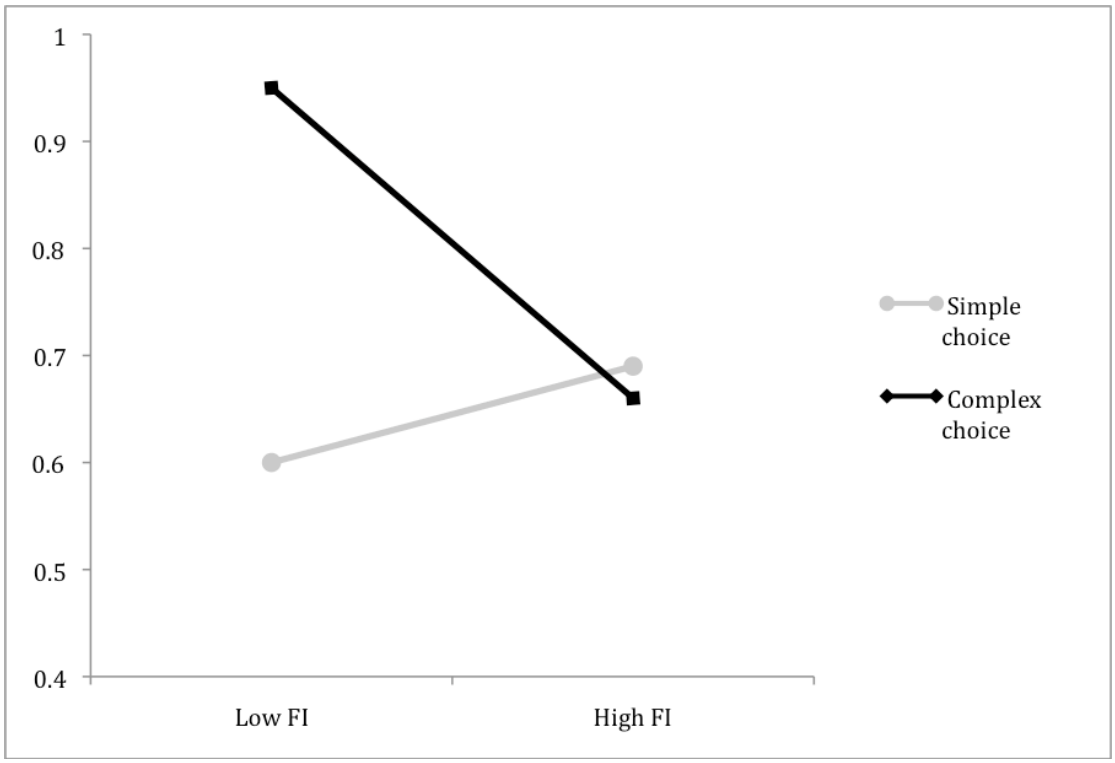

Figure 3. Probability of choosing the statistically superior bowl, by type of choice and faith in intuition. Values are predicted at +/- 1 SD of faith in intuition.

Within-subjects analysis. Most participants (71%) did not switch strategies between the first drawing and the second. Participants who chose the 10-marble bowl (or set of bowls) for the first drawing tended to choose the 10-marble bowl for the second, and the same was true of the 100-marble bowl. Thus, it appears that participants' initial choices served as the default for the subsequent choice. However, I examined the choices of those participants who did switch for consistency with my hypothesis. When participants chose the intuitively more appealing 100-marble bowl for the simple drawing and the statistically superior 10-marble bowl for the complex drawing, I coded them as hypothesis-consistent; when their choices followed the

opposite pattern, I coded them as hypothesis-inconsistent. Of the 20 switchers, 65% (13) were hypothesis-consistent, a result that, due to the small number of switchers overall, was not statistically significant, $\chi^2 = 1.80$, $p = .18$.

Discussion

In this study, real choices with monetary incentives showed a cueing effect parallel to that shown in Study 2a: More complex choices cued rationality, leading participants to show a heightened preference for the statistically superior but intuitively less appealing option. This supports the contention that strategy cueing is effective at guiding actual behavior in addition to influencing the perceived appropriateness of rational or intuitive decision strategies for hypothetical choices.

This study also uncovered an individual difference in responsiveness to cueing: The complexity of the choice cued those low in faith in intuition, but not those high in faith in intuition, to choose rationally. I did not have a strong a priori prediction regarding the interaction between faith in intuition, rationality, and choice complexity. However, one explanation for the current results is that high faith in intuition might lead one to disregard cues that suggest rational processing. That is, those individuals who put a great deal of stock in their intuitions might be quite reluctant to depart from them, even when task cues suggest that rational analysis should be favored. I will return to this possibility in the next study.

In varying complexity, I necessarily also changed certain other aspects of the choice problem, so it is important to consider whether any of these changes might have artifactually produced the observed effects. First, the complex choice set contained a higher total number of winners than did the simple set, but if anything, this should have produced the opposite of the effects observed here, as the additional winners were disproportionately added to the statistically inferior bowls. In the simple choice set, the statistically superior bowl had 8 fewer winners than did the inferior

bowl, whereas in the complex choice set the statistically inferior set had 51 fewer winners than did the superior set. Thus, basing one's choices only on the number of winners would have led to a much stronger preference for intuition in the complex condition.

Secondly, the complex choice involved a chance event (the roll of a die). However, it is unlikely that this would have led to the results obtained because there is no reason to think that the roll of a die would cue rationality. If anything, the idea of chance or luck might be expected to cue intuition. Finally, for the complex choice two bowls in the statistically superior set contained more than one winner, whereas for the simple choice the statistically superior bowl contained only one winner. One might argue that if people were differentiating the bowls based on an extremely crude "one winner vs. more than one winner" distinction, adding more winners to the statistically superior bowls might have artificially increased their attractiveness. However, a) there is no evidence to support the contention that this kind of "one vs. more than one" distinction underlies the ratio-bias phenomenon; and b) even if this distinction *was* important, this kind of intuitive heuristic should be especially prominent among those with high faith in intuition, when in fact those with higher faith in intuition were less affected by the complexity manipulation.

Study 3: Choice Importance

Another prediction that follows from the observation that rational processing of information is more effortful than intuitive processing is that rational analysis should be seen as especially suited to decisions where the stakes are high. If people believe that the effort exerted when making a choice should be proportional to its importance—that, in other words, important choices deserve great effort—important choices, due to their association with effort, should cue rationality in the same way complex choices do. Conversely, unimportant choices should be associated with ease

and should therefore cue intuitive thinking. Thus, people may be comfortable resolving relatively trivial decisions by going with their intuitions but may be more inclined, *ceteris paribus*, to resolve important decisions by adhering to rational analysis. I found some evidence to support this idea in Study 1: ratings of the importance of the various choice dilemmas were positively correlated with a preference for choosing rationally. In this study, I sought to replicate and extend this finding in two ways. First, rather than assessing the effect of choice importance indirectly by correlating ratings of importance with preferences for choosing rationally, I manipulated the importance of the choice directly.

Second, I wished to replicate the interaction between cueing and faith in intuition that I observed in Study 2b in a different context. Recall that in Study 2b, faith in intuition moderated the effect of task cues on choice strategy—those high in faith in intuition were not affected by a task cue (complexity) that suggested that rational analysis was called for. Similarly, those high in faith in intuition might ignore choice importance and continue to rely on intuitive responses, even when the stakes are high. Thus, I expected faith in intuition to be associated with a preference for an intuitive decision strategy and with a reluctance to change this strategy even when the choice was important.

Method

Participants were 51 Cornell undergraduates who completed the questionnaire as part of their participation in a larger, unrelated study. Two participants failed to complete the questionnaire, leaving 49 respondents (32 female). Of these, 25 were randomly assigned to the *important* choice condition and the rest to the *unimportant* choice condition. Participants first completed the 24-item short form of the rational-experiential inventory (REI-S; Norris & Epstein, 2003). They then turned the page to read a brief description of rational and intuitive decision-making, which stated that

some decisions are made "mainly on the basis of 'reason,' or rational analysis," whereas others are made "mainly on the basis of 'intuition,' or by consulting one's 'gut.'" Half of the participants were then asked to consider decisions that are relatively *unimportant*—decisions described as having "minor consequences" and invoking relatively little concern about choosing the right option. The remaining participants were asked to consider decisions that are relatively *important*—decisions described as having "major consequences" and invoking a great deal of concern about choosing the right option. All participants were then asked, "For an unimportant [important] choice, what do you think is the best way to choose?" Response options were "Based on intuition (your gut feeling)" and "Based on reason (your rational analysis)."

Results

Participants' responses yielded clear support for the cueing hypothesis. In the *unimportant choice* condition, 83% of participants thought it best to choose intuitively, whereas in the *important choice* condition, only 24% of participants thought it best to choose intuitively. This difference was significant, $\chi^2 = 17.31$, $p < .001$, Cramer's $V = .59$.

REI. I computed rationality scores by combining the 12 rationality subscale items ($\alpha = .88$) of the REI-S, and computed faith in intuition by combining the 12 items comprising the experientiality subscale ($\alpha = .84$). I tested the effect of rationality scores on choices using a logistic regression in which I regressed participants' responses on rationality scores, experimental condition, and their interaction. This analysis showed a main effect of rationality: Unsurprisingly, participants who reported higher rationality were more likely to prefer to choose rationally, likelihood-ratio $\chi^2 = 11.20$, $p = .0008$. There was no interaction between rationality and experimental condition, likelihood-ratio $\chi^2 = 2.76$, $p = .10$.

I next tested the effect of faith in intuition using a logistic regression in which I regressed participants' responses on faith in intuition, experimental condition, and their interaction. This analysis showed no main effect of faith in intuition, likelihood-ratio $\chi^2 = .64$, *ns*, but revealed an interaction between faith in intuition and experimental condition, likelihood-ratio $\chi^2 = 4.29$, $p < .05$, $\Delta R^2 = .06$. Simple slopes analyses (Aiken & West, 1991) revealed that at one standard deviation above the mean of faith in intuition, choice importance did not affect choice strategy, B = 1.25, Wald $\chi^2 = 1.69$, $p = .19$. At one standard deviation below the mean of faith in intuition, important choices cued a preference for rationality, B = 4.91, Wald $\chi^2 = 8.70$, $p = .003$. In other words, participants with low faith in intuition showed a preference for rationality over intuition when the choice was described as important, while those with high faith in intuition were more likely to maintain their preference for choosing intuitively even when the choice was described as important (see Figure 4).

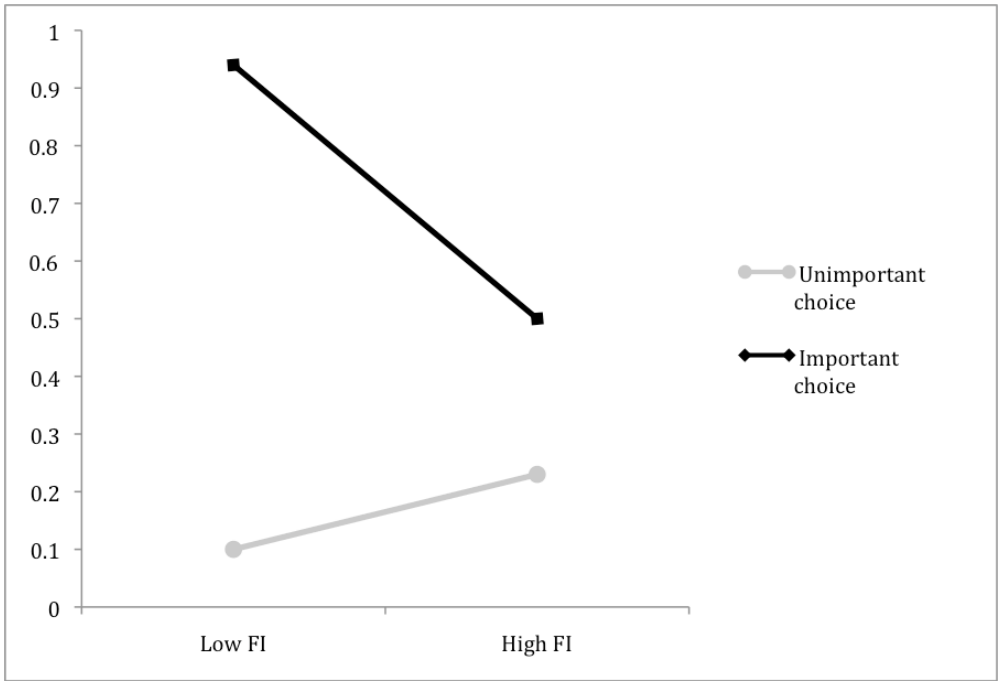

Figure 4. Preference for choosing rationally, by type of choice and faith in intuition. Values are predicted at +/- 1 SD of faith in intuition.

Discussion

Again, the results provide strong support for the cueing hypothesis. Replicating the results of Study 1, important choices were seen as more demanding of rational analysis. Unimportant choices, however, were seen as more appropriate for intuition by the overwhelming majority of participants.

The interaction between faith in intuition and cueing observed in Study 2b was replicated in the current study. As in Study 2b, those low in faith in intuition responded strongly to cues suggesting greater rational processing, while those high in faith in intuition did not. It appears that faith in intuition is associated with a resistance to task cues that suggest rational processing. In other words, those who trust their intuitions are unlikely to abandon them, even when choices are complex (Study 2b) or important (Study 3).

CHAPTER THREE:

STATE CUES

The previous chapter examined features of a task that might cue intuitive or rational thought. In this chapter, I examine a different class of cues: those arising from within, from one's mental or emotional state. Just as features of a task can be matched to features of intuitive or rational thought, features of one's ongoing subjective experience can similarly be matched to the features of intuition or reason. And just as people look to features of the task for cues suggesting how to proceed, they might similarly look to features of their mental states. For example, Alter and colleagues have shown that experiencing a feeling of cognitive disfluency or difficulty induces people to think more rationally across a variety of situations (Alter, Oppenheimer, Epley, & Eyre, 2007). The authors argue that people see feelings of disfluency as a cue that more in-depth processing is necessary, and that people respond to this cue by processing more rationally.

Another kind of mental state that might well cue rationality is that of carefulness or caution. Those in a careful mindset might find rational thought appealing for at least two reasons: First, rational thought is slower than intuitive thought, and making a decision slowly and deliberately should be especially attractive to those inclined to be careful. Second, rational thought's reliance on explicit rules means that the process leading to a rationally based decision can be precisely verbalized, retraced, and verified. In contrast, intuition's reliance on associations and feelings means that the process leading to an intuitive decision is much more opaque—intuitions arise in the mind without much insight into what produced them. The transparency of the process by which one arrives at a rational conclusion should, again, be especially appealing to those in a careful or cautious mindset, who may be inclined to re-check the steps by which they arrived at a decision.

If a mental state of carefulness cues rational processing, while a more lax mental state cues intuition, a variety of means of producing a careful mindset should lead to an enhanced preference for rational thought: The possibility that one will have to justify one's actions (Study 4), the prospect of a loss (Study 5), or a negative mood (Study 6), have all been shown to produce a mental state characterized by carefulness or caution, and thus are predicted to cue rationality.

Another type of mental state cue that may prove to be important is related to how vividly or abstractly one pictures a choice. Intuitive thought is often accompanied by vivid, concrete images, whereas rational thought is characterized by abstraction and generality. It is possible that the fact that intuitive and rational thought tend to be accompanied by different types of mental content might lead to a generalized association which also functions in the reverse direction: People may be cued to think intuitively by picturing a choice vividly and concretely; while picturing a choice abstractly may cue rational analysis. I test this hypothesis in Study 7.

One final kind of state cue that may be important is related to the subjective opacity of the processes that give rise to intuitions. Without a clear way to examine the basis of an intuitive preference, people may look to their current mental states and examine features of the intuitive preference itself to determine its validity. One diagnostic feature of an intuition may be its durability: An intuitive preference that is equally strong at time 1 and time 2 may be seen as more valid than one that exists only at a single point in time. An intuition's persistence across time, in other words, may be seen as a cue to its reliability. In the case of rational analysis, persistence over time should have no effect on perceived validity, as the validity of reason depends on information that is equally available at time 1 and time 2. Therefore, a conflict between intuition and reason that is persistent over time should lead to a greater preference for intuition. I examine this possibility in Study 8.

Study 4: Accountability

Accountability—the expectation that one will need to justify how one made a decision or arrived at a conclusion—has been shown to lead to a mindset of greater carefulness in a wide variety of domains. People who expect to be accountable for their actions and judgments are less likely to apply simple heuristics and are more likely to engage in an effortful search for information and to scrutinize their own thinking (Lerner & Tetlock, 1999; Tetlock, 1992). If a careful mindset is matched to the careful nature of rational thought, then accountability should cue a preference for rational analysis over intuition. To test this hypothesis, I created two descriptions of a choice involving a conflict between intuition and reason. In both, participants were asked to imagine that they were deciding which of two cars to rent, and that one car seemed rationally superior, while the other seemed intuitively more appealing. In the accountability version of this scenario, participants were asked to imagine that they were renting the car on behalf of a superior, while in the control version they were asked to imagine renting the car for themselves.

Method

Participants were 48 Cornell undergraduates (22 female) who completed the questionnaire either after being approached on campus or as part of their participation in a variety of unrelated studies. Participants were randomly assigned to the *accountability* condition (N = 24) or the *no accountability* condition (N = 24).

In both conditions, participants were asked to imagine that they were choosing between two rental cars, and that a rational analysis involving "writing down a list of explicit plusses and minuses of each possibility, and rationally weighing the importance of each good thing and each bad thing" had led them to prefer one car, but that they nonetheless had a "gut feeling" that the other car would be better. They were then asked to indicate to indicate whether they would choose to "go with your rational

calculus (and ignore your gut feeling)," or to "go with your gut feeling (and ignore your rational calculus)."

In the *accountability* condition, participants were asked to imagine that they were renting the car on behalf of the president of the company at which they worked, who would ask for an explanation of "what car you ordered and how you made your choice." In the *no accountability* condition, participants were asked to imagine that they were renting the car for a personal vacation.

Results

Participants' responses showed a strong cueing effect: in the no accountability condition, a majority of participants (58%) favored their intuitive feeling over their rational analysis. In the accountability condition, a much smaller fraction (29%) favored their intuitions. This difference was significant, $\chi^2 = 4.15$, $p = .04$, Cramer's $V = .31$.

Discussion

The prospect of having to justify one's choice—even hypothetically—led to a preference for rationality. Previous research has shown that accountability leads to more thorough, careful processing (for reviews, see Lerner & Tetlock, 1999; Tetlock, 1992). In this study, participants were not actually asked to examine any information about the two possible cars, so the preference for choosing rationally in the high accountability group cannot be the result of greater or more careful information processing by these participants. Rather, the current results show that the careful mindset produced by accountability cues a preference for rationality, even when *amount* of processing is held constant.

However, there are other features of accountability that might produce a preference for rationality. For example, one might argue that rationality's basis in explicit rules might motivate the use of rational thought when accountability is high,

as being able to explain the criteria one used to make a choice is likely to be seen as more desirable when one might be called to account. I am not able to rule out the possibility that this kind of mechanism contributes to the results of the current study. Therefore, Studies 5 and 6 induce a cautious mindset in two different ways, neither of which is susceptible to this alternative explanation.

Study 5: Losses versus Gains

Negative information generally elicits more careful, deliberate processing than positive information: negative feedback (Wofford & Goodwin, 1990), negative framing (Dunegan, 1993), and descriptions of losses as opposed to gains (Chatterjee, Heath, Milberg, & France, 2000) have all been shown to lead to more careful processing. Therefore, if a more careful mental state cues rationality while a more lax mental state cues intuition, people may prefer to decide on the basis of reason when choosing between losses and prefer to decide on the basis of intuition when choosing between gains. To examine this possibility, I created a scenario involving the prospect of a loss or a gain in which there was a conflict between rational and intuitive preferences. I predicted that participants would be more inclined to decide rationally when the scenario involved the prospect of a loss.

Method

Fifty-seven Cornell students (30 female) completed the questionnaire as part of their participation in a longer, unrelated study. Of these, 28 were randomly assigned to the gain condition and 29 were randomly assigned to the loss condition.

Participants read a scenario in which they were asked to imagine that they had invested $5000 in a stock that had either appreciated (*gain* condition) or declined (*loss* condition) in value. They were further asked to imagine that they had to decide whether to sell the stock and realize the gain or the loss, and that a rational analysis, which involved listing "explicit plusses and minuses of both options" and weighing

"the importance of each good thing and each bad thing" conflicted with their "gut feeling" about whether it would be better to sell or keep the stock. Importantly, the questionnaire did not specify whether the intuitive preference was to sell or keep the stock, only that it conflicted with a rational analysis. Participants were then asked whether they would go with their rational calculus (and against their gut feeling) or with their gut feeling (and against their rational calculus).

Results

Preliminary analyses revealed that women were more likely than men to favor their intuitive preferences, and so we tested the effect of gain or loss condition in a logistic regression which also included gender and the interaction of gender and condition as covariates. Gender remained a significant predictor of responses in this analysis, likelihood-ratio $\chi^2 = 6.54$, $p < .02$, but there was no interaction between gender and condition, likelihood-ratio $\chi^2 = 2.46$, *ns*.

Of primary theoretical interest, there was a notable cueing effect: consistent with the prediction that a mental state of carefulness and caution cues a preference for rationality, participants in the loss condition were more likely to honor their rational analysis over their intuitive preference, whereas participants in the gain condition exhibited no such preference. In the loss condition, 72% of participants said that they would choose on the basis of the rational analysis, whereas in the gain condition only 50% gave the same response, likelihood-ratio $\chi^2 = 3.91$, $p < .05$, $\Delta R^2 = .05$.

Discussion

When considering losses—a mental state known to be associated with careful, deliberate processing—participants were more inclined towards rationality than when considering gains. As in Study 4, a mindset of carefulness cued a preference for rationality. However, both of these studies asked participants for their responses to hypothetical situations, leaving open the possibility that state cueing only affects

people's intentions of how to make a choice while exerting no effect on their actual choices. The next study addresses this problem by asking participants to make an actual choice with real financial stakes.

Study 6: Negative versus Positive Affective States

In a wide variety of domains, people experiencing negative moods have been found to process information more thoroughly and carefully than those in positive moods (for reviews, see Fiedler, 1988; Forgas, 1995; Schwarz, 1998; Schwarz & Bless, 1991; Schwarz, Bless, & Bohner, 1991). For example, those in positive moods are more likely—and those in negative moods are less likely—to employ stereotypes (Bodenhausen, Kramer, & Susser, 1994; Bodenhausen, Sheppard, & Kramer, 1994). Those in negative moods are more likely to evaluate arguments based on their quality, while those in positive moods are more likely to rely on peripheral cues such as the communicator's prestige (Bless, Bohner, Schwarz, & Strack, 1990; Bless, Mackie, & Schwarz, 1992; Mackie & Worth, 1989; Worth & Mackie, 1987). Similarly, those in positive moods are more likely to employ a variety of other heuristic shortcuts (Isen, 1987; Isen, Means, Patrick, & Nowicki, 1982). As Schwarz and Bless (1991, p. 56) put it, "positive moods are likely to elicit a processing strategy…that is characterized by a lack of logical consistency and little attention to detail," while "negative moods are likely to elicit an analytical mode of information processing that is characterized by considerable attention to detail, careful, step-by-step analysis of the available information, and a high degree of logical consistency."

Many researchers believe that people in negative moods process more carefully due to the information about the environment conveyed by negative and positive mood states. According to this hypothesis, positive moods signal that all is well in the environment and that careful processing is not required. Negative moods, in contrast, signal that something is amiss, and that careful processing is called for in

order to identify and rectify the problem (Schwarz, 1990; Schwarz & Bless, 1991; Schwarz & Clore, 1983).

If negative moods do engender a more careful mindset, negative moods should cue rationality in the same way that accountability and the prospect of a loss do. In order to test this idea, I again turned to the ratio-bias task used in Study 2b (Denes-Raj & Epstein, 1994). Participants chose to draw from one of two bowls: an intuitively more appealing bowl that contained 9 winning marbles out of 100, and a statistically superior bowl that contained 1 winning marble out of 10. Participants were assigned either to a positive mood or a negative mood condition, and I predicted that those in the negative mood condition would be more likely to choose the statistically superior bowl.

Method

Forty-four Cornell undergraduates (33 female) participated in exchange for the opportunity to win $5 (some also received course extra credit for their participation). Of these, half were randomly assigned to the happy condition and half were assigned to the sad condition. As participants entered the lab room, they heard classical music playing at a comfortable volume. In the happy condition the music consisted of approximately three-minute excerpts of Antonio Vivaldi's *La Primavera* (Spring), from *The Four Seasons*, and of Hugo Alfven's *Midsommarvaka*. In the sad condition, the music consisted of excerpts from Tomaso Albinoni's *Adagio* in G minor and Samuel Barber's *Adagio* for Strings. These excerpts have been shown to induce happiness and sadness, respectively (Krumhansl, 1997). The music played in the background for the duration of the experiment, repeating as necessary.

Participants were told that the study concerned the effects of music on decision-making, and were asked to spend three minutes listening to the music, focusing on how it made them feel and on the thoughts and emotions that it evoked.

During this time, the experimenter exited the lab room, leaving the participant alone. After three minutes had elapsed, the experimenter re-entered the lab room and explained the rules of the game: participants were to choose between two bowls, one containing a single winning marble and nine losing marbles, the other containing nine winning marbles and ninety-one losing marbles. The participants were shown both bowls, which were clearly labeled with the number of winners and losers they contained. The experimenter explained that she would randomly draw a marble from the bowl chosen by the participant, and that if a winning marble were drawn, the participant would win $5. If a losing marble were drawn, the participant would win nothing. Participants completed a brief questionnaire to ensure that they understood the rules, then made their choices. The experimenter randomly drew a marble from the chosen bowl, and paid the participant $5 if a winning marble was drawn. At this point, participants who did not win the drawing and were not receiving extra credit (i.e., they were participating only for money) received a $2 consolation prize.

Participants next completed a mood scale which asked them to rate how much they were feeling each of 18 emotions "right now" on a 9-point scale anchored by "not at all/none" and "extremely/a great deal." The mood scale was followed by one or more unrelated filler questionnaires. Participants were then probed for suspicion, debriefed, thanked, and dismissed.

Results

During the suspicion probe, one participant articulated the hypothesis of the study. This participant is excluded from analysis. Neither gender nor whether participants received extra credit affected participants' responses, and so all analyses collapse across these factors.

Manipulation check. The mood scale contained four emotion terms relevant to our hypotheses: "happiness," "joy," "sadness," and "unhappiness." Ratings of

happiness and joy were highly correlated ($r = .64$, $p < .001$) and were combined into a composite measure of happiness. Similarly, ratings of sadness and unhappiness were highly correlated ($r = .78$, $p < .0001$) and were combined into a composite measure of sadness. The two composites were modestly negatively correlated with each other, $r = -.29$, $p = .06$.

Participants in the happy condition rated themselves as happier ($M = 4.45$) than did participants in the sad condition ($M = 3.45$), $t(41) = 2.03$, $p < .05$, $d = .63$. Participants in the sad condition rated themselves as sadder ($M = 1.98$) than did participants in the happy condition ($M = .80$), $t(41) = 2.27$, $p < .03$, $d = .71$. Thus, the manipulation successfully induced the desired emotions.[2]

Choices. Fifty-nine percent of happy participants chose to draw from the intuitively more appealing, but statistically inferior, 100-marble jar. Among sad participants, only 24% chose the 100-marble jar. This difference was statistically significant, $\chi^2 = 5.50$, $p < .02$. Across both conditions, higher composite sadness scores predicted a greater likelihood of choosing the statistically superior 10-marble jar, likelihood-ratio $\chi^2 = 6.02$, $p < .02$. There was no effect of composite happiness scores on choices, likelihood-ratio $\chi^2 = .75$, *ns.*

Discussion

Sad participants, who were in a more careful, cautious mindset, were more likely to follow their rational analysis over their intuitions. This parallels the results of the previous two studies, in which accountability (Study 4) or the prospect of a loss (Study 5) similarly cued rationality. Across the three studies, inducing a mental state of carefulness and caution cued a preference for rationality, while those in a more lax, less cautious mental state showed a greater reliance on intuition. Importantly, strategy

[2] This analysis includes six participants who won the drawing, which might affect mood. However, excluding these participants does not change the pattern of results.

cueing occurred both when the choices were hypothetical (Studies 4 and 5) and when they were real, with real financial consequences (Study 6).

Study 7: Abstract versus Vivid Choice Dilemmas

Dual process theorists have maintained that abstract thought is largely confined to the rational system (Epstein, 1994; Evans, 2007; Kahneman & Frederick, 2002; Sloman, 1996). Matching the characteristics of one's internal state with the characteristics of rational versus intuitive processing should therefore cue a preference for rational analysis when the choice dilemma is imagined in abstract terms. In contrast, intuitive thinking is often characterized by vivid and concrete mental images (Epstein, 1994), so picturing choices vividly and concretely should cue a preference for intuitive responding. To examine this hypothesis, I selected four choice dilemmas from those used in Study 1 and created a longer, more vivid description of each. For each choice dilemma, participants were asked to imagine that they were experiencing a conflict between their rational and intuitive preferences. Half of the participants were asked whether they would prefer to choose on the basis of intuition or reason after reading the fleshed-out, vivid version of each choice dilemma; the other half indicated their responses after reading the terse, abstract version of each dilemma. I expected that compared to participants who read the abstract descriptions of the choice dilemmas, those who read the vivid descriptions would exhibit more of a preference for choosing intuitively.

Method

Participants were 73 Cornell undergraduates who completed the questionnaire as part of their participation in a longer, unrelated study. Two failed to complete the questionnaire, leaving 42 participants who were randomly assigned to the concrete condition and 29 who were randomly assigned to the abstract condition.

All participants read about four choice dilemmas: "choosing a stock in which to invest," "choosing a city in which to live," "choosing a private school for your kids," and "choosing a rental car." For each dilemma, they were asked to imagine that "…your intuition was telling you to choose one option…and reason was telling you to choose the other option" and then to indicate whether they would choose to "go with your gut feeling (and ignore your rational calculus)" or to "go with your rational calculus (and ignore your gut feeling)." The order of these response options was counterbalanced between participants.

In the *abstract* condition, participants read and responded to the simple, terse descriptions of each choice dilemma presented above. In the *vivid* condition, in contrast, each dilemma was described in richer detail. For example, the dilemma of "choosing a stock in which to invest" was described as follows:

> Imagine that you are trying to decide which of two stocks to purchase with money you received as an inheritance. When you write down a list of explicit plusses and minuses of both stocks, and rationally weigh the importance of each good thing and each bad thing, this sort of rational calculus leads you to believe that Stock A is the best choice. However, you nonetheless have a gut feeling that Stock B would be better. The conflict between what your "head" is telling you and what your "gut" is telling you leaves you in a quandary.

Results. Once again, participants' responses revealed a pronounced cueing effect: for all four choices, a higher percentage of respondents in the *abstract* condition than the *vivid* condition preferred to choose on the basis of a rational analysis (see Table 2). For three out of four choices (*city, school,* and *car*), this difference was statistically significant, χ^2s > 4.17, *p*s < .05. On average, participants in the abstract condition favored a rational response in 3.5 of the 4 scenarios, whereas those in the vivid condition expressed such a preference for only 2.3 of the four

scenarios. This difference was significant with a large effect size, $t(66.04) = 5.20$, $p < .0001$, $d = 1.28$.

Table 2. Percentage of participants who prefer to choose rationally for each scenario, by condition.

	stock	*city*	*school*	*rental car*
Vivid descriptions	73.8	35.7	52.4	69.0
Abstract descriptions	89.7	79.3	93.1	89.7

Discussion

As predicted, imagining choice dilemmas vividly or abstractly affected preferences for intuition or reason: Picturing dilemmas abstractly matched the abstract nature of rational thought, and thus cued a preference for choosing rationally. Picturing dilemmas vividly and concretely matched the vivid, concrete nature of intuitive thought and so produced a greater preference for choosing intuitively. These results demonstrate another way that mental states can cue a preference for intuition or reason: Mentally representing a choice abstractly cues rationality, whereas representing it more vividly and concretely cues intuition.

Study 8: Persistence of Feeling

The associative and automatic nature of intuition means that people often have little insight into the process underlying an intuitive preference. In contrast, the rule-based and explicit nature of rational thought makes the process by which one arrived at a conclusion transparent. In the absence of direct insight into the process that produced an intuitive preference, decision-makers may turn to other features of the intuition to assess its validity. One such feature may be *persistence*: An intuitive preference that is equally strong at time 1 and time 2 may be seen as more valid than

one that exists only at a single point in time. An intuition's persistence across time, in other words, may be seen as a cue to its reliability. In the case of rational analysis, persistence over time should have no effect on perceived validity, as the validity of reason depends on information that is equally available at time 1 and time 2. Therefore, a conflict between intuition and reason that persists over time should lead to a preference for intuition, as intuition gains validity over time whereas reason does not. In order to examine this possibility, I created a questionnaire describing a conflict between intuition and reason that was persistent over time or not. I predicted that when the conflict was described as persistent, participants would be more likely to favor intuition over reason when indicating how they would choose.

Method

Participants were 42 Cornell undergraduates (27 female) who completed the questionnaire as part of their participation in a variety of unrelated studies. In both conditions, participants were asked to imagine that they were making an important decision between two options, and that "reason was telling you to choose one option" while "your intuition was telling you to choose the other option." In the *persistence* condition, the scenario continued:

"Imagine that you decide to take 24 hours to think about the choice, but at the end of the 24 hours you are no closer to choosing one of the options: your rational analysis is still to choose option A, and your gut feeling is still to choose option B."

In both conditions, participants then indicated whether they would choose by going with their "gut feeling" (and ignoring their rational analysis), or by going with their rational analysis (and ignoring their gut feeling).

Results

There were no effects of gender, and so analyses collapse across men and women.

As predicted, participants were more likely to prefer to choose based on their intuition when the conflict was described as persistent. In the persistence condition, 62% or participants preferred to choose based on intuition, compared to 29% in the control condition. This difference was significant, $\chi^2 = 4.71$, $p = .03$.

Discussion

Participants were more likely to favor their intuitions for a persistent conflict between intuition and reason than for a conflict that was not described as persistent. This supports the idea that the persistence of an intuition over time is seen as a cue to its validity, whereas the persistence of a rational conclusion does not increase its perceived validity. Of course, it is also logically possible that participants viewed persistent and non-persistent intuitions as equally valid, but viewed persistent rational conclusions as *less* valid than non-persistent conclusions. While this would produce the current pattern of results, it is difficult to see why the persistence of a rational conclusion would decrease its perceived validity.

CHAPTER FOUR:

GENERAL DISCUSSION

Across nine studies, the strategy cueing account was strongly supported: Participants showed a marked tendency to match the choice of an intuitive or rational decision strategy to aspects of the decision at hand. Participants overwhelmingly approved of a rational approach to choosing stocks or schools, but favored an intuitive approach to choosing desserts or dating partners. Participants were cued both by features of the choice—its objective evaluability, complexity, and importance—and by features of their internal states—carefulness, vivid images of a choice conflict, and persistent feelings. Furthermore, evidence of cueing was obtained both when participants were asked to rate which way one *should* choose (Studies 1 and 2a), when they were asked how they themselves would choose (Studies 3, 4, 5, 7 and 8), and when they made real choices with financial consequences (Studies 2b and 6).

Psychologists have recently placed great emphasis on the crucial role that intuition plays in people's everyday decisions (Gigerenzer, 2007; Kahneman & Frederick, 2002; Klein, 1998) and beliefs (Haidt, 2001), and this emphasis on the power of intuition is reflected in popular treatments of psychology as well (Gladwell, 2005; Myers, 2002). Much of the research on intuition has focused on buttressing the claim that intuition often yields decisions that are superior to those arrived at via deliberate thought (Djiksterhuis et al. 2006; Wilson & Schooler, 1991). Although it is certainly important to understand the circumstances under which intuition leads to superior decisions, it is also important to understand when and how people choose to decide rationally or intuitively. The current research is one step toward such an understanding.

Strategy cueing compared to other strategy selection models

A number of models of decision-making address how people choose a cognitive strategy based on features of the task or the environment. Of these, the most relevant to the strategy cueing account are Beach and Mitchell's (1978) contingency model of strategy selection, Payne, Bettman and Johnson's (1993) adaptive decision maker framework, and Hammond and colleagues' Cognitive Continuum Theory (Hammond, 1996; Hammond, Hamm, Grassia, & Pearson, 1987).

Beach and Mitchell's contingency model. The Beach and Mitchell (1978) contingency model of strategy selection posits that decision-makers possess a repertoire of decision-making strategies, which can be divided into three classes: *aided-analytic*, *unaided-analytic,* and *nonanalytic*. Aided-analytic strategies involve effortful computation and the use of some kind of decision tool or aid. Formal decision analysis, use of a decision algorithm, or simply listing the pros and cons of various options are all considered aided-analytic strategies. Unaided-analytic strategies involve an attempt to weigh the pros and cons of various options "in the head" without decision aids. For example, attempting to mentally predict the utility of each possible outcome, weighted by its probability, is considered an unaided-analytic strategy. Attempting to mentally simulate the outcome of making one choice or another is similarly considered an unaided-analytic strategy. Finally, nonanalytic strategies consist of very simple rules such as "flip a coin," "choose the same way I chose last time," and "choose what everyone else is choosing." It is assumed that aided-analytic strategies are the most effortful, nonanalytic strategies are the least effortful, and unaided-analytic strategies fall in between. Decision-makers are assumed to match the effortfulness of the strategy to the perceived demands of the task.

Beach and Mitchell (1978) discuss a number of task features that decision-makers are predicted to interpret as demands to process more effortfully. Among these

are several that are also important in the strategy cueing account: complexity of the choice, importance of the choice, and accountability are all thought to lead to more effortful processing according to the contingency model. Thus, there is some overlap between the two models in the features of choices that are thought to produce a preference for rationality. There are, however, important differences between the two accounts. The first concerns how *nonrational* thought is viewed. According to Beach and Mitchell's model, nonrational thought consists only of very simple rules of thumb, and decision-makers only view nonrational thought as appropriate when task demands are low.[3] In contrast, the strategy cueing account assumes that people view intuition as capable of complex decision-making, and that decision-makers will often prefer intuition even for important choices. This leads to the second important difference between the two models: The contingency model posits a single dimension along which tasks vary to engage more or less rational processing—perceived need for effort. In contrast, the strategy cueing account allows for the matching of intuitive or rational thought to a wide variety of features of the choice task. Finally, the contingency model does not distinguish between cues related to the task and cues arising from the decision-maker's mental state (although it does distinguish between characteristics of the task—e.g., complexity—and characteristics of the decision environment—e.g., accountability).

The adaptive decision maker framework. Payne, Bettman, and Johnson's (1993) adaptive decision maker framework is similar to the contingency model of strategy selection in that it posits that decision-makers choose from a range of

[3] Beach and Mitchell have since proposed *Image Theory* (Beach, 1990; Mitchell & Beach, 1990), which attempts to include a larger role for intuitive thought in decision-making. However, as Image Theory is quite complex and deals exclusively with the perceived acceptability of a single option (as opposed to choices between two or more options) it is not discussed further here.

strategies that vary in effort and accuracy depending on the demands of the task. However, the adaptive decision maker framework focuses on quantifying the amount of effort thought to be demanded by various strategies, and on measuring the effort/accuracy trade-offs between different strategies using both computer simulations and process tracing procedures in actual decisions. More accurate strategies are generally thought to be more effortful, and vice versa. For example, the weighted additive strategy, in which each feature of each option is weighted by its importance and then added to the total score for that option, is by definition the most accurate (because it weights and integrates all the available information) but is also the most effortful, because it involves many operations for each option. In contrast, the lexicographic strategy, in which the most important attribute is determined and the choice which is best on that attribute is selected, is less effortful but also less accurate than the weighted additive strategy (provided that one performs the weighting and adding correctly).

Like Beach and Mitchell's (1978) contingency model, the adaptive decision maker framework sees strategy selection as determined by aspects of the decision task. However, the focus is primarily on factors that might cause the decision-maker's processing capacity to be exceeded, prompting her to fall back on a less demanding strategy. For example, time pressure and more complex choice options are thought to increase processing demands and thus prompt a reliance on simpler, less effortful strategies.[4]

The most important difference between the adaptive decision maker framework and the strategy cueing account is that the adaptive decision maker framework deals exclusively with at least somewhat deliberative choice strategies

[4] *Contra* Beach and Mitchell's (1978) contingency model and the strategy cuing account, the adaptive decision maker framework predicts less rational processing when choices are complex. This apparent contradiction will be addressed below.

(although the strategies vary in effort). Even a low-effort strategy, such as the lexicographic strategy, or a satisficing strategy (in which the first acceptable alternative is chosen) would be considered a form of rational analysis under the strategy cueing account. The adaptive decision maker framework does not address the quick, holistic, and idiosyncratic assessments that are grouped under the heading of intuition by the strategy cueing account. Further, it is not clear how such a choice strategy could be included, as there is no clear way to quantify the cognitive effort involved in a strategy that does not apply some sort of algorithm. Thus, the adaptive decision maker framework is best suited to address under what circumstances decision-makers prefer to use different types of deliberative decision strategies, rather than how they choose to reconcile intuition and reason.

Cognitive Continuum Theory. Hammond's (1996) Cognitive Continuum Theory (CCT) is alone among the strategy selection models discussed here in that it explicitly acknowledges the role of intuition in decision-making. According to CCT, just as thinking can be described as more rational or more intuitive on a *cognitive continuum*, tasks can be described as rationality-inducing or intuition-inducing on a *task continuum*. Tasks are assumed, through an unspecified process, to induce a type of cognitive activity that matches their position on the task continuum (although the theory also states that a decision-maker can explicitly choose to engage in a mode of processing that matches the task demands). Furthermore, when one's position on the cognitive continuum matches the position of the task on the task continuum, accuracy is maximized (Hammond, Hamm, Grassia, & Pearson, 1987). Task characteristics thought to induce intuition include a large (> 5) number of cues, high redundancy among cues, perceptual (as opposed to objective) measurement of cue values, and lack of an organizing principle for cue classification.

Thus, there is little overlap between CCT and the strategy cueing account in terms of what task characteristics are thought to induce intuitive or rational processing. This is the result of the different kinds of decisions that are the focus of the two theories: As an outgrowth of Judgment Analysis (for an introduction, see Cooksey, 1996), CCT is well suited to describing judgments in which the inputs are very well specified, and accuracy can usually be defined objectively. CCT is less well suited to describing decisions "in the wild," where clearly isolating cues (and defining accurate decisions) is much more difficult, if not impossible. For example, multiple redundant cues, assessed perceptually, are typical of a great many of the "real-world" choices addressed by the strategy cueing account (think of how many intercorrelated cues are involved in a choice between cars and apartments, let alone dating partners). According to CCT, these decisions should be strongly intuition-inducing, yet people prefer to make some of these decisions rationally, and some intuitively.

The second major difference between the two theories is that the strategy cueing model addresses a question that CCT does not: How does a task lead to a preference for intuition or reason? CCT does not offer an explanation for how tasks induce intuition or reason; it simply assumes that they do. In contrast, the strategy cueing model makes explicit how the match between task characteristics and characteristics of intuition or reason is hypothesized to lead to the cueing of intuitive or rational choice.

Strategy cueing in the context of dual-process models of cognition

Among the many dual-process models of cognition in psychology (for an overview, see Chaiken & Trope, 1999), several address the circumstances under which people prefer to process more or less deliberatively. Two of the most relevant to the current research are the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986; Petty & Wegener, 1999) and the heuristic-systematic model of information

processing (Chaiken, 1980; Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999). These models offer important insights about what influences people's preference for deliberation. However, unlike the strategy cueing model, they largely focus on the specific domain of responses to persuasive messages. Also, both the ELM and the heuristic-systematic model implicitly assume that more deliberate or systematic processing is invariably more accurate than less deliberative processing. In contrast, the strategy cueing model does not assume (and, in fact, participants do not believe) that intuitive thinking is necessarily an inferior alternative to rational analysis.

The ELM. The Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986; Petty & Wegener, 1999) has been applied primarily in the context of persuasion—specifically, to explain how people process persuasive messages. The ELM posits two routes to persuasion—a *central route,* which involves in-depth, effortful processing of information; and a *peripheral route*, which entails less effort and a response based largely on superficial cues or heuristics. For example, a central route persuasion process might involve careful reading of an argument, analysis of its strong and weak points, and an effortful search for further implications of the claims made. A peripheral route persuasion process might instead involve a relatively quick response to superficial or unimportant cues, such as the number of arguments advanced (regardless of quality), or the attractiveness of the persuader.[5]

According to the ELM, the choice to process arguments along the central or peripheral route depends both on motivation and ability. Motivational factors that

[5] Complicating this account is the fact that a specific cue, such as source attractiveness, might operate via either a central or peripheral route depending on the motivation of the respondent and its perceived relevance to the message. For example, source attractiveness might operate via the central route if attractiveness is seen as message-relevant—e.g., an advertisement for beauty products (Petty & Wegener, 1999). However, this additional complexity can safely be disregarded for present purposes.

increase central route processing include the personal relevance of the issue (Petty & Cacioppo, 1984) and the person's chronic tendency to process systematically (Cacioppo, Petty, & Morris, 1983). Ability factors that increase central route processing include sufficient time to process the arguments (Ratneshwar & Chaiken, 1991) and freedom from distraction (Petty, Wells, & Brock, 1976). Thus, there is some overlap between the ELM and the strategy cueing account: Issue relevance can be seen as similar to choice importance, and both models predict more systematic processing when relevance/importance is high. However, there are also important differences between the aims and approaches of the two models.

The most salient difference between the ELM and the strategy cueing account is that the ELM is mainly concerned with responses to persuasive arguments, which means that it is silent on the effects of many of the factors that fall under the umbrella of strategy cueing. For example, consider the idea that more complex choice objects tend to engender a preference for choosing rationally rather than intuitively. The ELM would not predict that complex messages would increase central-route processing. Rather, it would predict an interaction between a pre-existing inclination to process via a central or peripheral route and message complexity—perhaps those processing via the central route would be more persuaded by a complex message (assuming that the arguments were valid), but those processing via the peripheral route would be more persuaded by a readily comprehensible simple message.

This brings up a less salient but deeper distinction between the approach taken here and the ELM. The ELM generally assumes that people believe central-route processing to lead to greater "subjective correctness." Thus, a variable that motivates people to value correctness (for example, issue involvement or importance) or that allows them the cognitive resources to process in more depth (for example, the absence of distraction), should, all other things equal, increase reliance on central-

route processing and decrease reliance on peripheral-route processing. This assumption effectively begs the question that the current research sets out to answer: Under what circumstances do people view rational or intuitive processing as more suited to a task? The current results show that rather than believing across-the-board that more rational, deliberative, processing leads to better outcomes, under many circumstances people prefer to listen to their hearts rather than their heads, even when the stakes are high.

The heuristic-systematic model. Chaiken and colleagues' heuristic-systematic model of information processing (Chaiken, 1980; Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999) bears a distinct family resemblance to the ELM. Like the ELM, the heuristic-systematic model posits two modes of thought—*systematic* processing, which is effortful, deliberate, and analytical; and *heuristic* processing, which is less effortful and relies on cognitive shortcuts or rules-of-thumb. For current purposes, the most important difference between the two models is the heuristic-systemic models' emphasis on the perceived *applicability* of heuristics—about which more below—and its explicit acknowledgment that an enhanced motivation to be accurate might lead to more emphasis on systematic or heuristic thought, depending on the characteristics of the problem.

The heuristic-systematic model's treatment of heuristic applicability is, in some ways, quite similar to the current account of strategy cueing. According to the heuristic-systematic model, "a heuristic will only exert a judgmental impact to the extent that it is applicable to the current judgmental task or domain" (Chen & Chaiken, 1999). Applicability might consist of a feature-level overlap, or match, between the heuristic and the problem at hand, or of a deliberate judgment that a heuristic is appropriate in a given situation (applicability in this sense is conceptually very similar to central-route processing of source cues such as attractiveness in the ELM).

However, the important difference between applicability as defined by the heuristic-systematic model and strategy cueing is the specificity of the matching or applicability. According to the heuristic-systematic model, matching occurs between features of the specific heuristic and the task. For example, the heuristic "expert sources can be trusted" matches a task in which one is asked to evaluate a New York Times editorial on the death penalty (example from Chen & Chaiken, 1999). In contrast, the strategy cueing account takes a much broader view of how matching might occur. On this view, similarities between features of a problem and global features of intuition or reason, rather than specific characteristics of a heuristic, cue either rational or intuitive decision strategies.

This distinction is a reflection of a deeper difference between the two approaches in how non-deliberative thinking is conceptualized. The heuristic-systematic model sees the alternative to deliberative thought as relatively simple heuristics, or rules of thumb, such as "expert sources can be trusted," or "longer arguments are more convincing." While intuitive thought can sometimes consist of these simple heuristics, it also can be quite complex and capable of integrating many different features of a stimulus (Dijsterhuis, 2004; Betsch, Plesner, Schwieren, & Gutig, 2001) or of reflecting many years of experience and expert judgment (Hammond, 1996). Thus, the strategy cueing account recognizes that people often place a great deal of confidence in their intuitions, rather than seeing intuitive thought as a less accurate alternative to deliberative processing. The latter view, which is implicit both in the ELM and the heuristic-systematic model, is derived from the cognitive-miser perspective (Fiske & Taylor, 1991), which holds that intuitive thought is a necessary evil that allows decision-makers to cope with limited cognitive resources. While the strategy cueing account is in agreement on the point that intuition is less resource-intensive than is rational analysis, it also recognizes that people view

intuition as far more sophisticated and capable than dual-process models have typically assumed.

When does complexity cue rationality?

The results of Studies 2a and 2b, in which greater complexity cued rationality, seem to conflict with some other strategy selection models, in which complexity (i.e., more features per option, or a greater number of options) has been shown to promote more heuristic processing (e.g. Payne, Bettman, & Johnson, 1993). Other strategy selection models, however, have viewed complexity as leading to more rational processing (Beach & Mitchell, 1978). One possible explanation for this apparent contradiction is that the relationship between complexity and rational processing may be curvilinear. A moderate level of complexity may cue rational processing, but a very high level of complexity could exceed one's cognitive capacity, prompting a fallback to less effortful types of processing. There was no evidence of this kind of curvilinear relationship in Study 2a, but such a pattern might be more likely to emerge when decision-makers are asked to integrate complex information online, with limited time and without being able to take notes or make use of other decision aids.

Defining intuition (and rationality): Are dual-systems theories the best way to distinguish intuitive and rational thought?

Dual-systems theories such as those of Epstein (1994), Sloman (1996), and Kahneman (2003) provide a convenient framework for distinguishing between two broadly different kinds of thinking. However, in dividing a large assortment of different mental processes into two general classes, these kinds of theories have the undesirable property of lacking of definitional clarity. Rather than describing necessary and sufficient conditions for classifying a type of thinking as rational or intuitive, these theories aim to provide more of a prototype of intuitive and rational thought, which a specific cognitive process can be said to resemble more or less.

One appealing but ultimately unsatisfying approach to this problem is to define rational thinking relatively restrictively, and to then call everything else intuitive thinking. The ELM and HSM take this approach: central route processing in the ELM and systematic processing in the HSM are defined as the careful and effortful evaluation of the available information according to normatively correct rules. Any *other* kind of processing is deemed peripheral (in the ELM) or heuristic (in the HSM). As Hammond (1996) points out, this is not a satisfying solution, because it defines intuition only as a negative: the absence of rational thought. It seems reasonable to expect that intuition should be defined positively: that there should be a set of features that characterize all intuitive processing. Furthermore, this approach ultimately runs into a problem of categorization similar to that discussed earlier. Distinguishing rational from intuitive thought on the basis of cognitive effort or control, which are continuous rather than dichotomous (Uleman, 1999) makes it difficult to determine where to draw the line between the two kinds of thinking. How much of the available information must be considered for processing to be called systematic? All of it? 90%? More than half? What if one evaluates all information, but does so according to a normatively incorrect rule? Wherever one draws the line between heuristic and systematic processing, the distinction risks seeming arbitrary.

It should by now be apparent that specifying the necessary and sufficient features of intuitive thought is difficult. This may be because there is no *one* kind of intuitive thought: Stanovich (2004) argues that intuition should be viewed as a set of evolved special-purpose systems designed for specific tasks, such as emotion perception, theory of mind, and intuitive physics. Similarly, Gigerenzer (2007) views intuition as consisting of a "heuristic toolbox" of simple but effective problem-solving strategies, such as choosing the option that feels most familiar. If one accepts the

argument that intuition consists of a set of special-purpose systems, is it possible to specify an essential feature that all intuitions share?

One possible candidate arises from the differing phenomenological experience associated with rational and intuitive thinking. When thinking rationally, one is aware of following an explicit rule: think of doing long division, balancing your checkbook, or deducing a conclusion from a set of premises. In contrast, intuitions seem to present themselves to consciousness as finished products, without any experience of following a series of steps to reach a conclusion. Think of evaluating whether a sentence in one's native language is grammatical: in most cases, the conclusion (a feeling that the sentence is grammatical or not) arrives first. Subsequently, one might, with a good knowledge of the rules of grammar, provide support for the conclusion, although this need not be the case: native language speakers are often unaware of the underlying rules that guide their judgments of whether a sentence is grammatical.

Thus, the proposed distinction is that when thinking rationally, we have the experience of deliberately following an explicit rule or plan. When thinking intuitively, we have the experience of arriving at a conclusion without awareness of the steps that led to it: We are presented with the end product of a train of thought without experiencing the process that preceded it. I suggest that the term *process unawareness* is a good description of this experience, although with the caveat that people may sometimes *know* the process that produced an intuitive judgment even though they don't subjectively *experience* the process as it occurs.

This distinction has the desirable features of being simple yet relatively precise. It also avoids the implicit value judgment inherent in many distinctions between rational and intuitive thinking, in which more deliberative thought is seen as more sophisticated and hence more desirable. Under the current distinction, rational thinking might consist of consciously applying a very simple rule (for example, that

experts should always be trusted, or that one should always choose the most popular option), while intuition might consist of a very complex integration of many cues (for example, expert judgments of which chess positions are "good" or "bad"). Distinguishing rational and intuitive thought on the basis of *awareness* rather than *effort* also avoids the problem of categorization discussed earlier. Whereas effort is continuous, awareness is dichotomous: one either has the experience of following a rule and arriving at a conclusion, or one does not.

Are people's intuitions about intuition correct?

So far, I have said little about the extent to which the influence of cueing on strategy selection is normatively appropriate or defensible. This is largely because, with a few exceptions (e.g. Djiksterhuis et al., 2006; Hammond, Hamm, Grassia, & Pearson, 1997) little is known about the circumstances under which deliberate decisions are superior to intuitive ones or vice versa. Interestingly, however, some of the existing data on the subject is in stark conflict with participants' responses. In particular, Djiksterhuis et al. (2006) found that for choices between objects with many different attributes, the quality of people's choices and their satisfaction with what they chose declined with the amount of rational thought that went into their choice. Djiksterhuis et al. argued that this was due to the superiority of intuition (or, as they put it, "unconscious thought"), at integrating the multiple trade-offs inherent in complex choices: The parallel nature of intuitive processing is thought to be superior to the serial nature of deliberate thought when the input to the decision is complex. Of course, this is precisely the opposite of the belief held by participants, who thought that more complex choices should be made rationally, not intuitively.

It is also difficult to view the influence of most mental state cues as normatively defensible. The preference for the statistically inferior drawing shown by happy participants in Study 6, for example, should probably be regarded as a bias (and

participants might well correct this bias were their attention drawn to the effect of their mood on their choices). Likewise, it is difficult to see what normative rule would justify deciding whether to sell a stock intuitively rather than rationally because the stock went up rather than down (Study 5). Finally, the added details in the vivid scenarios in Study 7 added no diagnostic information about the choice options, so there is no normatively justifiable explanation for the increased preference for intuition in the vivid condition.

However, the effects of accountability (Study 4) and the persistence of intuition (Study 8) might be normatively justifiable. There are reasons to prefer a rational analysis when one might have to explain one's thinking, and the persistence of an intuition might in fact be a reasonable cue to its validity.

Taking a broader view of the appropriateness of intuitive thought, a substantial literature comparing the relative accuracy of statistical (i.e., formula-based) and clinical (i.e., "in the head") judgment in predictions of phenomena from mental illness to parole violations to college performance has shown that actuarial formulas almost invariably outperform expert judges (Dawes, Faust, & Meehl, 1989). While this literature leaves open exactly *how* judges are making their decisions (for example, judges may be engaging in a very deliberative process of weighting and adding different cues, but may be weighting cues incorrectly or ignoring important cues entirely), these results do call into question how much confidence should be placed in "expert intuition," at least in domains where an actuarial formula can be empirically derived and verified. Of course, people often need to make judgments in domains where no such formula exists, in which case a reliance on intuition could be quite justifiable.

Future directions.

In the present research, I have attempted to vary or measure a single cue per study, holding other factors constant. While this approach has made examining the strategy cueing hypothesis more tractable methodologically, it does not allow for the examination of the possible interactive effects of multiple cues—and most real-world choices certainly have more than one cue suggesting intuition or reason. The simplest possibility is that the effects of multiple cues are additive. There is some support for this possibility in Study 1, in which choice importance and objective evaluability of the outcome contributed simultaneously and independently to a preference for rationality. However, I have not examined this possibility systematically, and it is certainly possible that multiple cues might have interaction effects. Future research should investigate whether cues combine additively, interactively, or both.

Past theoretical accounts of how decision-makers select choice strategies have focused on two factors: the decision-maker's *motivation* to exert cognitive effort, and her *ability* to do so (e.g. Chaiken, 1980; Payne, Bettman, & Johnson, 1993; Petty & Cacioppo, 1986). This focus is entirely reasonable: Surely motivation and ability do play a role in the selection of a decision strategy. However, the results reported here suggest that an *exclusive* focus on these two factors leaves out much of what affects people's decision strategy choices in the "real world." The current research is an attempt to broaden the picture by examining a large variety of different choices and identifying a wider variety of strategy selection cues. This approach has costs—positing many factors rather than two entails theoretical and methodological complications. However, I believe that the potential benefits of a more thorough and accurate understanding of how people actually choose decision strategies justifies these costs.

Although I have identified some important characteristics of different choices that cue an intuitive or rational decision strategy, I do not suppose that I have exhaustively covered all possible cues. A large number of features have been identified as characteristic of rational and intuitive thinking, and many of these features might be plausible cues. For example, Kahneman and Frederick (2002) describe intuitive thought as "parallel," and rational (or, in their words, "reflective") thought as "serial." Might decisions that seem relatively serial—i.e., decisions that involve a number of discrete steps—evoke a preference for deciding rationally compared to more "holistic" decisions that are made "all at once"? As another example, theorists generally see intuitive thought as faster than rational analysis. Might inducing a mental state of "quickness"—perhaps by asking subjects to make a series of fast judgments or decisions—subsequently lead to a preference for intuition? Finally, the precise, rule-based nature of rational thought is to some degree dependent on precise, clearly defined input. Representing decision cues precisely should therefore favor rational analysis, while representing cues more approximately should favor intuition—a point that is also made by Hammond (1996). Exploration of these sorts of issues is likely to provide additional insight into people's intuitions about when it is best to decide intuitively or deliberately.

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