

JUDGMENT AND DECISION MAKING

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People's lives are saturated by judgments and decisions. You make a judgment when you see an object and think that it is good or bad or when judging whether a future event is likely or unlikely to actually happen. You make a decision when you take a course of action while not taking other actions that were possible. People make hundreds, perhaps thousands, of decisions each day and are (often blissfully) unaware of many of them. Passing a candy dish and popping a piece into your mouth is the result of a decision, as is continuing to walk past a tray of fruit without partaking. Such actions (and inactions) may not be experienced as involving important considerations, or as involving any deliberation at all, yet discrete choices accumulate to influence everything from mood to mortality (Keeney, 2008).

While most people may question their own decisions from time to time, decisions by professionals and experts are not immune from the need for study. Mistakes are made by trained experts — mistakes that can cost lives. In the United States, approximately 250,000 people die each year from a decision error by a medical professional. In fact, medical decision error is estimated to be the third most common cause of death, placing it after heart disease and cancer, and before strokes, suicide, and diabetes (Makary & Daniels, 2016). If that surprises you (it did us), you are not alone. As the lead author said in an interview, “You have this over-appreciation and overestimate of things like cardiovascular disease, and a vast under-recognition of the place of medical care as the cause of death. That informs all our national health priorities and our research grants” (Allen & Pierce, 2016). These sentiments speak to the importance of using science to study outcomes such as medical decision errors, which is what the field of *judgment and decision making* does.

Judgments and Decisions: How Are They Defined, Explained, and Evaluated?

Definitions

What is a judgment? Judgment is a broad term. Making a judgment involves perceiving objects or events and coming to a conclusion about whether they are good or bad (*valence judgments*) or likely to occur (*likelihood judgments*). A *decision* is a commitment (to oneself or others) to an option or course of action from among a set of options. Decisions have outcomes, which are the circumstances or states that follow from the decision.

Decision outcomes are judged along two dimensions. Decision theorists often talk about a decision's *utility*, which is the joy, pleasure, or satisfaction that is derived from the outcome of the decision. (The study of decision making has roots in economics, which is a field dominated by mathematical models. When economists take their numbers and turn them into prose it typically does not go well; consequently there are a lot of heavy, clunky terms in the field of judgment and decision making.) Decision outcomes that would bring about the most utility (read: satisfaction) are called *normative*, a term meaning best or right. One dominant viewpoint, shared by many economists, states that people are utility maximizers and that the normative option under any circumstance is the one that people ought to be taking. In plainer terms, people should be rational and choose what will make them most satisfied in the future. Another viewpoint, shared by many psychologists, is that people are not rational and often do not appreciate what will make them satisfied in the future. The reality is that human behavior is somewhere in between rational and irrational. In the words of Daniel Kahneman (2003), a psychologist who won the Nobel laureate in economics, people are *incompletely rational*.

The insights put forth in the 1970s by Kahneman, along with his longtime collaborator, Amos Tversky, helped drag the field of judgment and decision making beyond utility maximization as the model of decision making. Years later, the effects of these realizations are still coming to light, as illustrated by economist Richard Thaler's receipt of the 2017 Nobel prize in economics. Thaler is known for his work with legal expert Cass Sunstein, which touts using judgment and decision making principles as the basis for governance policies (Thaler & Sunstein, 2009). Thaler and Sunstein's highly influential work reflects a move away from describing irrationality to prescribing ways to mitigate irrationality's effects. This progression illustrates a more general principle that before one can prescribe improvements to decision processes, the processes must be understood in depth. These notions raise the fundamental question, how do people make decisions?

Two Explanations of How People Make Decisions: One from Economics, One from Psychology

The predominant theory of decision making derived from economics is *subjective expected utility theory* (von Neumann & Morgenstern, 1944). Expected utility theory says that people make a decision by figuring out the likelihood of each option's outcome occurring and the value of the outcome in question. Then they multiply the likelihood and value for each option and compare across options. Whichever option has the highest score (i.e., the best combination of being likely to occur and highly desirable) is the option that people should choose because it will yield the most utility. Expected utility models make assumptions about people's preferences, which means the value they place on each possible decision outcome. Expected utility theory

assumes, for instance, that people value money, and so the option that is expected to yield the most money is assumed to be the normative (correct) choice.

One can see expected utility theory in action when people play game shows, such as *Who Wants to be a Millionaire?* Imagine a situation in which a player answers enough questions correctly to achieve \$50,000. Then the player faces a choice: end the game or continue. If the player ends the game then he or she walks away with \$50,000. Hence the option of “ending the game now” has a value of \$50,000 associated with it. If the player chooses to continue to the next level, getting the next question right will yield \$250,000. However, there is only a $\frac{1}{4}$ chance of winning because there are four multiple choice answers from which to choose, which also means that there is a $\frac{3}{4}$ chance that the player will lose. Faced with this choice, players should choose to answer the next question, even if it means arbitrarily guessing at one of the multiple choice options. This is an example of rational behavior. Can you see why?

The expected value of answering the question at the next level is \$62,500 ($[\$250,000 * .25]$), which is greater than the \$50,000 expected value ($\$50,000 * 1.0$) from ending the game. Hence the additional likelihood that the player will get the answer correct and win more money tips the scales toward the option of attempting the next question because it is associated with winning more money and hence offers higher expected utility.

An alternate decision theory, which came out of psychology, is Kahneman and Tversky's (1979) *prospect theory*. The moniker refers to the options (prospects) that decision makers face. Prospect theory is arguably the most important theory in the field of judgment and decision making.

Prospect theory created two major advances. One, it used psychology to help explain when and why humans make irrational choices. Until that point, economists treated people's irrational decisions as noisy and bothersome disturbances in their elegant mathematical equations and were largely unconvinced that these deviations represented anything meaningful. Prospect theory's use of psychology revealed that those irrational decisions are, in fact, quite meaningful because they reveal key insights into how the mind works. Two, prospect theory used mathematics, which made it a vehicle to speak to economists and therefore bring to their attention the importance of psychological processes.

Prospect theory uses likelihood judgments and outcome values, as does expected utility theory. However, prospect theory also states that the values associated with outcomes are not the same for everyone or across all situations but rather reflect people's current state of mind. That is, people make judgments about the values of outcomes from a *reference point*, which is akin to a personal point of view. To predict how people will value a certain outcome, one first has to know from where they stand when evaluating it. This tenet flies in the face of expected utility theory because it says that people do not perceive outcomes as having absolute values but instead think of them as better or worse (often referred to as gains or losses, respectively) from their current perspective. This aspect of prospect theory can be summarized as "everything is relative."

Reference point effects can be illustrated with the notion that people are *loss averse*. The psychological impact of losses is far bigger than that of gains, even if the value of the losses and gains is exactly the same. Loss aversion is part of a more general phenomenon called *bad is stronger than good* (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). In health, learning, interpersonal interactions, sexuality, major life decisions, events that yield bad outcomes have a

significantly bigger psychological impact than equivalent events that yield good outcomes. In the realm of money, for example, losses have about twice the psychological impact as gains. This means that people will experience an equivalent degree of emotional change from losing \$500 in the stock market as they will gaining \$1000 the same way. Attesting to the importance of belongingness in the human mind (Baumeister & Leary, 1995), in the realm of interpersonal relationships the psychological impact of bad to good is about 5:1. That is, one marital expert concluded that couples need to say five positive comments to neutralize one negative comment made to their partners (Gottman, 1994).

Loss aversion is illustrated by a classic finding named the endowment effect. Typically in these studies (e.g., Kahneman, Knetsch, & Thaler, 1990), some people are given a small gift, such as a coffee mug with the university's logo on it, whereas others see the same product but are not told that it is theirs. People who own the mug then are asked how much they would charge to sell it; people who do not own the mug are asked how much they would offer to buy it. Since random assignment to condition means that, overall, both groups ought to value the mug equally, it is remarkable (and in contrast to expected utility theory) that owners ask for considerably more money to sell the mug than buyers are willing to offer. One may think that it may be because buyers and owners have different motives about saving money and earning money. Yet this explanation does not explain the finding that when, 20 minutes later, the same people switch roles from being owners to buyers or vice versa, the endowment effect is seen once again: people want more money to sell the mug than they themselves would offer to buy it. To be sure, endowment effect findings are interpreted in different ways, and one of the most predominant explanations is loss aversion. People feel a stronger psychological impact of losing the mug when they already

own it than they do gaining the mug when they do not own it, which demonstrates the broader theme of reference points.

What Influences Decisions?

It is generally agreed that decisions are made by considering how likely each option is to occur combined with how valuable the outcome of that option seems. Expected utility theory says that decision makers rationally judge the likelihood of an event in terms of its *base rate* (meaning the objective tendency for an event to occur in a given circumstance) and possess stable preferences for outcomes (meaning they place the same value on outcomes across time and circumstance).

In contrast, prospect theory conceptualizes decisions as resulting from decision weights and constructed preferences. The concept of decision weights says that people do not judge the likelihood or importance (these two terms encompass the notion of weight) of all outcomes similarly. For instance, some people prefer the style of a car they are thinking of purchasing to be a more important factor than its safety. But when they start to think about having children, they might come to value safety more than style. On the likelihood front, for instance, it is well known that people overestimate the likelihood of events that are, in reality, highly improbable (such as flash flooding, terrorist attacks, and winning the jackpot). This indicates that people do not think about events in terms of their objective base rates but rather overestimate the likelihood of some (rare) events happening. *Constructed preferences* are values that people associate with different outcomes that are not stable but rather can be pushed around by the situation. This idea led the field of judgment and decision making to study situational features that change people's preferences and, hence, their choices.

It was a shock for decision scientists fifty year ago to think that people's preferences for outcomes can change with small differences in the situation — but they do. One concept that follows from constructed preferences and reference points is the idea of *sunk costs*. Standard economic theory states that no matter how much time, effort, money, energy, or emotion one has put into a cause, if it becomes clear that the outcome is no longer desirable, then one should quit attempting to achieve the outcome. People actually do otherwise. For instance, people sit through movies that they detest because they already spent the money to see the movie. People read the entirety of a boring novel only because they started it. People turn down invitations to go to a restaurant for dinner because they just bought groceries that day.

Sunk costs may help explain why women stay with abusive partners (Rusbult & Martz, 1995). Scholars studied 100 women who had fled their homes to stay at a shelter. Many had fairly serious injuries (three-fourths of them needed medical treatment upon arrival), and yet some women would willfully return to their abusive partners. Could the scientists predict which? Women reported the resources they had put into their relationship, namely whether the couple had children together, were married, or had been together for a long time. As predicted, sunk costs mattered. Women who had devoted time to raising children with the man, were married, or had been partnered with him for a longer period of time were likelier to return to their abusers than were women who had sunk fewer resources into the relationship.

Sunk cost effects are considered irrational because the money or time that one has spent is gone and one cannot get them back. The rational decision maker would ignore spent resources and decide whether to continue as if the experience were just starting and no money, time, or effort had been put into it yet.

Preferences can change because of the way that options are described. *Framing* is an important construct in the field of judgment and decision making because it sways decision makers' preferences without changing the objective information given to the decision maker. For instance, ground beef described as 75% lean is preferred to ground beef described as 25% fat, even though those descriptions convey the same information (Levin & Gaeth, 1988).

A classic example of framing effects is Kahneman and Tversky's (1979) Asian disease problem. People imagine that they are policymakers deciding on how to respond to a disease that threatens the health of 600 people. Some people are told to choose between two options: one that will save 200 people for certain and another that offers a $1/3$ probability that all 600 people will be saved and $2/3$ probability that nobody will be saved. Other people face two options that convey the same information but with a different framing: one option guarantees that 400 people die whereas the other offers a $1/3$ probability that nobody will die and $2/3$ probability that all 600 people will die. If you work out the math, everyone is given options that predict the same number of lives saved and lost. In principle, then, decision makers should choose the options at equal rates.

That is not what happens. The two options with certainty sway people's decisions because they bring to mind a different reference point. That is, the condition in which 200 lives are definitely going to be saved (versus $1/3$ chance that everyone will be saved and $2/3$ chance that everyone will die) gets people to think about a good outcome that is certain to occur. This is called a gain frame, and people generally react to gains by becoming risk-averse, meaning that they go for the certain option of 200 lives saved. Yet the opposite occurs when an option promises that 400 people will definitely die (versus a $1/3$ probability that nobody will die and a $2/3$

probability that 600 people will die). This option gets people to think about a bad outcome that is certain to occur. This is a loss frame, and losses tend to make people risk-seeking. Hence people choose the option that avoids 400 certain deaths. As this example demonstrates — and as politicians have known for centuries — decisions are heavily influenced by descriptions of the options.

The *attraction effect* and *compromise effect* are notable because they too reveal decision makers' irrationality. The attraction effect (Huber et al., 1982), also known as the decoy effect, describes choices when people are faced with two options that are closely matched in how preferable they are. Imagine that a group of people is offered donuts versus chocolate ice cream, and half of the people in the group choose donuts whereas the other half choose chocolate ice cream. Now imagine that a third option is introduced, and it is fish-flavored ice cream. Introducing this option, which is less preferred than the other two (so much so that nobody actually chooses it), shifts people's choices between donuts and chocolate ice cream. The unwanted option (here, fish-flavored ice cream) makes the option to which it compares most closely seem more attractive, leading people to choose it (here, chocolate ice cream).

The attraction effect is so interesting because the third option is completely undesirable and therefore it should be completely irrelevant. Because no one would ever choose fish-flavored ice cream, people who were on the fence about whether to choose chocolate ice cream or donuts should still be undecided. Yet suddenly, the presence of fish-flavored ice cream renders chocolate ice cream more appealing. Because the mind applies the result of that comparison to the harder comparison between chocolate ice cream versus donuts, with the result being that chocolate ice cream looks better than donuts.

The *compromise effect* (Simonson, 1989) arises when people are faced with options that tradeoff one feature for another, the most common being quality and price. In these cases, people tend to choose the option in the middle. Consider the example of a consumer choosing among cell phones with capacities of 80GB, 100GB, and 120GB that are priced at \$600, \$700, and \$800. The buyer would be likely to choose the 100GB option because while it gives up some space compared to the top model, it also does not cost as much money. The compromise effect continues to affect decisions when new options are added at the extremes (for instance, adding a 160GB option priced at \$900 and removing the 80GB option) as people once again tend to choose the middle option, which in this case is the 120 GB option.

You can easily see how sellers can use the compromise effect to move decision makers toward the particular products they want them to buy. In fact, restaurateurs take advantage of it. Where do they tend to put the wines that will make them the most profit? Those wines are not the most or least expensive on the menu, but instead more toward the middle. Restaurateurs are known to price the wine with the biggest markup as second cheapest. They realize that diners want to save money but do not want to appear to be a huge cheapskate by ordering the most inexpensive wine, and so they tend to order the second cheapest wine. Hence, that is where there is money to be made. Remember that when you are on your next date — be careful not to get a bad deal!

This next effect can change people's outcomes without getting them to act in a particular way. It involves *defaults*, which are pre-existing or already-chosen options. The pre-existing option may be someone else's choice (e.g., auto manufacturers' base model) or the most recent choice that the decision maker made (e.g., the TV station you last watched). Policy makers fig-

ured out that the default effect can help society. Take, for instance, organ donations. Society benefits as a whole if people agree that when they die, their organs could be transplanted into the body of someone else who needed them. In some countries, the default is that your organs are not donated unless you explicitly say so — but in other countries, the default is the opposite, so that your organs will be donated unless you say not to do so. One study found that changing the laws such that organ donation at death was the default dramatically increased the number of organs donated, even though citizens still retained the option not to donate their organs if they so chose (Johnson & Goldstein, 2003).

Other examples of changing the default option are more mundane and more common. When people first started using email and getting internet accounts for services that required data protection, like banking, the word *password* was often given as the default password that consumers were given. Guess what? Consumers failed to change that default password, which thieves quickly took advantage of. Banks and other firms now assign unique and difficult-to-decipher passwords on the chance that the password first given to consumers remains the password for the life of that account. The basic or default option is what many people are likely to end up with.

Decisions Evaluated: What Makes a Decision Good?

Judgment and decision making scholars think it is important to evaluate the quality of decisions. (If you are following closely, you will realize that these are judgments about decisions.) Scholars separate the process by which the decision was made from its outcomes when judging what makes a decision good.

The process by which one made a decision. One measure of whether a decision is good is to ask whether it was reasonably sound and made in a reasonable amount of time. One early insight in decision science came from psychologist Herb Simon (1955), who corrected the long-standing assumption in economics that people can and do devote lots of energy and time to decision making. Simon said that humans' information processing capacities were limited even in the best of circumstances and therefore people take judgment and decision shortcuts. His notion of *bounded rationality* explained when and why people make irrational decisions, earning Simon the 1978 Nobel prize in economics. Bounded rationality implies that, for the most part, making a 'good enough' decision rather quickly (a strategy called *satisficing*) is an optimal method for making decisions, insofar as it offers a decent tradeoff in terms of effort and outcomes.

Much research has demonstrated the advantages of using decision shortcuts, called *heuristics* (e.g., Payne, Bettman, & Johnson 1993; Gigerenzer & Goldstein, 1996). Heuristics often are used when the information people are wading through is complex. The main advantage of heuristics is that they save decision makers time. The main disadvantage is that they can be prone to error. The literature mostly shows how heuristics lead people to incorrect judgments (indeed, that is what most studies aim to show). Taking a broader view, though, it is clear that heuristics tend to result in pretty good decisions most of the time.

If decision makers wanted to avoid using heuristics to ensure that they achieve good decision outcomes, they would have to perform thorough information searches in order to come up with base rate information and objective criteria for evaluating each option's outcomes. People sometimes do this, for instance with high-stakes choices such as deciding on a car or whether to have surgery. But as you may be guessing, most judgments (including many high-stakes deci-

sions) are not made after thorough, rational information processing. Hence it is important to know the heuristics that people commonly use.

One heuristic is the tendency to diversify when there are many options related to a decision. Imagine a group of highly similar people, half of whom are offered two investment funds. One is comprised of stocks (which are riskier) and the other bonds (which are safer). In this context, people generally split their money equally, putting 50% in stocks and 50% in bonds, which may suggest that they preferred a moderately risky portfolio overall. Now imagine that the second group of people also can choose from two funds. One is comprised of stocks and the other of a mix of stocks and bonds (called a balanced fund). If the behavior of the first group reflected a moderate-risk goal, then people in the second group should, in general, put most of their money in the balanced fund. Instead, people in this second group again split their money 50/50 between the two funds. Both behaviors suggest less of a moderate risk goal and more of diversification heuristic (Benartzi & Thaler, 2001). In fact, economic lore has it that the diversification heuristic was used by Harry Markowitz for his own investment portfolio. That is notable because Markowitz won the 1990 Nobel Prize in economics — for formulating an algorithm that optimally allocates money across different financial investments. Yet instead of using his Nobel-winning system himself, he simply divided the money evenly among the various options (reported in Brighton & Gigerenzer, 2012).

The diversification urge is not something that happens only when investing money. One study found that kids select Halloween treats this way (Read & Loewenstein, 1995). Trick-or-treaters arrived at a house where the owners said that the kids could each take two candy bars and then offered them two different brands. Every single trick-or-treater took one of each kind.

Other ways of presenting the candy bars showed that this only occurred because the two different brands of candy bars were offered at the same time and the children were allowed to take two. “I can have two candy bars and there are two types of candy bars so therefore I’ll take one of each,” goes the mental shortcut. Think of shopping for groceries for the week. People tend to buy different flavors of yogurts for breakfast, perhaps as many flavors as there are days of the work week. But there can be costs to using this rule. In the words of Eli Finkel, one of the editors of this book, come Friday you can find yourself stuck with that peach yogurt that you never really liked anyway.

The outcomes that follow from the decision. Another way to judge what makes a decision good is whether the decision yields satisfactory outcomes. One popular version of this idea says decisions are good when they make people the happiest. Yet that assumes that people know what will bring them the most happiness or the least pain, which unfortunately they do not.

People are not that good at predicting what outcomes will make them feel a certain way. *Affective forecasting* research concerns people’s (in)ability to judge how they will feel in the future. People seem pretty good at predicting the valence of their feelings, that is whether they will feel positively or negatively. They correctly predict that they will feel anxious when taking their drivers’ license test and happy when they get married. Where people go wrong is in predicting how intensely or long they will feel that way (Wilson & Gilbert, 2005). Although it would be nice to predict precisely how one will feel in some circumstances, there may be advantages to mispredicting one’s feelings. Overestimating how intensely or long one will feel a certain way can motivate people to enact the behaviors they think will bring about the desired emotional state (Baumeister, Vohs, DeWall, & Zhang, 2008). People who think that they will feel miserable for

days if they fail an exam (or, gasp, even get a B) are exactly those people who are motivated to work extra hard to avoid that outcome. Yet, even if those people did fail (or get a disappointing B), affective forecasting research has demonstrated that the sadness would only last for a little while and not ruin the entire rest of the academic year as they might predict.

How people make decisions about their future selves is relevant to the topic of self-control. Choices with a self-control dimension typically have one option that is rewarding in the here-and-now pitted against another option that is costlier now but better for oneself in the future. Eating healthy, not smoking (or quitting smoking), exercising, and saving money are common examples of self-control choices. It is more enjoyable to eat French fries, smoke, lie on the couch, and gamble than it is not to do these things. Yet people's lives are happier when they avoid the easy, indulgent option and instead opted for the option that is more challenging now but more rewarding in the future (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014).

How Do Cognitive Processes Lead to Decision Errors?

An important theme in judgment and decision making is how different types of cognitive processing lead to different types of errors. Remember that judgment and decision making research often compares people's decisions against what would have been the logical choice or what option would make people better off in the long-run (i.e., normative decisions). In this section, we review classic phenomena in judgment and decision making organized into three themes for understanding how cognitive processes cause decision errors.

Decisions Errors Due to Not Enough Effortful Thought

The first theme, arguably the most pervasive, is that decision makers fail to put enough thought into their decisions to reach the best answers. Decision makers use a variety of cognitive strategies that range from simplistic (sometimes called intuitive) to effortful (sometimes called analytical). An influential framework is Kahneman's (Kahneman & Frederick, 2002) System 1 / System 2 distinction (Table 1). Using System 1 means to arrive at a judgment or decision relatively quickly, with little effort expended, and using the gist of the situation. Using System 2 means to arrive at a judgment or decision more slowly, after much conscious effort, and by making a detailed analysis. This section details how many decision making errors result from an overreliance on System 1 when decision makers should have been relying more on System 2.

One of the earliest demonstrations relates to likelihood judgments. The *availability bias* occurs when decision makers judge a possible event to be highly likely just because it is associated with information that was easy to conjure up in memory. For instance, people believe that words with *r* as the first letter are more common in English than are words with *r* as the third letter (Tversky & Kahneman, 1973). Words with *r* in the third position are actually more probable (trust us; or if you have a lot of time on your hands, sample the words on this page). Nonetheless, it is much easier to search one's memory for words marked by their first letter (the game Scattergories makes use of this) than by their third letter. The availability bias is a System 1 error, in that how easy it was to think of that information gives decision makers the sense that the outcome is common, which leads participants to stop at that point and form their judgment without further cognitive work.

Another example involves asking people to estimate the number of murders per year either across a whole state or a particular city in that state. One experiment had some people guess

how many murders happen each year in Michigan, whereas others estimated the number of murders each year in Detroit (Kahneman & Frederick, 2002). Guess which group's estimates were higher? Logically, the number of murders a year must be higher (or at worst exactly the same) for the entire state of Michigan than for the city of Detroit because Detroit is a city in Michigan. Yet people estimated that the median number of murders a year in Michigan is 100 compared to 200 in Detroit. People's judgments were logically inconsistent because they drew on different information. The stereotype of Detroit is of a rough, violent city, whereas the stereotype of Michigan is of a hearty Midwestern state with cold winters and tart cherries. Hence conjuring up different types of information about Michigan versus Detroit presumably made it seem that more murders would happen in Detroit than in Michigan. The converse happens when people find it difficult to think of information. Winkielman et al. (1998) asked some participants to recall 12 events from their childhood and others to recall four childhood events. Ironically, the group that thought of 12 events later rated themselves as less capable to remember their childhood compared to participants asked to recall only four events, despite having recalled three times as many memories. Retrieving 12 events from childhood is rather difficult to do and participants let those feelings of difficulty color their self-assessments.

The *representativeness heuristic* is another shortcut that people use when making judgments about probability. It occurs people judge an event as being probable because its appearance seems to fit the context. For instance, think about people who are asked to judge which sequence of five flips of a coin is likelier to occur: HTHHT or HHHHH (where H = heads; T = tails). The majority of people will say that the former is more likely to occur than the latter. But, statistically, both are equally probable because each flip of the coin offers a 50/50 chance of

heads or tails. In decision makers' minds, though, a series of coin flips showing both heads and tails seem more representative of a random pattern than when the series shows only heads.

One well-established mechanism that gives rise to decision making errors is *anchoring and adjustment*. Here, people do engage in System 2 but in insufficient amounts. A standard way to test anchoring and adjustment is to ask decision makers to first think about an arbitrary number (e.g., the last two digits of their social security number). Then they are presented with an object, for instance a bottle of wine (Ariely et al., 2003). They think back to the arbitrary number and then state whether the wine is worth more or less than this number. Last, they are asked to state a specific dollar amount they are willing to pay for the object. Even though decision makers know that the number they first considered had nothing to do with the wine's worth, that initial, irrelevant number influences how much people are willing to pay. People with higher social security number endings are willing to pay more money for the wine than people with lower social security number endings. We say that decision makers do not devote enough effortful cognitive energy to this task because they "anchor" on the initial number but fail to "adjust" sufficiently. This means that they think that they have moved away from the starting point enough but they are still being swayed by it.

Anchoring and adjustment is at work in many phenomena. For instance, can you remember seeing grocery store signs near discounted items that say "Limit X"? The number that is listed is likely to become an anchor that consumers seize on when asking themselves how many of that item they want. The higher the number on that sign, the more items consumers are likely to buy (Wansink, Kent, & Hoch, 1998). So too are interpersonal relations affected by anchoring and adjustment. Failing to take someone else's perspective has been said to result from people an-

choring on their own viewpoint and failing to adjust enough for others' perspectives (Epley et al., 2004).

The Cognitive Reflection Test (CRT) measures people's general tendencies to use System 2 processing to check and correct System 1 outputs (Frederick, 2005). To see how you might score, answer this CRT item: "A bat and a ball cost \$1.10. The bat costs \$1.00 more than the ball. How much does the ball cost? ____cents." For most people, a quick reading of this problem results in an intuitive, System 1 output of "10 cents." Did 10 cents spring to mind for you? If so, you probably went with your System 1 output. However, if you engaged System 2 elaborations to work test the \$.10 answer, you may have realized that the difference between 10-cents and \$1.00 is not, in fact \$1.00. Hence, the correct answer is \$.05. While CRT responses are correlated with indicators of intelligence, the measure seems more to represent cognitive style, as people who are skilled in basic arithmetic nonetheless routinely give the intuitive, System 1 response of \$.10 — often in surprising numbers. Samples of undergraduates recruited from selective (e.g., Ivy League) colleges typically show double-digit percentages of students who miss 3 out of 3 CRT questions. Those base rates suggest that most people are using System 1 much of the time, even in contexts, such as research experiments, where it is generally understood that they are being asked to think carefully and answer accurately. The CRT measure is useful as a way to track the effects of chronic dispositions in terms of System 2 correction of System 1, allowing for the important but often-overlooked perspective of individual differences in decision-making processes. The CRT is a robust and unique predictor of the tendency to use a wide variety of well-known heuristic decisions strategies, including many of those discussed in this chapter (Toplak et al., 2011). The CRT is also a fun way to trip up even your smart friends.

Summary. Heuristic decision strategies often sacrifice some decision accuracy but offer the benefit of reduced effort. However, putting a lot of effort into thinking does not guarantee error-free decision outcomes, as our second theme illustrates.

Theme 2: Increased Cognitive Processing Can Cause Error

The section above discusses research showing that decision error can result from not enough cognitive processing. This research suggests simple advice for decision makers: think more! Unfortunately for decision makers, but perhaps fortunately for judgment and decision making scholars who need interesting questions to research, getting rid of decision errors is not that easy.

This brings us to the second theme: thinking can itself cause errors. There are at least two explanations for why cognitive analysis can lead to decision error. First, some decision tasks may be inherently intuitive — meaning that the best decisions come from relying on one’s ‘gut feelings’ (Hammond et al., 1987). Second, people may use cognitive processing toward goals that lead them astray from making an accurate decision.

In an influential stream of research, researchers found that generating reasons for why a person made his or her choice can reduce the quality of that choice in terms of subsequent enjoyment or happiness. Wilson and Schooler (1991) told undergraduates that they were allowed to choose a poster to take home with them out of an array of posters. Some students were asked first, though, how they would go about choosing a poster – that is, to state the reasons for choosing a poster. Other students were simply allowed to choose. Researchers later went into students’ dorm rooms and saw that students who talked about how they would choose their poster were less likely to have the poster on their walls. Wilson and colleagues argued that the process of

coming up with reasons is inconsistent with the subsequent feelings-based experience of the posters. It seems that better decisions are made when the context in which people are placed while they make decisions (e.g., relying on feelings but not reasons) is highly similar to the context in which they will be experiencing those preferences (Payne, Bettman, & Schkade, 1999).

These and other findings have led to debate regarding the role of System 1 processing in decision making, one version of which is unconscious thought. Some researchers have made strong prescriptions regarding the superior benefits of unconscious thought in decision making (Dijksterhuis et al. 2006). Others, though, argue that those claims are overblown due to other factors, the result of which is erroneously ascribing conscious processes to unconscious thought (Newell & Shanks, 2014). For instance, a result that appears to show the benefit of unconscious deliberation could, instead, reflect decrements from artificially long periods of conscious thought forced by experimental procedures (Payne et al. 2008). That is, some findings that may seem to suggest System 1 processing is better may instead be a result of experimental conditions (e.g., forced, long deliberation times) that compare System 1 processing to flawed System 2 processing.

These debates illustrate how important it is to carefully assess both the specific thought processes and the fit between those processes and the judgment or decision at hand. For example, consider the hindsight bias, a robust effect whereby an uncertain event (e.g., the result of a political election) is believed to have been more easily predictable once the outcome of that event is known. Hence, someone who, in advance of the outcome of the 2016 US presidential election, would have been highly uncertain about who would win might, after the results are known, believe that she would have been able to predict Trump's win. Roese and Vohs (2012) discussed the

many processes that lead to the hindsight bias, with conscious processing providing one important source of the effect. They argue that, following outcome knowledge, people selectively misremember particular information (e.g., events that seem to support Trump's victory spring to mind after the victory is a foregone conclusion). Further, people then engage in processing aimed at sensemaking (e.g., using the remembered events to create a causal story that allows for a general sense of predictability and understanding of the event that occurred). Hindsight bias is one of the cases whereby more System 2 thought can impair the quality of decisions.

Decision makers who believe they will have to justify or be accountable to others for their decisions shift toward relying on System 2 processes more than they otherwise would. As you probably guessed from reading the previous section, accountability can improve decision quality because it offsets a heavy reliance on System 1 processes (Simonson & Nye, 1992). More counterintuitively, though, accountability can make decisions worse. Having to justify why you made a certain choice creates "choice based on reasons" in which people put too much thought towards thinking up justifications for their decisions and not enough thought on making the right choice. Using the attraction effect design, reviewed above, some people were told that they would have to explain to others why they chose as they did. Others made a choice among the same options but did not believe that they would have to justify their choice. People ready to justify their choice were swayed by the irrelevant option more than were people who chose without believing that they would have to justify their choice. Justifying one's choices can lead people to irrational decisions when people choose more on the basis of what is defensible and less on what is logical.

Summary. Although conscious thought is an important aspect of good decision making, it can go astray — and often in predictable ways. Reasons can disrupt decision making and accountability can introduce unhelpful goals.

Theme 3: Emotion Versus Cognition

While there are numerous ways to define and classify thought processes during decision making, one theme that has made inroads to judgment and decision making is whether those thoughts are emotional versus cognitive. The third theme we address is whether and how emotional decision making causes decision error.

Historically, judgment and decision making approaches have depicted decision making as a cold, cognitive process. Yet it would be remiss to ignore the fact that many decisions are made with — if not because of — emotional input. The question of when and how emotion plays a role in decision making also implicates the intuitive versus analytical reasoning divide mentioned in Themes 1 and 2. A classic debate in the 1980s pitted two theories of emotion against each other: Robert Zajonc (1980) claimed that “preferences need no inferences,” (which speaks to System 1 being active) whereas Richard Lazarus (1981) retorted with a “cognitivist's reply” (which speaks to System 2 being active). The debate can be resolved by agreeing that both routes coexist. Baumeister, Vohs, DeWall, and Zhang (2007) nominated the term *affect* for low-level, nonconscious, positive versus negative twinges and the term *emotion* for full-blown feeling states, and we use these labels in this chapter. Below we discuss how each can produce decision error.

Intuitive, Affective Processes. One influential model argued that decision makers' judgments about risky decisions are driven by the affect associated with the options. For instance, if positive affect arises when a decision maker thinks about skiing then this will likely increase

judgments of its benefits but curtail an analysis of its riskiness. On the other hand, the negative affect connected to the idea of a nuclear power plant increase judgments of its riskiness (Slovic et al., 2007).

Sometimes getting people in an emotional mindset leads them to make erroneous decisions. One set of researchers asked some people to state how much money they wanted to donate to save one panda, whereas others were asked how much money they wanted to donate to save four. For some participants, the panda bears in question were portrayed by black dots (either one or four), whereas other participants saw adorable pictures of pandas (again, one or four). The participants who saw the pandas as black dots said that they would donate more money to save four than save one, which is a logical response. But the participants who saw the pandas as pictures pledged to donate the same amount to save one of them as they did to save four of them (Hsee & Rottenstreich, 2004). The researchers argued that portraying pandas as cute and lovable brought people into an affective mode that made them ignore quantity and treat all the pandas the same. When pandas were described in plain, cold, non-emotional terms, participants' decisions about how much money would be needed to save them became sensitive to quantity and they pledged more money to save more bears.

Other evidence supports the idea being in an affective mindset changes decisions that are completely independent of the affect being felt. This is called a *misattribution* effect because people mistakenly carryover their current state (e.g., their feelings) to an unrelated judgment they are asked to make. A classic misattribution finding shows that after people read stories that elicited a negative mood they made more pessimistic judgments about the risk involved in various fatalities, even those with no logical relation to the source of the mood (Johnson & Tversky,

1983). Another classic misattribution finding demonstrated that people judge their lives to be happier with their lives overall when asked on sunny (versus rainy) days (Schwarz & Clore, 1983). This difference presumably occurs because people use their feelings about the day's weather to make judgments about their life overall. Other research extended this weather effect to university admissions officers' judgments (Simonsohn, 2010). On sunny days, admission officers give more weight to whether the applicant has social or extracurricular activities on his or her application whereas on overcast days they consider more heavily the applicant's academic record.

Carryover findings suggest that low-level affective states subtly alter decision makers' perceptions and goals. It is important to recognize that these carry over to influence other decisions and judgments, which affects a broad variety of outcomes (Lerner et al. 2015). For instance, initial experiences of sadness carry over to increase financial impulsivity whereas carried-over disgust does not (Lerner, Li, & Weber, 2013). While both are negative emotions, sadness apparently triggers goals to obtain immediate, perhaps mood-lifting, rewards.

Analytical Processes. Although psychological processes are often broken down into "emotional versus rational," anyone familiar with the concept of rumination can attest that more conscious cognitive activity does not necessarily mean less emotional experience. In fact, some emotions may be fueled by analytical processes.

Perhaps the emotion with the most sustained interest to judgment and decision making scholars is regret. Strategies to avoiding regret are said to be analytical (not intuitive) because people engage in counterfactuals, which are mental simulations of what might happen in the future. Simonson (1992) found that asking people to think about whether they would regret a deci-

sion made them choose safer options. For instance, thinking about whether they may regret their choice led participants to prefer a product with a sale price now as opposed to waiting for a potentially better sale but with the risk that one that may lose out on the discount altogether. Shoppers also chose a highly regarded brand of videocassette recorder over an unknown brand that was cheaper when reminded that they may regret their choice later. People can imagine that they will feel more regret if they made a risky decision as opposed to a safer one, so they avoid risky options so as to attenuate regret that they might feel about the decision in the future.

People put a lot of thought into the regret they feel about past behaviors too. One experiment investigated what kinds of decisions people have regretted. People reported regretting mistakes that involved actions (e.g., saying the wrong thing) soon after they performed the action but regretted mistakes involving inaction (e.g., not earning a graduate degree) after a long time has passed (Gilovich & Medvec, 1995). This means that as you get nearer to the end of life, you might regret the goals that you never pursued; but right now most of your regret revolves around acts like getting drunk and behaving foolishly at a party last weekend.

People also need to manage the emotions that arise while making decisions, and this can be a problem when the decision itself brings up negative emotions. Luce (1998) showed that people were more likely to choose the default option or be swayed by an irrelevant choice in the attraction effect when the decision situation itself elicited bad feelings. People want the negative feelings to end. Since the negative feelings stem from the decision at hand, people use readily-available cues, such as whichever option was the preselected default option, to get the decision over with and, as a result, alleviate their negative feelings. Hence, decision biases are exacerbated.

Summary. Conscious emotion and low-level affect both can cause decision errors. Low-level affect can substitute for cognitive analysis during decision making. Conscious emotions can give rise to emotion goals (e.g., avoid regret or diminish negative emotions). One final note is that although emotion can lead to decision errors, it does not always do so. Emotion can act as an important signal of what is important to the decision maker and in that sense it can steer behaviors toward worthy goals (e.g., Baumeister et al., 2007). Most work on emotion and decision making has focused on emotion's role in decision errors. Emphasis on emotion-driven errors reflects the judgment and decision making field's roots in exploring deviations from assumptions of rationality rather than necessarily reflecting emotion's general role in decision making.

Judgment and Decision Making Today: Improving Decision Quality

One major thrust emerging from the field of judgment and decision making today is to not only identify decision errors but to find corrections for them. The study of judgment and decision making has been interdisciplinary from the start, including policy-oriented practitioners as well as basic social scientists. The policy-oriented arm of judgment and decision making is what prompts scholars to find processes that will help decision makers to avoid decision errors. In judgment and decision making today, basic science and policy intersect better than ever before, applying judgment and decision making principles to explain and aid decision problems outside the laboratory.

The field of judgment and decision making began as a field focused on debate between economists' views of "rational man" and psychologists' views of "imperfectly rational man." For many decades, the field was largely focused on identifying decision effects (e.g., framing, misattribution) that illustrated how rational decision makers were or were not. Today, the field is firm-

ly rooted in a rich, psychological view of judgments and decisions and shifting towards more comprehensive views of decisions as complex and flexible psychological processes. It remains to be seen whether these newer views will usurp expected utility and prospect theories. But certainly, by moving beyond debates about whether decision makers are rational, judgment and decision making research is opening up to richer process explanations of decision making.

Richer, more comprehensive views of decision making have lent themselves to understanding the decisions that underlie important societal problems. For instance, the medical and pharmaceutical industries lament the low rate at which people take their medications. One sticking point for patients is when they are low on medication and need to have their prescription refilled. Multiple small steps are involved to do this: patients have to call to order the prescription to be refilled, go to their neighborhood pharmacy, wait in line, and pay for it. Judgment and decision making scientists know that each step means that people are less likely to follow through in getting their medicines. A series of small decisions (e.g., go to the pharmacy versus go grocery shopping) can mean that people lose sight of the importance of their health goal. To help with this, some plans have started shipping patients' medications to their home on a regular basis. (There is an option for patients to say that they do not want to have their medications shipped to their homes for those who still want to visit the pharmacy.) These plans take advantage of the default effect, which removes all those small decisions that were once needed in order to get a prescription filled. The hope is that very few patients will actively choose not to have their medications shipped to their homes, which would result in many patients having their medications on hand when they need to take them.

An integration of judgment and decision making principles with other disciplines is also at the forefront of research today. The organization to which judgment and decision making scholars belong is the Society for Judgment and Decision Making (sjdm.org), which partners with the Society for Medical Decision Making (smdm.org) to study health care, wellness, and physician and patient decision making. Work in this area is aimed at improving health care outcomes by using clinical studies and judgment and decision making ideas to sway patients, researchers, and the politico. Assessing health-related utility is important for these researchers, an example of which involves asking people to make comparisons about living a long time in an impaired health state versus living a shorter life in perfect health.

Social Psychology Can Improve the Study of Judgment and Decision Making

Social psychology brings much to the study of judgment and decision making. Perhaps because social psychology never adhered to the notion of a perfectly rational mind, it underscores the importance of processes that do not fit neatly into mathematical models. Emotion and motivation are two areas to which this comment applies. Judgment and decision making would benefit from incorporating a host of emotions (other than regret) into their theories of decision making (Lerner et al., 2015). The realization that people's decisions reflect their motivation to achieve a multitude of personal and interpersonal goals is a concept not fully embraced by judgment and decision making scholars. But this idea is quite amenable to the field of judgment and decision making because it recognizes that decisions function to maximize goals. Making use of the notion of goals in decision making will also help with the problem of integrating emotion and cognitive influences into decision making.

The field of judgment and decision making also could learn from social psychology the value in gathering seemingly isolated phenomena into overarching theories. Again perhaps because judgment and decision making scholars were fighting against the idea that decision making is rational, they failed to adopt loftier views of the psyche and the role of judgment and decision making in it. Social psychology and judgment and decision making share common challenges in terms of the struggle between approaching science by finding phenomena and by creating unifying theories. Social psychology's success in building grander theories could provide a roadmap for the field of judgment and decision making.

Social Psychology Can Be Improved by Studying Judgment and Decision Making

Judgment and decision making scholars have approached their discipline with an emphasis on basic phenomena, an emphasis from which the field of social psychology could benefit. A similar note applies to the importance placed on attempting to correct errors, which judgment and decision making does far more than social psychology. There is at times a sense from the field of judgment and decision making that social psychology does not value testing their theories under rich, naturalistic conditions nor on improving people's welfare with their science. The field of social psychology would almost surely have a greater impact on policy and everyday people's lives if it got out of the lab and tried to make life better for folks.

The study of social psychology could also be improved by studying judgment and decision making. Social psychology for the most part fails to grasp the importance of the act of making a decision and the impact that decision mistakes have on people's behavior. The example of battered women returning to their abusive partners illustrates that decision making is wildly important to relationship and life outcomes. Social psychological theories would be well served by

tracking the decision processes that people go through and social psychologists may find new avenues for understanding their favorite topic of study.

In Closing: Big Ideas. The topics and methods of study that judgment and decision making scholars use have the potential to be applied to big ideas. New insights on genocide came about because Paul Slovic (2007) incorporated ideas of how the emotion system reacts — actually, overreacts — to tragedy, a theory that was informed in part by social psychological ideas about emotions. Slovic found that the distress of seeing one victim is so great that adding a second victim, paradoxically, lessens the distress that people feel because the overwhelming emotion prompts them to disengage from the situation. Hence, the use of judgment and decision making helps to explain a tragically massive problem, with implications for mobilizing the political will to help genocide victims.

In addition to big ideas, there are opportunities for big interventions. Following Slovic's insights, a recent study indicates that training people to use cognition to reduce emotion can aid endorsement of conciliatory policies in the Israeli-Palestinian conflict (Halpern et al 2012). In one of the widest-reaching set of developments, real policy action is making use of findings from the field of judgment and decision making. Following the popularity of Thaler and Sunstein's (2009) *Nudge* book. For instance, the British Cabinet Office, World Bank, and Australian government all have created teams (often called nudge units) charged with leveraging behavioral science to foster positive social outcomes. The U.K. unit reports studies on a wide array of prosocial topics such as evaluating energy savings from smart thermostats, testing direct mail interventions to increase college applications by talented yet impoverished potential scholars, or deconstructing complex behaviors in order to identify interventions to improve health outcomes

while saving money. As social psychology and judgment and decision making continue to merge, we expect increasingly impactful insights into societies' biggest problems.

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Table 1. System 1 versus System 2: What they are and what they do

System 1	System 2
Defining Features	
Automatic	Time-Intensive
Effortless	Effortful
Parallel	Serial
Reasons by association	Reasons by application of logic and rules
Intuitive	Analytical
Experiential	Rational
Holistic	Piecemeal
Contributions to Decision Errors	
Perceptual errors: The psychological impact of losses is bigger than that of gains.	Cognitive Errors: Devoting much effort to deciding can hamper prediction of one's own preferences.
People substitute how easy it is for information to come to mind for trying to find base rates. People substitute the representativeness of an instance for logic.	There are times in which it is better to devote less effort even if it means sacrificing decision accuracy.
Feelings	
Preferences need no inferences: Feelings of good and bad arise very quickly.	Full blown emotions contain cognition and emotion and are distinguishable from one another.
Affect can automatically carry over to related decision such as when fearful individuals make pessimistic judgments.	Negative emotions such as regret are explicitly anticipated and avoided.