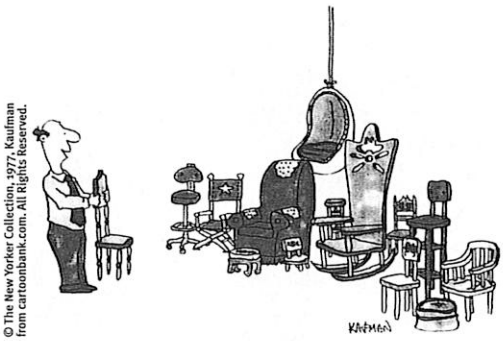
Thinking : Decision-Making : Myers Textbook



"Attention, everyone! I'd like to introduce the newest member of our family."

Concepts

OBJECTIVE 2 | Describe the roles of categories, hierarchies, definitions, and prototypes in concept formation.

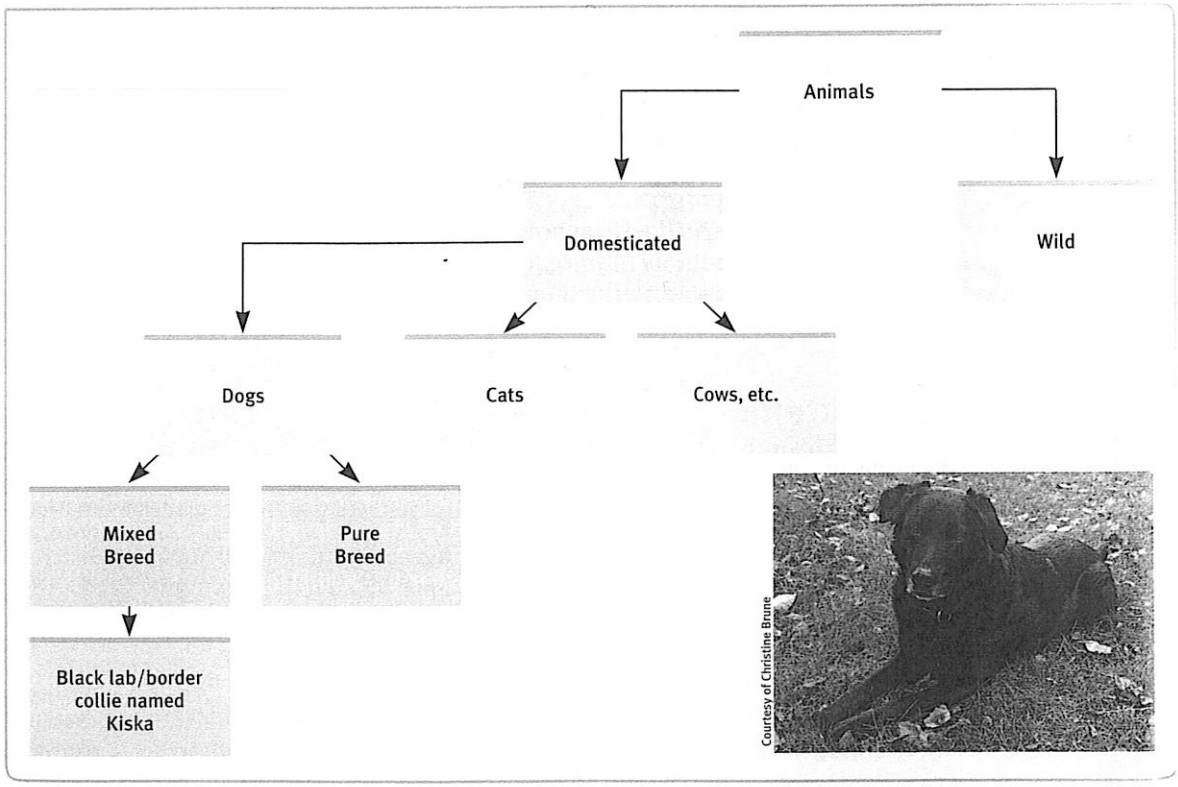
To think about the countless events, objects, and people in our world, we simplify things. We form **concepts**—mental groupings of similar objects, events, and people. The concept *chair* includes a variety of items—a baby's high chair, a reclining chair, the chairs around a dining room table, a dentist's chair—all of which are for sitting. Chairs vary, but it is their common features that define the concept of *chair*.

Imagine life without concepts. We would need a different name for every object and idea. We could not ask a child to "throw the ball" because there would be no concept of *ball* (or *throw*). Instead of saying, "They were angry," we would have to describe facial expressions, vocal intensities, gestures, and words. Such concepts as *ball* and *angry* provide us with much information without much cognitive effort.

To simplify things further, we organize concepts into category *hierarchies* (**FIGURE 10.1**). Cab drivers organize their cities into geographical sectors, which subdivide into neighborhoods and again into blocks. Once our categories exist, we use them efficiently. Shown a bird, car, or food, people need no more time to identify an item's category than to perceive that something is there. "As soon as you know it is there, you know what it is," report Kalanit Grill-Spector and Nancy Kanwisher (2005).

We form some concepts by *definition*. Told the rule that a triangle has three sides, we thereafter classify all three-sided geometric forms as triangles. More often, however, we form our concepts by developing **prototypes**—a mental image or best example that incorporates all the features we associate with a category (Rosch, 1978). The more closely something matches our prototype of a concept, the more readily we recognize it as an example of the concept. A robin and a goose both satisfy our definition

FIGURE 10.1
Category hierarchy
Organizing our mental categories into hierarchies helps us think about them.

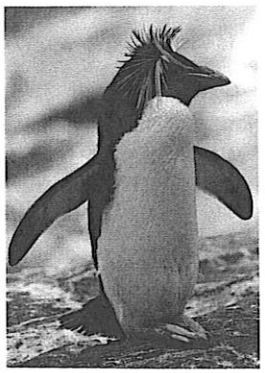


of *bird:* a two-footed animal that has wings and feathers and hatches from an egg. Yet people agree more quickly that "a robin is a bird" than that "a goose is a bird." For most of us, the robin, with its smaller beak and overall size, and its easier flight, is the birdier bird; it more closely resembles our bird prototype.

Once we place an item in a category, our memory for it later shifts toward the category prototype. Olivier Corneille and his colleagues (2004) found memory shifts after showing Belgian students ethnically mixed faces. For example, when shown a face that was a blend of 70 percent of the features of a Caucasian person and 30 percent of an Asian person, people categorized the face as Caucasian and later recalled having seen a more prototypically Caucasian person. (They were more likely to recall an 80 percent Caucasian face than the 70 percent Caucasian they actually saw.) If shown a 70 percent Asian face, they later recalled a more prototypically Asian face (**FIGURE 10.2**). A follow-up study found the phenomenon with gender as well. For example, those shown 70 percent male faces categorized them as male (no surprise there), and then later misrecalled them as even more prototypically male (Huart & others, 2005).

Move away from our prototypes, and categories may have fuzzy boundaries. Is a whale a mammal? Is a tomato a fruit? Is a 17-year-old female a girl or a woman? Are penguins and kiwis birds? Because these nonflying creatures fail to match our prototype, we are slower to recognize them as birds. Similarly, we are slow to perceive an illness when our symptoms don't fit one of our disease prototypes (Bishop, 1991). People whose heart attack symptoms (shortness of breath, exhaustion, a dull weight in the chest) don't match their prototype of a heart attack (sharp chest pain) may not seek help. And when discrimination doesn't fit our prejudice prototypes—of White against Black, male against female, young against old—we often fail to notice it. People more easily detect male prejudice against females than female against males or female against females (Inman & Baron, 1996; Marti & others, 2000).

Daniel J. Cox/Liaison/Getty Images



J. Messerschmidt/The Picture Cube

A bird and a . . . ?
If asked to imagine a bird, most people quickly come up with a mental picture that is something like this American robin. It takes them a bit longer to conceptualize a penguin as a bird because it doesn't match their prototype of a small, feathered, flying creature.

Courtesy of Olivier Corneille

90% CA 80% CA 70% CA 60% CA 50%/50% 60% AS 70% AS 80% AS 90% AS

FIGURE 10.2
Face categorization influences our recollection
For example, shown a face that was 70 percent Caucasian, people tended to classify the person as Caucasian and to recollect the face as more Caucasian than it was. (From Corneille & others, 2004.)

Solving Problems

OBJECTIVE 3 | Compare algorithms and heuristics as problem-solving strategies, and explain how insight differs from both of them.

One tribute to our rationality is our ability to form and use concepts. Another is our skill at solving problems as we cope with novel situations. What's the best route around this traffic jam? How shall we respond to a friend's criticism? How can we get into the house when we've lost our keys?

Some problems we solve through trial and error. Thomas Edison tried thousands of light bulb filaments before stumbling upon one that worked. For other problems, we may follow an **algorithm,** a step-by-step procedure that guarantees a solution.

concept a mental grouping of similar objects, events, ideas, or people.

prototype a mental image or best example of a category. Matching new items to the prototype provides a quick and easy method for including items in a category (as when comparing feathered creatures to a prototypical bird, such as a robin).

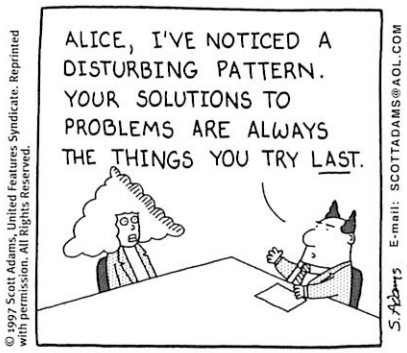
algorithm a methodical, logical rule or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*.

Heuristic searching
To search for guava juice you could search every supermarket aisle (an algorithm) or check the bottled beverage, natural foods, and produce sections (heuristics). The heuristic approach is often speedier, but an algorithmic search guarantees you will find it eventually.


B2M Productions/Digital Vision/Getty Images

Told to find another word using all the letters in *SPLOYOCHYG*, we could try each letter in each position, but generating and examining the 907,200 resulting permutations would be exasperating. Because step-by-step algorithms can be laborious (well-suited to computers), we often solve problems with simple strategies called **heuristics.** Thus, in rearranging the letters of *SPLOYOCHYG*, we might exclude letter combinations such as two *Y*'s together. By using heuristics to reduce the number of options, and then applying trial and error, you may hit upon the answer (page 404).

Sometimes we are unaware of using any problem-solving strategy; the answer just comes to us. We can all recall occasions when we puzzled over a problem. Then, suddenly, the pieces fell together and we perceived the solution. Such sudden flashes of inspiration we call **insight.** Ten-year-old Johnny Appleton displayed insight in solving a problem that had stumped construction workers: how to rescue a young robin that had fallen into a narrow 30-inch-deep hole in a cement-block wall. Johnny's solution: to slowly pour in sand, giving the bird enough time to keep its feet on top of the constantly rising sand (Ruchlis, 1990).



A team of researchers, including psychologists Mark Jung-Beeman, John Kounios, and Edward Bowden (2004), have identified brain activity associated with sudden flashes of insight. They gave people sets of three words, such as *pine, crab, sauce,* and asked them to think of another word that could form a compound word or phrase with each. Participants pressed a button when they achieved the solution (in this case: *apple*). About half the solutions were by a sudden Aha! insight. The researchers mapped either the location of the brain's associated neural activity (using fMRI) or its electrical signature (using EEG). When the solutions occurred with sudden insight, both methods showed a burst of activity in the right temporal lobe, just above the ear (**FIGURE 10.3**). One type of brain activity, which seemingly corresponded to the unconscious processing popping into a conscious insight, preceded the button pressing by about 0.3 second.

Insight provides a sense of satisfaction. After solving a difficult problem or discovering how to resolve a conflict, we feel happy. The joy of a joke may similarly lie in our capacity for insight—our sudden comprehension of an unexpected ending or a double meaning, as illustrated in the two jokes rated funniest (among 2 million ratings of 40,000 submitted jokes) in an Internet humor study co-sponsored by Richard Wiseman (2002) and the British Association for the Advancement of Science. First, the runner-up:

> Sherlock Holmes and Dr. Watson are going camping. They pitch their tent under the stars and go to sleep. Sometime in the middle of the night Holmes wakes Watson up.

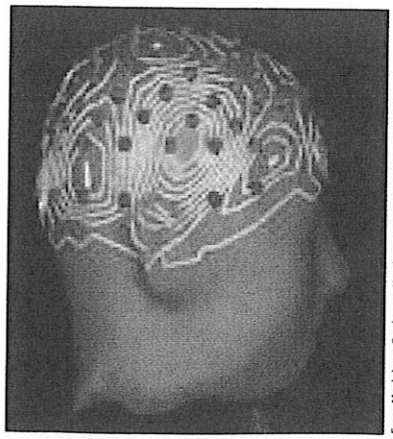

From Mark Jung-Beeman, Northwestern University and John Kounios, Drexel University

FIGURE 10.3
The Aha! moment
A burst of right temporal lobe activity accompanies insight solutions to word problems.

Holmes: "Watson, look up at the stars, and tell me what you deduce."
Watson: "I see millions of stars and even if a few of those have planets, it's quite likely there are some planets like Earth, and if there are a few planets like Earth out there, there might also be life. What does it tell you, Holmes?"
Holmes: "Watson, you idiot, somebody has stolen our tent!"

And roll the drums for the winner:

> A couple of New Jersey hunters are out in the woods when one of them falls to the ground. He doesn't seem to be breathing, his eyes are rolled back in his head. The other guy whips out his cell phone and calls the emergency services. He gasps to the operator: "My friend is dead! What can I do?" The operator, in a calm, soothing voice says: "Just take it easy. I can help. First, let's make sure he's dead." There is a silence, then a shot is heard. The guy's voice comes back on the line: "OK, now what?"

Obstacles to Problem Solving

OBJECTIVE 4 | Contrast confirmation bias and fixation, and explain how they can interfere with effective problem solving.

Inventive as we can be in solving problems, the correct answer may elude us. Two cognitive tendencies—*confirmation bias* and *fixation*—often lead us astray.

Confirmation Bias A major obstacle to problem solving is our eagerness to search for information that confirms our ideas, a phenomenon known as **confirmation bias.** Peter Wason (1960) demonstrated this tendency by giving British university students the three-number sequence 2-4-6 and asking them to guess the rule he had used to devise the series. (The rule was simple: any three ascending numbers.) Before submitting their answers, the students generated their own sets of three numbers, and each time Wason told them whether their sets conformed to his rule. Once they had done enough testing to feel *certain* they had the rule, they were to announce it. The result? Seldom right but never in doubt. Most of Wason's students convinced themselves of a wrong rule. Typically, they formed a wrong idea ("Maybe it's counting by twos") and then searched only for confirming evidence (by testing 6-8-10, 100-102-104, and so forth).

Such experiments reveal that we seek evidence verifying our ideas more eagerly than we seek evidence that might refute them (Klayman & Ha, 1987; Skov & Sherman, 1986). Business managers, for example, are more likely to follow the successful careers of those they once hired than to track the achievements of those they rejected, leading them to confirm their own perceived hiring ability. "Ordinary people," said Wason (1981), "evade facts, become inconsistent, or systematically defend themselves against the threat of new information relevant to the issue."

The results of doing so sometimes are momentous. The United States launched its war against Iraq on the assumption that Saddam Hussein possessed weapons of mass destruction (WMD) that posed an immediate threat. When that assumption turned out to be false, flaws in the judgment process identified by the bipartisan U.S. Senate Select Committee on Intelligence (2004) included confirmation bias. Administration analysts "had a tendency to accept information which supported [their presumptions] . . . more readily than information which contradicted" them. Sources denying such weapons were deemed "either lying or not knowledgeable about Iraq's problems, while those sources who reported ongoing WMD activities were seen as having provided valuable information."

Fixation Try your hand at these two classic brainteasers:

- Arrange the six matches shown in **FIGURE 10.4** so they will form four equilateral triangles.
- How can you use the box of matches, thumbtacks, and candle shown in **FIGURE 10.5** (page 400) to mount the candle on a bulletin board? (Read on after trying these problems.)

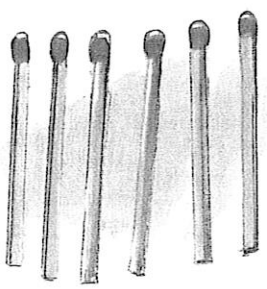
heuristic a simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error-prone than *algorithms*.

insight a sudden and often novel realization of the solution to a problem; it contrasts with strategy-based solutions.

confirmation bias a tendency to search for information that confirms one's preconceptions.

> The human understanding, when any proposition has been once laid down . . . forces everything else to add fresh support and confirmation."
>
> Francis Bacon, *Novum Organum*, 1620

FIGURE 10.4
The matchstick problem
How would you arrange six matches to form four equilateral triangles?



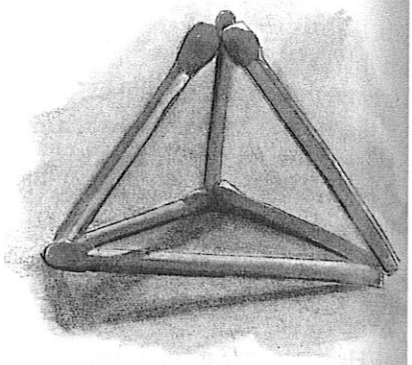


FIGURE 10.5
The candle-mounting problem
Using these materials, how would you mount the candle on a bulletin board? (From Duncker, 1945.)

FIGURE 10.6
Solution to the matchstick problem
To solve this problem, you must break the fixation of limiting your considerations to two-dimensional solutions.

Fixation—the inability to see a problem from a fresh perspective—is a true impediment to problem solving. Once we incorrectly represent the problem, it's hard to restructure how we approach it. If your attempts to solve the matchstick problem were fixated on two-dimensional solutions, then the three-dimensional solution shown in **FIGURE 10.6** will have eluded you.

Two examples of fixation are *mental set* and *functional fixedness*. As a perceptual set predisposes what we perceive, a **mental set** predisposes how we think. Mental set refers to our tendency to approach a problem with the mindset of what has worked for us previously. Indeed, solutions that worked in the past often do work on new problems. Consider:

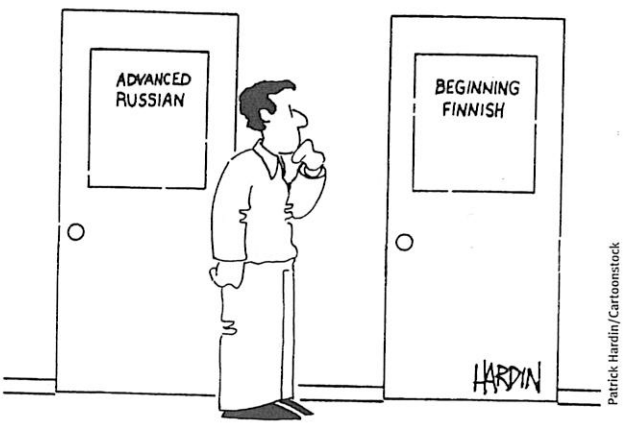
Given the sequence *O-T-T-F-?-?-?*, what are the final three letters?

Most people have difficulty recognizing that the three final letters are *F*(ive), *S*(ix), and *S*(even). But solving this problem may make the next one easier:

Given the sequence *J-F-M-A-?-?-?*, what are the final three letters? (If you don't get this one, ask yourself what month it is.)

Sometimes, however, our mental set based on what worked in the past precludes our finding a new solution to a new problem. Our mental set from past experience with matchsticks predisposes our arranging them in two dimensions.

Another type of fixation—our tendency to think of only the familiar functions for objects, without imagining alternative uses—goes by the awkward but appropriate label **functional fixedness.** A person may ransack the house for a screwdriver when a dime would have turned the screw. Perhaps you experienced functional fixedness when you tried to solve the candle-mounting problem. If you thought of the matchbox as having only the function of holding matches, you may have overlooked its use shown in **FIGURE 10.7** (page 402). Perceiving and relating familiar things in new ways is part of creativity. Much as stereotypes constrain our perception of people (we may forget that firefighters are also first aid experts and may be good cooks), so fixation constrains our perceptions of objects. Both stereotypes and fixation limit our thinking.



Mental set
The mental set created by reading the first door may predispose how one reads the second door.

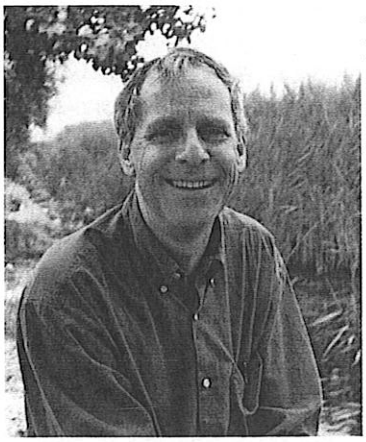
Making Decisions and Forming Judgments

When making each day's hundreds of judgments and decisions—Is it worth the bother to take an umbrella? Can I trust this person? Should I shoot the basketball or pass to the player who's hot?—we seldom take the time and effort to reason systematically. We just follow our intuition. After interviewing policymakers in government, business, and education, social psychologist Irving Janis (1986) concluded that they "often do not use a reflective problem-solving approach. How do they usually arrive at their decisions? If you ask, they are likely to tell you . . . they do it mostly by *the seat of their pants*."

Using and Misusing Heuristics

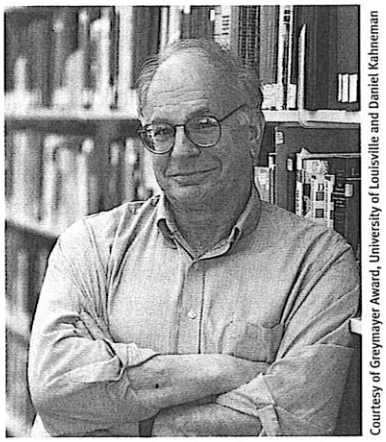
OBJECTIVE 5 | Contrast the representativeness and availability heuristics, and explain how they can cause us to underestimate or ignore important information.

Those mental shortcuts we call heuristics often do help us make reasonable seat-of-the-pants decisions. When quick action is needed, analysis can mean paralysis. Thanks to the mind's automatic information processing, intuitive judgments are instantaneous. But the price we sometimes pay for this efficiency—quick but bad judgments—can be costly. To gain an idea of how heuristics determine our intuitive judgments—and how they occasionally lead even the smartest people into dumb decisions—consider two heuristics identified by cognitive psychologists Amos Tversky and Daniel Kahneman (1974): *representativeness* and *availability*.



Courtesy of Greymayer Award, University of Louisville and the Tversky family

Amos Tversky, 1937–1996



Courtesy of Greymayer Award, University of Louisville and Daniel Kahneman

Daniel Kahneman

The Representativeness Heuristic To judge the likelihood of things in terms of how well they represent particular prototypes is to use the **representativeness heuristic.** To illustrate, consider:

> A stranger tells you about a person who is short, slim, and likes to read poetry, and then asks you to guess whether this person is more likely to be a professor of classics at an Ivy League university or a truck driver (adapted from Nisbett & Ross, 1980). Which would be the better guess?

If you are like most people, you answered "professor" because the description seems more *representative* of Ivy League scholars than of truck drivers. The representativeness heuristic enabled you to make a snap judgment. But it also led you to ignore other relevant information. When I help people think through this question, the conversation goes something like this:

Question: First, let's figure out how many professors fit the description. How many Ivy League universities do you suppose there are?

Answer: Oh, about 10, I suppose.

fixation the inability to see a problem from a new perspective; an impediment to problem solving.

mental set a tendency to approach a problem in a particular way, often a way that has been successful in the past.

functional fixedness the tendency to think of things only in terms of their usual functions; an impediment to problem solving.

representativeness heuristic judging the likelihood of things in terms of how well they seem to represent, or match, particular prototypes; may lead one to ignore other relevant information.

In creating these problems, we didn't set out to fool people. All our problems fooled us, too."

Amos Tversky (1985)

Intuitive thinking [is] fine most of the time. . . . But sometimes that habit of mind gets us in trouble."

Nobel laureate Daniel Kahneman (2005)

The information-processing shortcuts—called heuristics—which are normally both highly efficient and immensely time-saving in day-to-day situations, work systematically against us in the marketplace. . . . The tendency to underestimate or altogether ignore past probabilities in making a decision is undoubtedly the most significant problem of intuitive predictions."

David Dreman, *Contrarian Investment Strategy: The Psychology of Stock Market Success*, 1979

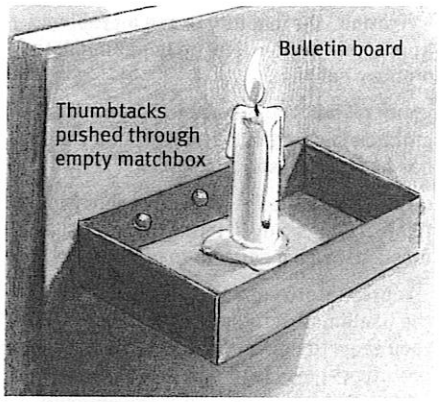
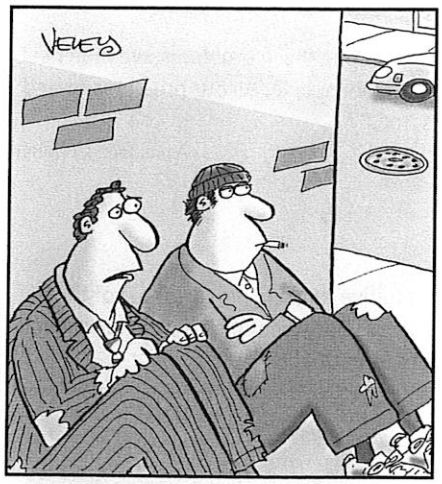


FIGURE 10.7
Solution to the candle-mounting problem
Solving this problem requires recognizing that a box need not always serve as a container. (From Duncker, 1945.)

Question: How many classics professors would you guess there are at each?
Answer: Maybe 4.
Question: Okay, that's 40 Ivy League classics professors. What fraction of these are short and slim?
Answer: Let's say half.
Question: And, of these 20, how many like to read poetry?
Answer: I'd say half—10 professors.
Question: Okay, now let's figure how many truck drivers fit the description. How many truck drivers do you suppose there are?
Answer: Maybe 400,000.
Question: What fraction are short and slim?
Answer: Not many—perhaps 1 in 8.
Question: Of these 50,000, what percentage like to read poetry?
Answer: Truck drivers who like poetry? Maybe 1 in 100—oh, oh, I can see where this is going—that leaves me with 500 short, slim, poetry-reading truck drivers.
Comment: Yup. So, although the person I've described may be much more representative of classics professors than of truck drivers, this person is still (even if we accept your stereotypes) 50 times more likely to be a truck driver than a classics professor.

The representativeness heuristic influences many of our daily decisions. To judge the likelihood of something, we intuitively compare it with our mental representation of that category—of, say, what truck drivers are like. If the two match, that fact usually overrides other considerations of statistics or logic.



"The problem is I can't tell the difference between a deeply wise, intuitive nudge from the Universe and one of my own bone-headed ideas!"

The Availability Heuristic The **availability heuristic** operates when we base our judgments on how mentally available information is. If instances of an event are easily available—if they come to mind quickly and with little effort—we presume such events are common. The faster people can remember an instance of some event ("a broken promise"), the more they expect it to recur (MacLeod & Campbell, 1992). Cognitively available events *are* more likely to recur—but not always. To see this, make a guess: Does the letter *k* appear more often as the first or third letter in English usage?

Because words beginning with *k* come to mind more easily than words having *k* as their third letter, most people guess that *k* occurs more frequently as the first letter. Actually, *k* is much more likely to appear as the third letter. So far in this chapter, words such as *know, kingdom,* and *kin* are outnumbered 50 to 15 by words such as *make, likely, asked,* and *acknowledged.*

Why does the availability heuristic lead us astray? Anything that increases the ease of our retrieving information can increase its perceived availability. Many factors enable information to "pop into mind." These include how recently you heard about it, its distinctiveness, and its concreteness. Thus, an event's availability to our memory need not indicate its likelihood in reality.

The judgmental errors influenced by the availability heuristic are not always harmless. A lot of important decisions involve judgments of risk (See Thinking Critically About: The Fear Factor, page 404.) Whether we favor using nuclear power or burning coal to produce energy depends partly on our judgments of their risks to our health, our air, and our climate. Our efforts to prevent various deadly diseases depend on our judgments of the likelihood of their occurrence. Our choice to buy or not to buy a lottery ticket depends on our hunch of the odds of striking it rich. Casinos entice us to gamble by signaling even small wins with bells and lights—making them vividly memorable—while keeping big losses soundlessly invisible. In such ways, hucksters can manipulate the intuitive hopes and fears of anyone naive about statistics.

The availability heuristic also affects our social judgments, as Ruth Hamill and her co-workers demonstrated (1980). They presented people with a single, vivid case of welfare abuse, in which a long-term welfare recipient had several unruly children.

Based on the roughly 10-million-to-1 odds against a bet's winning a state Lotto jackpot, one's chances are not much better than the odds of being struck by lightning. If you are an average British citizen and you place a bet in the National Lottery, the odds of your dying during the 20-minute National Lottery draw program on television are several times greater than the odds of your winning (*Chance News*, 1999).

Statistically, this case was exceptional: Most people who received welfare did so for four years or less (Duncan & others, 1988). Yet when the statistical reality was pitted against the single vivid case, the memorable case had greater influence on people's opinions about welfare recipients.

Overconfidence

OBJECTIVE 6 | Describe the drawbacks and advantages of overconfidence in decision making.

Our use of intuitive heuristics when forming judgments, our eagerness to confirm the beliefs we already hold, and our knack for explaining away failures combine to create **overconfidence,** a tendency to overestimate the accuracy of our knowledge and judgments. Across various tasks, people overestimate what their performance was, is, or will be (Metcalfe, 1998).

In a classic study of overconfidence, Kahneman and Tversky (1979) asked people to answer obscure factual questions with a wide enough range to surely include the actual answer. The questions had this format: "I feel 98 percent certain that the population of New Zealand is more than _____ but less than _____." Nearly one-third of the time, people's estimates, made with 98 percent confidence, failed to include the correct answer (4.1 million as of 2006, in this instance). Although very sure of themselves, they were often wrong. Warning people against overconfidence doesn't much reduce overconfidence.

People are also more confident than correct when answering such questions as, "Is absinthe a liqueur or a precious stone?" (It's a licorice-flavored liqueur.) On questions where only 60 percent of people answer correctly, respondents typically feel 75 percent confident. Even when people feel 100 percent certain of their answers to such questions, they err about 15 percent of the time (Fischhoff & others, 1977).

Overconfidence plagues decisions outside the laboratory, too. It was an overconfident Hitler who invaded Russia, an overconfident Lyndon Johnson who waged war with North Vietnam, an overconfident George W. Bush who marched into Iraq to eliminate supposed weapons of mass destruction. On a smaller scale, stockbrokers and investment managers market their services with confidence that they can outperform the market average in picking stocks, despite overwhelming evidence to the contrary (Malkiel, 2004). A purchase of stock X, recommended by a broker who judges this to be the time to buy, is usually balanced by a sale made by someone who judges this to be the time to sell. Despite their confidence, buyer and seller cannot both be right.

Students, too, are routinely overconfident about how quickly they can do assignments and write papers, report Roger Buehler and his colleagues (1994). They typically expect to finish projects ahead of schedule. But in fact, the projects generally get finished after about twice the number of days they predicted. Although we know we have often underestimated completion times, we remain overly confident of our next prediction. Moreover, presuming how much we're going to get done, we also overestimate our future free time (Zauberman, 2005). We expect to be experiencing more free time a month from today than today. So we say yes to requests for our future time, only to discover it's just as busy.

Failing to appreciate one's potential for error when making military, economic, or political judgments can have devastating consequences, but so can a lack of self-confidence. Overconfidence does have adaptive value. People who err on the side of overconfidence live more happily, find it easier to make tough decisions, and seem more credible (Baumeister, 1989; Taylor, 1989). Moreover, if given prompt and clear feedback on the accuracy of their judgments—as weather forecasters are after each day's predictions—people soon learn to assess their accuracy more realistically (Fischhoff, 1982). The wisdom to know when we know a thing and when we do not is born of experience.

The human understanding is most excited by that which strikes and enters the mind at once and suddenly, and by which the imagination is immediately filled and inflated. It then begins almost imperceptibly to conceive and suppose that everything is similar to the few objects which have taken possession of the mind."

Francis Bacon, *Novum Organum*, 1620

availability heuristic estimating the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common.

overconfidence the tendency to be more confident than correct—to overestimate the accuracy of one's beliefs and judgments.

Don't believe everything you think."

Bumper sticker

Worth Publishers photo by Nicole Villamora

Predict your own behavior
When will you finish reading this chapter?

When you know a thing, to hold that you know it; and when you do not know a thing, to allow that you do not know it; this is knowledge."

Confucius (551–479 B.C.), *Analects*

THINKING CRITICALLY ABOUT

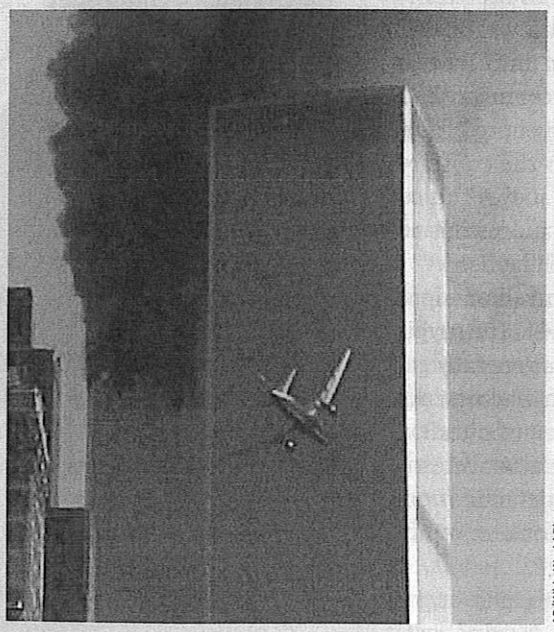
THE FEAR FACTOR—DO WE FEAR THE RIGHT THINGS?

"Most people reason dramatically, not quantitatively," said Oliver Wendell Holmes. Especially since 9/11, many people fear flying more than driving. Yet National Safety Council (2005) data reveal that between 2000 and 2002, Americans were—mile for mile—39.5 times more likely to die in an automobile crash than on a commercial flight. In a late-2001 essay, I calculated that if—because of 9/11—we flew 20 percent less and instead drove half those unflown miles, about 800 more people would die in traffic accidents in the year after 9/11 (Myers, 2001). When German psychologist Gerd Gigerenzer (2004) later checked this estimate against accident data (why didn't I think of this?), he found that the last three months of 2001 indeed produced significantly more U.S. traffic fatalities than the average for those months in the previous five years (**FIGURE 10.8**). Long after 9/11, the dead terrorists were still killing Americans. As air travel gradually recovered during 2002, 2003, and 2004, U.S. commercial flights carried nearly 2 billion passengers, with only 34 deaths—none on a major airline big jet (Miller, 2005). Meanwhile, 128,000 Americans died in traffic accidents.

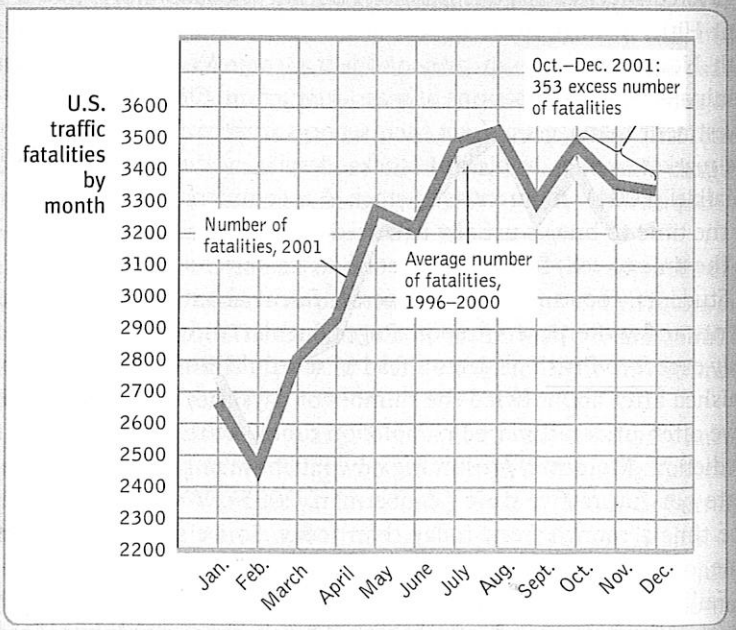
Why do we fear the wrong things? Why do we fear terrorism more than accidents—which kill nearly as many per *week* in just the United States as did terrorism with its 2527 worldwide deaths in all of the 1990s (Johnson, 2001)? Even with the horror of 9/11, more Americans in 2001 died of food poisoning (which scares few) than of terrorism (which scares many). And why do so many smokers (whose habit shortens their lives, on average, by about five years) fret before flying (which, averaged across people, shortens life by one day)?

Psychological science has identified four influences on our intuitions about risk. First, we fear *what*

FIGURE 10.8
Still killing Americans
Images of 9/11 etched a sharper image in our minds than did the millions of fatality-free flights on U.S. airlines during 2002 and after. Such dramatic events, being readily available to memory, shape our perceptions of risk. In the three months after 2001, those faulty perceptions led more people to travel, and some to die, by car. (Adapted from Gigerenzer, 2004.)



AP/Wide World Photos



Answer to SPLOYOCHYG anagram on page 398: PSYCHOLOGY.

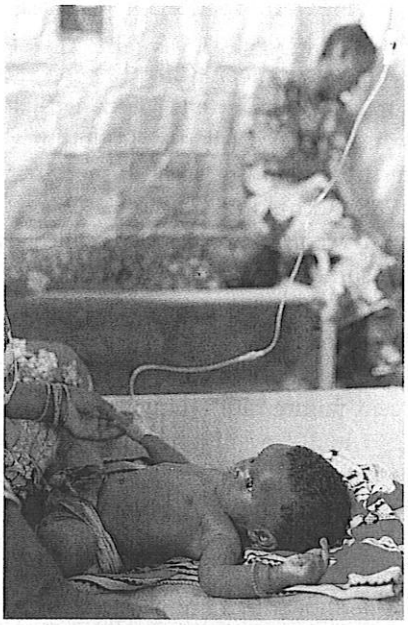
our ancestral history has prepared us to fear. Human emotions were road tested in the Stone Age. Yesterday's risks prepare us to fear snakes, lizards, and spiders (although all three combined now kill virtually no one in developed countries). And they prepare us to fear confinement and heights, and therefore flying.

Second, we fear *what we cannot control.* Driving we control, flying we do not.

Third, we fear *what is immediate.* Threats related to flying are mostly telescoped into the moments of takeoff and landing, while the dangers of driving are diffused across many moments to come, each trivially dangerous. Teens are often indifferent to smoking's toxicity because they live more for the present than for the distant future.

Fourth, we fear *what is most readily available in memory.* Horrific images of United Flight 175 slicing into the World Trade Center form indelible memories. And powerful, available memories serve as our measuring rods as we intuitively judge risks. Thousands of safe car trips (for those who have survived to read this) have extinguished our anxieties about driving.

Vivid events also distort our comprehension of risks and probable outcomes. We comprehend Andrew "Jack" Whittaker's winning $315 million in a 2002 Powerball lottery. We do not comprehend each of the more than 560 million losing players who undramatically enabled his jackpot. We comprehend those 9/11 flights that ended in the deaths of 266 passengers and crew. We do not comprehend the vast numbers of accident-free flights—16 *million* consecutive fatality-free takeoffs and landings during one stretch of the 1990s (Tolchin, 1994). Dramatic outcomes capture our attention; probabilities we hardly grasp. The result: We overvalue lottery tickets, overestimate flight risk, and underestimate the dangers of driving.



Ian Berry/Magnum Photos

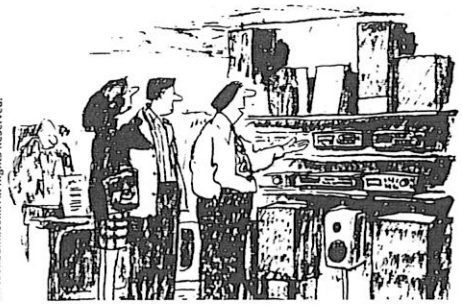
Dramatic deaths in bunches breed concern and fear

The memorable South Asian tsunami that killed some 300,000 people stirred an outpouring of concern and new tsunami-warning technology. Meanwhile, a "silent tsunami" of poverty-related malaria was killing about that many of the world's children every couple months, noted Jeffrey Sachs, the head of a United Nations project aiming to cut extreme poverty in half by 2015 (Dugger, 2005).

We fear too much those things that have killed people dramatically, in bunches, and recently, and we fear too little those threats that will claim lives undramatically, one by one, and in the distant future. If a single 747 were taken down by a rocket-propelled grenade, the horror would be seared upon our minds. But as Bill Gates has noted, each year a half-million children worldwide—the equivalent of four 747s full of children every day—die quietly, one by one, from rotavirus, and we hear nothing of it (Glass, 2004).

We must "learn to protect ourselves and our families against future terrorist attacks," warns a U.S. Department of Homeland Security ad that has appeared periodically in my local newspapers. The ad advises us on the food supplies, duct tape, and battery-powered radios we'll need if "there's a terrorist attack on your city." With 4 in 10 Americans being at least somewhat worried "that you or someone in your family will become a victim of terrorism," the "Be afraid!" message—be afraid not just of a terrorist attack on somebody somewhere, but of one on you and your place—has been heard (Carroll, 2005).

The point to remember: It is perfectly normal to fear purposeful violence from those who hate us. When terrorists strike again, we will all recoil in horror. But smart thinkers will also want to check their fears against facts and to resist those who serve their own purposes by cultivating a culture of fear. By so doing, we can take away the terrorists' most omnipresent weapon: exaggerated fear.



"This CD player costs less than players selling for twice as much."

Framing Decisions

OBJECTIVE 7 | Describe how others can use framing to elicit from us the answers they want.

A further test of rationality is whether the same issue, presented in two different but logically equivalent ways, will elicit the same answer. For example, one surgeon tells someone that 10 percent of people die while undergoing a particular surgery. Another tells someone that 90 percent survive. The information is the same. The effect is not. To both patients and physicians, the risk seems greater to those who hear that 10 percent will die (Marteau, 1989; McNeil & others, 1988; Rothman & Salovey, 1997).

The way we present an issue is called **framing,** and its effects are sometimes striking. Consumers respond more positively to ground beef described as "75 percent lean" rather than "25 percent fat" (Levin & Gaeth, 1988; Sanford & others, 2002). Nine in 10 college students rate a condom as effective if it has a supposed "95 percent success rate" in stopping the AIDS virus; only 4 in 10 think it successful when given a "5 percent failure rate" (Linville & others, 1992). And people express more surprise when a "1 in 20" event happens than when an equivalent "10 in 200" event happens (Denes-Raj & others, 1995). To scare people, frame risks as numbers, not percentages. People told that a chemical exposure is projected to kill 10 of every 10 million people (imagine 10 dead people!) feel more frightened than if told the fatality risk is an infinitesimal .000001 (Kraus & others, 1992).

Consider how the framing effect influences economic and business decisions. Merchants mark up their "regular prices" to appear to offer huge savings on "sale prices." A $100 coat marked down from $150 by Store X can seem like a better deal than the same coat priced regularly at $100 by Store Y (Urbany & others, 1988). My dentist doesn't charge more if we pay later, though she does offer a 5 percent discount for immediate cash payment. She, like thousands of other service providers, knows to frame the price difference as a "cash discount" rather than a "credit-card surcharge."

That our judgments can flip-flop so dramatically is startling. It suggests that our judgments and decisions may not be well reasoned, and that those who understand the power of framing can use it to influence important decisions—for example, by framing survey questions to support or reject a particular viewpoint.

Belief Bias

OBJECTIVE 8 | Explain how our preexisting beliefs can distort our logic.

We have seen that part of psychology's thinking about thinking emphasizes that we are prone to bias as we seek confirmation of our hunches, rely on efficient but fallible heuristics, display overconfidence, and fall prey to the effects of framing. But would logic help us escape the bias inflicted by our beliefs?

Logic does help, but we still find it easier to accept conclusions that agree with our opinions. Consider this logical argument:

Premise 1: Some communists are golfers.
Premise 2: All golfers are Marxists.
Conclusion: Some communists are Marxists.

In experiments, nearly everyone correctly recognized that the conclusion logically follows from the premises (Oakhill & others, 1989). But now consider this argument:

Premise 1: Some communists are golfers.
Premise 2: All golfers are capitalists.
Conclusion: Some communists are capitalists.

framing the way an issue is posed; how an issue is framed can significantly affect decisions and judgments.

belief bias the tendency for one's preexisting beliefs to distort logical reasoning, sometimes by making invalid conclusions seem valid, or valid conclusions seem invalid.

belief perseverance clinging to one's initial conceptions after the basis on which they were formed has been discredited.

Many people had a harder time seeing that, given the premises, this conclusion is equally valid. Judge this next conclusion for yourself (adapted from Hunt, 1982):

Premise 1: Democrats support free speech.
Premise 2: Dictators are not democrats.
Conclusion: Dictators do not support free speech.

If that conclusion seems logical, you are experiencing **belief bias**—the tendency for our beliefs to distort our logic (Oakhill & others, 1990). (Premise 1 did not exclude the possibility that others, even dictators, can believe in free speech.) Consider another set of statements with *identical form and logic* and note how much easier it feels to refute the conclusion:

Premise 1: Robins have feathers.
Premise 2: Chickens are not robins.
Conclusion: Chickens do not have feathers.

Thus, belief bias: We more easily see the illogic of conclusions that run counter to our beliefs than of those that agree with our beliefs.

"God is love.
Love is blind.
Ray Charles is blind.
Ray Charles is God."
Anonymous graffiti

The Belief Perseverance Phenomenon

OBJECTIVE 9 | Describe the remedy for the belief perseverance phenomenon.

An additional source of irrationality is **belief perseverance,** our tendency to cling to our beliefs in the face of contrary evidence. Belief perseverance often fuels social conflict. Charles Lord and his colleagues (1979) revealed how this happens when they studied people with opposing views of capital punishment. Those on both sides studied two supposedly new research findings, one supporting and the other refuting the claim that the death penalty deters crime. Each side was more impressed by the study that supported its own beliefs, and each readily disputed the other study. Thus, showing the pro- and anti-capital-punishment groups the *same* mixed evidence actually *increased* their disagreement.

If you want to rein in the belief perseverance phenomenon, a simple remedy exists: *Consider the opposite.* When Lord and his colleagues (1984) repeated the capital-punishment study, they asked some of their participants to be "as *objective* and *unbiased* as possible." The plea did nothing to reduce the biased evaluation of evidence. They asked another group to consider "whether you would have made the same high or low evaluations had exactly the same study produced results on the *other* side of the issue." Having imagined and pondered *opposite* findings, these people became much less biased in their evaluations of the evidence.

The more we come to appreciate why our beliefs might be true, the more tightly we cling to them. Once people have explained to themselves why they believe a child is "gifted" or "learning disabled," or why candidate X or Y will be more likely to preserve peace, or why company Z is a stock worth owning, they tend to ignore the evidence that undermines that belief. Prejudice persists. Once beliefs form and get justified, it takes more compelling evidence to change them than it did to create them.

Once you have a belief, it influences how you perceive all other relevant information. Once you see a country as hostile, you are likely to interpret ambiguous actions on their part as signifying their hostility."
Political scientist Robert Jervis (1985)

To begin with, it was only tentatively that I put forward the views I have developed . . . but in the course of time they have gained such a hold upon me that I can no longer think in any other way."
Sigmund Freud,
Civilization and Its Discontents, 1930

The Perils and Powers of Intuition

OBJECTIVE 10 | Describe the smart thinker's reaction to using intuition to solve problems.

We have seen how our irrational thinking can plague our efforts to solve problems, make wise decisions, form valid judgments, and reason logically. Moreover, these perils of intuition appear even when people are offered extra pay for thinking smart, even when they are asked to justify their answers, and even when they are

"I'm happy to say that my final judgment of a case is almost always consistent with my prejudgment of the case."

expert physicians or clinicians (Shafir & LeBoeuf, 2002). From this we might conclude that our heads are indeed filled with straw. All in all, these and many other findings (see **TABLE 10.1**) suggest "bleak implications for human rationality" (Nisbett & Borgida, 1975).

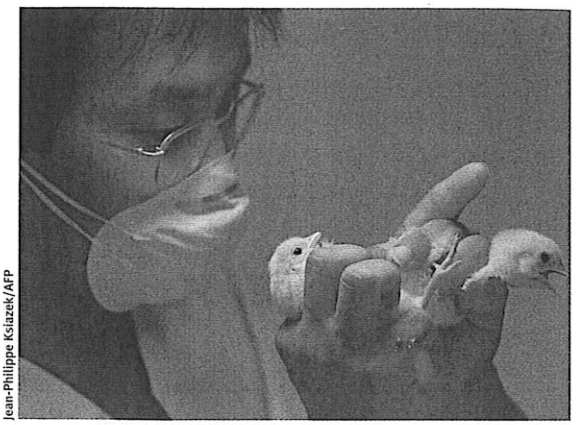
Truths often come in complementary pairs. It is true that unchecked intuition is perilous. But today's cognitive scientists also are revealing intuition's powers. Our cognition, for the most part, is wonderfully efficient and effective. Its instant, intuitive reactions enable us to react quickly and *usually* adaptively (see Table 10.1 for a synopsis of examples from throughout this book). Experienced nurses, firefighters, art critics, car mechanics, hockey players, and you, for anything in which you develop expertise, learn to size up many a situation in an eye blink.

In showing how everyday heuristics usually make us smart (and only sometimes make us dumb), Gerd Gigerenzer (2004) asked both American and German university students, "Which city has more inhabitants: San Diego or San Antonio?" Sixty-two percent of the Americans, after thinking a moment, guessed right: San Diego. In Germany, where many people have not heard of San Antonio (apologies to our Texas friends), students used a fast and frugal intuitive heuristic: Pick the one you recognize. With less knowledge but an adaptive heuristic, 100 percent of Gigerenzer's German respondents answered correctly.

TABLE 10.1

INTUITION'S PERILS AND POWERS (TEXT CHAPTER NUMBERS FOLLOW)

Intuition's Dozen Deadly Sins	Evidence of Intuition's Powers
• *Hindsight bias*—looking back on events, we falsely surmise that we knew it all along. (1)	• *Blindsight*—brain-damaged persons' "sight unseen" as their bodies react to things and faces not consciously recognized. (2)
• *Illusory correlation*—intuitively perceiving a relationship where none exists. (1)	• *Right-brain thinking*—split-brain persons displaying knowledge they cannot verbalize. (2)
• *Memory construction*—influenced by our present moods and by misinformation, we may form false memories. (9)	• *Infants' intuitive learning*—of language and physics. (4)
• *Representativeness and availability*—fast and frugal heuristics become quick and dirty when leading us into illogical and incorrect judgments. (10)	• *Moral intuition*—quick gut feelings that precede moral reasoning. (4)
• *Overconfidence*—our intuitive assessments of our own knowledge are often more confident than correct. (1,10)	• *Divided attention and priming*—unattended information processed by the mind's downstairs radar watchers. (5, 9)
• *Belief perseverance and confirmation bias*—thanks partly to our preference for confirming information, beliefs are often resilient, even after their foundation is discredited. (1,10)	• *Everyday perception*—the instant parallel processing and integration of complex information streams. (5)
• *Framing*—judgments flip-flop, depending on how the same issue or information is posed. (10)	• *Automatic processing*—the cognitive autopilot that guides us through most of life. (various)
• *Interviewer illusion*—inflated confidence in one's discernment based on interview alone. (12)	• *Implicit memory*—learning *how* to do something without knowing *that* one knows. (9)
• *Mispredicting our own feelings*—we often mispredict the intensity and duration of our emotions. (13)	• *Heuristics*—those fast and frugal mental shortcuts that normally serve us well enough. (10)
• *Self-serving bias*—in various ways, we exhibit inflated self-assessments. (15)	• *Intuitive expertise*—phenomena of nonconscious learning, expert learning, and physical genius. (10, 11, 15)
• *Fundamental attribution error*—overly attributing others' behavior to their dispositions by discounting unnoticed situational forces. (18)	• *Creativity*—the sometimes-spontaneous appearance of novel and valuable ideas. (11)
• *Mispredicting our own behavior*—our intuitive self-predictions often go astray. (18)	• *Social and emotional intelligence*—the intuitive know-how to comprehend and manage ourselves in social situations and to perceive and express emotions. (11)
	• *The wisdom of the body*—when instant responses are needed, the brain's emotional pathways bypass the cortex; hunches sometimes precede rational understanding. (13)
	• *Thin slices*—detecting traits from mere seconds of behavior. (15)
	• *Dual attitude system*—as we have two ways of knowing (unconscious and conscious) and two ways of remembering (implicit and explicit), we also have gut-level and rational attitude responses. (18)


Jean-Philippe Ksiazek/AFP

Chick sexing
When acquired expertise becomes an automatic habit, as it is for experienced chick sexers, it feels like intuition. At a glance, they just know.

Intuition is huge. More than we realize, thinking occurs off-screen, with the results occasionally displayed on-screen. Intuition is adaptive. It feeds our expertise, our creativity, our love, and our spirituality. And intuition, smart intuition, is born of experience. Chess masters can look at a board and intuitively know the right move. Playing "blitz chess," where every move is made after barely more than a glance, they display a hardly diminished skill (Burns, 2004). At every moment, skilled violin players know, without thinking, just where to place the bow, at what angle, with what pressure. Experienced chicken sexers can tell you a chick's sex at a glance, yet cannot tell you how they do it. In each case, the immediate insight describes acquired, speedy expertise that feels like instant intuition. Intuition is recognition, observed Nobel laureate psychologist-economist Herbert Simon (2001). It is analysis "frozen into habit."

Mindful of intuition's perils and powers, smart thinkers will welcome their intuitions but also check them against available evidence. Our gut intuitions are terrific at some things, such as instantly reading emotions in others' faces, but not so good at others, such as assessing risks. Wisdom comes with knowing the difference.

>> LEARNING OUTCOMES

Thinking

OBJECTIVE 1 | Define *cognition*.
Cognition is a term covering all the mental activities associated with thinking, knowing, remembering, and communicating.

OBJECTIVE 2 | Describe the roles of categories, hierarchies, definitions, and prototypes in concept formation.
We use concepts to simplify and order the world around us. We divide clusters of objects, events, ideas, or people into *categories* based on their similarities. In creating *hierarchies,* we subdivide these categories into smaller and more detailed units. We form other concepts, such as triangles, by *definition* (three-sided objects). But we form most concepts around *prototypes,* or best examples of a category. Matching objects and ideas against prototypes is an efficient way of making snap judgments about what belongs in a specific category.

OBJECTIVE 3 | Compare algorithms and heuristics as problem-solving strategies, and explain how insight differs from both of them.
An *algorithm* is a time-consuming but thorough set of rules or procedures (such as a recipe for cookies, or a step-by-step description for evacuating a building during a fire) that guarantees a solution to a problem. A *heuristic* is a simpler thinking strategy (such as running for an exit if you smell heavy smoke) that may allow us to solve problems quickly, but sometimes leads us to incorrect solutions. *Insight* differs from both because it is not a strategy-based solution, but rather an Aha! reaction—a sudden flash of inspiration that solves a problem.

OBJECTIVE 4 | Contrast the confirmation bias and fixation, and explain how they can interfere with effective problem solving.
The *confirmation bias* predisposes us to verify rather than challenge our hypotheses. *Fixation,* such as mental set and functional fixedness, may leave us doggedly pursuing one line of reasoning and prevent us from taking the fresh perspective that would let us solve the problem.

OBJECTIVE 5 | Contrast the representativeness and availability heuristics, and explain how they can cause us to underestimate or ignore important information.
The *representativeness heuristic* leads us to judge the likelihood of things in terms of how they represent our prototype for a group of items. The *availability heuristic* leads us to judge the likelihood of things based on how vivid they are or how readily they come to mind. Either of these two thinking shortcuts can cause us to ignore important information or to underestimate the chances of something happening.

OBJECTIVE 6 | Describe the drawbacks and advantages of overconfidence in decision making.
The main drawback of overconfidence is that our tendencies to seek confirmation of our hypotheses and to use quick and easy heuristics can blind us to our vulnerability to error—a fault that can be tragic if we are in a position of responsibility. But on a personal level, overconfident people tend to live happier lives, make difficult decisions more easily, and seem more credible.