Lecture 14

Psychological Influences on Personal Probability

Thought Question 1:

During Cold War, Plous (1993) presented readers with the following test: Place a check mark beside the alternative that **seems most likely to occur within the next 10 years**:

- An all-out nuclear war between the United States and Russia
- An all-out nuclear war between the United States and Russia in which neither country intends to use nuclear weapons, but both sides are drawn into the conflict by the actions of a country such as Iraq, Libya, Israel, or Pakistan.

Using your intuition, pick the more likely event at that time. Now consider the probability rules discussed in Chapter 16 to try to determine which statement is more likely.

Thought Question 2:

Which is a more likely cause of death in the United States, homicide or diabetes?

How did you arrive at your answer?

Thought Question 3:

Do you think people are **more likely to pay to reduce their risk** of an undesirable event from **95% to 90%** or to reduce it from **5% to zero**?

Explain whether there should be a preferred choice, based on material from Chapter 16.

Thought Question 4:

A fraternity consists of 30% freshmen and sophomores and 70% juniors and seniors. Bill is a member of the fraternity, he studies hard, he is well-liked by his fellow fraternity members, and he will probably be quite successful when he graduates.

Is there any way to tell if Bill is **more likely** to be a lower classman (freshman or sophomore) or an upper classman (junior or senior)?

17.1 Revisiting Personal Probability

- Some situations not repeatable.
- **Personal probabilities**: values assigned by individuals based on how likely they think events are to occur.
- Still should ***follow the rules*** of probability.

17.2 Equivalent Probabilities, Different Decisions

Certainty Effect: people more willing to pay to reduce risk from fixed amount down to 0 than to reduce risk by same amount when not reduced to 0.

Example 1: Probabilistic Insurance

- Students asked if want to buy "probabilistic insurance" … ***costs half as much as regular insurance but only covers losses with 50% probability***.
- Majority (80%) not interested.
- Expected value for return is same as regular policy.
- Lack of assurance of payoff makes it unattractive.

Source: Kahneman and Tversky (1979)

Pseudocertainty Effect: people more willing to accept a complete reduction of risk on certain problems and no reduction on others than to accept a reduced risk on a variety (all) problems.

Example 2: Vaccination Questionnaires

- ***Form 1: probabilistic protection*** = vaccine available for disease that afflicts 20% of population but would protect with 50% probability. **40% would take vaccine**.
- ***Form 2: pseudocertainty*** = two strains, each afflicting 10% of population; vaccine completely effective against one but no protection from other. **57% would take vaccine**.
- In both, vaccine reduces risk from 20% to 10% but complete elimination of risk perceived more favorably.

Source: Slovic, Fischhoff, and Lichtenstein, 1982, p. 480.

Pseudocertainty - Example

- Which of the following do you prefer:
  - (a) A sure win of $30
  - (b) An 80% chance to win $45

Example continued

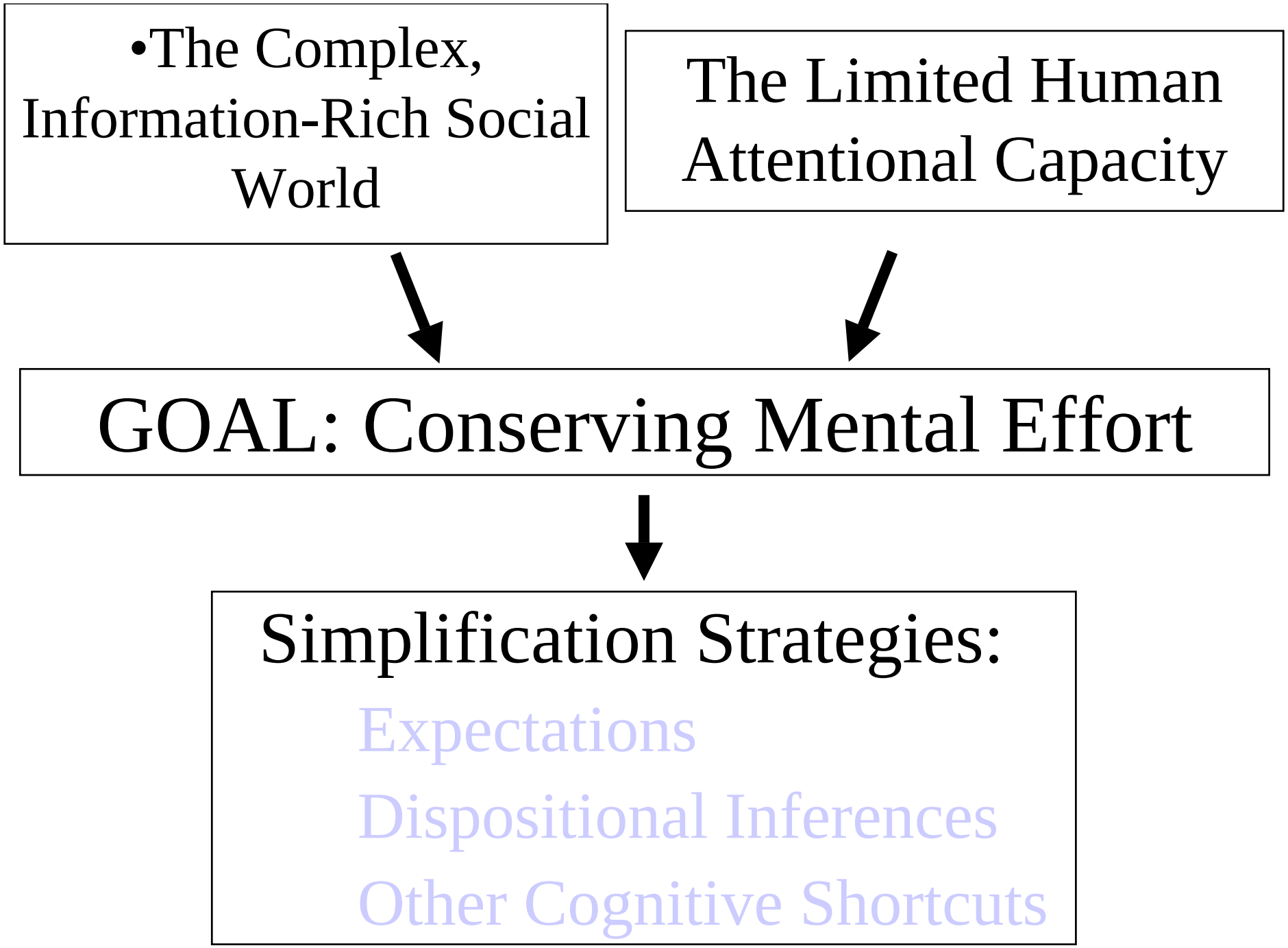
- Consider the following 2-stage game. In the first stage there is a 75% chance to end the game without winning anything, and a 25% chance of moving into the second stage. You must choose (a) or (b) prior to the start of the game.
  - (a) A sure win of $30
  - (b) An 80% chance to win $45

Example continued

- Which of the following do you prefer:
  - (a) A sure win of $30
  - (b) An 80% chance to win $45

Psuedocertainty – What this means

- Did you choose the same option in all three choices (first or second)?
  - If not, then you have reacted to certainty and psuedocertainty effects.
- The reduction in the probability of an outcome is more important when the initial state is certain rather than merely probable
- The change in game 2 is due only to the introduction of uncertainty of reaching the second state (psuedocertainty.)


•The Complex, Information-Rich Social World
The Limited Human Attentional Capacity
GOAL: Conserving Mental Effort
Simplification Strategies:
Expectations
Dispositional Inferences
Other Cognitive Shortcuts

Conserving Mental Effort

- We often think in ways that tend to preserve our expectations
  - We pay attention to behaviors relevant to our expectations.
  - We interpret ambiguous events/behaviors in ways that support our expectations.
  - We remember people and events consistent with our expectations.

Heuristics

- One of the most important ways that we overcome information overload is through the use of *heuristics*--mental shortcuts, or **strategies**, that allow fast and usually correct processing of information.

- 1.) Representativeness Heuristic
- 2.) Availability Heuristic

- 3.) Regression to the mean

17.3 How Personal Probabilities Can Be Distorted

The Availability Heuristic

Tversky and Kahneman (1982a, p. 11) note that "there are situations in which people assess the . . . probability of an event by the ease with which instances or occurrences can be brought to mind. . . . This judgmental heuristic is called ***availability***."

Which do you think caused more deaths in the United States in 2000, homicide or diabetes?

Most answer *homicide*. The actual death rates were 6.0 per 100,000 for homicide compared with 24.6 per 100,000 for diabetes (*National Center for Health Statistics*).

Distorted view that homicide is more probable results from the fact that ***homicide receives more attention in the media***.

Distorted Personal Probabilities

Anchoring

Risk perception distorted by providing a reference point, or an **anchor**, from which they adjust up or down.
Most tend to stay close to the anchor provided.

Example 3: Nuclear War *Source:* Plous (1993, pp. 146-147)

What is the chance of nuclear war between U.S. and Soviet Union?

- **Low-anchor** version: Do you think the chances were higher or lower than 1%? Give your best estimate of the exact chances.
- **High-anchor** version: Do you think the chances were higher or lower than 90%? Give your best estimate of the exact chances.
- **No-anchor** version: Give your best estimate of the exact chances.

Low-anchor estimates < No-anchor estimates < High-anchor estimates

“CAUSES OF DEATH” STUDY - SLOVIC, FISCHHOFF & LICHTENSTEIN (1976)

- Subjects asked to estimate frequency of various causes of death.

Cause	S. estimate	Truth
Tornado	564	90
Fireworks	160	6
Asthma	506	1886
Drowning	1684	7380

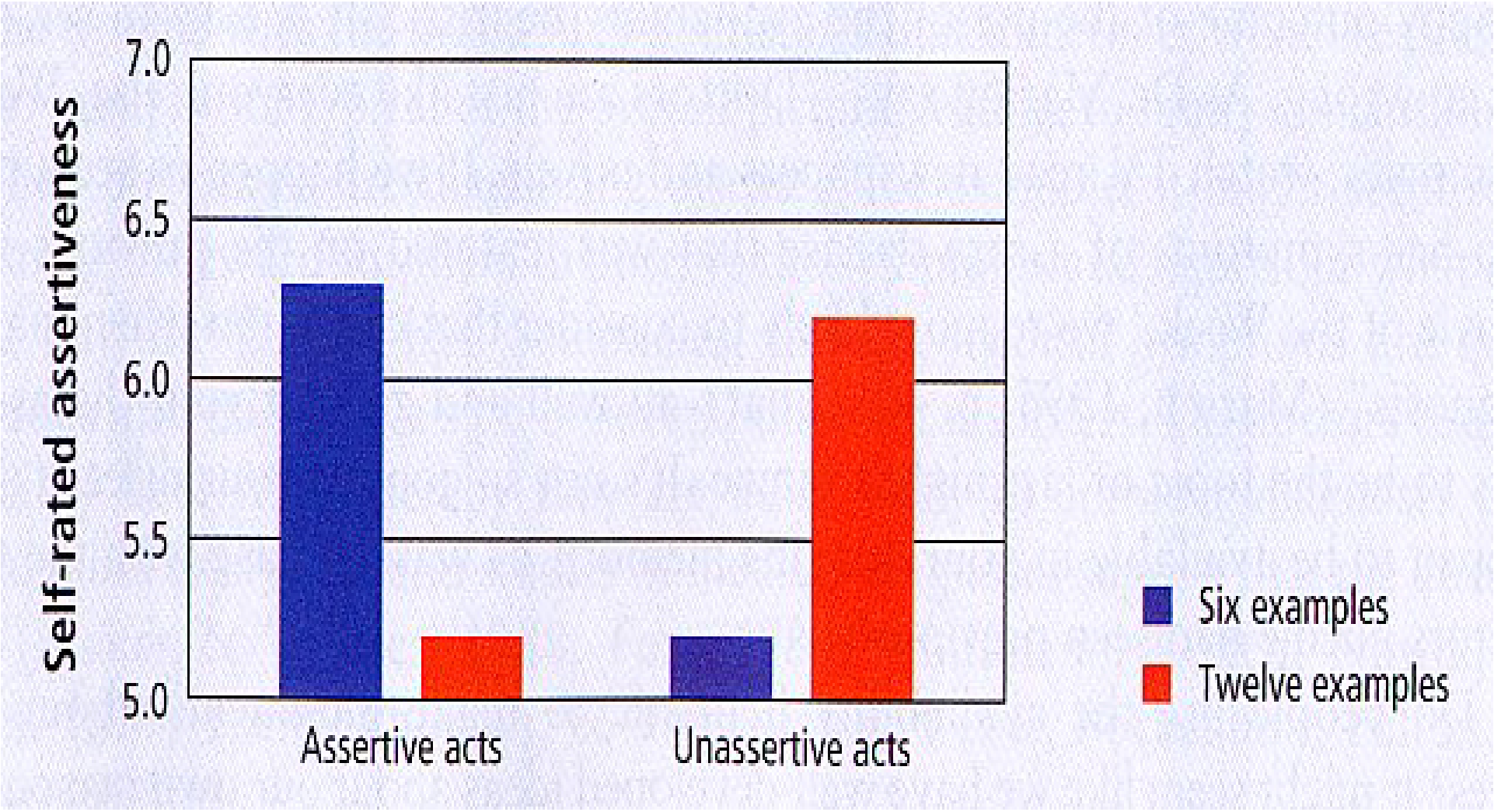
(rates per 200m US residents per year)

Some examples of the availability heuristic in action:

- Does the “k” appear in print more often as the first or third letter? Do more people live in Cambodia or Tanzania?
- Overestimation of crime rates, especially violent crime.
- Errors in judging the likelihood of dying in a plane crash

Availability influences impressions of ourselves. Schwartz et al. (1991) asked participants to think of either 6 or 12 times when they behaved assertively or unassertively. Then they provided ratings of their assertiveness. It should be easier to call to mind 6 examples of behavior than 12 examples and that “availability” should affect ratings of assertiveness.

The ease with which the examples could be called to mind directed the ratings, regardless of the direction of the behavior.



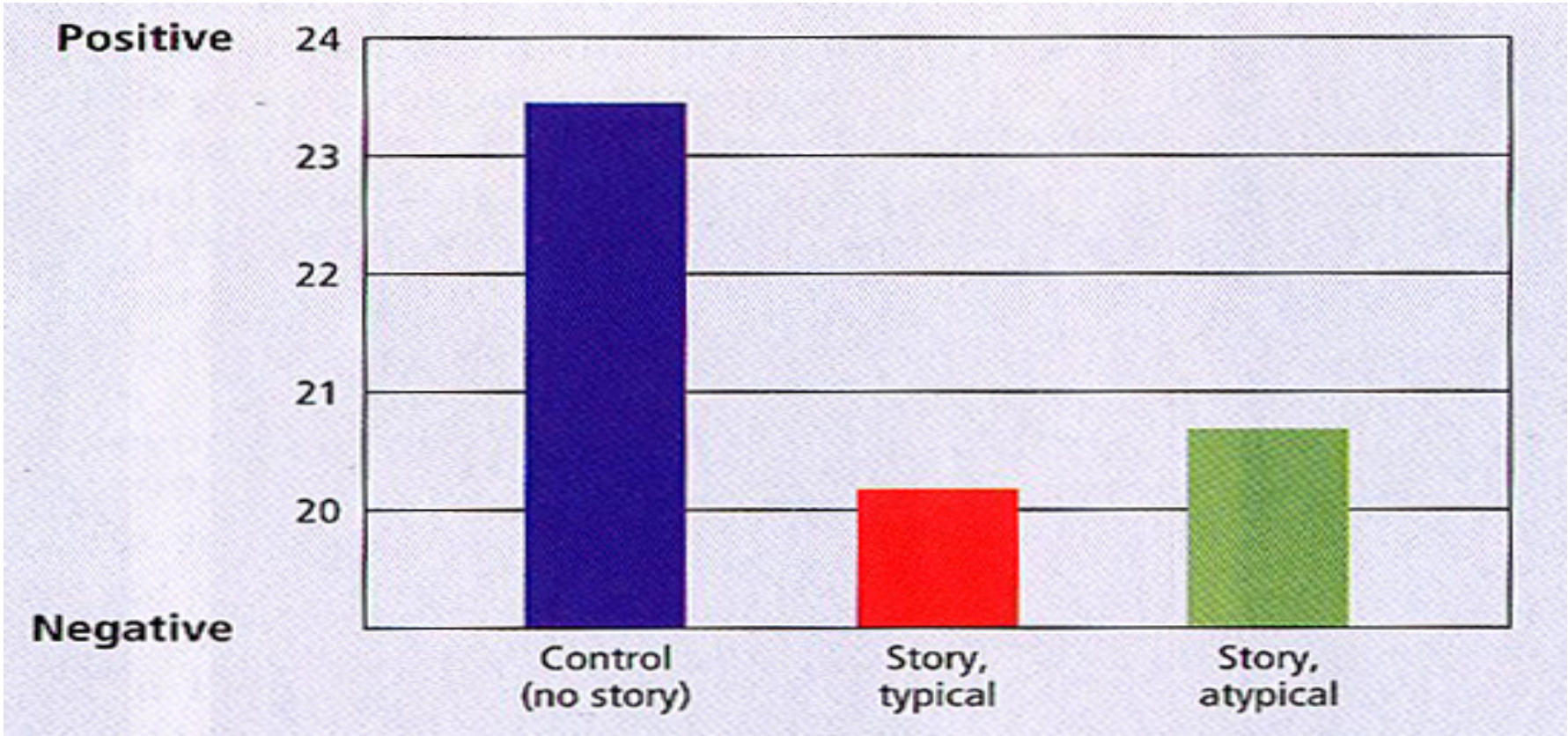
The Anchoring and Adjustment Heuristic

Related to availability, is the *anchoring and adjustment heuristic*. In many judgment situations (e.g., sentencing a defendant) we need to start with some beginning value and then adjust up or down given other information. The problem is that the starting point might be quite arbitrary and based on availability (e.g., I turned 45 today). We may not correct sufficiently from such biased values.

Hamill, Wilson, and Nisbett (1980) had participants read a story about an unlikable welfare recipient. She was described as **irresponsible** and her life as bleak. Some participants were told this woman was typical of welfare recipients. Others were told she was atypical of welfare recipients.

Then participants rated their attitudes about all welfare recipients.

An unbiased decision maker should start with the story as an anchor (it is highly available) but then adjust given information about typicality. Most people do not adjust sufficiently . . .



Distorted Personal Probabilities

Detailed Imagination

Risk perceptions distorted by having people vividly imagine an event.

Example:

Salespeople convince you that $500 is a reasonable price to pay for an extended warranty on your new car by having you imagine that if your air conditioner fails it will cost you more than the price of the policy to get it fixed. They don't mention that it is extremely unlikely that your air conditioner will fail during the period of the extended warranty.

Distorted Personal Probabilities

The Representativeness Heuristic and the Conjunction Fallacy

Representativeness heuristic leads people to assign higher probabilities than warranted to scenarios that are representative of how we imagine things would happen.

This leads to the **conjunction fallacy** … when detailed scenarios involving the conjunction of events are given higher probability assessments than statements of one of the simple events alone.

Example 5: An Active Bank Teller

Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.

Respondents asked which of two statements was ***more probable***:

1. Linda is a bank teller.
2. Linda is a bank teller who is active in the feminist movement.

Results: "in a large sample of statistically naïve undergraduates, 86% judged the second statement to be more probable".

Problem: If Linda falls into the second group, she must also fall into the first group (bank tellers). Therefore, the first statement must have a higher probability of being true.

Source: Kahneman and Tversky (1982, p. 496)

Bill is 34 years old. He is intelligent, but unimaginative, compulsive, and generally lifeless. In school, he was strong in mathematics but weak in social studies and humanities.

Below are statements about Bill. Rank order the statements according to how likely they are to be true of Bill (1 = most likely).

_____ Bill is a physician who plays poker for a hobby.

_____ Bill is an architect.

_____ Bill is an accountant.

_____ Bill plays jazz for a hobby.

_____ Bill surfs for a hobby.

_____ Bill is a reporter.

_____ Bill is an accountant who plays jazz for a hobby.

_____ Bill climbs mountains for a hobby.

Bill is 34 years old. He is intelligent, but unimaginative, compulsive, and generally lifeless. In school, he was strong in mathematics but weak in social studies and humanities.

Below are statements about Bill. Rank order the statements according to how likely they are to be true of Bill (1 = most likely).

_____ Bill is a physician who plays poker for a hobby.

_____ Bill is an architect.

_____ ***Bill is an accountant.***

_____ ***Bill plays jazz for a hobby.***

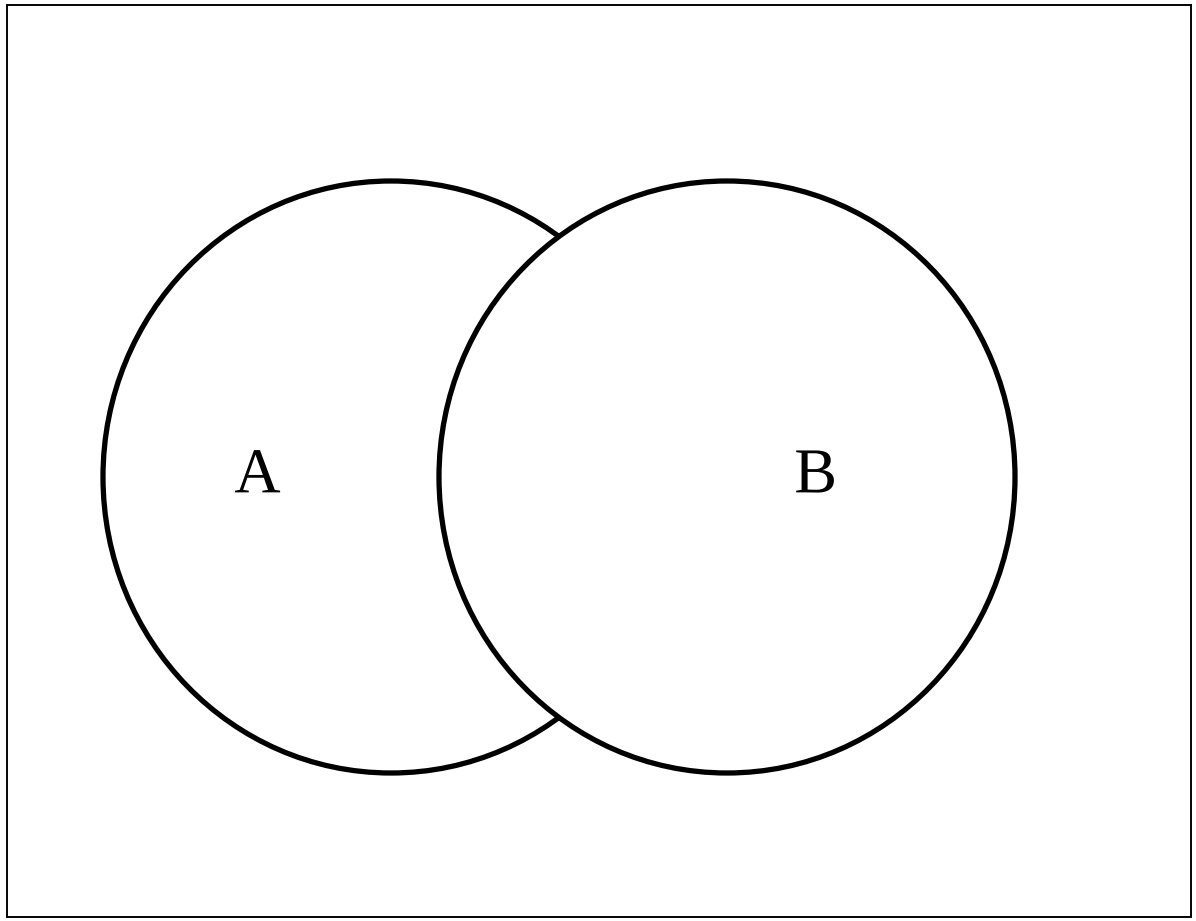
_____ Bill surfs for a hobby.

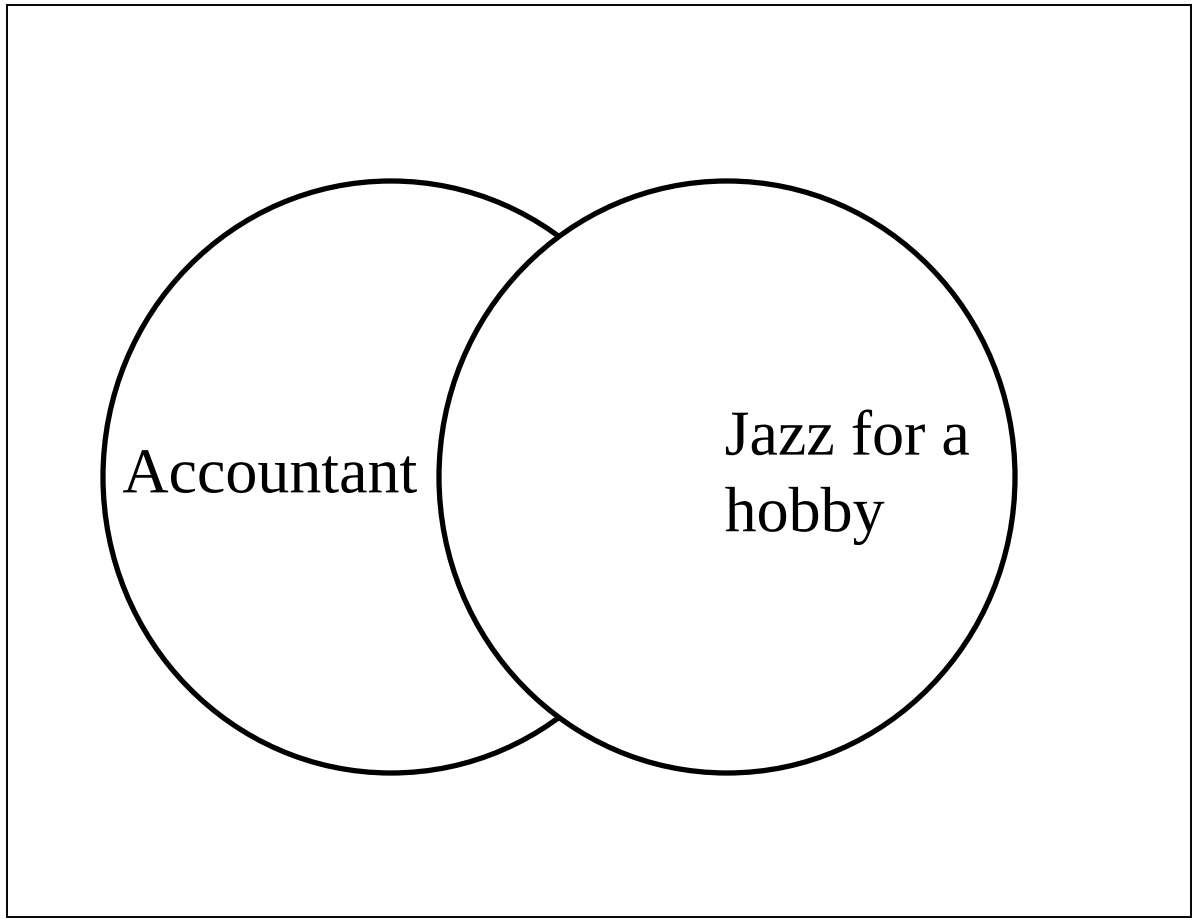
_____ Bill is a reporter.

_____ ***Bill is an accountant who plays jazz for a hobby.***

_____ Bill climbs mountains for a hobby.

In most studies of the conjunction error, over 80% of people asked to provide judgments assign a higher probability to the conjunction than to one of the components.


A
B


Accountant
Jazz for a hobby

Distorted Personal Probabilities

Forgotten Base Rates

The representativeness heuristic can lead people to ignore information about likelihood of various outcomes

Example:

Subjects told a population has 30 engineers and 70 lawyers. Asked: What is the likelihood that a *randomly selected individual* would be an engineer? Average close to 30%. Then subjects given this description and asked likeliness:

> *Dick is a 30-year-old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked by his colleagues.*

Subjects ignored base rate of 30%, median response was 50%.

Source: Kahneman and Tversky (1973, p. 243)

You meet a person who is short, slim, and likes to read poetry. Is this person an Ivy League Classics professor or a truck driver?

Use of the representativeness heuristic would lead to the conclusion that the person is an Ivy League Classics professor. Careful consideration of base rate information would produce a different conclusion.

1. How many Ivy League universities are there? 8

2. How many Classics Professors at each? 4

3. How many of those Classics professors are short and slim? 1/2

4. How many of those short, slim, Classics professors like to read poetry? 1/2

How many Ivy League Classics professors fit the description? 8

1. How many truck drivers are there?
   400,000

2. How many are short and slim? 1/8

3. How many of those short, slim truck drivers like to read poetry? 1/10

How many truck drivers fit the description? 5000

What are the odds that the person in the description is a truck driver? 625 to 1

REPRESENTATIVENESS AND THE GAMBLER'S FALACY

- Representativeness can also explain the Gambler's Fallacy (the belief that an event - e.g., red on a roulette table- is likely to come up now because it is "due" e.g., after a run of black).

- 3.) Regression toward the mean

- Observed ability = true ability + chance

- Whenever ability is influenced by chance, observations will over or underestimate one's true ability

- In 1989, *Sports Illustrated* reported that of those baseball players who hit more than 20 home runs in the first half of the season, 90% hit fewer than 20 during the second half
- The regression-toward-the-mean explanation is that their skills did not deteriorate, but rather that their unusually good performances during the first half exaggerated their skills
-

Table 1. How the Ten Players with the Highest batting averages in 1997 Did in 1996 and 1998

	1996	**1997**	1998
Larry Walker	.366	.363	.379
John Olerud	.294	.354	.298
Bernie Williams	.328	.339	.342
Mo Vaughn	.315	.337	.281
Eddie Perez	.215	.336	.249
Dante Bichette	.308	.331	.298
Albert Belle	.274	.328	.297
Mike Piazza	.362	.328	.303
Eric Davis	.304	.327	.257
Jason Kendall	.294	.327	.332
Average	.306	.337	.304

17.4 Optimism, Reluctance to Change, and Overconfidence

Optimism

Slovic and colleagues (1982, pp. 469–470) note that "the great majority of individuals believe themselves to be better than average drivers, more likely to live past 80, less likely than average to be harmed by the products they use, and so on."

Example 6: Optimistic College Students

On the average, students rated themselves as 15 percent more likely than others to experience positive events and 20 percent less likely to experience negative events.

Sources: Weinstein (1980) and Plous (1993, p. 135)

Reluctance to Change

The reluctance to change one's personal-probability assessment or belief based on new evidence.

Plous (1993) notes, "***Conservatism*** is the tendency to change previous probability estimates more slowly than warranted by new data" (p. 138).

Overconfidence

The tendency for people to place too much confidence in their own assessments.
When people venture a guess about something for which they are uncertain, they tend to overestimate the probability that they are correct.

Example 7: How Accurate Are You?

Study Details:
Asked people hundreds of questions on general knowledge.
e.g. Does *Time* or *Playboy* have a larger circulation?
Also asked to rate odds they were correct, from 1:1
(50% probability) to 1,000,000:1 (virtually certain).

Results: the more confident the respondents were,
the more the true proportion of correct answers
deviated from the odds given by the respondents.

Solution: Plous (1993, p. 228) notes, "The most effective way to improve calibration seems to be very simple:
Stop to consider reasons why your judgment might be wrong".

Source: Fischhoff, Slovic, and Lichtenstein (1977)

17.5 Calibrating Personal Probabilities of Experts

Professionals who help others make decisions (doctors, meteorologists) often use personal probabilities themselves.

Using Relative Frequency to Check Personal Probabilities

For a ***perfectly calibrated*** weather forecaster, of the many times they gave a 30% chance of rain, it would rain 30% of the time. Of the many times they gave a 90% chance of rain, it would rain 90% of the time, etc.

Can assess whether probabilities are **well-calibrated** only if we have enough repetitions of the event to apply the relative-frequency definition.

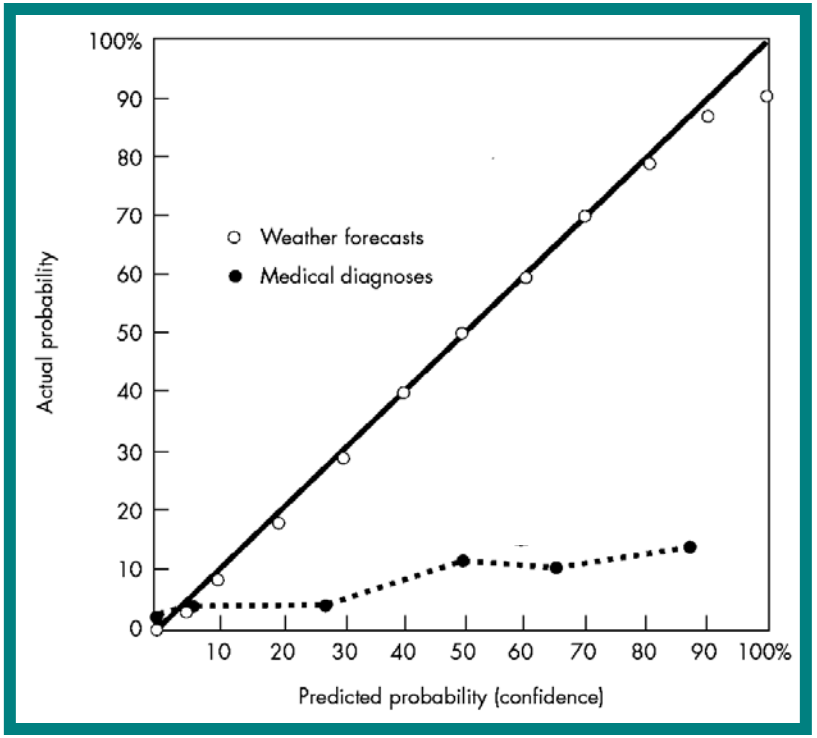
Case Study 17.1: Calibrating Weather Forecasters and Physicians

Open circles: actual relative frequencies of rain vs. forecast probabilities.
Dark circles relative frequency patient actually had pneumonia vs. physician's personal probability they had it.

Weather forecasters were quite accurate, well calibrated.

Physicians tend to overestimate the probability of disease, especially when the baseline risk is low.

When physician quotes a probability, ask "personal or based on data?"



Source: Plous, 1993, p. 223

17.6 Tips for Improving Personal Probabilities and Judgments

1. Think of the ***big picture***, including risks and rewards that are not presented to you. For example, when comparing insurance policies, be sure to compare coverage as well as cost.

2. When considering how a decision changes your risk, try to ***find out what the baseline risk is*** to begin with. Try to determine risks on an equal scale, such as the drop in *number* of deaths per 100,000 people rather than the *percent* drop in death rate.

Tips for Improving Personal Probabilities and Judgments

3. Don’t be fooled by ***highly detailed scenarios***. Remember that excess detail actually decreases the probability that something is true, yet the representativeness heuristic leads people to increase their personal probability that it is true.

4. Remember to list reasons why your judgment might be wrong, to provide a more realistic confidence assessment.

Tips for Improving Personal Probabilities and Judgments

5. Do not fall into the trap of thinking that bad things only happen to other people. ***Try to be realistic*** in assessing your own individual risks, and make decisions accordingly.

6. Be aware that the techniques discussed in this chapter are often used in marketing. For example, ***watch out for the anchoring effect*** when someone tries to anchor your personal assessment to an unrealistically high or low value.

7. If possible, ***break events into pieces*** and try to assess probabilities using the information in Chapter 16 and in publicly available information.