Judgment and Decision Making

PSYC 313 - Lecture 16
Dr. J. Nicol

Fast and Slow Thinking

- Our decision making is frequently irrational and surprising

- Rational behaviour can be described as objective and logical, while irrational behaviour is more subjective and biased

- *Psychological bias:* psychological factors affect our decision making in consistent and predictable ways

- Our errors are systematic and reliable (Ariely, 2008)

Fast and Slow Thinking

- *Thinking fast (System 1)* refers to decision making that operates quickly, with little effort and less control

- *Thinking slow (System 2)* refers to decision making that operates more slowly, with more effort and more deliberate control

- Both systems are useful — they complement each other depending on the situation (Kahneman, 2011)

Judging Under Uncertainty

- Our decisions can only be optimal if we have full knowledge of all relevant alternatives, including their consequences and probabilities, and only if the the world is predictable (Simon, 1979)

- Using heuristics (thinking fast—System 1) can be more practical than using rational models (thinking slow—System 2) (Gigerenzer & Goldstein, 1996)

- Although System 1 allows us to make decisions quickly and efficiently through intuitive judgments and heuristics, the disadvantage is that biases and irrelevant information often sway our judgments and can lead to irrational decisions

Heuristics

- **Heuristic:** a strategy that uses only a subset of information available, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods (Gigerenzer & Gaissmaier, 2011)

- Most of the time heuristics allow us to make good judgments, but under some conditions they lead to make predictable errors

"Steve is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail."

Do you think Steve is more likely to be a librarian or a farmer?

Tversky & Kahneman (1974)

The Representativeness Heuristic

- Probabilities that reflect the state of the world are known as **base rate frequencies**, or **prior probabilities**

- The **representativeness heuristic** is a mental shortcut that is used to estimate the likelihood of an event based on how closely it matches or represents related examples or stereotypes that come to mind (Kahneman & Tversky, 1973)

- Representative information does not change the base rate probabilities, but causes people to focus on similarity to stereotypes

---

THE IMPORTANCE OF BASE RATES

DO LEECHES CURE FEVER?		
	Fever cured	**Fever not cured**
Patients treated with leeches	195	105
Patients not treated with leeches	130	70

Years ago, physicians believed that attaching leeches to the body would cure fever. Here, we've provided some *fictitious data* to illustrate why many people believed this claim—and also why the claim is *false*. Notice that in these data, 195 people treated with leeches were cured. If we focus on just these cases, we might decide that leeches are effective ("I know a man who . . ."). In addition, among people treated this way, two thirds (roughly 200 out of 300) were cured. If we focused on this fact, we might again be impressed with leeches' efficacy. We draw the opposite (and correct) conclusion, though, when we consider the base rate: The overall cure rate in these data is also two thirds, so your chances of cure are the same with leeches or without. Can you think of modern examples of bogus cures that show the same data pattern?

"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"

Which of the following is a more probable description of Linda?
(A) Linda is a bank teller.
(B) Linda is a bank teller and is active in the feminist movement

Tversky & Kahneman (1974)

*The **conjunction fallacy**—the false assumption that a combination of conditions is more likely than either condition by itself*

Because feminist bank tellers are a subset of bank tellers, it is aways more likely that someone is a bank teller than a feminist bank teller

---

Table 2
Mean Attitudes Toward Guards as a Function of Guard Humaneness and Sampling Information

| Group | Sampling information | | |
	Typical	No informa-tion	Atypical
Guard type			
Humane			
M	12.56	13.28	11.94
SD	2.09	1.90	2.62
Inhumane			
M	9.44	10.44	10.11
SD	1.85	2.43	2.03
Control			
M		10.97	
SD		2.67	

Note. The higher the mean, the more favorable the attitude toward guards.

Hamill et al. (1980)

We are wrong about what to afraid of —people are more fearful of statistically improbable dangers than of more common dangers

More risk, less fear → More fear, less risk

| Event Odds of injury requiring medical treatment Odds of dying | Skin cancer 1 in 200 1 in 29,500 | Food poisoning 1 in 800 1 in 55,600 | Heat exposure 1 in 950,000 | Amusement parks 1 in 34,800 1 in 72.3 million | West Nile virus 1 in 68,500 1 in 1 million | Shark attacks 1 in 6 million 1 in 578 million |

Ropeik & Holmes (2003)

Within each pair, which cause of death do you consider to be more likely for people in North America?

Cause A
Homicide
Auto-train collision
Botulism
Asthma
Appendicitis

Cause B
Appendicitis
Drowning
Asthma
Tornado
Pregnancy

The Availability Heuristic

- The *availability heuristic*—describes how when people estimate the frequency of an event, they base those estimations on how easily examples of the event come to mind (Tversky & Kahneman, 1973)

- Events that are more easily remembered are judged as being more probable than events that are less easily remembered

- Usually the ease of thinking of examples is a useful heuristic for judging the frequency or probability of an event because frequently occurring events are easier to recall than uncommon ones

Which is more common is the English dictionary, words that begin with the letter "R" or words in which "R" is the third letter?

Tversky & Kahneman (1973)

The Availability Heuristic

- A survey of married couples found that the total reported house-cleaning effort added up to more than 100% (Ross & Sicoly, 1979)

- When participants were asked to estimate whether there more more males or females in the list they had heard, their answer was influenced by which famous list they had heard (McKelvie, 1997)

Table 1
Ratings of Assertiveness as a Function of Valence and Number of Recalled Behaviors

	Type of behavior	
No. recalled examples	Assertive	Unassertive
6	6.3	5.2
12	5.2	6.2

Note. $n = 9$ or 10 per condition. Mean score of three questions is given; possible range is 1 to 10; higher values reflect higher assertiveness.

Schwarz et al. (1991)

The Availability Heuristic

- Course evaluations were higher among students who were asked to list 10 ways that the course could be improved than among students who were asked to list just 2 ways it could be improved (Fox, 2006)

- Facebook users who spend a significant amount of time using it tend to believe that other people are happier and have better lives than they do (Chou & Edge, 2012)

Availability Heuristic and Representativeness Heuristic

You want to judge . . .	Instead you rely on . . .	This usually works because . . .	But this strategy can lead to error because . . .
Frequency of occurrence in the world	Availability in memory: How easily can you think of cases?	Events that are frequent in the world are likely to be more available in memory.	Many factors *other than* frequency in the world can influence availability from memory!
Probability of an event being in a category or having certain properties	Resemblance between that event and other events that are in the category	Many categories are homogeneous enough so that the category members do resemble one another.	Many categories are not homogeneous!

"A town is served by two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50% of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50%, sometimes lower. For a period of 1 year, each hospital recorded the days on which more than 60% of the babies were born boys."

Which hospital do you think recorded more of such days?
(A) The larger hospital
(B) The smaller hospital
(C) About the same (i.e., within 5% of each other)

Kahneman & Tversky (1972)

Sample Size and Chance

- ***The law of sample size:*** smaller sample sizes produce more variance

- Most people understand that larger sample sizes are more valid, but they fail to apply this knowledge (Kahneman, 2011)

When a coin is tossed for heads (H) or tails (T), which of the following sequences is more likely?

(A) H—T—H—T—T—H—H—T

(B) H—H—H—H—T—T—T—T

Kahneman & Tversky (1972)

---

*The **gambler's fallacy** describes the erroneous reasoning that past events in a sequence affect the likelihood of future events*

*The **hot hand effect** refers to a belief that a certain course of events will continue*

TABLE 1
Probability of Making a Shot Conditioned on the Outcome of Previous Shots for Nine Members of the Philadelphia 76ers

Player	P(hit/3 misses)	P(hit/2 misses)	P(hit/1 miss)	P(hit)	P(hit/1 hit)	P(hit/2 hits)	P(hit/3 hits)	Serial correlation r
Clint Richardson	.50 (12)	.47 (32)	.56 (101)	.50 (248)	.49 (105)	.50 (46)	.48 (21)	−.020
Julius Erving	.52 (90)	.51 (191)	.51 (408)	.52 (884)	.53 (428)	.52 (211)	.48 (97)	.016
Lionel Hollins	.50 (40)	.49 (92)	.46 (200)	.46 (419)	.46 (171)	.46 (65)	.32 (25)	−.004
Maurice Cheeks	.77 (13)	.60 (38)	.60 (126)	.56 (339)	.55 (166)	.54 (76)	.59 (32)	−.038
Caldwell Jones	.50 (20)	.48 (48)	.47 (117)	.47 (272)	.45 (108)	.43 (37)	.27 (11)	−.016
Andrew Toney	.52 (33)	.53 (90)	.51 (216)	.46 (451)	.43 (190)	.40 (77)	.34 (29)	−.083
Bobby Jones	.61 (23)	.58 (66)	.58 (179)	.54 (433)	.53 (207)	.47 (96)	.53 (36)	−.049
Steve Mix	.70 (20)	.56 (54)	.52 (147)	.52 (351)	.51 (163)	.48 (77)	.36 (33)	−.015
Daryl Dawkins	.88 (8)	.73 (33)	.71 (136)	.62 (403)	.57 (222)	.58 (111)	.51 (55)	−.142**
Weighted means	.56	.53	.54	.52	.51	.50	.46	−.039

Note. Since the first shot of each game cannot be conditioned, the parenthetical values in columns 4 and 6 do not sum to the parenthetical value in column 5. The number of shots upon which each probability is based is given in parentheses.
* $p < .05$.
** $p < .01$.

Gilovich et al. (1985)

Anchoring and Adjustment

- The *anchoring heuristic* refers to how different starting points produce different estimates or decisions, by which people adjust their evaluations of things by means of certain reference points called end anchors

---

Table 1
THE IMPACT OF MULTIPLE-UNIT PRICING ON SUPERMARKET SALES

Product	Level of Discount	Form of Price Expression	Percentage Change in Unit Sales Single unit	Multiple unit	p-Value
Bathroom Tissue	15%	1/50¢ versus 4/$2.00	+57	+97	.02
Candy	9%	1/50¢ versus 2/$1.00	+24	+25	n.s.
Cereal (Breakfast)	33%	1/$1.99 versus 2/$3.98	+133	+137	n.s.
Cookies	44%	1/$1.67 versus 2/$3.34	+306	+372	.01
Frozen Dinners	12%	1/$2.49 versus 2/$5.00	+33	+70	.003
Frozen Dinners	20%	1/$2.50 versus 2/$5.00	+133	+195	.0001
Frozen Entrees	26%	1/$1.25 versus 2/$2.50	+133	+156	.02
Paper Towels	31%	1/75¢ versus 2/$1.50	+403	+565	.001
Soap (3-Bar Packs)	15%	1/$1.99 versus 2/$3.98	+48	+30	n.s.
Soft Drinks (2 Liters)	17%	1/$1.49 versus 2/$3.00	+33	+66	.01
Soup (Canned)	20%	1/$1.33 versus 2/$3.34	+200	+248	.01
Soup (Canned)	17%	1/50¢ versus 2/$1.00	+108	+112	n.s.
Tuna (Canned)	18%	1/65¢ versus 2/$1.30	+36	+66	.004
	21%		+125%	+165%	.0001

Wansick et al. (1998)

Measure	Quantity Limit Level		
	No Limit	Limit 4	Limit 12
Purchase Quantity per Buyer	3.3[a]	3.5[a]	7.0[b]
Purchase Incidence	7%	10%	9%
Total Units Sold	73[a]	106[a]	188[b]

Note: Means with different superscripts are reliably different from others in that row at the $p < .05$ level according to the Duncan multiple comparisons procedure.

Wansick et al. (1998)

THE IMPACT OF SUGGESTIVE SELLING ANCHORS AND DISCOUNTS

Anchor ("Buy 18 for your freezer") (3.9)

(3.3)

(3.3)

(2.6)

No Anchor
(2.5) ("Buy some for your freezer")

Purchase Quantity Intentions (in units)

(1.4)

Full Price   20% Discount   40% Discount

Discount Level
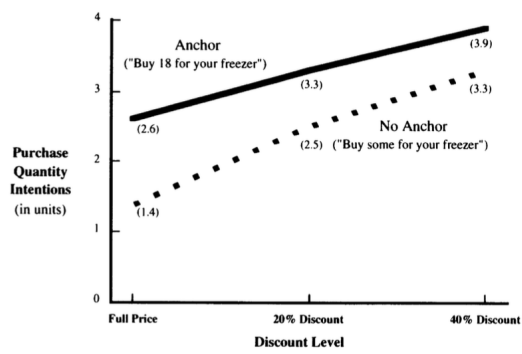
Wansick et al. (1998)

Choose your subscription to *The Economist*

Print	Print + Digital	Digital
$125	**$125**	**$59**
One-year subscription to the print edition of *The Economist*	One-year subscription to the print edition of *The Economist* and online access to all articles from *The Economist* since 1997	One-year subscription to Economist.com and online access to all articles from *The Economist* since 1997
Subscribe now	Subscribe now	Subscribe now
Student and gift options available	Student and gift options available	Student and gift options available

Ariely (2008)

Intuitive Thinking

- Some decisions demand conscious, deliberate thought —thinking slow rather than thinking fast

- But even in such instances, conscious thought does not always lead to sound choices

- Our attention is limited, so we can only consider a few factors at a time, and information overload may lead poorer decisions if the wrong factors are emphasized

- Research has shown that unconscious thought can be useful for complex decisions that involve multiple factors (e.g., buying a car, renting an apartment)

Intuitive Thinking

- In a process called the **deliberation-without-attention effect,** you consciously make a decision, but unconscious processes helped to reach it

- In many cases, deliberation without attention can help lead to better decisions
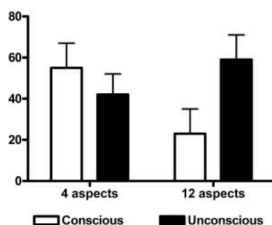
Fig. 1. Percentage of participants who chose the most desirable car as a function of complexity of decision and of mode of thought ($n = 18$ to 22 in each condition). Error bars represent the standard error.
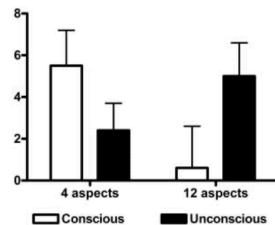
Fig. 2. Difference in attitude (on a scale of -25 to $+25$) toward the desirable and undesirable car as a function of complexity of decision and of mode of thought ($n = 12$ to 14 in each condition). Error bars represent the standard error.

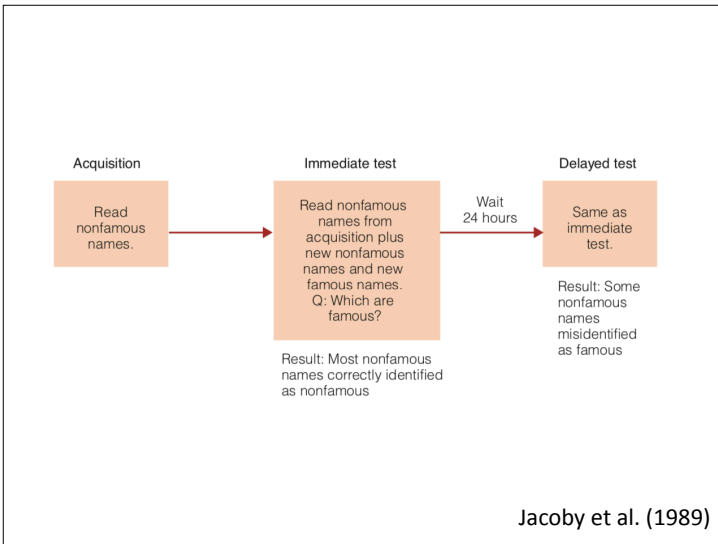Djikerhuis et al. (2006)

Intuitive Thinking

- Participants who deliberated about their choice subsequently reported being less happy with their choices and even less likely to keep the posters on their dorm room walls (Wilson et al., 1993)

- *Less-is-more effects* refer to situations where too much information, computation, or time devoted to a problem may lead to less accurate, sensible, or satisfying decisions

- When faced with more options, people who try to maximize their decisions to achieve the "best" possible outcome, relative to those who chose what's "good enough", tend to be less satisfied and more regretful (Schwartz et al., 2002)

Recognition-Based Heuristics

- The *recognition heuristic* states that people who are presented with two alternatives place higher value on the one they recognize versus the one that is novel

- In a peanut-butter taste test, people favoured their familiar brand even when it was labeled as lower-quality product (Hoyer & Brown, 1990)

- People prefer things that are familiar, and novel options can be made familiar through mere repeated exposure (Zajonc, 1968)

Recognition-Based Heuristics

- When all alternative are familiar, the *fluency heuristic* states that people assign higher value to the option that is recognized first, that is, more quickly and easily

- Repeated exposure to an item or claim allows you to recognize it faster, which is known as fluency (Jacoby & Dallas, 1981)

- And increased fluency can increase the perceived truth of repeated claims of fame of name (Jacoby et al., 1989)

Slide 1

Acquisition   Immediate test   Delayed test

Read nonfamous names.   →   Read nonfamous names from acquisition plus new nonfamous names and new famous names. Q: Which are famous?   — Wait 24 hours →   Same as immediate test.

Result: Some nonfamous names misidentified as famous

Result: Most nonfamous names correctly identified as nonfamous

Jacoby et al. (1989)

Slide 2

Decision Making

- *Decision making:* selecting a course of action from multiple options or alternatives

- *Expected utility theory* is based on the assumption that people are basically rational, so if they have all the relevant information, they will make a decision that results in the maximum expected utility

- The idea is that we try to maximize *positive utility* and minimize *negative utility*

Slide 3

Which of the following bets would you choose?

(A) A 5% chance of earning $1000
(B) A 95% chance of earning $100

Decision Making

- According to **rational choice theory,** we make decisions by comparing the expected value of our options
- The rational models that help us calculate these choices are called normative
- **Normative theories** are based on rational, logical, and mathematical calculations to compare decision options, explaining how decisions should be made in order to maximize utility and rewards


(a) 1 out of 10 red
Odds = 10%
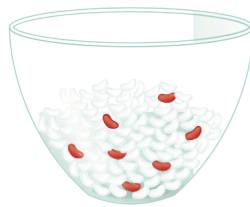
(b) 7 out of 100 red
Odds = 7%

Denes-Raj & Epstein (1994)

Decision Making

- **Descriptive theories** are concerned with how we actually make decisions, describing beliefs and preferences as they are, not as they should be
- Decision making in everyday life deviates from normative analysis for two main reasons:
  - Options are ambiguous, or open to more than one interpretation (Hsu et al., 2005)
  - Even if likelihoods were well defined, value (utility) is subjective—concept of **subjective value** is the notion that utility is not objective but dependent on the decision maker and context
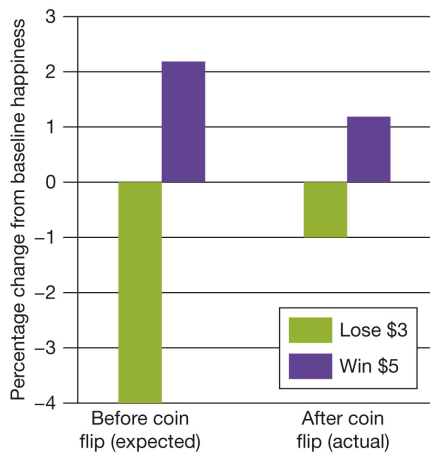
Which of the following options would you choose?

(A) A sure loss of $750
(B) A 75% chance of losing $1000 and a 25% chance of losing nothing

---

Prospect theory
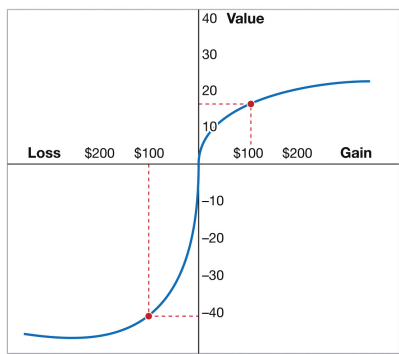
Kahneman (2011)

Kermer et al. (2006)

Framing Effects

- *Framing effects*: decisions are influenced by how the choices are presented (Tversky & Kahneman, 1981)

- We tend to choose options that demonstrate risk aversion when were are faced with the possibility of potential gains

- And we tend to choose options that demonstrate risk seeking when are faced with options involving potential losses

---

Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a one-third probability that 600 people will be saved, and a two-thirds probability that no people will be saved.
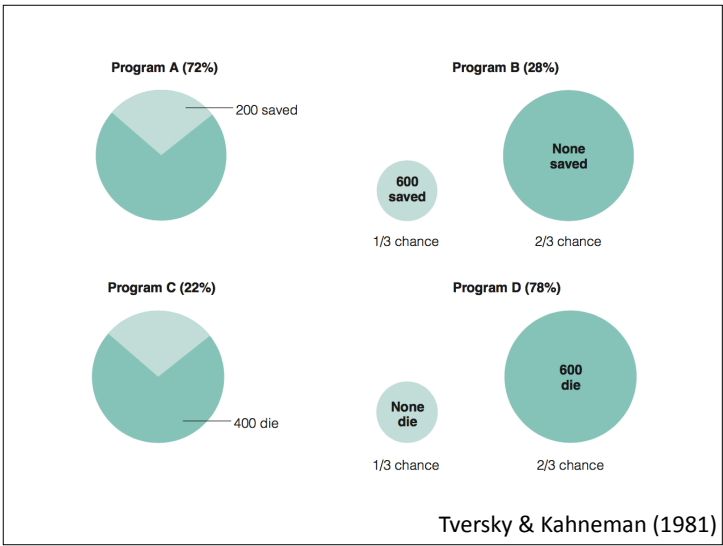
Tversky & Kahneman (1981)

Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 400 people will die.

If Program B is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.

Tversky & Kahneman (1981)

Program A (72%)
200 saved
600 saved
1/3 chance

Program B (28%)
None saved
2/3 chance

Program C (22%)
400 die
None die
1/3 chance
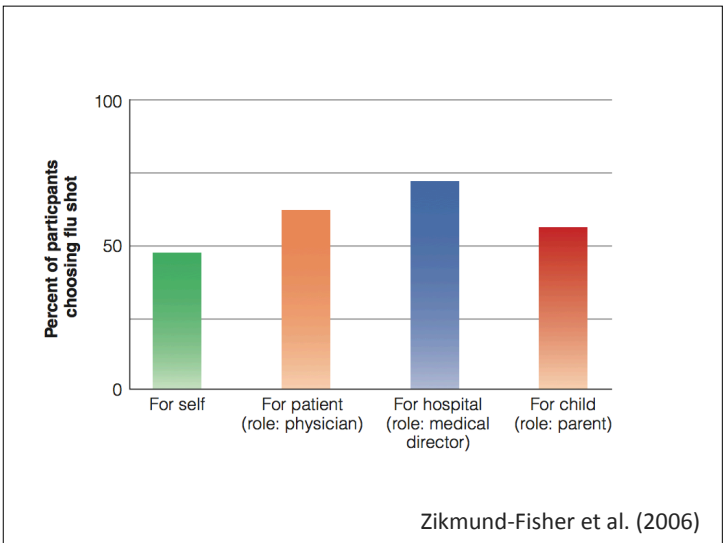
Program D (78%)
600 die
2/3 chance

Tversky & Kahneman (1981)

Imagine that there will be a deadly flu going around your area next winter. Your doctor says that you have a 10 percent chance (10 out of 100) of dying from this flu. A new flu vaccine has been developed and tested. If administered, the vaccine will prevent you from catching the deadly flu. However, there is one serious risk involved: The vaccine is made from a somewhat weaker type of flu virus, so there is a 5 percent risk (5 out of 100) that the vaccine could kill you. Considering this information, decide between the following two alternatives:

- I will not take the vaccine, and I accept the 10 percent chance of dying from this flu.
- I will take the vaccine, and I accept the 5 percent chance of dying from the weaker flu in the vaccine.

Zikmund-Fisher et al. (2006)

Percent of participants choosing flu shot

For self
For patient (role: physician)
For hospital (role: medical director)
For child (role: parent)

Zikmund-Fisher et al. (2006)

Imagine that you serve on the jury of an only-child sole-custody case following a relatively messy divorce. The facts of the case are complicated by ambiguous economic, social, and emotional considerations, and you decide to base your decision entirely on the following few observations. To which parent would you award sole custody of the child?

Parent A   average income
average health
average working hours
reasonable rapport with the child
relatively stable social life

Parent B   above-average income
very close relationship with the child
extremely active social life
lots of work-related travel
minor health problems

Status Quo Bias

- The *status quo bias* is a preference for the current state of affairs

- The *endowment effect* is a type of status quo bias—it is the tendency to overvalue what you have, and it is commonly seen in the real estate market
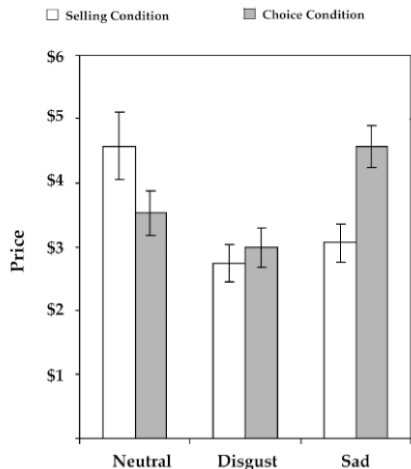
Lerner et al. (2004)

The Sunk Cost Effect

- The **sunk cost effect** is a maladaptive behaviour, the greater tendency to continue an endeavour once an investment in money, effort, or time has been made (Arkes & Ayton, 1999)

Imagine that you have just taken a tough qualifying examination. It is the end of the semester, you feel tired and run-down, and you find out that [(*pass group*) you passed the exam; (*fail group*) you failed the exam and will have to take it again in a couple of months—after the Christmas holidays]. You now have the opportunity to buy a very attractive 5-day Christmas vacation package to Hawaii at an exceptionally low price. The special offer expires tomorrow. Would you

- Buy the vacation package?
- Not buy the vacation package?
- Pay a $5 nonrefundable fee in order to retain the right to buy the vacation package at the same exceptional price the day after tomorrow?
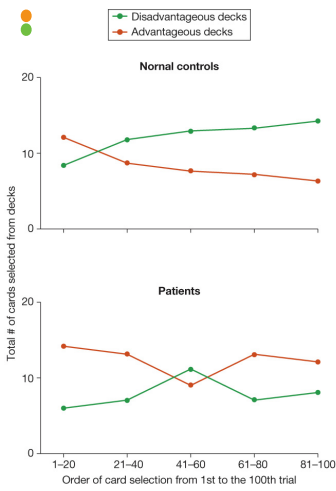
Tversky & Shafir (1992)

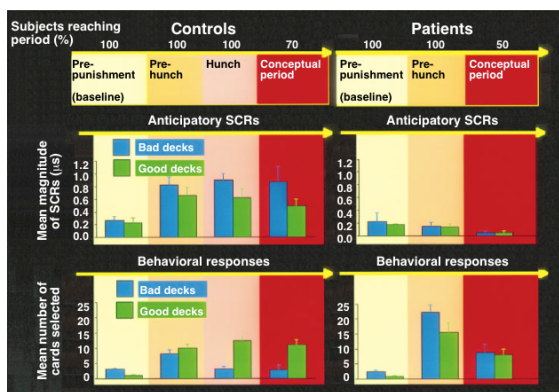|	Passed	Failed	Result in 2 Days
Buy vacation package	54 %	57 %	32 %
Don't buy	16	12	7
$5 to keep open option to buy later	30	31	61

Tversky & Shafir (1992)

Damage to the **prefrontal cortex (PFC)**
impairs the ability to make good decisions
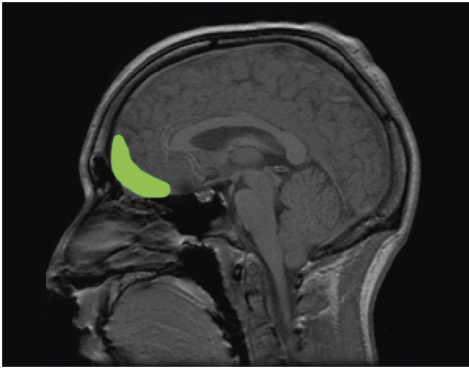
Bechara et al. (1997)

Bechara et al. (1997)