RESEARCH **Bower, Black and Turner (1979)—effects of scripts**

Essential understanding
✪ *Generalized mental representations (scripts) underlie our interpretation and memory of sequential events.*

Procedure
The researchers used short texts describing sequences of actions, for example, visiting the dentist (having a toothache, making an appointment, checking in with the receptionist, and so on). Some of the steps in these descriptions were missing.

Results
It was demonstrated that when recalling the texts, participants would fill in the gaps and "remember" actions that were not actually in the text. For example, they would recall checking in with the receptionist even if this was skipped in the text.

Conclusion
This shows that participants encoded the text based on an underlying script.

2.1.3 Thinking and decision-making

DEFINITIONS

- **Decision-making strategy**—a specific algorithm that enables one to solve a multi-attribute choice problem
- **Descriptive models**—models of thinking and decision-making that describe how people actually think and make decisions, taking into account irrational factors
- **Macro-scale models**—models that focus on observable actions and their predictors
- **Micro-scale models**—models that focus on the transient process of making a decision (what goes on in a person's mind when he or she is making a decision)
- **Multi-attribute problem**—a choice problem involving choosing between several alternatives (options) each characterized by several attributes (parameters)
- **Normative models**—models of thinking and decision-making that describe the rules of rational thinking and decision-making

ESSENTIAL UNDERSTANDING

Thinking and decision-making
- Thinking is the cognitive process responsible for modifying previously encoded information. Unlike other cognitive processes, thinking results in obtaining new information from existing information.
- Decision-making is the cognitive process of choosing between given alternatives. It always involves a choice.
- Thinking and decision-making are closely connected because in order to make a choice you need to use thinking (for example, breaking alternatives down into smaller parts or aspects). So thinking is a prerequisite of decision-making.

Models of thinking and decision-making: two types
In the variety of models of thinking and decision-making we can broadly distinguish two categories—normative models and descriptive models. Normative models describe thinking the way it should be, while descriptive models describe thinking as it is. See **"Normative models and descriptive models"**.

The theory of planned behaviour (TPB)
- The TPB sees decision-making as actions that result from behavioural intentions which, in turn, are determined by: attitudes, perceived social norms and perceived behavioural control. It is a macro-level theory: it looks at actions as visible results of decision-making processes. See **"Ajzen (1985)—The theory of planned behaviour (TPB)"**.
- One of the ways to test the TPB is to establish its predictive validity: the extent to which the combination of variables postulated in the theory actually predicts real-life behaviour.
- Albarracin *et al* (2001) investigated predictive validity of the TPB in the domain of condom use. They found a 0.51 correlation between intention and behaviour in their meta-analysis. **See Albarracin *et al* (2001)**.

The adaptive decision-maker framework
The adaptive decision-maker framework (Payne, Bettman, Johnson 1993) is a micro-level cognitive model—it zooms in on the transient internal process of making a decision. The theory states the following.
- People possess a toolbox of strategies they can use to make decisions.
- The choice of strategy is dictated by four meta-goals: maximizing decision accuracy; minimizing cognitive effort; minimizing the experience of negative emotion; maximizing the ease of justification. In this way the theory claims that factors other than accuracy must be integrated directly into a model of decision-making. See **Payne, Bettman and Johnson (1993)**.
- Luce, Bettman and Payne (1997) provided support to the model by demonstrating that in a situation that is emotionally pressing, people tend to process information more extensively, but at the same time avoid emotionally difficult trade-offs. See **Luce, Bettman and Payne (1997)**.

NORMATIVE MODELS AND DESCRIPTIVE MODELS

- **Normative models** describe "ideal" thinking and decision-making that result in "correct" choices. These are models of what thinking and decision-making should be. Examples of normative models are formal logic, statistical theory of probability, normative utility theory. Formal logic describes correct thinking patterns. Statistical theory of probability may be used as a normative model in formulating predictions. Normative utility theory tells us what is right and wrong in choosing between economically attractive alternatives. It uses monetary value to define utility.
- **Descriptive models** describe the processes of thinking and decision-making as they are. It is impossible for people to use normative models to make every decision because normative models require too many resources and also assume that we are fully informed, while decisions in real life are usually made under uncertainty (incomplete information) and limited time.

Psychology focuses on descriptive models because what interests us is a prediction of people's decisions, with all their biases and fallacies. However, normative models are used as a background for this research, because we look at how people deviate from normative models and try to determine whether or not the deviations are predictable.

THEORY

AJZEN (1985)—THE THEORY OF PLANNED BEHAVIOUR (TPB)

Essential understanding
✪ *Actions are determined by behavioural intentions which, in their turn, are determined by a number of subjective beliefs.*

Macro-level
The theory of planned behaviour is a macro-level cognitive model: it looks at behaviour at a large scale, on the visible level of whether an action is performed or not.

The theory
Behavioural intention determines effort: the stronger it is, the harder we try to implement the behaviour. Behavioural intention is determined by three factors:
- attitudes—individual perceptions of the behaviour (positive or negative)
- subjective norms—perceived social pressure regarding this behaviour (acceptable or unacceptable)
- perceived behavioural control—the perception of one's ability to perform the action.

In other words, the theory holds that if your attitude to a particular behaviour is positive, you believe this behaviour to be socially acceptable, and you believe you are able to perform the action, this will create a behavioural intention. If the intention is strong enough, the action will be performed.

Research
- The theory of planned behaviour requires the researcher to have self-report measures of four predictor variables (attitudes, norms, behavioural control, intention) and one target variable (future behaviour itself).
- The theory predicts that there should be a correlation between: attitudes and intention; behavioural control and intention; subjective norms and intention; intention and behaviour. However, behaviour should not be significantly correlated directly with attitudes, subjective norms or perceived control.
- If the theory provides a good fit to empirical data, it should have high **predictive validity**: the four predictor variables collectively should be able to predict the target variable (future behaviour) with high probability.

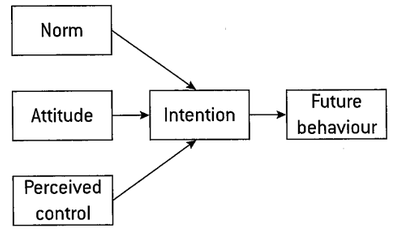

Figure 2.5 The model for the TPB

RESEARCH **Albarracin *et al* (2001)—a meta-analysis of TPB as a model of condom use**

Essential understanding
✪ *The TPB fits well into observed behaviour in the domain of condom use.*

Aim
To investigate predictive validity of the theory of planned behaviour for people's decisions to use or not to use condoms (this is essential to enhance prevention of sexually transmitted diseases).

Method
A meta-analysis.

Participants
42 published and unpublished research papers with a total of 96 data sets.

Procedure
All data sets from published research were combined in a single large data matrix, which was then used to analyse the fit of the model of planned behaviour.

Results
- TPB turned out to be a successful predictor of condom use. The correlation between intention and behaviour in this model was 0.51.

- There were significant correlations between behavioural intentions (on the one hand) and norms, attitudes and perceived control (on the other hand).

Conclusion

It was concluded that people are more likely to use condoms when they have formed an intention to do so. In their turn, these intentions are based on attitudes, subjective norms and perceived behavioural control. On a broader scale, the study also confirms predictive validity of the TPB in the specific domain of condom use.

THEORY

PAYNE, BETTMAN AND JOHNSON (1993)—THE ADAPTIVE DECISION-MAKER FRAMEWORK

Essential understanding

✪ *People possess a toolbox of decision-making strategies, and the choice is guided by emotion-related goals (such as minimizing negative emotion in the process of making a decision) as well as an attempt to achieve accuracy.*

Micro-level

The adaptive decision-maker framework is a micro-level cognitive model. It zooms in on the process of making a decision and looks at what is happening in a person's mind when he or she is making the decision.

A typical decision-making scenario

This model suggests that people have a toolbox of strategies that they use in various decision-making situations involving making a choice between several alternatives compared against several attributes.

Alternatives	Attributes		
	Quality of food	Quality of service	Location
Restaurant 1	…	…	…
Restaurant 2	…	…	…
Restaurant 3	…	…	…

Table 2.3 Examples of alternatives and attributes

The strategies in the toolbox are summarized in Table 2.4.

Strategy	Alternative-based or attribute-based?	Process
Weighted additive strategy (WADD)	Alternative-based	Calculate the weighted sum (utility) of attributes for each alternative, choose the alternative with the highest weighted sum.
Lexicographic strategy (LEX)	Attribute-based	Choose the most important attribute and then the option that has the best value on this attribute.
Satisficing strategy (SAT)	Alternative-based	Determine a cut-off point for every attribute (no less than…). Find the option that exceeds the cut-off points on all attributes.
Elimination by aspects (EBA)	Attribute-based	Choose the most important attribute and eliminate all the options that do not satisfy your requirements for this attribute. Choose the second most important attribute and eliminate more options. Continue until only one option is left.

Table 2.4 Strategies in the toolbox

All strategies may be divided into alternative-based and attribute-based.

- In **alternative-based strategies** (WADD and SAT) you select an alternative and compare attributes within it.
- In **attribute-based strategies** (LEX and EBA) you select an attribute and compare alternatives against it.

It is important to know that alternative-based strategies are emotionally tougher, because they involve more trade-offs (an alternative often combines some attractive attributes with unattractive ones).

Meta-goals

According to the adaptive decision-maker framework, what strategy a person selects from the toolbox is guided by four meta-goals.

Meta-goal	Which strategy to choose
Maximizing decision accuracy	WADD
Minimizing cognitive effort	LEX
Minimizing the experience of negative emotion	Choose any attribute-based strategy (and avoid alternative-based strategies): LEX, EBA
Maximizing the ease of justification	This depends on the context, but most often SAT and EBA are chosen.

Table 2.5 The four meta-goals

RESEARCH **Luce, Bettman and Payne (1997)—support for the adaptive decision-maker framework**

Essential understanding

✪ *Emotional variables should be directly incorporated into the model of decision-making because it can be demonstrated that decision-making adapts to emotion.*

Aim

The researchers predicted that, if decision-making really adapts to emotion, people who make choices involving emotionally difficult trade-offs will:

- process information more extensively (because they want to make an accurate decision), and at the same time
- choose strategies that allow them to avoid emotionally difficult trade-offs.

Method

Experiment; independent measures design.

Participants

27 undergraduate students.

Procedure

Subjects assumed the role of members of a charity and were required to decide which of five candidate children would get financial support. Each of the five children was described in terms of five attributes (such as living conditions and family size). All attributes were relevant to the decision-maker.

Participants were split into two groups.

- Higher-emotion group, in which participants were told that the other four children were not likely to receive help from anywhere else.
- Lower-emotion group, in which participants were told that the four remaining children were likely to receive help elsewhere at a later time.

Measurement of DVs was done with "Mouselab", a software in which information was presented in the form of a table (children × attributes), but information in the cells was hidden and participants had to click the mouse on a particular cell to reveal that information. The software recorded the order in which participants opened cells. Occurrence of two types of transitions was counted. The types were:

- alternative-based transitions (after opening cell A, open a cell for a different attribute but the same alternative)
- attribute-based transitions (after opening cell A, open a cell for the same attribute but a different alternative).

Results

- Participants in the higher-emotion group spent more time on the task and opened a larger number of cells in total, which shows that they were considering the decision more carefully.
- Participants in the higher-emotion group engaged more frequently in attribute-based transitions. As you know, attribute-based strategies involve less emotionally difficult trade-offs. This shows that participants were avoiding experiencing negative emotion in the process of making the decision.

Conclusion

Predictions of the adaptive decision-maker framework were confirmed so it may be concluded that emotional variables need to be incorporated directly into a model of decision-making because the strategies of decision-making are not only influenced by, but directly adapt to, task-related emotion.

2.2 Reliability of cognitive processes

2.2.1 Reconstructive memory

DEFINITIONS

- **Misleading question**—one of the forms that post-event information can take; misleading questions suggest information that is not entirely consistent with what actually happened
- **Post-event information**—information about an event provided (directly or indirectly) after the event already occurred
- **Recall**—a form of retrieval, retrieval of required information from memory in the absence of any prompts
- **Recognition**—a form of retrieval that involves identifying an object as previously seen
- **Reconstructive memory**—the theory that views memory to be an active process of recreation of past events as opposed to a passive process of retrieval

ESSENTIAL UNDERSTANDING

The theory of reconstructive memory

- There are cases of memory unreliability, such as memory distortions, when you remember things that did not actually happen (or not exactly the way they happened).
- These phenomena can be explained by the **theory of reconstructive memory** which suggests that memory is not passive retrieval of information from a long-term store, but rather an active recreation of the event in the mind every time it is remembered. The theory recognizes two kinds of information: information obtained during the perception of the event and external post-event information. Over time, information from these two sources can get integrated to the extent that we are unable to tell them apart.

Supporting research

- A classic study supporting this theory is Loftus and Palmer (1974), where the researchers demonstrated that in an eyewitness situation people's accounts of an event can be influenced by slight differences in the

way the question is formulated. See **Loftus and Palmer (1974)**.
- The researchers also discussed and tested two potential explanations: genuine memory change or simple response bias (when the memory is unchanged, but participants tweak their responses based on what they think is expected of them).
- The phenomenon of reconstructive memory was found both for recall tasks and recognition tasks, both for verbal information and visual information. For example, Loftus, Miller and Burns (1978) in an experiment involving a recognition task found that misleading verbal post-event information can integrate with visual memory and distort it. See **Loftus, Miller and Burns (1978)**.
- One criticism of research in this area is lack of ecological validity. Yuille and Cutshall (1986) conducted a study in naturalistic settings (a real-life gun store robbery) and found that misleading questions had very little effect on how eyewitnesses recalled the events, thus contradicting the theory of reconstructive memory. See **Yuille and Cutshall (1986)**.
- However, results of Yuille and Cutshall's study may be a reflection of a completely different memory mechanism—flashbulb memory.

RESEARCH Loftus and Palmer (1974)—the eyewitness study

Essential understanding
✪ *In an eyewitness situation misleading post-event information can integrate with memory of the event and alter it.*

Aim
To investigate if memory can be altered by misleading post-event information (in an eyewitness situation).

Method
Experiment; independent measures design.

Participants
University students, convenience samples. Experiment 1—45 students, 5 groups; experiment 2—150 students, 3 groups.

Procedure
Experiment 1: participants were shown recordings of traffic accidents, then they were given a questionnaire with a number of questions about the accident they had just witnessed. Only one of these questions was critical for the research: "About how fast were the cars going when they hit each other?"

The five groups in experiment 1 only differed in the emotional intensity of the verb used in that sentence. The verbs used were: group 1 "smashed"; group 2 "collided"; group 3 "bumped"; group 4 "hit"; group 5 "contacted". The independent variable (IV) was therefore the misleading post-event information, operationalized as the emotional intensity of the verb in the question. The dependent variable (DV) was the speed estimate.

Experiment 2: participants were shown a film of a car accident. After the film they filled out a questionnaire. Three groups of participants got three different versions of the critical question: group 1 "smashed into each other"; group 2 "hit each other"; group 3: no critical question (control group).

A week later, participants were given another questionnaire that consisted of 10 questions and included one critical yes/no question: "Did you see any broken glass?" The IV in experiment 2 was therefore the emotional intensity of the verb in the leading question and the DV was whether or not participants reported having seen broken glass. In reality there was no broken glass.

Results
Experiment 1: the mean speed estimates varied significantly for the five groups (see Table 2.6).

Verb	Speed estimate (mph)
Smashed	40.5
Collided	39.3
Bumped	38.1
Hit	34.0
Contacted	31.8

Table 2.6 Findings from Loftus and Palmer (1974)—speed estimates

Experiment 2: emotional intensity of the verb in the leading question influenced the probability that participants would report seeing broken glass in the video (see Table 2.7).

Verb	% of participants saying "yes" to the question about broken glass
Smashed	32%
Hit	14%
No critical question	12%

Table 2.7 Findings from Loftus and Palmer (1974)—broken glass

Conclusion
Experiment 1 clearly demonstrated that misleading post-event information influences eyewitness accounts of an event. However, there could be two potential explanations for this finding.
- There could be genuine memory change (the question causes a change in the participant's representation of the event).
- There could be response bias (memory of the event does not change, but verbs of a higher emotional intensity causes participants to give higher estimates when they are uncertain).

Experiment 2 was conducted to rule out the second explanation. Since it demonstrated that verbs of a higher emotional intensity may cause participants to recall events that never occurred, researchers concluded that we should reject the response bias explanation and accept genuine memory change.

RESEARCH Loftus, Miller and Burns (1978)—reconstructive memory in a visual recognition task

Essential understanding
✪ *Effects of misleading verbal post-event information can also be seen in visual recognition tasks.*

Aim
To investigate whether verbal post-event information can be integrated with visual information obtained originally.

Method
Experiment, independent measures, 2 × 2 experimental design.

Participants
195 university students.

Procedure
Participants were shown a series of slides depicting a car (a red Datsun) that was approaching an intersection with a sign, then turned right and knocked down a pedestrian. The critical slide was the one showing the sign at the intersection.
- For half the participants, the slide showed a stop sign.
- For the other half, it was a yield sign.

After seeing the slides, participants were asked a series of questions, with the critical one as follows.
- Half the participants were asked: "Did another car pass the red Datsun while it was stopped at the stop sign?"
- The other half were asked: "Did another car pass the red Datsun while it was stopped at the yield sign?"

This resulted in a 2 × 2 experimental design, shown in Table 2.8.

Sign in the slides	Sign in the question	
	Stop	Yield
Stop	Group 1	Group 2
Yield	Group 3	Group 4

Table 2.8

Finally, participants had a forced-choice recognition test where they had to pick the slide they had seen from a pair of slides.

Results
Participants who received misleading post-event information (groups 2 and 3) recognized the slide they had seen correctly in 41% of the cases, while participants who received consistent post-event information (groups 1 and 4) were able to do so in 75% of the cases.

Conclusion
Misleading post-event verbal information can get integrated with visual memory, alter it and affect performance on a visual recognition task. This has great practical significance because visual recognition tasks are a common practice in police investigations.

RESEARCH Yuille and Cutshall (1986)—gun store robbery study

Essential understanding
✪ *The phenomenon of reconstructive memory is not found in highly naturalistic settings involving strong emotional reactions while witnessing an event. However, in such cases we could be dealing with a separate memory mechanism (flashbulb memory) that overrides reconstructive memory.*

Aim
To investigate whether eyewitness accounts get distorted as a function of misleading post-event information in a naturalistic setting.

Method
Interviews with elements of an experiment.

Participants
13 eyewitnesses to a real crime (a gun store robbery) in Vancouver.

Procedure
- In this real-life robbery, a thief entered a gun store, tied up the owner, stole money and guns, and left. The owner managed to untie himself, take a gun and run outside. This was followed by a gun shooting in which the robber was killed. The shooting was witnessed by 21 people from various viewpoints. All the witnesses were interviewed by the police.
- Four months after the incident researchers conducted interviews where they also used experimental elements (some participants were asked leading questions with misleading information, others were not).
- To determine the accuracy of participants' memories, they were compared to official police records.

Results
Misleading questions had very little effect on recall. Participants were able to accurately recall a large number of details.

Conclusion
The results have two potential explanations.
- Reconstructive memory is a phenomenon that is only found in artificial conditions of laboratory experiments.
- The study actually tapped into a different memory phenomenon—flashbulb memory. It occurs when the witnessed event is accompanied by a strong emotional experience, so memory of the event gets "imprinted" with a high degree of accuracy. See "**2.3.1 The influence of emotion on cognitive processes**".

2.2.2 Biases in thinking and decision-making

DEFINITIONS

- **Cognitive biases**—systematic deviations from normative models that can result from heuristics
- **Confirmation bias**—the tendency to focus on information that supports a pre-existing belief and ignore information that can potentially contradict it
- **Expected utility theory**—a normative theory of choice; claims that choices should be made based on a calculation of expected outcome for each option and then selecting the option with maximum expected outcome
- **Framing effect**—a heuristic of making a choice under risk; describes how the choice depends on whether the problem is formulated (framed) in terms of potential gains or in terms of potential losses
- **Heuristics**—mental shortcuts that people take when there is no time or resources to analyse the situation thoroughly
- **Illusory correlation**—a cognitive bias where people see a relationship between things or event that are not actually related
- **System 1 and system 2**—hypothetical systems of thinking that describe the relationship between intuitive thinking and rational analysis

ESSENTIAL UNDERSTANDING

Normative and descriptive models of thinking and decision-making

- **Normative models** of thinking and decision-making describe the rules of "correct" thinking. They assume that a decision-maker is completely rational, has unlimited computational capacity, is uninfluenced by emotional factors, and considers all available information. However, in reality people do not possess those kinds of resources. They take shortcuts.
- Incomplete, simplified strategies (shortcuts) that people use to arrive at decisions are known as **heuristics**. Using heuristics may or may not lead to **cognitive biases**—systematic, predictable deviations of actual decisions from normative models.
- Models that attempt to explain human thinking and decision-making as they really are (even when they deviate from normative rules) are called **descriptive models**.

Two systems of thinking

The way heuristics and rational reasoning interact with each other may be described through the idea of system 1 and system 2 thinking (Kahneman 2003).

- System 1 is responsible for quick, intuitive decisions based on past experiences. Such decisions have evolutionary value.
- System 2 can check these decisions and override them if necessary. It is responsible for deep rational analysis and it developed later in the process of evolution. See "**System 1 and system 2 thinking**".

Examples

- Numerous cognitive biases have been identified. They can be loosely grouped on the basis of their hypothetical causes. See "**Common causes of intuitive thinking**".
- One of such causes is a tendency to focus on a limited portion of available information. An example of this is systematic deviations of human decisions from expected-utility theory under risk described in the prospect theory (Kahneman, Tversky 1979). See "**Prospect theory**".
- Empirically prospect theory is backed up by the discovery of **framing effect**: in decision-making situations involving risk, people are more risk-aversive when the problem is described (framed) in terms of gains and less risk-aversive when it is described in terms of losses. See **Tversky and Kahneman (1981)**.
- Another possible cause of intuitive thinking is a tendency to seek out information that confirms pre-existing beliefs. Ignoring information that can potentially contradict an existing belief is known as confirmation bias. Confirmation bias violates rules of logic. It has been demonstrated (for example, by Wason, 1968) that this cognitive bias is common for human thinking. See "**Confirmation bias**".
- The tendency to seek out information that confirms one's beliefs can also be seen in illusory correlation—a cognitive bias leading people to see a connection between things or events that are not actually connected. As demonstrated by Chapman and Chapman (1969), illusory correlation underlies practising clinicians' interpretations of Rorschach ink-blot test. It can also be the mechanism of stereotype formation. See "**Illusory correlation**".

THEORY

SYSTEM 1 AND SYSTEM 2 THINKING

Essential understanding

✪ *Hypothetically there exist two systems of thinking, one quick and intuitive, the other one rational and more thorough.*

Kahneman (2003) differentiated between two hypothetical systems of thinking—system 1 and system 2.

- **System 1 thinking** is fast, instinctive, emotional, automatic and relatively unconscious. It is thought to be the system that developed first in the process of evolution. It enables individuals to make rapid decisions based on their past experiences, which is important for survival. However, this comes at the cost of such decisions not being always accurate or entirely rational. System 1 is where heuristics originate. It is also commonly referred to as "intuition".
- **System 2 thinking** is slower, more analytical, logical, rule-based and conscious. It is thought to have evolved later with the development of language and abstract thought. System 2 enables us to override immediate automatic responses and analyse the situation in greater depth. When we have the time, resources or the necessity to cross-check the first intuitive decisions, system 2 may be switched on to override possibly faulty thinking.

COMMON CAUSES OF INTUITIVE THINKING

Research in this area has identified numerous cognitive biases. They can be loosely grouped based on the factors that may cause them, such as:

- the tendency to focus on a limited portion of available information (for example, asymmetric dominance, framing effect)
- the tendency to seek out information that confirms pre-existing beliefs (for example, confirmation bias, illusory correlation)
- the tendency to avoid the mental stress of holding inconsistent cognitions (for example, cognitive dissonance).

THEORY

PROSPECT THEORY

Essential understanding

✪ *Prospect theory is a descriptive theory of decision-making under risk. It explains deviations from expected utility theory by suggesting that people think about utilities as changes from a reference point.*

Prospect theory by Kahneman and Tversky (1979) is a descriptive theory of decision-making under risk. It claims that individuals think about utilities as changes from a reference point. In its turn, the reference point may be manipulated by the way the decision problem is formulated.

- Problems formulated in terms of potential losses cause people to be more eager to take risks.
- Problems formulated in terms of potential gains cause people to be more risk-avoidant.

The counterpart normative model

The normative model that prospect theory is compared to is **expected utility theory**. In this theory utility of an outcome should be multiplied by the probability of that outcome, and then the outcome that yields the largest value is chosen as the preferred one.

In expected utility theory, the relationship between expected utility and the subjective value attached to an option is a linear function: the more utility we expect, the more we are willing to take a risk to pursue that option.

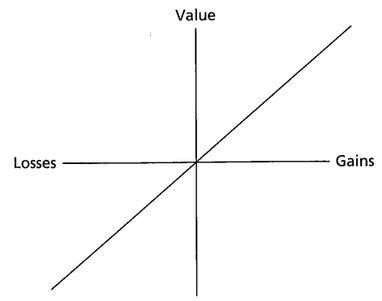

Figure 2.6 Value function in the normative expected utility theory

Deviations from the normative model

However, experiments showed that actual human decisions deviate from this linear function. Prospect theory suggests that people assign less subjective value to gains and more subjective value to losses, so that the choice function looks like Figure 2.7.

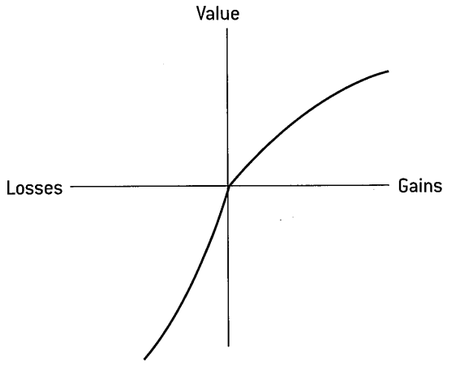

Figure 2.7 Value function in prospect theory

This tendency of human decision-makers to depend on whether the problem is formulated in terms of gains or losses is known as the framing effect.

RESEARCH **Tversky and Kahneman (1981)—framing effect**

Essential understanding

✪ *In decision-making situations involving risk, people are more risk-aversive when the problem is described (framed) in terms of gains and less risk-aversive when it is described in terms of losses. This is a systematic deviation from the predictions of the normative expected utility theory.*

Aim

To investigate the influence of the way a decision problem is framed on decisions in scenarios involving risk.

Method

Experiment; independent measures design.

Participants

307 university students who answered brief questionnaires in a classroom setting.

Procedure

Participants were given the following problem.

Imagine that the USA is preparing for an 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 estimate of the consequences of the programs are as follows.

Group 1 was given the following options.

A: *200 people will be saved.*

B: *There is 1/3 probability that 600 people will be saved and 2/3 probability that no people will be saved.*

Group 2 was given the following options.

C: *400 people will die.*

D: *There is 1/3 probability that nobody will die, and 2/3 probability that 600 will die.*

Results

- Option A was chosen by 72% of participants (and option B by 28%).
- Option C was chosen by 22% of participants (and option D by 78%).
- Note that logically the problem given to the two groups was equivalent. If you assume that people make decisions rationally, you would expect choices in the two groups to be no different. However, we see that decisions were actually reversed.

Conclusion

The only difference between the two groups is in how the situation is described, either in terms of potential gains ("will be saved") or potential losses ("will die"). This should not matter for a rational decision-maker, so the observed reversal of choices is a deviation from the normative expected utility theory.

This has been called the framing effect: "Avoid risks, but take risks to avoid losses" (Baron 2008).

CONFIRMATION BIAS

Essential understanding

✪ *Confirmation bias is a tendency to focus on information that confirms a pre-existing belief and ignore information that contradicts it. Confirmation bias violates logic (which in this case is the normative model).*

Demonstration: Wason's four-card problem

Wason (1968) demonstrated this in the now classic four-card problem. Participants were given four cards and were told the following.

- Each of the cards has a letter on one side and a number on the other side.
- There is a rule: "If a card has a vowel on one side, then it has an even number on the other side".

The task was to "name those cards, and only those cards, that need to be turned over in order to determine whether the rule is true or false".

Suppose the four cards are "A", "K", "4" and "7". From the point of view of logic (the normative model), the correct answer is "A" and "7". This is why.

- Turning A or 7 can lead to either supporting the rule or refuting it. For example, if you turn A and there is an even number on the reverse side, that supports the rule, but if there's an odd number, that refutes the rule.
- Turning 4 can only lead to supporting the rule, but not refuting it. So, logically, turning card 4 is useless because it does not really test the rule.
- Similarly, turning K is useless because the rule will be neither supported nor rejected.

However, the most popular answers in Wason's study were "A only" or "A and 4". This shows that people attend selectively to information that can potentially support their expectations and at the same time ignore information that can potentially contradict their expectations.

ILLUSORY CORRELATION

Essential understanding

✪ *Illusory correlation violates norms of statistics. People may see a relationship between things that are not related if this goes in line with their prior beliefs. Illusory correlation is widespread—it was shown to be prevalent in thinking of practising clinicians and it is believed to be a mechanism of stereotype formation.*

Explanation

The tendency to seek out information that confirms pre-existing beliefs is also seen in illusory correlations. An illusory correlation is the belief that two phenomena are connected when in reality they are not. The normative model that is violated in this case is statistics.

Demonstration

Male homosexuality and responses on the ink-blot test.

Chapman and Chapman (1969) investigated how practising clinicians were using the Rorschach ink-blot test to diagnose, in particular, male homosexuality. Rorschach ink-blot test is a projective test where patients are given an unstructured ambiguous stimulus (an ink blot) and asked to say what they "see". It is believed that we can use the responses to gain an insight into the patient's personality. It had been demonstrated (statistically) that male homosexuals do in fact have a tendency to give particular responses for particular pictures. These statistically established tendencies are known as **clinically valid signs** of male homosexuality.

However, clinicians in the study failed to see these signs as indicative of male homosexuality despite actual frequent co-occurrence. Instead, they saw other signs of homosexuality—ones that might confirm prior expectations, but were not backed up by real evidence. For example, one of the clinically valid signs of homosexuality is seeing a "humanized animal", such as "a pigeon wearing mittens" in Card V.

Figure 2.8 Rorschach Card V

In contrast, one of the signs that clinicians incorrectly thought to be valid is humans with confused or uncertain sex, male or female genitalia.

Illusory correlation and stereotypes

Illusory correlation forms the basis of many other phenomena in psychology. For example, it may be the mechanism of formation of stereotypes. See "**3.1.3 Stereotypes**" in "**Unit 3 Sociocultural approach to behaviour**".

2.3 Emotion and cognition

2.3.1 The influence of emotion on cognitive processes

DEFINITIONS

- **Covert rehearsal**—replaying the previously witnessed event in one's own memory
- **Flashbulb memory**—a special memory mechanism; vivid and highly detailed recollection of the circumstances surrounding witnessing or receiving the news of an unexpected and emotionally arousing event
- **Overt rehearsal**—discussing an event with other people
- **Personal consequentiality**—the extent to which an event is perceived as significant to oneself personally; if it is perceived as significant, it arouses an emotional reaction

ESSENTIAL UNDERSTANDING

Bidirectional relationship between cognition and emotion

- Emotion and cognition are closely interrelated. There exists a bidirectional relationship between them: cognition may influence emotion, and emotion may influence cognition.
- The way cognition influences emotion is through cognitive appraisal of stimuli that mediates a person's emotional reaction. The latest theories of emotion recognize cognitive variables as an integral part of emotional reactions.
- There are many examples of how emotion influences cognition. One of them is a special memory mechanism known as flashbulb memory. See **Brown and Kulik (1977)**.

Support for flashbulb memory

In their study Brown and Kulik (1977) investigated memories of a set of events and found that the more personally consequential the event, the more detailed and vivid its subsequent recollection. They also showed the role of overt rehearsal. See **Brown and Kulik (1977)**.

Further investigation of flashbulb memory

Further research in this area aimed to clarify certain issues surrounding the idea of flashbulb memory as a special memory mechanism. Some of the issues are as follows.

- If it is a special memory mechanism, does it have a special neural basis?
- Is it encoding at the time the event occurs or rather subsequent rehearsal that creates the vividness characteristic of flashbulb memory?
- How does vividness of flashbulb memory compare to its accuracy? See "**Further exploration of the theory of flashbulb memory**".

To answer the first question, Sharot *et al* (2007) demonstrated that flashbulb memories trigger selective activation of the left amygdala. **See Sharot *et al* (2007).**

For the second question, it has been demonstrated in some research (for example, by Neisser *et al*, 1996) that rehearsal may play a more important role than the experience of the event itself. See "**Is vividness of flashbulb memory the result of encoding or rehearsal?**"

For the third question, research by Neisser and Harsch (1992) showed that accuracy of flashbulb memories is questionable. There is evidence that accuracy of flashbulb memories decreases with the course of time at the same rate as accuracy of regular memories. See "**How accurate are flashbulb memories?**"