



# Thinking Fast and Slow

Health Psychology (CMED2006)

LKS Faculty of Medicine

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# Learning Objectives

At the end of the lecture, student should be able to

- Contrast system 1 and system 2 thinking
- Describe the common heuristics and common errors in human decision making
- Suggest ways to modify people's behaviour through the engagement of system 1 thinking





# Part 1

## Rational... or not



## Scenario 1

In a shop, Andy saw a shirt that he really wanted.

According to the shop, the shirt costs \$490; but if one pays with credit card, there is \$10 surcharge. Andy does not have enough cash, and therefore decided not to buy the shirt.

Can you explain Andy's behaviour?

How can we encourage Andy to buy the shirt?





## Scenario 1 (Possible Answer)

We can of course just eliminate the surcharge;

Tell Andy that he looks really good in the shirt;

Give him a gift if he buys the shirt;

Reduce the price of the shirt



## Scenario 1 (Possible Answer)

We can avoid invoking loss aversion by framing the situation different by stating “The shirt costs \$500; but if you pay with cash, there is \$10 discount.”

In this way, Andy is less likely to think about "losing \$10 because he does not have cash" but rather “missing out on a bonus of \$10 if he does not have cash”





## Tool 5: Framing

People are often directed or distracted  
by the way a decision is framed,  
thus focusing on one aspect instead of the big picture

Things can be framed as possible gains or possible losses  
Or framed as monetary issue or ethical issue etc.



## Scenario 2

Betty has been playing in a casino for 2 hours and won \$10,000. She continues to play but losses \$1,000 (of the \$10,000) - which prompted her to stop playing and just cashes in and leaves.

Bella has been playing in a casino for 2 hours and lost \$10,000. She continues to play and recovers \$1,000 (of the \$10,000) - which prompted her to continue to play and tries to recover more.



## Tool 6: Reflection Effect

When faced with the possibility of profits,  
most people prefer avoiding losses  
to acquiring gains (risk-averse)

When faced with the possibility of losses, most people prefer  
the choice that has the potential to avoid losses (risk-seeking)





## Scenario 3

Candy received a movie ticket for free. However, after an hour in the cinema, she realizes that she does not enjoy the movie at all.

She therefore left the cinema before the movie finishes.

Cally bought a movie ticket to see a movie. However, after an hour in the cinema, she realizes that she does not enjoy the movie at all. However, she does not want to waste the movie ticket and therefore sat through the movie - having a bad time .



## Tool 7 Sunk Cost Fallacy

When considering costs and benefits of a decision,  
people have a tendency to (wrongly) include sunk costs

Sunk cost refer to cost that  
has already happened and cannot be recovered



# Activity 1

## CRT



## Question 1

A baseball bat and a ball cost \$110 in total. The bat costs too dollars more than the ball.

How much does the ball cost?





## Question 2

If five machines made five gadgets in five minutes, how much time would it take for ten machines to make ten gadgets?





## Question 3

There was a lake that was full with lily pads. Each day the lily pads doubled in size. It took 48 days for the lily pads to cover all of the lake.

How long would it take for the lily pads to cover half of the lake?





# Cognitive Reflection Test

- Developed by Shane Frederick<sup>1</sup>
- Average score was 2.18 for MIT students, 1.43 for Harvard students, 0.57 for University of Toledo

1. Frederick S (2005) Cognitive Reflection and Decision Making. *Journal of Economic Perspectives*, 19(4), 25-42.





# Activity 2

## Judgment under Uncertainty

### (or Time Limit)



# Introduction

Try to answer the following questions without looking for outside help (i.e. ask someone or search online)



# Question 1

Are there more English words with K as the 1<sup>st</sup> letter,  
or more English words with K as the 3<sup>rd</sup> letter?



# Question 2 (Tversky & Kahneman, 1974)

Estimate

$8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$



# Question 3 (Tversky & Kahneman, 1974)

Estimate

1 × 2 × 3 × 4 × 5 × 6 × 7 × 8



## Question 4 (Tversky & Kahneman, 1974)

A certain town is served by 2 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 percent of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50 percent, sometimes lower. For a period of 1 year, each hospital recorded the days on which more than 60 percent of the babies born were boys. Which hospital do you think recorded more such days?

- A. The larger hospital
- B. The smaller hospital
- C. About the same (that is, within 5 percent of each other)



## Question 5

If you toss a coin 6 times, which of the following results, if any, is more likely?

- I. H-T-H-T-T-H
- II. H-H-H-T-T-T
- III. H-H-H-H-T-H



## Question 6

Steve loves playing video games. He also likes sharing his thoughts on video games with other people - as well as showing other people how great he is at video games.

Is Steve more likely to be:

- (a) a medical student; or
- (b) a medical student who is also a Twitch streamer





## Question 7

Estimate your risk of sexually transmitted infection (STI) in the next 12 months.

Compare to the rest of your class (HKU BNursing, year 2), do you:

- A. Have lower risk than average
- B. Have about the same risk as average
- C. Have higher risk than average



## Tool 8: Judgment under Uncertainty

Even though people generally like to be rational,  
there is often not enough information, time, or processing power  
to analyze all the options completely

As a result, people often uses shortcuts to arrive at  
likely answers or estimation - these shortcuts are useful  
but have some serious limitation and can result in errors



# Underestimation of Risks

We often do not know the risk of any situation or behaviour, and need to estimate with very limited information - we often use what is available to us as a substitute for evidence, and then adjust

This often leads to underestimation of risks





# Unrealistic Optimism

4 main contribution factors:

- Lack of personal experience with the problem
- The belief that if the problem has not yet appeared, it will not appear in the future
- The belief that the problem is infrequent
- The belief that the problem is preventable by individual action





## Tool 9: Unrealistic Optimism

People sometimes underestimate the risk faced by themselves, which lead to more risk-taking behaviours and/or lack of action to reduce one's risk

This can be due to the lack of personal experience and inaccurate believes



# Part 3

# Dual Processing Theory



# Dual Process Theory

- Dual process theory proposes that there are two distinct types of thinking process in our brain
  - System 1, sometimes called “intuition”, is fast and automatic
  - System 2, sometimes called “reasoning”, is slow and controlled





## System 1 Intuition

Fast  
Automatic  
Effortless  
Associative  
Emotional  
Parallel  
Non-logical

## System 2 Reasoning

Slow  
Controlled  
Effortful  
Rule-governed  
Neutral  
Serial  
Logical



## Tool 10: System 1 (Automatic) Thinking

People often choose to do things because it was the obvious thing to do - without even considering the other options

There are different circumstances where people engage in automatic thinking, which might lead to different errors



# Tool 11: System 2 (Reasoned) Thinking

People sometimes try to analyse a situation using  
reasoning and calculation

This takes a lot of time and effort, and therefore cannot be used  
to solve most problems - and it is still limited by analytical skills  
and the availability and accuracy of information





# Activity 3

## Deductive Reasoning



# Deductive Reasoning Task

The following slides are sets of statements. You need to decide whether it is logical (i.e., logically sound) that **If statement 1 and statement 2 are both true, statement 3 must be true**



1

1. If A is true, then B is true
2. A is true
3. Therefore, B is true

Logical or not?

J



## 1a

1. If Amy is a HKU student, then Amy is living in HK
2. Amy is a HKU student
3. Therefore, Amy is living in HK

Logical or not?





2

1. If A is true, then B is true
2. B is true
3. Therefore, A is true

Logical or not?

J



# 2Q

1. If Barry is my boyfriend, then Barry loves me
2. Barry loves me
3. Therefore, Barry is my boyfriend

Logical or not?





3

1. If A is true, then B is true
2. A is false.
3. Therefore, B is false

Logical or not?

J



## 3d

1. If Amy is a HKU student, then Amy is living in HK
2. A is not a HKU student
3. Therefore, B does not live in HK

Logical or not?





# 4

1. If A is true, then B is true
2. B is false.
3. Therefore, A is false

Logical or not?





# 4Q

1. If Barry is my boyfriend, then Barry loves me
2. Barry does not love me
3. Therefore, Barry is not my boyfriend

Logical or not?





5

1. A is true or B is true
2. B is true
3. Therefore, A is not true

Logical or not?

J

## 5a

1. Dr Chan is smart or Dr Chan is hardworking
2. Dr Chan is hardworking
3. Therefore, Dr Chan is not smart

Logical or not?



# 6

1. It is not the case that both A is true and B is true
2. B is not true
3. Therefore, A is true

Logical or not?



## 6a

1. Denise cannot have both influenza and common cold
2. Denise does not have common cold
3. Therefore, Denise has influenza

Logical or not?



7

1. All Zs are Bs
2. Y is a B
3. Therefore, Y is a Z

Logical or not?

J



# 7Q

1. All influenza patients have fever
2. Eric has fever
3. Therefore, Eric has influenza

Logical or not?





# Tool 12: Logical Fallacy (in deductive reasoning)

People often make wrong logical conclusion

For example,

If P then Q

Q

Therefore P

If one has diabetes, they have nocturia

This person has nocturia

Therefore they have diabetes





# Activity 4

## Wason's 2-4-6 Task



## Instruction - Part 1

You will be given three numbers which conform to a simple rule I have in mind. Your aim is to discover this rule by writing down sets of three numbers, together with reasons for your choice of them.





## Instruction - Part 2

After you have written down each set, I shall tell you whether your number conform to the rule or not. Remember that your aim is not simply to find numbers that conform to the rule, but to discover the rule itself. When you are highly confident that you have discovered it, and not before, you are to write it down and tell me what it is.



Ψ

The first set of numbers I'll give you is:

[246]

J



## Tool 13: Confirmation Bias (in inductive reasoning)

People tend to checks to see if something is  
compatible with their hypothesis

Rather, we should also checks to see if something is  
incompatible with the hypothesis  
(i.e. eliminative reasoning / negative testing)





# Part 4

# Behavioural Change



## Scenario 4

Doris is not suffering from any symptoms. However, she just underwent a mammography that her doctor told her is 100% sensitive to breast cancer. The result is positive:

1. The mammography result is positive.
2. If Doris has breast cancer, the result will be positive.
3. Therefore, Doris has breast cancer.



Sensitivity = 100%; Specificity = 90%

	Breast Cancer	No Breast Cancer	
Positive result	100	9,990	10,090
Negative result	0	89,910	89,910
	100	99,900	100,000





Sensitivity = 100%; Specificity = 90%

	Breast Cancer	No Breast Cancer	
Positive result	10,000	9,000	19,000
Negative result	0	81,000	81,000
	10,000	90,000	100,000



Sensitivity = 85%; Specificity = 90%

	Breast Cancer	No Breast Cancer	
Positive result	8,500	9,000	17,500
Negative result	1,500	81,000	82,500
	10,000	90,000	100,000



## Scenario 5

Eileen is convinced that the new magical treatment, LOVID, that she bought over the internet can cure COVID because:

1. Effective treatment means that COVID patient will no longer has COVID after taking the treatment
2. She herself took LOVID when she had COVID, and one day later she was no longer COVID-positive
3. Therefore, LOVID is an effective treatment



## Scenario 6

Frank is skeptical about MMR vaccines. He heard that many vaccination has side effects, and MMR vaccines had been linked to autism. He therefore went to both Google and YouTube to search for information using the prompt “Does MMR vaccines cause autism?”

What do you think would happen next?



## Scenario 6

Not only does he get lots of result that claims MMR vaccines cause autism, Google's algorithm now thinks that Frank is interested in conspiracy theories and keeps suggesting similar content to him.



## Scenario 7

Imagine a couple is getting divorce and  
each wants the custody of their only child

You are not part of the jury, but you are in charge of designing  
the form that the jury members have to fill in their decision

How can you design the form to "help" parent A (or vice versa)?



# Information about the 2 Parents

<u>Parent A</u>	<u>Parent B</u>
Average income	Above-average income
Average health	Minor health problems
Average working hours	Lots of work-related travel
Relatively stable social life	Extremely active social life
Reasonable rapport with child	Very close relationship with child



## Scenario 8

Imagine you are a doctor facing a cancer patient.

You need to encourage the patient to make  
an informed choice between surgery and radiation therapy

What are the actual words that you should say to make sure  
that you do not unwittingly affect the patient's decision?



## Scenario 8

	Surgery	Radiation Therapy
Live through postoperative period	90%	100%
Die during postoperative period	10%	0%
Alive at the end of 1 <sup>st</sup> year	68%	77%
Die by the end of i <sup>st</sup> year	32%	23%
Alive at the end of 5 <sup>th</sup> year	34%	22%
Die by the end of 5 <sup>th</sup> year	66%	78%



## Scenario 8

Is there a difference between the followings?

*"Of 100 people having surgery, 90 live through the postoperative period, 68 are alive at the end of the first year, and 34 are alive at the end of 5 years."      the end of 5 years."*

*"Of 100 people having surgery, 10 die during surgery or post-operative period, 32 die by the end of the first year, and 66 die by the end of 5 years."*



## Case 2

Canice, 20, is a university student. He is in a stable relationship with his girlfriend, and they have sex about twice a week. They never use condom - partly because of the cost, and partly because they believe it reduces the pleasure of sex.

To their knowledge, neither of them had sexual partners before, so they are not worried about STL In fact, they think that using condoms might suggest a distrust in one's partner. The way they avoid pregnancy is to avoid having sex during “fertile period”.



## Case 2 - Explain and (maybe) Intervene

Describe the behaviour of Canice and his girlfriend

What are the thought processes (rational or otherwise) that contribute to their behaviour? How can we confirm these?

Should we (as a third party) try to encourage them to use condom? If yes, how?



# Reading / References

- Kahneman, D. (2011). Thinking, Fast and Slow. Chapter 1: Two systems. The characters of the story.
- Tversky A & Kahneman D (1974) Judgment under Uncertainty: Heuristics and biases. *Science*, 185, 1124-1131.
- Kahneman D & Tversky A (1979) Prospect theory: an analysis of decisions under risk. *Econometrica*, 47, 263-291.



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