Human Reasoning

&

Complex Cognition

SCI/ SSC 3019

'Untitled' by Caroline van Kimmenade

2016 / 2017

Table of contents

Course coordinator

Dr. Manuela Heins, University College Maastricht, room 1.020; Tel. 043-3885477; e-mail
manuela.heins@maastrichtuniversity.nl

Introduction

The present course is concerned with theoretical and empirical perspectives on four complex cognitive processes: reasoning, decision making, (moral) judgement, and problem solving. Reasoning is the cognitive process of making inferences, i.e. drawing conclusions from a set of premises. Judgement is formation of beliefs about the likelihood of uncertain events or formation of opinions about what can and should be, and reasoning is used to explain the 'why' of our beliefs and opinions. Decision making is about choosing between alternatives; once reasoning yields conclusions, you have to decide which course of action to pursue. Problem solving is the ability to find appropriate solutions for problems and is a combination of reasoning, judging and deciding. Judgement, decision making and problem solving draw on reasoning processes. This means that these cognitive processes are overlapping and interactive. Furthermore, all four cognitive processes are so-called complex cognitive processes. Non-complex or more elementary cognitive processes are topic of a 2000 level UCM course Foundations of Cognitive Psychology (FoCP) and are largely ignored in the current course. Not for the fact that they are non-complex (which by the way does not necessarily means that they are simple; they are non-complex because they do not rely on the (inter)action between several cognitive systems or processes) but because the current course builds on the more basic topics in FoCP. Examples of non-complex cognitive processes are perception, long-term and working memory, and attention. Complex cognitive processes as compared to non- complex cognitive processes do rely on the action of (usually several) non-complex cognitive processes and as mentioned. Like FoCP the topics of the current course also are part of Cognitive Psychology and thereby Cognitive Science. This means that for any given topic the chances are high that there are multiple (competing) explanatory models of these processes along with various experimental finding to back them up. Moreover, definitions may also vary and often divert from non- psychological common sense definitions. For instance 'reasoning' as defined in Webster's Third New International Dictionary is "thinking that is coherent and logical". At the end of this course however, you will see that this definition is not really appropriate and that experimental data show that we as human beings often reason inductively based on heuristics and biased thinking. The same dictionary defines 'decision making' as "The cognitive process of reaching a decision". Emphasis is put on control by stating that "a good executive must be good at decision making". Webster's furthermore divides decision making into three separate categories. For an economist decision making refers to "choosing among alternatives in cases where there is some uncertainty about the final result of each possible course of action". For a healthcare professional the terms mean "The process of making a selective intellectual judgement when presented with several complex alternatives consisting of several variables, and usually defining a course of action or an idea". And finally in statistics decision making is "a procedure for making logical decisions on the basis of sample data". What these interpretations seem to have in common is that in one way or another

they all refer to choosing between alternatives and that this choice is based on thought or some other set of rules. Helpful as these definitions might be for a person who is learning the English language, as a student in this course you will focus much more on how exactly humans reason and make decisions rather than look at definitions of human thought (processes). Do not just get stuck on definitions, make sure that you know how humans reason under different circumstances and what experimental data support the models of human reasoning. The same applies to decision making, judgement and problem-solving processes. It is much more important to find out exactly which circumstances or states of mind influence complex cognitive processing and why this is the case without focusing on definitions of the various concepts that are used. In this course, you will acquire knowledge on several topics of the cognitive psychology of complex cognitions via 11 PBL problems. The first three problems of the course are reasoning topics and the eight other problems are a mix of complex cognition topics.

Set-up of the course

The course consists of two parts: 1. studying different aspects of complex cognition in the traditional Problem-Based Learning (PBL) format followed by an exam and 2. writing a paper based on an (fictional) 'interview' with yourself as the expert on one of the topics of the PBL problems.

1. The readings

▫   Problems and Tutorials

Complex cognition theories and research cover a broad terrain. Therefore, you do not have the time to study all facets of a given topic. Problems differ in the emphasis they put on certain themes (e.g. cognitive models, practical implications). Your tutor will intervene if your learning goals do not cover the area intended by the problem in question. Note that this precludes a tempting solution for formulating learning goals; it often happens that tutorial groups come up with the two obvious questions of 1) What is X? 2) What are the theories on X?). It should be clear that using these questions as learning goals may in most cases simply be too general. It does not help you focus on those parts of the literature that are most relevant for a certain topic. General learning goals will turn out to be a problem when selecting the appropriate literature for self-study. Of course (one of) those two questions might serve as problem statement for the brainstorm in your group. But remember; if you want to ask these questions, use them as a starting point but not as the conclusion of the first discussion of a problem.

▫   Literature study

As is common practice in PBL, the learning goals emerging from the group discussion should give rise to literature study. The next question is where to find relevant sources of information. Note that even though in this course we do not use a basic textbook, there are several basic books mentioned in the literature list one page 24 of this manual. These books can be found in the UM library and in the UCM reading room. You are advised to start reading through the relevant parts of the relevant chapters in

these books before trying the e-readers. There are several e-readers available on Eleum that should help get a deeper understanding of the topics. Furthermore, the list is not intended as obligatory reading. Do not attempt to read every article that is listed for a certain case (especially when the list contains relatively many articles). Or even every part of every article; again the learning goals are supposed to guide you through the literature. Scan through the papers (or their abstracts) to see if they contain useful information as answers to your learning goals, and only read (the parts of) those papers that do.

2. The 'interview' paper

Next to writing an exam, you also have to write a paper on one of the eleven topics that are discussed in this course. Once you have chosen a topic that interests you, you need to not only read the relevant literature for that topic that is listed in this course manual, but you are also urged to find some additional literature on this topic if need be. Once you have acquired enough information, imagine that you are going to 'interview an expert' on this topic (the expert being yourself actually, pretending to be an author who has published numerous articles). This means that you should come up with relevant questions on the topic and then imagine what the answers will be based on the reading that you have done. Make the paper look as much as a real interview as possible, you may even add pictures to make it look 'journal-like'. Open by introducing the topic (so you do need an introduction first) and welcoming the expert (give yourself a name you made up, e.g. Dr. Ann Siwani from the University of Berlin, maybe even describe your 'career' briefly) and close by thanking him/ her and coming to a conclusion.

- ▫ Criteria for the paper

The paper should:

- ▪ Be around 2000-2200 words (this does not include title page, appendices, reference list etc.).
- ▪ Look like a real interview, so contain questions and answers in the middle part, but also have an introduction and a conclusion.
- ▪ Have an APA style reference list.
- ▪ Be handed in before Friday 20 October 2017, 17.00 hours (via safe assignment and email to manuela.heins@maastrichtuniversity.nl no hardcopy needed).

Interview paper grading criteria Between parentheses you find an indication of how each element will contribute towards the overall grade for your paper	Points (0-5)
Structure and content (25)	
Introduction: Introduction: Is the purpose of the paper made clear? Is the 'expert' and topic introduced? Etc.	
Body: a body that includes questions and answers; is the quality of the body good? E.g. is there a logical order from one question to the next? Originality, evidence of having thought the subject over, etc.	
Conclusion/ Discussion	
Paragraph organization: Are the paragraphs unified, coherent and fully developed? Is there a 'flow' from one to the next?	
Word count	
Sources (20)	
Finding evidence: Are the interview questions answered by making use of an adequate number of <u>relevant</u> facts/ theories/ data found in reliable and relevant sources?	
Providing evidence: Are these facts and or theories applied in a meaningful way? (application of material)	
Use of the sources: Are the facts, details and theories found in the sources presented accurately, and interpreted in a meaningful way? Multiple answers? Are they presented objectively and criticized/ analyzed?	
Notes and reference page: Consistent and clear? One style used?	
Presentation and format (15)	
Spelling and choice of words: are words spelled and chosen correctly, avoiding jargon, yet applying relevant terminology etc?	
Sentences: Are sentences clear and concise? Is grammar correct?	
Lay-out	
Total (grade = n/ 6)	Max: 60

Attendance and Grading

The current course is taught in a PBL format so an 85% tutorial attendance is required. This means that you can miss 2 of the 12 tutorial meetings without it having any negative consequences for your attendance requirement. Keep in mind that you are still advised to attend all meetings. If you miss 3 meetings you can ask for an additional assignment for failed attendance via the form that can be picked up at the Office of Student Affairs. If you miss more than 3 meetings you fail the current course with no chance of making up for failed attendance.

There are two grades to be earned during this course:

1. There is an exam at the end of the course. The exam consists of open-ended non-essay questions (on the literature as well as the lectures!) and is graded on a 0-10 scale
2. During the course, an interview paper has to be written that is graded on a 0-10 scale (see 'Criteria for the interview paper').

The final grade is a weighted average of the exam grade and the interview paper grade. The exam makes up 65% of the final grade and the paper 35%. If your final grade is 5.4 or below, you may be eligible for a retake exam. You are eligible to retake the part of the grade that made you fail (i.e. the exams or the paper or both) if the following requirements are met:

- Your final grade is 5.4 or below
- Your exam and paper are considered a valid attempt[1]
- You passed attendance

The format of the retake depends on which part(s) you are retaking. If you failed the paper, you are allowed to write a new one or re-write the one you handed in (this will be decided by the tutor). If you fail the exam, there is a written retake exam in the resit week.

Course overview per week

Week	Monday	Thursday
1 (4-8 September)	**Lecture** 'HR & CC': Manuela Heins Pre-discussion problem 1	Post-discussion problem 1 Pre-discussion problem 2
2 (11-15 September)	**Lecture** 'Deductive and Inductive Reasoning': Manuela Heins Post-discussion problem 2 Pre-discussion problem 3	Post-discussion problem 3 Pre-discussion problem 4
3 (18-22 September)	**Lecture** 'Rationality in Human Thought': Manuela Heins Post-discussion problem 4 Pre-discussion problem 5	Post-discussion problem 5 Pre-discussion problem 6
4 (25-29 September)	**Lecture** 'Decision Making' Post-discussion problem 6 Pre-discussion problem 7	Post-discussion problem 7 Pre-discussion problem 8
5 (2-6 October)	**Lecture** 'Artificial cognition': Michael Capalbo Post-discussion problem 8 Pre-discussion problem 9	Post-discussion problem 9 Pre-discussion problem 10
6 (9-13 October)	Post-discussion problem 10 Pre-discussion problem 11 **Lecture**: 'Conscious Causation and Punishment': Manuela Heins	Post-discussion problem 11
7 (17-20 October)	**Final exam, exact date and time t.b.a.**	**Friday: Deadline interview paper (17:00 hours)**

---

[1] The person who grades the exam and paper decides what is considered a valid attempt.

Problems

Problem 1: Reasoning about possibilities

"Sometimes I've believed as many as six impossible things before breakfast."
Lewis Carroll (1832 - 1898), *Alice in Wonderland*

A

Why is there a God? Or why isn't there a God? Why do aliens exist? Or why don't they? How do you know your perceptions are real? Why do you think we have a soul? Why do you think people can be born evil? Or why do you think they are not born evil, but 'made' evil?

A small assignment: choose one of the questions above to think about. Don't think about it too long, but try to keep track of your reasoning process: how did you come up with an answer to the question? Write your thoughts down in a few steps. After everyone's done, compare your answers.

Notice anything? *How did you reason*?

B

If there is a circle then there is a triangle or if there is a diamond then there is a star.

What are the possibilities compatible with these statements?

Never mind actually. *Mental model theory* nicely explains why we find it difficult to reason about these kinds of statements. Apparently, the fact that it is a disjunction makes it much harder than if it is a conjunction. But of course this is only one of the factors that explain our reasoning difficulties here.

C

According to Jonathan Evans and others there are 3 principles of hypothetical thinking: The singularity principle, the relevance principle, and the satisficing principle. Moreover, reasoning consists of several steps carried out by two cognitive systems. Although he prefers to see it as two types of processes: an intuitive and a reflective one. Over the years these so-called dual process theories have been criticized amongst others for being too vague and having too many different definitions and descriptions. But as always in cognitive science, the replies to the criticisms are plenty.
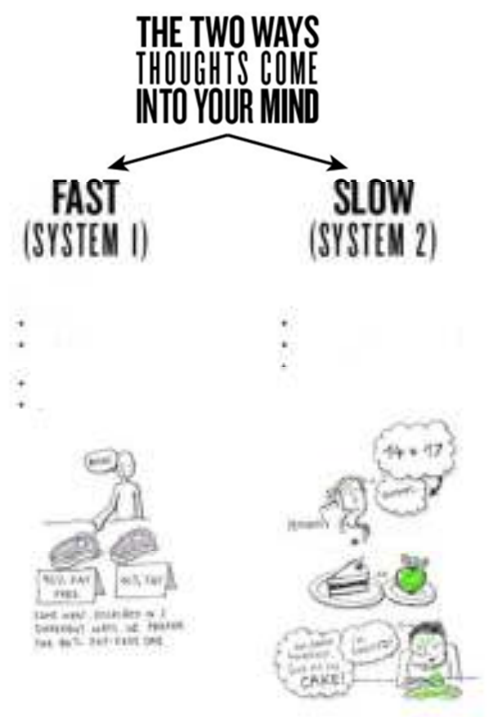
Problem 2: The deductive mind

A

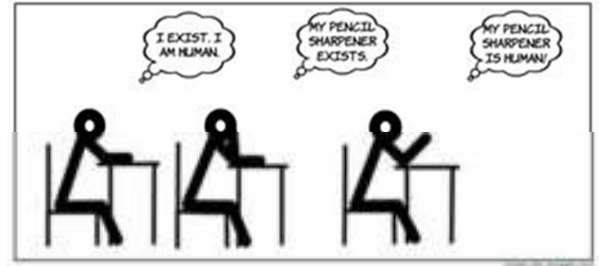Only one of the following statements is true:

At least some of the plastic beads are not red,

　　　　　　or

None of the plastic beads is red.

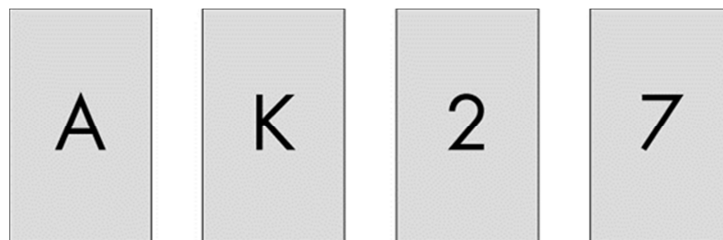Is it possible that there are no red plastic beads?

(Write your answer down before the brainstorm)

B

Four cards are presented: A, K, 2, and 7. There is a letter on one side of each card and a number on the other side. Which card(s) must you turn over to determine whether the following statement is false: "If a card has a vowel on one side, then it has an even number on the other side."?

(Write your answer down before the brainstorm)

C

Research shows that the so-called belief bias has a large impact on logical or deductive reasoning. How certain are you that the conclusion is logically valid in the syllogisms presented below?? How correct and certain you are depends on both individual characteristics and task demands. Both mental model theory and dual-process theories aim at explaining these findings.

Consider the following syllogisms:

1.

All animals eat food

Horses eat food

Therefore horses are animals

2.

All things that are smoked are healthy

Cigarettes are smoked

Therefore cigarettes are healthy

3.

All insects have legs

Cats have legs

Therefore cats are insects

4.

All motor vehicles need oil

Cars are motor vehicles

Therefore cars need oil

Problem 3: The inductive mind: Rules of thumb & preconceived notions

A

You are at a party hosted by a friend of yours. He studies international business and has invited 90 of his fellow students who all showed up. He also invited some UCM students and 10 showed up. Turns out you don't know anyone at the party, except for your friend. So, you decide to mingle and pretty soon you are talking to two interesting guys. Karl is 21 years old, wears a suit and tie and keeps talking about his huge BMW (yes, you have to suppress a yawn every now and then). He tells you that his primary goal in life is to make as much money as possible and urges you to also invest in stock as he does. Nick is 20 years old and wears faded jeans and a T-shirt. He says that driving a car is bad for the environment and that is why he only owns a bicycle and often travels by train. Money is not important to him; helping people is.

Is Karl likely to be a UCM student? And what about Nick?

(Write your answer down before the brainstorm)

B

A bat and a ball cost € 1.10 in total. The bat costs 1 € more than the ball. How much does the ball cost?

(Write your answer down before the brainstorm)

A modified version:

You had a chicken curry and a Pepsi at the restaurant 'Spice of India' and the total bill is €17.00. The chicken curry costs €10.00 more than the Pepsi. How much does the Pepsi cost?

(Write your answer down before the brainstorm)

C

Both Mental Model Theory and Dual-Process Theory have explanations of how we reason inductively and moreover how we can reduce the apparent reasoning biases we have. But they seem to do so differently.

Problem 4: Framed decisions

A

Finally you have enough money set aside to buy a car to get you from A to B. You have made list of important 'good car' attributes: it should be small to medium size, have low mileage, cannot be too expensive (1000 euro is all you have to spend) and cannot be a rare brand (the rarer the brand the more difficult it is to find cheap spare parts). Two of your friends, Steven and Janet, are helping you decide which car to buy and together you searched online for used cars. After a while you have narrowed your choices down to 3 potential buys:

1. A midnight-blue, 2003 Suzuki Swift, low mileage for 975 euros
2. A red, 1999 Chrysler Voyager, medium mileage for 1025 euros
3. A red, 2003 Fiat Panda, medium mileage for 750 euros

Steven points out that it is relatively simple now: option 1 is the car that fits your list best, so you should decide to buy that one. Hmm, midnight-blue? That's such a boring colour. Red is much prettier. Janet agrees that the Panda is a much better decision; you would even save 250 euros. You could buy some new shoes to go with the car! Yuck, a Panda? You look at Janet as if she just landed in a UFO. Who would want to be seen driving a Panda? It seems like you are deciding in favour of the Chrysler. Your friends shake their head in wonder; you just never seem to make the *optimal decision*.

B

The framing effect

The Netherlands is preparing for the outbreak of an unusual Asian disease, expected to kill 600 people. Two alternative programs to combat the disease have been proposed:

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-third probability that no people will be saved.

Which one of the programs would you choose?

Your answer:………..

Write down your answer before you continue to read.

And now?

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-third probability that 600 people will die.

Which one of the programs would you choose?

Your answer: …………

C

Would you buy Chupa Chups lollypops because as it says on the package "They're 100% fat-free!"?

11

Problem 5: Rationality questioned

> "To want to tackle everything rationally is irrational."
> Ilyas Kassam (Writer and poet)

According to great thinkers such as Rene Descartes we are the only species with the capacity to reason. We build bridges, invent thinking machines, and cure diseases by altering genetic codes. We are on top of the food chain; this must be because we are rational. However, so far you have seen that people make large and systematic (i.e. non-random) thinking errors, use heuristics to reason and make decisions, are biased and are susceptible to framing effects. This suggests that humans might be irrational. And perhaps even worse, most animals like for example birds and bees don't seem to make such mistakes. Are they more rational than humans? Does it even matter?

Here is a small assignment: first your tutor divides you into two groups, then after 15 minutes of a brainstorm with your group, one group defends human rationality (whoot whoot... way to go humans?) while the other defends human irrationality. Although normally we would define 'rationality' first.. But let's not do that and see if it makes a difference. Moreover, try to think of experimental designs that would support your claims. Once the 15 minutes are up, one of you (your spokesperson) briefly presents your arguments or claims and how you want to prove them.

VS.

Problem 6: Emotions and complex cognition

A

Research on the relationship between affect and complex cognitive processes is numerous and perhaps a bit confusing. First, we should distinguish between the impact of mood/ emotion on 4 types of complex cognition: Interpretation, judgement, decision making, and reasoning. Second, it is also important to distinguish between integral and incidental affect (err... the what now?). Third, there are different types of emotions; should we make it that general? Oh yes and yippee some studies have contradictory results.
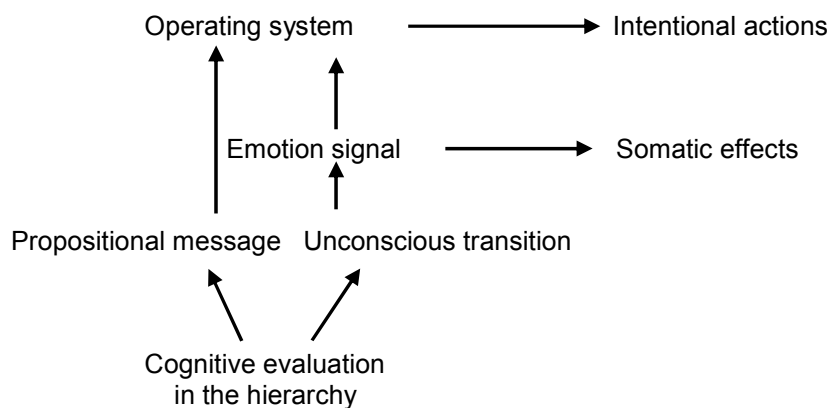
Now what?

B

Johnson-Lairds communicative theory of emotions nicely explains a very interesting phenomenon: a double dissociation between emotion and cognition. There are neurological patients that experience emotions but cannot articulate them and there are other patients that know which emotions they ought to be feeling, but do not experience them. Johnson-Laird explain that in the one type of damage the signal system is affected and in the other the message system.

A schematic diagram of the two channels of communication in emotion:

Operating system ⟶ Intentional actions

Emotion signal ⟶ Somatic effects

Propositional message   Unconscious transition

Cognitive evaluation
in the hierarchy

Problem 7: Unconscious cognitions

A

So you ended up in Maastricht. Found a room. However, living in Maastricht turns out to be more expensive then you thought (stupid Bijenkorf!). Therefore you and your roommates, Jill and Frits decide to find another person to split the rent with. The three of you come up with a rather extensive list of 'demands': there are 12 attributes that you will rate the potential roommates on (8 positive and 4 negative ones). And since your apartment has all the luxuries any student apartment should have (your mom worries about your health and sends a cleaning lady over twice a month) you have 5 people to choose from. However, you and your roommates disagree on how to find the right conclusion after having met the potential candidates and probed them for answers on the 12 attributes:

1. You think the best way would to just on the spot: go for an immediate conclusion. Why think about it?
2. Jill thinks it is best to think about it for 5-10 minutes and then conclude
3. Frits thinks that it is best to think about something else for 5-10 minutes (finally finish that Sudoku puzzle!) and then conclude who is best

B

In an experiment conducted by Winkielman and colleagues (2005) subliminally presented happy or angry faces as primes in a gender-discrimination task were used. The participants' task was to judge the gender of neutral faces; these were preceded by briefly presented happy, angry or neutral faces. After this task they rated the participants' mood and consumption behaviour: would they drink more and pay more for a drink after the subliminal exposure to happy faces?
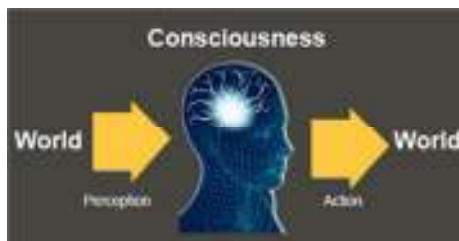
Problem 8: Conscious cognition

The experiments in the previous problem are only a few among many experiments on the influence of unconscious processing on decision making (or cognition in a more general sense). As you have seen, the conclusions in all of them are mostly the same: consciousness is slow, has limited capacity, is biased, and prone to make errors. In addition, we often are not aware of what the real reasons are behind our decisions or which stimuli influence us. So when we need to make difficult decisions, or have something complicated to think about, especially in uncertain situations, the best thing to do is let unconscious cognitive processes do the job. In a recent review, Newell and Shanks (2014) however, argue for quite the opposite and especially criticize the methodology of these types of experiments. Can you defend conscious processing? Surely, there must be some things we do consciously?

Here is a small assignment (Yes again… obviously the coordinator cannot come up with a PBL problem description on this topic as well that leads to a 50 minute brainstorm): first your tutor divides you into two groups, then after 15 minutes of a brainstorm with your group, one group defends unconscious cognition being most important for decision making, reasoning and all other complex cognition, while the other defends conscious cognition as being most important. Moreover, try to think of experimental designs that would support your claims. Once the 15 minutes are up, one of you (your spokesperson) briefly presents your arguments or claims and how you want to prove them.

(Important note: this is NOT, I repeat, this is NOT at all related to free will.. obviously we assume we are free even though obviously we are not.. this is about conscious vs unconscious cognition being in charge.. it doesn't matter if are free or not)

15

Problem 9: Creative solutions

"Creativity requires the courage to let go of certainties." Erich Fromm (1900-1980)

A

Cognitive psychologists typically tend to use so-called insight-problems to measure a person's problem solving ability. Some examples:

A man in a town married 20 women. He and the women are still alive, and he has had no divorces or annulments. He is not a bigamist (meaning he is not legally married to more than one woman at once), and he broke no law. How is that possible?

Two men played five full games of checkers and each won an even number of games, with no ties, draws, or forfeits. How is that possible?

The nine-dot problem: Draw four continuous straight lines, connecting all the dots without lifting your pencil from the paper.
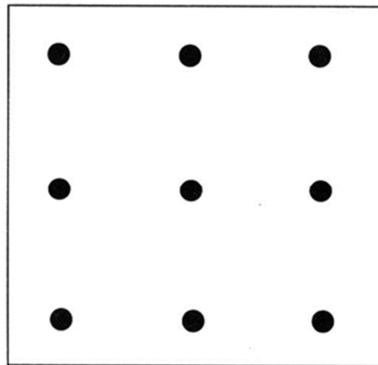
Yesterday I went to the zoo and saw the giraffes and ostriches. Altogether they had 30 eyes and 44 legs. How many animals were there?

B

Some say creative people are better problem solvers. To measure creativity, psychologists often use Remote Associates Tests (RAT). You are given 3 words and are asked to find one word that connects the three. For example: an easy one: cottage/ swiss/ cake, solution = cheese. Try a few:

Cream/ skate/ water =
Rocking/ wheel/ high =
Piece/ mind/ dating =
Pie/ luck/ Belly =

Obviously there are more ways to measure creativity, but the main problem is more what makes a creative problem-solver: reason or intuition? Conscious deliberation or unconscious processing? Or are some people just more creative than others?

Problem 10: Moral thinking

In previous problems you have discussed the role of emotions in complex cognition, whether or not intuition is a valid source for processing or rationality is preferred, and the debate between a normative vs. a descriptive approach to the psychology of thought. Guess what? You are not done yet, in contrast: if ever those topics are of importance it is when thinking about *right* and *wrong*.

A

Is it okay to steal bread if you're hungry? Or to steal shoes because you cannot afford them this month, but really really like them? Is it ever okay to kill a person? Would you kill one to save many?

When reasoning about these questions we try to determine the deontic status of these actions. It may be permissible, obligatory, or forbidden. Theories on moral reasoning differ in the emphasis they put on either emotion or reason guiding our moral decisions and judgements. Although individuals may very well differ in how they think about what is right and what is wrong.

B

Some examples from research on moral dilemmas to consider:

Rate the following from 1 = not morally wrong at all, to 7 = extremely morally wrong:

"A man goes to the supermarket once a week and buys a dead chicken. But before cooking the chicken, he has sexual intercourse with it. He then cooks it and eats it in the privacy of his own home."

"Julie and Mark are brother and sister. They are travelling together in France on summer vacation from college. One night while staying alone in a cabin near the beach, they decide that it would be interesting and fun if they tried making love. Julie was already taking birth control pills, but Mark uses a condom too, just to be safe. They both enjoy making love, but they decide not to do it again. They keep that night as a special secret, which makes them feel even closer to each other."

Make a choice:

Situation: You are the pilot of a helicopter taking 4 people on a sightseeing trip in the French Alps, at an altitude of about 2,000 metres. At a certain point, the helicopter loses altitude and no longer responds to the commands. You send out a mayday signal and try various manoeuvres, but the helicopter continues to fall and risks crashing into a rock face.

Option 1: Not recovering altitude due to the failure of the control let the helicopter precipitate. You and the four people will die on impact

Option 2: To gain altitude, you push the person next to you out of the helicopter. You know that this person will plummet to the ground and will die, but you and the other three will be saved

The Trolley problem:

"There is a runaway trolley barreling down the railway tracks. Ahead, on the tracks, there are five people tied up and unable to move. The trolley is headed straight for them. You are standing some distance off in the train yard, next to a lever. If you pull this lever, the trolley will switch to a different set of tracks. However, you notice that there is one person on the side track. You do not have the ability to operate the lever in a way that would cause the trolley to derail without loss of life (for example, holding the lever in an intermediate position so that the trolley goes between the two sets of tracks, or pulling the lever after the front wheels pass the switch, but before the rear wheels do). You have two options: (1) Do nothing, and the trolley kills the five people on the main track. (2) Pull the lever, diverting the trolley onto the side track where it will kill one person. Which is the correct choice?

Or a slightly different version below. Does the difference matter?

"There is a runaway trolley barreling down the railway tracks. Ahead, on the tracks, there are five people tied up and unable to move. The trolley is headed straight for them. You are standing some distance off in the train yard, and you notice that next to you there is a person on the side track. If you push the person off the side track onto the tracks where the trolley is on, the trolley will switch to a different set of tracks. You do not have the ability to do anything that would cause the trolley to derail without loss of life. (You have two options: (1) Do nothing, and the trolley kills the five people on the main track. (2) Push the person onto the tracks, diverting the trolley onto the side track where it will kill one person. Which is the correct choice?"

Problem 11: Pro-social cognition: punishment and trust

"Love all, trust a few". William Shakespeare (1564-1616).

"Innovation and new ventures fuel the global economy but the spark comes from investment. Investment is about trust. It's about knowing that the people investors entrust with their money are running ethical, transparent and effective businesses". Arthur Rock (An American venture capitalist).

Standard Economic Theory (you know it as Expected Utility Theory) asserts that humans behave in certain predictable ways:

1. Humans are self-interested: they seek pleasure and avoid pain.
2. Humans make consistent and rational decisions.
3. Humans tend to be risk averse.
4. Humans must optimize because choices are bounded by limited resources.

Roughly put, the decisions we make are basically self-serving: whenever an opportunity to exploit society or individuals presents itself, we should grab it with both hands. However, in real life, humans seem less selfish than Standard Economic Theory predicts; we display so-called 'pro-social' behaviours: we donate blood, work for charity, and we even pay our taxes.

A

Consider the following (simple) economic game: 2 players are given the opportunity to plit a sum of money. Ober player is the proposer (P) and the other is the responder (R). The P makes an offer to split the money in a certain way and the R can either reject or accept the offer. If the offer is accepted, the money is split in the way that was proposed by P, if the offer is rejected, neither player received anything.

How would you play this game?

B

Jane is a very successful investment banker who also is very pregnant and since her baby has decided to extend its 40-week vacation in her womb with another 2 weeks, her gynaecologist has decided to induce labour via oxytocin injections. Jane, being the hard-working soul she is, uses the time it takes for the contractions to start to make an important business decision: she is going to invest in a small cooking-utilities design company. The moment her partner hears of her decision, she wondered if Jane forgot about the financial crisis. Agreed, she has had only one meeting with the designers and yes, at that time she did worry about whether the business would be successful or not. Currently, however, Jane feels that this is the ideal time to invest in the company and has just agreed to do so.

A case of a well thought-through risky business decision or too much trust?

Sources of information

RR = Reading room UCM: Johnson-Laird, P.N., (2008). How we reason. Oxford, NY: Oxford University Press

E = E-reader on Eleum

ULR = University library, location Randwyck

ULI = University library, location Inner city

* = introductory level (advised to be read first)

** = intermediate (read after *)

*** = difficult (read after * or **)

**** = impossible to grasp, don't even try

Problem 1: Reasoning about possibilities

Evans, J. St. B. T., Over, D. E., & Handley, S. J., (2003). A Theory of Hypothetical Thinking. In Thinking: Psychological perspectives on reasoning, judgement and decision making. Eds. D. Hardman & L. Macchi. West Sussex: John Wiley & Sons Ltd. (*E: only parts of chapter 1: pp 3-10).

Evans, J. St. B. T., & Stanovich, K. E., (2013). Dual-Process Theories of Higher Cognition: Advancing the Debate. Perspectives on Psychological Science, 8(3), 223-241. (Due to copyright this is not offered as an e-reader, but can be found online)(**)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**E/ RR: chapter 3, Models of possibilities: from conjuring tricks to disasters, pp. 38-47).

Johnson-Laird, P. N., (2013). Mental models and cognitive change, Journal of Cognitive Psychology,25(2), 131-138. (**E)

Stanovich, K. E., & Toplak, M. E., (2012) Defining features versus incidental correlates of Type 1 and Type 2 processing. Mind Soc., 11, 3-13. (**E)

Note: a nice but relatively long source (so read only the relevant parts!) that is easier to read than the *How We Reason* book is: Johnson-Laird, P. N., & Khemlani, S. S., (2014). Toward a Unified Theory of Reasoning. In The Psychology of Learning and Motivation, 2014, first edition, pp. 1-42. (*)

Problem 2: Deductive reasoning

Ahn, W-K., & Graham, L. M., (1999). The impact of necessity and sufficiency in the Wason four-card selection problem. Psychological Science, 10(3), 237-242. (**E).

Brisson, J., de Chantala, P-L., Lortie Forgues, H., & Markovitsa, H., (2014). Belief bias is stronger when reasoning is more difficult. Thinking and Reasoning. DOI: 10.1080/13546783.2013.875942 (**E).

Dawson, E., Gilovich, & T., Regan, D.T., (2002). Motivated Reasoning and Performance on the Wason Selection Problem. Society for Personality and Social Psychology, 28, 1379-1387. (**E).

Eliades, M., Mansell, W., Stewart, A. J., & Blanchette, I., (2012). An investigation of belief-bias and logicality in reasoning with emotional contents. Thinking and Reasoning, 18(4), 461-479. (**E)

Johnson-Laird, P. N., (2010). Mental Models and Human Reasoning. PNAS, 107(43): 18243-18250 (*E).

Pennycook, G., Cheyne, J. J., Koehler, D., J., & Fugelsang, J. A. (2013). Belief bias during reasoning among religious believers and skeptics. Psychon Bull Rev. 20, 806-811. (**E)

Sternberg, R. J., & Sternberg, K., (2012). Cognition. Wadsworth: Cengage Learning. Parts of chapter 11: Decision Making and Reasoning, pp 462- 473. (*E)

Problem 3: Inductive reasoning: Rules of thumb and preconceived notions

Goldstein, E. B., (2011). Cognitive Psychology. Wadsworth: Cengage Learning. Chapter 13: Thinking: Reasoning and Decisions, pp. 368-374. (*E)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**RR: chapter 12, Modulation: A step towards Induction, pp. 165-173)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**RR: chapter 13, Knowledge and Inductions, pp. 174-184)

Kahneman, D. & Frederick, S., (2001). Representativeness Revisited: Attribute Substitution in Intuitive Judgment. Link to pdf: http://faculty.som.yale.edu/ShaneFrederick/RepRevisited.pdf. (**)

Kahneman, D. & Frederick, S., (2005). Chapter 12: A Model of Heuristic Judgment. Link to pdf: http://faculty.som.yale.edu/ShaneFrederick/Model_of_Heuristic_Judgment.pdf. (**)

Sternberg, R. J., (2009). Cognitive Psychology. Wadsworth: Cengage Learning. Parts of chapter 12: Decision Making and Reasoning, pp. 488-497, 513-515. (*E)

Trémolière, B., & De Neys, W., (2014). When intuitions are helpful: Prior beliefs can support reasoning in the bat-and-ball problem. Journal of Cognitive Psychology, 26(4), 486-490, DOI:10.1080/20445911.2014.899238 (**E)

Tversky, A. & Kahneman, D., (1974). Judgment under Uncertainty: Heuristics and Biases. Science, New Series, 185(4157), 1124-1131251. (*E)

Problem 4: Framed decisions

Cassotti, M., Habib, M., Poirel, N., Aïte, A., Houdé, O., & Moutier, S., (2012). Positive Emotional Context Eliminates the Framing Effect in Decision-Making. Emotion, 12:5, 926-931. (**E)

Cheng, F-F., & Wu, S-C., (2010). Debiasing the framing effect: The effect of warning and involvement. Decision Support Systems, 49, 328-334. (**E)

Garcia-Retamero, R., & Galesic, M., (2010). How to Reduce the Effect of Framing on Messages About Health. J Gen Intern Med, 25(12):1323-1329. (**E)

Goldstein, E. B., (2011). Cognitive Psychology. Wadsworth: Cengage Learning. Chapter 13: Thinking: Reasoning and Decisions, pp 380-374. (*ULI: BF311, only the parts on decision making)

Huangfu, G., & Zu, L., (2014). A reexamination of the robustness of the framing effect in cognitive processing. Social Behavior and Personality, 42(1), 37-44. (**E)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (*E: part of chapter 6: Emotions as Inferences, pp. 84-85)

Maule, J., & Villejoubert, G., (2007). What lies beneath: Reframing framing effects. Thinking and

Reasoning, 13(1), 25-44. (**E)

Problem 5: Rational thought

Evans, J. St. B. T., (2010). Heuristic thinking and human intelligence: a commentary on Marewski, Gaissmaier and Gigerenzer. Cogn Process, 11, 171-175. (**E: if read, then it should be read after the below listed Marewski article).

Evans, J. St. B. T., (2013). Two minds rationality. Thinking and Reasoning, 20(2), 129-146. (**) (Due to copyright this is not offered as an e-reader, but can be found online via UB).

Evans, J. St. B. T., (2014). Rationality and the illusion of choice. Frontiers in Psychology, 5, 1-4 (article 104). (**E)

Fantino, E., & Stolarz-Fantino, S., (2013). In: APA handbook of behavior analysis, Vol. 1: Methods and principles. G. J. Madden (Ed.); W. V. Dube (Ed.); T. D. Hackenberg (Ed.); G. P. Hanley (Ed.); K. A.Lattal (Ed.); Washington, DC, US: American Psychological Association, 2013. pp. 439-461. Chapter19: The logic and illogic of human reasoning. (**)
(Due to copyright this is not offered as an e-reader, but can be found via UB).

Marewski, J., N., Gaissmaier, W., & Gigerenzer, G., (2010). Good judgments do not require complex cognition. Cogn Process, 11, 103-121. (**E)

Oaksford, M., & Chater, N., (2001). The probabilistic approach to human reasoning. TRENDS in Cognitive Sciences, 5(8), 349- 357. (***E)

Stanovich, K. E., (2013). Why humans are (sometimes) less rational than other animals: Cognitive complexity and the axioms of rational choice, Thinking & Reasoning, 19(1), 1-26. (*)
(Due to copyright this is not offered as an e-reader, but can be found via UB.)

Problem 6: Emotion & complex cognition

Blanchette, I., (2006). The effect of emotion on interpretation and logic in a conditional reasoning problem. Memory & Cognition. 34(5), 1112-1125. (**E)

Blanchette, I., & Richards, A., (2009). The influence of affect on higher level cognition: A review of research on interpretation, judgement, decision making and reasoning. Cognition & Emotion. 24(4), 561-595. (To link to this article: http://dx.doi.org/10.1080/02699930903132496 (or e-journals via http://www.maastrichtuniversity.nl/web/Library/home.htm) (**)

Blanchette, I., & Campbell, M., (2012). Reasoning about highly emotional topics: Syllogistic reasoning in a group of war veterans. Journal of Cognitive Psychology, 24(2), 157-164, DOI: 10.1080/20445911.2011.603693. (**E)

Blanchette. I., & Caparos, S., (2013). When emotions improve reasoning: The possible roles of relevance and utility. Thinking & Reasoning, 19(3-4), 399-413, DOI: 10.1080/13546783.2013.791642. (**E)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**RR: chapter 6, Emotions as inferences)

Oatley, K., & Johnson-Laird, P. N., (2014). Cognitive approaches to emotions. Trends in Cognitive

Sciences, 18(3), 134- 140. (***E)

Problem 7: Unconscious cognition

Berridge, K. C., & Winkielman, P., (2003). What is an unconscious emotion? (The case for unconscious "liking"). Cognition and Emotion. 17(2), 181-211. (*E)

Betsch, T., Plessner, H., Schwieren, C., & Gütig, R., (2001). I like it but I don't know why: A value-account approach to implicit attitude formation. Personality and Social Psychology Bulletin, 27, 242-253. (**E)

Dijksterhuis, A., (2004). Think Different: The Merits of Unconscious Thought in Preference Development and Decision making. Journal of Personality and Social Psychology, 87(5), 586-598. (**E)

Dijksterhuis, A., & Van Olden Z., (2006). Think Different: On the benefits of thinking unconsciously: Unconscious thought can increase post-choice satisfaction. Journal of Personality and Social Psychology, 42, 627-631. (**E)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**RR: Parts of chapter 4: Mental architecture and the unconscious, and chapter 5: Intuitions and unconscious reasoning)

Karremans, J. C., Stroebe, W., & Claus, J., (2006). Beyond Vicary's fantasies: The impact of subliminal priming and brand choice. Journal of Experimental Social Psychology, 42(6), 792-798 (*E)

Strahan, E. J., Spencer, S. J., & Zanna, M. P., (2002). Subliminal priming and persuasion: Striking while the iron is hot. Journal of Experimental Psychology, 38(6), 556-568. (**E)

Winkielman, P., Berridge, K. C., & Wilbrager, J. L., (2005). Unconscious affective reactions to masked happy versus angry faces influence consumption behaviour and judgements of value. Personality and Social Psychology Bulletin, 31(1), 121-135. (*E).

Note for problems 7 and 8: a very nice book that can also be read (but needs to be scanned before reading thoroughly is Consciousness and the Brain: deciphering how the brain codes our thoughts (2014) by Stanislaus Dehaene. Chapter 2 is relevant (offers a very nice overview of the most important research on unconscious cognition) for problem 7 and chapter 3 for problem 8. It is highly recommended literature, however for true lovers of academia only.

Problem 8: Conscious cognition

Baumeister, R. F. Masicampo, E. J., & Vohs, K. D., (2015). In: APA handbook of personality and social psychology, Volume 1: Attitudes and social cognition. M. Mikulincer, (Ed.); P. R. Shaver, (Ed.); E. Borgida, (Ed.); J. A. Bargh, (Ed.); Washington, DC, US: American Psychological Association, pp. 231-250. (**, Chapter 7, Conscious thoughts and the causation of behaviour).

(Due to copyright this is not offered as an e-reader, however can be accesses via: http://www.maastrichtuniversity.nl/web/Library/home.htm , go to databases, log in, choose

psychology in disciplines, and then one of the databases is: PsychBOOKS (EBESCO), copy
and paste the title of chapter 7 and you should have access)

NOTE: Newell is very long, your tutor will recommend pages: □

Newell, B. R., & Shanks, D. R., (2014). Unconscious influences on decision making: A critical review.
BEHAVIORAL AND BRAIN SCIENCES, 37, 1-61 doi:10.1017/S0140525X12003214.
(Due to copyright this is not offered as an e-reader, but can be found via UB)

Problem 9: Creative solutions

Beaty, R. E., Nusbaum, E.C., & Silvia, P.J., (2014). Does Insight Problem Solving Predict Real-
World Creativity? Psychology of Aesthetics, Creativity, and the Arts. Advance online
publication. http://dx.doi.org/10.1037/a0035727 (**E)

Dane, E., Baer, M., Pratt, M. G., & Oldham, G. R., (2011). Rational Versus Intuitive Problem Solving:
How Thinking "Off the Beaten Path" Can Stimulate Creativity. Psychology of Aesthetics,
Creativity, and the Arts, 5(1), 3-12. (**E).

Goldstein, E. B., (2011). Cognitive Psychology. Wadsworth: Cengage Learning. Chapter 12:
Thinking: Problem Solving, pp 325-357. (*ULI: BF311, only read the relevant parts, keep an
eye on the learning goals)

Gilhooly, K. J., Georgiou, G, & Devery, U., (2013) Incubation and creativity: Do something different.
Thinking & Reasoning, 19(2), 137-149, DOI:10.1080/13546783.2012.749812 (**E)

Jauk, E., Benedek, M., & Neubeuer, A.C., (2014). The Road to Creative Achievement: A Latent
Variable Model of Ability and Personality Predictors. European Journal of Personality, 28,
95-105. (**E). (Note: just ignore the methods, focus on their findings)

Johnson-Laird, P. N., (2008). How we reason. Oxford, NY: Oxford University Press. (**RR: parts of
chapter 24, How we solve problems).

Medeiros, K. E., Partlow, P. J., & Mumford, M. D., (2014). Not Too Much, Not Too Little: The Influence
of Constraints on Creative Problem Solving. Psychology of Aesthetics, Creativity, and the Arts,
8(2), 198-210. (**)

Murray, A. M., & Byrne, R. M. J., (2013). Cognitive change in insight problem solving: Initial model
errors and counterexamples. Journal of Cognitive Psychology, 25(2), 210- 219,
http://dx.doi.org/10.1080/20445911.2012.743986 (**E)

Sio, U. N., & Ormerod, T. C., (2009). Does Incubation Enhance Problem Solving? A Meta-Analytic
Review. Psychological Bulletin, 135(1), 94-120. (**)
(Due to copyright this is not offered as an e-reader, however can be accesses via the UB).

Problem 10: Moral thinking

(Note: in some of the literature deontology is compared to consequentialism, since these terms are not
always explained in the texts, feel free to 'Wikipedia' these terms before you begin reading any of texts
listed below)

Bucciarelli, M., Khemlani, S., & Johnson-Laird, P. N., (2008). The psychology of moral reasoning.
Judgment and Decision Making, 3(2), 121-139. (**E)

Gubbins, E. & Byrne, R. M. J., (2014). Dual processes of emotion and reason in judgments about moral dilemmas, Thinking & Reasoning, 20(2), 245-268, DOI: 10.1080/13546783.2013.877400. (**) (Link to article: http://dx.doi.org/10.1080/13546783.2013.877400.)

Manfrinati, A., Lotto, L. , Sarlo, M., Palomba, D., & Rumiati, R., (2013) Moral dilemmas and moral principles: When emotion and cognition unite, Cognition and Emotion, 27(7), 1276-1291, DOI: 10.1080/02699931.2013.785388. (**) (Link to article: http://dx.doi.org/10.1080/02699931.2013.785388.)

Monin, B., Pizarro, D.A., & Beer, J. S., (2007). Deciding Versus Reacting: Conceptions of Moral Judgment and the Reason-Affect Debate. Review of General Psychology. 11(2), 99-111. (**E)

Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J., Fugelsang, J.A., (2014) The role of analytic thinking in moral judgements and values. Thinking & Reasoning, 20(2), 188-214, DOI: 10.1080/13546783.2013.865000. (Link to article: http://dx.doi.org/10.1080/13546783.2013.865000.)

Pizarro, D. A., Tannenbaum, D., (2012). In: The social psychology of morality: Exploring the causes of good and evil. M. Mikulincer, (Ed.); P. R. Shaver, (Ed.). Washington, DC, US: American Psychological Association. (**E: Chapter 5, Bringing character back: How the motivation to evaluate character influences judgments of moral blame, pp. 91-108)

Problem 11: Pro-social cognition: Punishment and Trust

(Note: some of the literature mentions specific brain regions and mechanisms. Feel free to ignore most of this stuff or at least do not worry about it. The emphasis lies on the research and theories, not so much on the brain regions)

De Dreu, C. K. W., (2014). In: Mechanisms of social connection: From brain to group. M. Mikulincer, (Ed.); P. R. Shaver, (Ed.); Washington, DC, US: American Psychological Association, 2014. pp. 391-407. (**E: Chapter 21: Oxytoncinergic circuitry motivated group loyalty). Note: read this before Kosfeld et al. (2005)

De Quervain, D., J-F., Fischbacker, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., & Fehr, E., (2004). The Neural Basis of Altruistic Punishment. Science, 305, 1254-1258. (***E).

Fehr, E., & Camerer, C. F., (2005). Social neuroeconomics: the neural circuitry of social preferences.Trends in Cognitive Sciences. 11(10), 419-427. (**E)

Knoch, D., Pascual-Leone, A., Meyer, K., Treyer, V., & Fehr, E., (2006). Diminishing Reciprocal fairness by Disrupting the Right Prefrontal Cortex. Science, 314, 829-832.(***E)

Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., & Fehr, E., (2005). Oxytocin increases trust in humans. Nature, 435, 673-676. (**E)

Meier, S., (2006). A Survey of Economic Theories and Field Evidence on Pro-Social Behavior. Downloaded from http://www.bos.frb.org/economic/wp/index.htm. (*)

Safey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D., (2003).The Neural Basis of Economic Decision-Making in the Ultimatum Game. Science, 300, 1755-1785. (**E)

UCM Writing Centre

The UCM Writing Centre is a place for you to receive help with any aspect of your writing. This can begin with a discussion of ideas for your paper, prewriting and outlining techniques, and helping you overcome writer's block. As your paper develops, we can give you feedback on your structure, paragraphs, grammar, and help you ensure your argument is coherent. It does not matter at which point in the writing process you come and see us, we can usually help. You can even bring a past paper along at the beginning of a period to get some feedback on your writing before starting a new paper!

As with most things in life, writing is a process, and good writing comes through practice and guidance. The Writing Centre is not a quick-fix solution (though we can help you improve some aspects of your paper on short notice), and we cannot proofread your writing. Rather, writing is a long-term process of personal development, and the best results are achieved through multiple appointments. Even experienced writers can still improve!

You can find us in room 2.018 and on Facebook. If you would like to come and see us, we recommend you book an appointment via email: ucm-writingcentre@maastrichtuniversity.nl.

The UCM Writing Centre