

AU COVID19 Guidelines

- Use the hand sanitiser before we start
- Have ~1 meter of space between each other
 - Also during group work
- At the end of class, please help clean the room
 - Your table and your chair seat and back
 - If we all help, it's only 5-10 mins

Cognition and Semiotics

MA Cognitive Semiotics, Fall 2020

Lecture 1
Monday Aug 31st

Overview

- Introduction
 - Semester plan
 - Study regulations and exam
 - Practicalities
- Today's lecture: Social cognition I
 - Implicit processes
 - Social perception
 - Explicit processes
 - Mentalising + metacognition
 - Quiz & exercises

Course plan

- This course has been to cover interpersonal aspects of human behaviour and cognition and the domain of experimental cognitive semiotics (~50/50)
 - central concepts in the interface between cognitive science and cognitive semiotics (with a splash of linguistics and biology)
 - The first half will be more Cognitive Science-based and the second more Semiotics-based
 - Doesn't mean that cognition and semiotics can be fully separated
- We will aggregate and move up in 'levels of description'
- Course plan for the semester is as follows:

Semester plan as available on blackboard

Lesson 1: Concepts in interpersonal cognition and behaviour

Lesson 2: Concepts in interpersonal cognition and behaviour II

Lesson 3: Group and crowd cognition I

Lesson 4: Group and crowd cognition II

Lesson 5: Cultural dynamics of interacting minds

Lesson 6: Cultural dynamics of interacting minds II

-- Week 42 - Fall vacation - no class

Semester plan as available on blackboard

Lesson 7: Semiotics in the lab I

Lesson 8: Semiotics in the lab II

Lesson 9: Cognition and human meaning-making I

Lesson 10: Cognition and human-meaning making II

Lesson 11: Biology, culture and cognition

Lesson 12: Extended and distributed cognition - GUEST LECTURE

Lesson 13: Course recap + exam preparation + end evaluations

All readings are on
Blackboard as links
(see *semester plan*)
and .pdfs (see
literature)

Always check Blackboard for updates and changes though!

Office hours and supervision

Feel free to contact me about anything

Make appointments and email

14. Exam

Handout: 7/1 - submission: 14/1

Exam preparation in the course

- Written assignments
- Mock exams
- Peer review

Please also use the
Comment Section

E20 - Cognition and
Human Meaning-
making - Hold -
[147191U001]

Home Page

Course content

Lesson Plan

Literature

Comment section

Assignments

Most important points for the exam are the following:

Study regulations for Cog & Sem (2020)

- Knowledge:
 - demonstrate knowledge of the **basic elements of human meaning-making** (in language, thinking, and communication)
 - demonstrate knowledge of the **most significant theories used to explain cognition and meaning-making**
- Skills
 - **identify the mental structures** that form the basis of meaning comprehension and meaning construction in linguistic, visual, and conceptual meaning phenomena
 - **adapt forms and means of communication** to serve a specific purpose, as well as to analyse and **assess the communication and interaction efficiency of others**
 - **communicate the basic aspects** of human meaning construction in both academic and non-academic work contexts.

Exam in Cog & Sem (2020)

- The exam consists of an individual, set take-home assignment. The student is given a question at the beginning of the exam via Digital Exam
- Length: **10-13 standard pages** (1 page = 2400 characters incl spaces)
- The examination is conducted in either English or Danish, according to the preference of the student
- Duration: **1 week** (Jan 7-14th)
- Questions?



- Note the slide number(s) for note-taking!
- Please interrupt with comments or questions!
- This course requires pre-lecture preparation and in-class activity

Important! Especially
on new terminology
that I perhaps
assume you know

AU COVID19 Guidelines

- Use the hand sanitiser before we start
- Have ~1 meter of space between each other
 - Also during group work
- At the end of class, please help clean the room
 - Your table and your chair seat and back
 - If we all help, it's only 5-10 mins

Concepts and notions ahead:

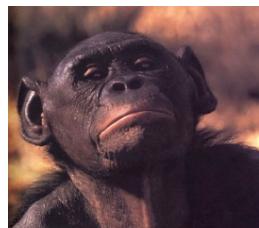
- **Two-systems approach**
- Automatic vs deliberate
- **Implicit processes**
- Social perception
- Biological motion
- Perceptual animacy
- Ascription of intentions, beliefs, desires
- Automatic predictions
- Prediction error/predictive coding
- **Implicit social processes**
- Automatic imitation
- Implicit “mentalising”
- **Mirror neurons**
- Motor resonance
- Action recognition vs ‘understanding’
- **Explicit mentalising/Theory of Mind**
- Social representations
- False belief task
- Demand characteristics
- High-functioning ASD
- ToM impairments
- Mindblindness
- Cultural differences
- **Implicit vs. explicit metacognition**
- Metacognitive representations
- Second-order behavior
- Confidence ratings
- Metacognitive accuracy/ability
- *Under- and overconfidence*

Today's topic: Concepts in interpersonal cognition and behaviour

- Quick associations?
- What is it?
- Common background



Interdisciplinary interest



Comparative psychology



Social psychology



Developmental psychology

Social Cognition



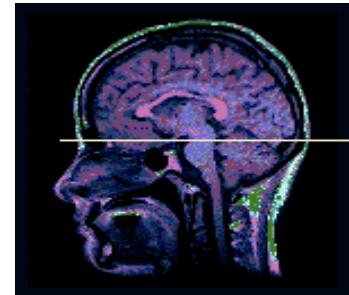
Computer
science and
artificial
intelligence



Cognitive neuroscience

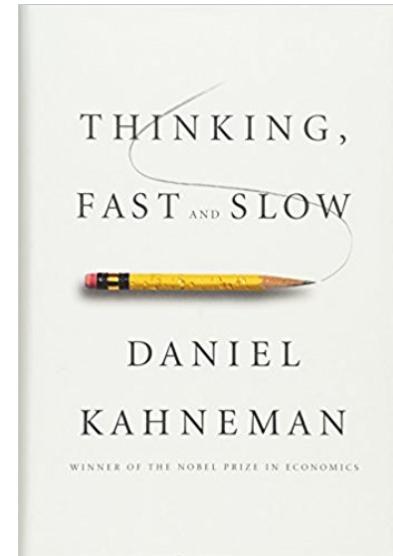
Defined typically as “any cognitive process that involves other people”

- Danger of too broad a definition
 - Long tradition of the study of social interaction: Animal and Human
- We narrow down:
 - Processes which imply **an effect of one person on another**
- Specificity:
 - Mechanisms that can be implemented computationally and at the neural level
 - All cognitive processes (language, memory, etc) **can be involved in social cognition**. But some processes specifically **sustain** the effect of one person on another
 - The mind distinguishes intentional and mechanical events, animate and inanimate objects, agents and non-agents, faces and objects



Levels of awareness

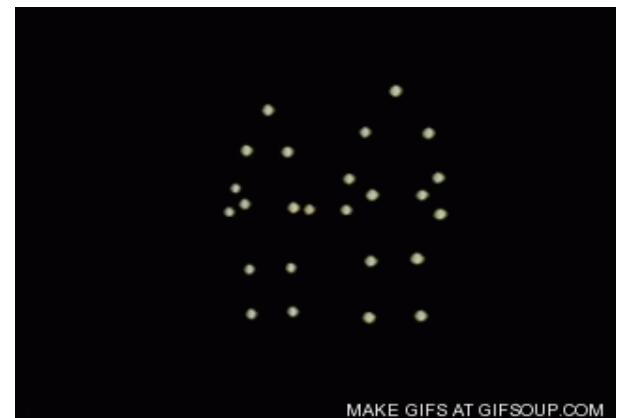
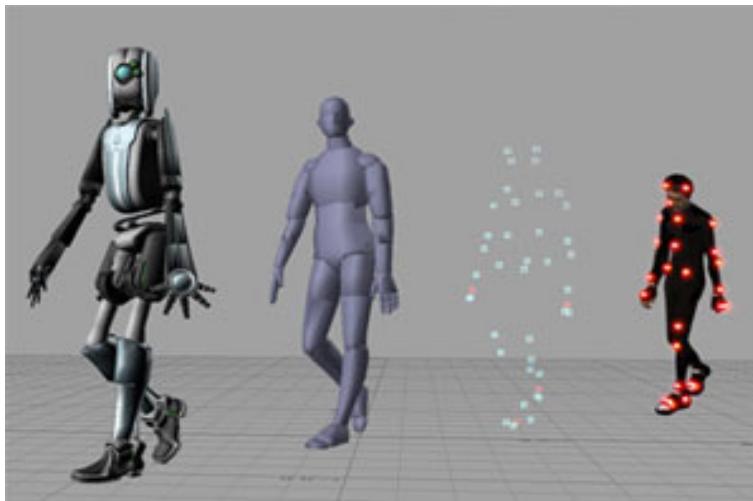
- Helpful distinction:
 - Implicit vs explicit
 - Involuntary vs deliberate
 - Automatic vs ostensive
 - Non-conscious vs conscious
- What are some examples?
- Two-systems approaches
 - i.e. System 1 & System 2, (Kahneman et al.)



Concepts in interpersonal cognition and behaviour

Biological motion

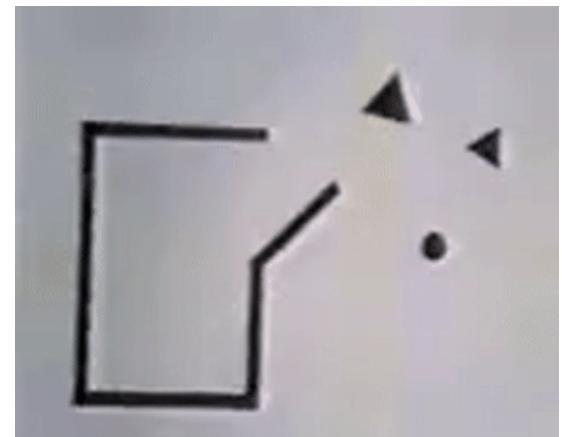
- Point-light displays of motion agency (i.e. alive-ness and not yet intentions, etc.)



- <http://www.biomotionlab.ca/Demos/scrambled.html>
- <http://www.biomotionlab.ca/Demos/BMLwalker.html>

Perceptual animacy (and causality)

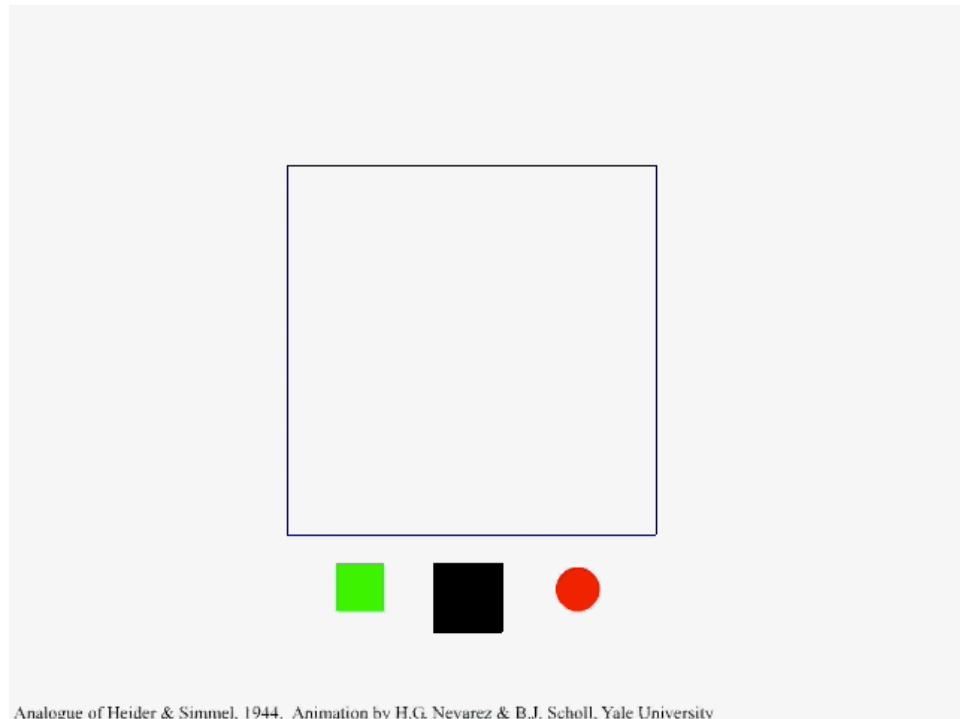
- A step farther than attributing ‘biology’ and ‘biological motion/motor behaviour’.
- Attributing animacy involves **ascription of intentions, beliefs, desires, and other high-level mental states** (automatically)
- Heider and Simmel (1944) animation
<https://www.youtube.com/watch?v=n9TWwG4SFWQ>
- Decreased behaviour in psychiatric disorders, such as ASD, Schizophrenia, etc.



Simple black geometrical objects on a white background, but from their interactions and mutual responses, we infer mental states, i.e. “minds”.

Video (more recent analogue)

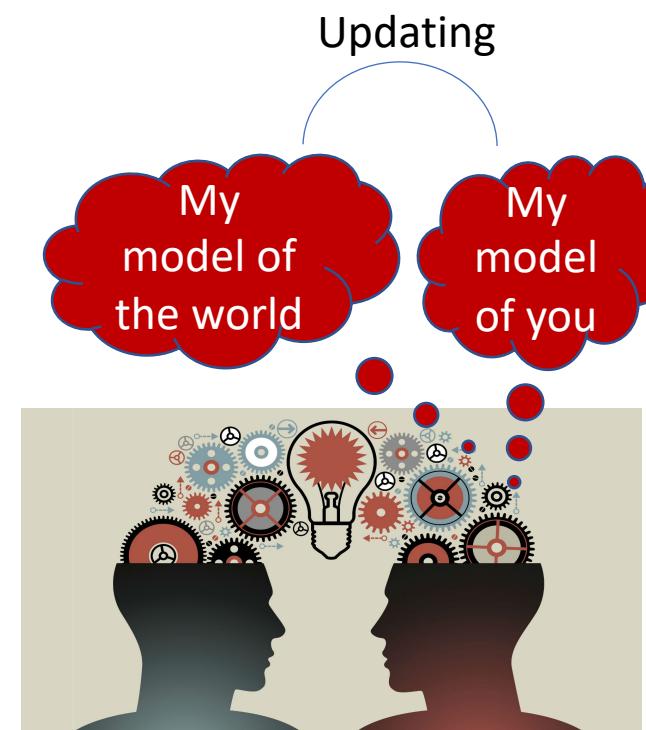
- Contrasted to a movie of objects moving at random or semi-random
- Fast, automatic, irresistible, and **highly stimulus-driven** - despite the fact that they involve higher-level cognitive processing
- Can you describe what happens in the video, please?



Analogue of Heider & Simmel, 1944. Animation by H.G. Nevarez & B.J. Scholl, Yale University

Automatic processes based on expectations and predictions

- Not only do we attribute biology, agency and causality in retrospect and online; we also automatically make predictions about what happens next (e.g. predictive coding)
- We then observe how well our model of the world, or our predictions, match what really happens – (how surprised are we?) – and use that result/output (prediction error signal) to adjust the following predictions
- The more surprised we are, the more we adjust our future predictions, continuously
- And this affects adjustments on higher and lower levels as well (hierarchical predictive coding)



Dating back to Thomas Bayes and Helmholtz, and formulated (with variation) by many since then

Fx. social predictions in learning

- When learning a given task in the context of others, there are many examples of how we use a prediction error (PE) signal **to guide our learning**
- One model of such learning is the reinforcement learning (RL) model
 - Says that your **next prediction** is the result of **what just happened combined with what you thought would happen** (PE) and a willingness to adjust (**learning rate**)

$$V_{t+1} = V_t + \alpha_t \delta_t$$

- At their most simple, RL algorithms state that **expectations of future reward (V_{t+1})** should be a function of **current expectations (V_t)** and **their discrepancy from the actual outcome** that is experienced - the **prediction error (δ)**. More specifically, future expectations should be updated by the product of the prediction error and **the learning rate (α)**



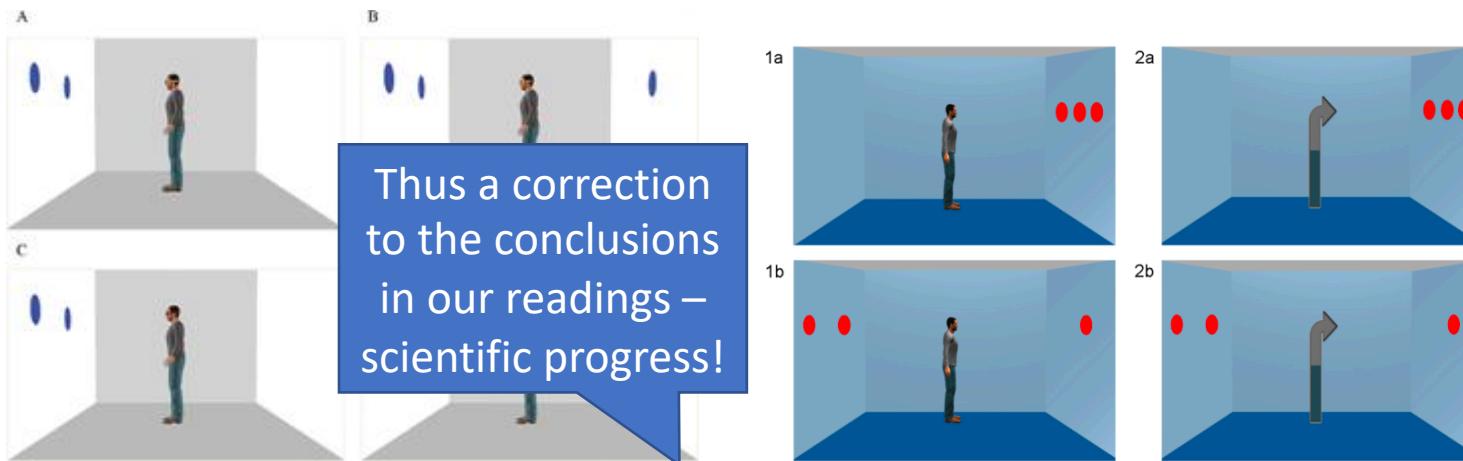
This basic idea was mentioned several times in both text?

Implicit social processes

- Learning about the **internal cognitive states of others**, such as their beliefs and knowledge, **can also be processed implicitly** in cases where that information relates to a mental model of
 - the **social status** (represented automatically)
 - the **past behaviour** (e.g. interpersonal affiliations or alliances)
 - and **predicted future** behaviour of individuals (to facilitate a continuous learning process of others' behaviour)
- Even under non-conscious perception of face expressions and configurations, we keep track of the emotional states of others, or their level of social threat
- **Take-home:** The workhorse in much of our social cognition is *implicit processes* – automaticity is freeing up capacity for more demanding tasks and novel stimuli.

NB: Implicit social(?) processes

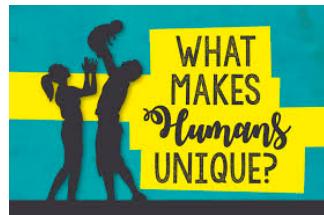
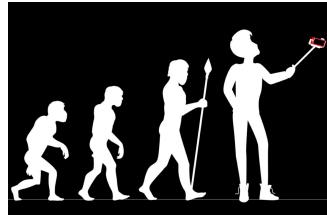
- Studies demonstrating that humans will automatically take the perspective of an avatar, despite being instructed to ignore it, have been used to argue for “automatic mentalizing”, or an implicit “theory of mind”



- However, simple extensions of these studies have suggested that non-social stimuli with orienting properties, such as an arrow, could replicate the effect
- That is, a directional cue could elicit the same result, suggesting that simple attentional orienting, rather than mental state attribution of theory of mind, could explain the influence on behaviour

(Catmur *et al.*, 2016; Santiesteban *et al.*, 2014)

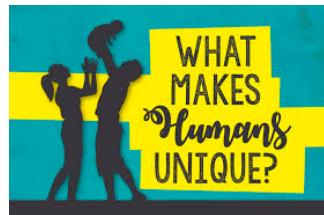
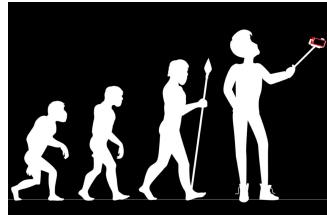
Implicit social processes



- **Implicit learning processes** of relevant information about places, objects, actions and agents are primarily developed through **the observations of others** (Social Learning)
- Importantly, these enable us to keep track of social information, such as their actions and the usefulness of the social advice, and appear to be based on **simple domain-general learning mechanisms** (not domain-specific to social abilities), e.g. associative learning
- *Not unique*: Humans can reliably keep track of changing cognitive processes and use them to predict future behavior and to learn from others
- But so can a lot of **non-human animals!**



Implicit social processes



- **Implicit learning processes** of relevant information about places, objects, actions and agents are primarily developed through **the observations of others (SL)**
- Importantly, these enable us to keep track of social information, such as their actions and the usefulness of the social advice, and appear to be based on **simple domain-general learning mechanisms** (not domain-specific to social abilities), e.g. associative learning
- *Not unique:* Humans can reliably keep track of changing cognitive processes and use them to predict future behavior and to learn from others
- But so can a lot of **non-human animals!**

Mirror Neuron system (MNS)

- (1) Take a few minutes to discuss with your class mate(s) what *mirror neurons* and the *Mirror Neuron System (MnS)* are
- What does mirror neurons tell us about ‘social-emotional resonance’ and ‘mentalising mechanisms’ in general?

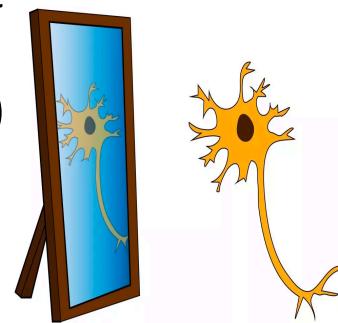


Mirror Neuron system (MNS)

- In monkeys: A class of single neurons, mostly in motor areas, that both fire **when an individual performs an action** and when the individual **observes another individual performing that same action**
 - e.g. grasping a nut and observing someone else grasping a nut
- In humans: **Mirror Neuron System** (note: not single neurons), which is a brain ‘area’ that is active when performing and observing the same action (as measured with fMRI)
- Proposed to explain ‘**intention understanding**’, empathy, imitation, even ASD impairments and language evolution

Mirror Neuron system (MNS)

- Not yet found in humans (hence MNS)
 - BOLD signal vs single cell recording (translatable?)
 - Some attempts with mixed results (half find MN evidence, half do not)
- Immensely hyped in cognitive science (and science journalism)
 - But they *do play an important role in social cognition*
 - Just as likely a consequence of action understanding, as a cause
- Mirrors/resonates motor behaviour, *facilitating associative learning* (during e.g. imitation, observational learning, etc.)
- *No evidence* of high-level “understanding” (or “mentalising”) involved
- Thus, this concept *falls under implicit cognitive processes!*



Mentalising (Theory of Mind)



- Let's utilize our abilities to predict and integrate social information into our own learning
 - In groups of three...
- (1) Take a few minutes to discuss with your class mate(s) what **ToM** is
- (2) how do individuals with **ASD** differ from neurotypicals?
- (3) What does ToM impairments tell us about ToM or mentalising mechanisms in general?

Slide 18+

- Helpful distinction: Implicit vs explicit
 - Involuntary vs deliberate
 - Automatic vs ostensive
 - Non-conscious vs conscious

Implicit 'processes' (maybe ToM)	Implicit metacognition
----------------------------------	------------------------

Explicit mentalizing (ToM)	Explicit metacognition
----------------------------	------------------------

From now

Mentalising (Theory of Mind)

- *Theory of Mind* refers to the human ability to explicitly make inferences and monitor the mental states of others and use this to predict behaviour
 - also known as **mentalising**, folk psychology, or mind reading
- Having a Theory of Mind allows one to
 - Attribute thoughts (beliefs), desires, and intentions to others
 - To predict or explain their actions
 - To posit their intentions
 - Realize that mental states can be the cause of other's behavior
- Implies one must conceive of the mind as a generator of representations

Mentalising (Theory of Mind)

- Children enter the world **predisposed to form reasonable theories** about how the mind works.
 - From 3-years onward, children have a naïve theory of how the mind works
 - **False Belief Task**
 - Gold standard in understanding of beliefs - require understanding of one's own or **another person's false belief**
 - E.g. child shown a box of Smarties, asked what is inside, says, "Smarties", and is shown there is really pencils inside. Then asked **what someone new will think** is inside the Smarties box.
 - 5-year-olds predict the other child will say Smarties
 - 3-year-olds predict the other child will say pencils
 - http://www.youtube.com/watch?v=8hLubgpY2_w
- Byurakn will talk more about this!

But a few small notes – not important for us...

- Age of development is debated (!)
- Factors that can affect performance:
 - Children can succeed at younger ages if the story involves deception as the motive for the change (such as the chocolate was moved to trick the protagonist)
 - Children perform better and succeed earlier if they carry out the transformation themselves (such as the children move the chocolate themselves, rather than watching the experimenter move it).
 - Children perform better and succeed earlier if the target object is not present when the false belief question is asked (such as if the chocolate is removed from the drawer and eaten so it is no longer present).
 - Children perform better and succeed earlier with stories in which the protagonist's belief is explicitly stated or pictured (such as if the story explicitly states, "Maxi thinks his chocolate is in the drawer") than in stories in which the protagonist's beliefs need to be inferred.
 - Children older than about 4 years tend to perform better if the false belief question emphasizes the time frame involved (such as, "When Maxi comes back, where will he look first for his chocolate?")

Three things to keep in mind for these studies

- Why do 3-year-old fail the false-belief task? Three schools of thought
 - Don't yet have Theory of Mind (lack competency to understand that people's minds include representations that can differ from their own)
 - Task Demands: Requirements that the task places on verbal skills or understanding of conversational conventions (performance can be improved by modifying task)
 - Domain-general information processing demands of the task, such as the ability to reason with complex, hierarchical rules or the ability to inhibit a dominant response



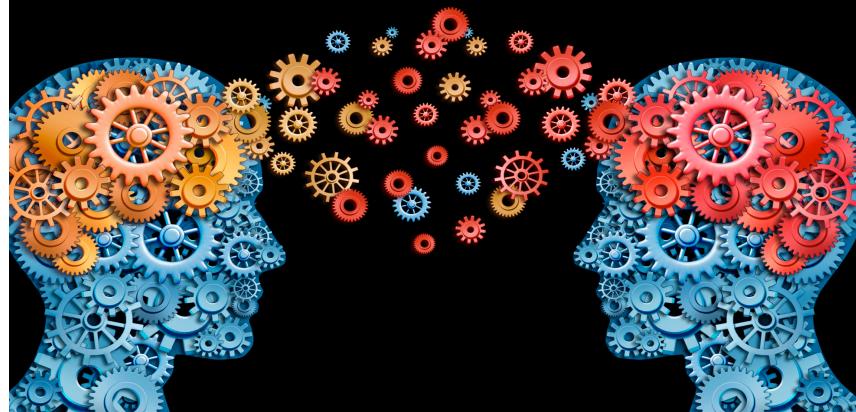
Impairments of ToM

- No problems with similar complex problem for **non-social inferences** in high-functioning ASD, but:
 - Harder time seeing things from any other perspective than their own
 - More difficulty determining the intentions of others
 - Less understanding of how their behavior effects others
 - More difficult time with social reciprocity
- Believed to be a key feature of ASD, i.e. ‘mindblindness’

Potential topic for exam: What is the relationship between implicit & explicit ToM and ASD?

Explicit Mentalising (ToM)

- Explicit mentalising is based on a different neurocognitive mechanism from *implicit* social cognitive processes, and that this mechanism is specialised for thinking about mental states



- However, ‘specialised’ is not meant to imply that this is an inborn, genetically inherited mechanism, but rather an acquired, domain-specific mechanism – i.e. appears to be socially learned
- Time for a Quiz!

Quiz questions

- 1) Tests of explicit mentalising improves in children, but doesn't appear to improves late is in in adolescence and into adulthood • FALSE
- 2) Cross-cultural studies suggests that individuals in different cultures learn explicit mentalising differently • TRUE
- 3) Some cultures regard 'situations' as more important than 'mental states' for understanding the behaviour of others • TRUE
- 4) Some cultures regard mental states as external to the body • TRUE
- 5) Some cultures regard mental states as guided by supernatural sources rather than natural sources • TRUE

Explicit Mentalising (ToM)

- Explicit mentalising is an important component of social and linguistic interactions
 - In the example of a dialogue, individuals continuously infer and predict the mental states of their partner, as well as their partner's model of the world
- Evidently, this process is malleable and adaptive as a result of interaction and cultural context
- Underlies mutual adaptation, alignment, and coordination – intersects many research topics!
- Questions about explicit mentalising?

Metacognition

- What is metacognition?



Metacognition (broadly defined)

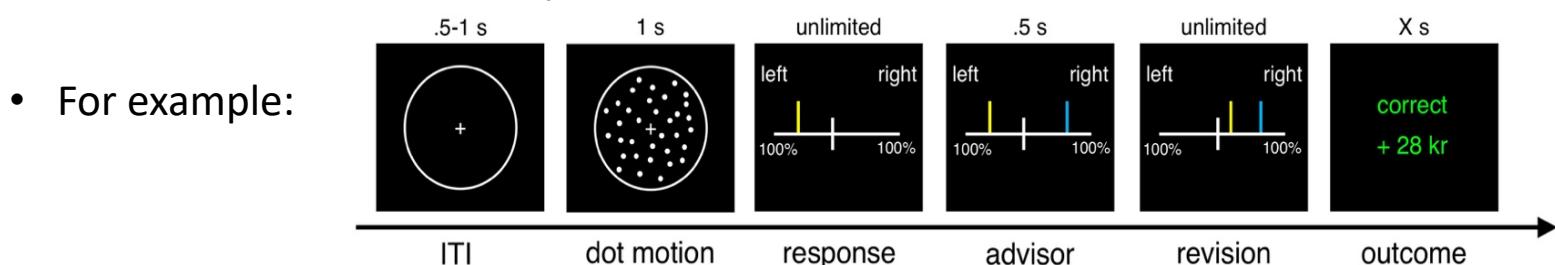
- While mentalising refers to the ability to make inferences about and monitor the mental states of others, metacognition refers to a similar ability but regarding our own mental states rather than others'.
- *Metacognition* is broadly defined as monitoring or supervisory cognitive processes that make meta-level representations about cognition, and which in turn use these representations for control of cognition (adjustments, e.g. to focus attention)
- Traditionally studied experimentally in relation to memory, action and perception, and was initially the focus of research on improving learning and memory

I'm being
distracted!

I am *not sure*
I understand
completely!

Assessing metacognition

- Generally, to assess metacognition we **can measure second-order responses**, fx **confidence reports** or **error detection judgements**, given by the participant **in connection to a first-order task decision**, which could be about, say, a perceptual or probabilistic stimulus
 - In memory retrieval, metacognition would relate to the participant's estimate of **how well they will recall** items that has been presented to them.
 - In relation to volition in motor action, it would relate to the participant's **estimate of how much they were in control** of an action



- Other methods include post-decision **wagering**, requiring an individual to make a monetary **bet** on a decision, or requiring a viable **waiting time** before a reward is given and measuring the time the individual is willing to wait before leaving for the next trial
- Its all about **uncertainty about own internal cognitive processes!**

Metacognition (implicit and explicit)

- Metacognition is similar to mentalising in that it refers to the ability to make inference about the mind, but monitoring one's own rather than others' minds
 - But the conceptual notion of metacognition also shares another characteristic: implicit and explicit metacognition, e.g.

Implicit 'mentalising'	Implicit metacognition
Explicit mentalising	Explicit metacognition

- Whereas *implicit metacognition* refers to **automatic, non-conscious** processes that are fast and minimally dependent on working memory,
- *Explicit metacognition* refers to **conscious, reportable** processes that are slower and more dependent on working memory



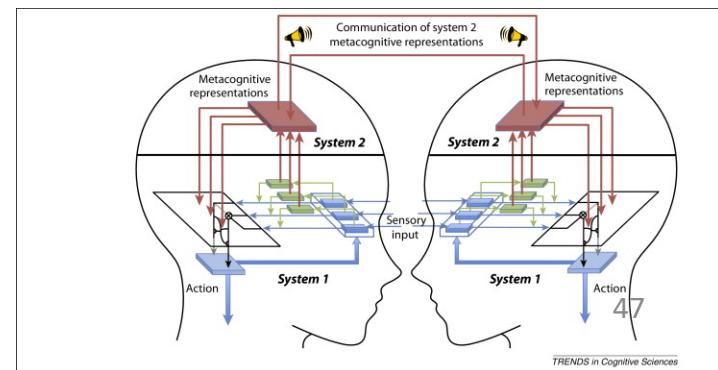
Explicit metacognition

- Unlike implicit metacognition, explicit metacognition represent properties of cognitive processes at a conscious, reportable and domain-specific level
 - As such, these metacognitive representations can be communicated verbally, e.g. by expression of uncertainty, or non-verbally, e.g. by gestural signs and facial expressions
- Explicit metacognition can be shared socially !



Next time metacognition in more detail:

- Rather than taking explicit metacognition as a mechanism primarily for reporting uncertainties (which the individual already have implicit access to) directed to oneself, it may better be understood as **a mechanisms for sharing uncertainties with others**
- We will review its function in social interaction, allowing individuals to coordinate behaviour, reach agreement between conflicting opinions, etc.
- Stay tuned!



Recap – concepts and notions

- **Two-systems approach**
- Automatic vs deliberate
- **Implicit processes**
- Social perception
- Biological motion
- Perceptual animacy
- Ascription of intentions, beliefs, desires
- Automatic predictions
- Prediction error/predictive coding
- **Implicit social processes**
- Automatic imitation
- Implicit “mentalising”
- **Mirror neurons**
- Motor resonance
- Action recognition vs ‘understanding’
- **Explicit mentalising/Theory of Mind**
- Social representations
- False belief task
- Demand characteristics
- High-functioning ASD
- ToM impairments
- Mindblindness
- Cultural differences
- **Implicit vs. explicit metacognition**
- Metacognitive representations
- Second-order behavior
- Confidence ratings
- Metacognitive accuracy/ability
- *Under- and overconfidence*

Please help me remember!

- Send a picture of you and a text that says what your name is, where you're from and an unusual fact about you! → karsolsen@gmail.com



*My name is Karsten, I'm
from Kolding (denmark),
and I'm a big fan of the
liquorish/chocolate-combo
and my dog Charlie!*

See you next time