

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 2

Monday Sep 7th

Overview

- Today's lecture: Concepts in interpersonal cognition and behaviour II
 - Mind reading (mentalising)
 - Paper discussion
 - Ontogenetic & phylogenetic topics
 - Cross-cultural differences
 - Metacognition (slight repetition)
 - Explicit metacognition cont.
 - Supra-personal cognitive control
 - Shared explicit metacognition
 - Summing up

Concepts and notions ahead:

- **Explicit mentalising (mind reading)**
- Non-genetic evolution
- Cultural inheritance
- Heritable variation in *fitness*
- Selection
- Social learning
- Neurobiological basis in cortical areas
- Developmental disorder
- Cultural commonalities /differences
- Home sign and sign language (NSL)
- Cultural transmission
- **Explicit metacognition (recap)**
- Metacognitive representations
- Second-order (judgements)
- Metacognitive accuracy/ability
- Post-error slowing
- Divergence/dissociation
- Reportable signals
- Synchronic and diachronic functions
- Malleability / limitations
- Change blindness
- Inter-individual differences
- *Under- and overconfidence*
- Social evaluation and ‘weighting’
- Common language (alignment)
- Mutual adaptation

Reminder

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

Elaborating and
expanding on
explicit processes
and their functions

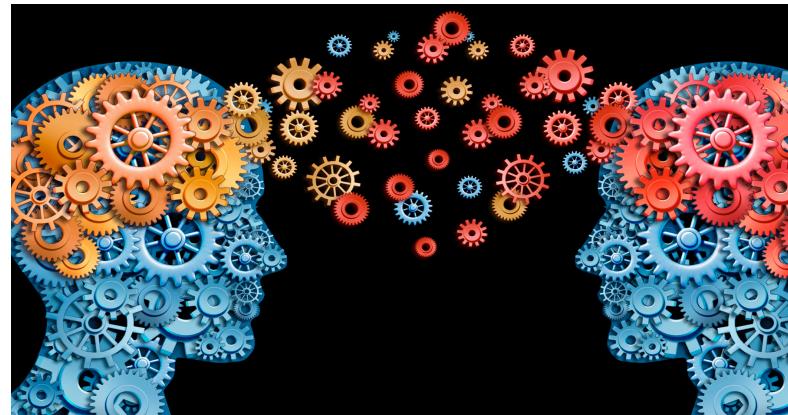


Explicit Mentalising (ToM) - recap

- Refers to the human ability to make inferences and monitor the mental states of others and use this to predict behaviour
 - also known as ToM, folk psychology, or mind reading
 - Explicit mentalising is likely specialised for thinking about mental states
- However, ‘specialised’ is not meant to imply that this is an inborn, genetically inherited mechanism, but perhaps an acquired, domain-specific mechanism – i.e. appears to be socially learned

Explicit sociocognitive processes generally

- Explicit social processes are to a greater extent developed through social interaction
- Evidence in support of this view comes from *developmental*, *neuroscientific*, and *cross-cultural* studies
- These suggest that mechanisms for explicit mentalising are *late developing*, *slow*, and *cognitively demanding*



The cultural evolution of mind reading paper

SOCIAL COGNITION

The cultural evolution of mind reading



”Evolution” of reading/literacy

- *Reading* involves deriving meaning from signs (usually markings on paper) and the meaning relates to objects and events in the world
- Literacy developed (significantly) only 5-6 thousand years ago
- Now a phenomenon across almost every terrestrial habitat on the planet

”Evolution” of reading/literacy

- Reading and writing systems used across the world today have developed, diversified, and been honed by **non-genetic evolutionary processes**
- These processes are *evolutionary* because they produce **change through heritable variation in fitness**
 - However, the inheritance occurs **via social learning** rather than genetic mechanisms,
 - fitness is defined by the **number of individuals or groups who adopt the system through social learning**, rather than by the number of biological offspring

Social learning
~~Genetic inheritance~~



Cultural evolution
~~Biological evolution~~

The cultural evolution of mind reading paper – written exercise

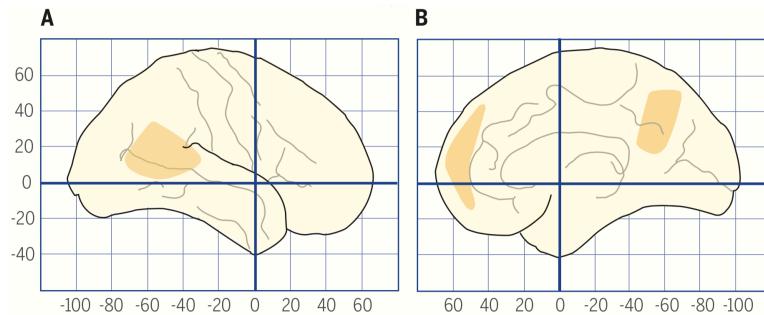
- Group exercise:



- Can reading and mentalising be compared? In your groups, discuss your individual *understandings* of the paper's **main points**
 - Resolve any differences that you may have
- Collectively, you will later write a **short paragraph or max half a page in bullet points** that presents your critical thoughts or comments on these points

Explicit mentalising 2.0

- Neuroimaging studies suggest a **dedicated social 'explicit mentalising' network/neurobiological basis**
 - Meta-analysed and replicated
 - improvement on tests continues in adolescence and into adulthood, while the related cortical areas among the latest to reach maturity
- Developmental disorders
 - Which is?
 - Genetic?
- Cultural commonalities
 - And differences (last week's Quiz!)



Post. temporal sulcus and TPJ
mPFC (left) and precuneus

Remember?

Quiz questions

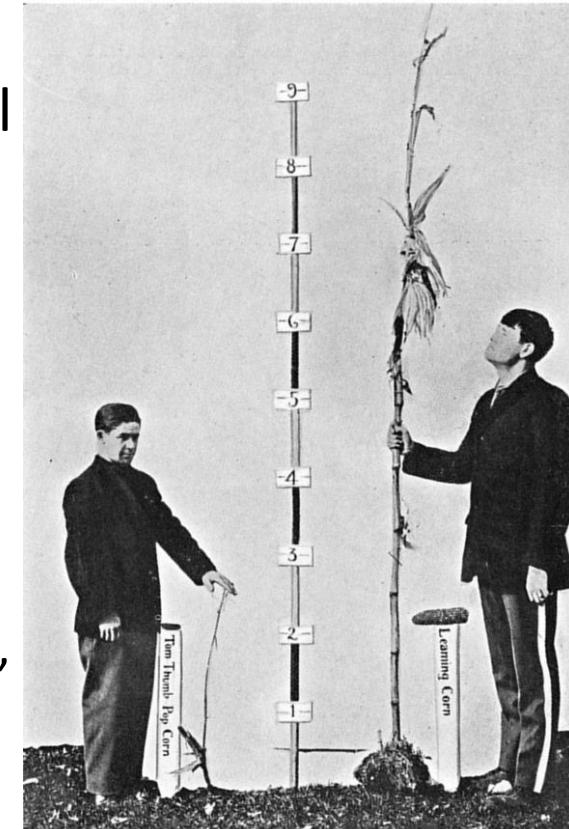
- 1) Tests of explicit mentalising improves in children, but doesn't appear to improve late in adolescence and into adulthood • FALSE
- 2) Cross-cultural studies suggests that individuals in different cultures learn explicit mentalising differently • TRUE
- 3) Some cultures regard 'situations' as more 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 2.0

- Heritability in mentalising abilities can be tested using twins:
Large cohort study suggests that abilities are *not* more correlated **between identical twins** vs non-identical twins?
 - What does that tell us?
- Heritability is a complicated issue – let's take a short detour:

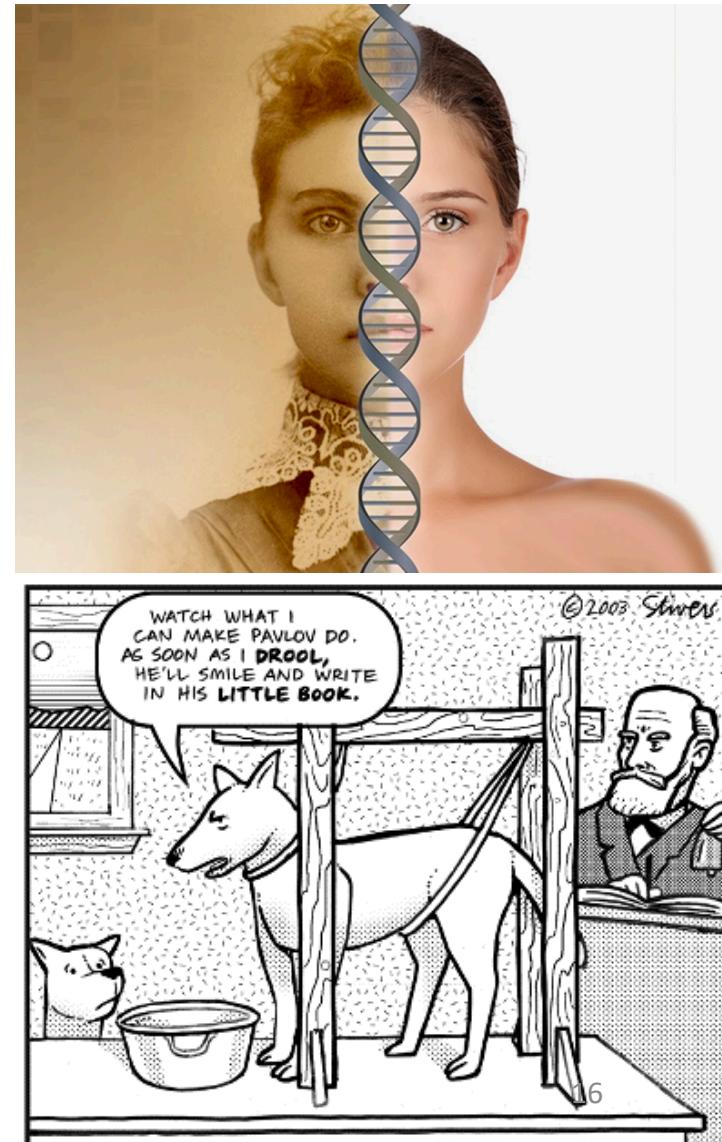
Testing genes, twins, heritability, etc

- The concept of **Heritability**: A measure of the degree of variance in a trait that can be assigned to genetic rather than environmental differences
 - Not the same as causation; e.g. if heritability is .80 then can't necessarily conclude that it is "mainly caused by genes":
- Differences in environment may lead to differences in heritability. For example:
 - In societies where only some children go to school, then heritability of "reading ability" will be lower
 - The number of fingers on our hands has low heritability (?)



Testing genes, twins, heritability, etc

- Further complicating things:
- “Gifted” people may **actively seek out stimulating environments**, e.g.
 - talented football-players will be admitted to talent teams with better training
 - Students with bright minds may seek programmes (erhm!), where there are other students with bright minds (erhm!), allowing better teaching!
- Small differences grow on you!



Explicit mentalising 2.0

- Heritability in mentalising abilities can be tested using twins:
Large cohort study suggests that abilities are *not* more correlated **between identical twins** vs non-identical twins?
 - What does that tell us? Heritability is complicated.
- The example of home-sign → **Nigaranuan Sign Language (NSL) development** (all time favorite)
 - First cohort showed **decreased abilities on False Belief tasks**, compared to second cohort (10 years later)
 - with the “full language” containing more mental states



Take-home message:
“We learn about the mind through conversation about the minds”



"Constructed through explicit instruction from and interaction with other *experts*"



Parallels between mind reading and print reading

Feature	Mind reading	Print reading
Meaning from signs	Mental states from situations and behavior	Referents from inscriptions
Neural specialization	E.g., medial prefrontal cortex and temporo-parietal junction (4)	E.g., occipito-temporal “visual word form area” (5)

Cultural learning of *mind reading* (replacing notions of slide 10)

- Mentalising behaviour across the world today have developed, diversified, and been honed by **nongenetic evolutionary processes** (i.e. cultural transmission and inheritance)
- These processes are evolutionary because they produce **change through heritable variation in fitness**
 - inheritance occurs **via social learning** rather than genetic mechanisms
 - and fitness is defined by the **number of individuals adopting (through social learning)**, rather than biological offspring)

Social learning
~~Genetic inheritance~~



Cultural evolution
~~Biological evolution~~

The cultural evolution of mind reading paper – written exercise



- What do you think, are you convinced of the analogy? Any details that do not sit well with you?
- In groups, please write a paragraph or in bullet points any critical thoughts or comments (positive or negative) on the matter
 - Fx also use real-life/anecdotal (counter)examples
- Add your names, save as a .pdf, and upload to Blackboard “Assignments” before end of class/today!
 - Typos and formal details are irrelevant!

Cultural evolution and cognitive requirements will be revisited

- In Lecture 5 & 6 we will explore cultural evolution, social learning and cultural dynamics again - although quite differently, but we will link back to this

Metacognition (Recap)

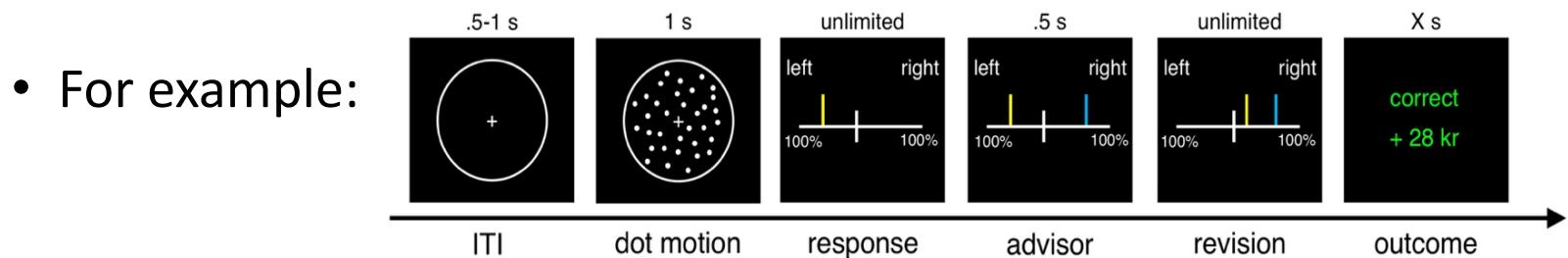
- While mentalising refers to the ability to make inferences about and monitor the mental states of others, metacognition refers to a similar ability but regarding our own mental states rather than others'.
- *Metacognition* is broadly defined as monitoring or supervisory cognitive processes that make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

I'm being
distracted!

I am *not sure*
I understand
completely!

Assessing metacognition (recap)

- Generally, to assess metacognition we can measure second-order judgements in connection to a first-order task decision, which could be about, say, a perceptual stimulus
 - In memory retrieval, the participant's estimate of how well they will recall items that has been presented to them.
 - In relation to volition in motor action, the participant's estimate of how much they were in control of an action



- Its all about uncertainty about own internal cognitive processes!

Metacognition (implicit and explicit)

- The conceptual notion of **metacognition also distinguishes**: implicit and explicit metacognition

Implicit 'mentalising'	Implicit metacognition
Explicit mentalising	Explicit metacognition

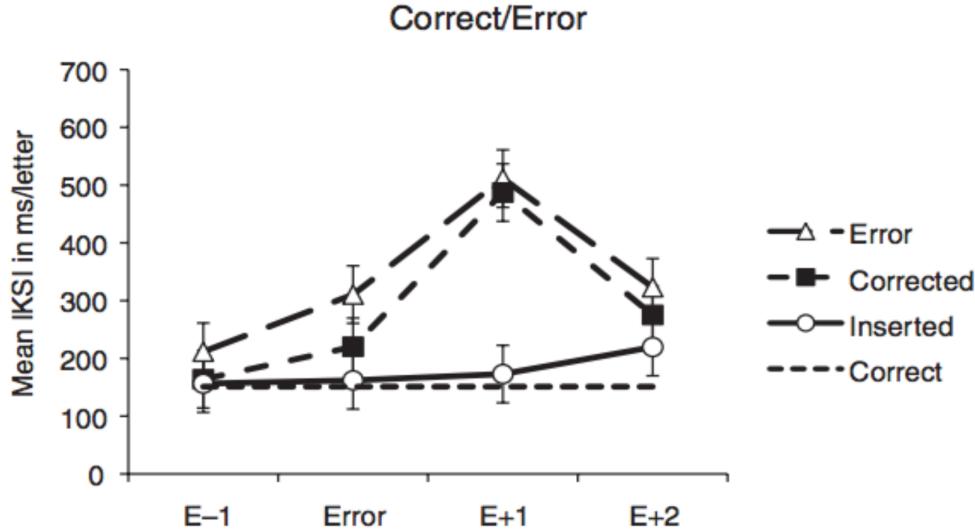
- Whereas *implicit metacognition* refers to **automatic, non-conscious** processes that are fast and minimally dependent on working memory,
- Explicit metacognition* refers to **conscious, reportable** processes that are slower and more dependent on working memory



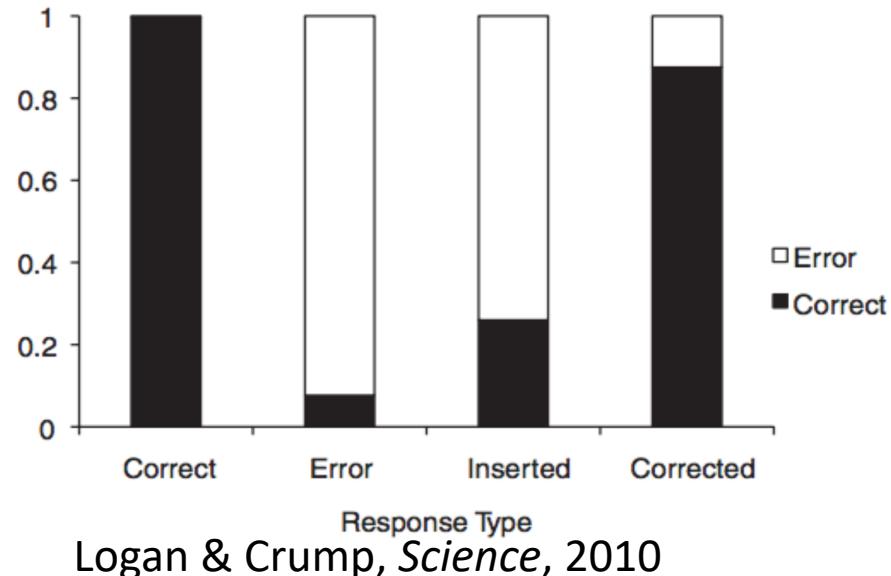
Divergence of implicit explicit metacognition - example

- Expert typists were asked to type pre-determined text and explicitly report their own errors
- Correction of **real** and **fake** errors by expert typists:
 - Researchers *inserted* mistakes (below: circles) and *corrected* other mistakes online (below: squares) *unbeknownst* to the typists – who could only watch their typed text on-screen

A



B



Supra-personal cognitive control and metacognition paper

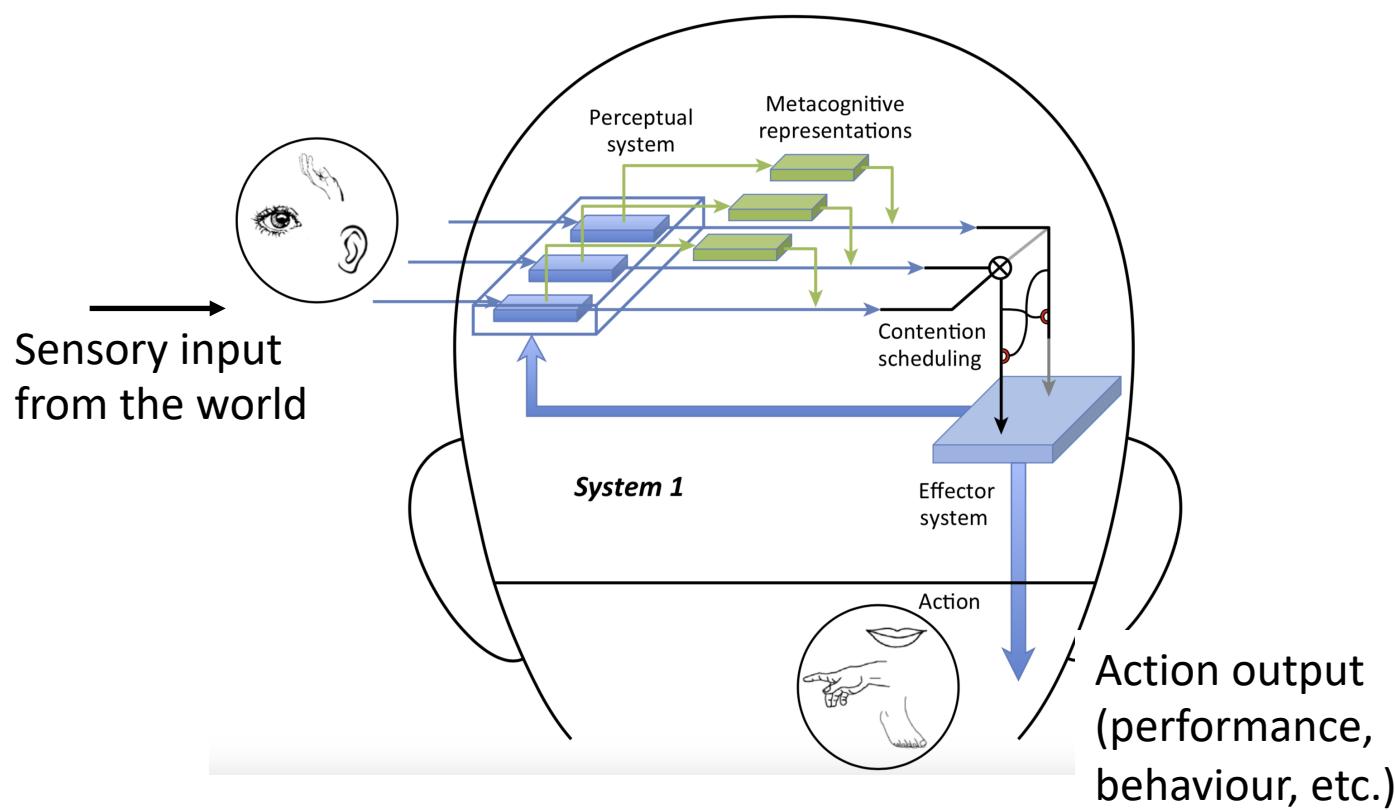


- Three types of work done by explicit metacognition are proposed - **what are they?**
- W1, W2 and W3
- You can look it up in the paper if needed

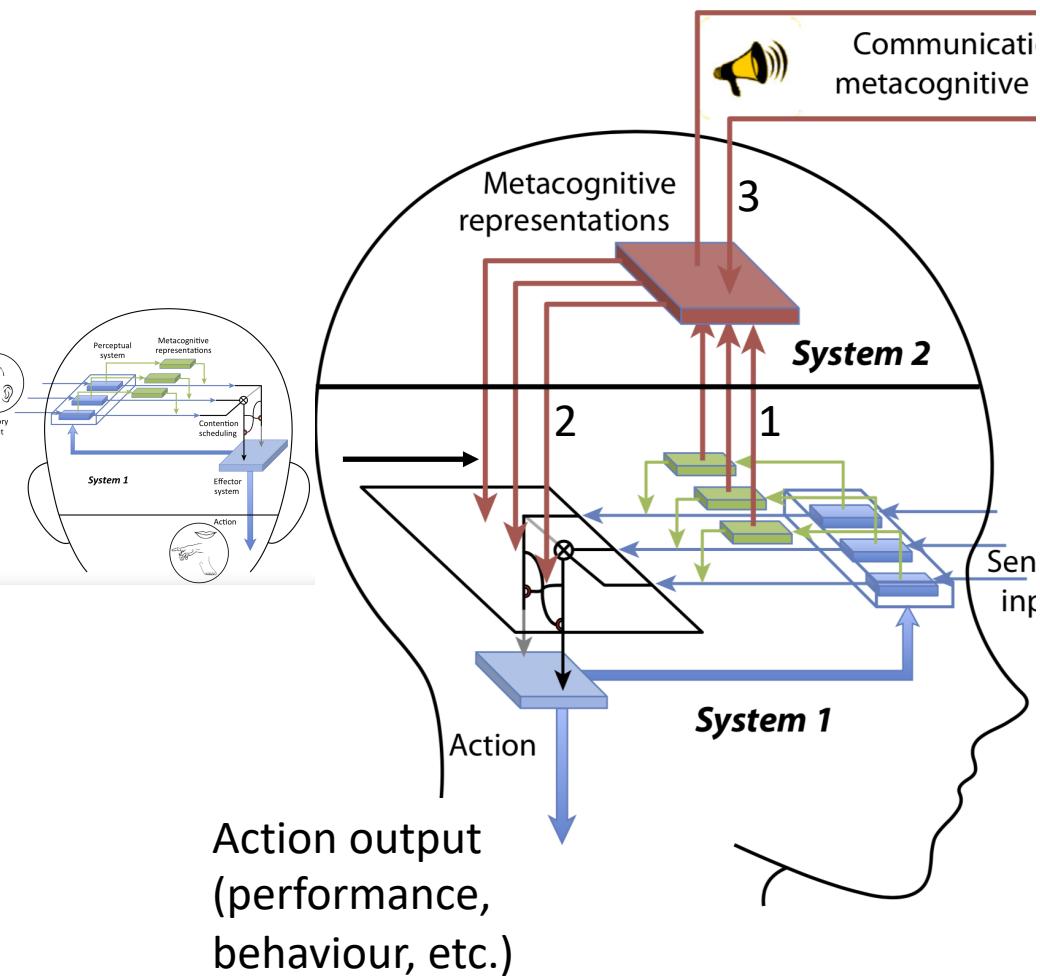
Supra-personal cognitive control and metacognition paper

- W1: Makes metacognitive representations available for report and hence for communication
- W2: Works out the significance of the available metacognitive representation (what to do)
- W3: construct or infer metacognitive representation from multiple (conflicting or variable) sources of information/evidence

Implicit metacognition at the individual level



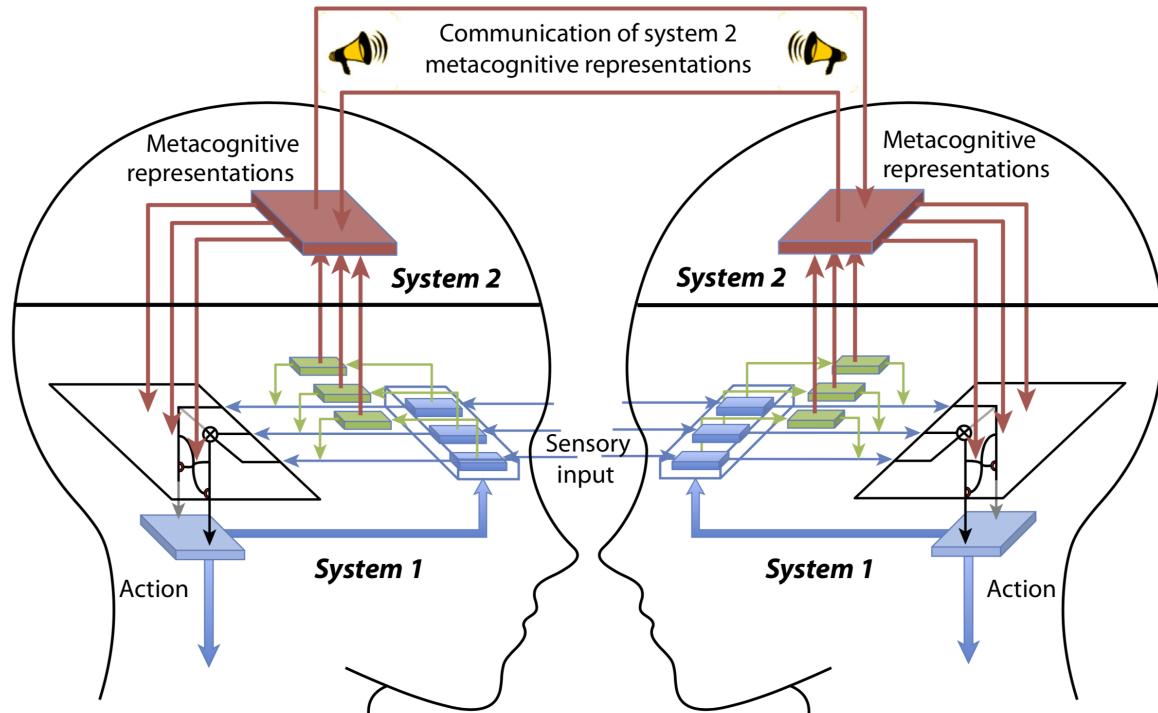
Explicit metacognition at the inter-individual level



Explicit metacognition at the inter-individual level

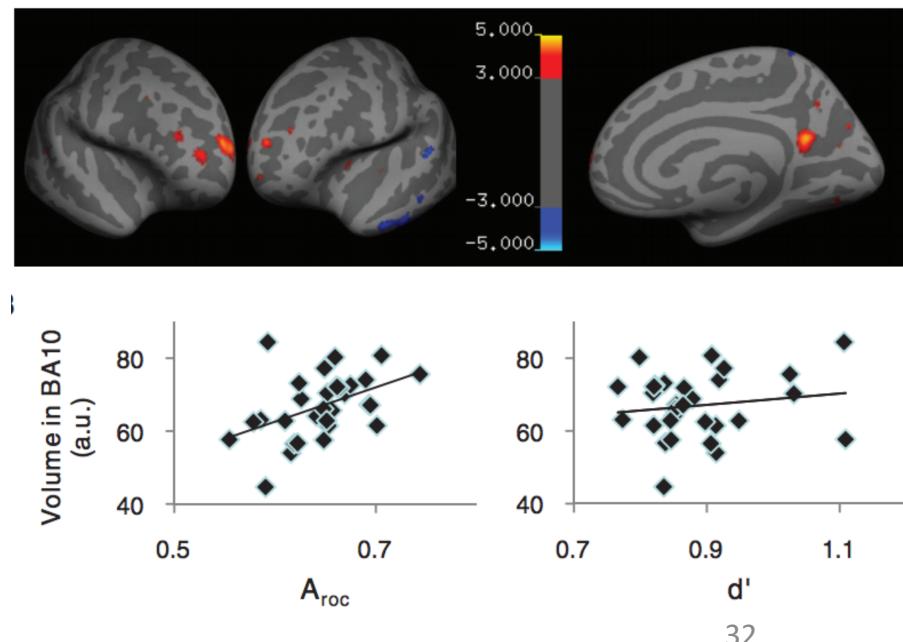
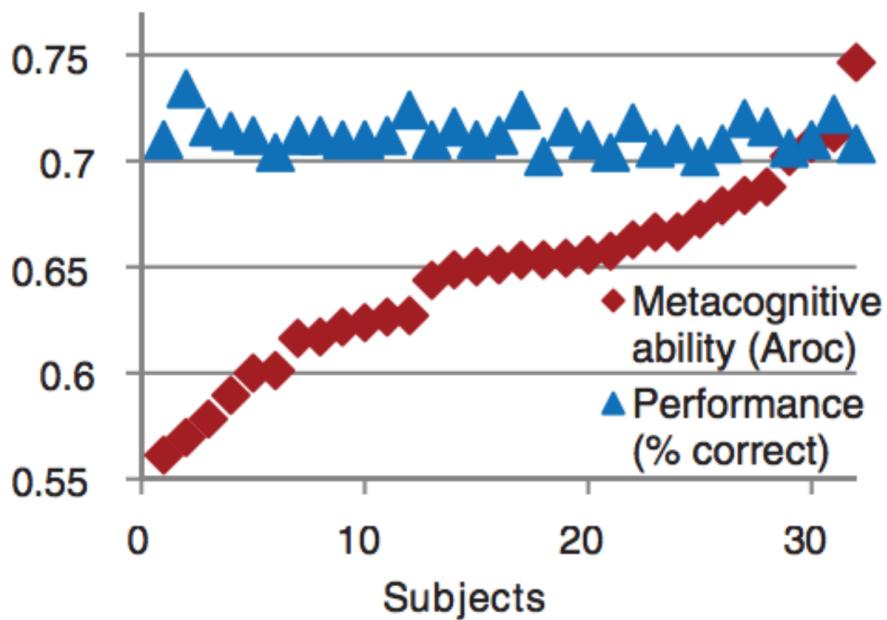
Signals arising from subpersonal cognitive processes are converted into representations that can be communicated

Communications are converted into signals that can modulate subpersonal cognitive processes



Explicit metacognition is imperfect

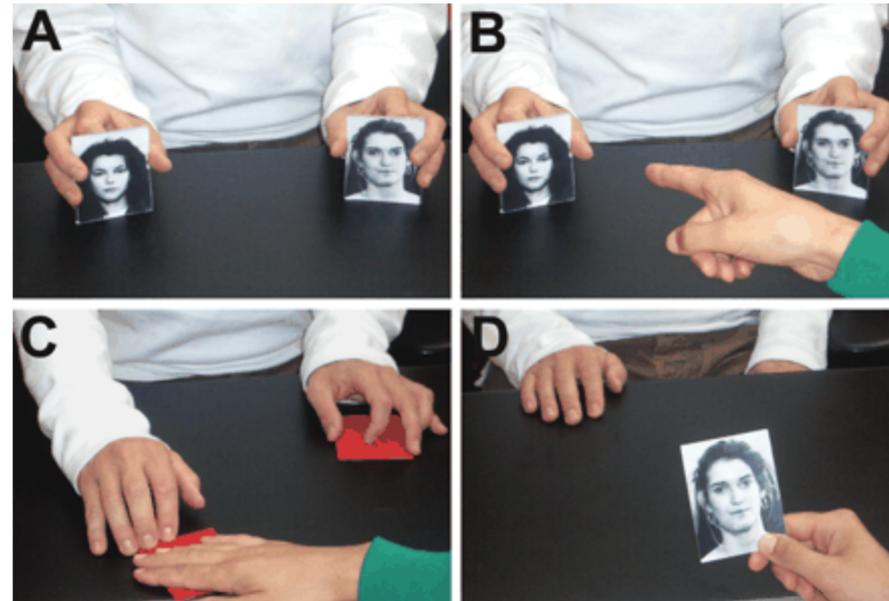
- Inter-individual differences in **metacognitive accuracy/ability** for the self:
 - Individuals with low ability exhibit over- and underconfidence



Explicit metacognition is imperfect

- Can be **inaccurate** and **fallible** (justifying actions we have not performed, as the typists did)
- Another example: **Change blindness:**

- 20% switched
- 74% deceptions

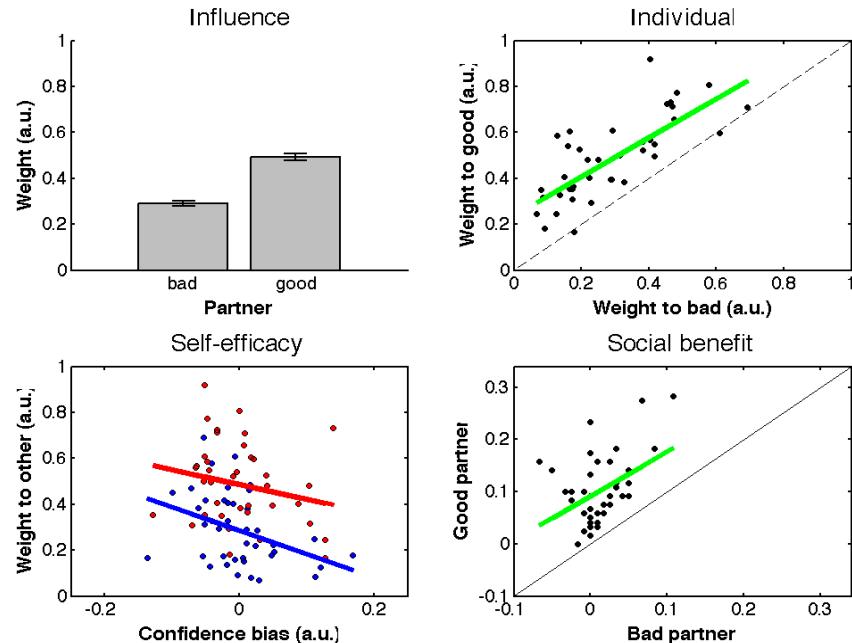
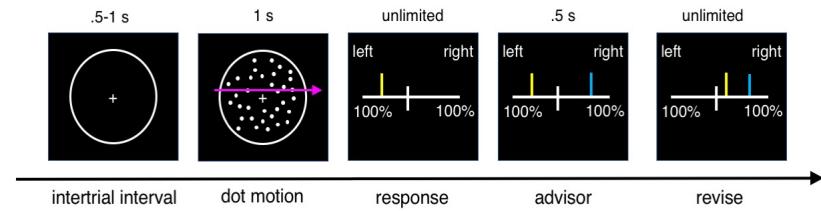


Choose

Explain
choice

Inter-individual differences in evaluating and weighting *others'* metacognitive ability:

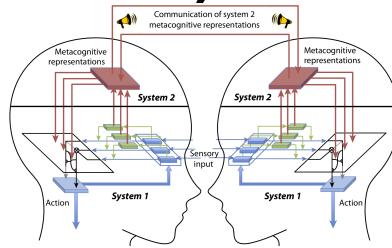
- in the appropriate weighting of others' decision confidence (and social benefits obtained)
- If you are poor at weighting good advisors, you are also poor at weighting the bad advisors – it's a trait-like thing
- Also, Individuals who were objectively underconfident were more likely to be follow the partner's opinions, whereas overconfident individuals were less likely to listen to their partner (i.e. self-efficacy)
- This is similar to egocentric advice discounting (ignoring others' better advice) which means they're less able to judge and weight the social advice according to the advisors reliability



Shared explicit metacognition

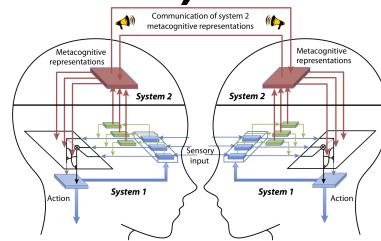
- Unlike implicit metacognition, **explicit metacognition is reportable** (this is key)
 - can be **communicated verbally or non-verbally**
 - However, very error-prone and malleable
 - individuals vary in ability for *self* and ‘weighting’ *others*
- Explicit metacognition can be **shared socially**
 - i.e. Shared explicit metacognition
- *By communicating to others the reasons for our actions and sensations, humans can learn to make better inferences about their own mental processes*

Shared explicit metacognition: How does it work, in other words?



- Over the course of time, as interacting individuals learn from and about each other, the individual has 2 tasks:
 - As the “sender”
 - (#1) explicitly communicate metacognitive information in a **way that takes into account the other** individual,
 - e.g. the knowledge and goals, based on the previous interactions
 - for tailoring the communicated uncertainties in a “**common language**” **that aligns** with previous communications
 - This tracking of other’s mental model is continuously updated
 - depends on **adaptive** communication and **EXPLICIT MENTALISING**

Shared explicit metacognition: How does it work, in other words?



- Over the course of time, as interacting individuals learn from and about each other, the individual has 2 tasks

As the “receiver”

- (#2) **interpret the received information based on explicit information about the other** individual, which is taken together and integrated into subsequent behaviour
- attempt to match their **communicated uncertainties** onto a **personal equivalent** of uncertainties
- “do they refer to the same degree of uncertainty with *slightly sure* and *vague*, as I do?” “If not, then what?”
- requires SEM to be **more responsive to social factors and individual variability**

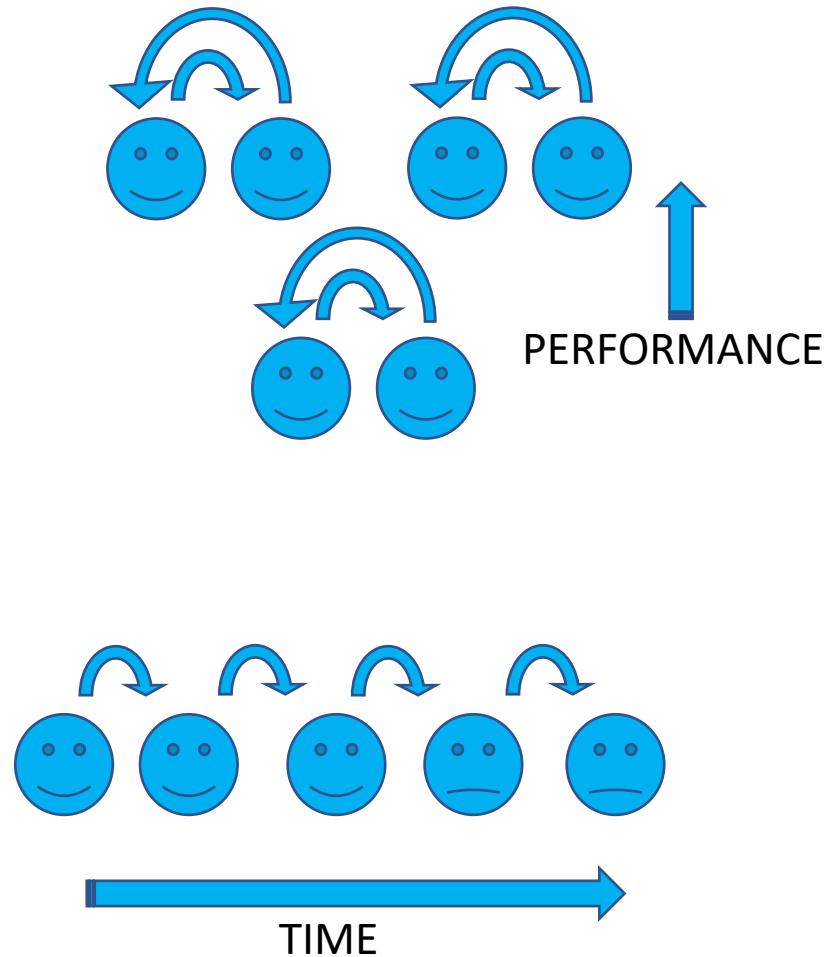
Supra-personal cognitive control and metacognition paper

- How do we distinguish between the **synchronic** and **diachronic** functions of shared explicit metacognition?
- What are they/can you give an example?



Synchronic and diachronic functions

- Working together on the same task at the same time
 - Improve performance of the group
 - Coordinate joint action (synchronise/complement)
- Teaching others (next “generation”) how to think/act/use meta. reps. in future joint or solo tasks



In sum, for next time

Summing up: *Shared explicit metacognition is the cognitive mechanism, by which uncertainties are communicated and received, and in turn used to guide personal and group learning and behaviour toward a shared goal*

Continuously updated, through the online interaction, by a process of mutual adaptation with the other

Thus, an interactive form of social learning, which depends, as it were, on bidirectional interaction (i.e. a two-way “dialogue” of information exchange) in order to facilitate mutual adaptation and performance



Explicit metacognition

- In light of the review of whether '*mind reading*' is genetically or culturally inherited, what expectations would you then have about whether *metacognition* is genetically or culturally inherited?
- What would you expect/predict?
 - Meaning from signs?
 - Neural specialization?
 - Developmental disorders?
 - Cultural variation?
 - Implicit competence?
 - Slow development?
 - Individual differences?
 - Etc.



Next time (in lecture 3 & 4) on the group and crowd level:

- Concrete examples of the use of these mechanisms in groups and experiments
- What influences are at play and what biases emerge – when does it fail?
- Next time: In-class lab demonstration

Recap – concepts and notions

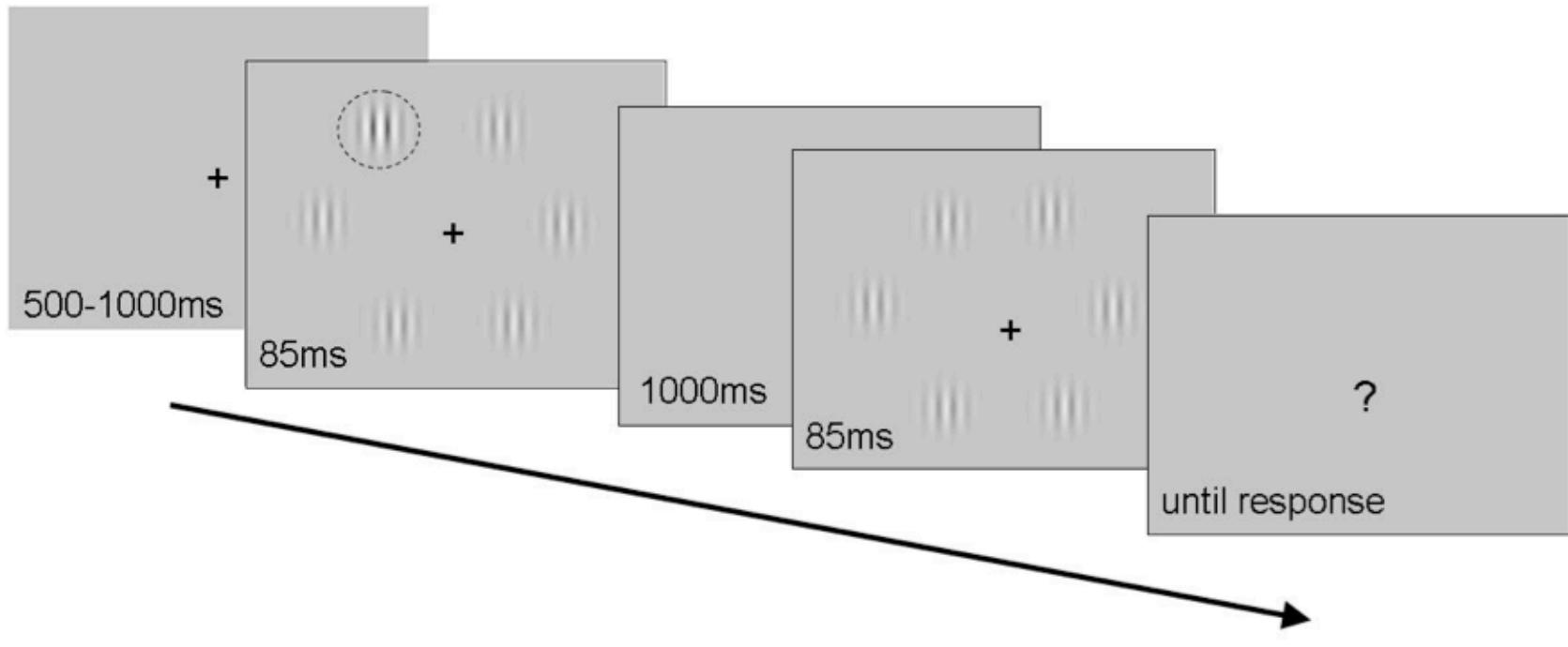
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- Mutual adaptation

See you next week

Experimental design

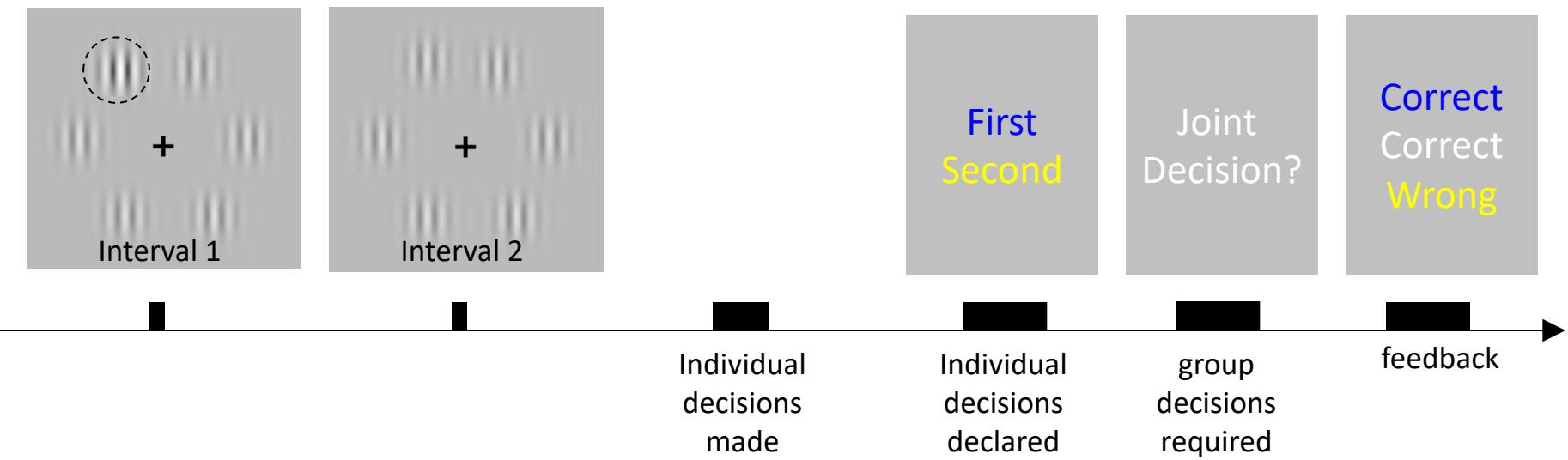


Experimental design

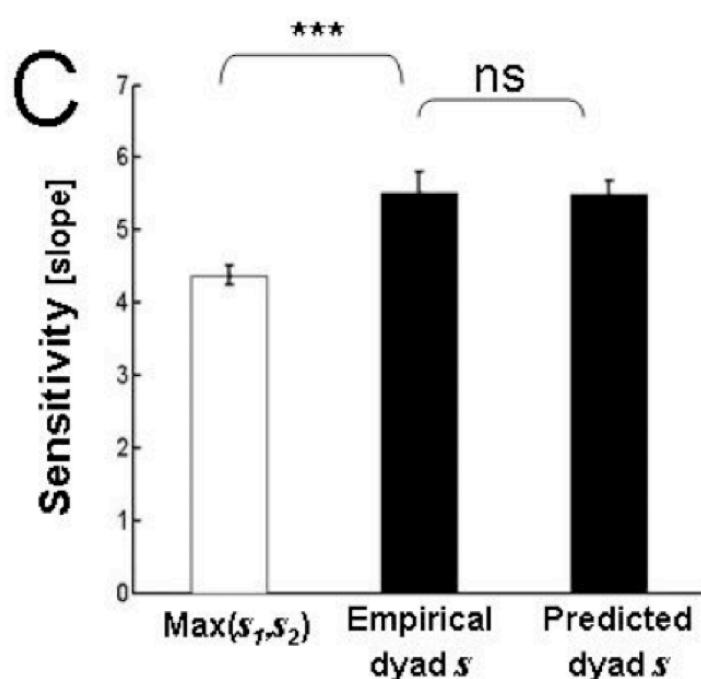


Task: in which interval did you see the contrast oddball?

Experimental design



Findings



But it depends on the individuals' relative similarity in competence (perceptual ability)

Two heads are better than the better individual – and Bayes optimal

