

# 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 3  
Monday Feb 14th

# Overview

- Today's lecture: **Group and crowd cognition I**
  - Explicit processes and SEM (Recap)
  - Group interactions and sociality
    - Shared goals and reciprocity
    - Information exchange and mutual alignment
    - Taxonomy of interaction types
  - Class Exercise
  - Linguistic alignment
    - Collective decision-making
    - Local and global linguistic alignment
  - Summing up

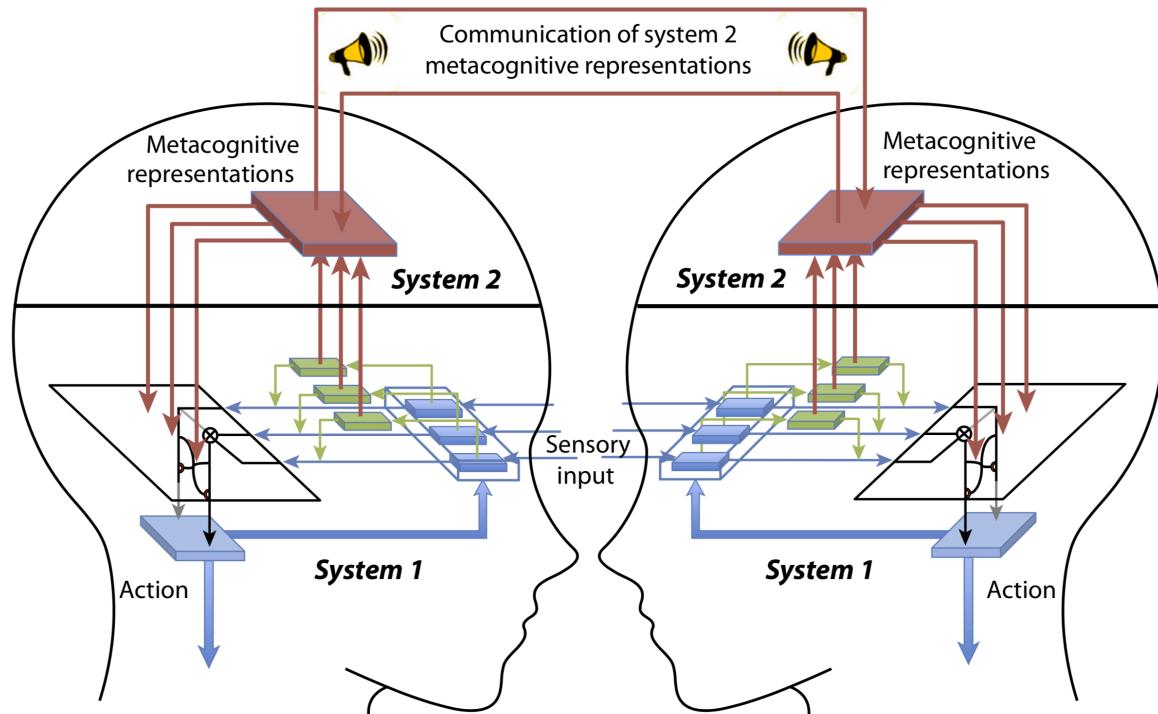
# Concepts and notions ahead:

- **Sociality**
- Shared (or collective) intentionality
- Alignment (broadly)
- Synchronization and coordination
- Joint action
- Shared /common goals
- Interactive turn
- Embodied, embedded, enacted, extended (4E approaches)
- Second-person perspective
- We-mode
- Reciprocity
- Shared awareness
- **Taxonomy of interactions**
- Online/offline interaction
- Leader-follower relationship
- Bidirectional information exchange
- Mutual adaptation
- Continuum of social interactions
- **Common ground (alignment)**
- Collective decision-making
- Groupthink
- Multi-sensory integration (analogue)
- Weighted confidence-sharing
- 2HBT1 effect (Two heads are better than one)
- Similarity
- Global linguistic convergence
- Local linguistic alignment
- Optimal alignment and performance

# 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



# Shared explicit metacognition

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*

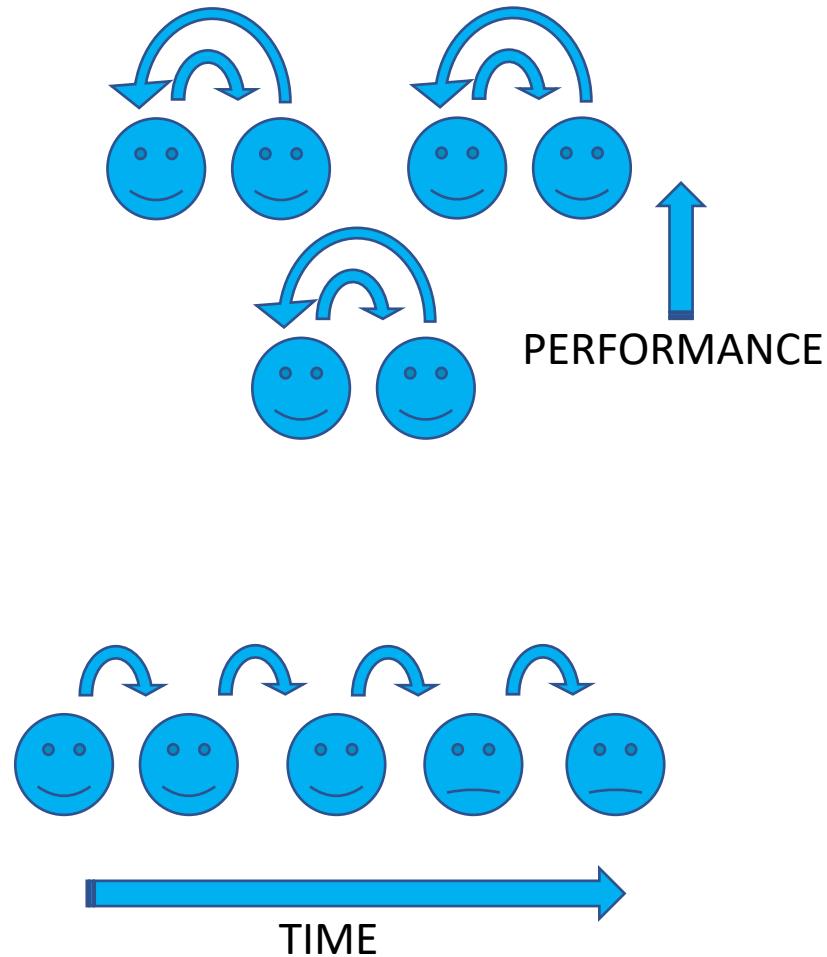
Continuously updated, through the online interaction, by a process of mutual adaptation with the other



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

# 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



# Leveling up: Human sociality

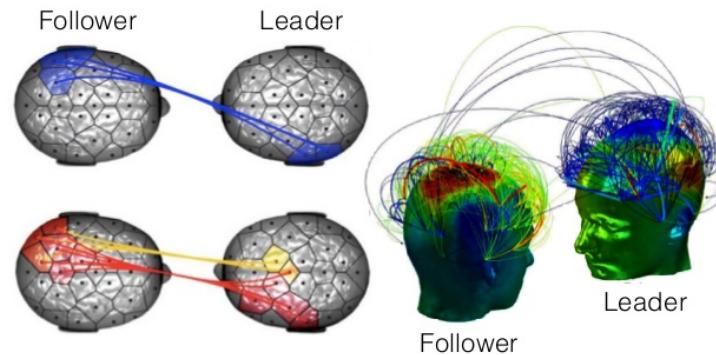


- **Sociality** is the *degree to which we are social*:
  - e.g. human groups exhibit a high degree of sociality
- In cognitive science, human sociality is proposed to be explained by, i.a., the **unique capacity to share the mental states of others; “shared intentionality”**
  - related to the concept of **collective intentionality** and the group-oriented stance argued by Tomasello et al.
- Central importance to know **how exactly individuals interact and adapt to each other** to form shared representations of the world



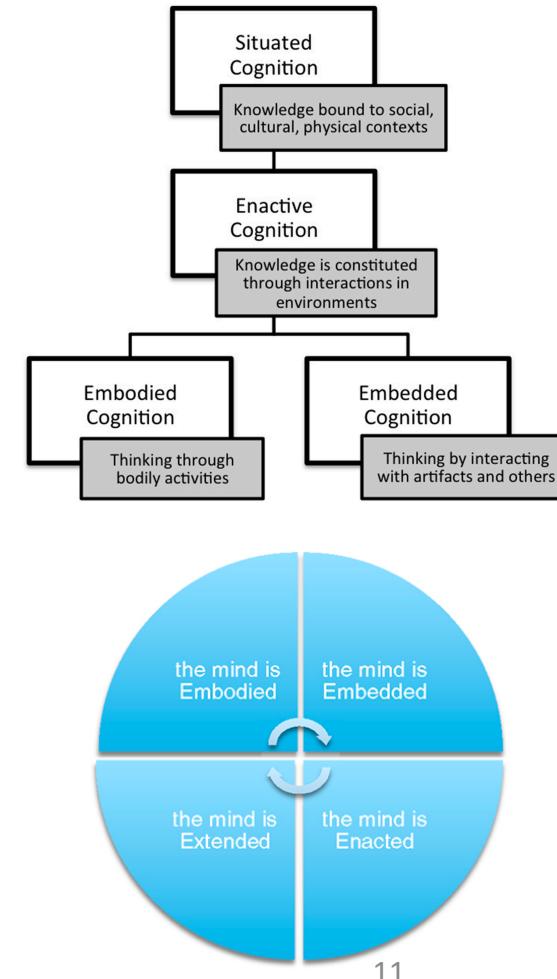
# The notion of alignment

- Early studies of language use in dialogue:
  - Alignment of partner-specific **conversational** properties
- Evolved to **many levels** of 'dialogue':
  - Bodies, behaviour, brains & minds
  - Synchronization, coordination, etc.
- **Umbrella term**, from low-level action-based and perceptual alignment to high-level explicit social processes



# What is the defining feature of an interaction that makes it social?

- One suggestion is: It must be an (online) **joint action** with a common/shared goal!
  - Thus arguing that empirical studies must involve tasks with real-time interaction and subjects achieving a shared goal
- Prominent after the “**interactive turn**”: 4E approaches
  - **Embodied** involving more than the brain, including a more general involvement of bodily structures and processes.
  - **Embedded** functioning only in a related external environment.
  - **Enacted** involving not only neural processes, but also things an organism does (by acting it creates the environment - part of cognition)
  - **Extended** into the organism's environment.
- = when agents are interacting, they appear to have access to more information about the behaviour of their partners, than if they were mere social observers

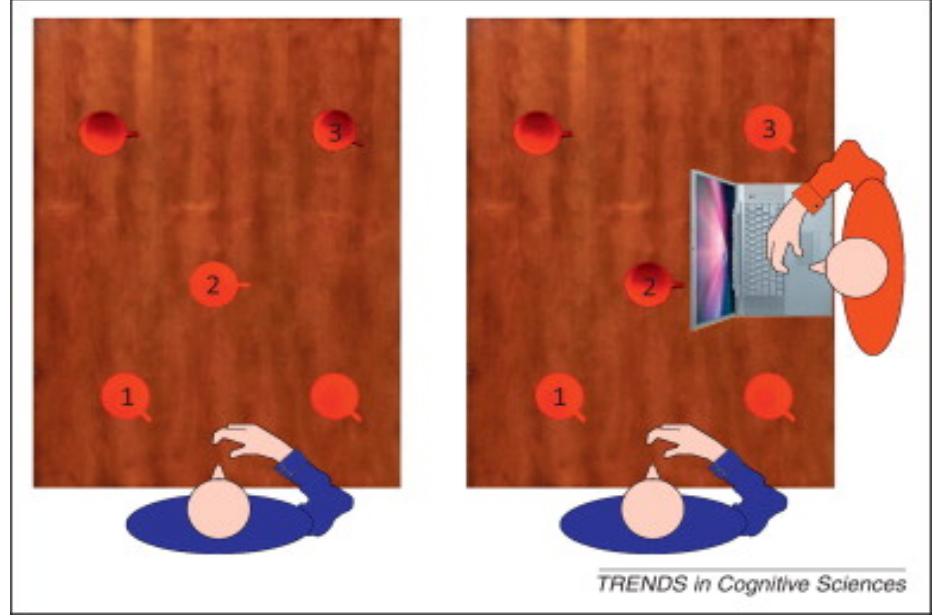


# Shared goals

= access to more information?

- The case of the **we-mode**:

- an irreducibly **collective perspective** or state that individuals may enter into automatically when engaging in a joint action or task:
  - i.e. a given action is represented **as pursued together with others**
  - entails the process that individuals gain access to **additional information from other 'group member(s)'** and integrate this with own improved decisions



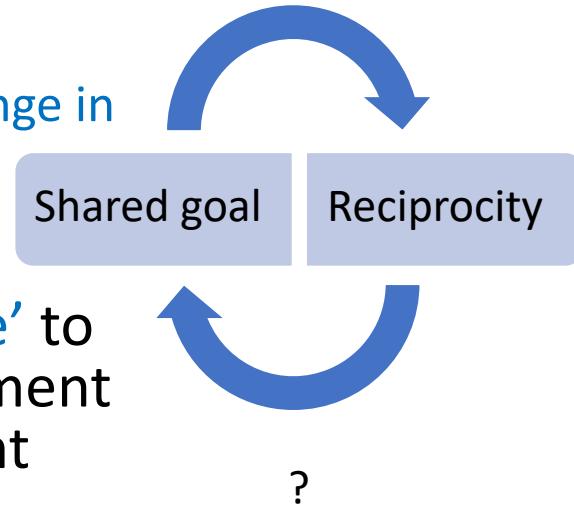
NB: by 'mode' we refer to the property of a mental representation that captures the subject's *perspective* or *attitude* on a given intentional object – e.g. do individuals intend to pursue individually (I-mode) or together (we-mode)

Gallotti et al 2013

- Only theoretical – empirical evidence?

# Joint action research: Shared goals and reciprocity

- In addition to *shared goals* generally being a defining feature, **reciprocity** has recently been recognised (theoretically and empirically) to capture the *jointness* of joint action
  - The behaviour of one individual **results in a change in another**, and vice versa, in a reciprocal way
- Individuals are **aware** and may **adapt 'online'** to a varying degree, resulting in physical alignment and, in turn, affiliation and mental alignment
- So, this concludes that interactions are social if **goals are shared** and behaviour/cognition is **reciprocal** (i.e. adaptive and aligning)
  - Yes, but!



# But there's a but: Gallotti's 3 main objections:

- What are the main shortcomings or issues with this that the paper points out?
  - Which they believe can be remedied...
- Discuss and note down please



# But there's a but: Gallotti's 3 main objections:

1. Can we have reciprocity without shared goals?

2. Can we have reciprocity without shared awareness?

3. Can we take the success of their joint performance as a measure of how shared their goals are?



# But there's a but: Gallotti's 3 main objections:

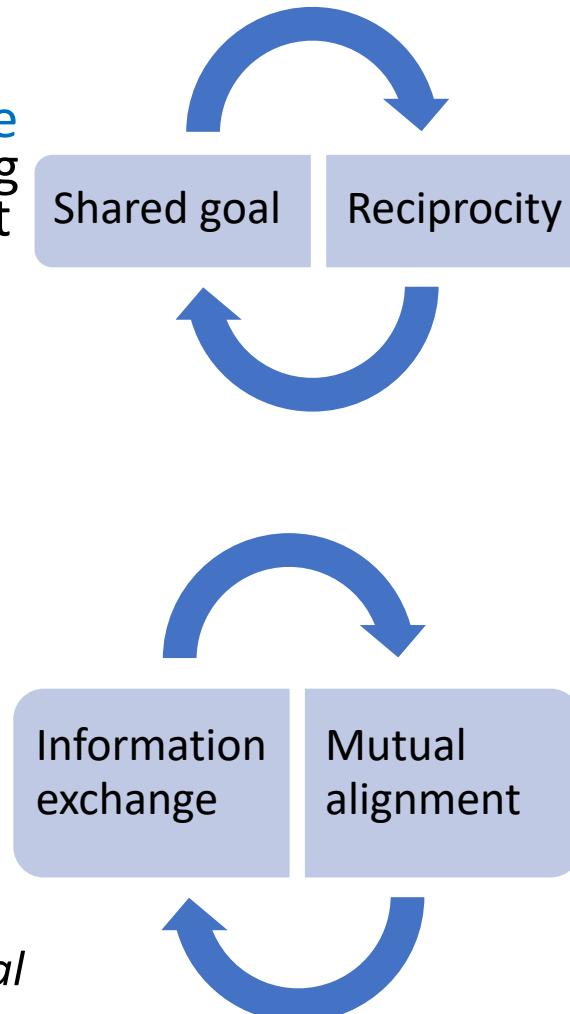
- 1. Reciprocity and alignment in social interaction can occur **without a shared goal**
  - E.g. Competitive situations; unawareness of shared goal, diverging individuals goals, etc.
  - Enjoyment of pleasure and smoothness of social exchange **with no common goal to be jointly pursued**
- 2. Reciprocity **does not require explicit shared awareness** of the reciprocal exchange
  - Individuals may adapt reciprocally **and pre-reflectively**

# Reciprocity, alignment and optimal performance

- The claim that not only do individuals perform better together in reciprocal interaction, but **also improve towards optimality**
  - 3. But is optimal performance necessary for mental alignment and social interaction?
  - What is this referring to?
- First, there are many cases where the (reciprocal) alignment **does not necessarily lead to optimal behaviour**
- Second, the interacting partners may not be maximising what the experimenters had in mind
  - **We'll see – stay tuned!**

# Then what: Current approach

- Step away from the notion of **shared goals as the paradigm case** of social interaction and regarding reciprocity as a (important) **consequence** of joint action – too narrow!
- Instead focus on the **nature of the information exchange** between interacting individuals – *irrespective of shared goals* – achieved by adjusting bodily and mental states to varying degrees (alignment)
- As such, reciprocity is the **primary requirement** for social interaction: aka *mutual alignment*, which is bidirectional
  - Alignment may occur in any exchange, but only **bidirectional information exchange** results in *mutual alignment* and thus *social interaction*



# The degrees of alignment between two interacting individuals: A taxonomy of interaction types

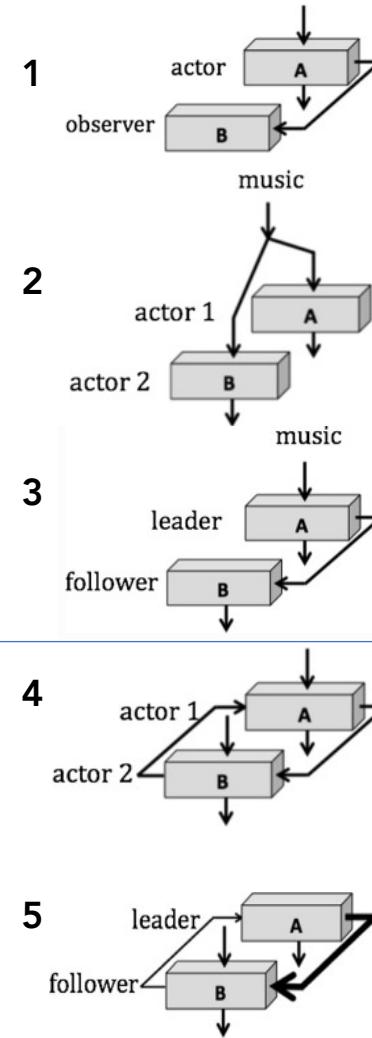
**(1) Off-line social cognition**, which involves one system (the observer) who can observe the other system (the actor), but the actor cannot align with the observer

**(2) Coordination without mutual alignment**, in which alignment of the two systems are both linked to an external input, but there is no information exchange, thus based primarily on synchronisation

**(3) On-line social cognition without mutual adaptation**, external input available to one system (leader), while (follower) only has the first system available to align with. They act as if they are cooperating although only follower experiences the interaction

**(4) On-line social cognition with mutual alignment**, which involves both systems exchanging information reciprocally and adapting to each other

**(5) On-line social cognition with mutual alignment**, with leader-follower relationship. To preserve the interaction the follower is required to adapt more or less depending on leader information



# The degrees of alignment between two interacting individuals: A taxonomy of interaction types

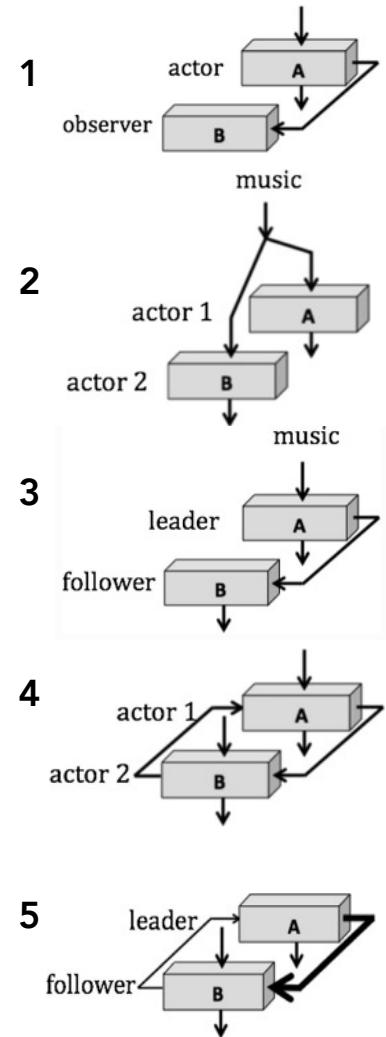
- A broad distinction can be made here between **unidirectional** (1-3) and **bidirectional** (4-5) exchanges of information, which differ in regard to whether they involve **mutual adaptation**
  - bidirectional interaction we take to involve reciprocity and continuous mutual adaptation between interactors, based on the shared information available
- Question: Can we then distinguish, for example, between bidirectional interaction and linguistic interaction?

# Group assignment

- 2 Tasks: Writing up answers and peer commenting on answers (2x10 mins)
- In **groups**, read the Class 3 Exercise in blackboard (under assignments) and follow the instructions
  - One person writes and emails/uploads
- Ask me for clarifications or help!
- Submit today – but no later than friday

# Group assignment

- Examples
- What are the benefits of this approach?



# Interim summary

- In this approach, interaction is **not about** discrete points of e.g. synchronization or coordination based on shared goal (tasks) and intentionality
  - Rather, the **dynamic process of bidirectional information exchange in mutual alignment**, which *leads* to those behaviours
  - Captures those **without shared goals and awareness**
  - Descriptive **on the group-level** > individual-level
- Suggests a **continuum** rather than in-or-out view (e.g. offline and online)
  - Alignment comes in degrees on a spectrum with higher resolution, analogous to sociality – and hence social interactions
- Avoid making assumptions about the representational states (shared representations of tasks, goals, modes)!

# Group decision-making - paper

- A bit of background for the *Optimally interacting minds* paper...

# Are group decisions any good?

Prediction Markets

THE WISDOM OF CROWDS  
JAMES SUROWIECKI



Condorcet's Jury Theorem

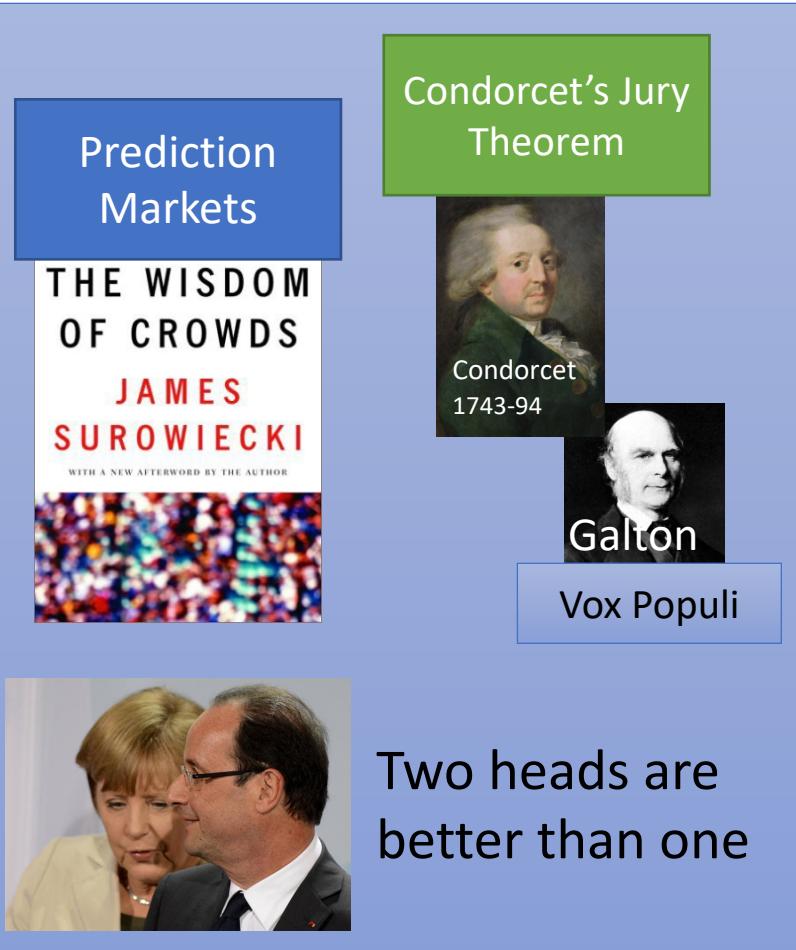


Condorcet  
1743-94

Galtón  
Vox Populi

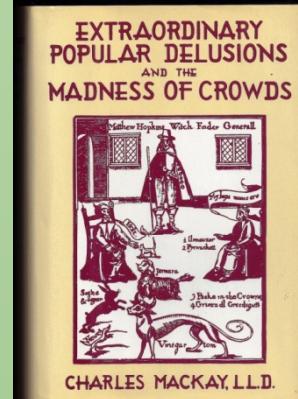
Two heads are better than one

# YES

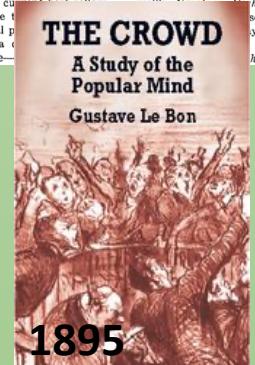


# Groupthink

by William H. Whyte Jr.



1842

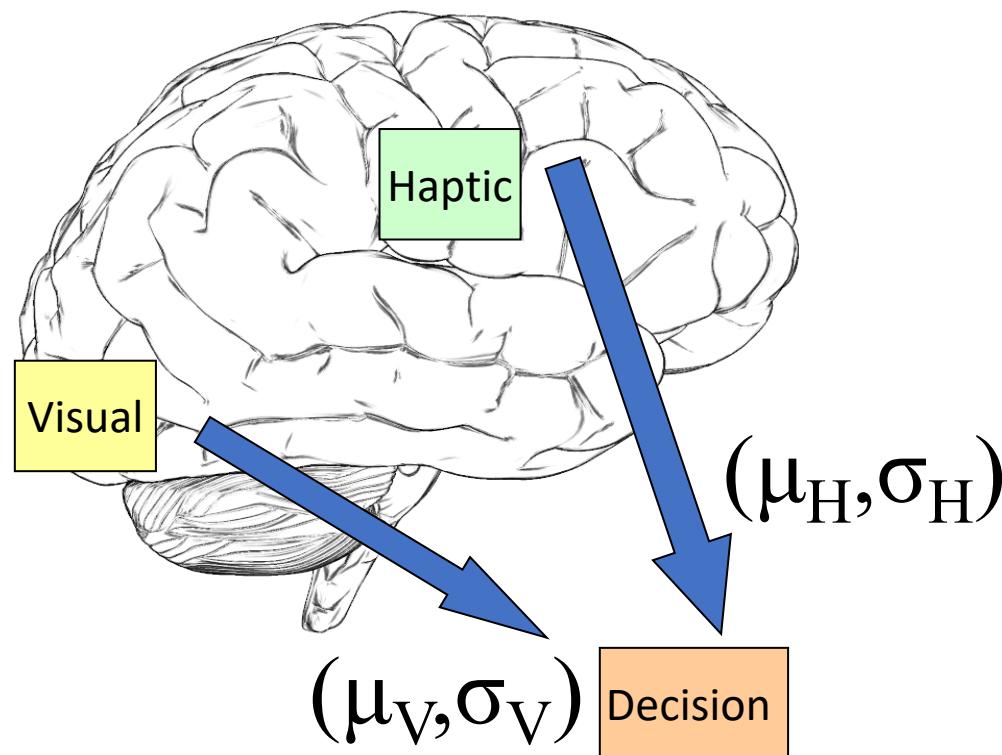


Too many cooks spoil the broth

# NO

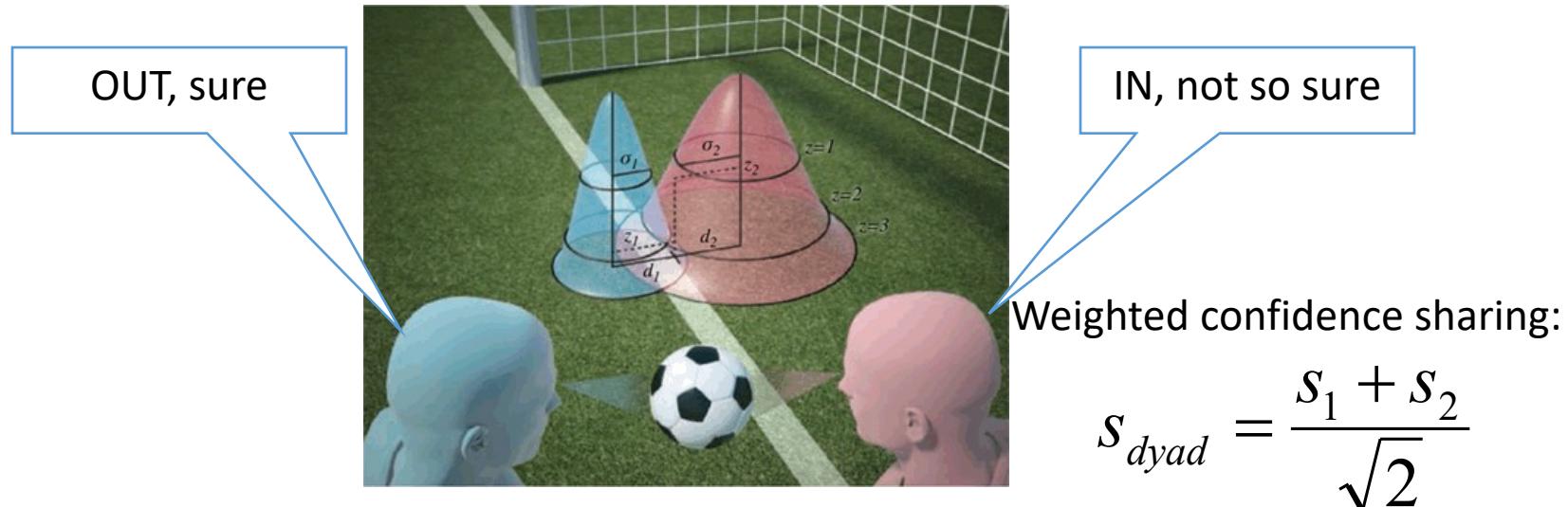
# Research questions of the study

- Within one brain, information from two different modalities (sources) are combined and integrated:
- What about same modality between two brains?



# Research questions of the paper II

- Vision combined from two independent sources (brains):

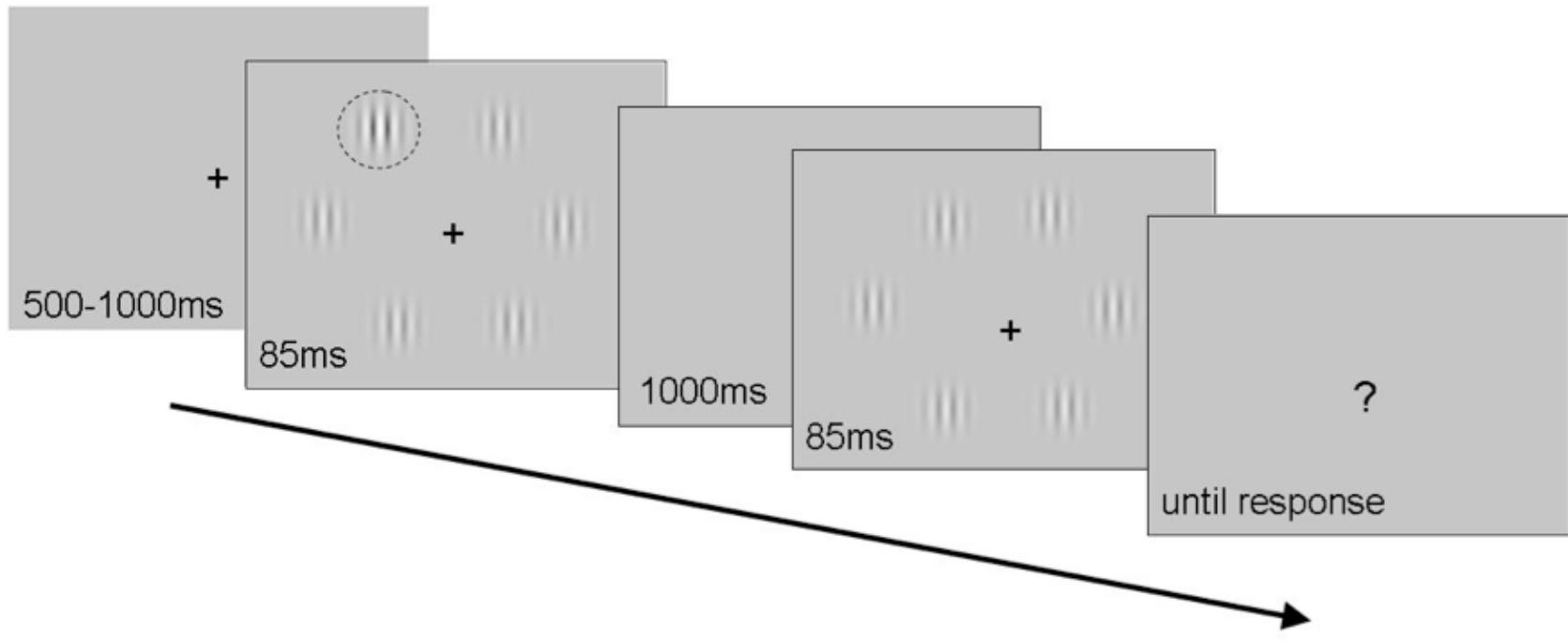


- Can two individuals **use social interaction to share and integrate information into a decision** in a similar manner as the brain makes multisensory decisions?
  - If so, how well??

# Experimental design

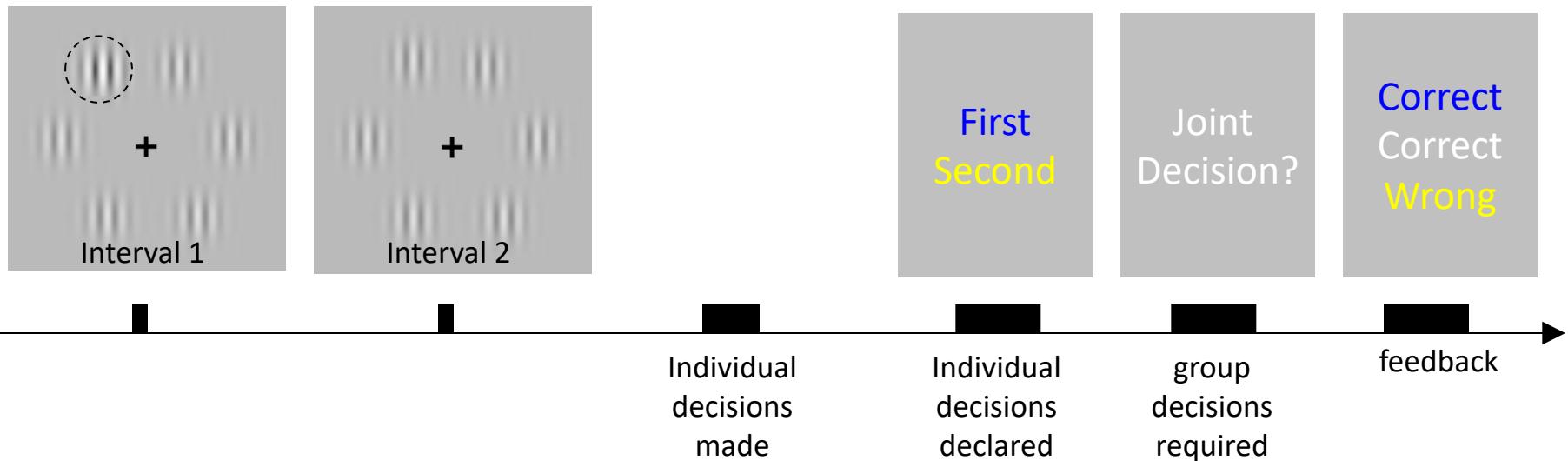


# Experimental design

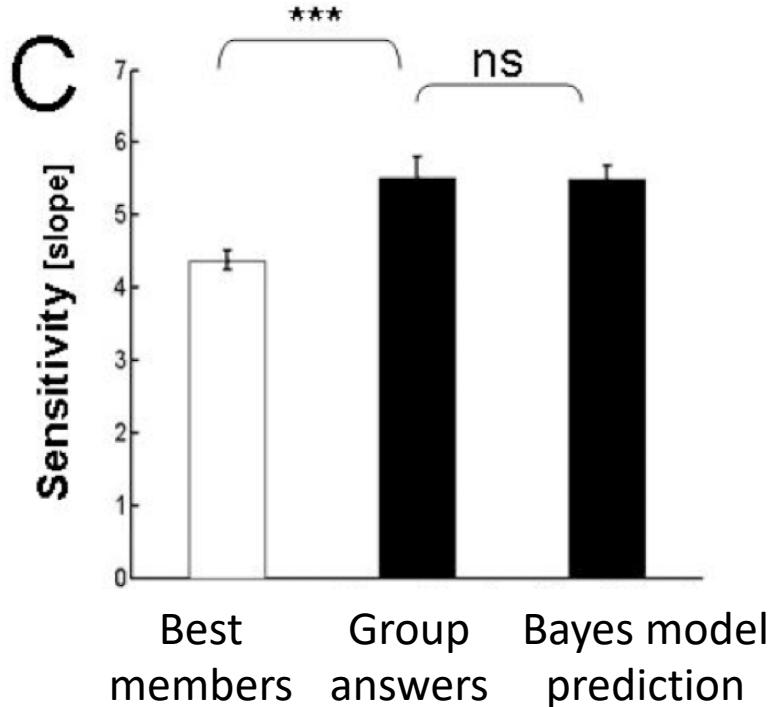


Task: in which interval did you see the contrast oddball?

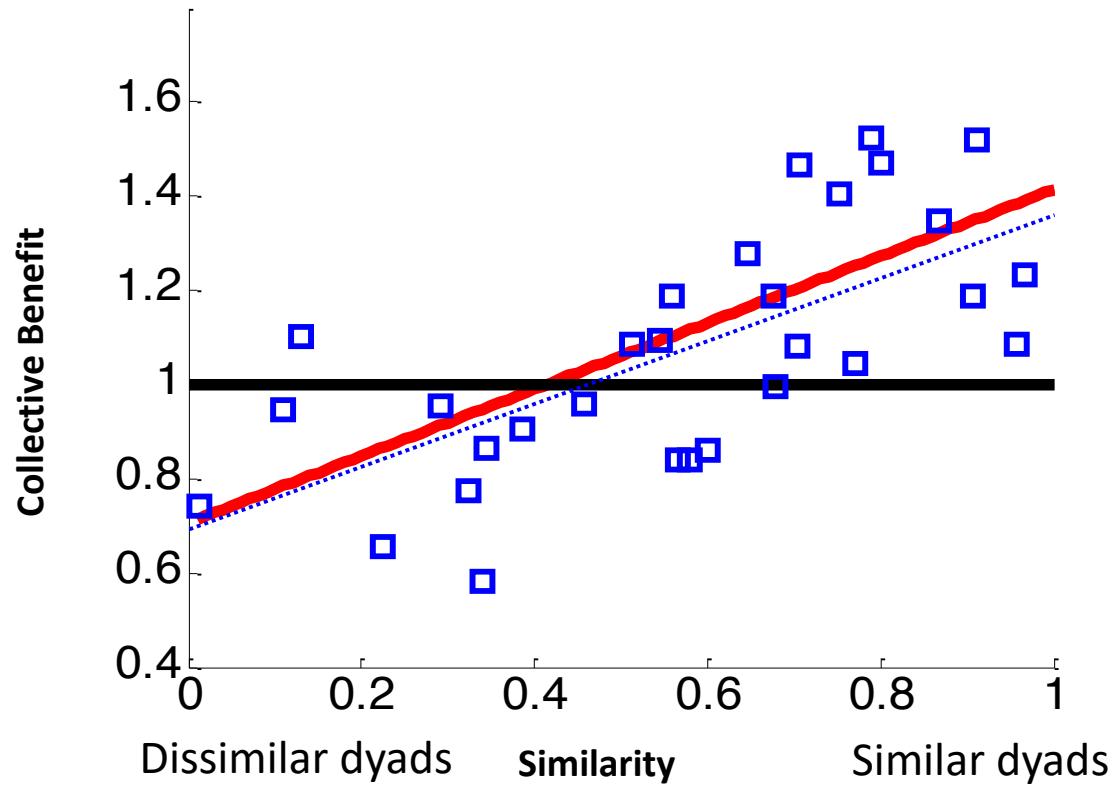
# Experimental design



# Findings



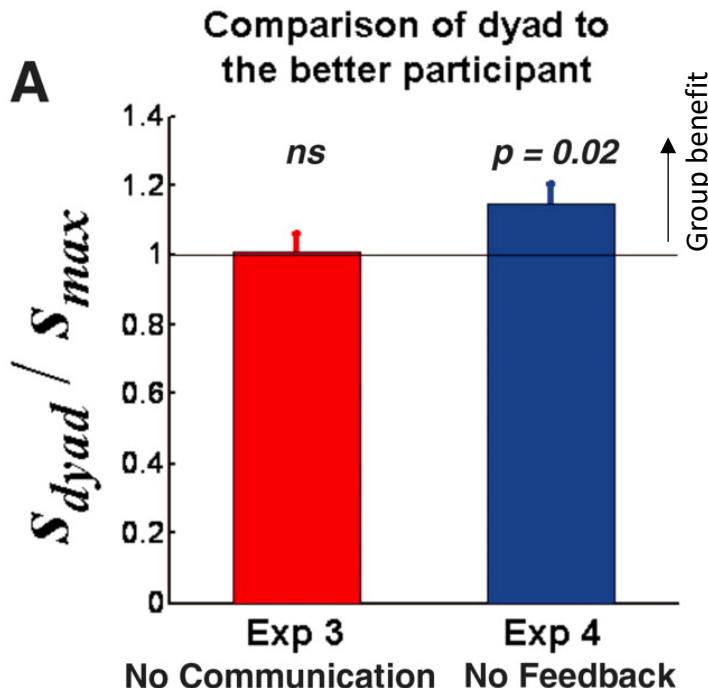
But it depends on the individuals' relative similarity in competence (perceptual ability)



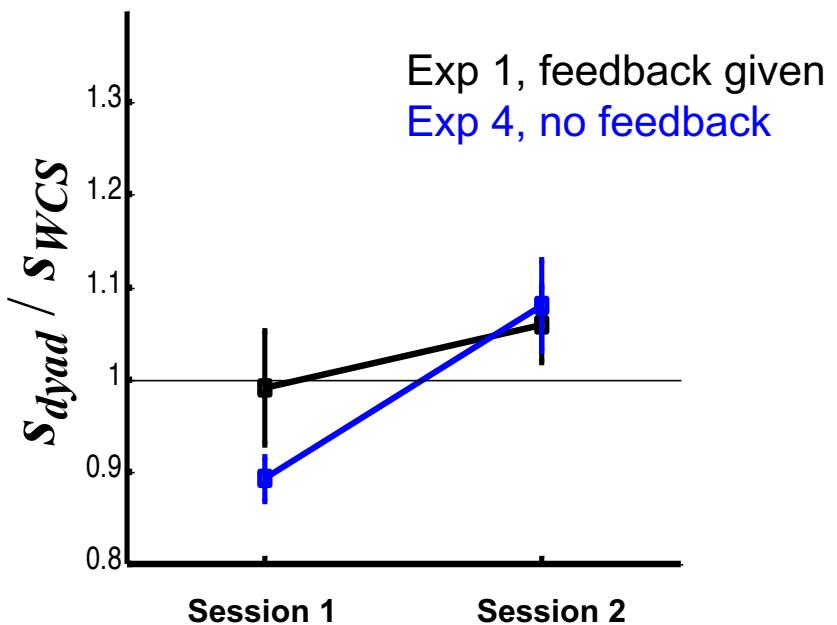
Two heads are better than the better individual – and Bayes optimal

# Findings cont.

Communication of confidence is necessary for the group benefit  
– only as good as the best member

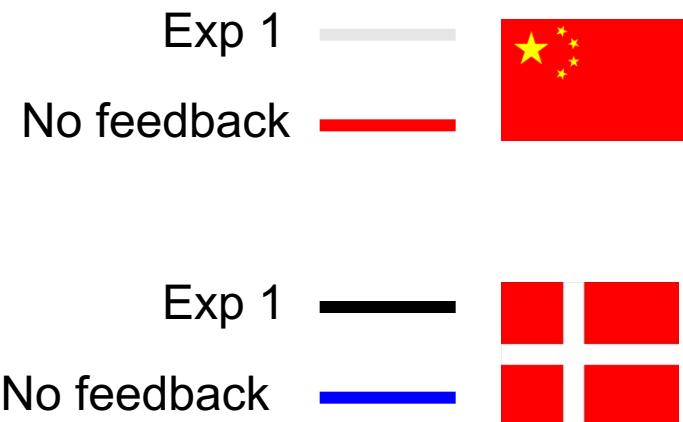
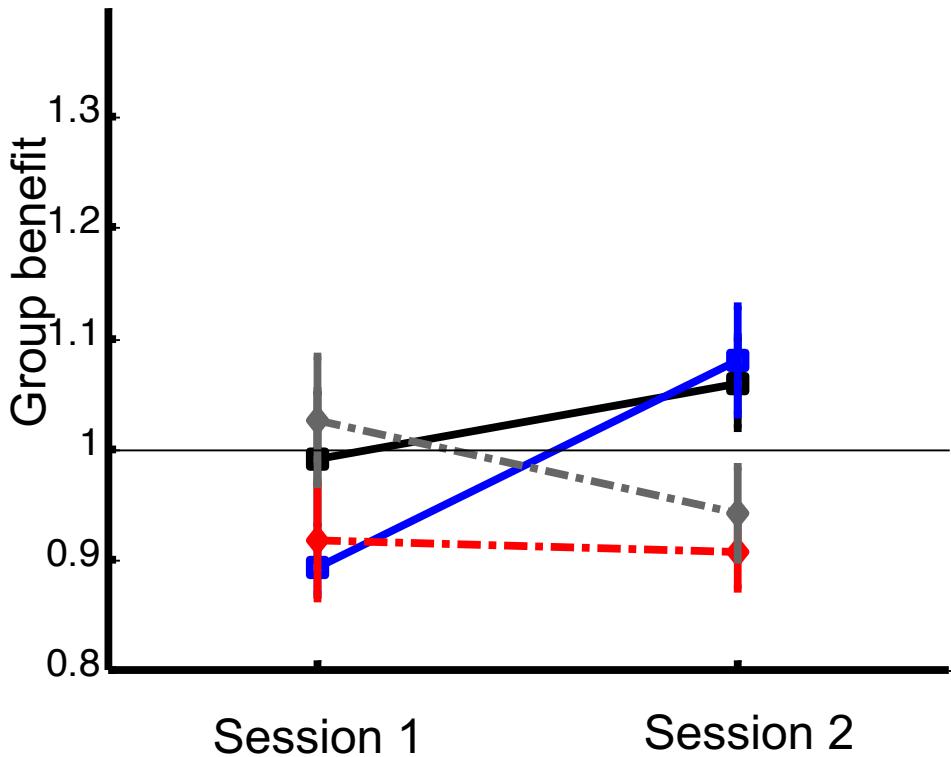


But task feedback (on correctness) is not always necessary as long as they can communicate confidence:



Thus, without feedback collective benefit took longer to achieve: Feedback seems to accelerate the process of effective communication

# Interesting side-note about cross-cultural effects of absence of feedback:



Reliance on an objective truth

The role of independently being able to get an intuition of objective feedback/truth from a “subjective estimate of being correct”

# Are group decisions any good?

- What can we conclude from this study?
- Groups can be better than the best individual in that group
  - If they use shared explicit metacognition
- However this **depends on similarity** in the given ability relevant to the task – if too dissimilar, then better to listed to the most competent
- Communication is necessary: Two-way interaction allows sharing of **explicit metacognition** (confidence, experiences, introspection, etc) allowing **mutual adaptation** and **alignment**
- Now, we can assess the **Coming to terms** paper:

# Coming to terms paper

- What does this paper set out to investigate?

**Psychological Science**  
<http://pss.sagepub.com/>

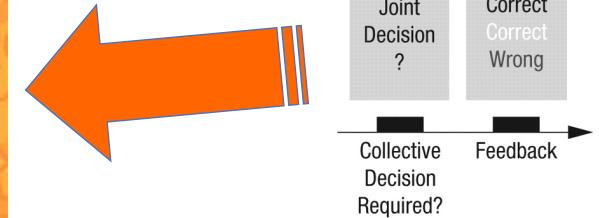
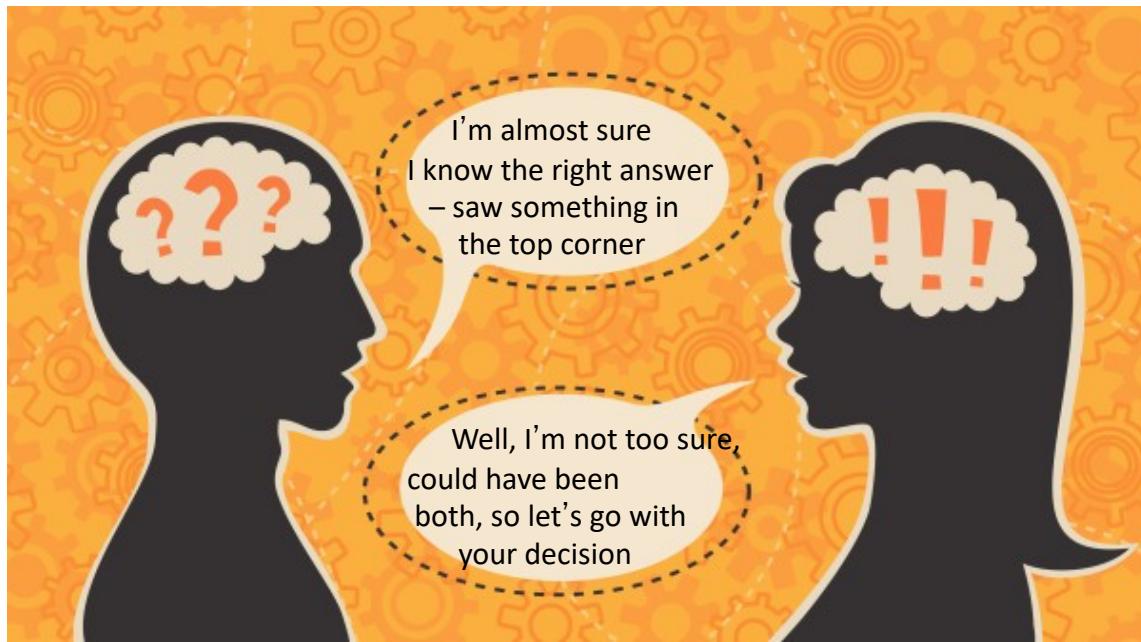
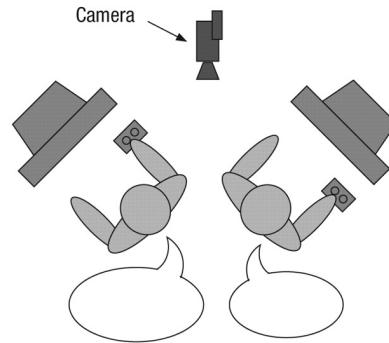
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**Coming to Terms : Quantifying the Benefits of Linguistic Coordination**  
Riccardo Fusaroli, Bahador Bahrami, Karsten Olsen, Andreas Roepstorff, Geraint Rees, Chris Frith and Kristian Tylén  
*Psychological Science* 2012 23: 931 originally published online 17 July 2012  
DOI: 10.1177/0956797612436816

The online version of this article can be found at:  
<http://pss.sagepub.com/content/23/8/931>

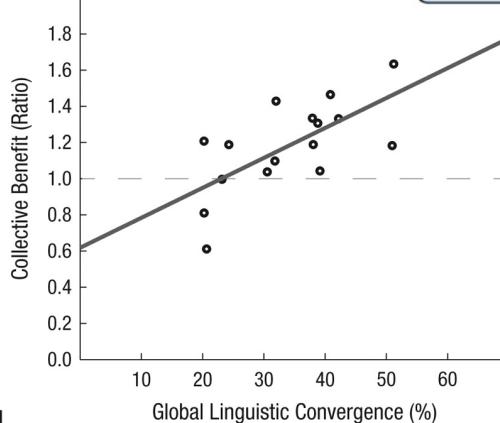
# Coming to terms paper

a

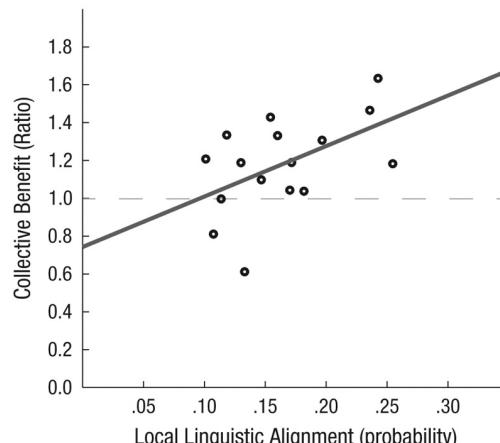


# Linguistic alignment analysis of joint decisions

b



d



Approach 2: Fusaroli et al., 2012

transition probability = A's words (t+1) | B's words (t)

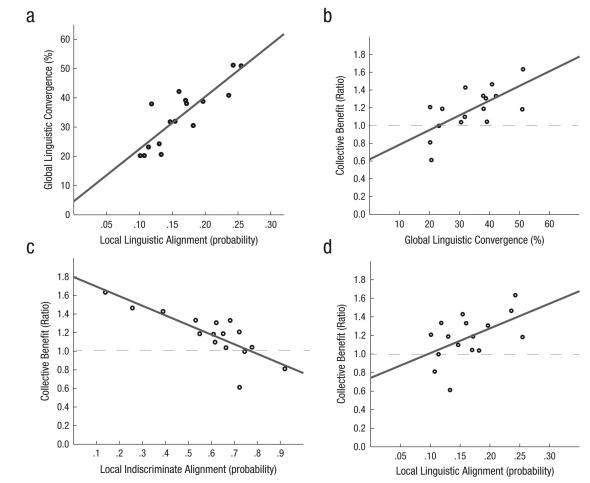
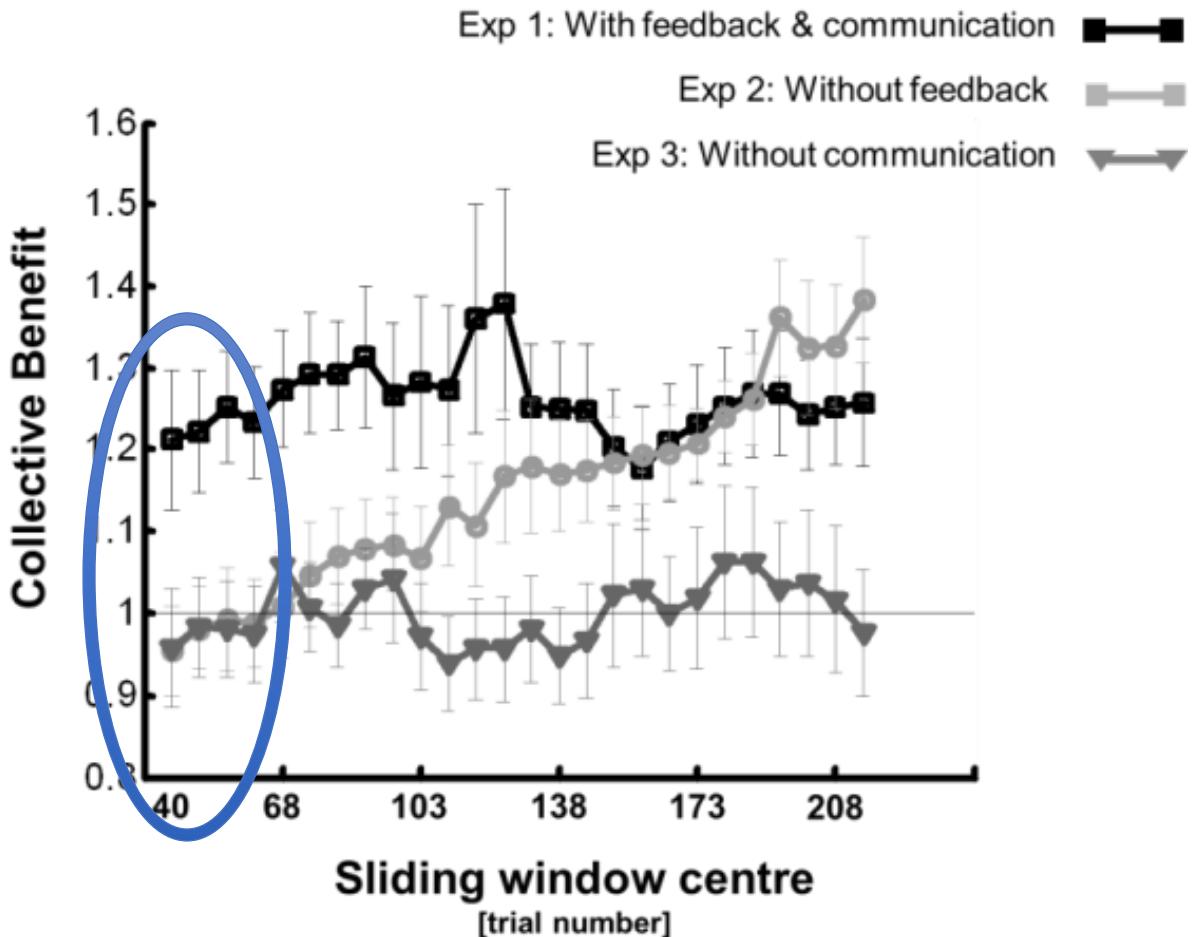
A: I don't know  
B: I too don't know  
B: says something both in the left corner and in the center on the right in both of them  
A: okay, I think I saw it in the left side, but oehm I'll pass  
B: no  
A: we ruin the scores - now we must...  
B: yeah, now we must pull ourselves together

Successful group performance is predicted by:

- *Local linguistic alignment*
- *Global linguistic convergence*
- and negatively by *Local indiscriminate alignment*

Questions?

# Reminder of improvement with(out) communication and with(out) feedback:



Successful group performance is predicted by:

- *Local linguistic alignment*
- *Global linguistic convergence*
- and negatively by *Local indiscriminate alignment*

# Coming to terms paper

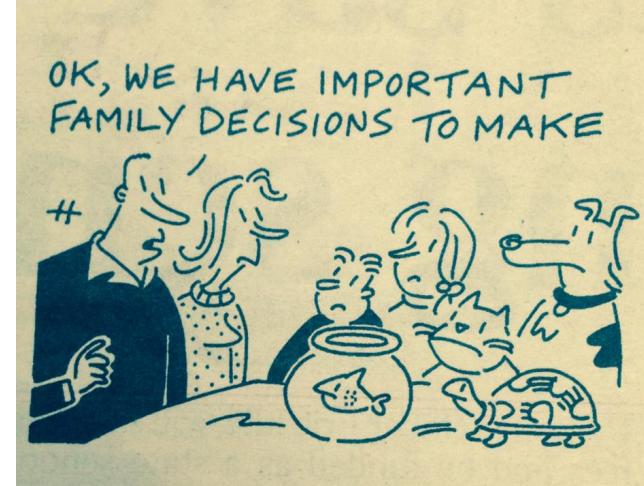
(4) On-line  
social cognition  
with mutual  
adaptation

- (1) What interactions type would this experiment example fit into and why?
- “Global linguistic convergence”: What defining feature of a social interaction does that relate to?
- Taken together, these aspects and this study is a good example of one of the functions of shared explicit metacognition – which is?

Synchronic  
function: Improve  
and coordinate  
joint action

**Coming to Terms : Quantifying the Benefits of Linguistic Coordination**  
Riccardo Fusaroli, Bahador Bahrami, Karsten Olsen, Andreas Roepstorff, Geraint Rees, Chris Frith and Kristian Tylén  
*Psychological Science* 2012 23: 931 originally published online 17 July 2012  
DOI: 10.1177/0956797612436816

# Summing up



- When making decisions together, explicit metacognition can be used for communication and social interaction
  - However, explicit metacognition is imperfect, and exhibit individual differences
- But by sharing uncertainties in interaction, we are able to alleviate differences and mutually align instead – to make better inferences about the world (and each other)
- As a result of this, two heads can be better than the best individual (**2HBT1 effect**)
  - However, there are quantitative limitations (i.e. dissimilarity)
- Despite limits, good performance is associated with global and local linguistic alignment through mutual adaptation
- The example paper involved the distinct types of *bidirectional interaction*: reciprocity and continuous mutual adaptation between interactors, based on the shared information available

# Recap – concepts and notions

- **Sociality**
- Shared (or collective) intentionality
- Alignment (broadly)
- Synchronization and coordination
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- Global linguistic convergence
- Local linguistic alignment
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See you next week