Mindreading & Joint Action

8. Shared Intention & Motor Representation in Joint Action
Outline

1. The leading philosophical approach to shared agency
2. Limits of this approach
3. (Building blocks for) an alternative approach
4. Motor representation
5. The emergence of mindreading
conjecture

The prior existence of capacities for shared agency partially explains how sophisticated forms of mindreading emerge in evolution or development (or both).
1. All shared agency involves shared intention.

2. Shared intention requires sophisticated mindreading.

Therefore:

3. The prior existence of capacities for shared agency partially explains how sophisticated forms of mindreading emerge in evolution or development (or both).
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shared agency without shared intention
Joint action: an action event with two or more agents (Ludwig 2007)
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- Tidying up the toys together \textit{(Behne et al 2005)}
- Cooperatively pulling handles in sequence to make a dog-puppet sing \textit{(Brownell et al 2006)}
- Bouncing a ball on a large trampoline together \textit{(Tomasello & Carpenter 2007)}
- Pretending to row a boat together

Fred’s death

Fred’s killing

Nora’s shooting

Olive’s shooting
Joint action: an action event with two or more agents (Ludwig 2007)

Nora’s shooting → Fred’s death

Olive’s shooting → Fred’s death

Fred’s killing

too broad

- tidying up the toys together (Behne et al 2005)
- cooperatively pulling handles in sequence to make a dog-puppet sing (Brownell et al 2006)
- bouncing a ball on a large trampoline together (Tomasello & Carpenter 2007)
- pretending to row a boat together
What is the relation between a purposive action and the goal or goals to which it is directed?
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shared intention
What is the relation between a purposive action and the goal or goals to which it is directed?

shared intention

coordinates

represents

joint

free

amuse

smash

alarm

wave

joint action

reach

grasp

scratch
What is the relation between a purposive action and the goal or goals to which it is directed?
G is a distributive goal: it is an outcome to which each agent’s actions are individually directed and it is possible that: all actions succeed relative to this outcome.
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Members of a flash mob simultaneously open their newspapers noisily

Two friends walk to the metro station together.

Onlookers simultaneously open their newspapers noisily

(cf. Searle 1990: 92)

Two strangers walk the same route side-by-side.

(Gilbert 1990)
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Two friends walk to the metro station together.

Nora and Olive, deadly enemies, kill Fred.

Two strangers walk the same route side-by-side.

(Gilbert 1990)

Two friends collaboratively kill Fred.
G is a distributive goal: it is an outcome to which each agent’s actions are individually directed and it is possible that: all actions succeed relative to this outcome.

G is a collective goal

(a) it is a distributive goal;
(b) the actions are coordinated; and
(c) coordination of this type would normally facilitate occurrences of outcomes of this type.
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“It ... seems useful to draw a distinction between elementary or thin forms of joint action common to humans and other social mammals and sophisticated or thick forms of joint action, perhaps unique to the human species.”

(Pacherie & Dokic 2006, 110)
Some joint actions are facilitated by the agents engaging in reciprocal, parallel agent-neutral motor planning for outcomes whose realisation would normally involve action on the part of each agent, where the resulting plans are identical (or similar enough).
Some joint actions are facilitated by the agents engaging in agent-neutral reciprocal, parallel motor planning for outcomes whose realisation would normally involve one’s own and another’s (or others’) actions.
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Move it from there to here
Move it from there to here

get it
reach
hand-1

grasp
move
arrive

hand-2

release

position it

move
place

release

grasp

reach

get it

move it
Move it from there to here

get it

move it

position it

reach

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arrive

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place

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hand-1

hand-2
Move it from there to here

joint action: same goal

get it

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position it

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hand-1

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Move it from there to here

joint action: same goal

get it

move it

position it

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move

arrive

release

reach

grasp

move

place

release

similar timing problem
Move it from there to here

get it
grip
move
arrive
release
reach
grasp
move
place
position
release

hand-1
reach
grip
move

hand-2
reach
grasp
move

similar timing
problem

joint action:
same goal

same
planning
Move it from there to here

get it

hand-1
reach  grasp  move

hand-2

move it

arrive  release

position it

release

move

place

reach  grasp

similar timing problem

prevention needed

same planning

joint action: same goal

needed

similar timing
G is a distributive goal: it is an outcome to which each agent’s actions are individually directed and it is possible that: all actions succeed relative to this outcome.

**shared motor action**

G is a collective goal

- (a) it is a distributive goal;
- (b) the actions are coordinated; and
- (c) coordination of this type would normally facilitate occurrences of outcomes of this type.

1. we each have a motor representation of G;
2. we are each disposed to inhibit some (not all) of the resulting planning or actions;
3. we each expect that if G occurs, we will all be agents of it; and
4. (1) and (2) because (3)
What is the relation between a purposive action and the goal or goals to which it is directed?
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Therefore:

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conjecture

The prior existence of capacities for shared agency partially explains how sophisticated forms of mindreading emerge in evolution or development (or both)
Head southeast on Rue Cujas toward Rue Victor Cousin. Turn right onto Rue Saint-Jacques.

Take RER B and get out at the Luxembourg station, from there it's less than 5 minutes walk.
Head southeast on Rue Cujas toward Rue Victor Cousin. Turn right onto Rue Saint-Jacques.
The Interface Problem
The Interface Problem

Some joint actions involve both shared intention and shared motor representation.
The Interface Problem

Shared motor representations:

i. represent outcomes;

ii. ground the purposiveness of some joint actions

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The Interface Problem

**Shared motor representations:**

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Two outcomes, A and B, *match* in a particular context just if, in that context, either the occurrence of A would normally constitute or cause, at least partially, the occurrence of B or vice versa.

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The Interface Problem: How are non-accidental matches possible?

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How are non-accidental matches possible?

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iii. differ in format from (the constituent attitudes of) shared intentions.

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Some joint actions involve both **shared** intention and **shared motor representation**
Head southeast on Rue Cujas toward Rue Victor Cousin. Turn right onto Rue Saint-Jacques. ...
Follow *that* route
Follow *that* route
Do *that*
Shared motor representations:

i. represent outcomes;

ii. ground the purposiveness of some joint actions; and

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The Interface Problem:

How are non-accidental matches possible?

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Some joint actions involve both shared intention and shared motor representation.
Planning Others’ Actions
(slides from Natalie Sebanz)

Kourtis et al., subm.

‘interaction partners ... not only represent their own part of the joint task but also generate a representation of their co-actor’s part’

(Kourtis et al 2012: 8)
Kourtis et al., subm.
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Cue Stimulus

NoGo  Individual Action  Joint Action

200 ms

1000 ms
Kourtis et al., subm.

**Cue Stimulus**

- NoGo
- Individual Action
- Joint Action

1000 ms

1000 ms

200 ms

Foreperiod
No Action
Kourtis et al., subm.
Kourtis et al., subm.
Kourtis et al., subm.
Planning others’ actions can inform planning for one’s own (slides from Cordula Vesper)

Joint jumping task (performance): „Land at the same time!“
Imagery

Joint jumping imagery

- Task: “Imagine to jump while landing at the same time as another person on the other side of the occluder!”

- Measurement: Self-reported duration of imagined jump
**EXPERIMENT 1: IMAGERY**

**Distance difference**
- □ Δ 35 cm
- □ Δ 70 cm
- ■ Δ 105 cm

Relative jump duration (ms)

- Individual
- Joint

*closer*

*farther*
In some joint actions, the agents have a single representation of the whole outcome (slides from Natalie Sebanz)
Experimental paradigm is based on the phenomenon of ‘perception-action matching’: Observing an action creates a tendency to perform this action. That is, individual action plans are activated based on the observation of individual actions.

As a consequence, performing an action that is similar to the observed action is easy while performing an action that is opposite to the observed action is more difficult (e.g., Brass et al., 2001).
Group-level action planning?

If co-actors form group-level action plans, then observing joint action should create a tendency to perform joint actions (perception-action matching at an inter-group level).

It should be more difficult to perform joint actions when observing individual actions.
Participant’s task is to press a key when the right hand is moving.

Congruent condition: Confederate moves when left hand is moving and when both hands are moving.
Participant’s task is to press a key when the right hand is moving.

Inongruent condition: Confederate moves when left hand is moving and when right hand is moving, but not when both hands are moving.
Tsai, Sebanz, & Knoblich, 2011, Cognition

(A)

CONGRUENT
(Group Observed)

1 Hand Moving | 2 Hands Moving |
340 (ms) | 360 | 380 | 400 | 420

1 Hand Moving | 2 Hands Moving
Tsai, Sebanz, & Knoblich, 2011, Cognition

(A)

CONGRUENT
(Group Observed)

420
400
380
360
340 (ms)

1 Hand Moving 2 Hands Moving

INCONGRUENT
(Individual Observed)

ME Response
WE Response

1 Hand Moving 2 Hands Moving
Tsai, Sebanz, & Knoblich, 2011, Cognition

(B)

CONGRUENT (Group Observed)

INCONGRUENT (Individual Observed)

1 Hand Moving
2 Hands Moving
1 Hand Moving
2 Hands Moving

ME Response
WE Response
Evidence for…

Perception-action matching at an inter-group level.

Observing actions being performed simultaneously by two agents activates a corresponding action plan. This action plan specifies an agent’s own action in relation to their co-actor’s action (possibly in terms of perceptual events). Performing an individual action in response to an observed joint action is difficult, because the joint action plan activated through joint action observation needs to be replaced by an individual action plan.
Sufficient conditions

We have a shared intention that we J if

“1. (a) I intend that we J and (b) you intend that we J

“2. I intend that we J in accordance with and because of la, lb, and meshing subplans of la and lb; you intend [likewise] …

“3. 1 and 2 are common knowledge between us”

(Bratman 1993: View 4)
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