

# Which Joint Actions Ground Social Cognition?

s.butterfill@warwick.ac.uk



A black and white photograph of two young children standing side-by-side. The child on the left is wearing overalls and looking down with a smile. The child on the right is wearing a patterned sweater and looking towards the camera. The background is solid black.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

A black and white photograph of two young children. The child in the foreground is wearing denim overalls over a patterned shirt and is looking down with a slight smile. The child behind them is wearing a patterned shirt and is looking towards the camera with a smile.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

Representing perceptions, knowledge states and beliefs is hard, for it requires



# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

Representing perceptions, knowledge states and beliefs is hard, for it requires

(a) conceptual sophistication

- takes years to develop
- development tied to acquisition of executive function and language
- development facilitated by training and siblings

(b) scarce cognitive resources

- attention
- working memory



# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

Representing perceptions, knowledge states and beliefs is hard, for it requires

(a) conceptual sophistication

- takes years to develop
- development tied to acquisition of executive function and language
- development facilitated by training and siblings

(b) scarce cognitive resources

- attention
- working memory



# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

Representing perceptions, knowledge states and beliefs is hard, for it requires

(a) conceptual sophistication

- takes years to develop
- development tied to acquisition of executive function and language
- development facilitated by training and siblings

(b) scarce cognitive resources

- attention
- working memory

A black and white photograph of two young children standing side-by-side. The child on the left is wearing overalls and looking down with a smile. The child on the right is wearing a patterned sweater and looking towards the camera. The background is solid black.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.



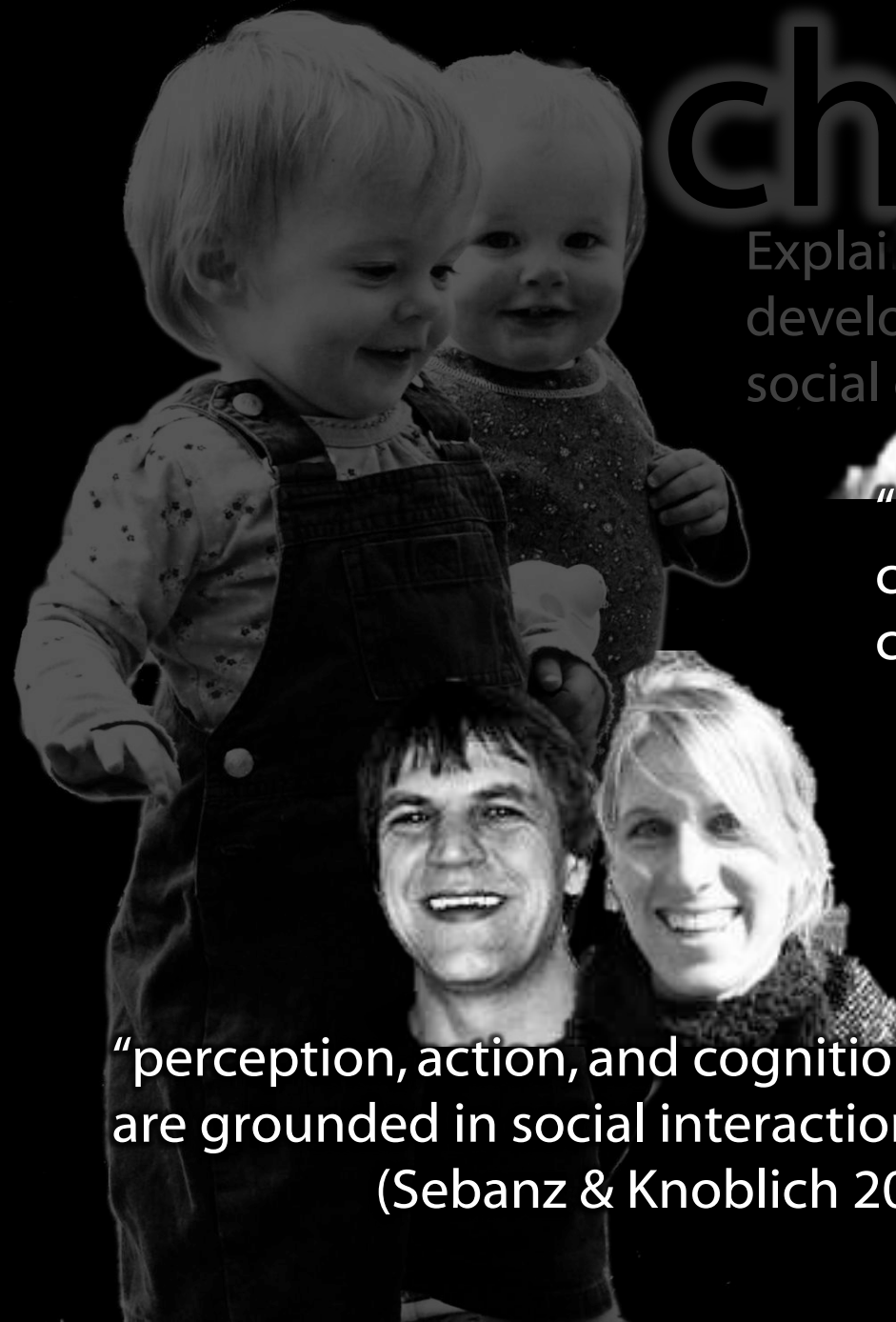
# challenge

Explaining the evolution of human cognition or development in terms of social co-operation



"the unique aspects of human cognition ... were driven by, or even constituted by, social co-operation"  
(Moll & Tomasello 2007)

"perception, action, and cognition are grounded in social interaction"  
(Sebanz & Knoblich 2008)





A black and white photograph of two young children. The child in the foreground is a toddler with light hair, wearing a patterned long-sleeved shirt under dark denim overalls, looking down and smiling. The child behind them is a younger toddler with light hair, wearing a dark sweater, looking towards the camera and smiling.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

# conjecture

The existence of abilities to engage in joint action partially explains how sophisticated forms of social cognition emerge in evolution or development (or both)

A black and white photograph of two young children. The child in the foreground is a toddler with light hair, wearing a patterned shirt and dark overalls, looking down and smiling. The child behind them is a younger toddler, also smiling, wearing a dark sweater. They are standing against a dark background.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

# conjecture

The existence of abilities to engage in **joint action** partially explains how sophisticated forms of social cognition emerge in evolution or development (or both)

A black and white photograph of two young children. The child in the foreground is a toddler with light hair, wearing dark overalls over a patterned shirt, looking down and smiling. The child behind them is a younger toddler, also smiling, wearing a patterned shirt. They are standing against a dark background.

# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

# conjecture

The existence of abilities to engage in joint action partially explains how sophisticated forms of social cognition emerge in evolution or development (or both)

# question

Given the conjecture, what could joint action be?

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

painting a house together

(Bratman 1992)

lifting a heavy sofa together

(Velleman 1997)

preparing a hollandaise  
sauce together

(Searle 1990)

going to Chicago together

(Kutz 2000)

walking together

(Gilbert 1990)

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

shared intention



'I take a collective action to involve a collective  
[shared] intention.'

(Gilbert 2006, p. 5)

'I take a collective action to involve a collective  
[shared] intention.'

(Gilbert 2006, p. 5)

'The sine qua non of collaborative action is a joint goal  
[shared intention] and a joint commitment'

(Tomasello 2008, p. 181)

'I take a collective action to involve a collective  
[shared] intention.'

(Gilbert 2006, p. 5)

'The sine qua non of collaborative action is a joint goal  
[shared intention] and a joint commitment'

(Tomasello 2008, p. 181)

'the key property of joint action lies in its internal  
component [...] in the participants' having a  
"collective" or "shared" intention.'

(Alonso 2009, pp. 444-5)

'Shared intentionality is the foundation upon which  
joint action is built.'

(Carpenter 2009, p. 381)

**What is shared intention?**

**What is shared intention?**



# What is shared intention?

Functional characterisation

Substantial account





# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account



# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account

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 Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

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

(Bratman 1993:View 4)



# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account

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 Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

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

(Bratman 1993:View 4)

Intentions about intentions



# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account

We have a shared intention  
that we J if

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

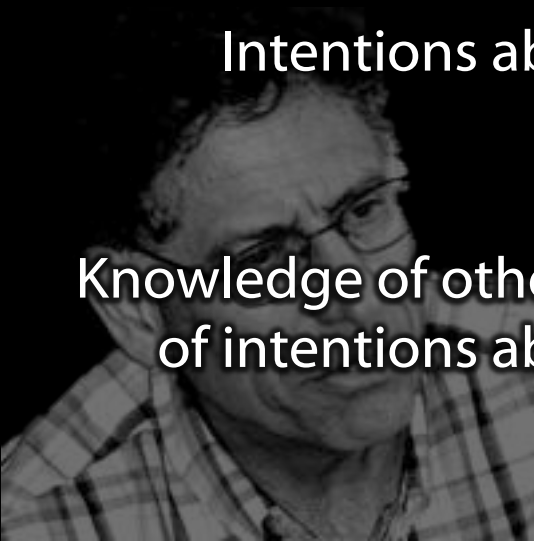
“2. I intend that we J in  
accordance with and  
because of Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

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

(Bratman 1993:View 4)

Intentions about intentions

Knowledge of others' knowledge  
of intentions about intentions



# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account

We have a shared intention  
that we J **if**

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

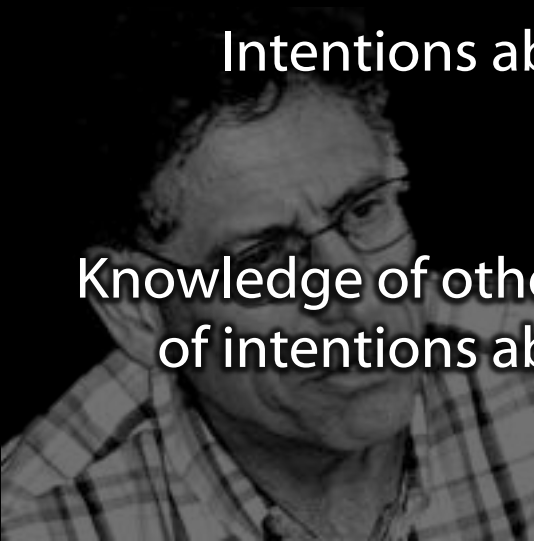
“2. I intend that we J in  
accordance with and  
because of Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

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

(Bratman 1993:View 4)

Intentions about intentions

Knowledge of others' knowledge  
of intentions about intentions



# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

## Substantial account

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 Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

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

(Bratman 1993:View 4)





# What is shared intention?

## Functional characterisation

shared intention serves to  
(a) coordinate activities, (b)  
coordinate planning and (c)  
structure bargaining

'shared intentional agency  
consists, at bottom, in  
interconnected planning  
agency of the participants.'

(Bratman 2011, p. 11)

## Substantial account

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 Ia, Ib, and  
meshing subplans of Ia and  
Ib; you intend [likewise] ...

"3. 1 and 2 are common  
knowledge between us"

(Bratman 1993:View 4)

1. All (significant) joint actions require shared intention.

2. Shared intention requires sophisticated theory of mind cognition.

Therefore:

3. Abilities to engage in joint action could play no significant role in explaining how sophisticated theory of mind cognition emerges.

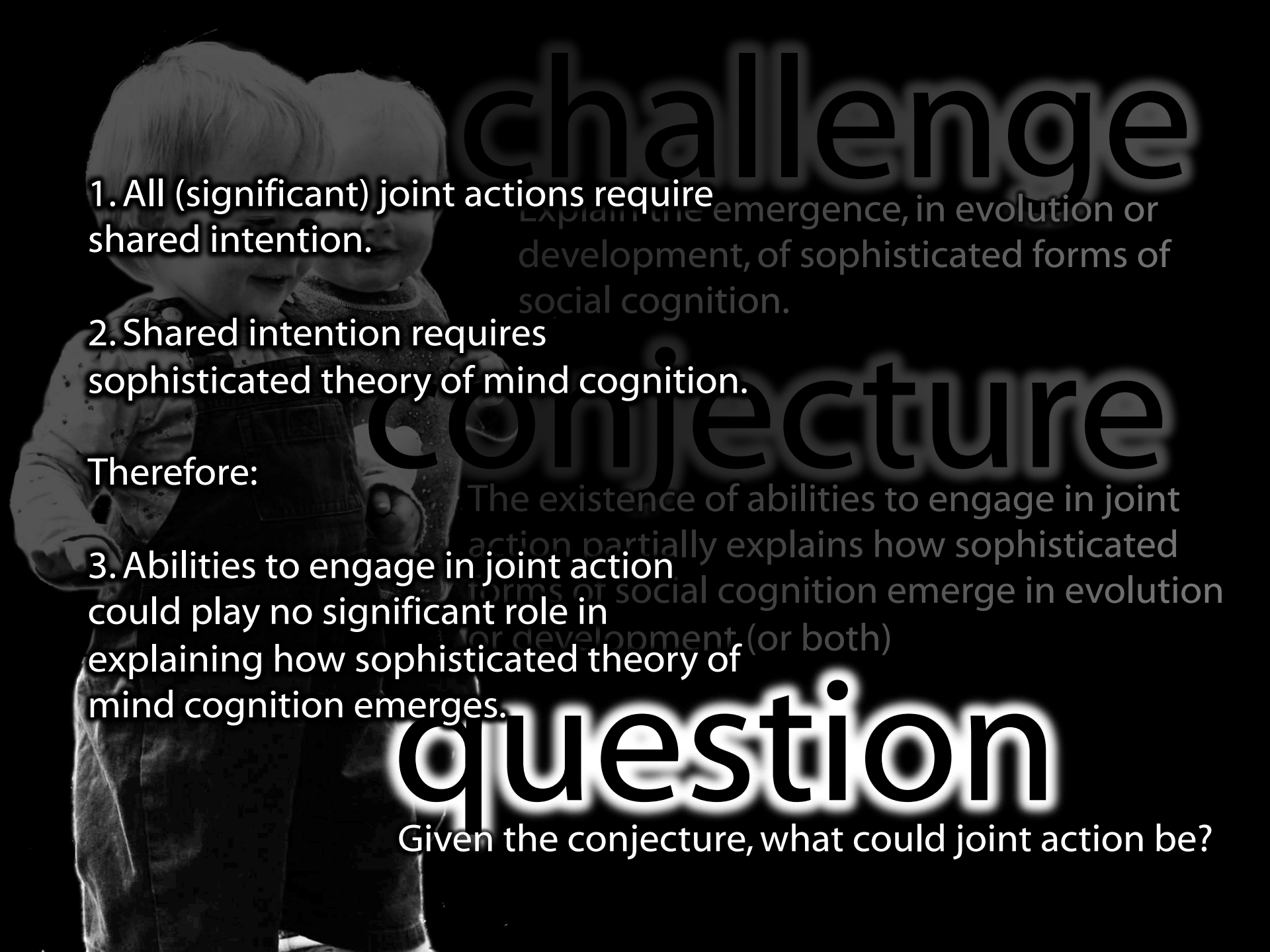
1. All (significant) joint actions require shared intention.

2. Shared intention requires sophisticated theory of mind cognition.

Therefore:

3. Abilities to engage in joint action could play no significant role in explaining **how** sophisticated theory of mind cognition emerges.

(not why)



1. All (significant) joint actions require shared intention.

2. Shared intention requires sophisticated theory of mind cognition.

Therefore:

3. Abilities to engage in joint action could play no significant role in explaining how sophisticated theory of mind cognition emerges.

# question

Given the conjecture, what could joint action be?

1. All (significant) joint actions require shared intention.

2. Shared intention requires sophisticated theory of mind cognition.

Therefore:

3. Abilities to engage in joint action could play no significant role in explaining how sophisticated theory of mind cognition emerges.

1. All (significant) joint actions require shared intention.

2. Shared intention requires sophisticated theory of mind cognition.

Therefore:

3. Abilities to engage in joint action could play no significant role in explaining how sophisticated theory of mind cognition emerges.

Joint action:  
an action with two or more  
agents (Ludwig 2007)

Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

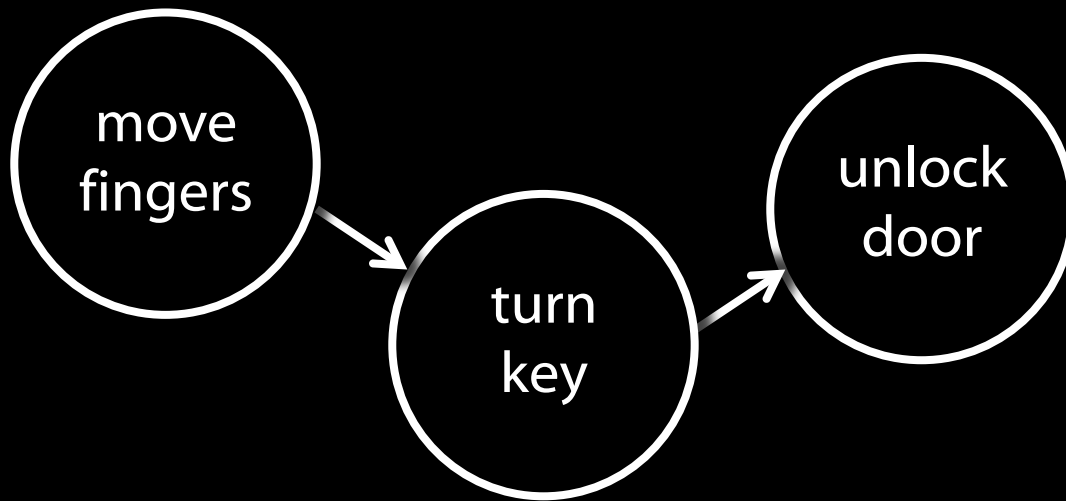


Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

'our primitive actions, the  
ones we do not by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).

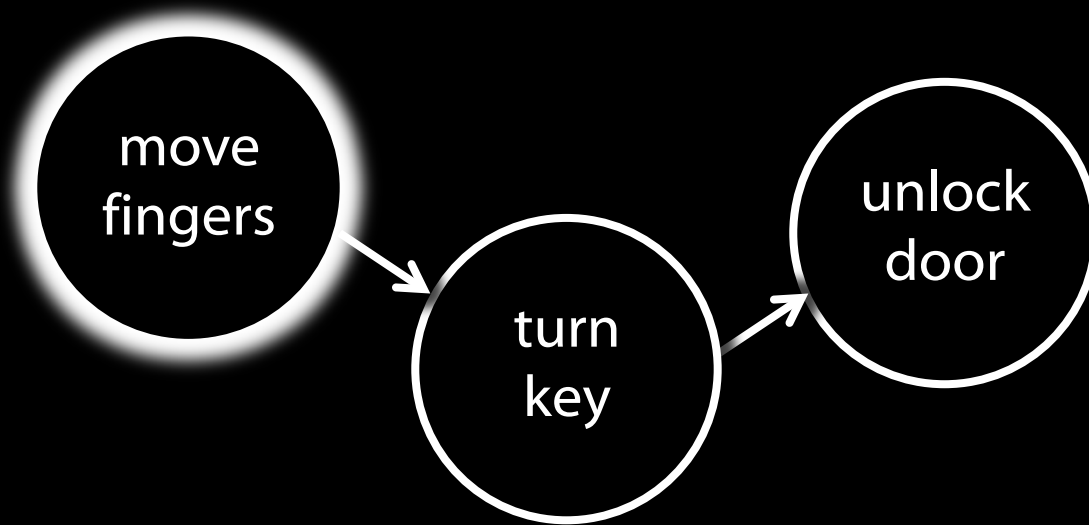
Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

'our primitive actions, the  
ones we do not by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).



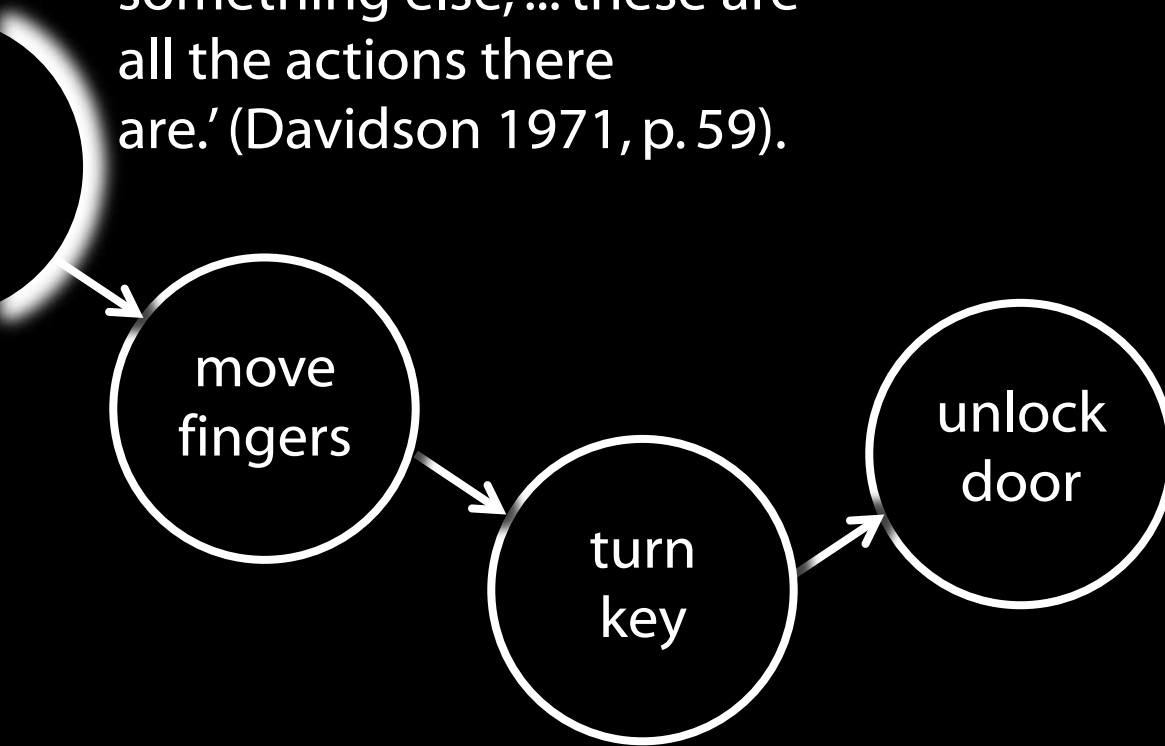
Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

'our primitive actions, the  
ones we do not do by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).



Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

'our primitive actions, the  
ones we do not do by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).



Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

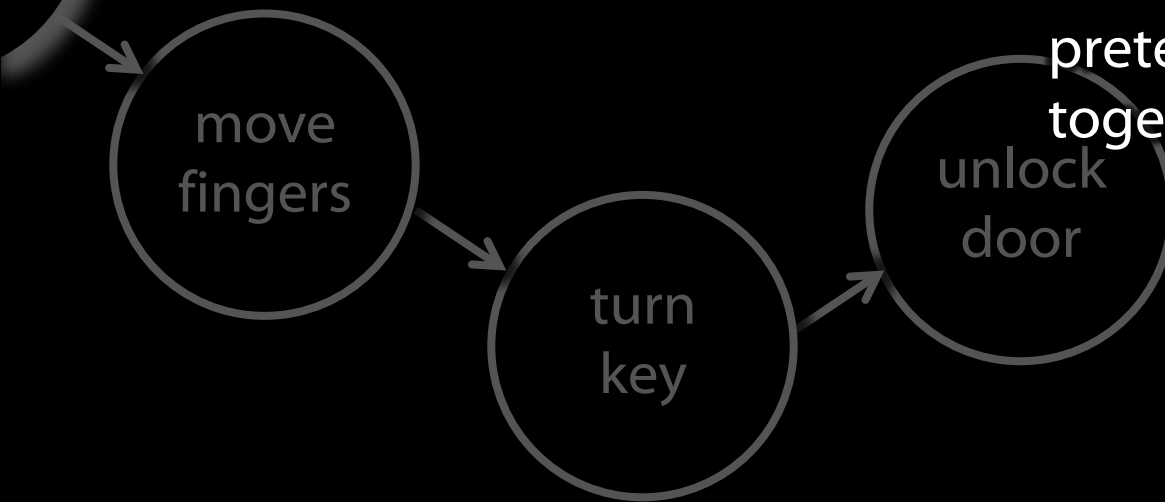
'our primitive actions, the  
ones we do not by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).

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



Joint action:  
an **action** with two or more  
agents (Ludwig 2007)

'our primitive actions, the  
ones we do not do by doing  
something else, ... these are  
all the actions there  
are.' (Davidson 1971, p.59).

tidying up the toys together  
(Behne et al 2005)

cooperatively pulling  
handles in sequence to  
make a dog-puppet sing  
(Brownell et al 2006)

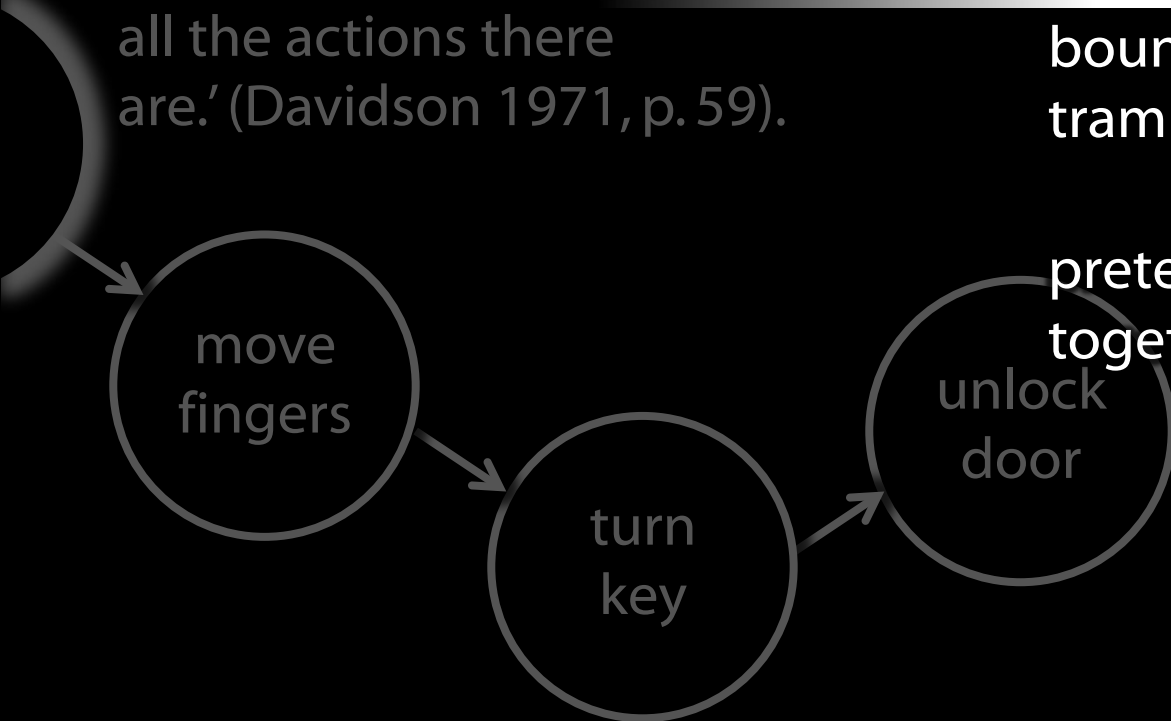
bouncing a ball on a large  
trampoline together  
(Tomasello & Carpenter 2007)

pretending to row a boat  
together

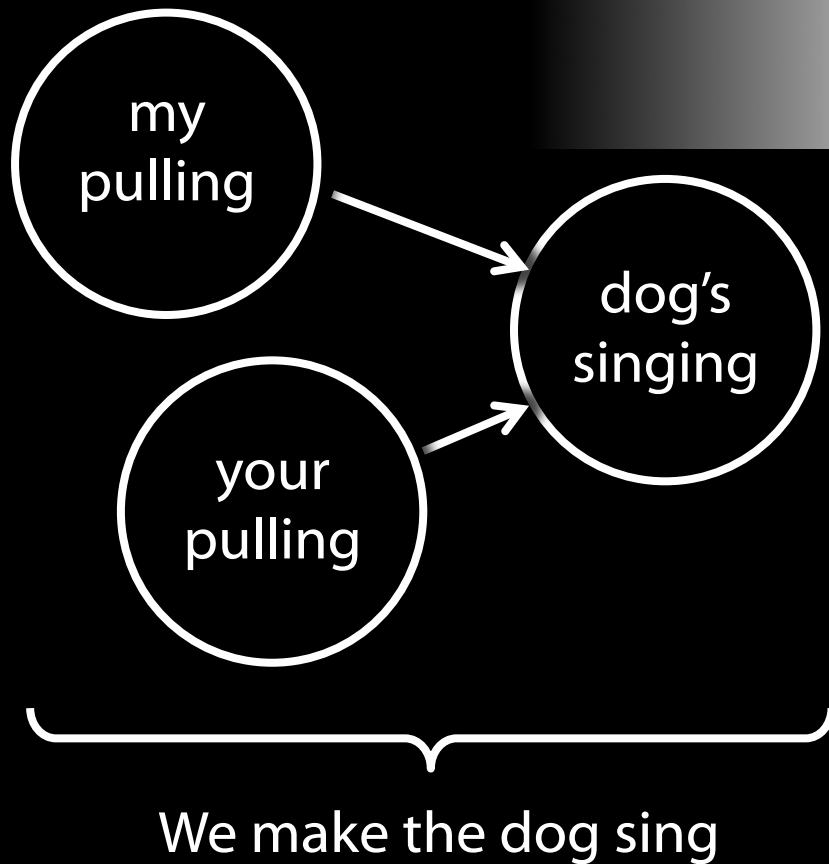
move  
fingers

turn  
key

unlock  
door



Joint action:  
an **action** with two or more  
agents (Ludwig 2007)



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

Joint action:  
an **action** with two or more  
agents (Ludwig 2007)



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



1 Joint action:  
an action with two or more  
agents (Ludwig 2007)

2 Bodily movements 'are all  
the actions there  
are' (Davidson 1971, p. 59)

3 In supposedly paradigm  
cases of joint action, there  
are no bodily movements  
with more than one agent.

Therefore:

4 Supposedly paradigm cases  
are not joint actions.

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

1 Joint action:  
an action with two or more  
agents (Ludwig 2007)

2 Bodily movements 'are all  
the actions there  
are' (Davidson 1971, p. 59)

3 In supposedly paradigm  
cases of joint action, there  
are no bodily movements  
with more than one agent.

Therefore:

4 Supposedly paradigm cases  
are not joint actions.

} too  
narro  
w

grouping up the toys together  
(Behne et al 2005)

alternatively 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

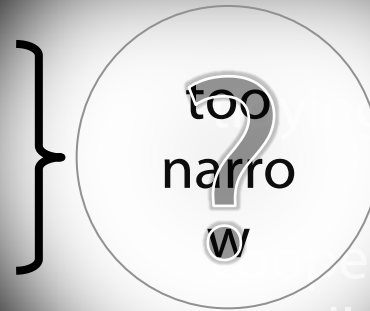
1 Joint action:  
an action with two or more  
agents (Ludwig 2007)

2 Bodily movements 'are all  
the actions there  
are' (Davidson 1971, p. 59)

3 In supposedly paradigm  
cases of joint action, there  
are no bodily movements  
with more than one agent.

Therefore:

4 Supposedly paradigm cases  
are not joint actions.



up the toys together  
(Behne et al 2005)

eratively 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

1 Joint action:  
an action with two or more  
agents (Ludwig 2007)

2 Bodily movements 'are all  
the actions there  
are' (Davidson 1971, p.59)

3 In supposedly paradigm  
cases of joint action, there  
are no bodily movements  
with more than one agent.

Therefore:

4 Supposedly paradigm cases  
are not joint actions.



too narrow  
picking up the toys together  
(Behne et al 2005)

alternatively 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

1 Joint action:  
an action with two or more  
agents (Ludwig 2007)

too narrow  
grouping the toys together  
(Behne et al 2005)

2 Bodily movements 'are all  
the actions there  
are' (Davidson 1971, p. 59)

iteratively pulling  
handles in sequence to  
make a dog-puppet sing  
(Brownell et al 2006)

3 In supposedly paradigm  
cases of joint action, there  
are no bodily movements  
with more than one agent.

bouncing a ball on a large  
trampoline together  
(Tomasello & Carpenter 2007)

Therefore:

4 Supposedly paradigm cases  
are not joint actions.

pretending to row a boat  
together

Joint action:  
an action with two or more  
agents (Ludwig 2007)

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)

## Grounding

events  $D_1, \dots, D_n$  ground  $E$ , if:

$D_1, \dots, D_n$  and  $E$  occur;

$D_1, \dots, D_n$  are each (perhaps improper) parts of  $E$ ; and

every event that is a proper part of  $E$  but does not overlap

$D_1, \dots, D_n$  is caused by some or all of  $D_1, \dots, D_n$ .

## Agency

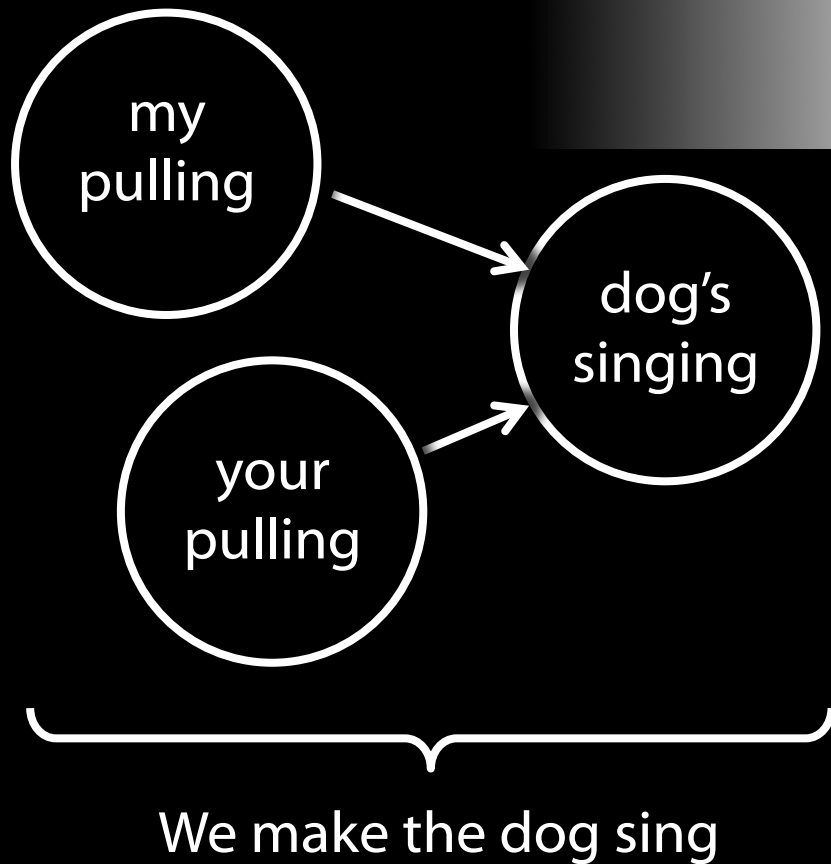
For an individual to be among the agents of an event is for there to be actions  $a_1, \dots, a_n$  which ground this event where the individual is an agent of one or more of these actions.

(Adapted from Pietroski 1998)



Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)



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

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)

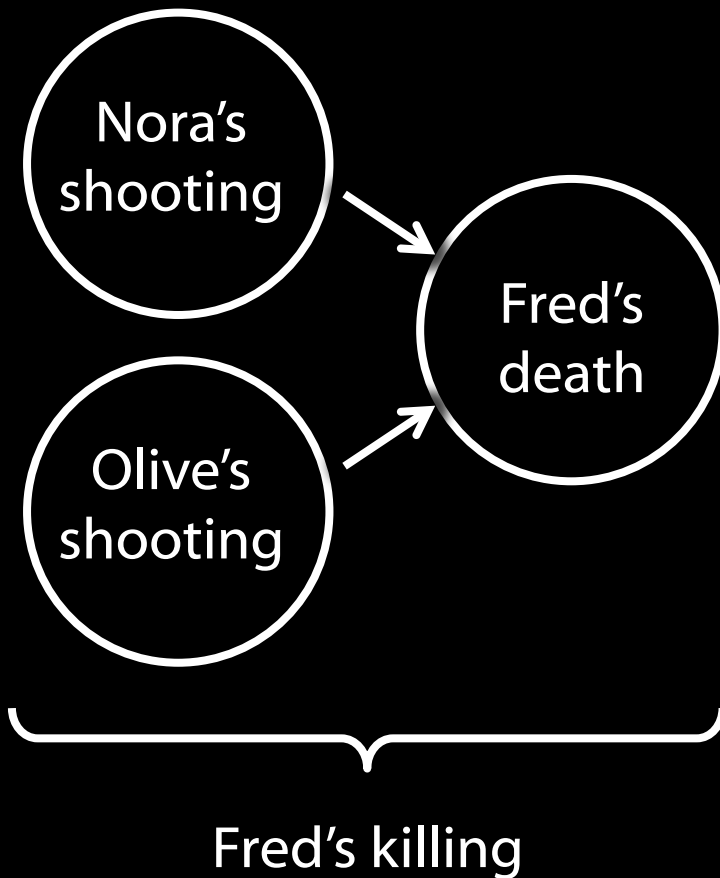
tidying up the toys together  
(Behne et al 2005)

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

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)



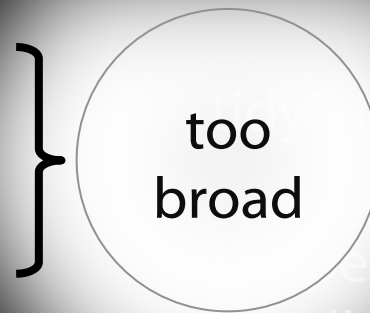
tidying up the toys together  
(Behne et al 2005)

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

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)



pick up the toys together  
(Behne et al 2005)

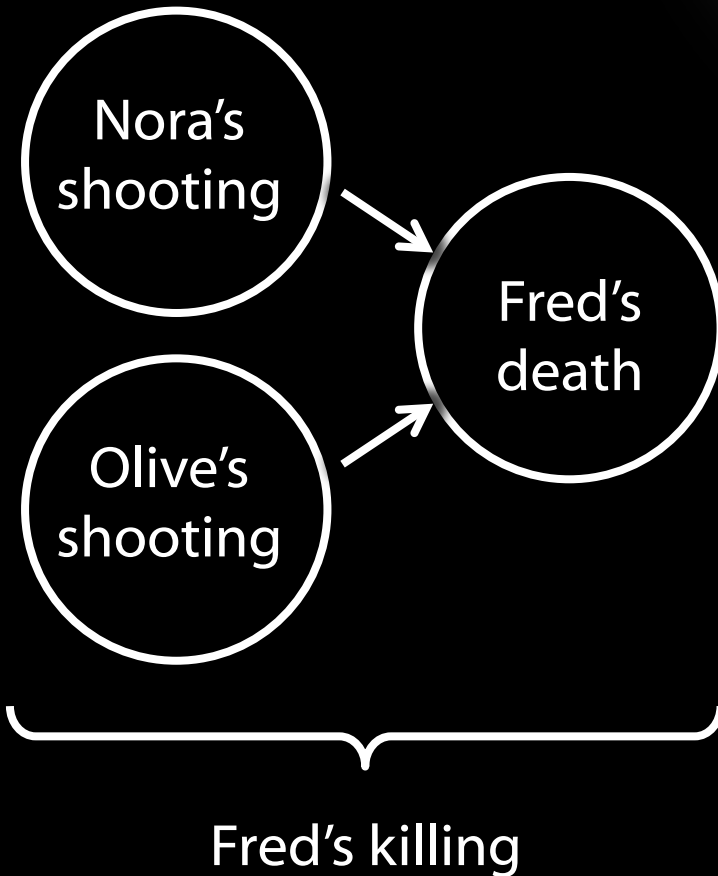
alternatively pulling  
handles in sequence to  
make a dog-puppet sing

(Brownell et al 2006)

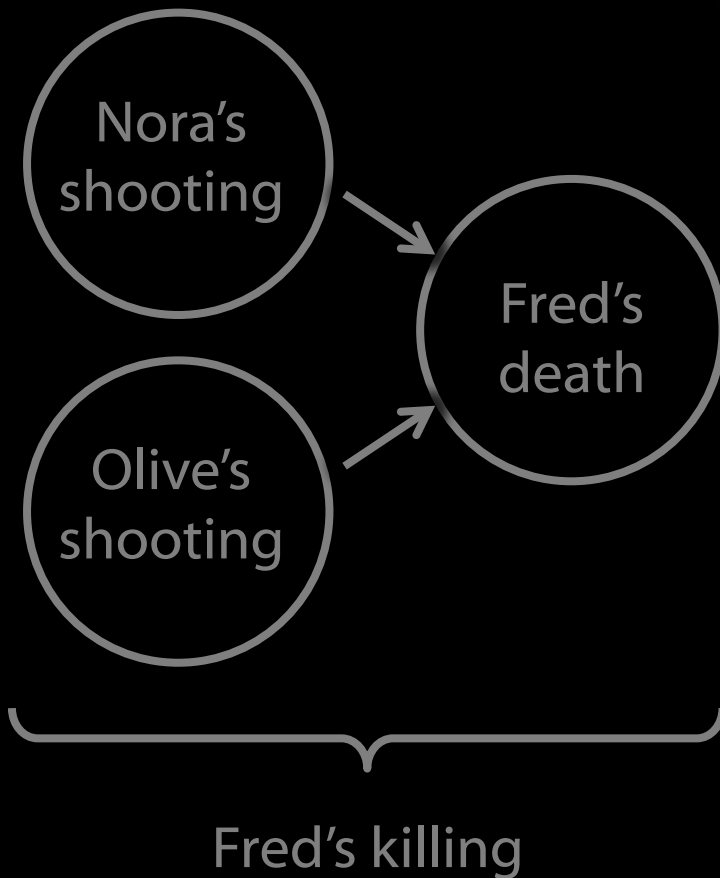
bouncing a ball on a large  
trampoline together

(Tomasello & Carpenter 2007)

pretending to row a boat  
together



Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)



} tidying up the toys together  
too broad (Behne et al 2005)

cooperatively pulling  
handles in sequence to  
make a dog-puppet sing

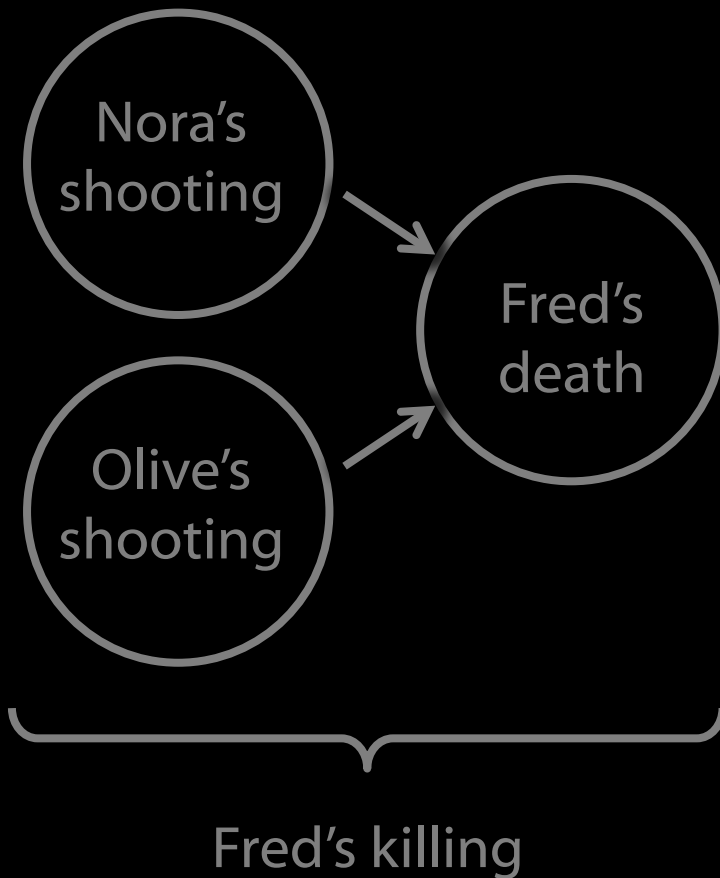
(Brownell et al 2006)

bouncing a ball on a large  
trampoline together

(Tomasello & Carpenter 2007)

pretending to row a boat  
together

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.



cooperatively pulling  
handles in sequence to  
make a dog-puppet sing

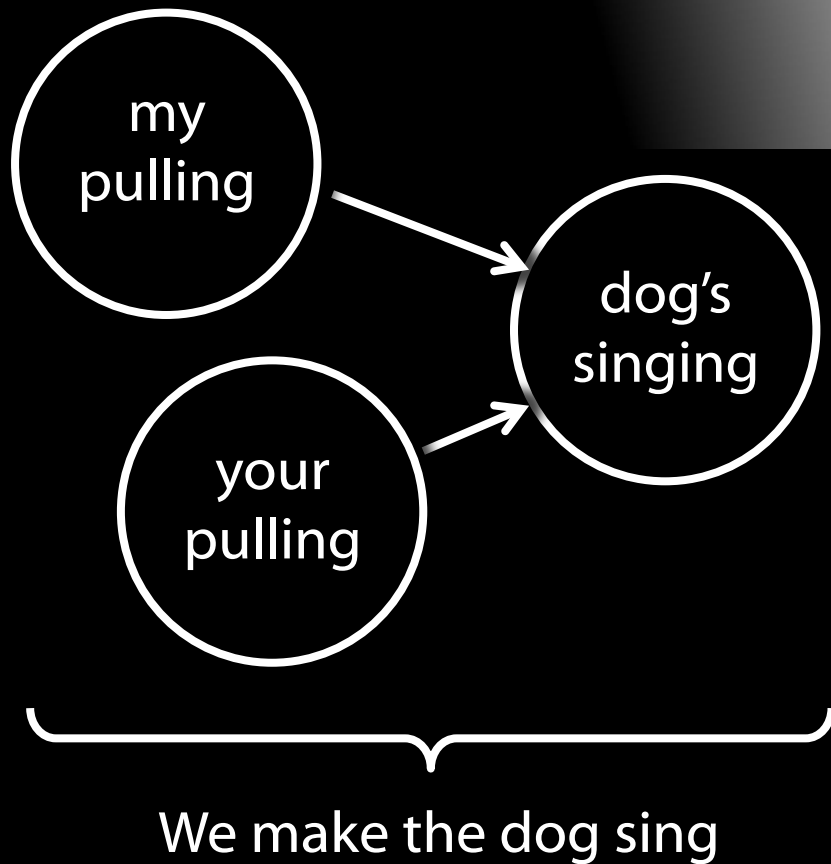
(Brownell et al 2006)

bouncing a ball on a large  
trampoline together

(Tomasello & Carpenter 2007)

pretending to row a boat  
together

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.



cooperatively pulling  
handles in sequence to  
make a dog-puppet sing

(Brownell et al 2006)

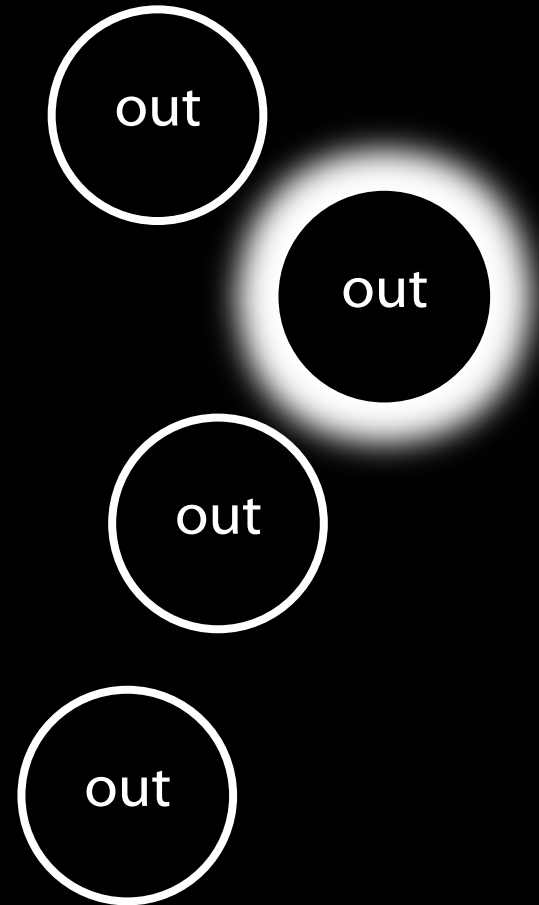
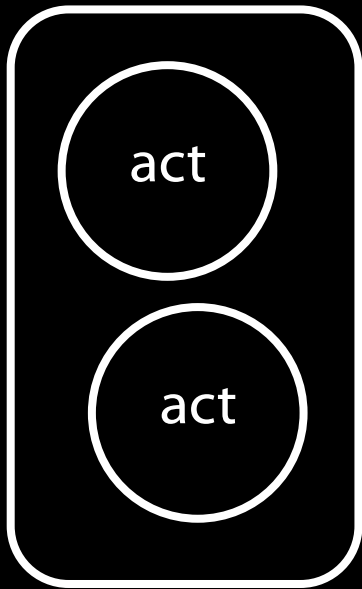
bouncing a ball on a large  
trampoline together

(Tomasello & Carpenter 2007)

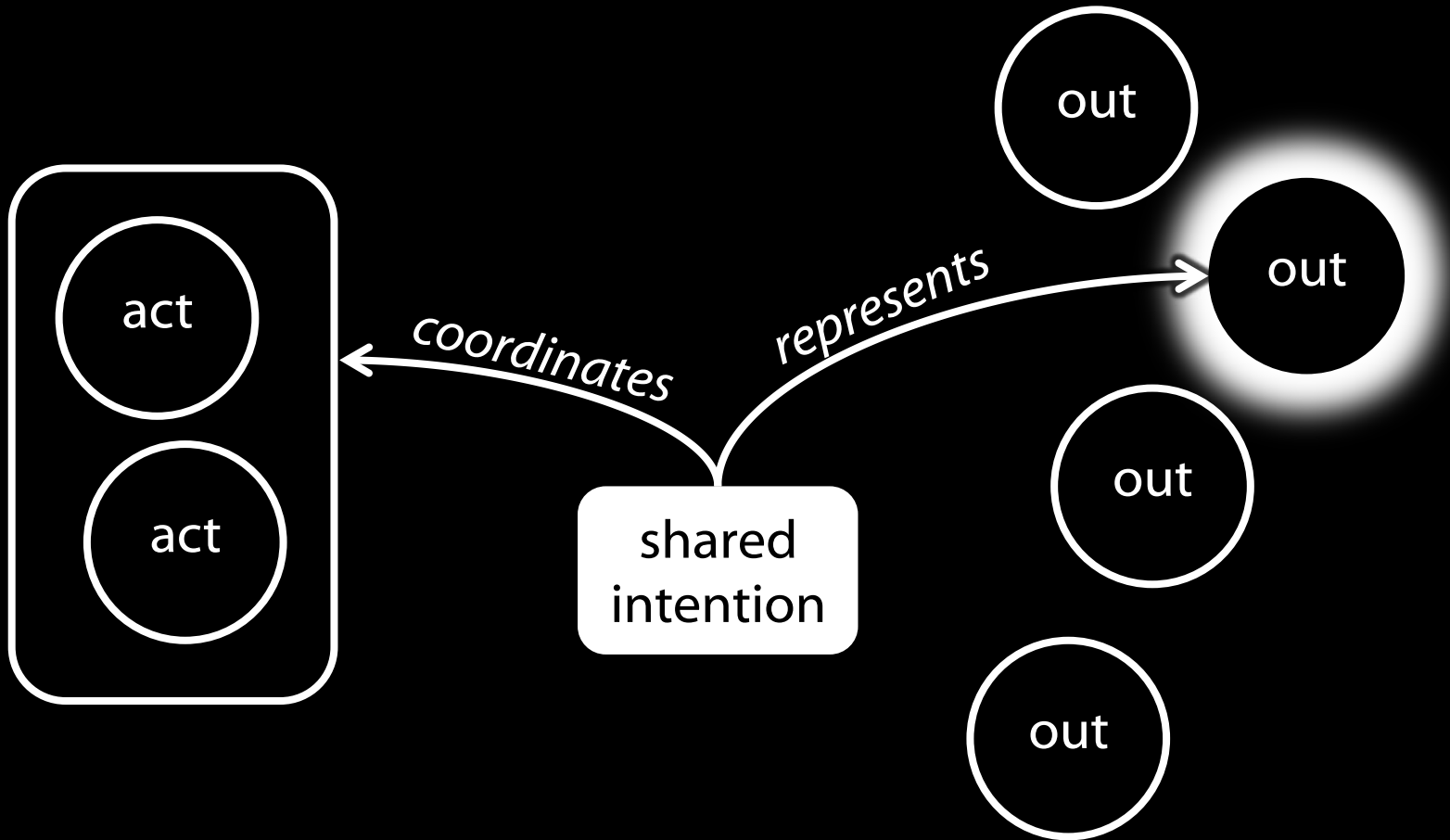
pretending to row a boat  
together



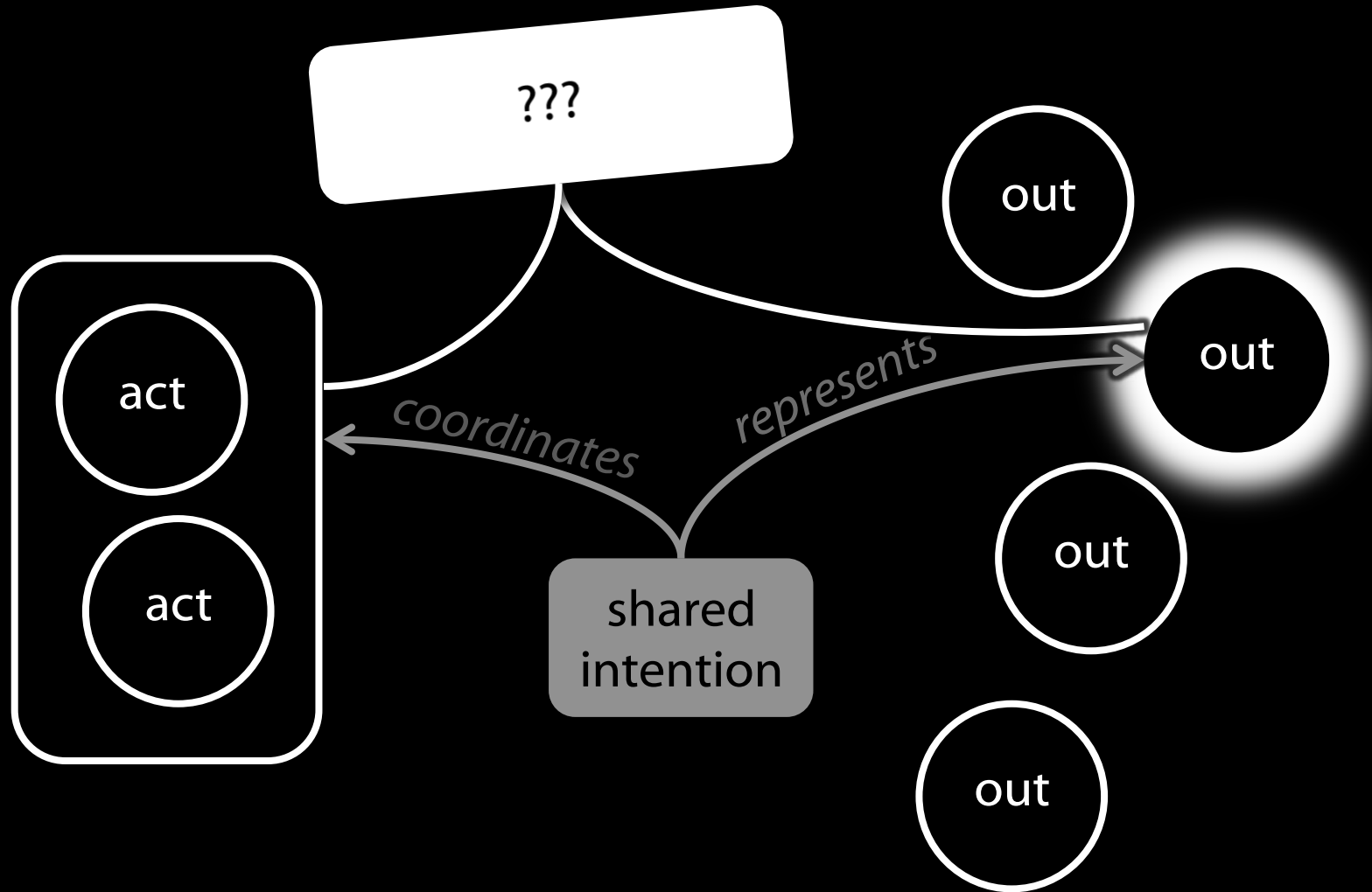
Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.



Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

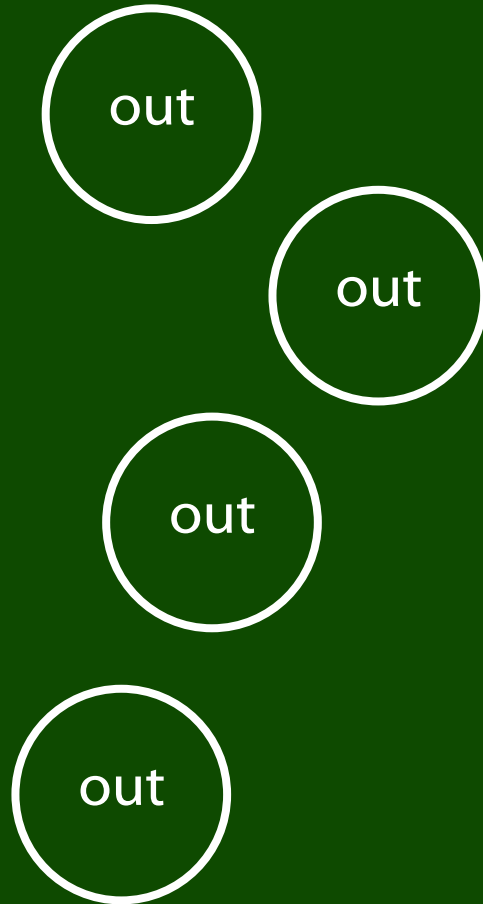


Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

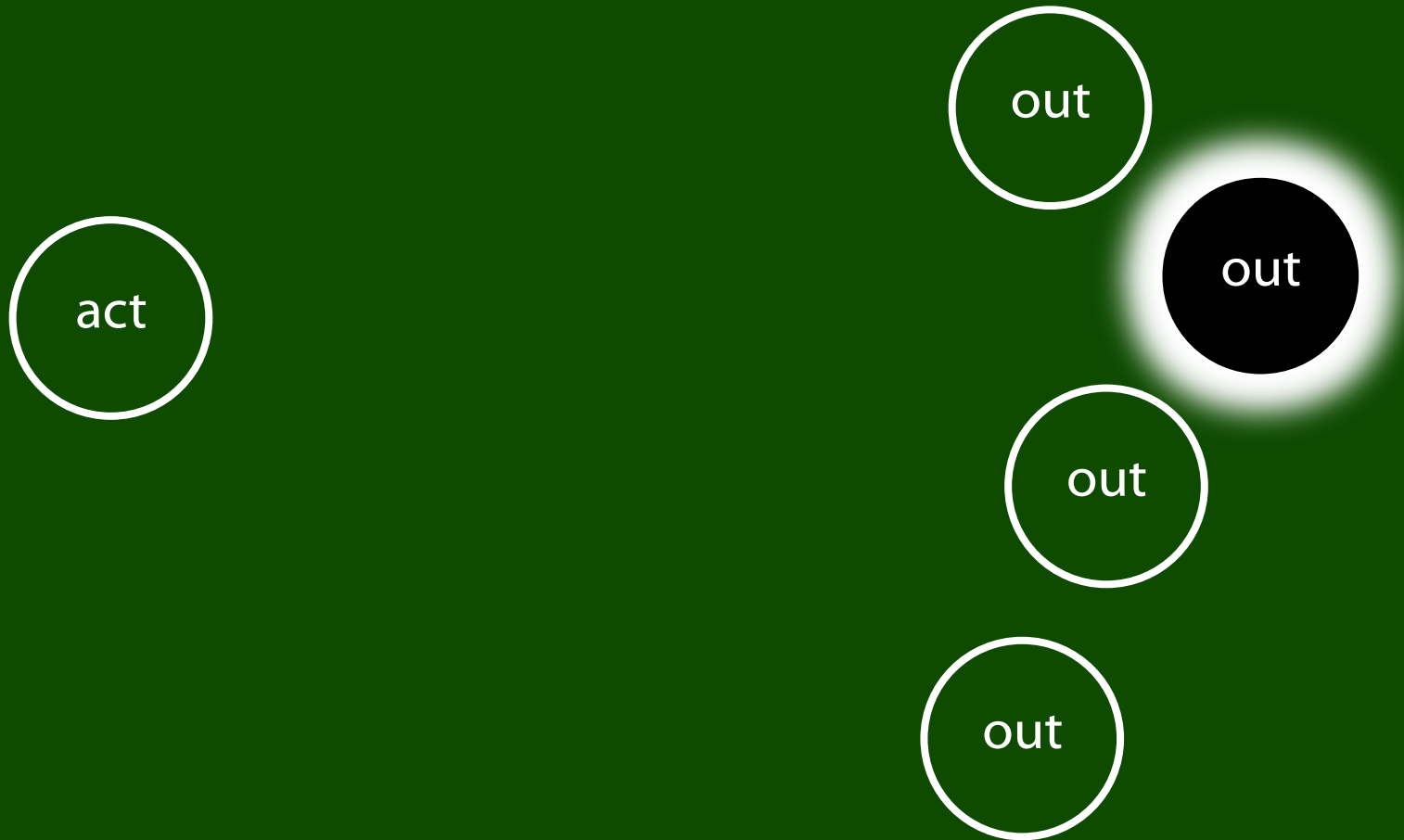


Detour  
Goals are not intentions

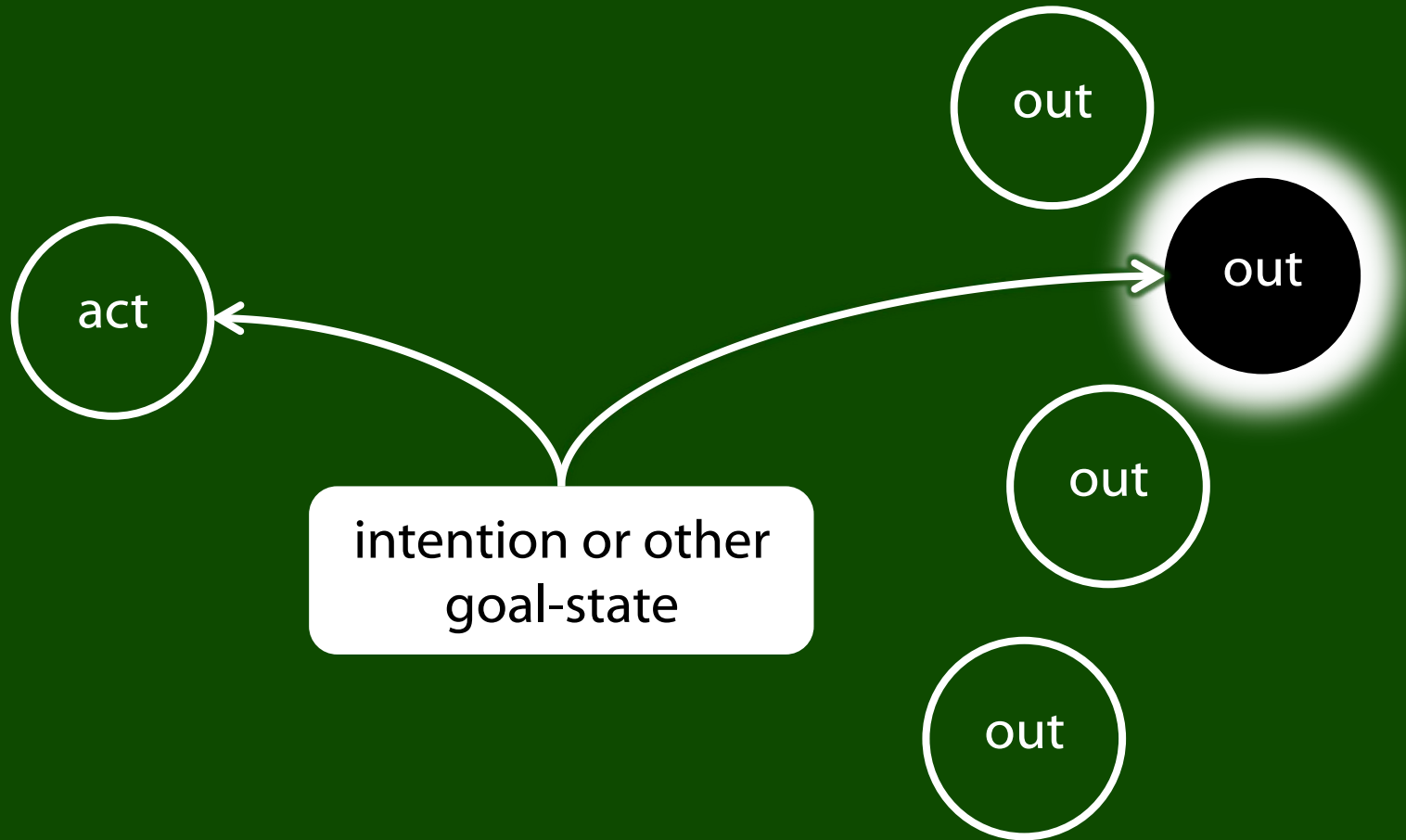
What is the relation between an action and the goal (or goals) to which it is directed?



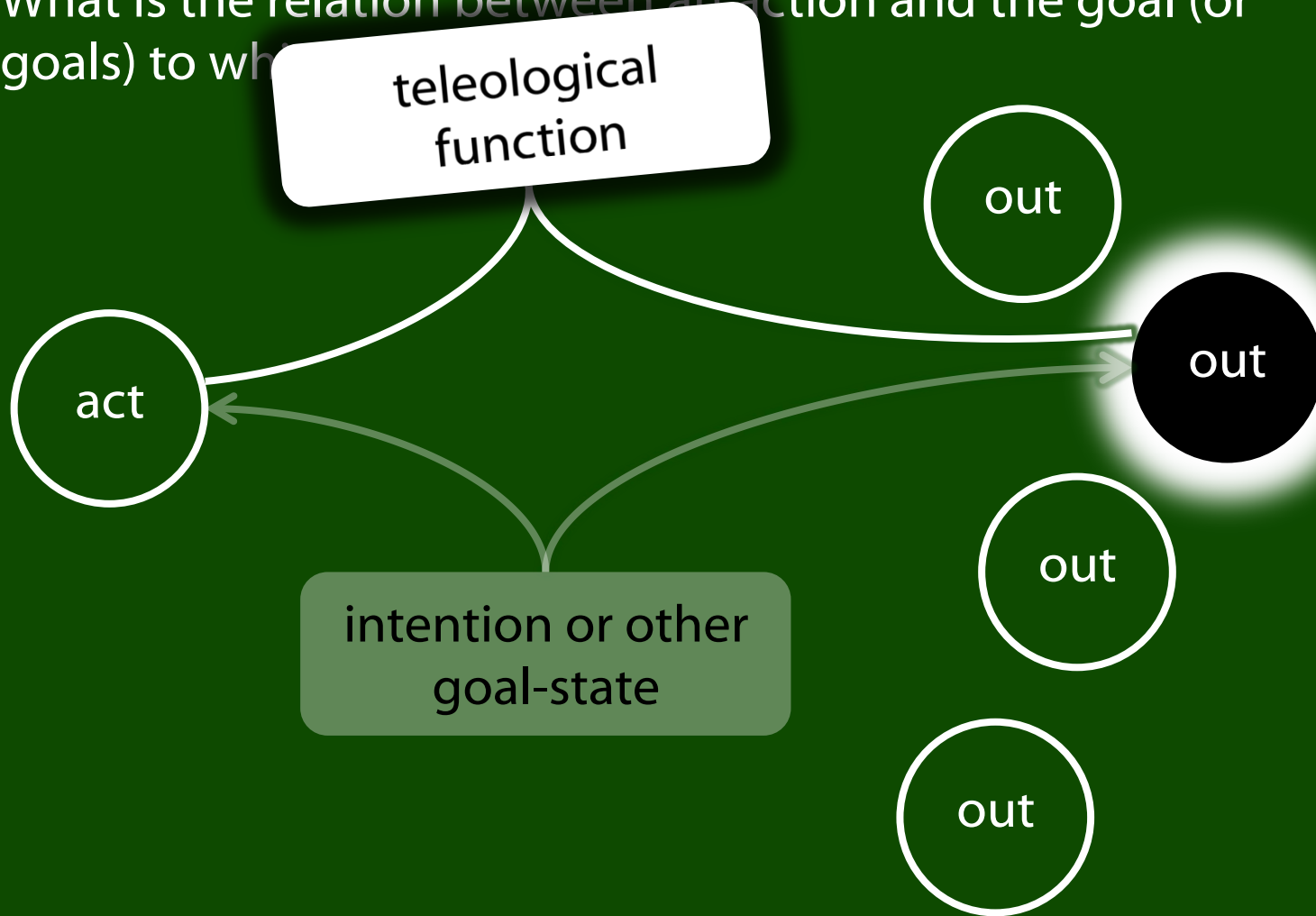
What is the relation between an action and the goal (or goals) to which it is directed?



What is the relation between an action and the goal (or goals) to which it is directed?



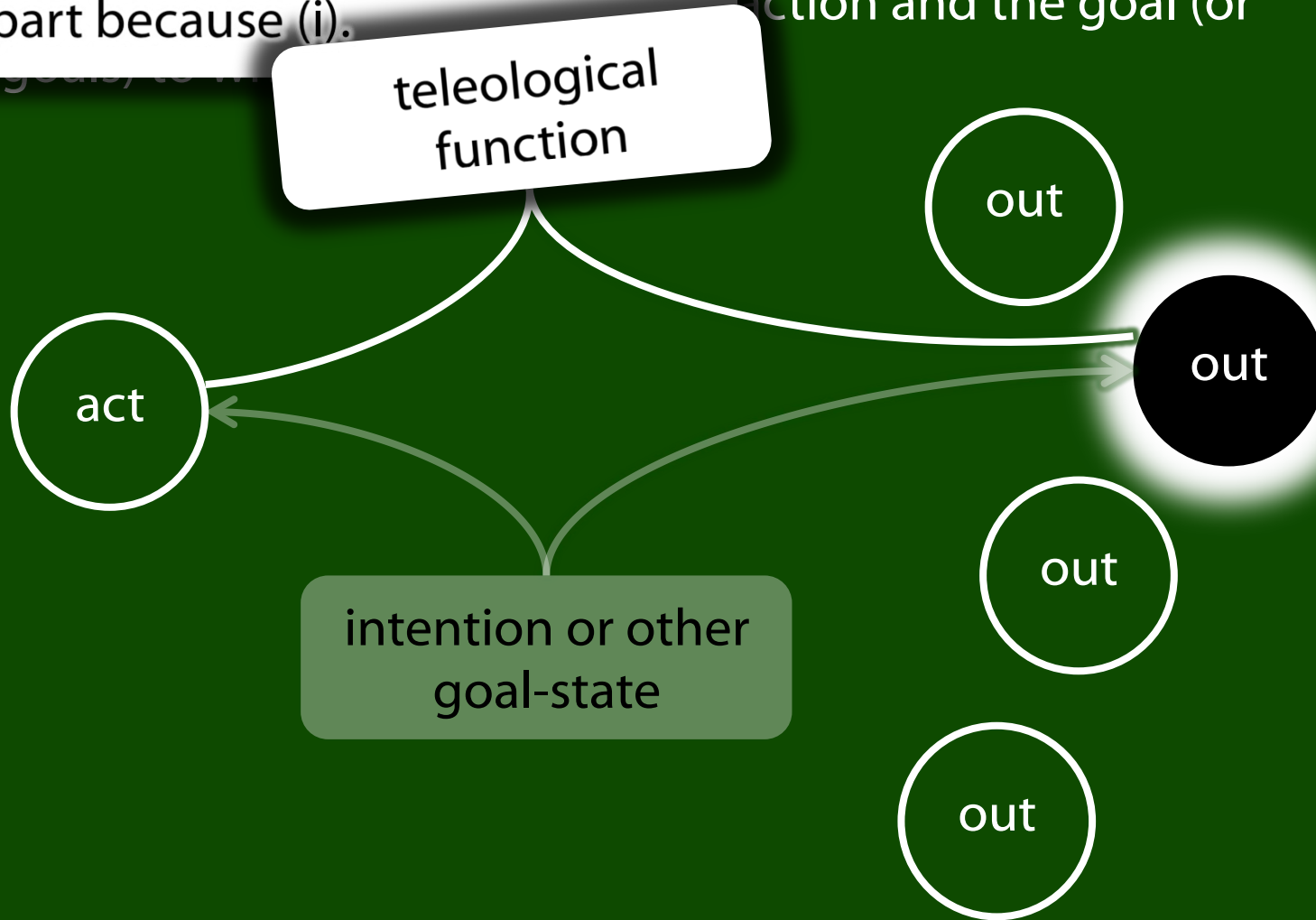
What is the relation between an action and the goal (or goals) to which it is directed?





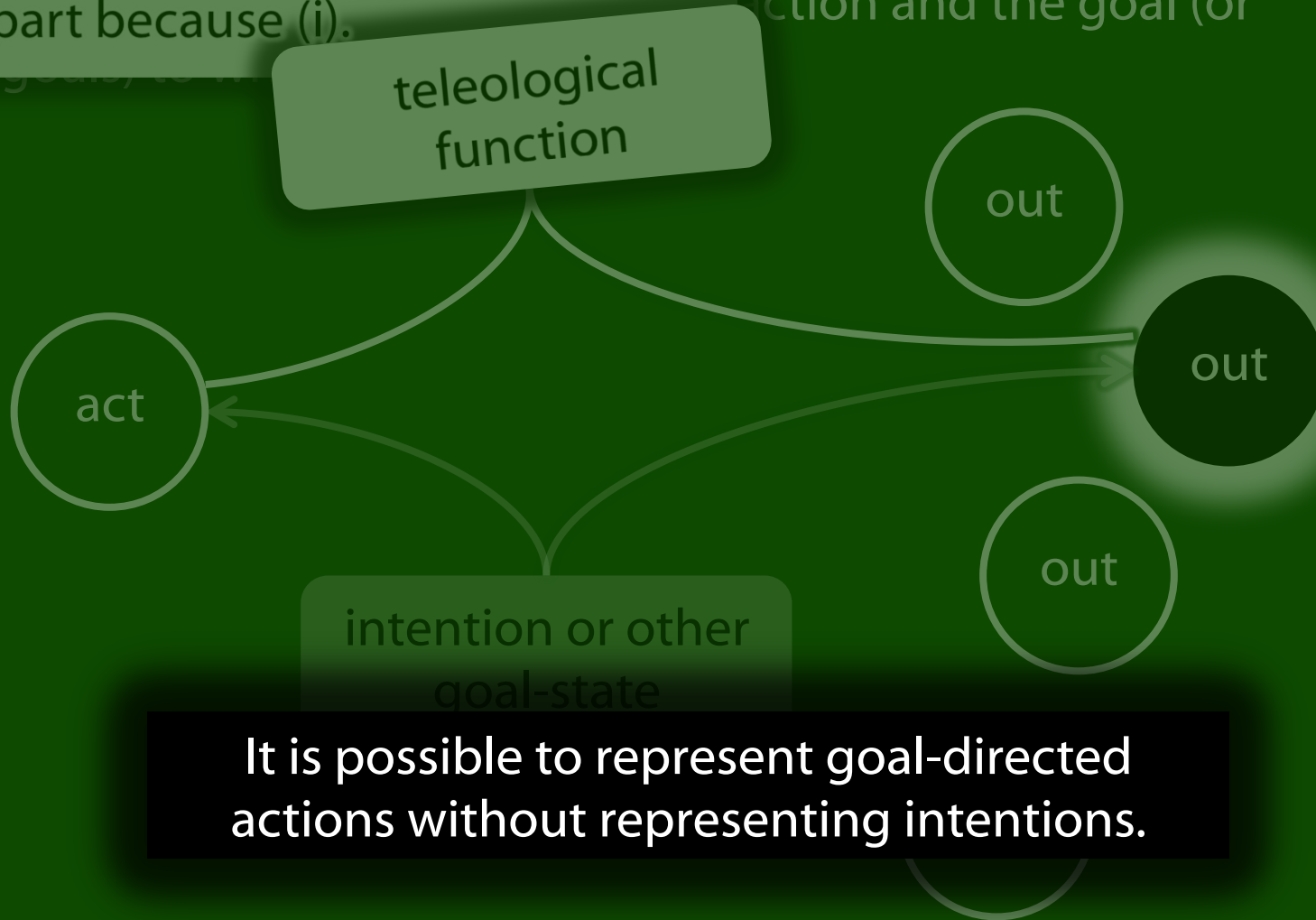
(i) in the past, actions of this type have caused outcomes of this type; (ii) this action happens now in part because (i).

action and the goal (or



(i) in the past, actions of this type have caused outcomes of this type; (ii) this action happens now in part because (i).

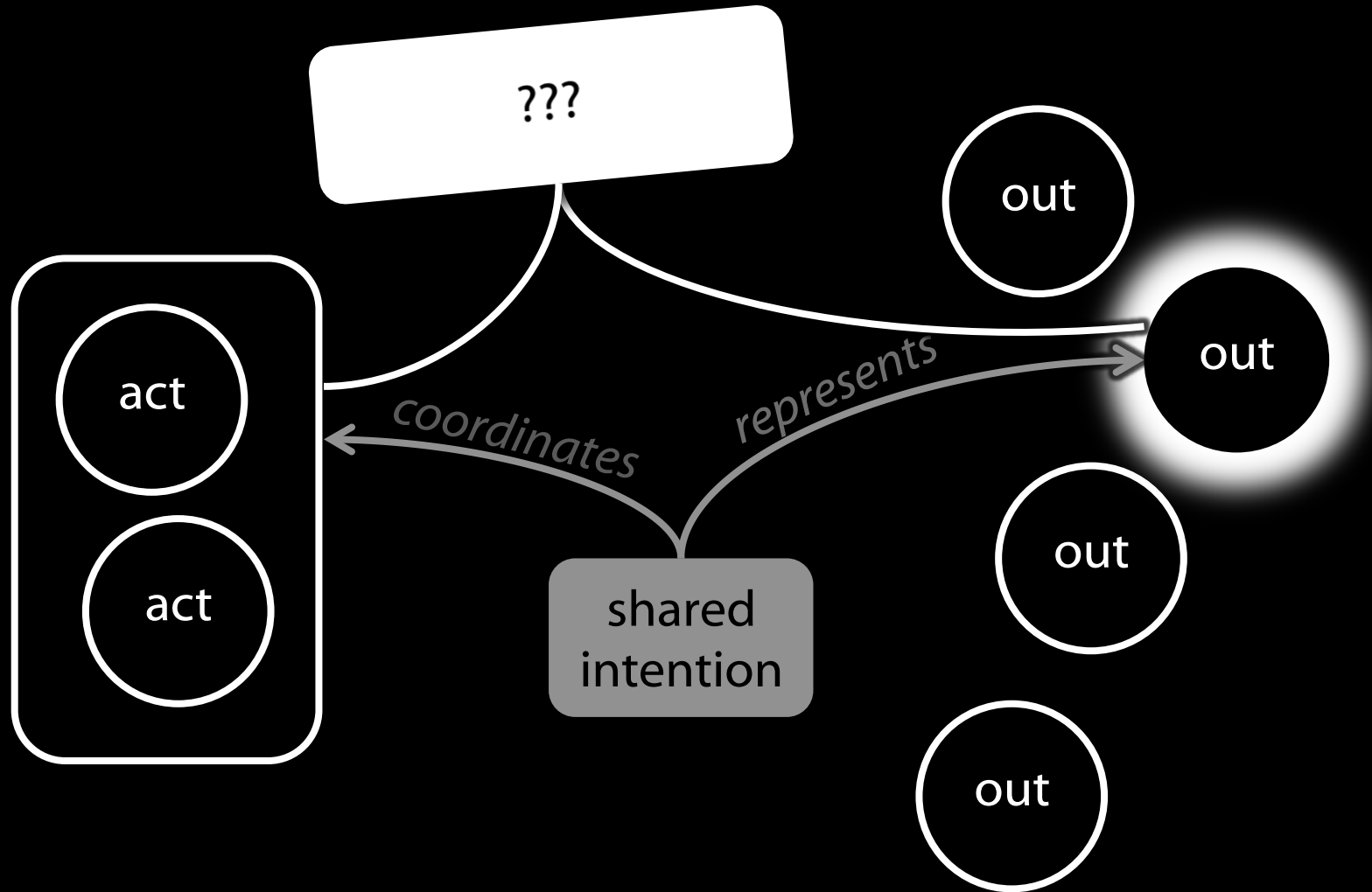
action and the goal (or



It is possible to represent goal-directed actions without representing intentions.

End Detour

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.



Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

G is a collective goal

---

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

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

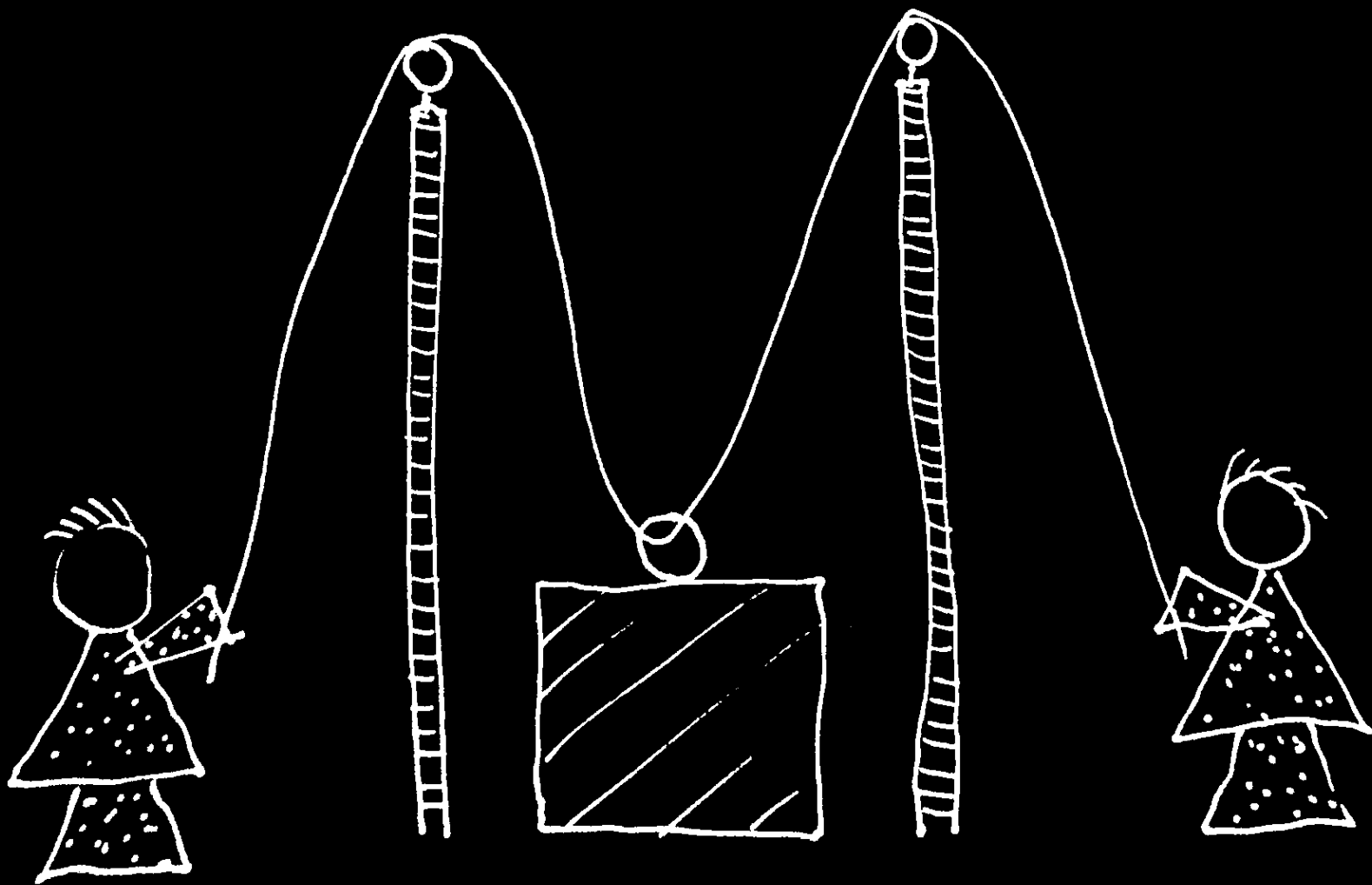
G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

G is a collective goal

(a) it is a distributive goal;

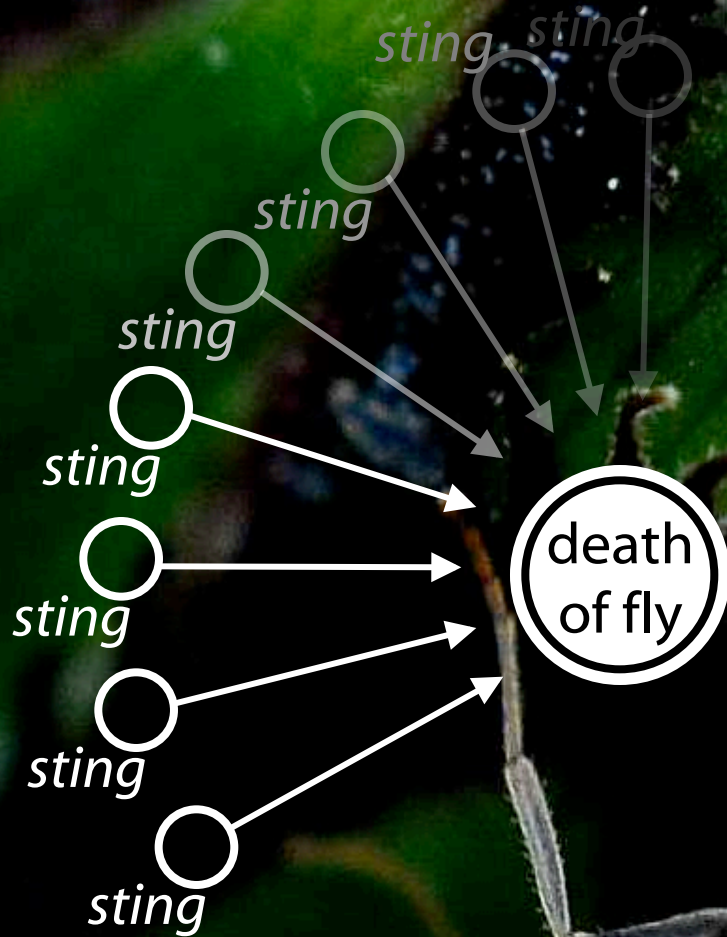
(b) the agents' activities are coordinated; and

(c) coordination of this type would normally facilitate occurrences of outcomes of this type.









Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

G is a collective goal

(a) it is a distributive goal;

(b) the agents' activities are coordinated; and

(c) coordination of this type would normally facilitate occurrences of outcomes of this type.



Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

---

G is a shared goal

---

G is a collective goal

---

(a) it is a distributive goal;

(b) the agents' activities are coordinated; and

(c) coordination of this type would normally facilitate occurrences of outcomes of this type.

Each agent expects each of the other agents to perform activities directed to the goal.

Each agent expects the goal to occur as a common effect of all their goal-directed actions.

Joint action:  
an ~~action~~ event with two or  
more agents (Ludwig 2007)



# challenge

Explain the emergence, in evolution or development, of sophisticated forms of social cognition.

# conjecture

The existence of abilities to engage in joint action partially explains how sophisticated forms of social cognition emerge in evolution or development (or both)

# question

Given the conjecture, what could joint action be?

Goal-directed joint action: an event with two or more agents which, taken as a whole, is directed to a goal.

G is a distributive goal: it is an outcome to which each agent's activities are individually directed and it is possible that: all agents succeed relative to this outcome.

---

G is a shared goal

---

G is a collective goal

---

(a) it is a distributive goal;

(b) the agents' activities are coordinated; and

(c) coordination of this type would normally facilitate occurrences of outcomes of this type.

Each agent expects each of the other agents to perform activities directed to the goal.

Each agent expects the goal to occur as a common effect of all their goal-directed actions.

