

# DESIGNING REFERRING EXPRESSIONS

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# Communication Design



Dad, what's that book?



This is one of my philosophy books.  
It's by a philosopher named Ludwig Wittgenstein.  
It's called *The Philosophical Investigations*.



Wittgen...stein?



Yes.



Do you want to know what it says?





Yes.



Well, here's one thing that it says:  
In order to know what a rule tells us to do, we  
need help from other people.



Other people? Like our teachers?



Yes, or our friends, or our family. If they don't help us, we won't know what the rule means.



This is one of  
my philosophy books.  
It's by a philosopher  
named Ludwig Wittgenstein.  
It's called *The Philosophical  
Investigations*.



**MESSAGE DESIGN**

*The Investigations.*



Oona doesn't know much about philosophy, and hasn't heard of Wittgenstein. So I will start with some very general information about the book to introduce her to a new topic.

This is one of my philosophy books. It's by a philosopher named Ludwig Wittgenstein. It's called *The Philosophical Investigations*.

*The Investigations.*

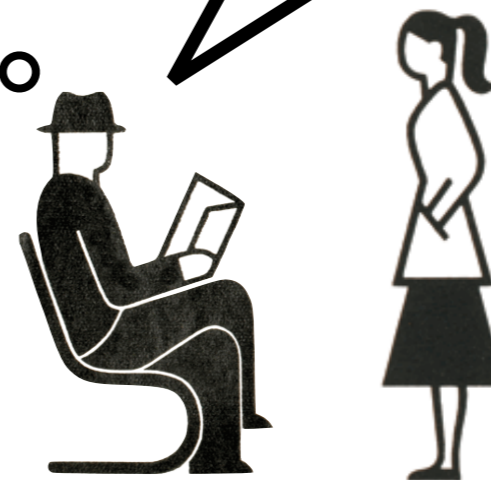


**MESSAGE DESIGN**

My colleague has read this book before,  
and so all I need to do is to increment  
some information she already has.

This is one of  
my philosophy books.  
It's by a philosopher  
named Ludwig Wittgenstein.  
It's called *The Philosophical  
Investigations*.

*The Investigations.*



**MESSAGE DESIGN**

Well, here's one thing that it says:  
In order to know what a rule tells us to do,  
we need help from other people.



**SIGNAL DESIGN**

I think the view is that following a  
rule is an essentially social  
practice.





Oona doesn't know what a "social practice" is, or what the word "essentially" means. So I will describe those ideas in simple terms.

Well, here's one thing that it says:  
In order to know what a rule tells us to do,  
we need help from other people.

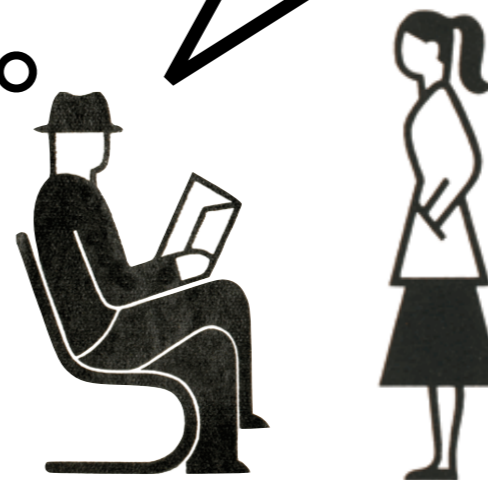
I think the view is that following a  
rule is an essentially social  
practice.



My colleague knows lots of philosophical terminology, and will be offended if I talk to her like she's a kid, so I will say "essentially social practice."

Well, here's one thing that it says: In order to know what a rule tells us to do, we need help from other people.

I think the view is that following a rule is an essentially social practice.



# Noun-Phrase Design



A philosopher named 'Ludwig Wittgenstein'  
The philosopher who wrote *The Philosophical Investigations*  
The philosopher I was telling you about last week

Ludwig Wittgenstein

Wittgenstein

Ludwig

him



My addressee has never heard  
of Wittgenstein but knows what  
philosophers are.

**A philosopher named 'Ludwig Wittgenstein'**

The philosopher who wrote *The Philosophical Investigations*

The philosopher I was telling you about last week

Ludwig Wittgenstein

Wittgenstein

Ludwig

him



My addressee has heard of *The Philosophical Investigations* but doesn't know (or doesn't remember) who wrote it.

A philosopher named 'Ludwig Wittgenstein'

**The philosopher who wrote *The Philosophical Investigations***

The philosopher I was telling you about last week

Ludwig Wittgenstein

Wittgenstein

Ludwig

him



My addressee remembers talking to me about a philosopher last week but doesn't know this is the same one.

A philosopher named 'Ludwig Wittgenstein'

The philosopher who wrote *The Philosophical Investigations*

**The philosopher I was telling you about last week**

Ludwig Wittgenstein

Wittgenstein

Ludwig

him



My addressee knows who Ludwig Wittgenstein is, and by that name, but they might also know about some other Wittgensteins.

A philosopher named 'Ludwig Wittgenstein'

The philosopher who wrote *The Philosophical Investigations*

The philosopher I was telling you about last week

**Ludwig Wittgenstein**

Wittgenstein

Ludwig

him





My addressee knows who Ludwig Wittgenstein is, and he is the most salient Wittgenstein for them.

A philosopher named 'Ludwig Wittgenstein'  
The philosopher who wrote *The Philosophical Investigations*  
The philosopher I was telling you about last week

Ludwig Wittgenstein

**Wittgenstein**

Ludwig

him



LW is the most salient Ludwig  
with whom my addressee is on a  
first-name basis, and they also  
think that I am on a first-name  
basis with LW.

A philosopher named 'Ludwig Wittgenstein'  
The philosopher who wrote *The Philosophical Investigations*  
The philosopher I was telling you about last week

Ludwig Wittgenstein

Wittgenstein

**Ludwig**

him



LW is currently very salient to my addressee, either because we have just been talking about him or for some other reason, and they can infer that I know this.

A philosopher named 'Ludwig Wittgenstein'

The philosopher who wrote *The Philosophical Investigations*

The philosopher I was telling you about last week

Ludwig Wittgenstein

Wittgenstein

Ludwig

**him**



# **Communication Design: Humans vs. Non-Humans**

# Message Design in Humans

- Gives us unparalleled flexibility about what, when, where, and with whom to communicate
- Expands the number of goals that communication can serve
- Makes communication stimulus independent to an unparalleled degree
- Makes communication efficient by allowing us to communicate only what is needed to achieve our goals
- Allows for cooperativity by allowing us to communicate in ways that serve addressees' goals

# Message design in non-human primates?

- Wild chimpanzees selectively target ignorant group members with alarm calls (Crockford et al 2017)
- Baboons and other primates target affiliative and aggressive vocalizations at others in ways that are sensitive to complex information about group social relations. (Engh et al 2005)
- So it happens, but it is less ubiquitous, less flexible, and confers fewer communicative advantages

# Signal Design in Humans

- Increases efficiency and reliability: more information in smaller packages
- Dramatically changes the kind of natural languages we are capable of using, which dramatically expands the kinds of things we can communicate  
(more on this later)

# Signal Design in Non-Human Primates?

- Use of gaze, body positioning to indicate who is the target of affiliative/aggressive vocalizations and gestures (Povinelli et al 2003).
- Repetition of alarm calls, gestures until uptake is secured, sensitivity to addressees' attentional states (Hostetter et al 2001).
- Very few examples of nonhuman primates changing the contours of signal with a given meaning based on facts about the addressee or their thoughts.



# **Communication Design and Intention Recognition**

# INTENTION RECOGNITION

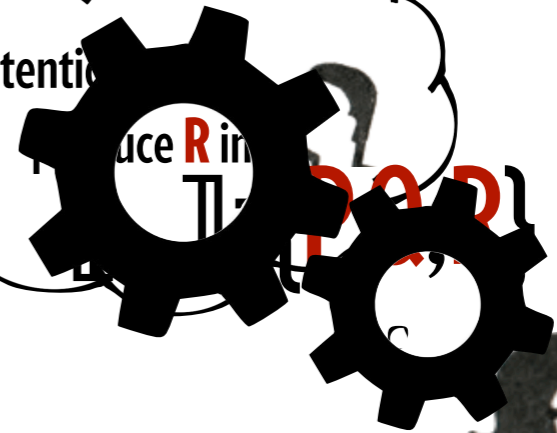
(cf. Grice 1957, 1969)

(1) Intention to produce **R** in 

(2) Intention for  to recognize  
intention (1)

U

Intention



(1) Intention to produce **R** in 

(2) Intention for  to recognize  
intention (1)

**U**



# Intentions and planning

(Bratman 1987, etc.)

Intentions are stable, action-guiding commitments that serve as both the inputs and outputs of episodes of practical reasoning.



**Planning**

**Mindreading**

**Language**

# Planning

PRIOR INTENTION

**Intention to go to Iceland**

relevant beliefs,  
other intentions,  
pressure to stay  
rationally coherent



SUBPLAN

**Intention to book a  
flight**

# Planning

PRIOR INTENTION  
**Intention to book a  
flight**

relevant beliefs,  
other intentions,  
pressure to stay  
rationally coherent

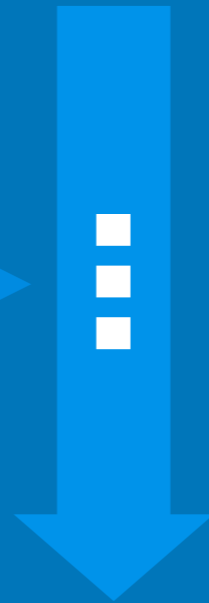


SUBPLAN  
**Intention to book  
*this* flight**

# Planning

PRIOR INTENTION  
**Intention to book  
*this* flight**

relevant beliefs,  
other intentions,  
pressure to stay  
rationally coherent



SUBPLAN

**Motor instructions  
to move my fingers  
in a certain way**



# Rational Requirements

## MEANS-END RATIONALITY

To be rational, you have to intend what you take to be the necessary means to your intended ends.

## CONSISTENCY OF INTENTIONS

To be rational, you have to avoid intending inconsistent things

## DOXASTIC CONSTRAINT

To be rational, you should avoid intending things that you believe you can't do.

**Beliefs about where  
Iceland is, the nature of air  
travel, my finances...**

**Domain  
Generality and  
Unencapsulation**

**Preferences about  
when to fly, where to  
sit, how much to pay...**

**Intentions about when to be  
in other places, what else to  
spend money on, who to  
travel with, etc.**

## **Grice, meet Bratman**

Communicative intentions are intentions.

This means that part of their functional role is to serve intrapersonal and interpersonal coordination.

# Planning

PRIOR INTENTION

**Intention to give a talk**

relevant beliefs,  
other intentions,  
pressure to stay  
rationally coherent



SUBPLAN

**Intention about  
what to say**

# Planning

**PRIOR INTENTION**  
**Intention about**  
**what to say**

**relevant beliefs,**  
**other intentions,**  
**pressure to stay**  
**rationally coherent**

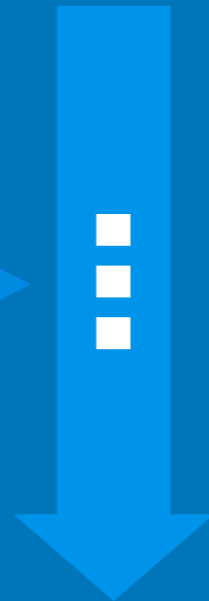


**SUBPLAN**  
**Intentions about**  
**how to say it**

# Planning

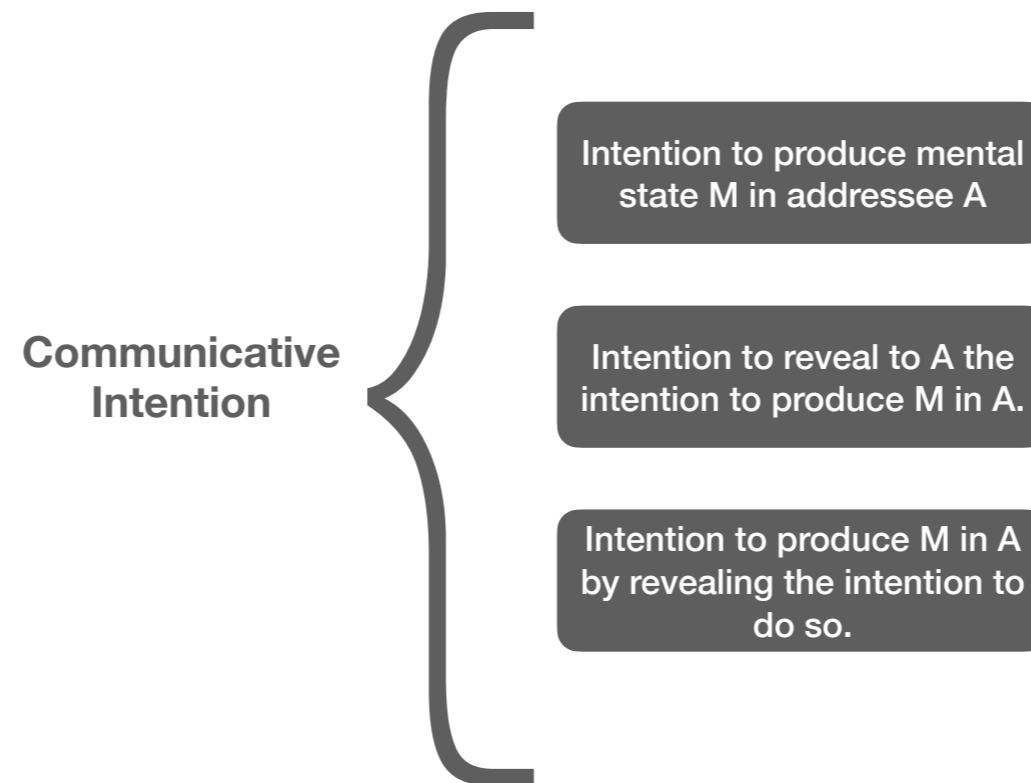
**PRIOR INTENTION**  
**Intentions about  
how to say it**

**relevant beliefs,  
other intentions,  
pressure to stay  
rationally coherent**

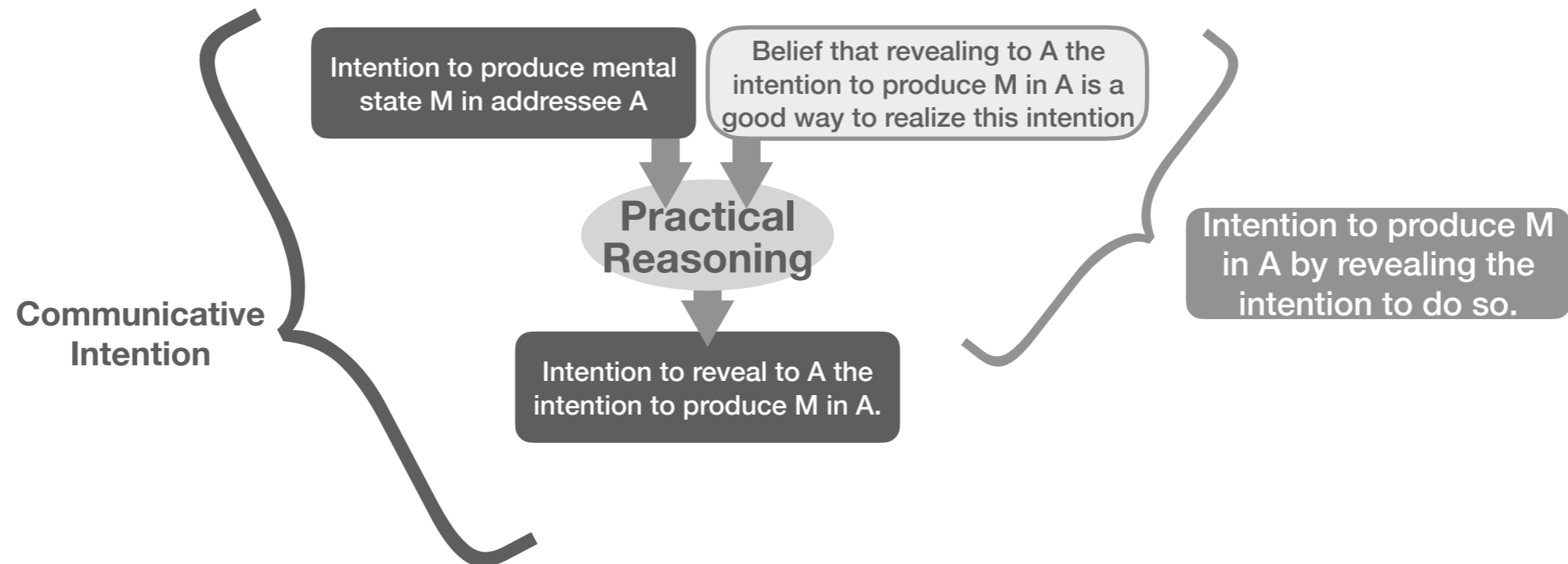


**SUBPLAN**  
**Motor instructions  
to move my lips in a  
certain way**

# Planning and Communicative Intentions

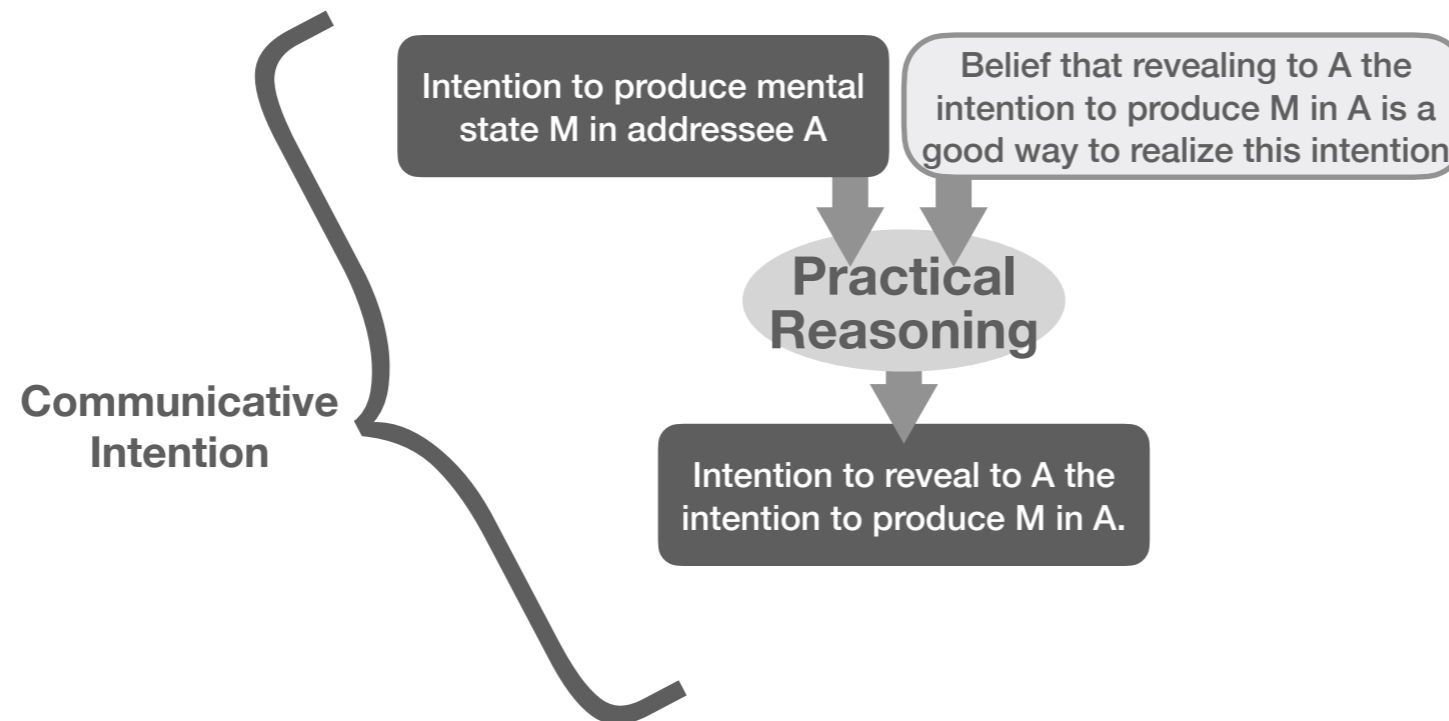


# Planning and Communicative Intentions

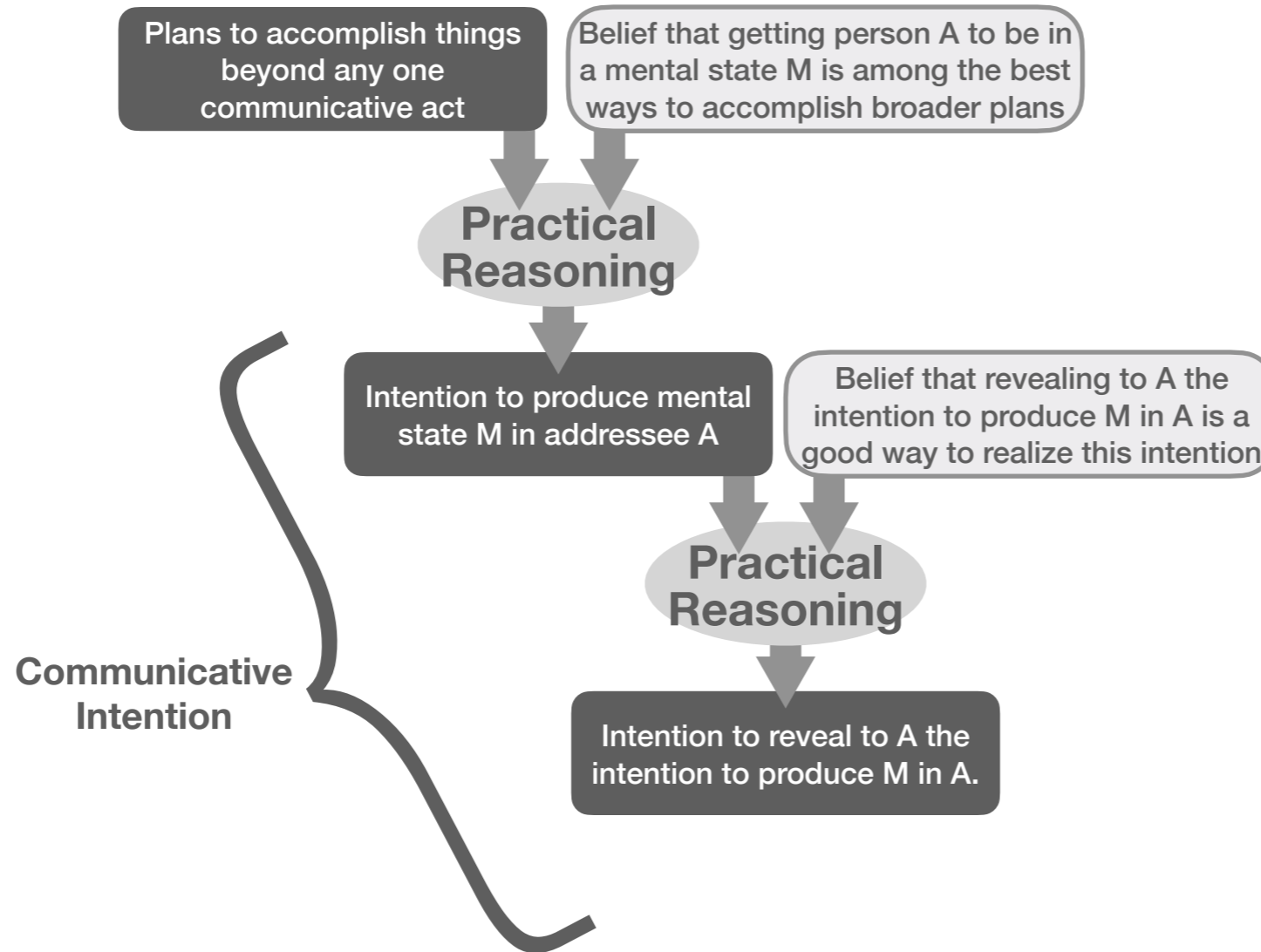




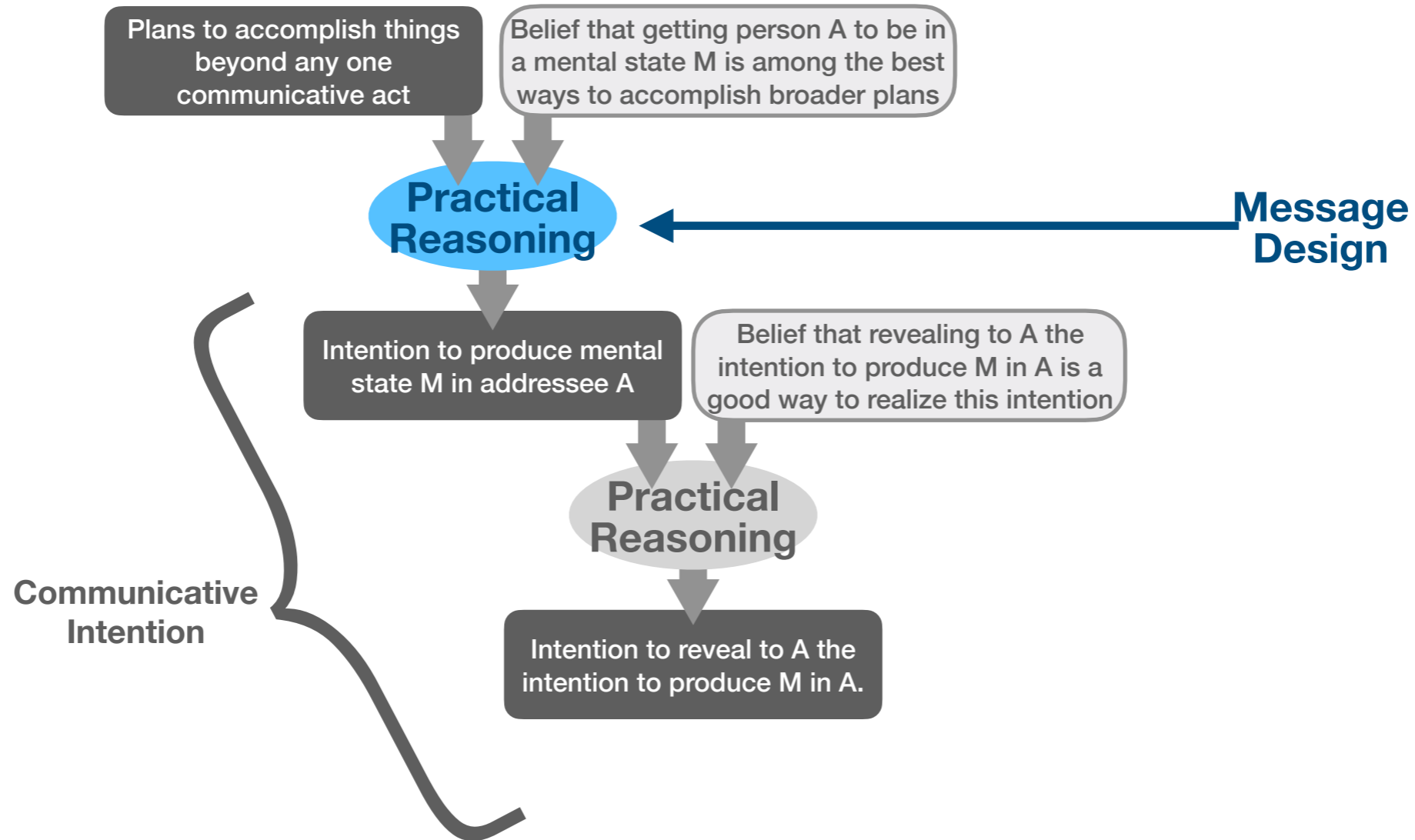
# Planning and Communicative Intentions



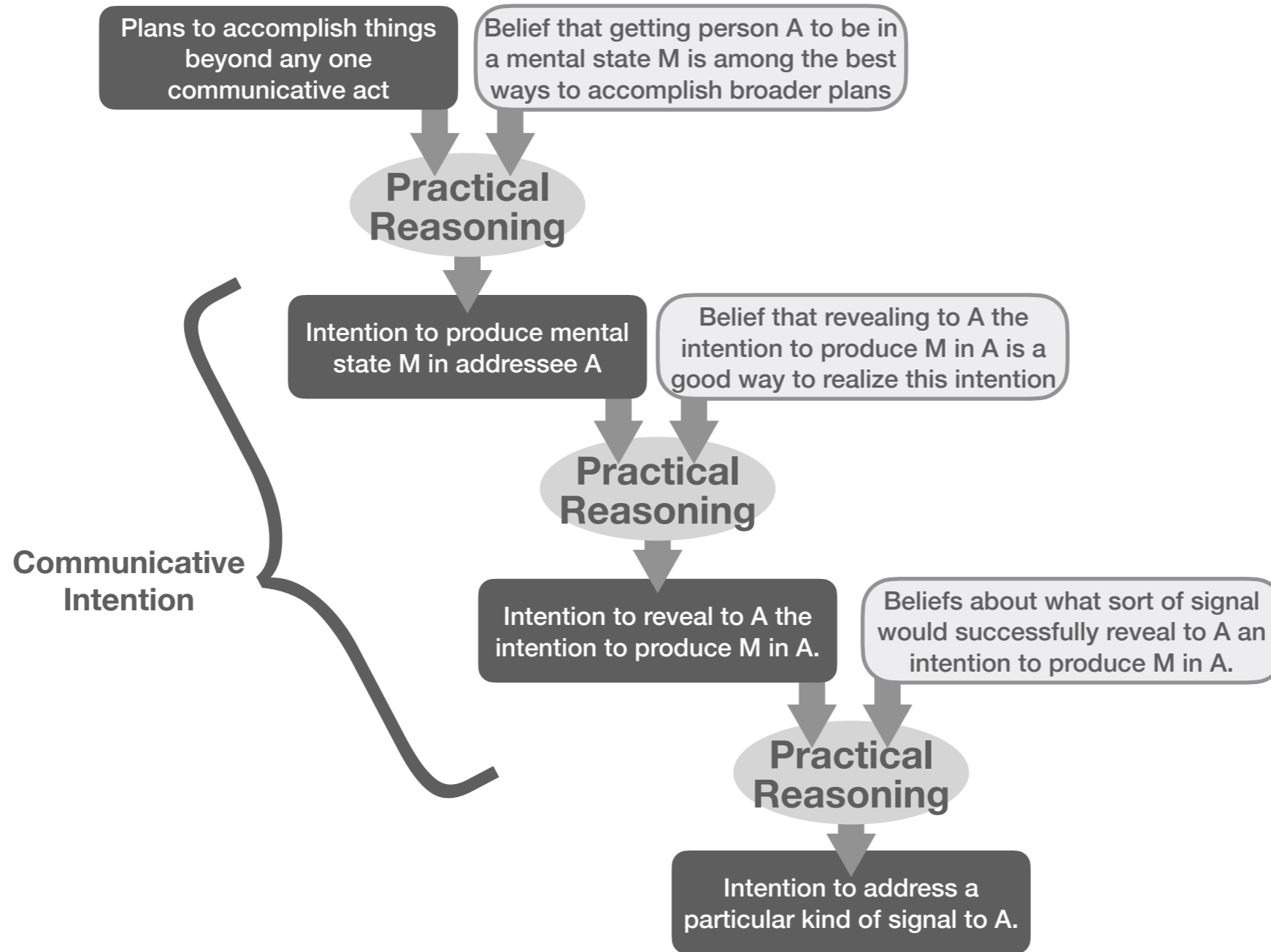
# Planning and Communicative Intentions



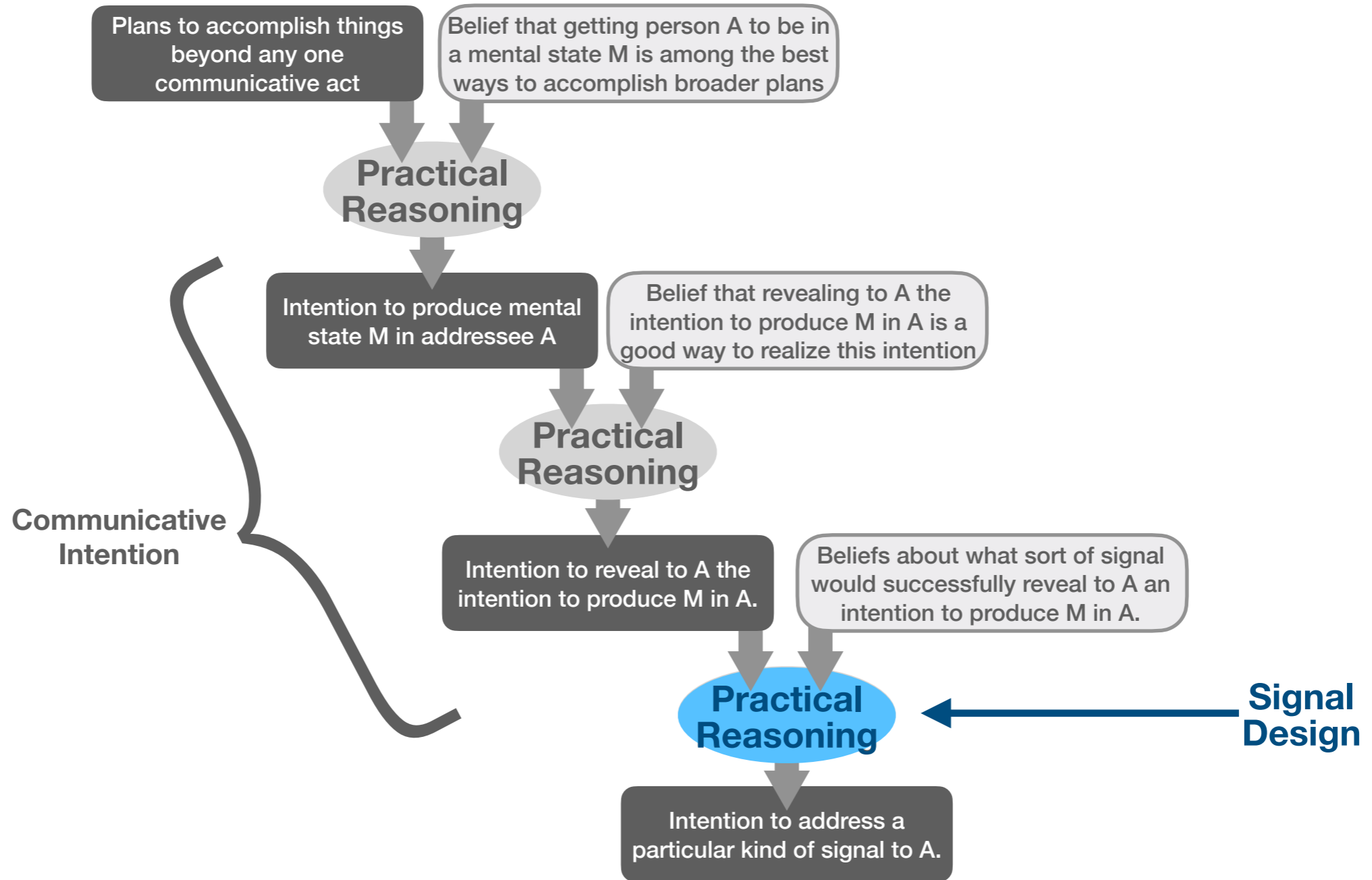
# Planning and Communicative Intentions

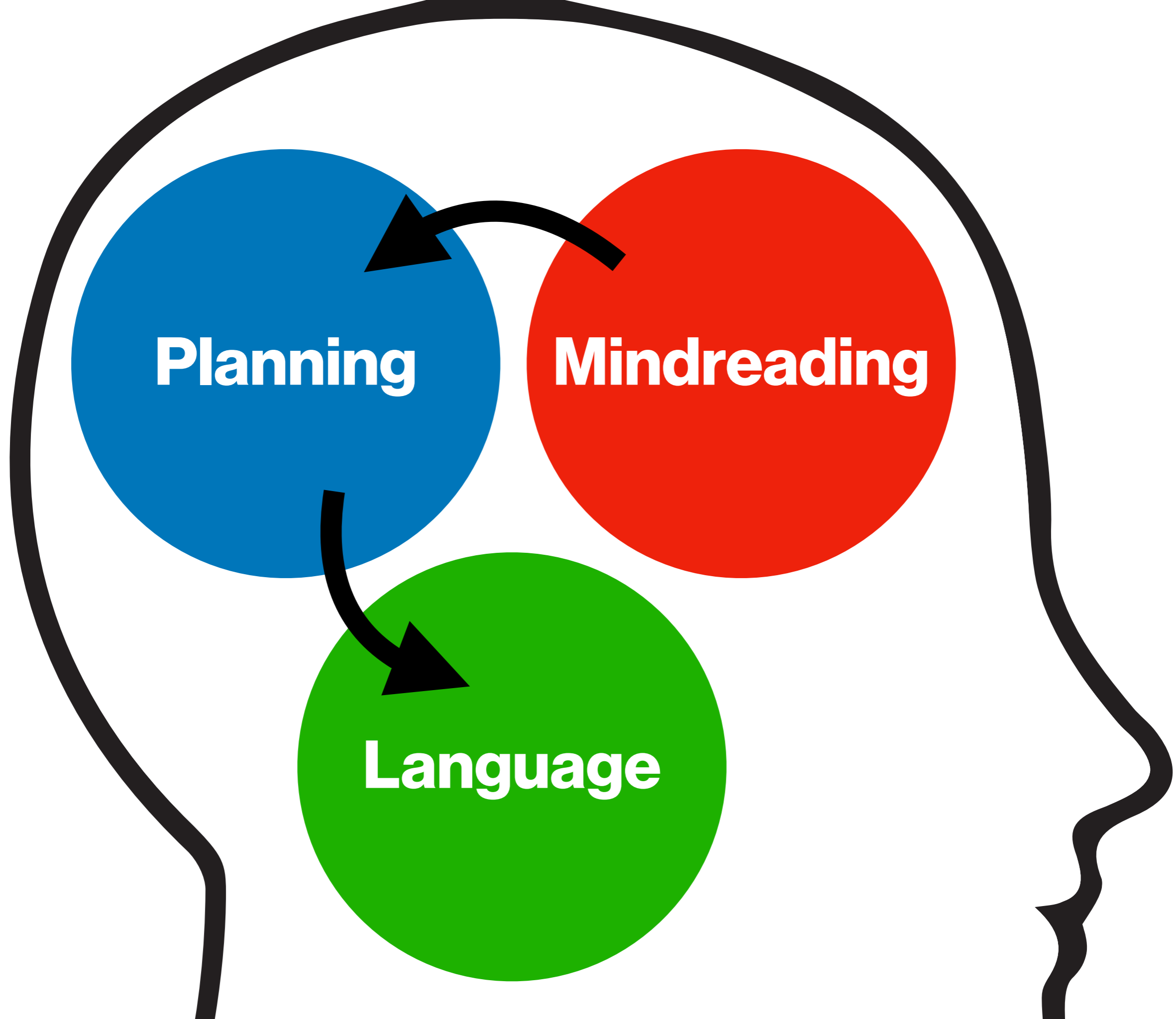


# Planning and Communicative Intentions



# Planning and Communicative Intentions





**Planning**

**Mindreading**

**Language**

# **Why Communicative Intentions?**

1. To explain communication design, we need to posit domain-general practical reasoning that bridges abstract goals and motor instructions.
2. The intermediate steps in practical reasoning are intentions.
3. There will be one such intention that first pairs a message to be communicated with an addressee:
  - Message design must culminate with such an intention.
  - Signal design must begin from such an intention.
4. This is (the first component of) a communicative intention.



## **Objection: Communication design as an add-on**

Maybe the basic case of communication doesn't involve communication design, and so doesn't involve intentions.

### **FIRST ALTERNATIVE**

Expressionism as the basic case: We go around expressing thoughts, and only start strategizing about addressees in special cases.

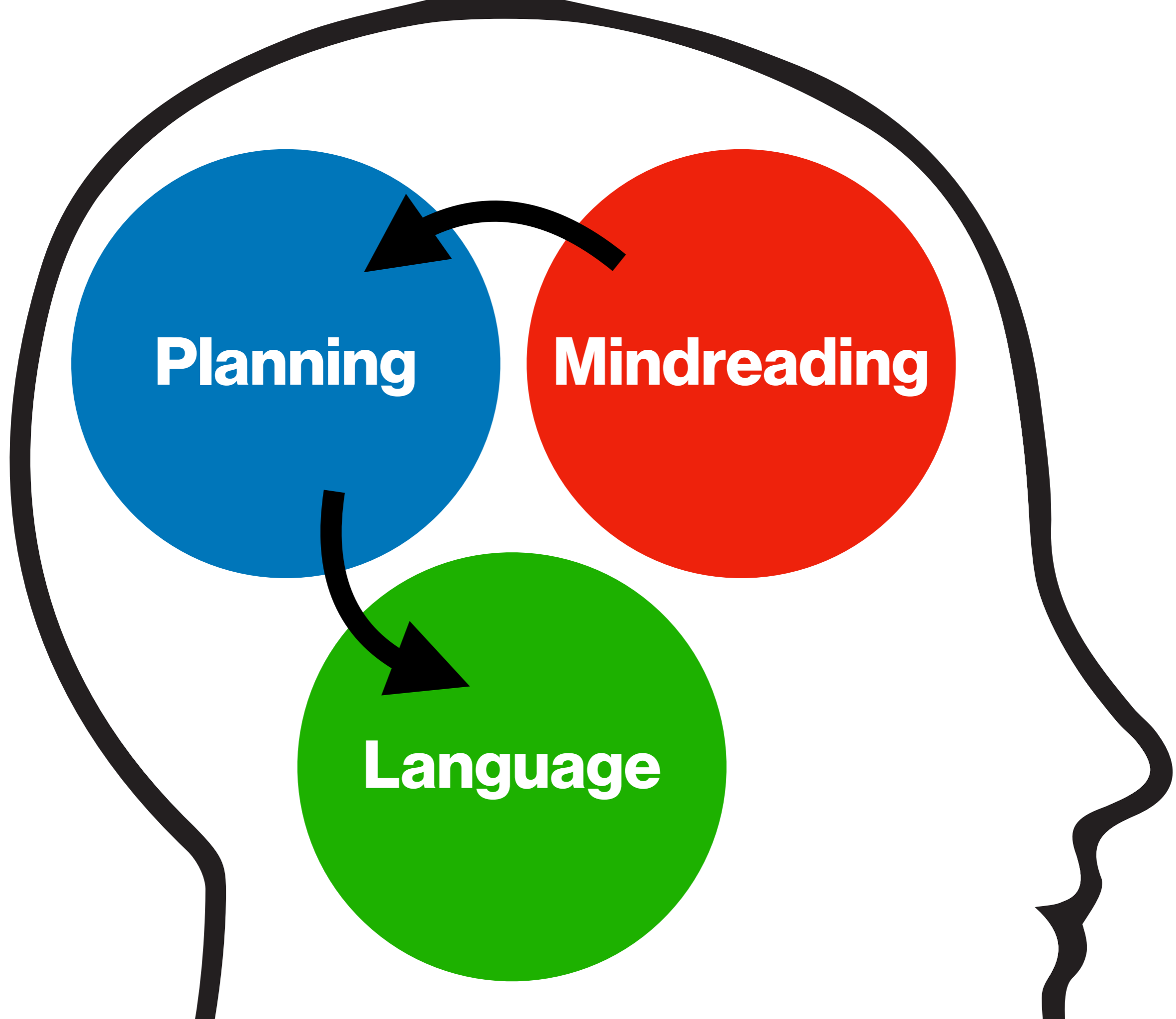
### **SECOND ALTERNATIVE**

Normally what drives us to communicate are subpersonal or nonconceptual motivational states. Intentions only play that role in special cases.

One motivation: fear of over-intellectualization.

(Introspection, children, apes, etc.)

**Do we really do this reasoning?**



**Planning**

**Mindreading**

**Language**

# Mindreading

Q: Do we really do all of this mindreading and practical reasoning in the course of a normal conversation?

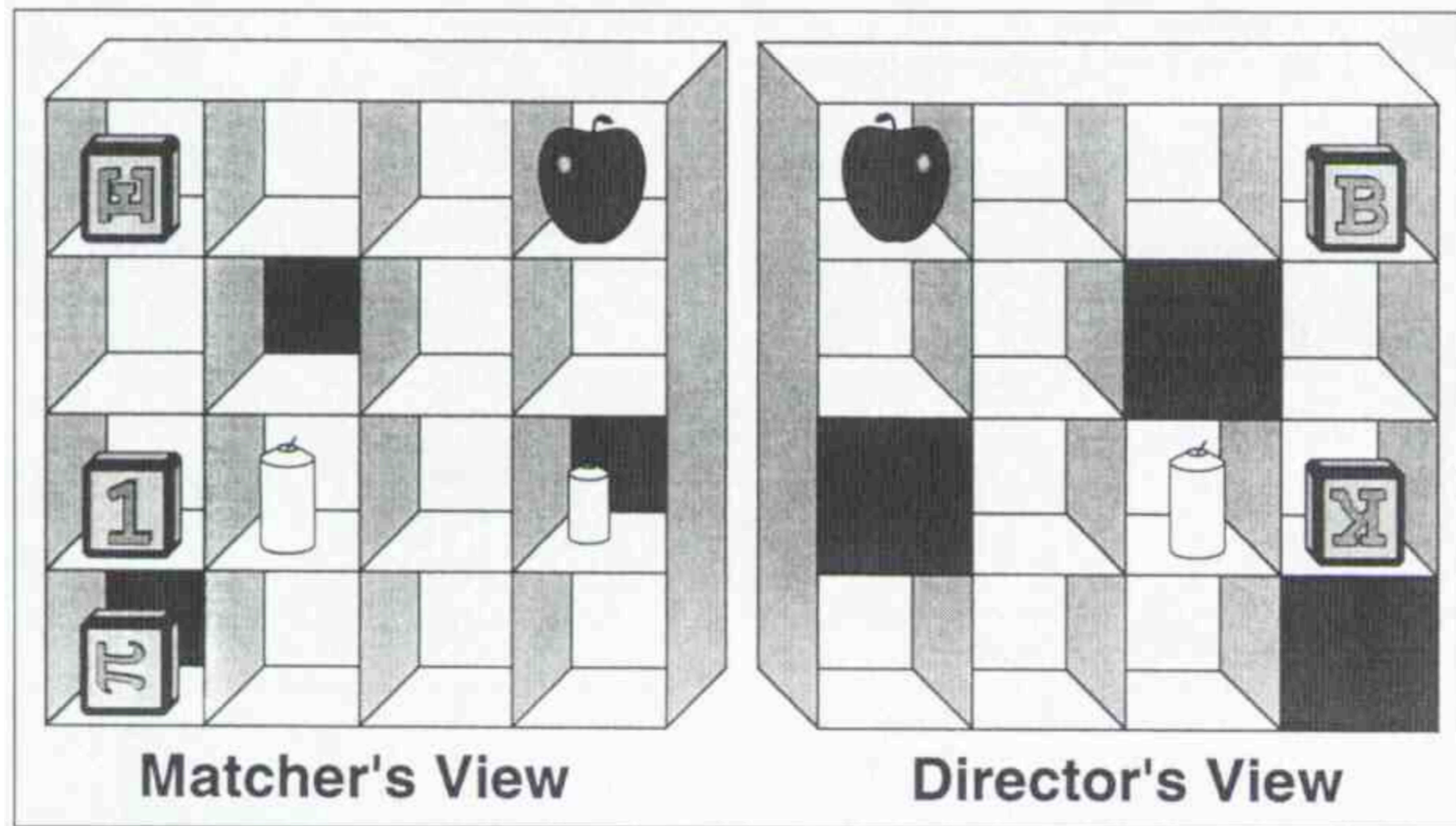
A: Yes!

...sometimes!

...it's complicated!

# The Director Task

Keysar, Barr, and Horton (1998): "The Egocentric Basis of Language Use: Insights From a Processing Approach,"



Director's instructions to Matcher:

"Put **the bottom block** below the apple."

If the Matcher moves the block marked **E**, then they have reasoned "egocentrically"—i.e., failed to account for the Director's perspective.

# The Anchor-and-Adjust Model

Speakers and hearers are often sensitive to others' perspectives.

But not always. Some patterns:

- cognitive load → more egocentric (Keysar 2008)
- Verbal-working-memory deficit → more egocentric (Lin et al 2010)
- Happier → more egocentric (Converse et al 2008)
- Younger children → more egocentric (Keysar 2008)
- Eye tracking studies: everyone is at least partly egocentric at first (Keysar et al 1998)

## **Theory:**

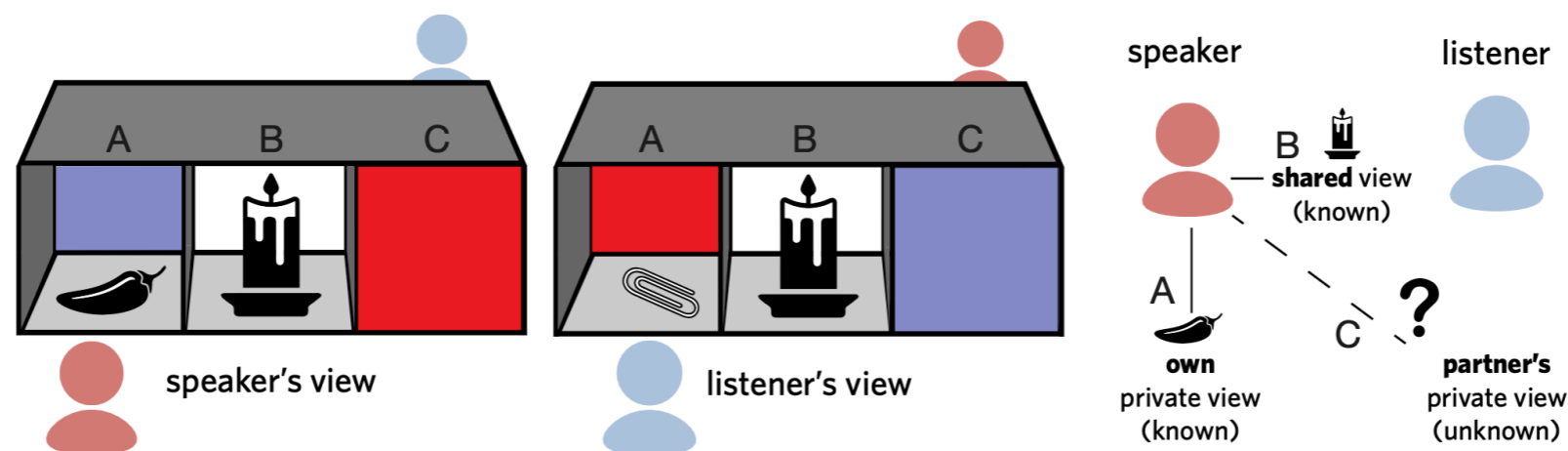
We anchor to our own perspective, and adjust away if we have enough cognitive resources.  
(Keysar 2007; Barr 2014; Epley et al 2004)

# The Resource-Rational Model

- Eye-tracking studies: Subjects consider both their own and others' perspectives, even early in processing (Nadig & Sedivy 2002; Heller et al 2008, etc.)
- Speakers compensate for uncertainty about addressees' perspective by using more informative descriptions (Hawkins et al 2021)
- Subjects who encounter egocentric interlocutors repeatedly learn to invest more effort in later interactions (Hawkins et al 2021)

## Theory:

We reason not only about others' states of mind, but also about how likely they are to be thinking about our states of mind, and about how much effort will be worth putting into this reasoning. (Hawkins et al 2021)



# **Communication Design and Natural-Language Design**



**Natural languages have evolved to be used by communication designers**

# **Natural languages have evolved to be used by communication designers**

Noun-phrase systems

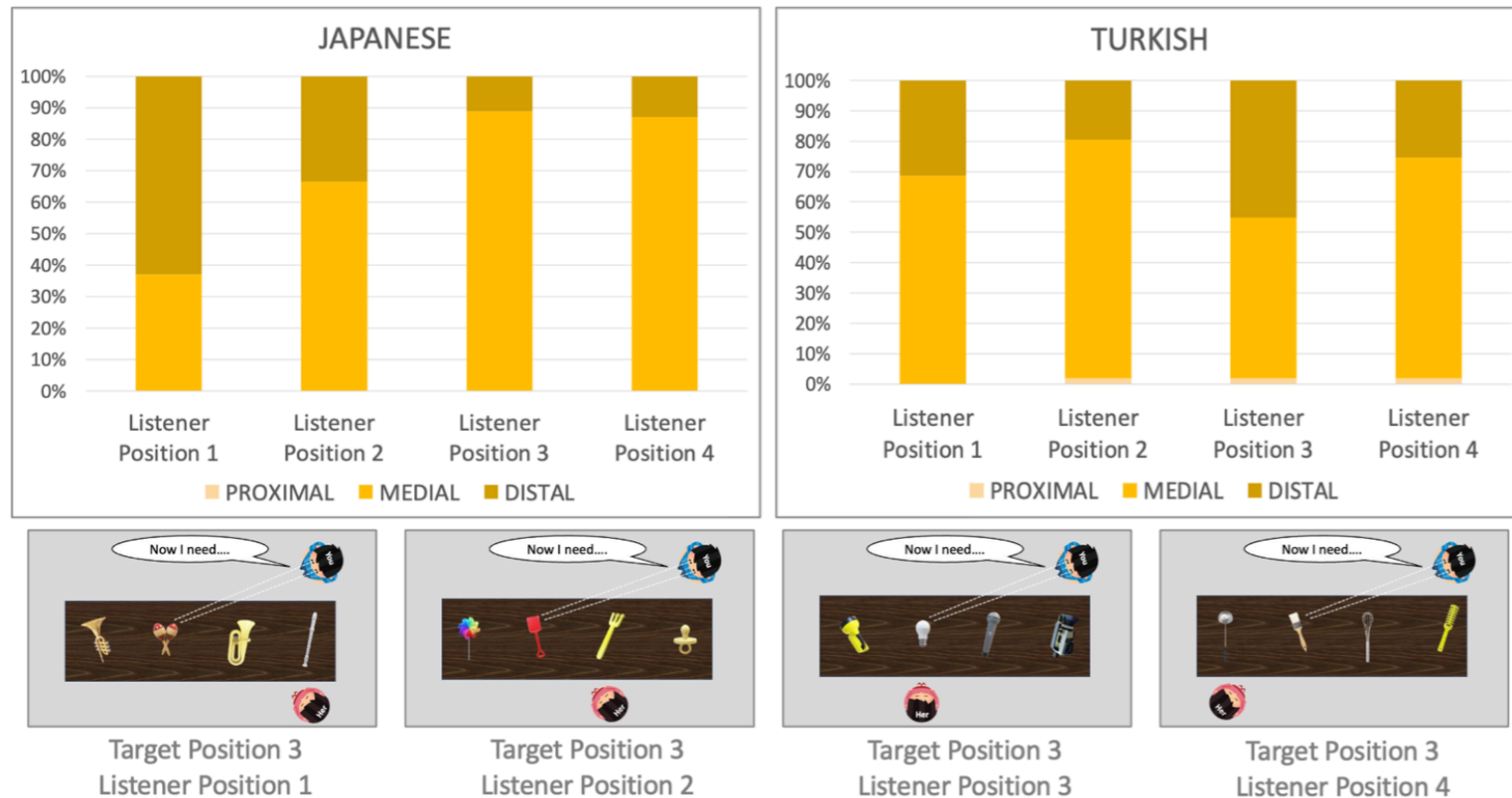


Fig. 1: Average demonstrative choice in four randomized trials performed by native speakers of Japanese and Turkish in an online task. The four displays at the bottom are the images that participants saw in each trial (with the speech bubble appearing in the language of test). The target object was in Position 3 in all four trials (counting from the speaker's position on the top right), while the listener's position varied across trials. Results reveal that Japanese speakers preferred the distal demonstrative when the target was far away from both interlocutors, but as the listener got closer to the target, they selected the medial form more frequently. By contrast, Turkish speakers did not show sensitivity to the listener's position in their demonstrative choice.

**Paula Rubio-Fernandez** on  
 “person-oriented” vs.  
 “distance-oriented”  
 demonstrative systems

from “Cultural evolutionary pragmatics: Investigating the co-evolution of language and social cognition” (ms)



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him



# **Natural languages have evolved to be used by communication designers**

Noun-phrase systems

Semantic Underspecification

Context sensitive expressions

Polysemy

Lexical variation and specialization

## **Objection: Children use language!**

Yes, but they are not proficient language users.

In particular, they are bad at communication design, and bad at using the parts of language that depend on it.

Compare: A child riding a bicycle who doesn't know how to use the breaks yet.

## Conclusions

Our capacity for communication design is an important part of what allows us to communicate and use language in the ways we do.

This capacity relies on our domain-general capacities for practical reasoning and mindreading.

This gives us a reason to posit communicative intentions beyond Grice's ordinary-language considerations.

**Thanks**