Cognition: Methods and Models

PSYC 2040

L11: Social Cognition

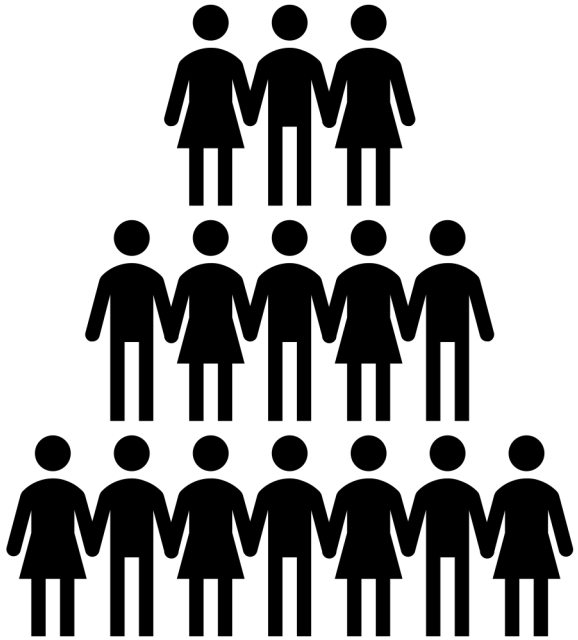
Part 1

recap: Apr 25, 2023

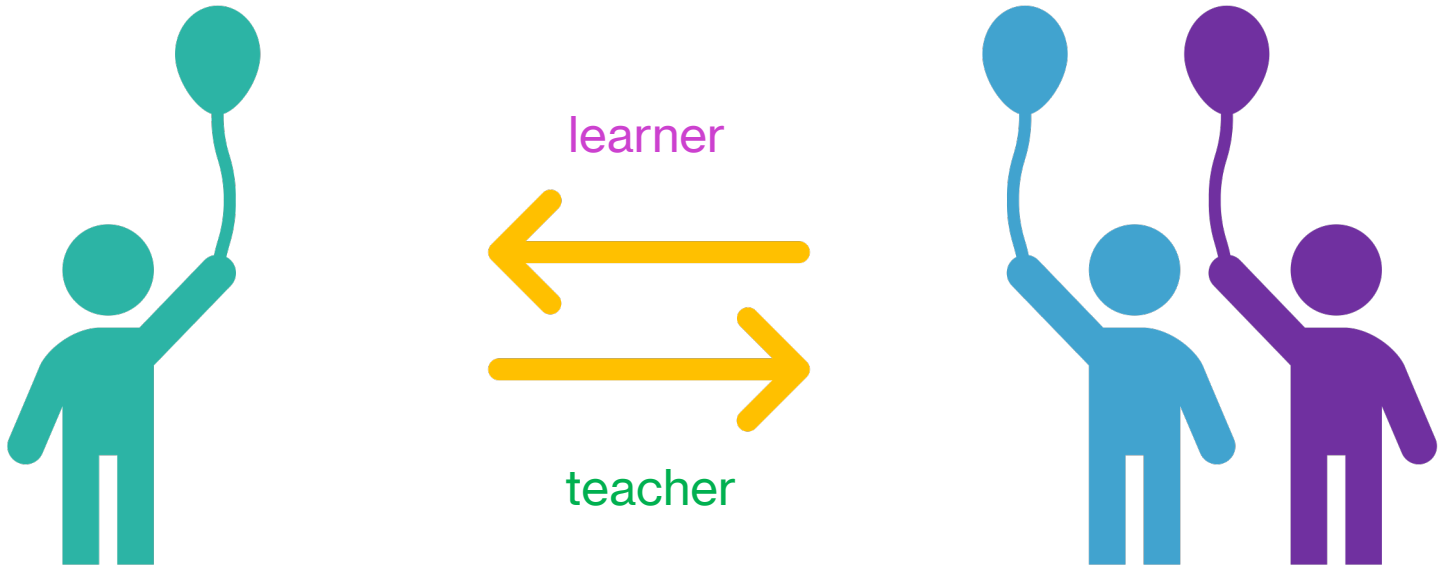
- what we covered:
  - social cognition mechanisms: imitation
  - logic of pragmatic inference (recursive thinking)
- your to-dos were:
  - *work on:* project milestone #3
  - *post*: conceptual question

key questions in social cognition

- social cognition is a field that studies how people process, store, and retrieve information in social contexts
- many questions:
  - how do we learn from others?
  - how do we interpret communicative signals?
  - how do we teach?
  - how do we collaborate/compete/cooperate?
- mechanisms: imitation vs. inference

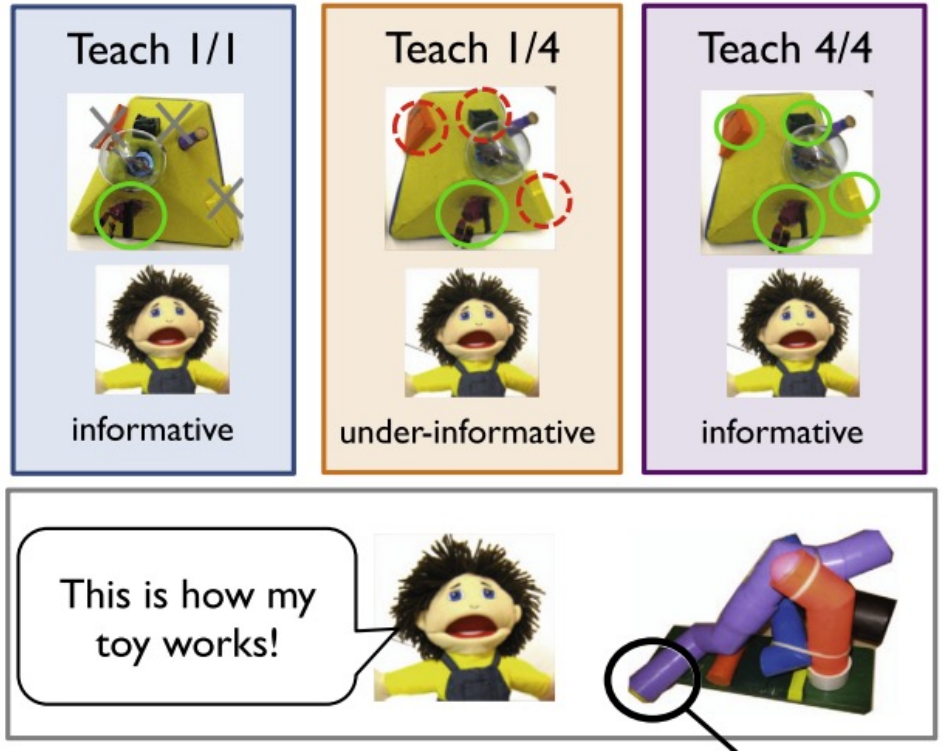


social learning as inference



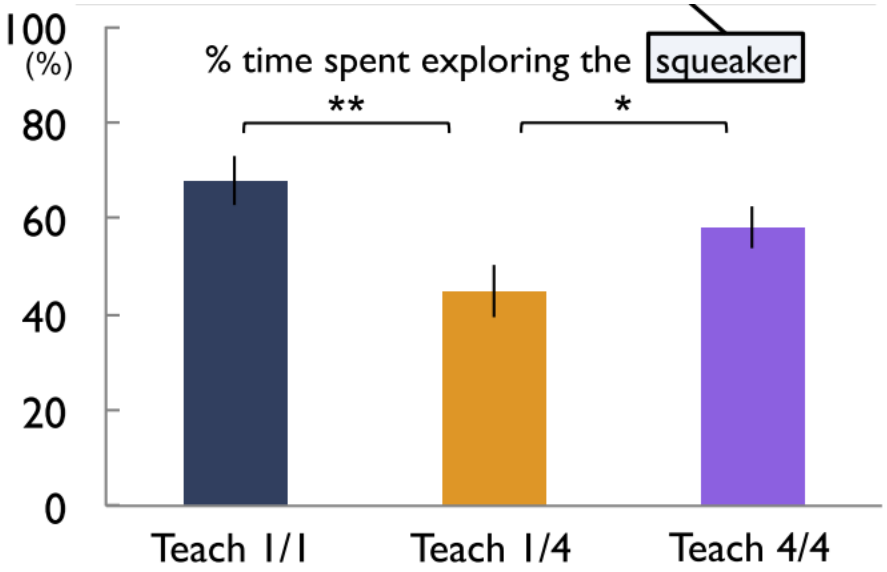
child as learner: evaluating evidence

- Gweon et al. (2014) evaluated whether children (6-7yo) can evaluate and compensate for under-informative teaching
- teacher first provided under-informative or fully-informative demonstrations of a toy, and then demonstrate one function of a new toy
- recorded time spent exploring the squeaker part of the toy

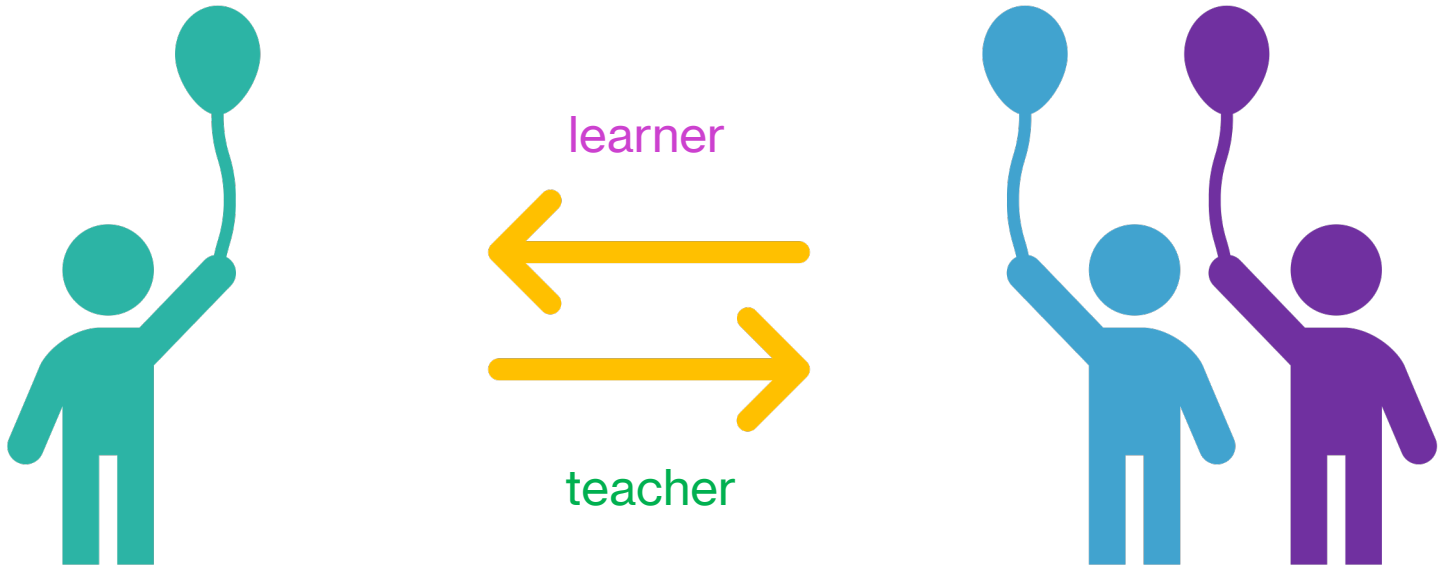


child as learner: evaluating evidence

- children spent less time on the squeaker and more time on other parts when the teacher was under-informative, vs. when the teacher was fully-informative
- children engaged in compensatory exploration (non-squeaker parts) when they doubted the informativeness of a teacher



social learning as inference

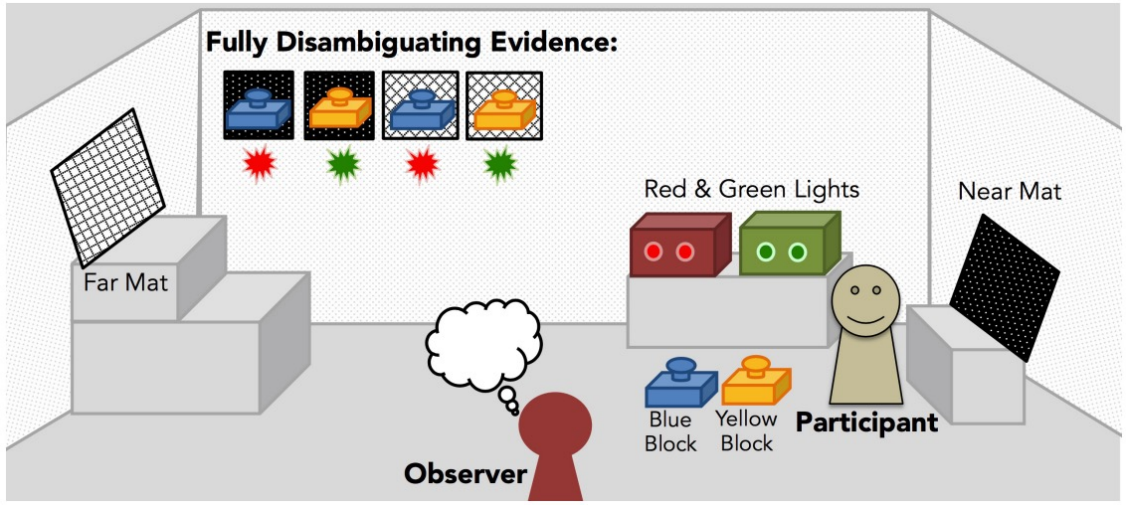


activity

- groups of 3
  - truth-teller (earliest birthday)
  - demonstrator
  - naive agent (latest birthday)
- truth-teller will moderate the experiment
  - truth-teller spreadsheet
  - I will debrief the truth tellers
- naive agents should sit together for phase 1 and join their groups only when the truth-teller calls them

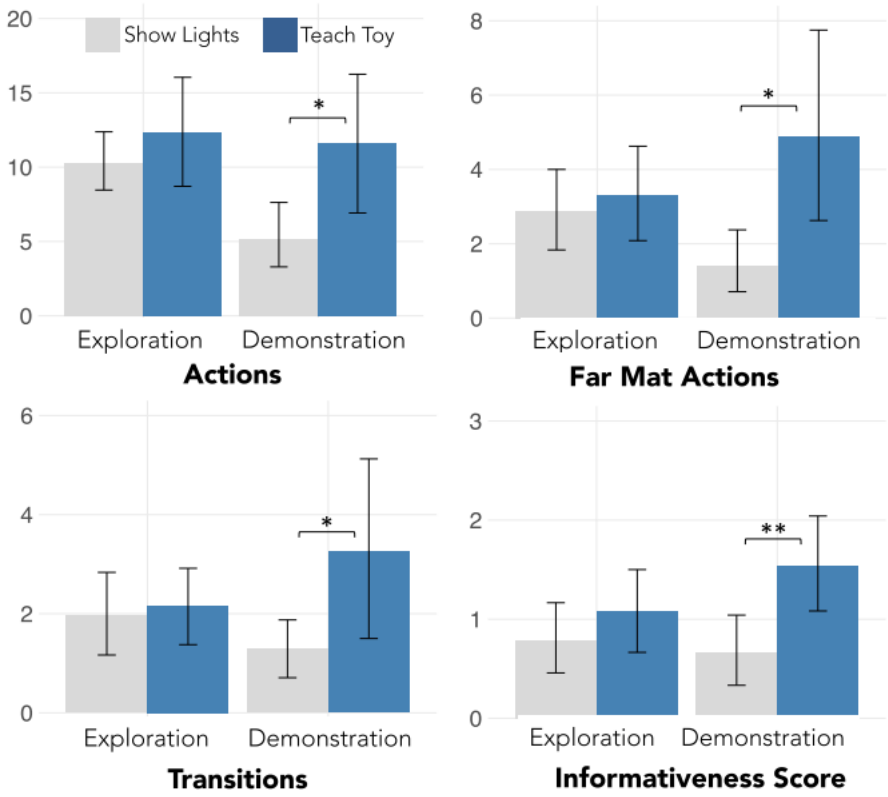
child as teacher: inferring mental states

- Gweon and Schulz (2018) presented 4-to-7-year-olds with a causally ambiguous toy and then demonstrated the toy to a naïve agent
  - one causal variable (block color) is relevant whereas other (mat color) is not relevant to the red/green lights
  - naive agent wants to see the effect generated (Show Lights) or understand how the toy works (Teach Toy)
- actions, far mat actions, transitions, and informativeness (first four actions) was measured



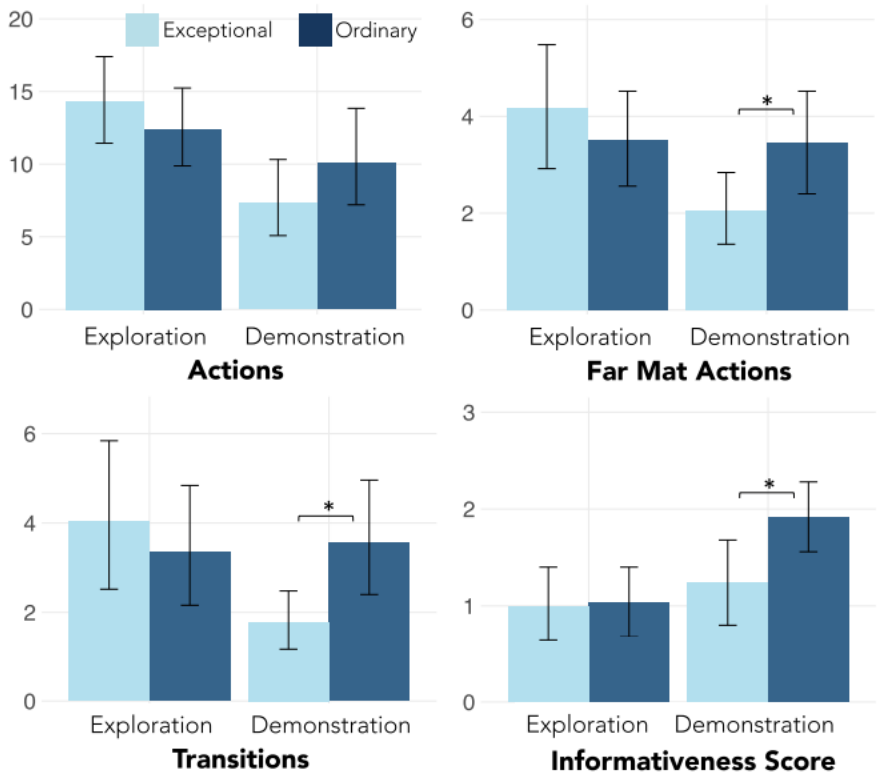
child as teacher: inferring mental states

- no differences during exploration phase
- children in the Teach Toy condition produced more actions, more far mat actions, more transitions compared to the Show Lights condition



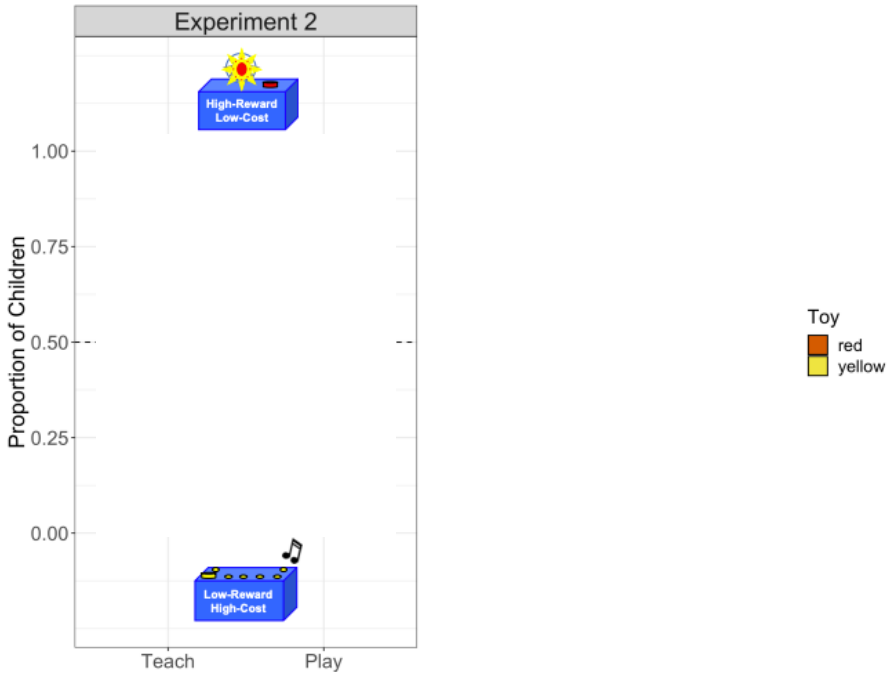
child as teacher: inferring mental states

- experiment 2: children were asked to teach the observer (exceptional or ordinary)
- children did more actions and transitions for ordinary agents and were more informative early on for the ordinary agents
- inference: children can flexibly adjust evidence based on the observer's goals and competence



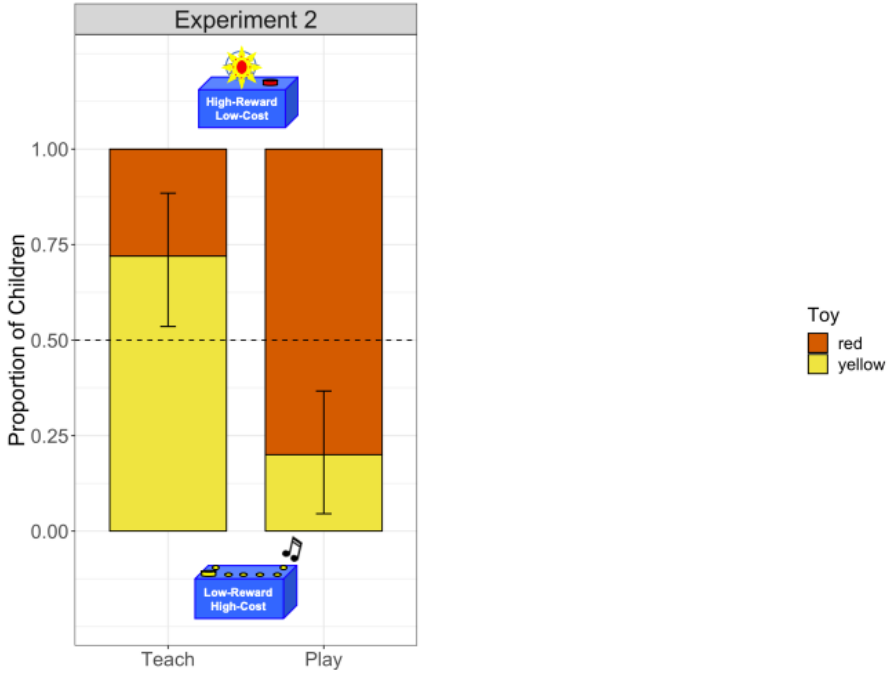
child as teacher: inferring utilities

- Bridgers, Jara-Ettinger, and Gweon (2020) tested 5–7-year-olds with toys
  - low/high cost
  - low/high reward
- experiment 2: choose a toy to teach or play



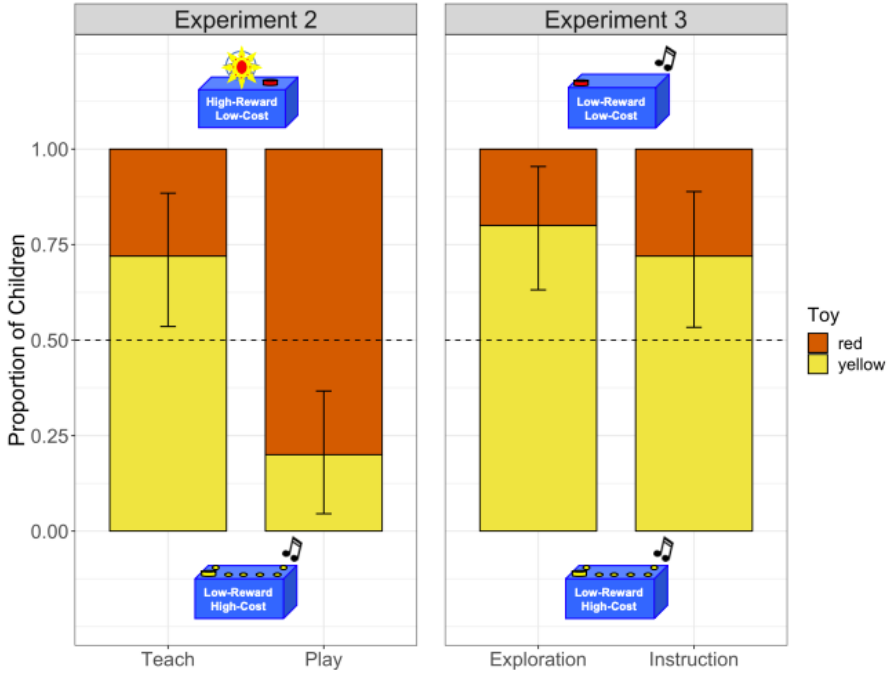
child as teacher: inferring utilities

- Bridgers, Jara-Ettinger, and Gweon (2020) tested 5–7-year-olds with toys
  - low/high cost
  - low/high reward
- experiment 2: choose a toy to teach or play
- children chose low-reward/high-cost toys to teach and high-reward/low-cost toys to play with
- children prioritized the learner's utilities over their own when deciding what to teach



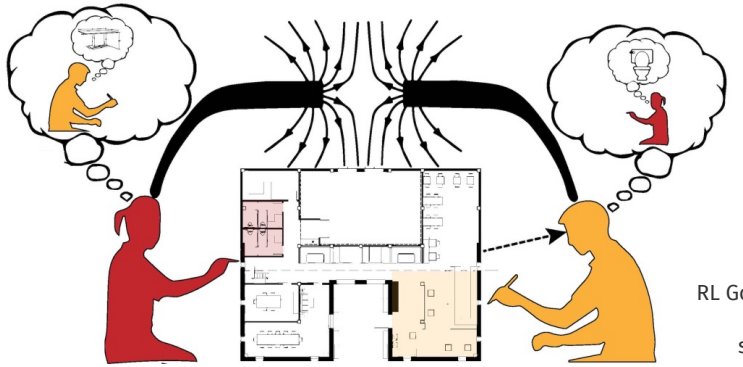
child as teacher: inferring utilities

- experiment 3: choose a toy to teach after exploration or instruction
- children chose low-reward/high-cost toys regardless of whether or not they explored the toys themselves or not
- children can infer the costs for others' learnings even in the absence of direct experience

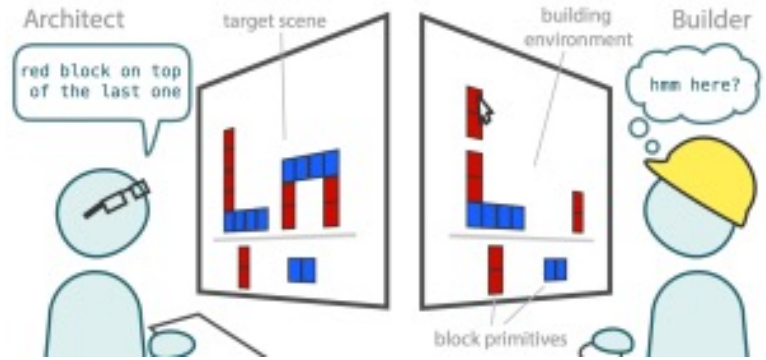


from children to adults

- social inference is a thriving area of research in computational cognitive science
- researchers combine developmental + adult human studies with explicit mathematical models to account for a wide variety of cognitive phenomena



RL Goldstone, E Andrade-Lotero, RD Hawkins, ME Roberts (2023). The emergence of specialized roles within groups. *Topics in Cognitive Science.*

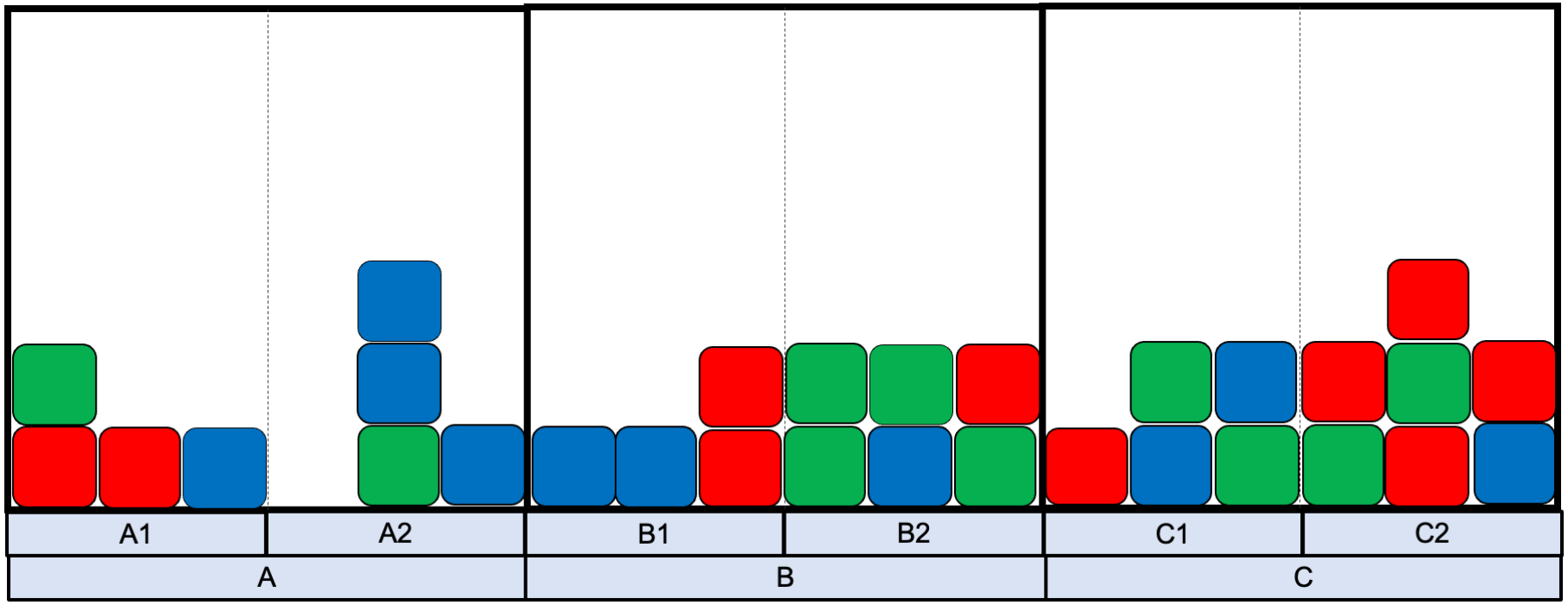


W McCarthy*, RD Hawkins*, C Holdaway, H Wang, J Fan (2021). Learning to communicate about shared procedural abstractions. *Proceedings of the 43rd Annual Conference of the Cognitive Science Society.*

helping

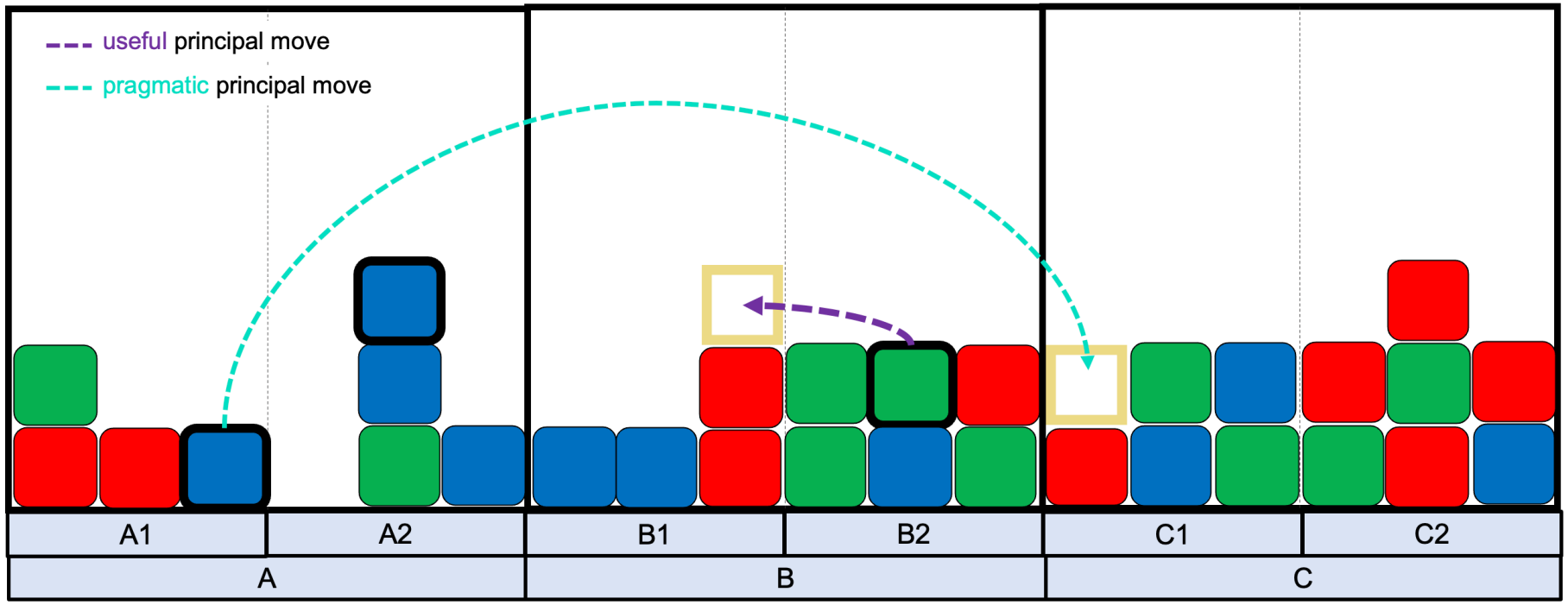
- helping has inherently cognitive roots
- infants (and animals) appear to help without any extrinsic reward
- what cognitive mechanisms underlie wanting help or being helped?

goal: move blue blocks to room C



Kumar and Steyvers (2023). *Proceedings of the 44th Annual Conference of the Cognitive Science Society.*

goal: move blue blocks to room C



Kumar and Steyvers (2023). *Proceedings of the 44th Annual Conference of the Cognitive Science Society.*

inference = recursive thinking

ground truth

	blue square	blue circle	green square
blue	1	1	0
circle	0	1	0
square	1	0	1
green	0	0	1

literal listener

	blue square	blue circle	green square
blue	0.5	0.5	0
circle	0	1	0
square	0.5	0	0.5
green	0	0	1

pragmatic speaker

	blue square	blue circle	green square
blue	0.5	0.33	0
circle	0	0.67	0
square	0.5	0	0.33
green	0	0	0.67

pragmatic listener

	blue square	blue circle	green square
blue	0.60	0.40	0
circle	0	1	0
square	0.60	0	0.40
green	0	0	1

Frank and Goodman (2012)

helping as inference

ground truth

	goal 1	goal 2	goal 3
move 1	0	0	1
move 2	1	1	0
move 3	0	1	0
move 4	1	0	1

literal architect

	goal 1	goal 2	goal 3
move 1	0	0	1
move 2	0.5	0.5	0
move 3	0	1	0
move 4	0.5	0	0.5

pragmatic helper

	goal 1	goal 2	goal 3
move 1	0	0	0.67
move 2	0.5	0.33	0
move 3	0	0.67	0
move 4	0.5	0	0.33

pragmatic architect

	goal 1	goal 2	goal 3
move 1	0	0	1
move 2	0.60	0.40	0
move 3	0	1	0
move 4	0.60	0	0.40

Kumar and Steyvers (2023). *Proceedings of the 44th Annual Conference of the Cognitive Science Society.*

big takeaways

- get in groups of 3 and report key takeaways from today
- takeaways document

next class

- **before** class:
  - *finish:* L11 quiz/assignments
  - *submit*: project milestone #5
  - *do*: practice assessment 2
- **during** class:
  - judgment & decision-making
  - L7-L11 review