

Imitation versus Innovation: Cultural Evolution, Life History and LLM's

Alison Gopnik, APS Presidential Column

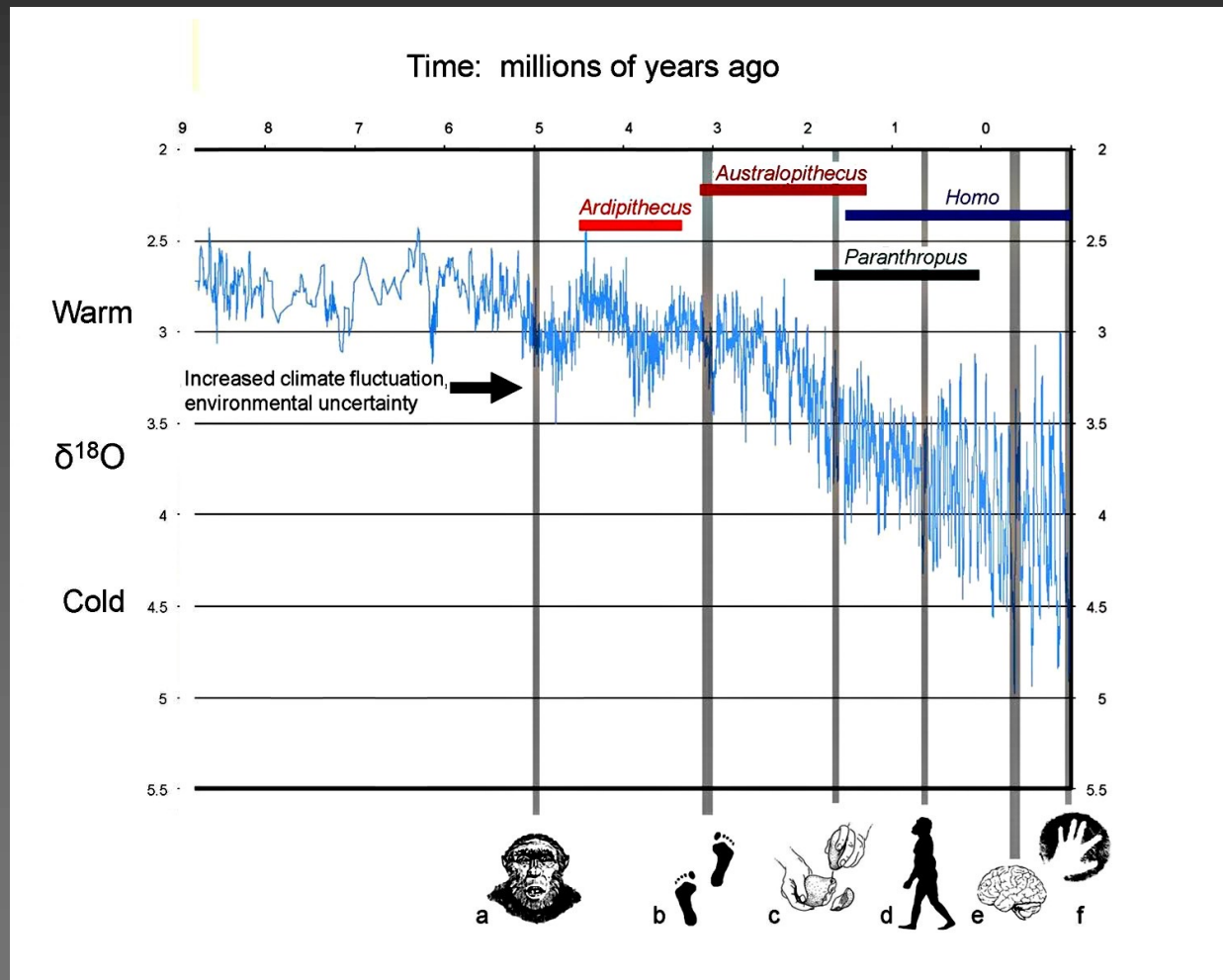
<https://www.psychologicalscience.org/observer/children-creativity-intelligence>

Yiu, Kosoy and Gopnik "Transmission vs Truth: Imitation versus Innovation: What children can do that large language and language-and-vision models cannot (yet)?." Perspectives in Psychological Science.

The Cultural Niche: Boyd & Richerson, Henrich



The Cultural Niche and the Non-stationary Environment



The Intelligent Agent View of LLMs: Genius or Golem



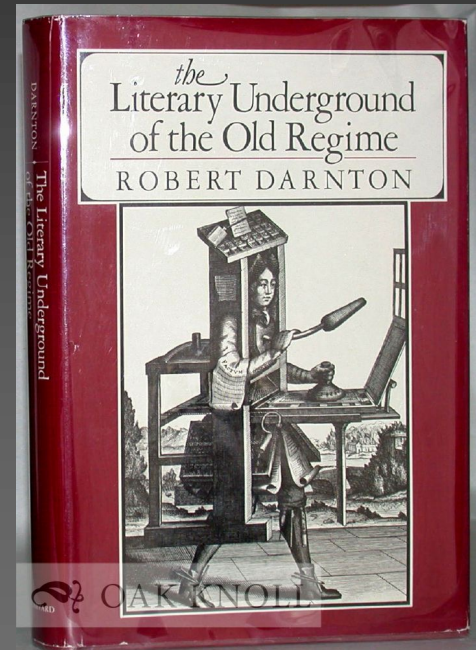
Large Models as Cultural Technologies

- Language
- Pictures
- Writing
- Print
- Libraries
- Internet Search
- Wikipedia

The Good and Bad of Writing - Socrates

- You know, Phaedrus, that is the strange thing about writing, which makes it truly correspond to painting. The painter's products stand before us as though they were alive. But if you question them, they maintain a most majestic silence. It is the same with written words. They seem to talk to you as though they were intelligent, but if you ask them anything about what they say from a desire to be instructed they go on telling just the same thing forever.

The Good and Bad of Print



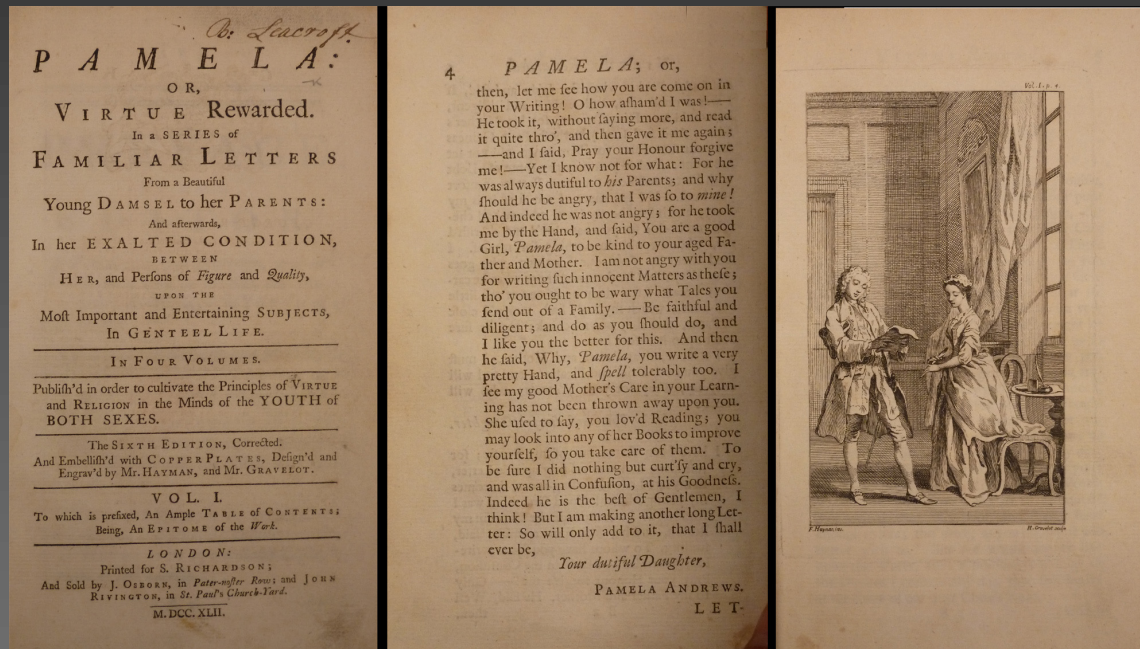
Fictional Agents: Campfire Stories



Fictional Agents: Greek Gods



Fictional Agents: The Novel



Norms, Rules, Regulations and Laws

Truthfulness Norms

Testimony Under Oath

Editors

Journalism Schools

Fact-Checkers

Libel Laws

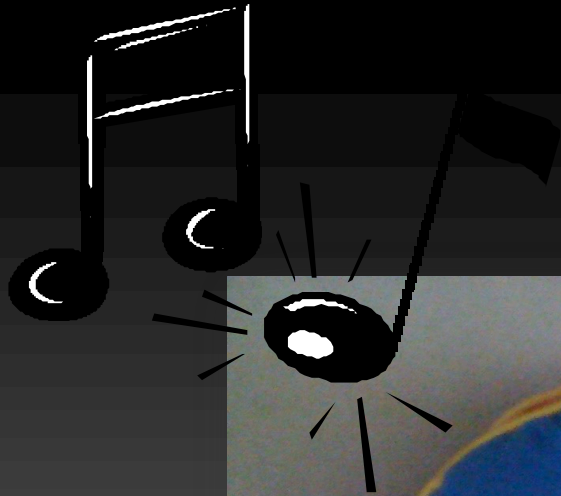
Imitation Versus Innovation: Cultural Evolution and Life History

Social Learning

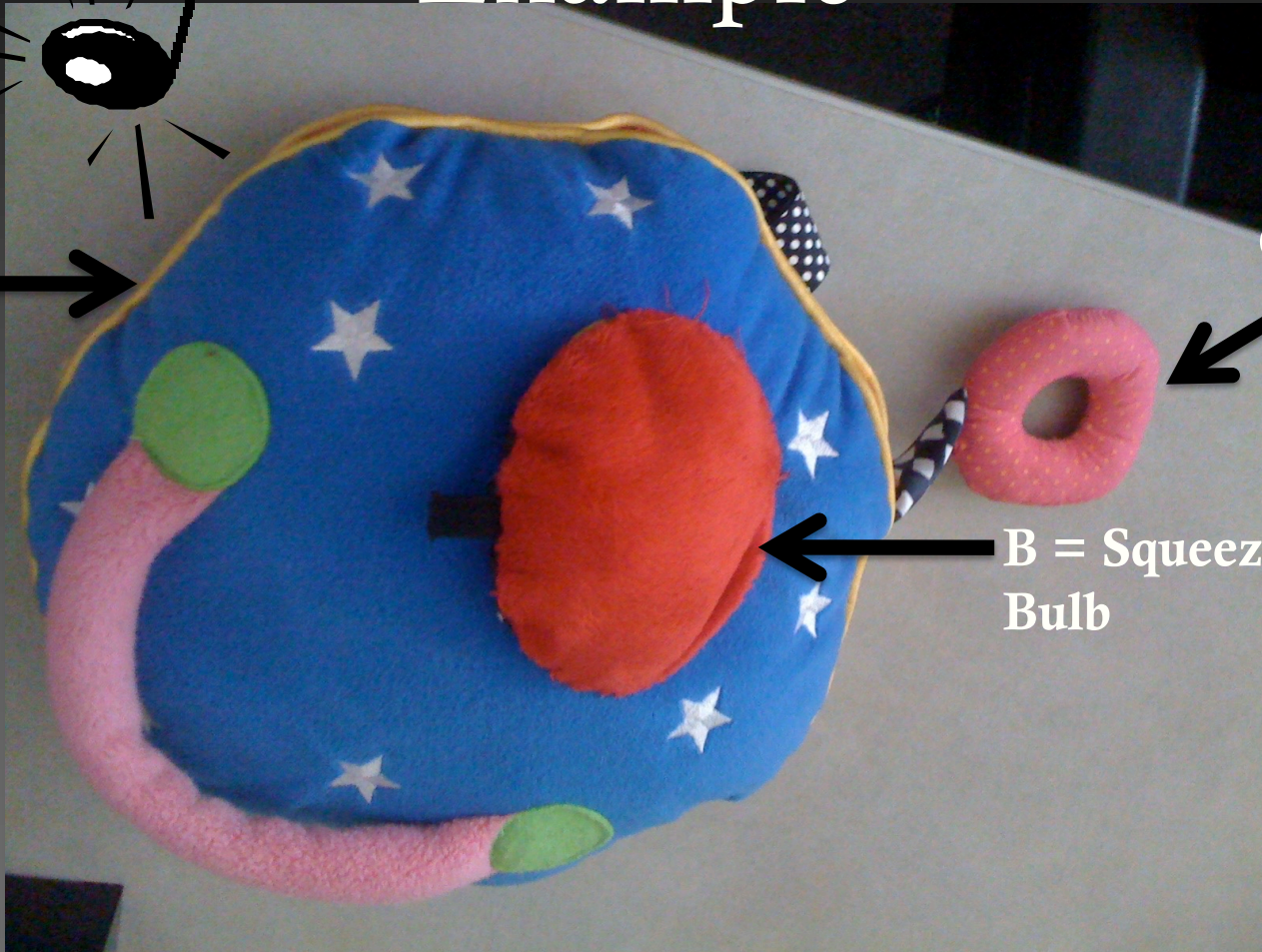
- Buchsbaum, Gopnik, Griffiths and Shafto, Cognition, 2011



Example



A =
Squish Toy

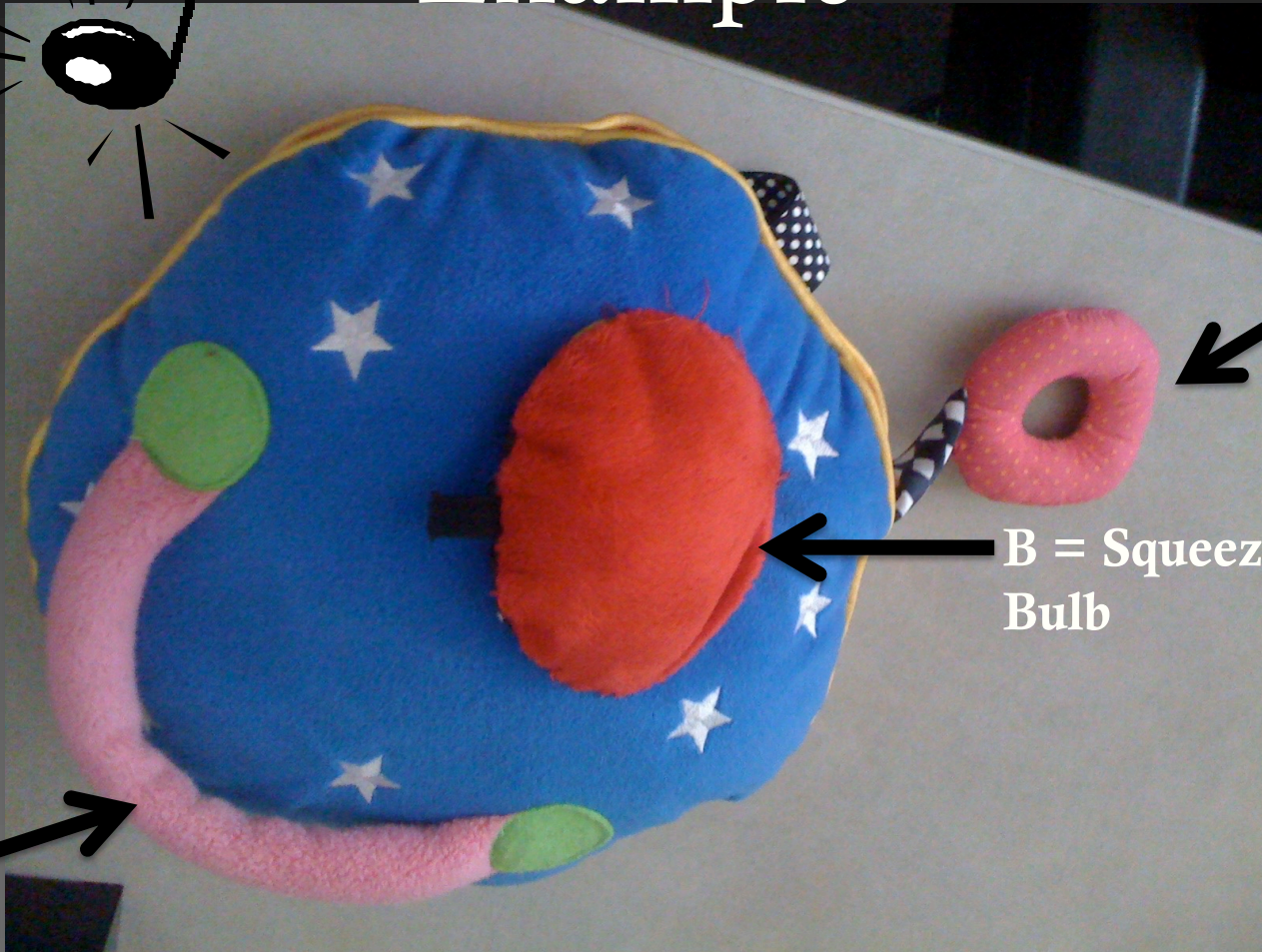
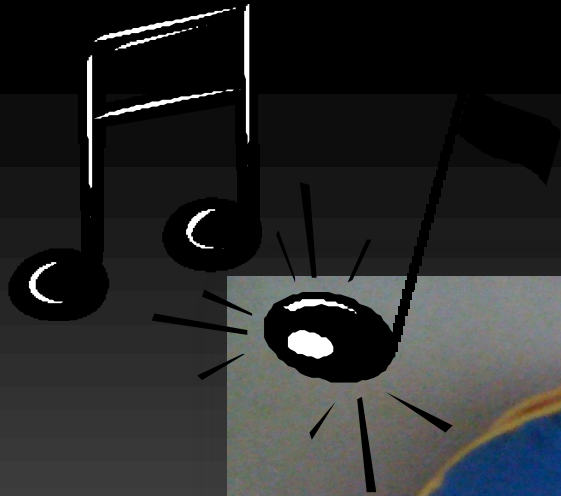


C = Pull Ring

B = Squeeze
Bulb

How do you make it play music?

Example



C = Pull Ring

B = Squeeze Bulb

D = Pull Handle

How do you make it play music?

Evidence Patterns

**“ABC”
Condition**

ABC+

DEC

ABC+

EDC

ABC+

- Individual actions shown an equal number of times in all conditions
- Different causal relationships





Pedagogical Demonstrator

“BC”
Condition

ABC+

ADC

DBC+

AEC

EBC+

- Same demonstrations as naive BC condition
- Children are told experimenter knows how the toy works and is showing them

Multiple Intelligences Trading-off in Development

- There is no such thing as General Intelligence, Natural or Artificial.
- Exploitation_ Adults
- Exploration - Children
- Care/Teaching- Elders

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

BIOLOGICAL SCIENCES

COMING SOON

**Life history and learning: how childhood,
caregiving and old age shape cognition and
culture in humans and other animals**

A theme issue compiled and edited by Alison Gopnik,
Willem E Frankenhuis and Michael Tomasello

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Image credit: Ilaria Pretelli



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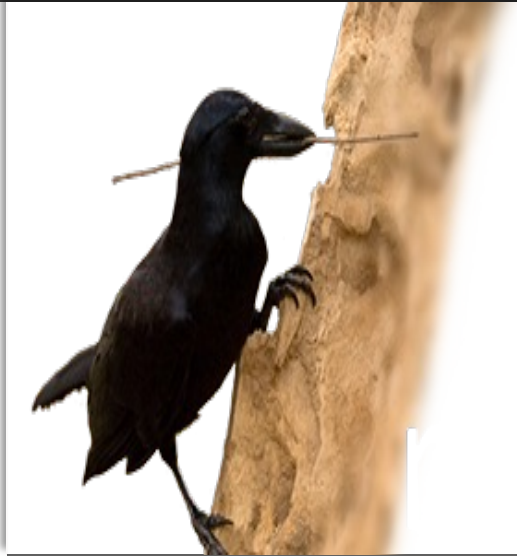
Life History and The Evolution of Childhood



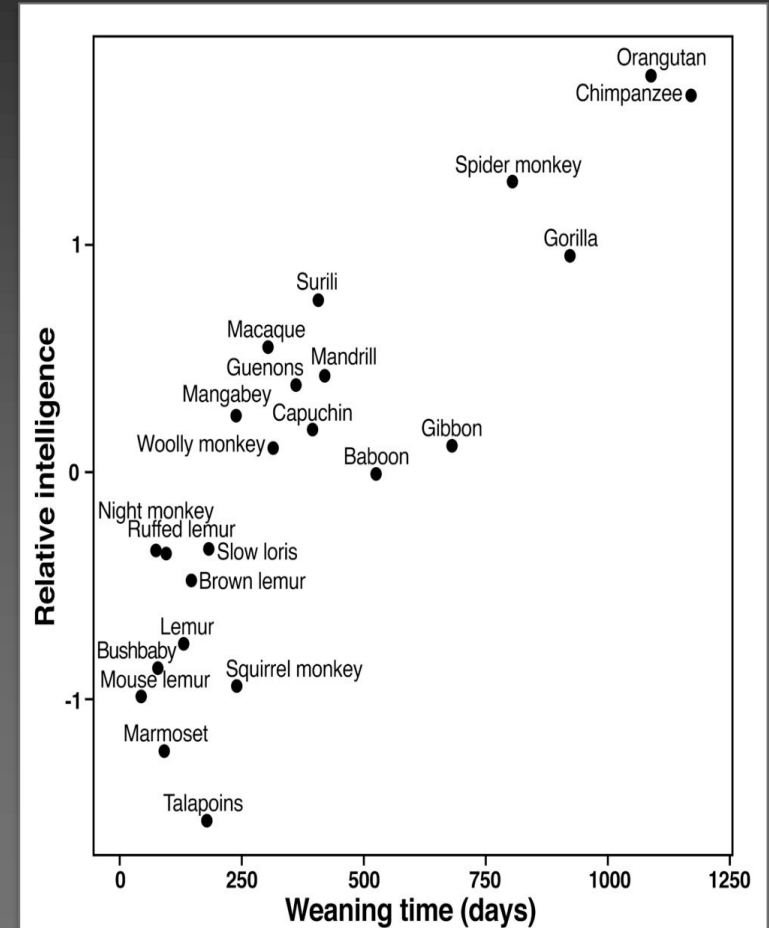
The period of immaturity is correlated with intelligence, relative brain size, and flexibility across species.



Reaches maturity in approximately 2 weeks

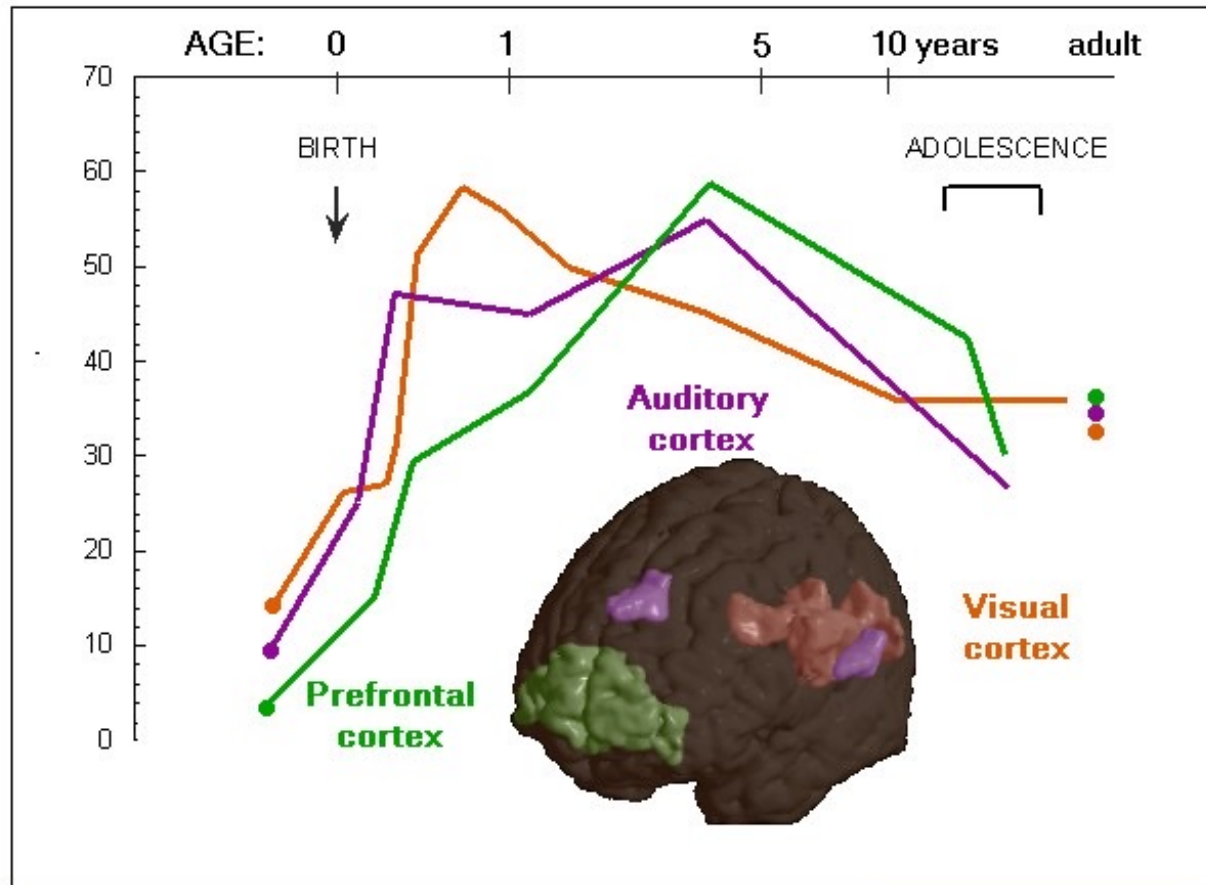


Reaches maturity in approximately 2 years



(Piantidosi & Kidd, 2016)

Human Brain Development of Connections (Synapses)



Adapted from P. Huttenlocher et. al. (1979-1997)

Exploitation vs. Exploration Trade-Offs

Low-temperature search

Quick to settle on high-probability answer

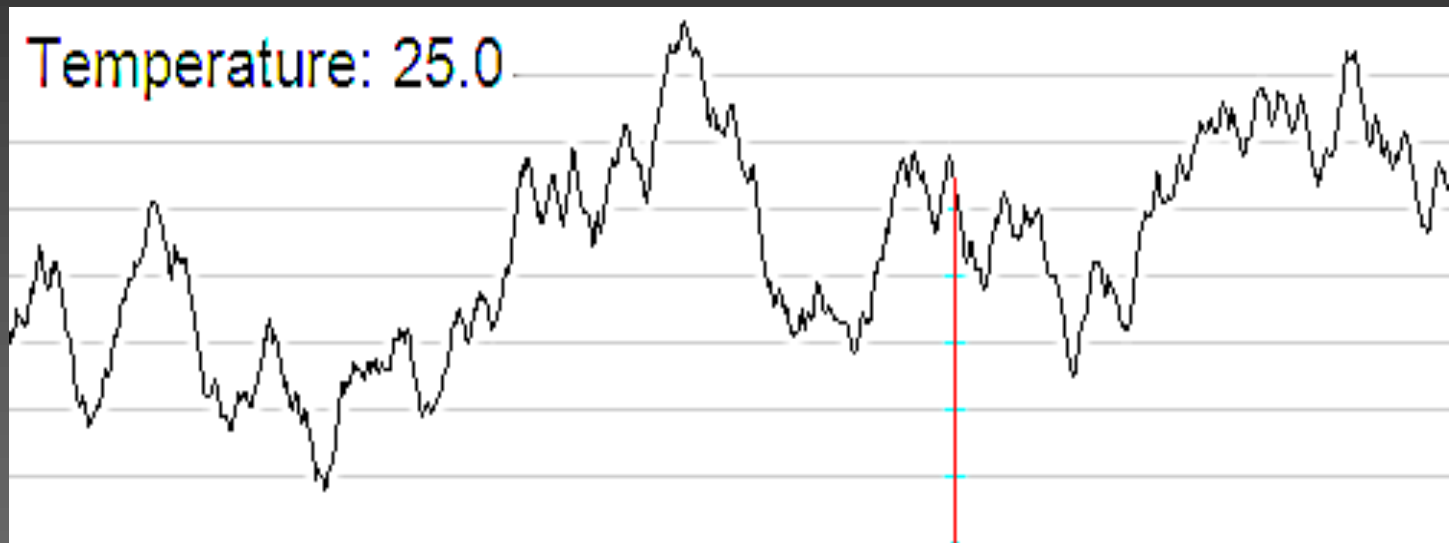
May miss low-probability answer

High-temperature search

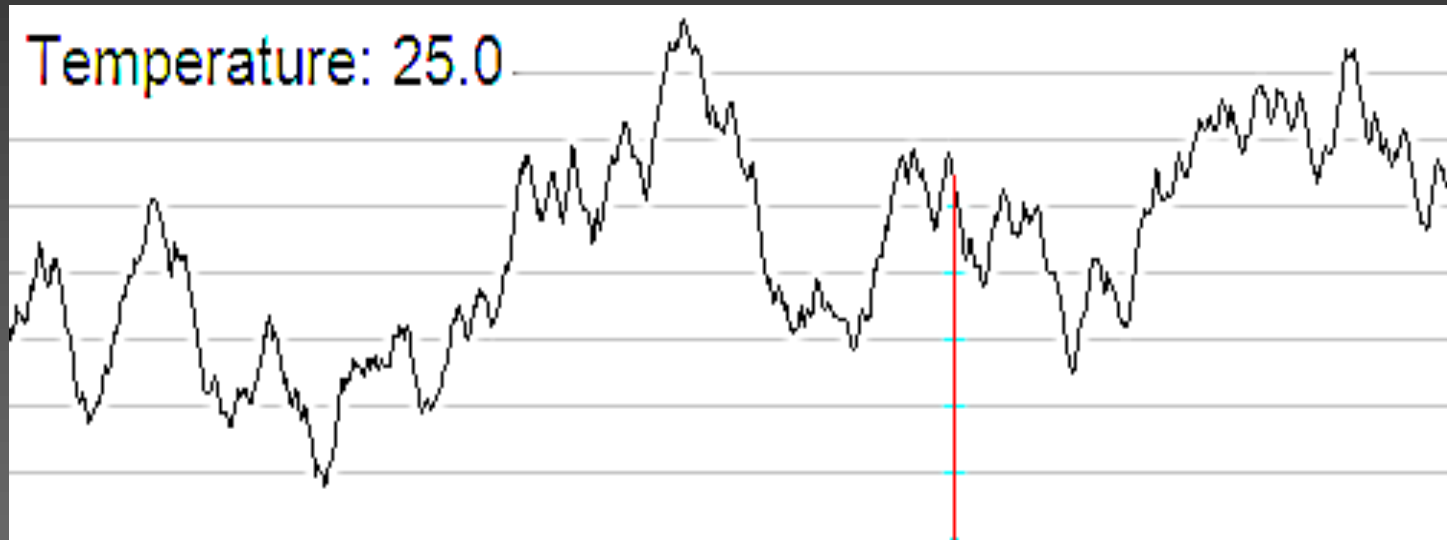
Slow to settle on high-probability answer

More likely to find low-probability answer

Simulated Annealing



Simulated Annealing



Hypothesis

Childhood is evolution's way of resolving explore/exploit trade-offs and performing simulated annealing.

Gopnik et al. 2017, PNAS, Gopnik,
Philosophical Transactions of the Royal
Society B, 2020

Explore Features, Exploit Bugs

- Noisiness, variability, randomness
- Risk-taking
- Impulsivity
- Play
- Curiosity

Examples Where Younger Learners Are More Exploratory

Greater exploration in RL tasks, Wu et al. 2020, Blanco & Sloutsky, 2021, Sumner et al. 2020, Liquin and Gopnik, 2022,

Learning unlikely causal hypotheses, Lucas et al, 2014, 2015, Gopnik et al. 2017, Wente et al. 2018., Seiver et al. 2013,

Learning foreign language vs. own language distinctions: Kuhl 2004, Werker, 2015.

Learning novel vs. familiar artifact uses: German & Defeyter, 2000.

Preferential approach to informative cue to aversive stimuli, Sullivan 2006, Tottenham et al, 2019.

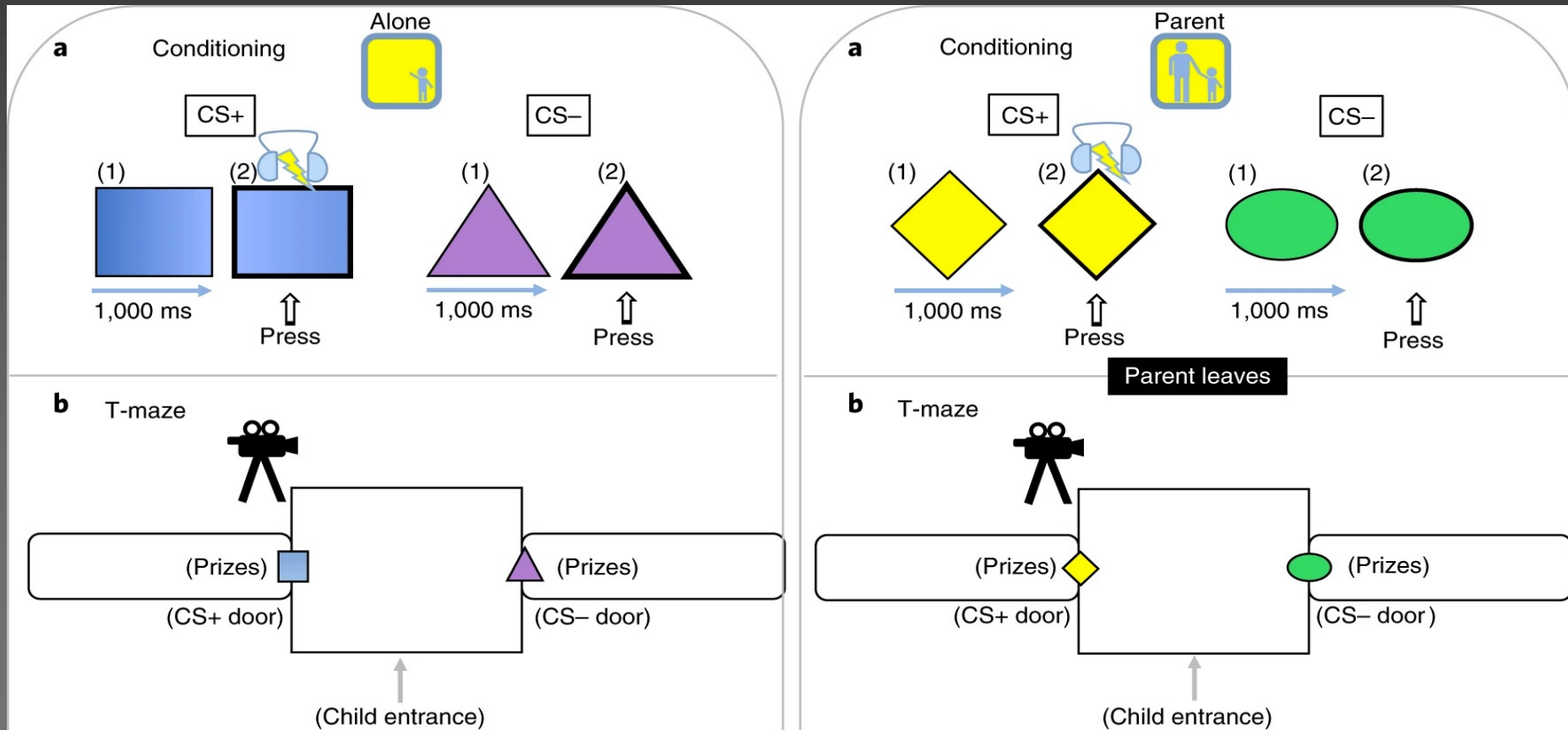
Developmental changes in learning resemble stochastic optimization

Nature Human Behaviour, June 2023

Anna P. Giron^{1,*}, Simon Ciranka^{2,3,*}, Eric Schulz⁴, Wouter van den Bos^{5,6}, Azzurra Ruggeri^{7,8,9}, Björn Meder^{2,10}, and Charley M. Wu^{1,2,+}

Analogies to stochastic optimization are common in developmental psychology, describing a gradual reduction in randomness over the lifespan. Yet for lack of concrete empirical comparison, there is ambiguity in how to interpret this analogy. Using data from $n=281$ participants ages 5 to 55, we show that “cooling off” does not only apply to the single dimension of randomness. Rather, development resembles a stochastic optimization process in the space of learning strategies, which we characterize along key dimensions of reward generalization, uncertainty-directed exploration, and random temperature. What begins as large tweaks in the parameters that define learning during childhood, plateaus and converges in adulthood. The developmental trajectory of human parameters is strikingly similar to several stochastic optimization algorithms, yet we begin to observe a divergence around adolescence. Remarkably, none of the optimization algorithms discovered reliably better regions of the strategy space than adult participants, suggesting an incredible efficiency of human development.

Love and Learning: Tottenham et al. 2019, Nature Human Behavior



The Intelligence and Ethics of Care

11/22/2020

Why childhood and old age are key to our human capacities | Aeon Essays

aeon



Photo by Cristina Garcia Rodero/Magnum Photos

Vulnerable yet vital

The dance of love and lore between grandparent and grandchild is at the centre, not the fringes, of our evolutionary story

Alison Gopnik

Daedalus, 2023

Caregiving in Philosophy, Biology & Political Economy

Alison Gopnik

Caring for the young and the old, the fragile and the ill, is central to human thriving, and has played a fundamental role in human evolution. Yet care has been largely invisible in political economy and it does not fit the prevailing philosophical, political, and economic frameworks. Care typically emerges in the context of close personal relationships, and it is not well suited to either utilitarian or Kantian accounts of morality, or to "social contract" accounts of cooperation. Markets and states both have difficulty providing and supporting care, and as a result, care is overlooked and undervalued. I sketch alternative ways of thinking about the morality and politics of care and present alternative policies that could help support carers and those they care for.

Love and care go together: parents caring for children (and vice versa), husbands and wives, friends and neighbors looking after each other. In fact, in her commentary, political scientist Anne-Marie Slaughter argues persuasively that care itself should be understood as a relationship rather than an activity.¹ But caregiving doesn't show up in economic measures like GDP. Instead, it has been relegated to the world of the private and personal, and especially the world of women, who have historically been responsible for much of the work of care.

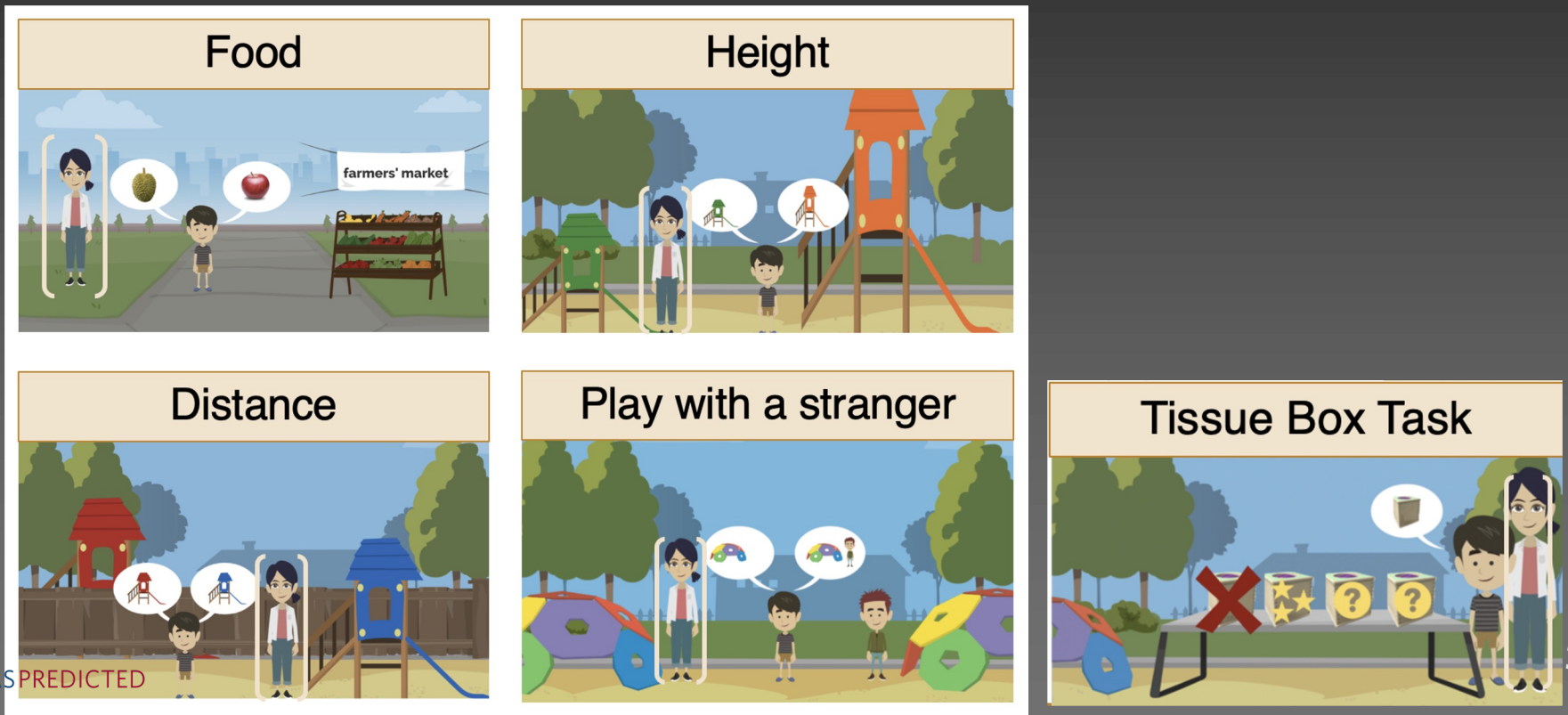
Caregiving has also been neglected because it does not fit well into the standard conceptual frameworks of philosophy, politics, and economics. Traditional philosophical approaches to morality, whether they invoke utilitarian or Kantian principles, are universalist—they are designed to apply equally to everybody. But this is in tension with the characteristically specific and local relationships between carers and the people they care for.² In many cases, like caring for a dying or severely disabled child, the cost to the carers might seem to outweigh the benefit to the cared for, contradicting the utilitarian principle of the greatest good for the greatest number. And yet we continue to feel that such caring is morally exemplary. You can see this tension vividly, for example, in philosopher Peter Singer's controversial though consistent utilitarian arguments for euthanasia.³ Caregiving also does not fit the Kantian view of universally binding categorical moral imperatives, like "do not lie." You feel a moral imperative to care for the people close to

Care and Exploration

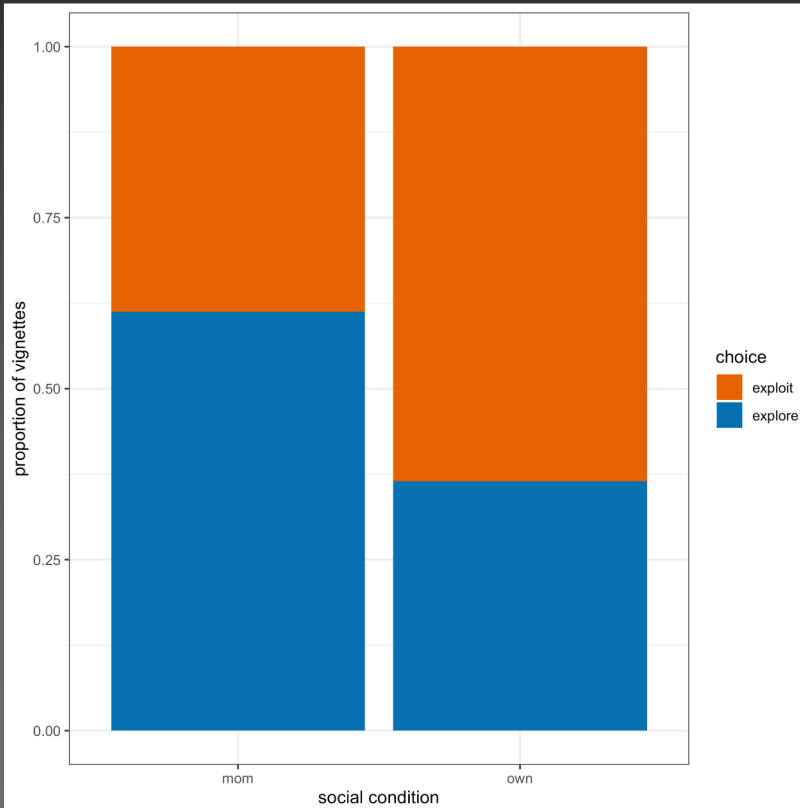
- Annya Dahmani: Intuitive Theories of Care
- We investigate whether children and adults think that children are more likely to explore when caregivers are present



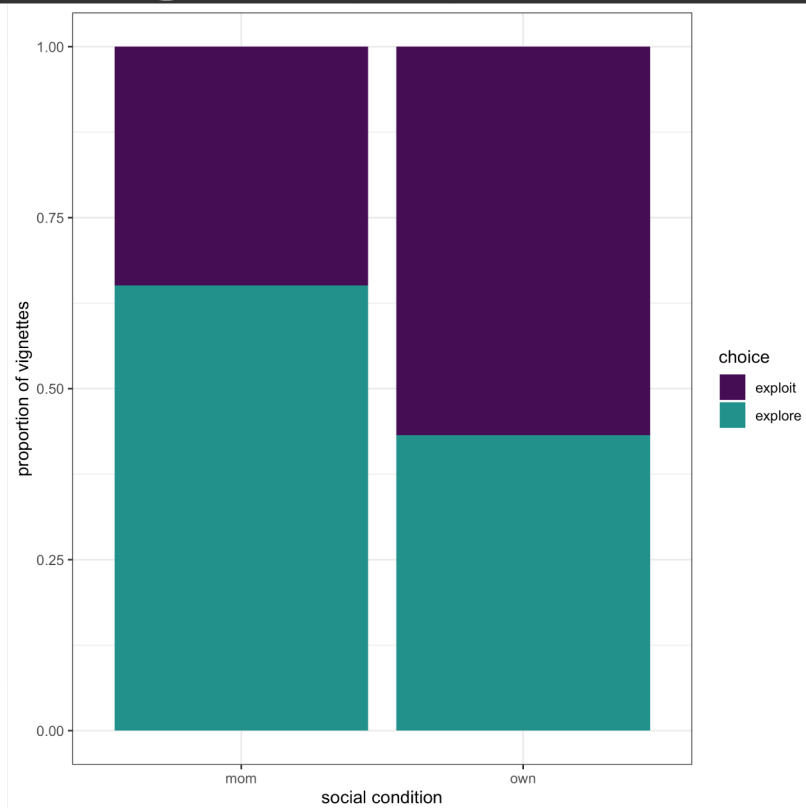
N=87 6-8 year-olds and 80 adults from Prolific



Adult data



Child data



Care and Culture

Grandmothers



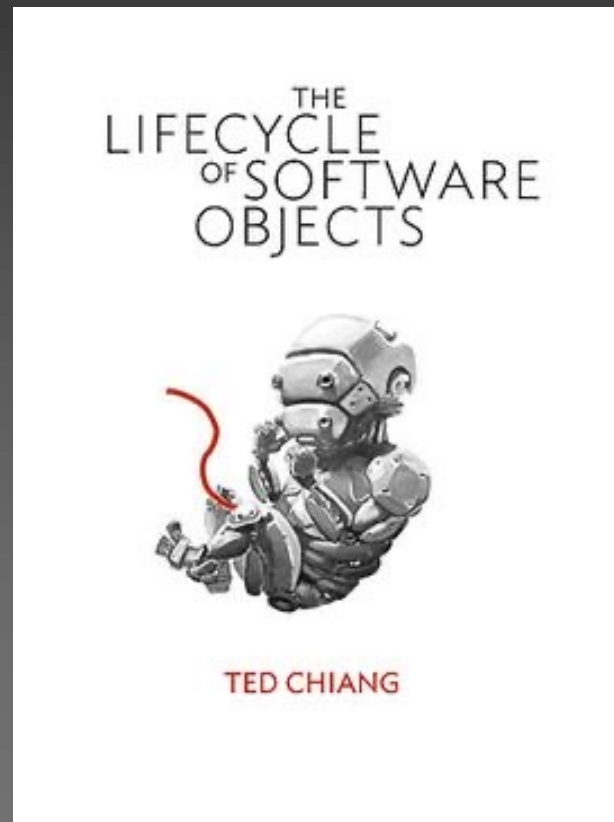
Orca Grandmothers



Gurven et al. Teaching



Developmental Diversity as A Condition for Intelligence



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