

# Prereaching infants expect causal agents to act efficiently without motor training

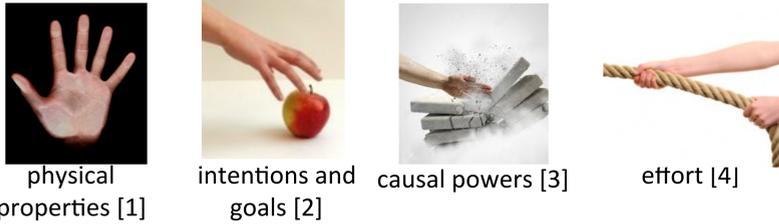
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## Introduction

Before their first birthdays, infants express knowledge about agents':



What supports the emergence of this knowledge?

1. First-person action experience in the world [5,6]
2. Constrained search for fillers (actions, objects, and effects) that satisfy an innate system for action understanding [7]

## Evidence from pre-reaching infants

Training prereaching infants to pick up objects enhances their causal perception [8], as well as sensitivity to object-directed action [6] and action efficiency [9]. However, these studies leave open the target of learning:

- Abstract concepts? c.f. [9]
- The causal affordances of a novel action?
- Identifying actions that are goal-directed and objects that are goals?

**Q: What do infants have to learn about intentional action, and is first-person experience the only way to learn it?**

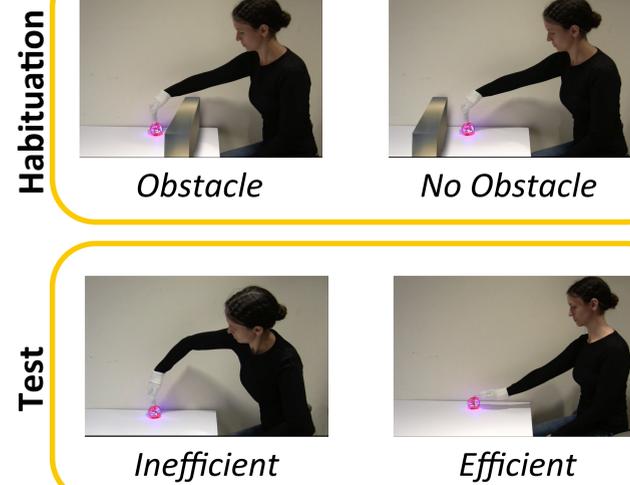
### Fillers

Role  
Intentional  
action

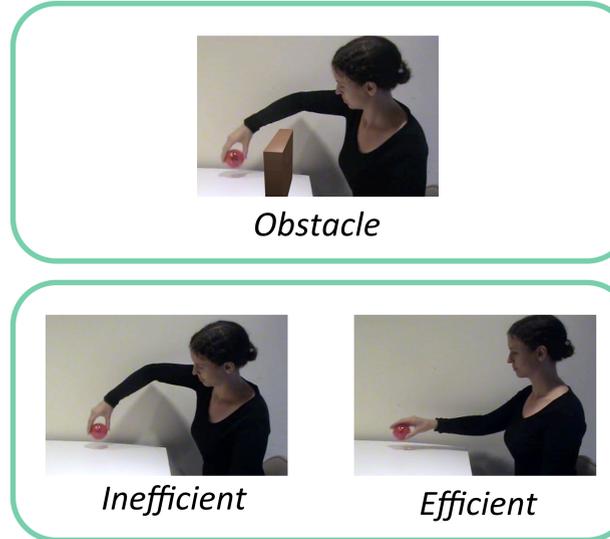
Dancing	Throwing
Climbing	Breaking
Reaching	Reading
Cooking	Buying

## Methods

**Exp. 1: Actress reaches towards object, which lights up on contact.**



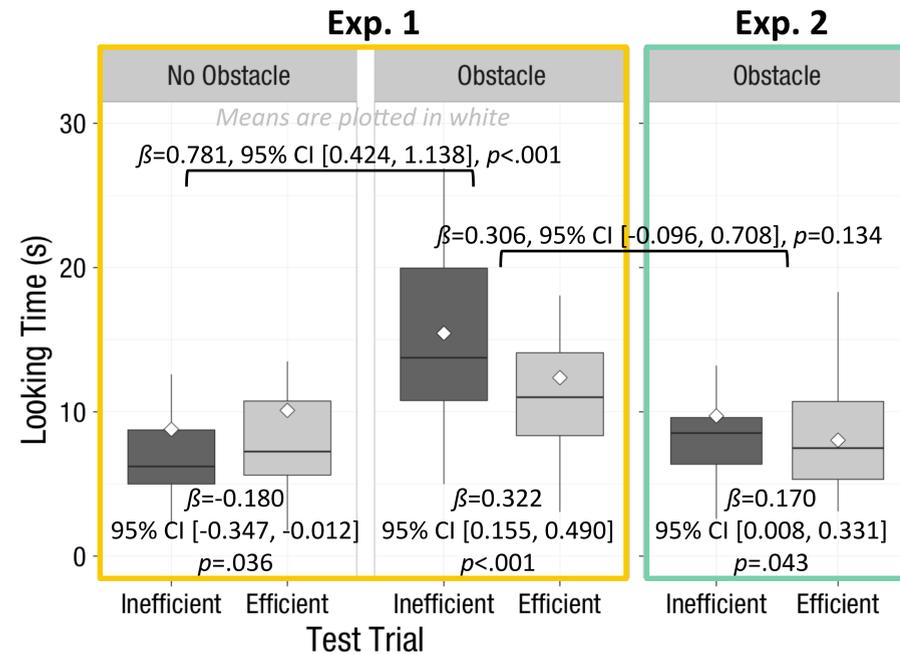
**Exp. 2: Actress reaches towards and picks up object. Replication of [9].**



N=60 3-month-olds, 20 per condition (range 91-122 days)

Primary DV: Log-transformed average looking to inefficient vs. efficient test event  
All influential measures by Cook's Distance are excluded from the results below

## Results



Across both experiments, infants attend longer to a reach made newly inefficient by the removal of a barrier.

A control condition in Exp.1 rules out low-level looking preferences for curved reaches.



## Discussion

Mechanisms that help us parse and analyze action sequences are necessary for learning from and understanding the actions of others.

Expectations for efficient action emerge early, before mastery of reaching, and are observable in the lab without motor training. Critically, the insight that obstacles impose constraints on goal-directed action precedes the relevant action experience [4, 9-10].

In contrast with previous null findings [9], untrained prereaching infants recovered attention to newly inefficient pickup actions. Follow-up studies are underway to explore this finding further.

**A: Infants face the problem of identifying the movements of an agent that are goal-directed actions and the specific objects that serve as the agent's goals. Experience performing these actions aids this learning process but is not necessary for it.**

## Future Directions

1. Testing for the surface property of the hand (i.e., the mitten) as an explanation for previous null findings [9].
2. Distinguishing effect of causal versus attention-grabbing actions (e.g. by introducing spatiotemporal gap).
3. Exploring the role of obstacles as guides to infants' attribution of goals.

