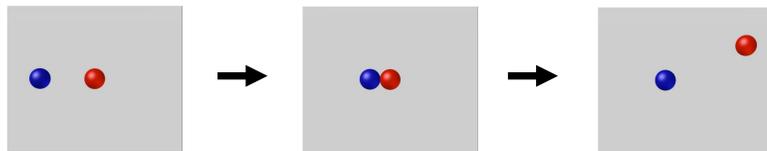


## Causality & Force Dynamics

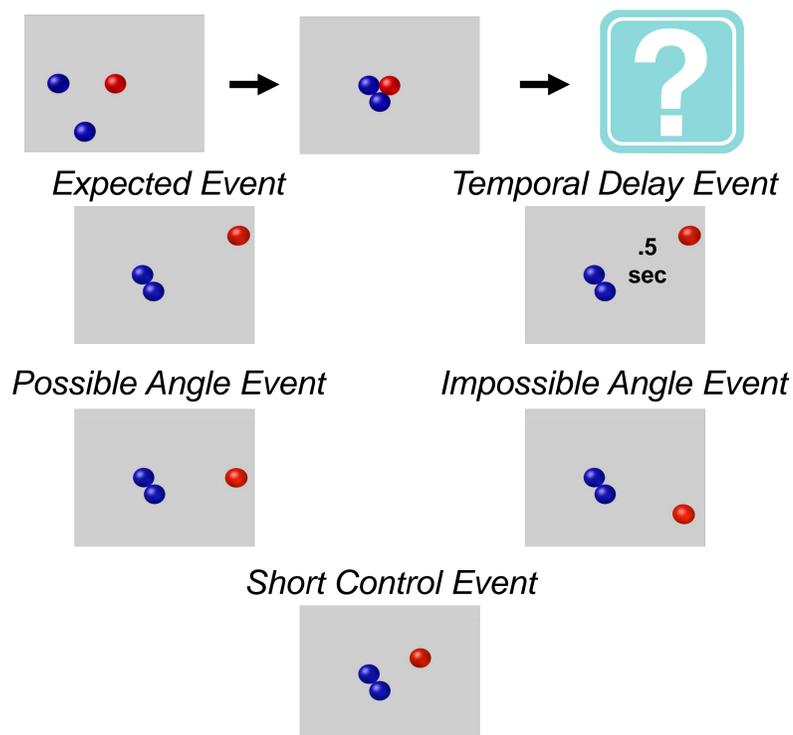
- *Simple cause* is a cornerstone of research on event perception (Michotte 1946/1963)
- *Force dynamics* is a neglected area of study that:
  - Expands beyond simple cause
  - Embraces the multi-force interactions of *cause*, *prevent*, and *enable*
  - Is encoded across languages (Wolff & Song, 2003)
- Adults perceive multi-force interactions dynamically, encoding properties of force (Wolff, 2007)
- 7- to 9-month-olds encode the dynamics of simple cause, recognizing improbable trajectories (Göksun et al., 2010)



### RESEARCH QUESTION

Does the dynamic integration of *multiple forces* emerge at a similar age?

## Stimuli



## Study One

### Method

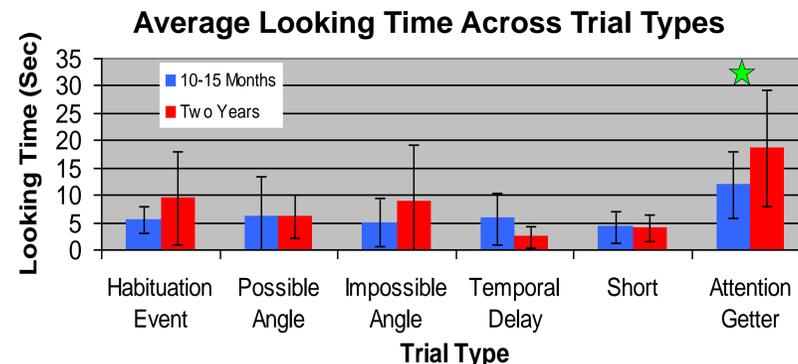
#### Participants

- 14 10- to 15-month-olds (M = 12.89 mos, 7 male)
- 7 2-year-olds (M = 28.77 mos, 2 male)

#### Procedure

- *Habituation*: expected event
- *Test trials*: one of each of the presented event types

### Results



- Children up to age 2 failed to react to any stimulus outside of the attention getter ( $ps > 0.05$ )

### An Unexpected Turn

While younger infants recognize dynamics in one-force events, the addition of a second force baffles even toddlers!



When can children reason dynamically about multiple forces?

## Study Two

### Method

#### Participants

- 27 5-year-olds (M = 65.02 mos, 14 male)

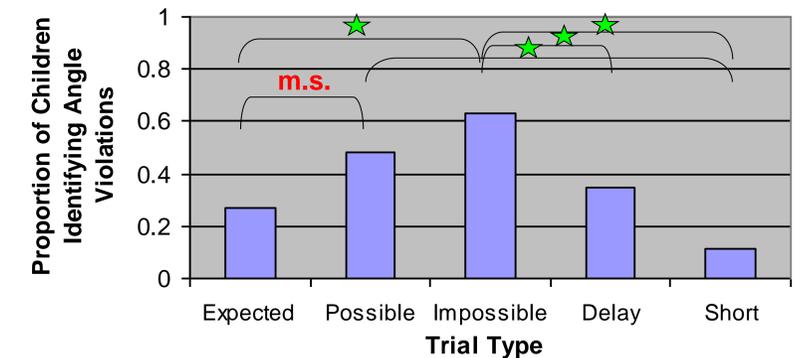
#### Procedure

- Animations shown in counterbalanced order
- Child asked whether each event was *ok* or *weird*
- If weird, child was asked to explain
- Explanations coded as referring to angle, distance, delay, speed, or other

## Study Two (Cont'd)

### Results

#### Proportion of Children Reporting Angle Violations



- Significantly more children identified angle violations in the impossible angle events compared to the expected angle event,  $\chi^2(1) = 7.39, p < 0.01$
- Marginally more children identified angle violations in the probable angle compared to the expected angle event,  $\chi^2(1) = 2.98, p = 0.084$

## Discussion

- Young infants understand the dynamics of simple causal events
- The additional processing burden of the second force delays extension of this understanding to multi-force events
- By age 5, children begin to reason dynamically about two-force events

### Future Questions

- Is language required to broaden children's attention to encode force dynamics?
- When can infants discriminate between force dynamics categories?

Thank You  
for  
Your Interest

