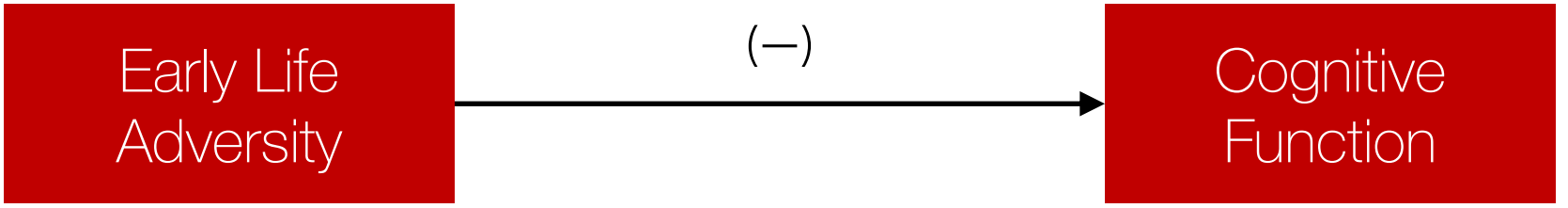
Childhood Unpredictability and Cognitive Abilities

The Sensitized-Specialization Hypothesis

Ethan Young

The Deficit Model:

Bad → Bad



- Poverty
- Family conflict
- Deprivation
- Trauma

- IQ
- Standardized tests
- Working memory
- Executive function
- Language

(Blair et al., 2011; Bradley & Corwyn, 2002; Farah et al., 2006; Hackman et al., 2014)

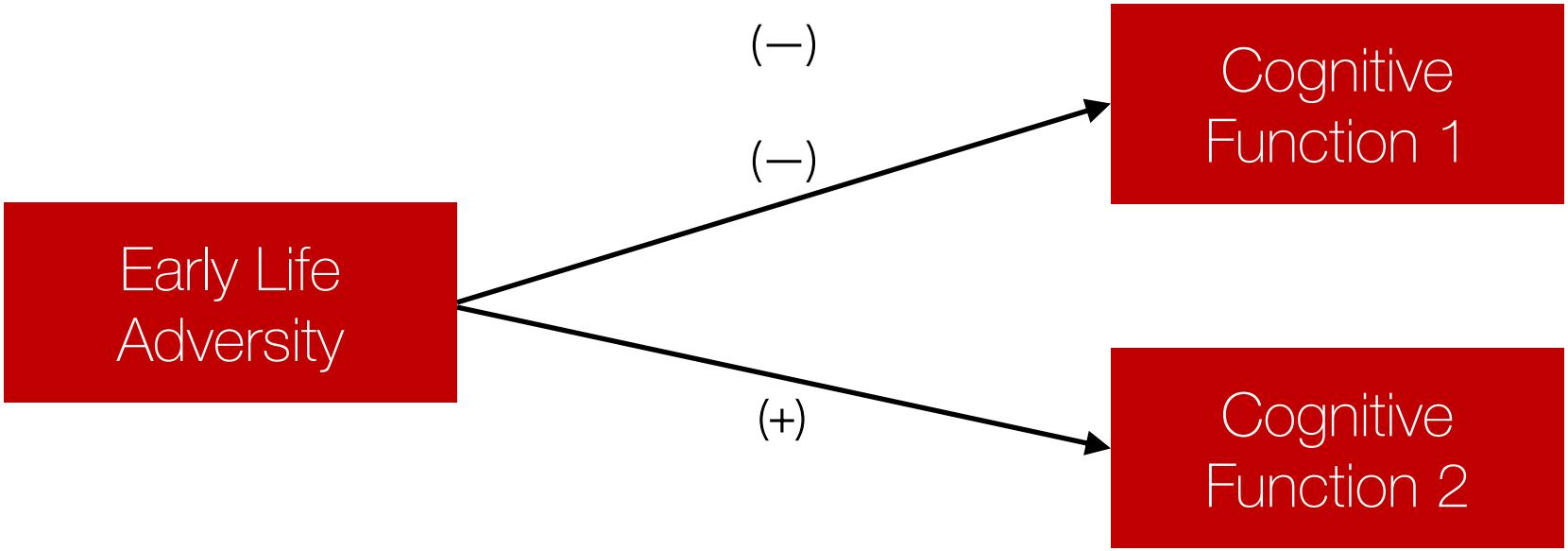
Adaptation-Based Model:

- The Deficit Model presents a one-sided story
- Evolutionary-developmental theory suggests cognition is *shaped* by early experiences
- Early adversity should specialize the mind rather than universally impair it

(Ellis, Bianchi, Griskevicius, & Frankenhuis, 2016; Frankenhuis & de Weerth, 2013)

Bad → Different

Can early adversity enhance specific cognitive abilities?



(Ellis et al., 2016; Frankenhuis & de Weerth 2013; Mittal, Griskevicius, Simpson, Sung, & Young, 2015)

Early Adversity: Environmental Unpredictability

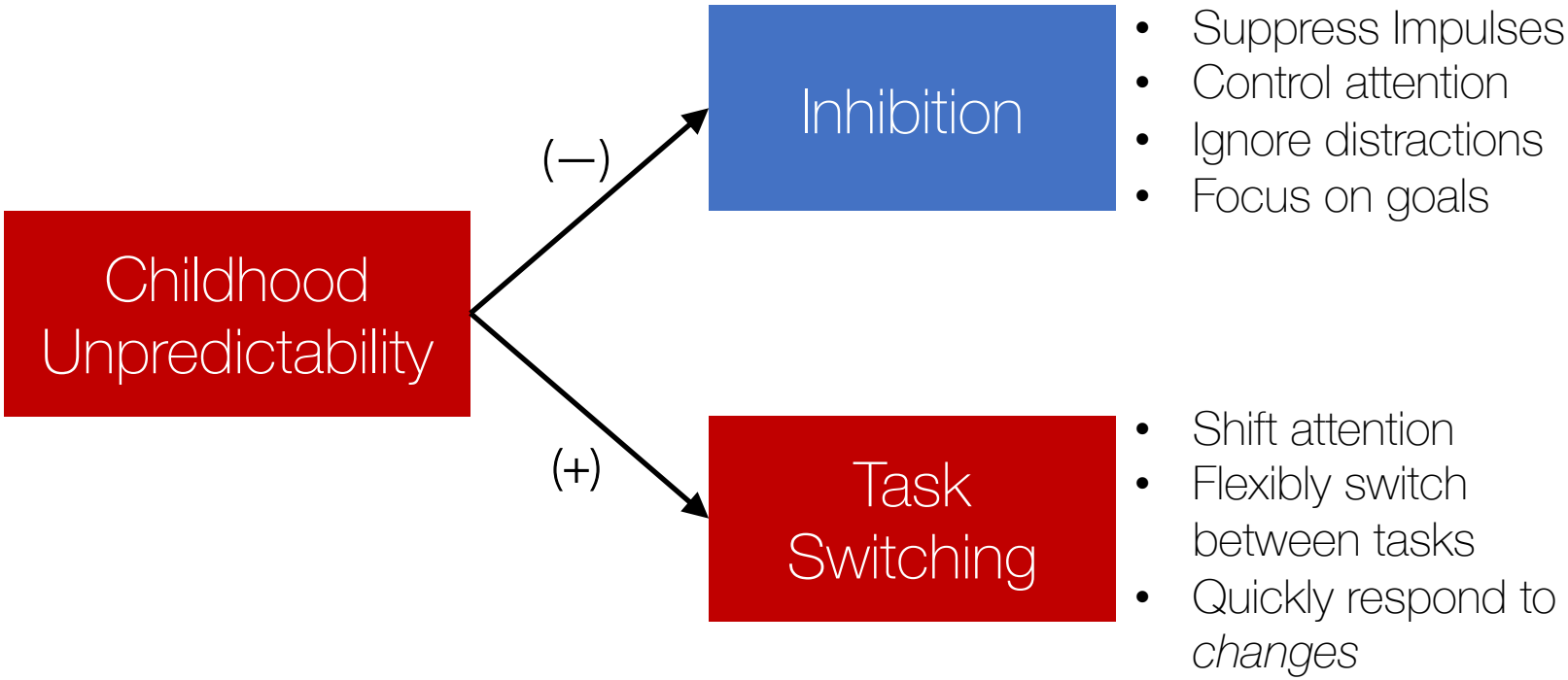
- Unforeseeable environmental fluctuations
- Inconsistency in physical and social environment
- Difficult to predict the future

When I was younger than 10…

- things were often chaotic in my house
- people often moved in and out of my house on a pretty random basis
- I had a hard time knowing what my parent(s) or other people in my house were going to say or do from day-to-day

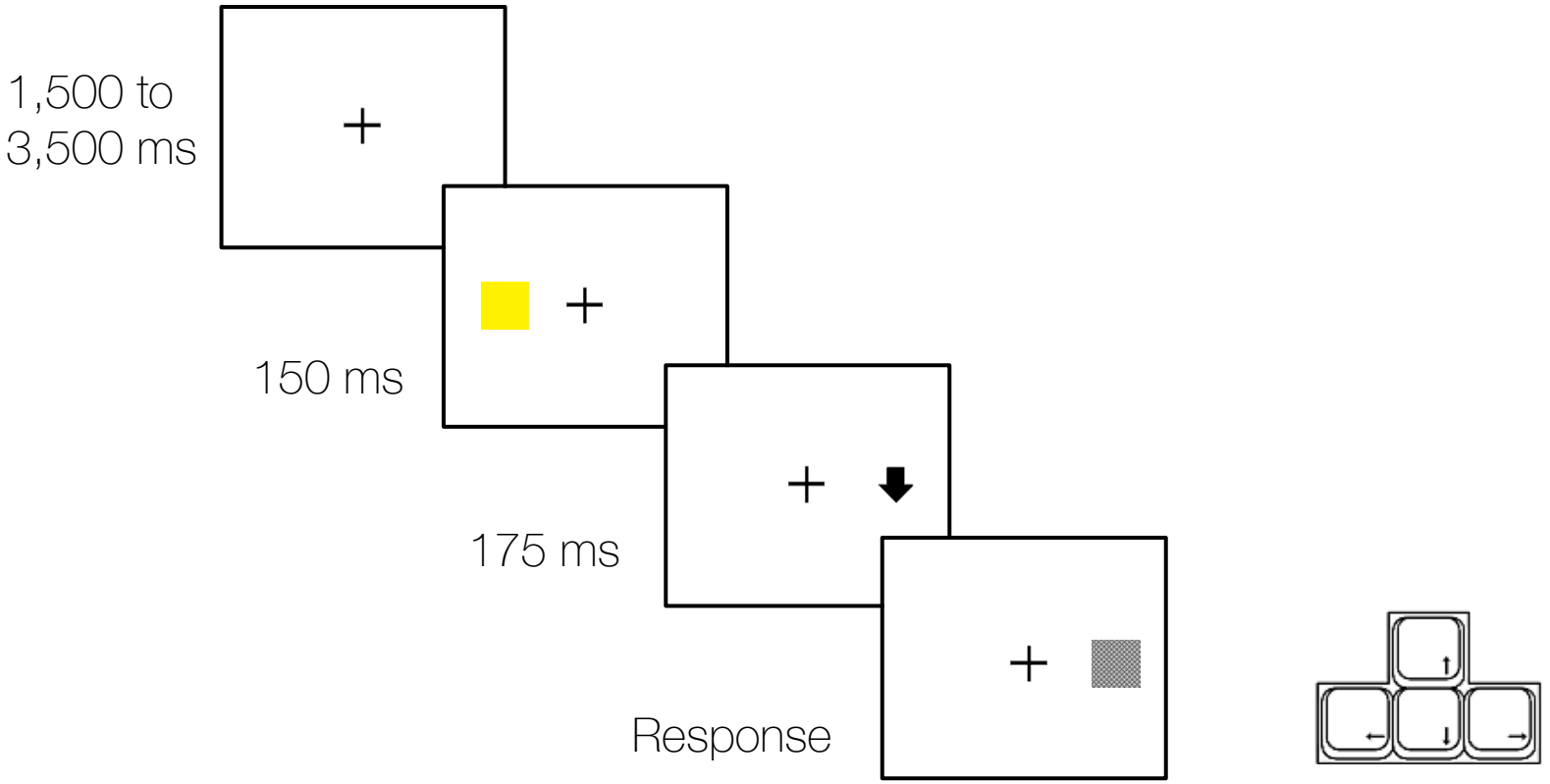
Unpredictability & Executive Function

Ability to guide and manage complex behavior toward goals



(Mittal, Griskevicius, Simpson, Sung, & Young, 2015)

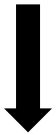
Inhibition



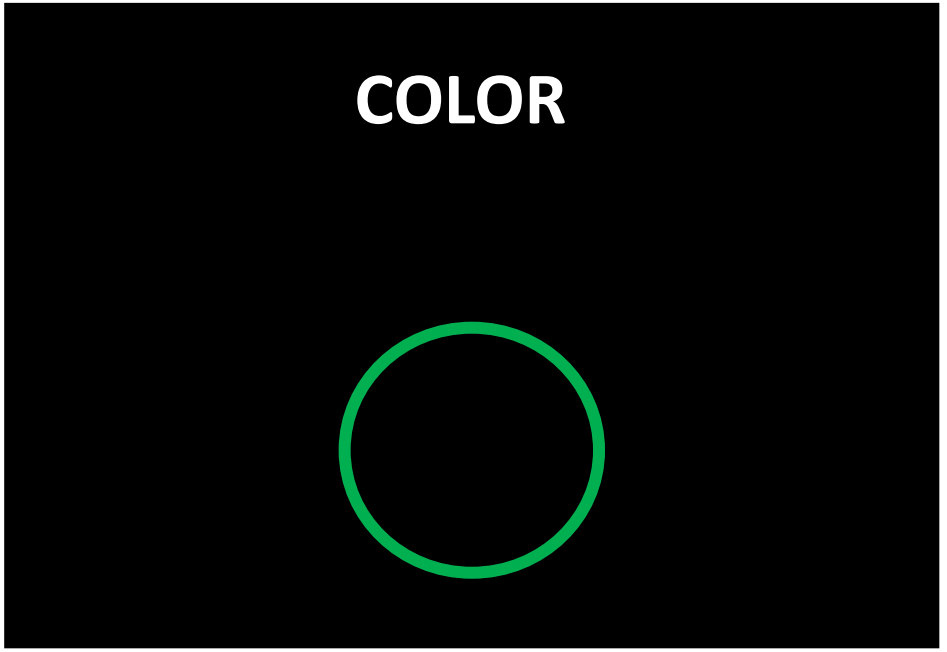
Task-Switching

Color or Shape Task

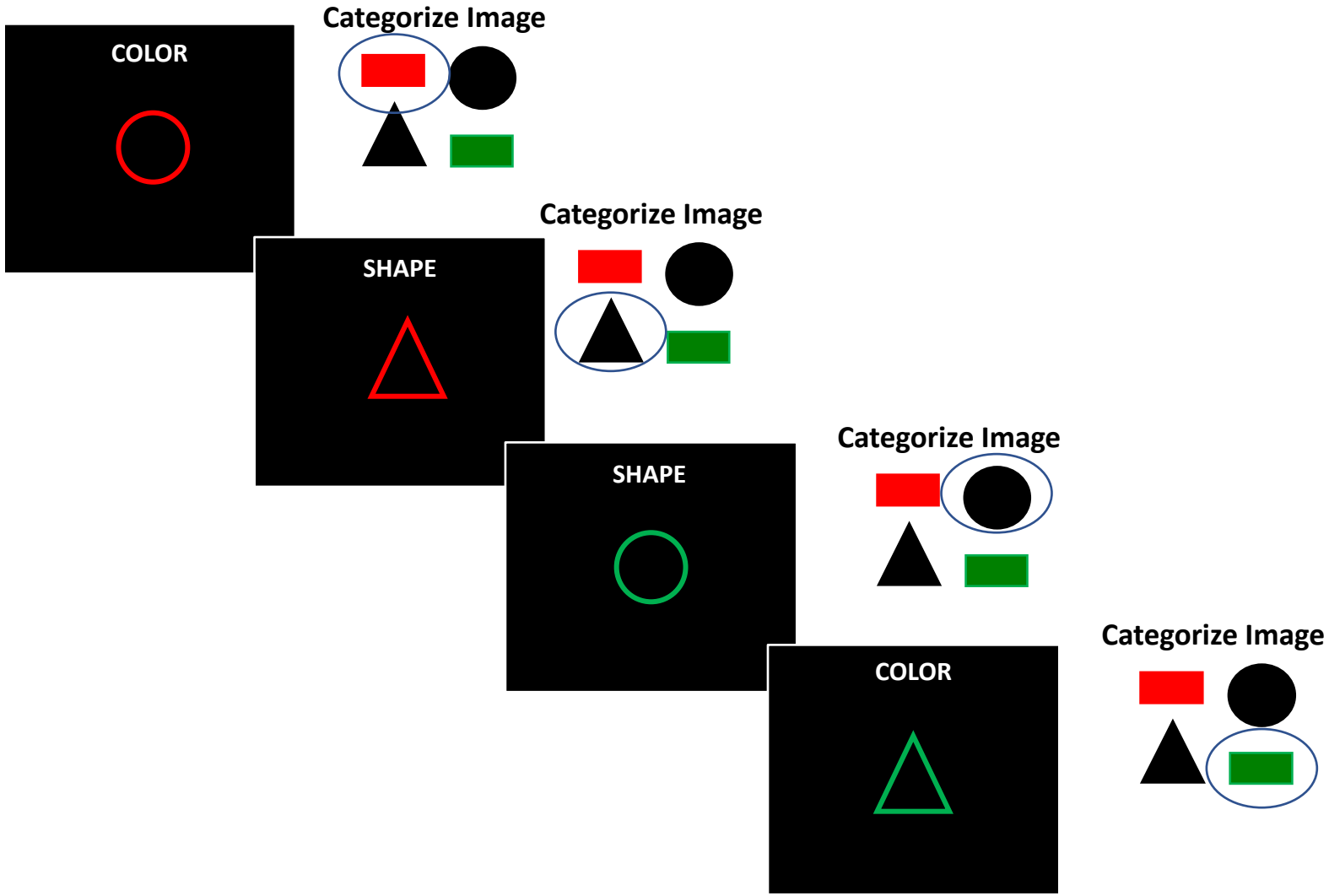
Participant sees
Circle OR Triangle
that is
Red OR Green



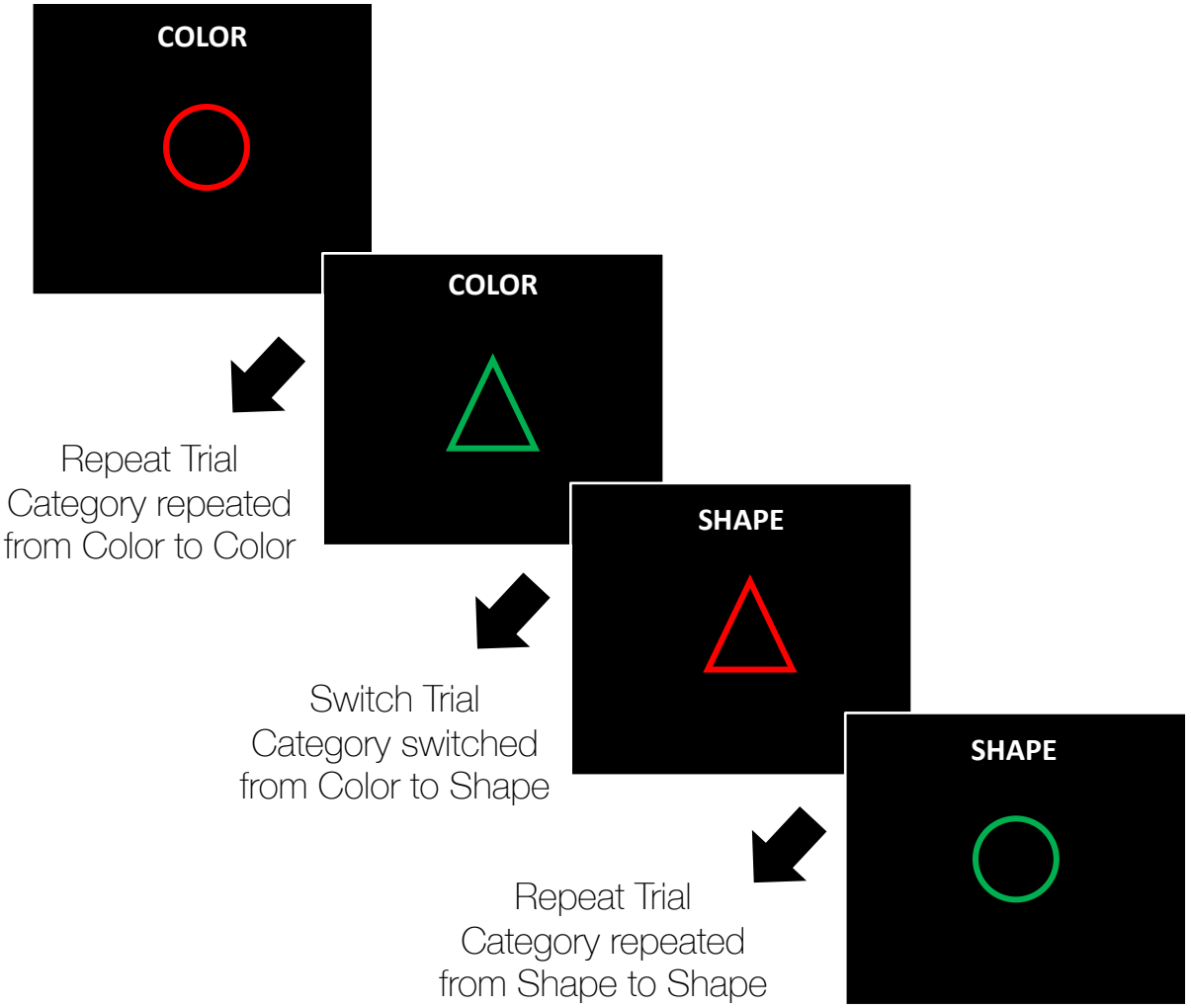
Categorized image
according to
Shape OR Color



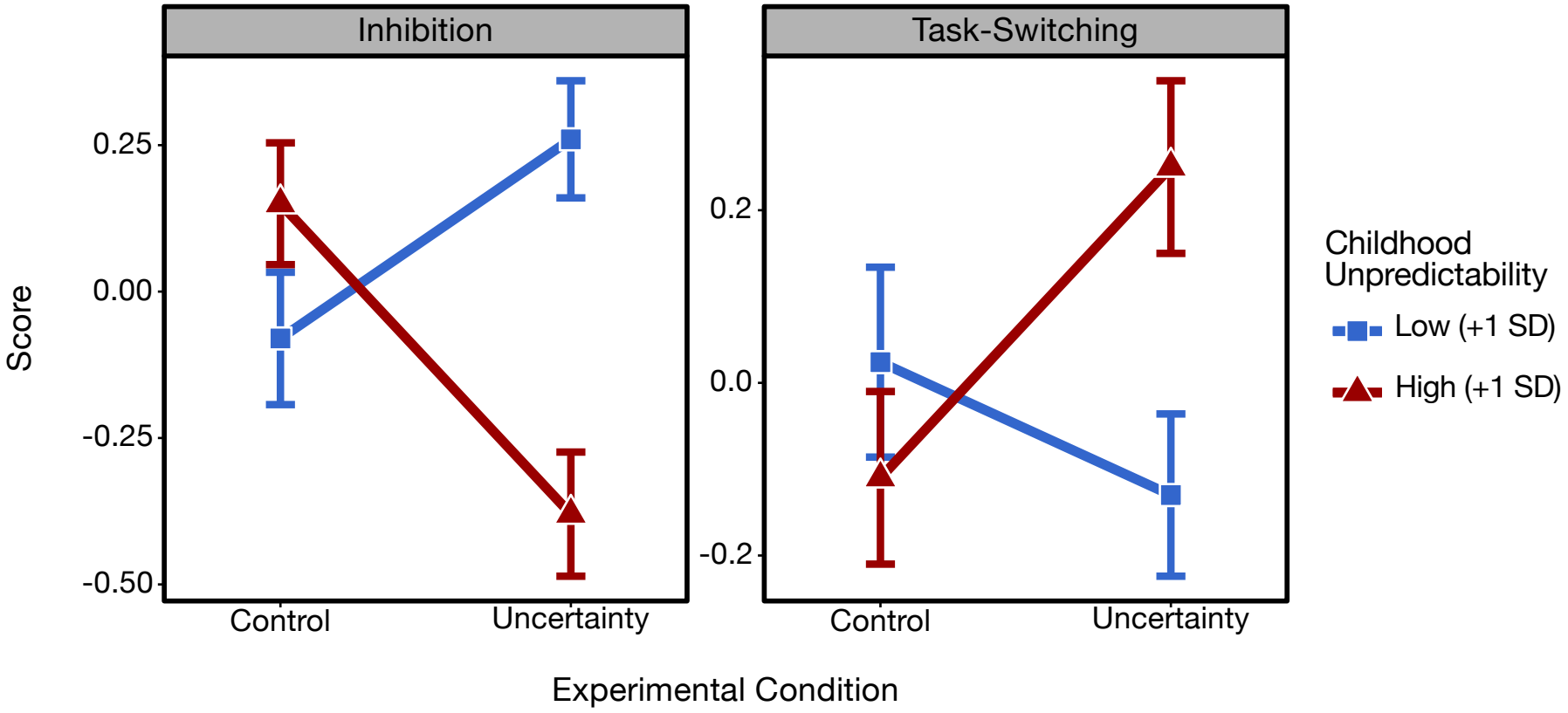
Task-Switching



Task-Switching



Childhood Unpredictability and Executive Functions

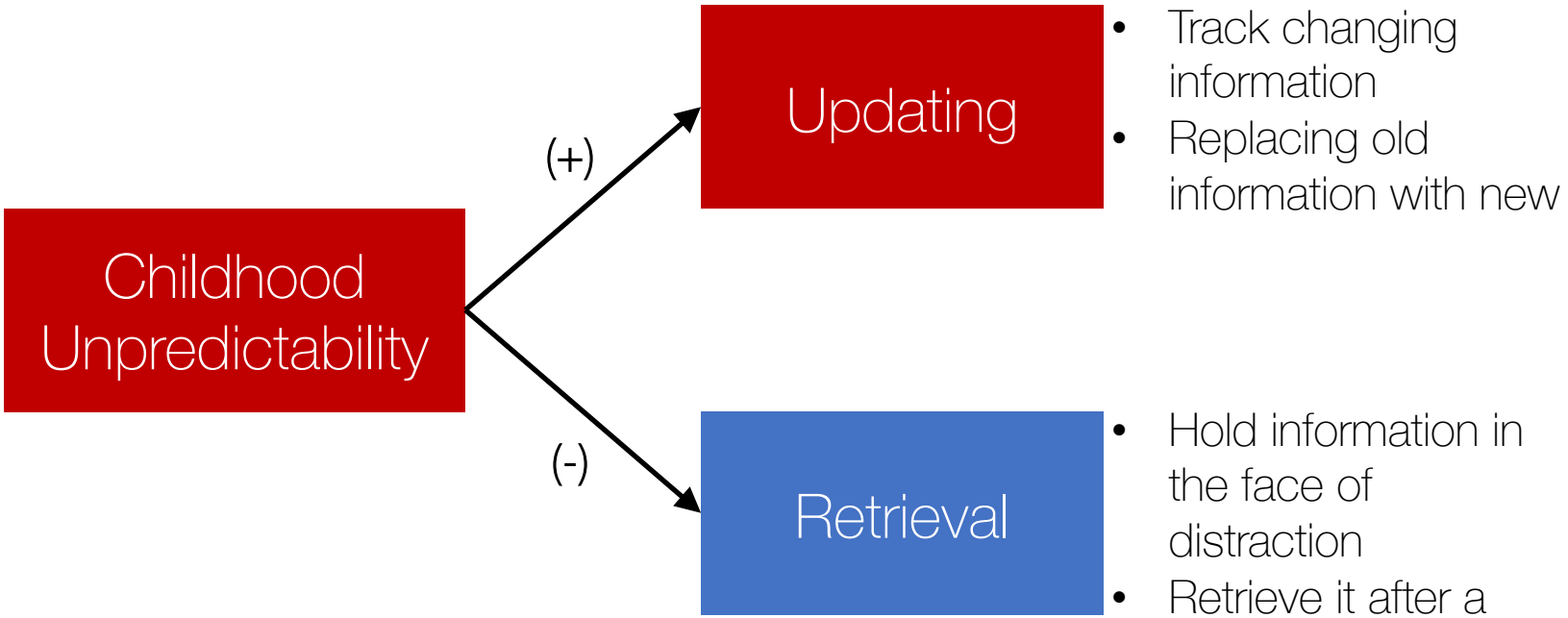


Sensitized-Specialization

Developmentally specialized abilities become *sensitized* to manifest under particular conditions later in life.

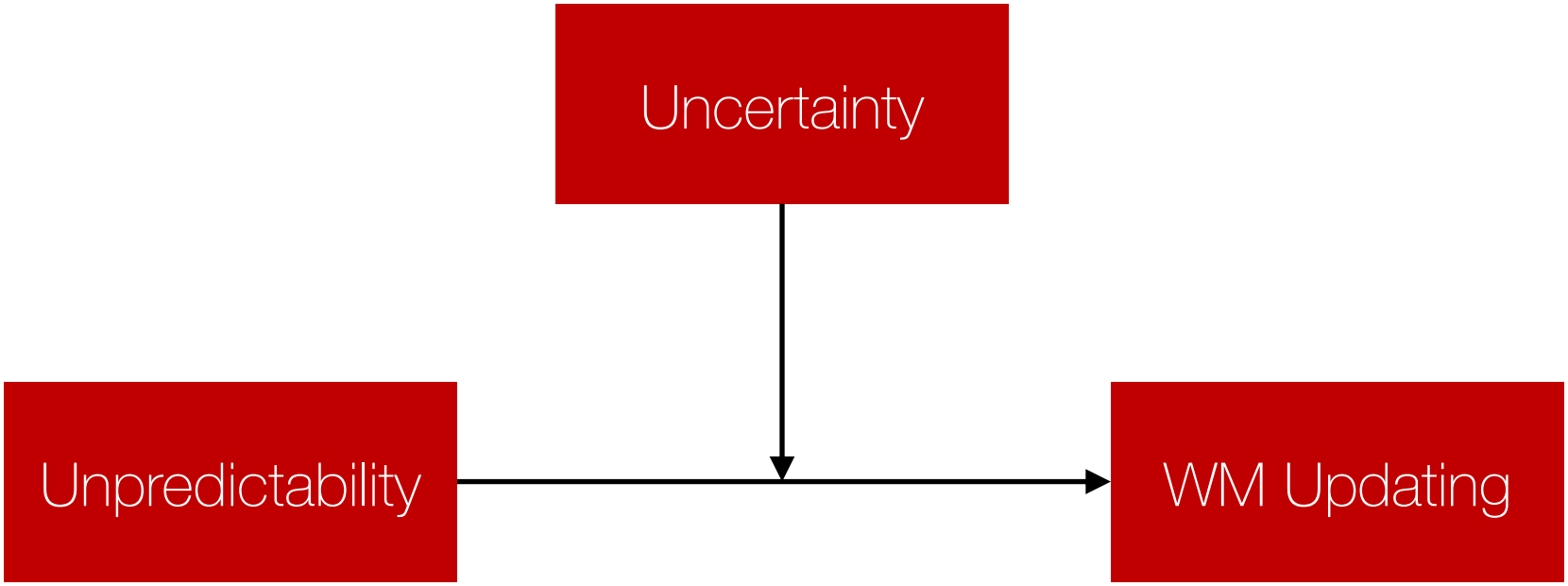
Unpredictability & Working Memory

Working memory is a multi-faceted cognitive system designed for interacting with information over relatively short time-periods

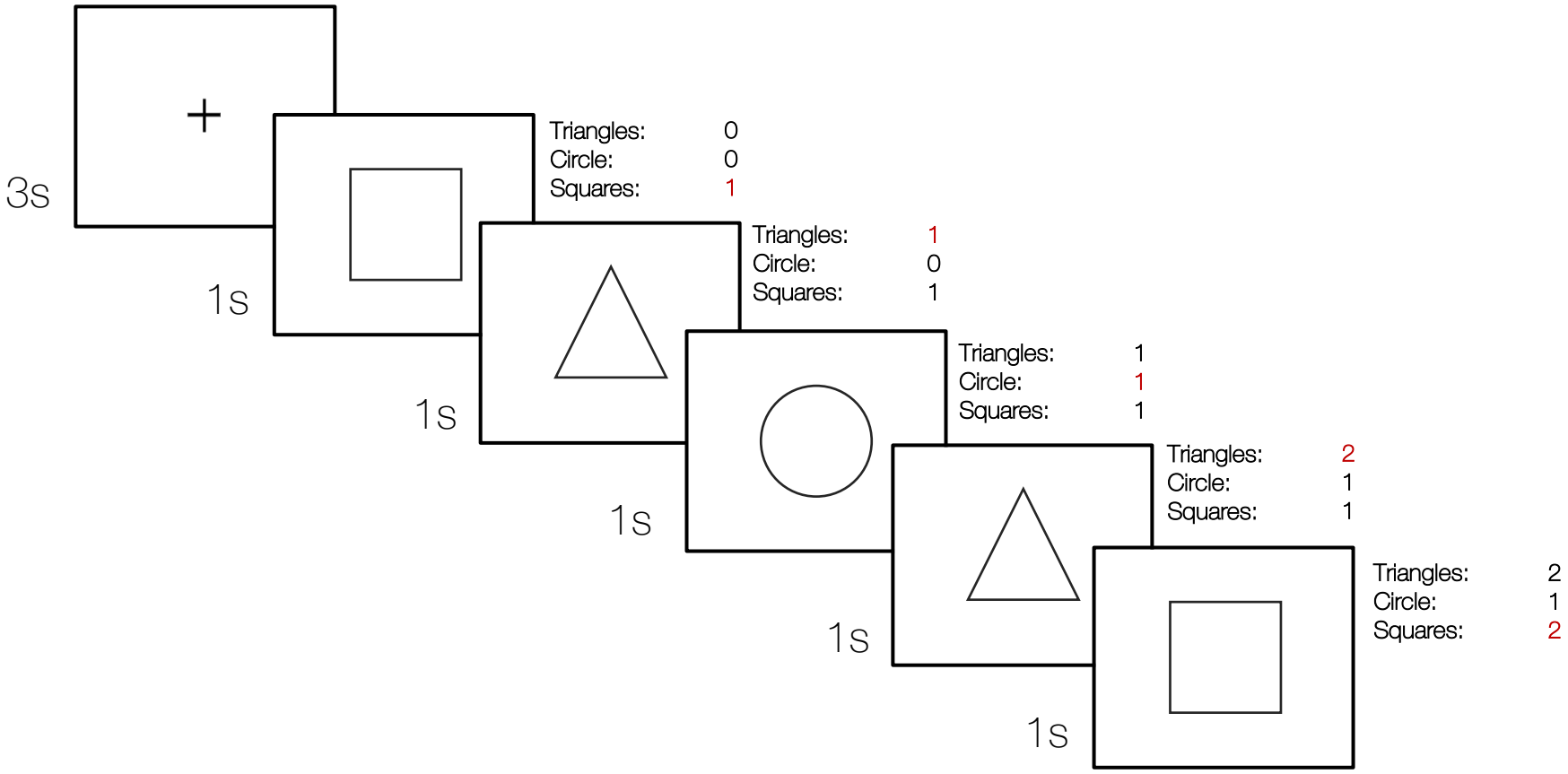


(Young, Griskevicius, Simpson, Waters, & Mittal, under review)

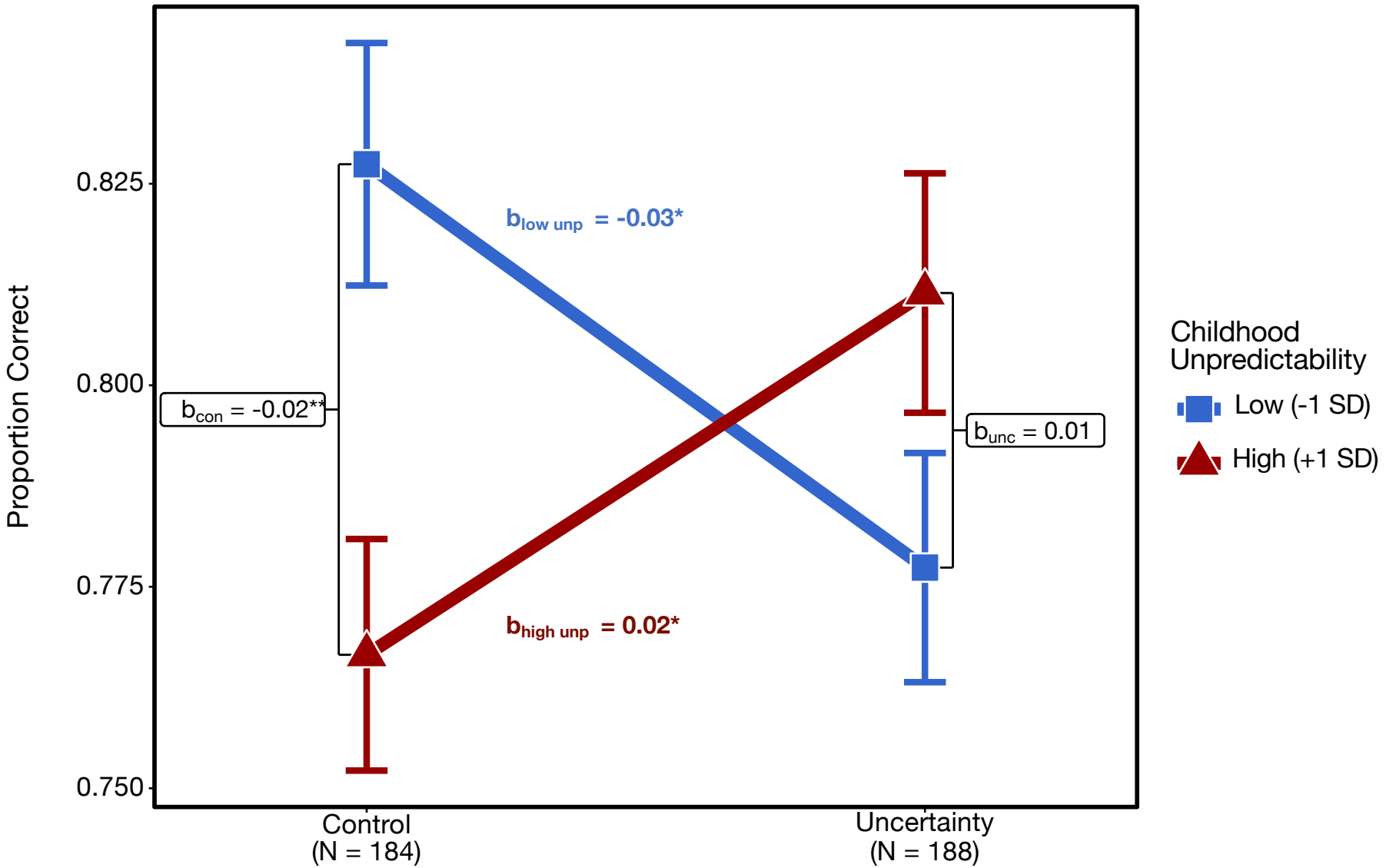
Sensitized-Specialization: Working Memory Updating



Continuous Counters

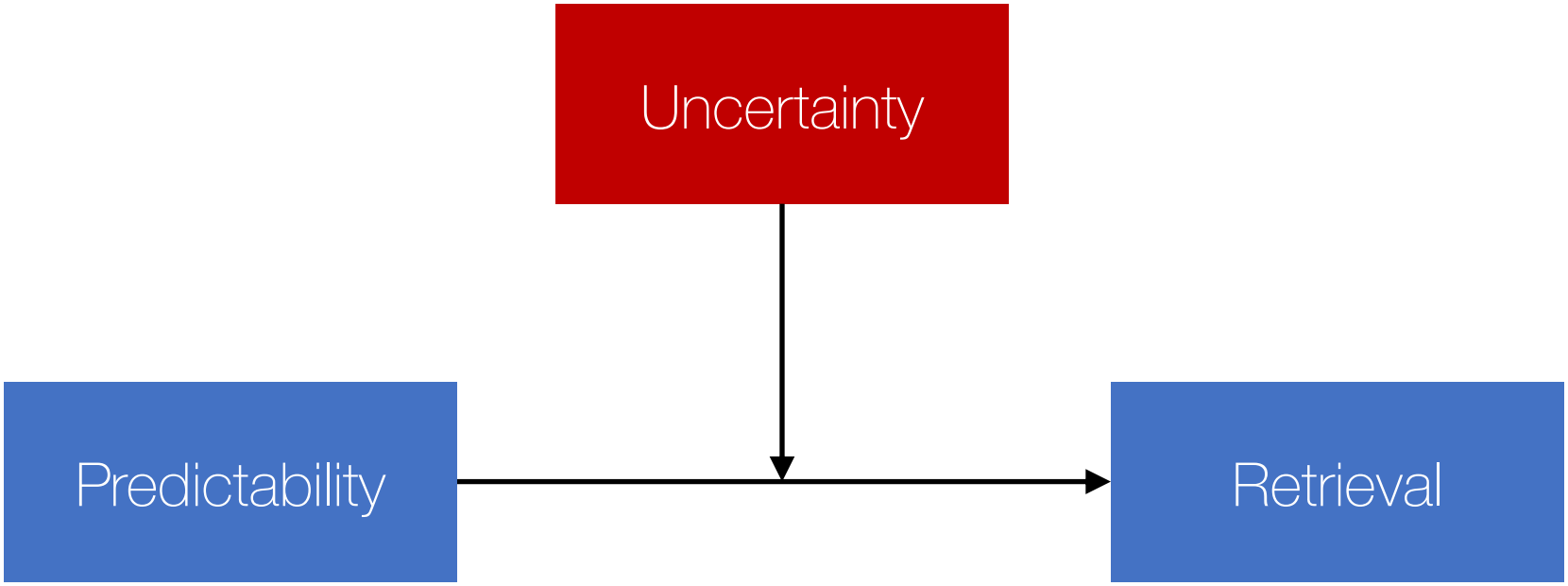


Experiment 1: Working Memory Updating (N=372)

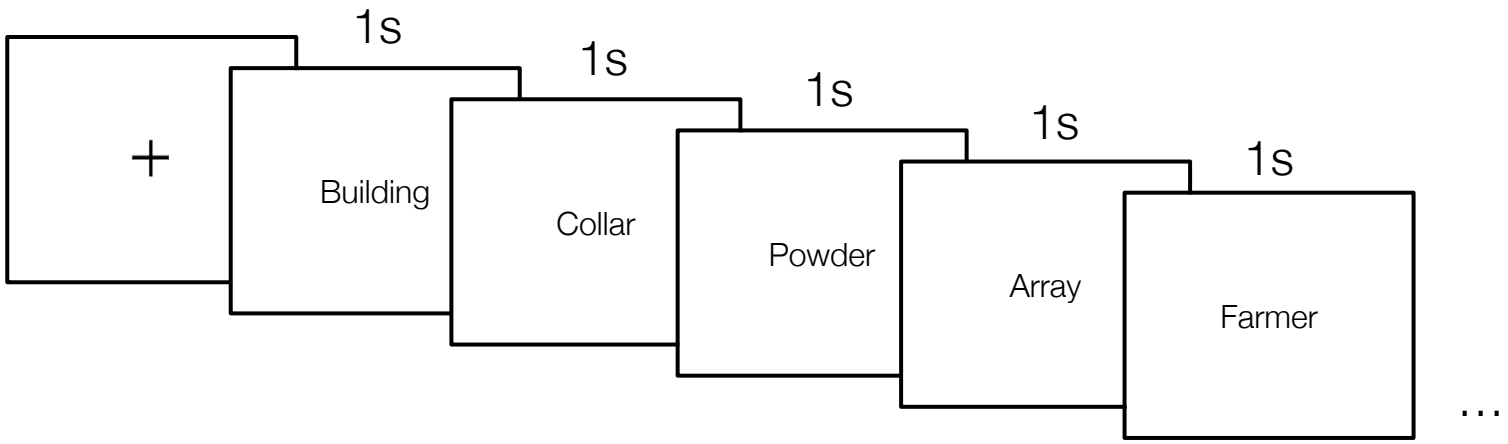


Note: Error bars reflect standard errors.

Sensitized-Specialization: Working Memory Retrieval



WM Retrieval

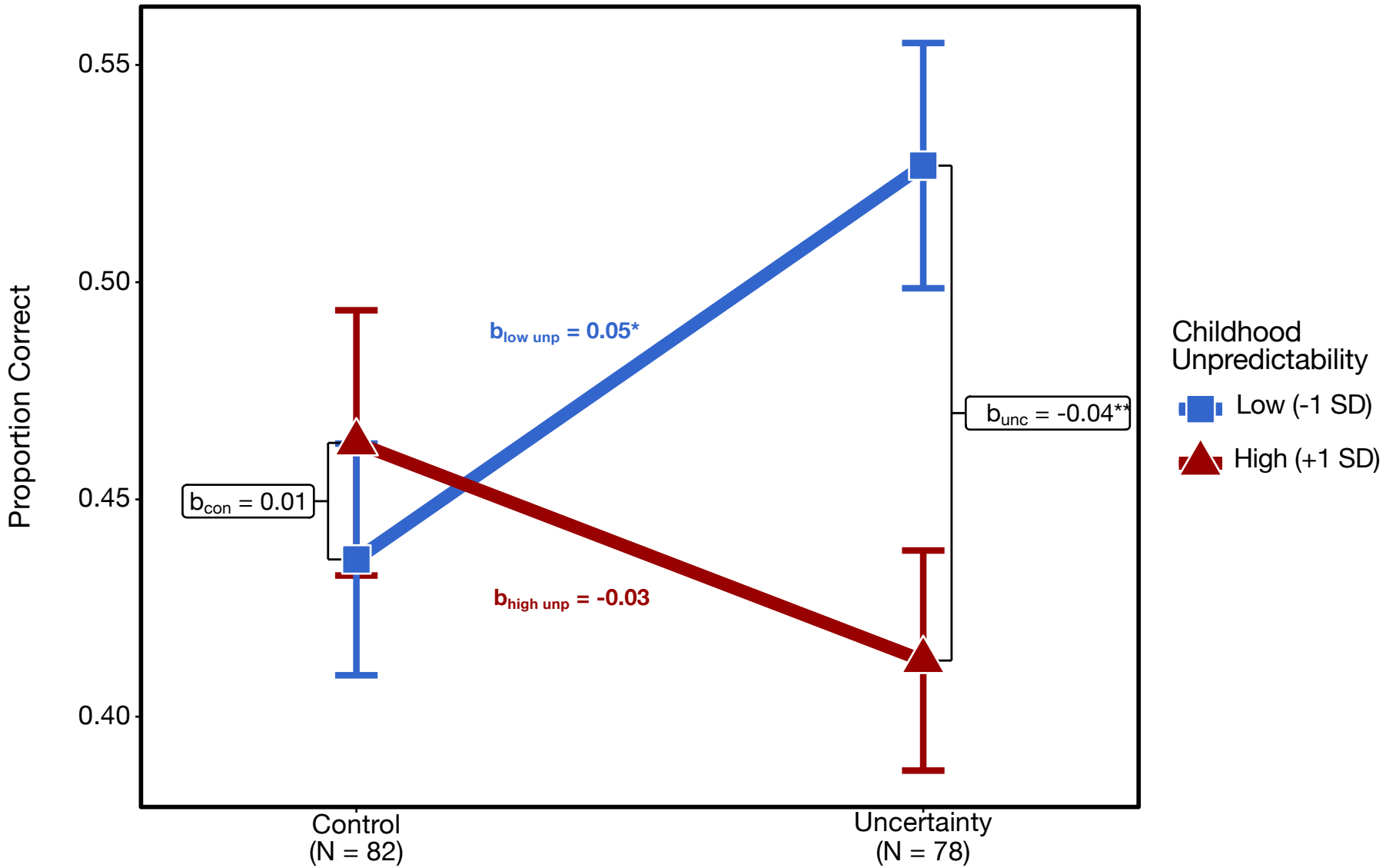


30s — Put the following 3 digit numbers in ascending order.

146	562	971	236	702	784	468	865

Recall
(any order)

Experiment 2: Working Memory Retrieval (N=160)



Note: Error bars reflect standard errors.

Summary

Predictable Environments	Unpredictable Environments
• Adapting to the same challenges across time and space	• Adapting to different challenges across time and space
• Inhibition	• Task-Switching
• Working Memory Retrieval	• Working Memory Updating

Sensitized-Specialization

- Specialized abilities are context specific
- Cues of environmental uncertainty bring specialized cognitive abilities online
- *Both* unpredictable and predictable childhood environments show evidence for sensitized-specialization

Limitations and Future Directions

- Longitudinal data (ideally genetically informed) data are needed to appropriately test these questions

- Why are some abilities sensitized and specialized?
  - What is the mechanism behind uncertainty primes?
  - What are the psychological, physiological, and/or affective mechanisms responsible for sensitization?

- Is there a more general “stress-adapted cognitive phenotype” that is shaped by early adversity?

Thank You