QUANTIFYING CURIOSITY & PLAY ON TOUCHSCREEN TABLETS

Madeline Pelz, Amanda Yung, & Celeste Kidd

IDC Curiosity Workshop

6.21.15

BACKGROUND

- Curiosity serves to reduce uncertainty (e.g., "Information gap" theory, Loewenstein, 1994)
- Limited quantitative work in this area

PROJECT AIMS

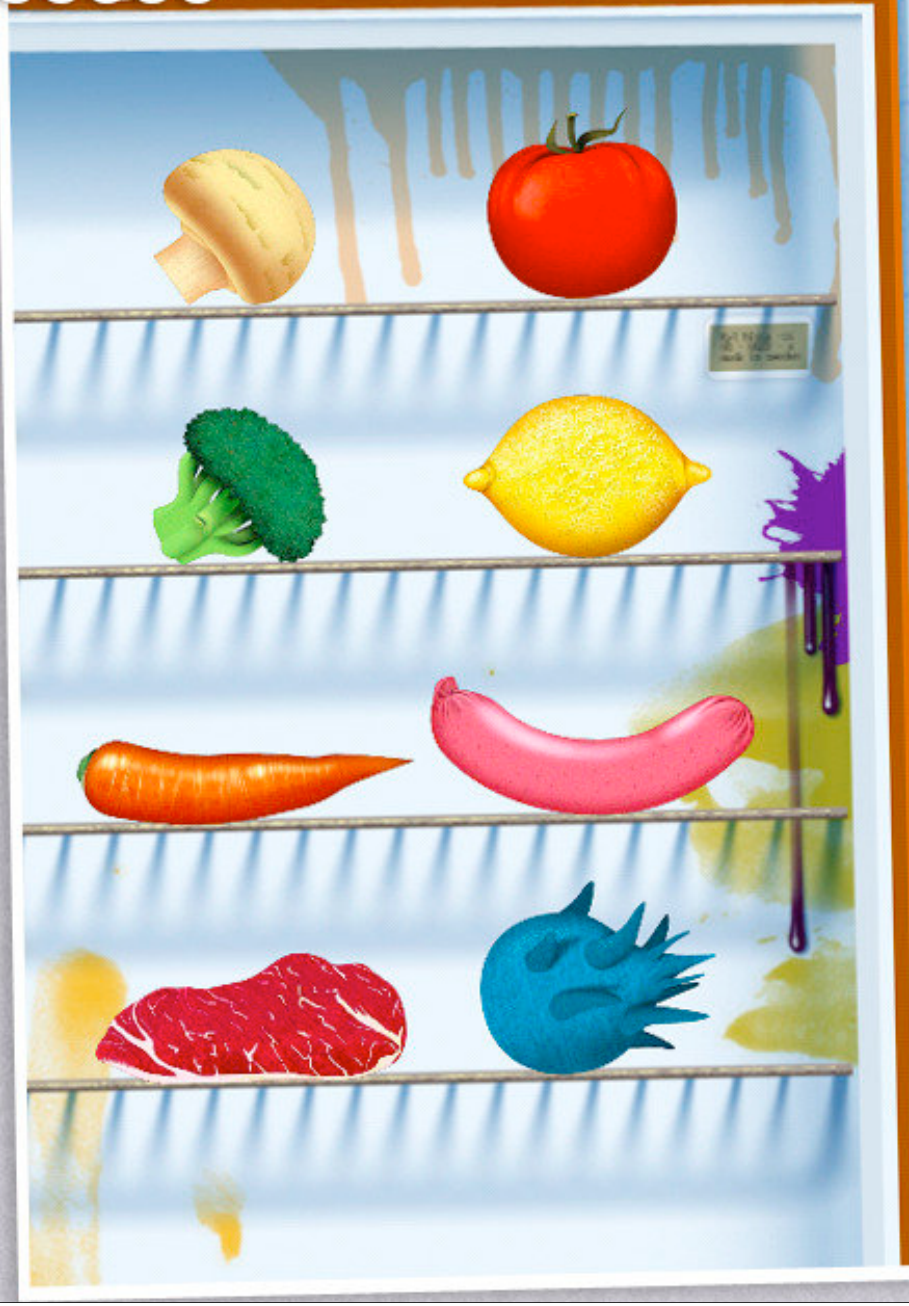
- **How does curiosity and exploratory behavior change across development?**
- Evaluate roles of **maturation** and **experience**
- Hypothesis: Children become more efficient explorers across development

THE "ENVIRONMENT"

- Free-play game
- Generalizable to real scenes
- Rich environment with causal structure
- Toca Kitchen Monsters (Toca Boca)

TOCA BOCA

What do monsters like to eat?




00:00

EXAMPLE OF GAMEPLAY

PARTICIPANTS

N=121
(1-12 years, *M*=4.8)

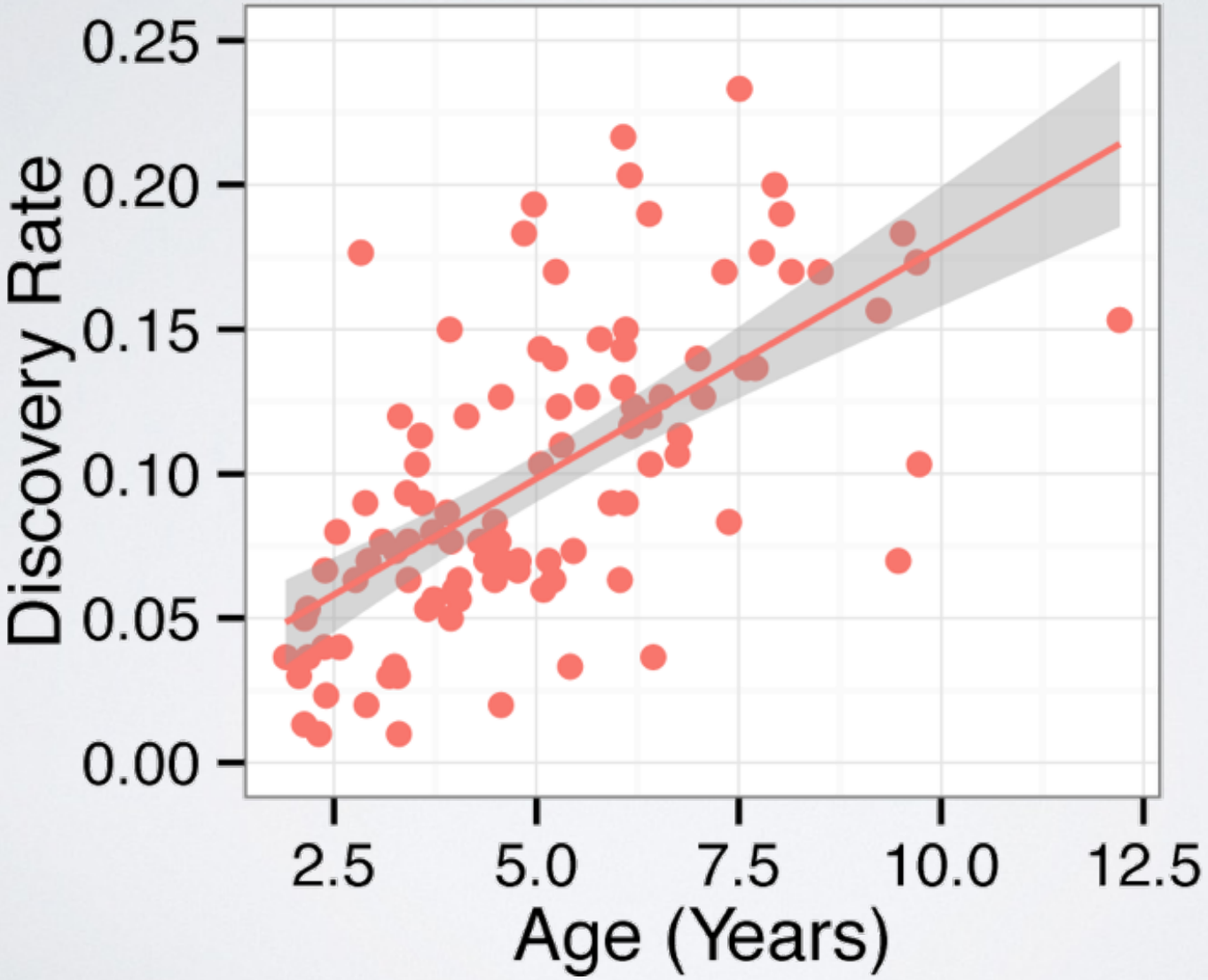
DESIGN

- 5 minutes of play
- No feedback from experimenter
- Data output: Object/Location/Time

QUANTIFYING RATE OF EXPLORATION

$$\text{Discovery Rate} = \frac{\text{Novel objects touched}}{\text{Time played}}$$

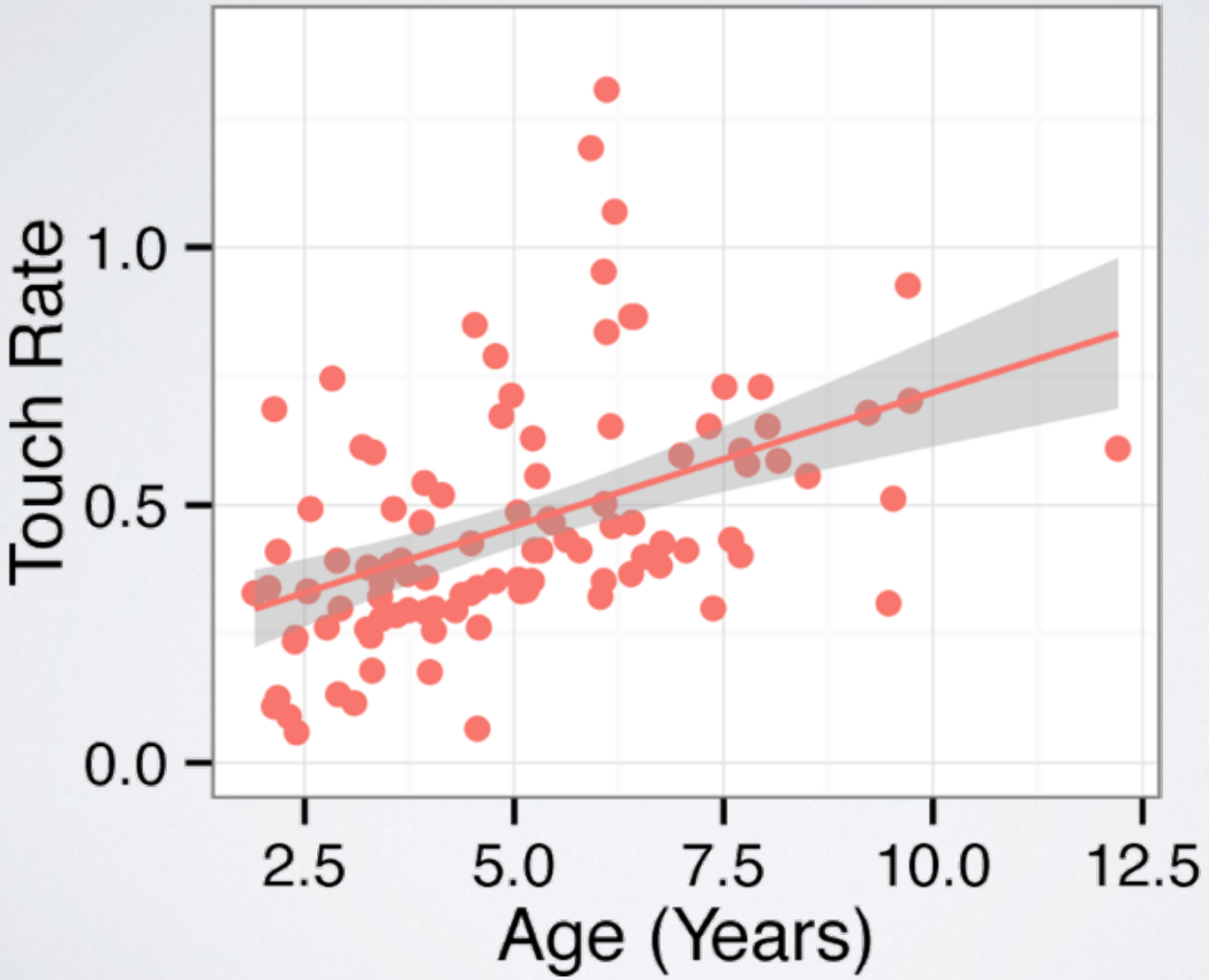
DISCOVERY RATE INCREASES WITH AGE



$R^2 = 0.41$

$p < 0.001$

TOUCH RATE INCREASES WITH AGE

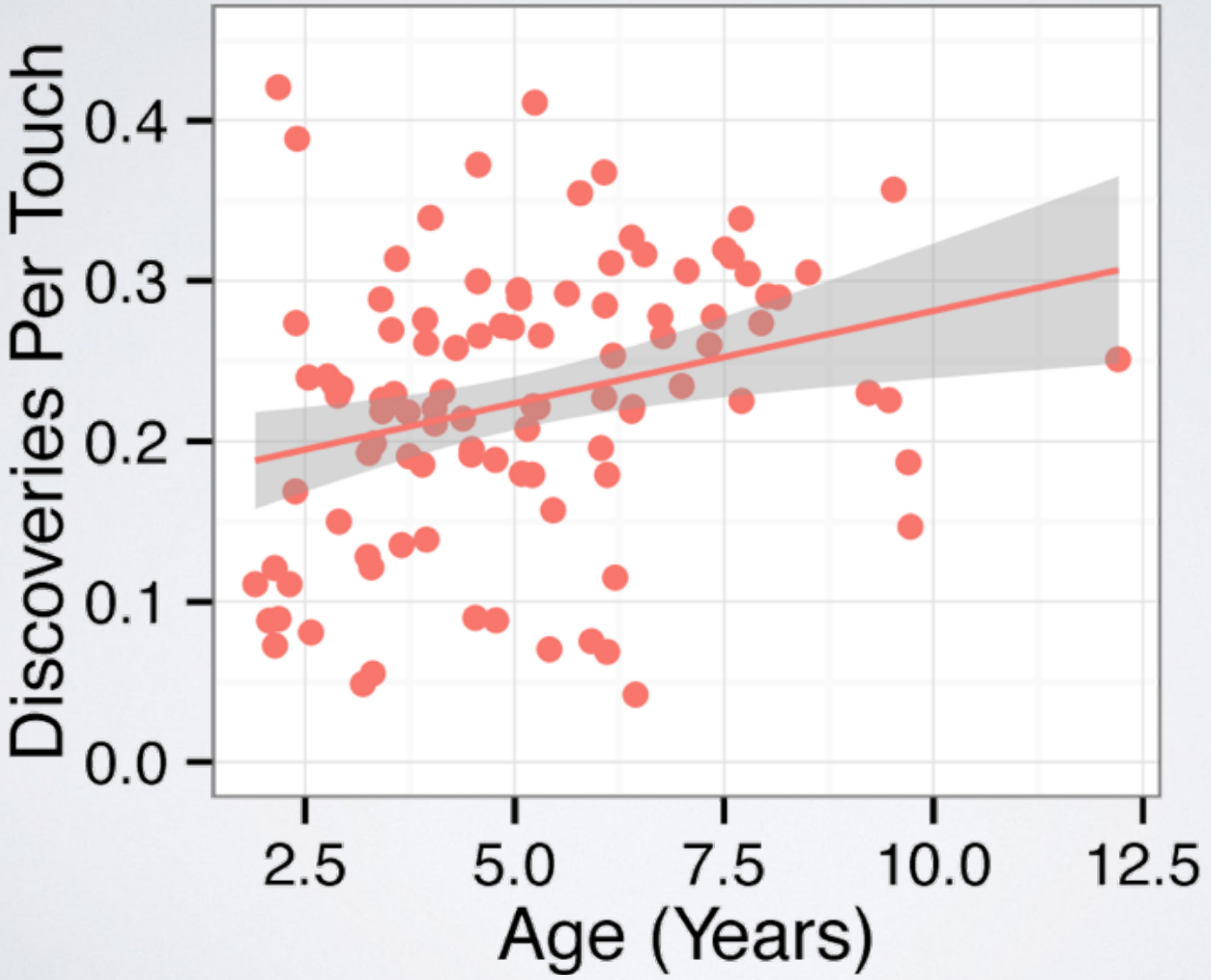


$R^2 = 0.26$
$p < 0.001$

QUANTIFYING EFFICIENCY OF EXPLORATION

$$\text{Discoveries Per Touch} = \frac{\text{Novel objects touched}}{\text{Total touches}}$$

DISCOVERIES PER TOUCH INCREASE WITH AGE



$R^2 = 0.079$

$p < 0.05$

INTERIM SUMMARY

- Discovery rate increases across development
- Touch rate also increases
- Discoveries per touch (efficiency) also increases
- Really maturation?

MODELING THE EFFECTS OF EXPERIENCE

- Touchscreen experience measured by parental survey (minutes/day)
- GLM predicting discoveries per touch by age and experience
- Age contributes significantly ($p < 0.05$)
- Experience does not ($p = 0.6$)

LIMITATIONS

- Experience might accumulate across age
- Parents of **every** U.S. child (ages 1-12) reported touchscreen use
- Separate maturation from experience

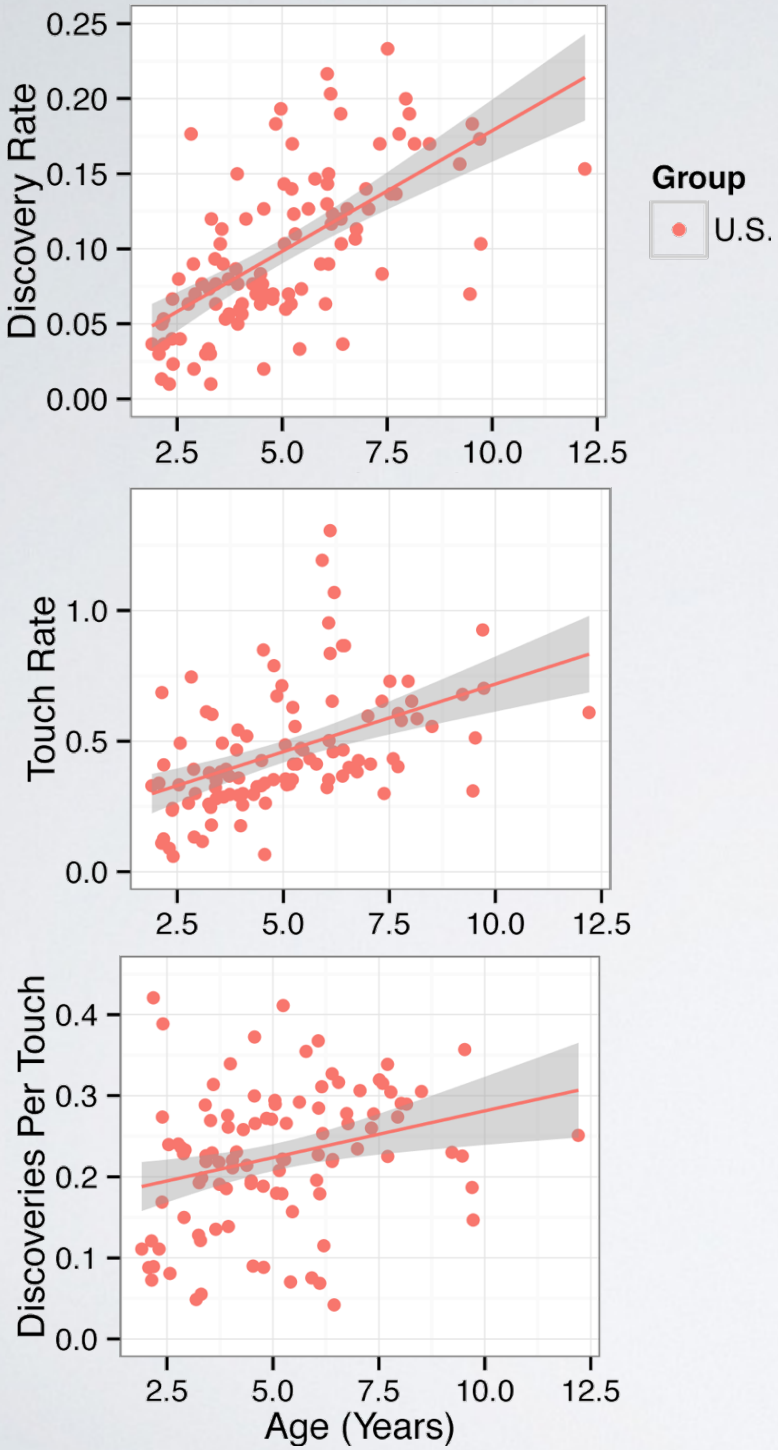
TSIMANE'

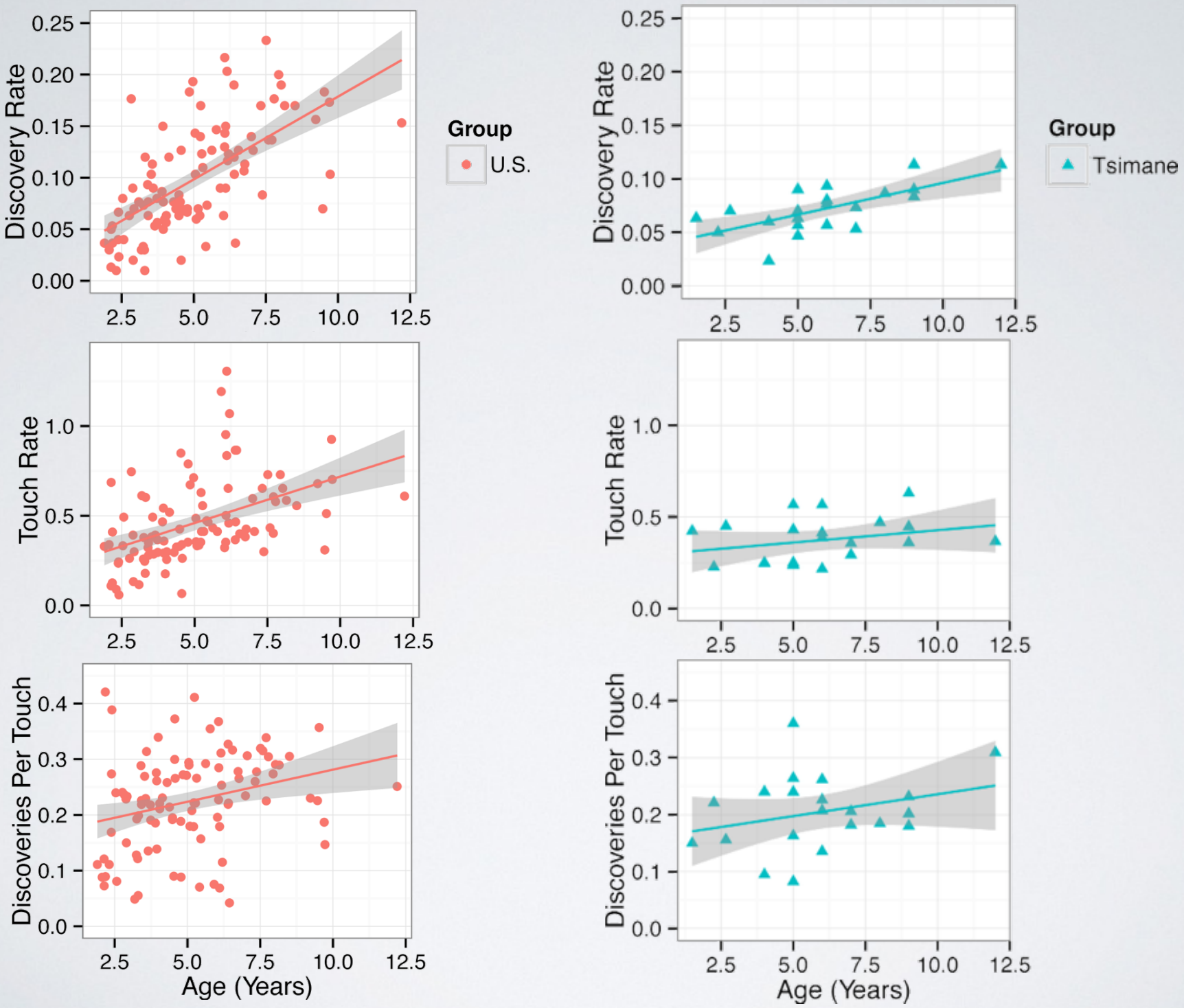
- Farmer-forager community in Bolivia
- "Education-optional" system, no manufactured toys or touchscreen experience

PARTICIPANTS
(TSIMANE')

N=24
(1-12 years, *M*=5.7)

Data collection still in progress

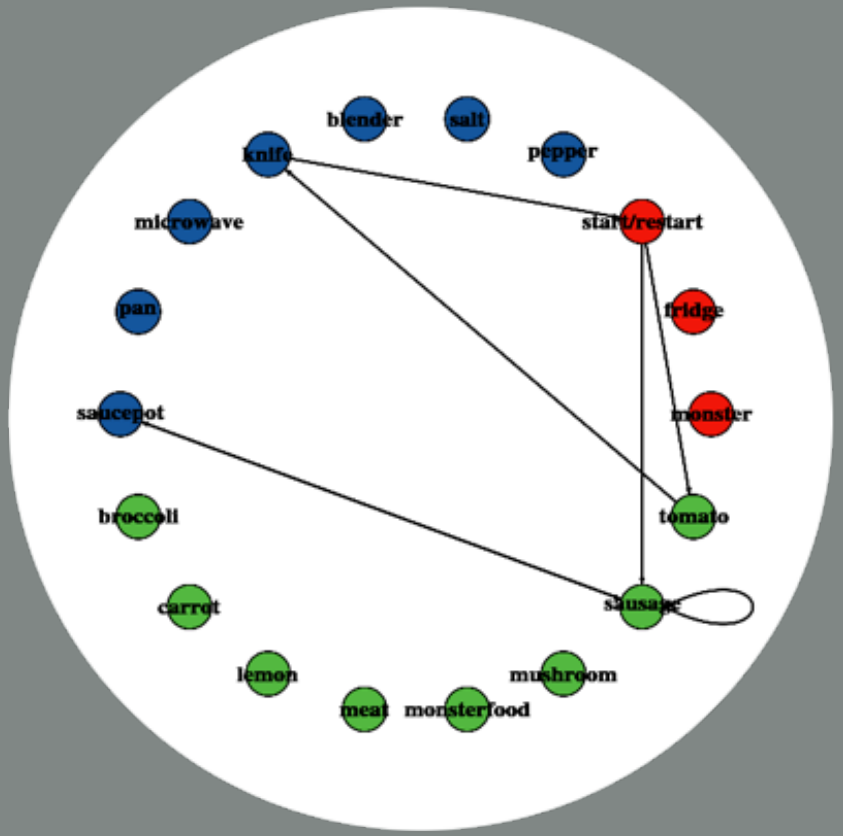

Discovery Rate
0.25
0.20
0.15
0.10
0.05
0.00
2.5
5.0
7.5
10.0
12.5
Group
U.S.
Touch Rate
1.0
0.5
0.0
Discoveries Per Touch
0.4
0.3
0.2
0.1
0.0
Age (Years)


Discovery Rate
0.25
0.20
0.15
0.10
0.05
0.00
2.5
5.0
7.5
10.0
12.5
Group
U.S.
Tsimane
Touch Rate
1.0
0.5
0.0
Discoveries Per Touch
0.4
0.3
0.2
0.1
0.0
Age (Years)

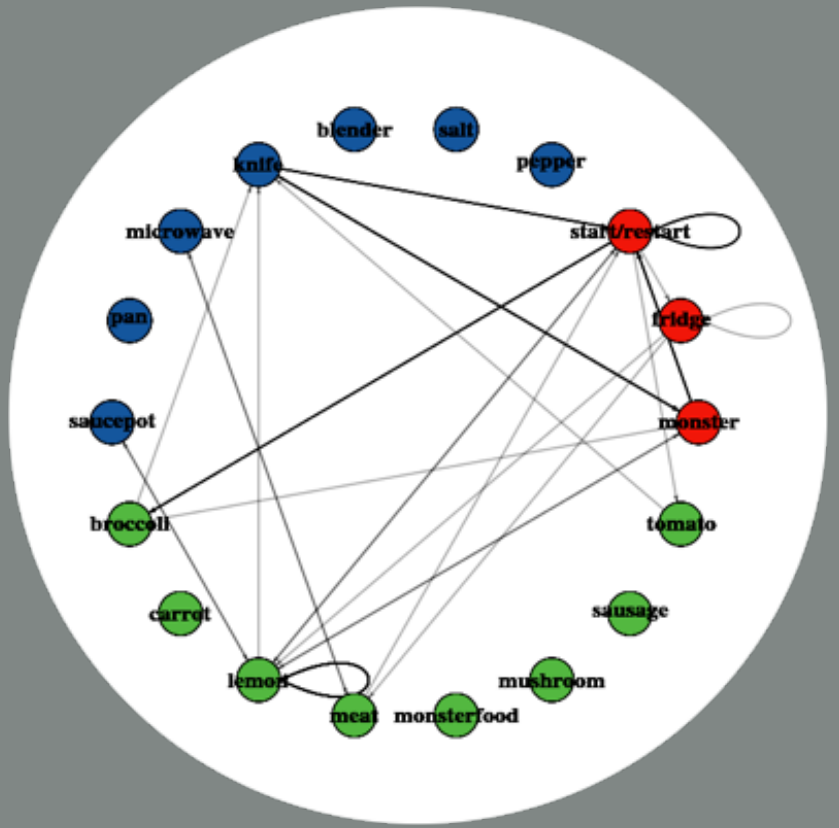
WHY DO OLDER CHILDREN DISCOVER MORE?

- Perseveration (Piaget)
- Young children show repetitive behaviors during exploration/learning

PERSEVERATION



Age: 2

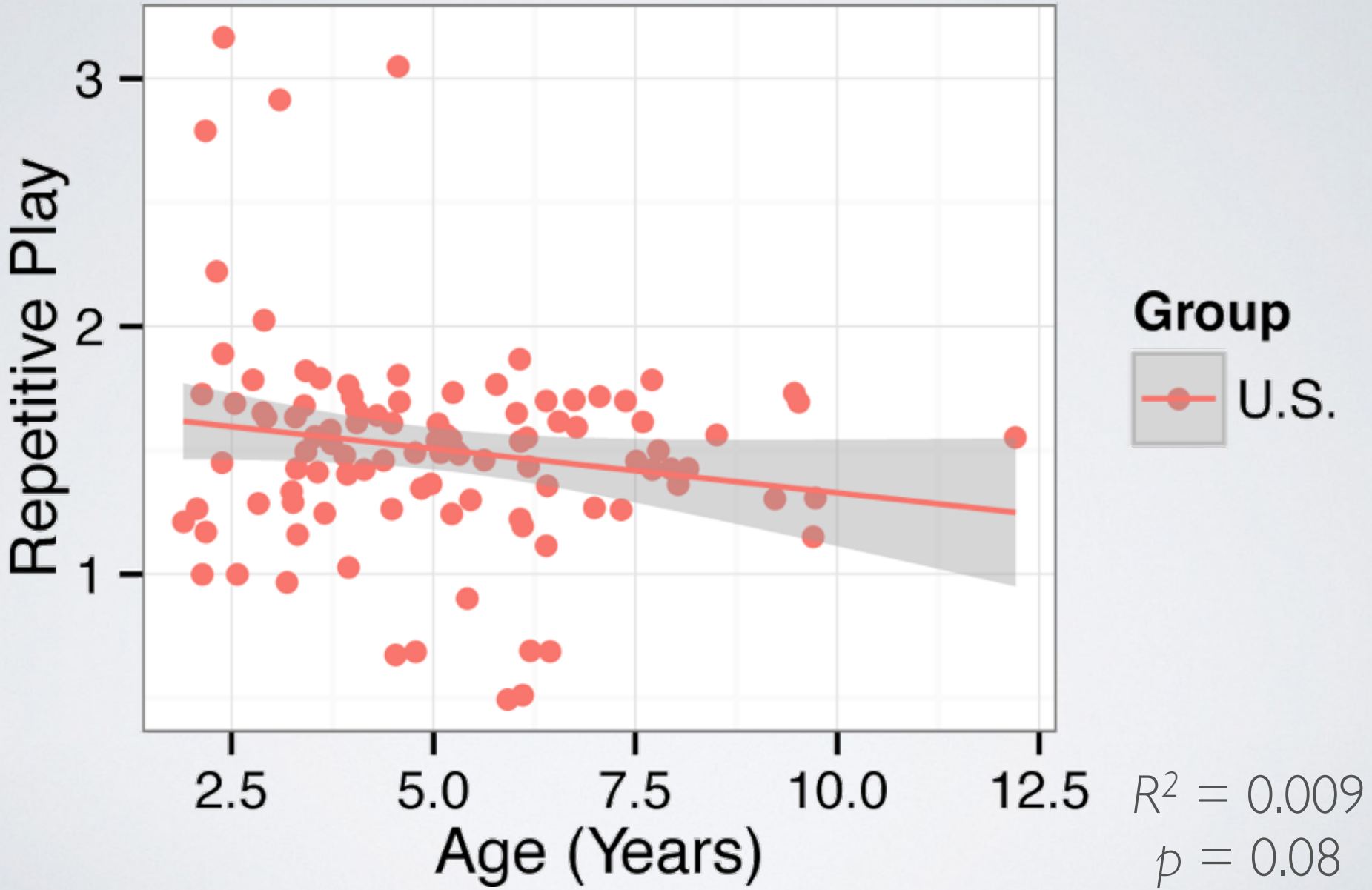


Age: 4.5

QUANTIFYING REPETITIVE PLAY

- Compressed file size based on ordered object list
- Lempel-Ziv-Welch algorithm

REPETITIVE PLAY



$R^2 = 0.009$

$p = 0.08$

SUMMARY

- Discovery rate, touch rate, and discoveries per touch increase across development
- Children become more efficient explorers with age
- Preliminary cross-cultural results suggest effects of maturation
- Repetitive play decreases marginally with age

FUTURE DIRECTIONS

- Testing the "Information Gap" hypothesis
- Directly manipulating uncertainty
- Hypothesis: children will preferentially explore to reduce uncertainty

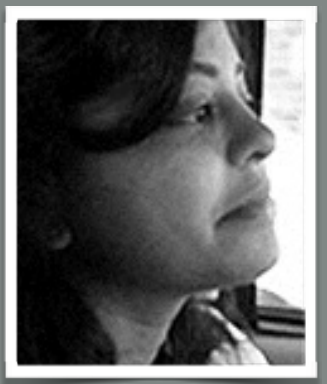
KiDD LAB

Amanda Yung

Celeste Kidd

Shirlene Wade

Habiba Azab



Shraddha Shah

Louis Marti

Holly Palmeri

Carla Macias

Tsimane' team:
Dino Nate Añez,
Robertina Nate Añez,
Salomon Hiza Nate &
Julian Jara-Ettinger

Rochester Kid Lab
@ the University of Rochester

TOCA BOCA

Rochester Baby Lab
@ the University of Rochester

TOCA BOCA

Toca Boca Kitchen Monsters
http://tocaboca.com/app/toca-kitchen-monsters

Björn Jeffery

Fredrik Telenius

Alex Wein

Andrey Zhukov

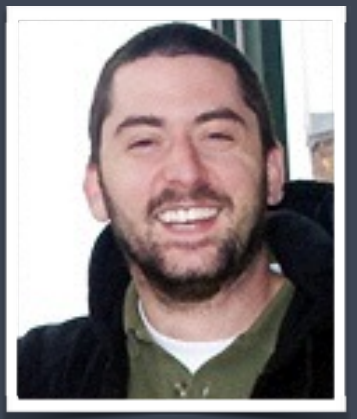
KELPY

Kid **E**xperimental **L**ibrary in **Py**thon)

https://github.com/piantado/kelpy

Steve Piantadosi

Amanda Yung



Matthew McGovern

THANK YOU