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Teaching Advanced Verbal Behavior to Children with Autism Using Speech Generating Devices

Alice Shillingsburg, PhD, BCBA-D
May Institute

Autism (DSM-5, APA)

- Neurodevelopmental Disorder
  - Impairments in Social Communication and Social Interaction
  - Restricted and Repetitive Patterns of Behavior

- Social Deficits are the Hallmark Feature

- Language deficits can range from mild to severe

Autism

- Approximately 65% to 75% of children with ASD exhibit moderate to severe language delays (Anderson et al., 2007)
- Almost 30% were not using spoken words consistently

Table 1

Expressive Language Level at Age 9 by Age 2 Diagnosis: Percentage of 172 Participants

Language level	Autistic (n = 84)	PDD-NOS (n = 46)	Nonspectrum (n = 42)
Complex sentences (ADOS Module 3)	23.8	58.7	54.8
Sentences but not fluent (ADOS Module 2)	23.8	26.1	31.0
Words but not sentences (ADOS Module 1; ADI-R = 1)	23.8	10.9	7.1
No or few consistent words (ADI-R = 2)	28.6	4.3	7.1

Note. Four children were not administered ADOSs; level of language was inferred from ADI, Vineland, and best verbal IQ scores. PDD-NOS = pervasive development disorders-not otherwise specified; ADOS = Autism Diagnostic Observation Schedule; ADI-R = Autism Diagnostic Instrument-Revised

(Anderson et al., 2007)

Augmentative and Alternative Communication (AAC) (Ganz, 2015)

- Provides a means of communicating when speech is delayed
- AAC does not impede spoken language
- Aided and Unaided
  - Picture exchange
  - Sign language
- Low-tech and High-tech
  - Picture exchange systems
  - Speech generating devices

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High-Tech SGD

- Ubiquitous in society
- Low cost
- Easy to modify
- Easy to transport

- Widespread use and demand has gotten ahead of the research

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Research on AAC

- Majority of research on AAC focuses on teaching requesting/Mands (Ganz, et al., 2012)
- Meta-analysis of tablet use to teach communication (Alzrayer, Banda, & Koul, 2014)
  - Majority taught simple manding (requesting)
  - Single word tacts (labels), greetings, please and thank you
  - 14 of 15 targeted single-step communication

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Today's Presentation

- Present a set of studies teaching advanced communication skills to children with ASD who use high-tech SGD
- Replications of previous studies with vocal participants
  - Mands for Information
  - Reporting past behaviors
  - Tacts using noun-verb combinations

Mands for Information

Motivating Operations (Michael, 1993)

1. Change the reinforcing effectiveness of other stimuli (reinforcer establishing/abolishing effect)
2. Change frequency of the occurrence of behaviors associated with those reinforcers (evocative/abative effect)

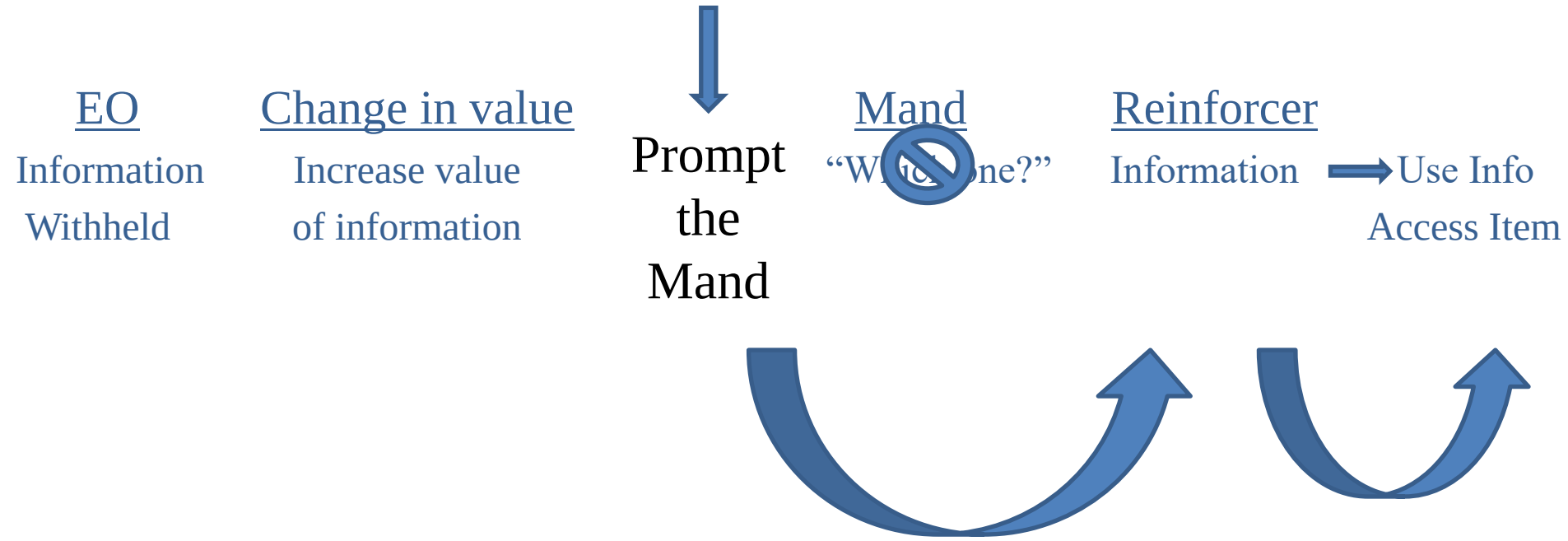
EO (motivation)	Change in value	Change in Behavior
5 hours since Breakfast	Food becomes valuable	-Go to fridge -Look up menu -Ask for a snack
AO (no motivation)	**Change in value**	**Change in Behavior**
Just finished buffet lunch	Food loses value	-Take a nap -Watch a football game -Do not ask for a snack

Mand Training
(Request Training)

EO	Change in value		Mand	Reinforcer
Snack Time	Increase value of snack item	Prompt the Mand	“[illegible]” 	Access to chips

Manding for Information

- A child asks for something he can't find
- He's told it's in a cabinet but isn't told which specific cabinet



Manding for Information

- A child asks for something he can't find
- He's told the specific cabinet where the item is

AO	Change in value	Mand	Reinforcer	
Information Provided	**NO** Increase value of information	NA	NA	Use Info Access Item

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Functional Manding

- Functional manding requires discriminating EO and AO conditions
  - Manding under AO conditions
- Mands for information
  - Teach individuals to mand when information is needed
- Avoid rote responding

Journal of
Applied Behavior Analysis

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2014, 47, 136–150 NUMBER 1 (SPRING)

MANDS FOR INFORMATION USING "WHO?" AND "WHICH?" IN THE PRESENCE OF ESTABLISHING AND ABOLISHING OPERATIONS

M. Alice Shillingsburg

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AND

Crystal N. Bowen, Amber L. Valentino, and Laura E. Pierce

MARCUS AUTISM CENTER

Treatments designed to teach mands for information have included prompting and differential reinforcement, as well as procedures to manipulate the relevant establishing operation (EO). However, previous studies have not included relevant abolishing operation (AO) conditions to ensure that the mand is under relevant antecedent control. Data on listener responses (i.e., use of the information) are also absent in the literature. The current study shows differential responding under EO and AO conditions and reports listener responses that demonstrate use of the provided information. Three participants, diagnosed with an autism spectrum disorder, learned to mand for information using "who?" and "which?" questions exclusively under EO conditions. In addition,

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Mands for Information—Who and Which

- Contrive relevant Establishing Operations (motivation) and Abolishing Operations (AO)
- EO Present (EO) – Information regarding location of preferred item NOT given (contriving a motivation for the information)
- EO Absent (AO) – Information regarding location of preferred item given (no motivation for information)
- Dependent Variables
  - Asking “Who has it?” or “Which” when EO is Present
  - Refraining from asking when Motivation is Absent

Mands for Information—Who and Which

- EO Present (EO) –

  Hide a preferred item in a container amongst a set of similar containers and do not specify which container it is in. (contrive motivation for information)

- EO Absent (AO) –

  Hide a preferred item in a container amongst a set of similar containers and DO specify which container it is in. (no motivation for information)

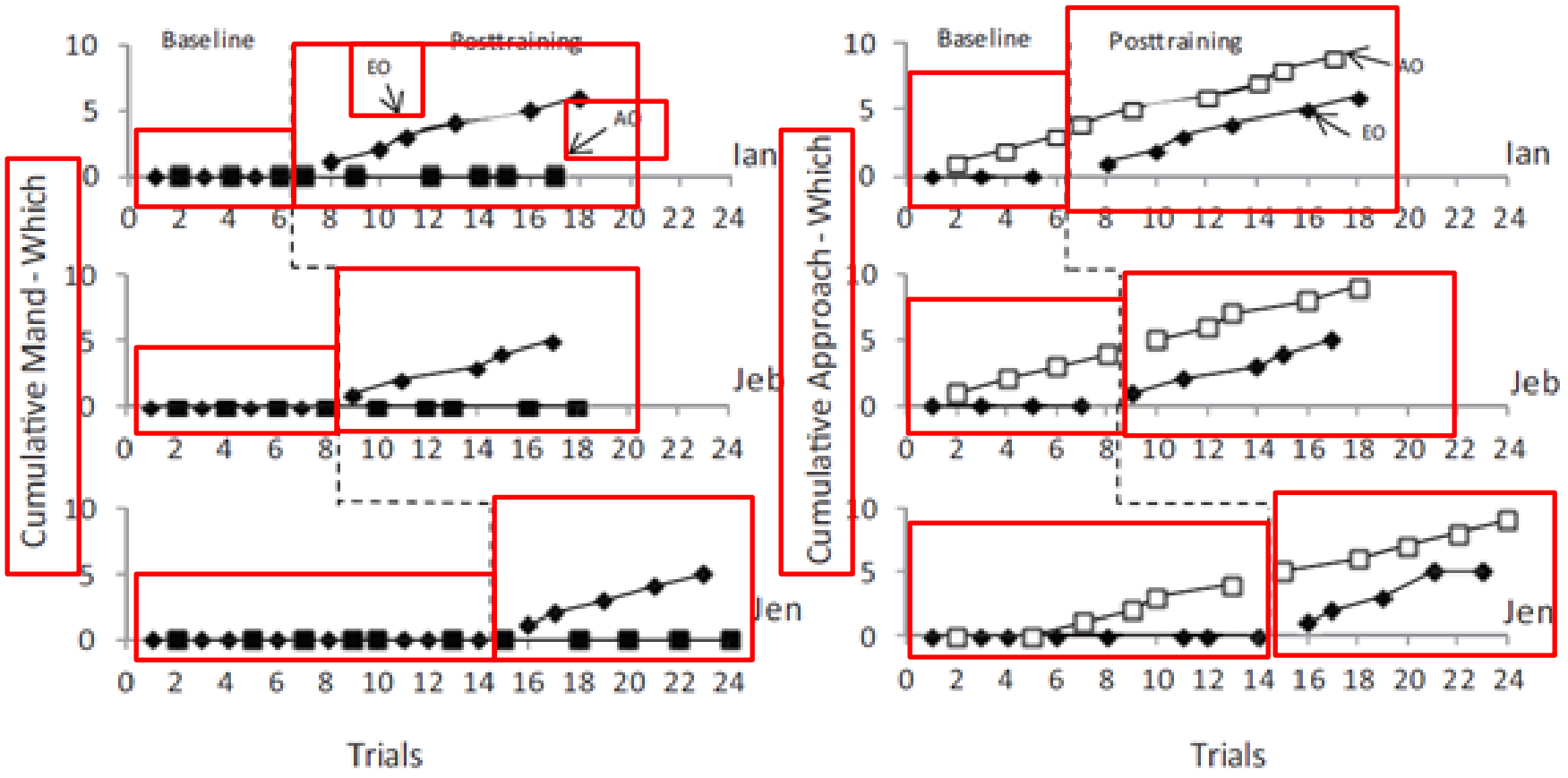
Mands for Information—Who and Which

- EO Present (EO) –

  Child asks for a cookie. You say, "sure, its in one of those boxes." Contrive motivation for which box and sets the stage to prompt the mand.

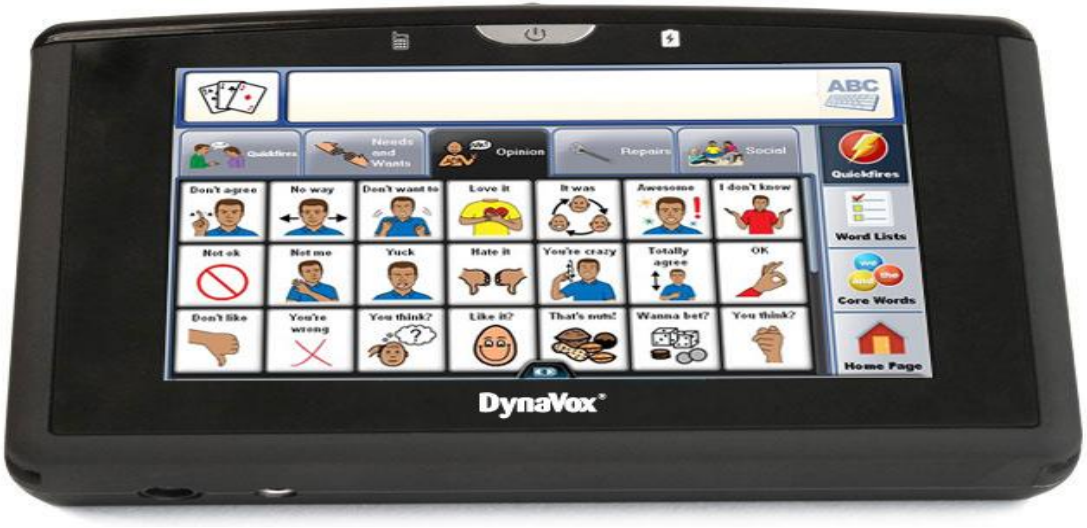
- EO Absent (AO) –

  Child asks for a cookie. You say, "sure, its in the yellow box." Abolishes motivation for which box and sets the stage for direct use of the information.


Baseline
Posttraining
EO
AO
Cumulative Mand - Which
Cumulative Approach - Which
Ian
Jeb
Jen
Trials

Mands for Information—AAC

- Shillingsburg, Marya, Bartlett & Thompson (2019 online, JABA)



Journal of
Applied Behavior Analysis

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2019, **9999,** 1–16 NUMBER 9999 ()

Teaching mands for information using speech generating devices: A replication and extension

M. ALICE SHILLINGSBURG

MAY INSTITUTE, RANDOLPH, MA

VIDESHA MARYA, BRITTANY L. BARTLETT AND TAYLOR M. THOMPSON

MARCUS AUTISM CENTER, ATLANTA, GA

Approximately 30% of individuals diagnosed with autism spectrum disorder (ASD) fail to develop vocal communication and, therefore, use some form of augmentative or alternative communication system. The current study replicates and extends previous research on teaching "Who?" and "Which?" mands for information to 3 young children diagnosed with ASD using a speech generating device. Procedures were evaluated using a multiple baseline across participants design. All participants learned to mand for information and, subsequently, used the information to access preferred items.

Key words: augmentative and alternative communication, autism spectrum disorder, mands for information, speech generating device, "wh" questions

	Gender	Age	VBMAPP Scores	Mand Scores	Diagnosis	Expressive Language
Bruce	Male	3	76	9	ASD	SGD
Emma	Female	6	113	10.5	ASD	SGD
Justin	Male	6	142.5	14	ASD	SGD

Home

Clinic

Favorite things

People

My schedule

Work

Play

Clinic locations

Clinic Activities

Questions


Clinic
Favorite things
I want
token
doll
cat
more
doctor kit
juice
chips
all done
Box
bunnies
songs

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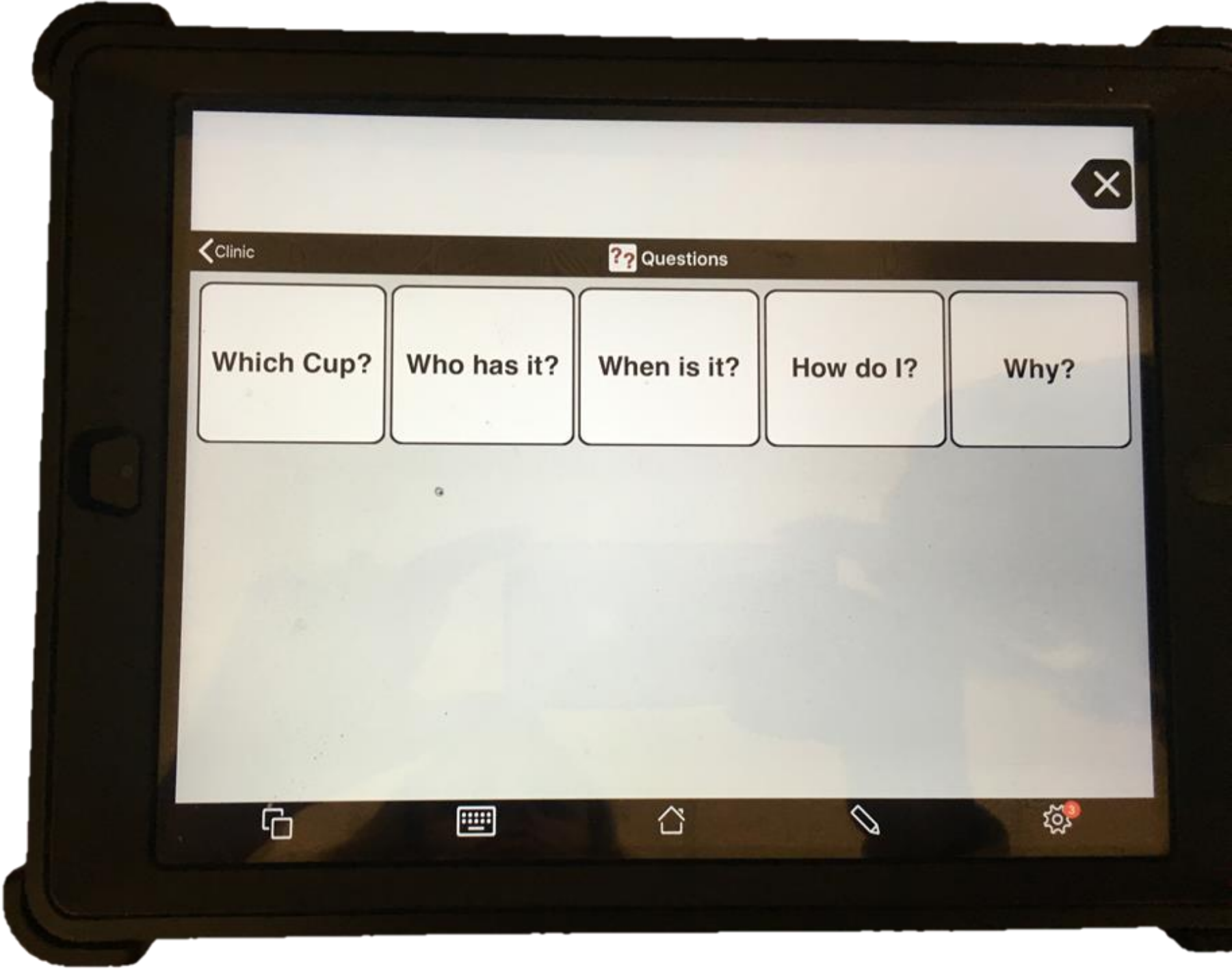
“Sure, one of your teacher’s has it.”

Favorite things

I want	token	doll	cat	more
doctor kit	juice	iPad	chips	all done
playdough	snoopy	Box	bunnies	songs


Home
Clinic
Favorite things
People
My schedule
Work
Play
Clinic locations
Clinic Activities


Clinic
Questions
Which Cup?
Who has it?
When is it?
How do I?
Why?

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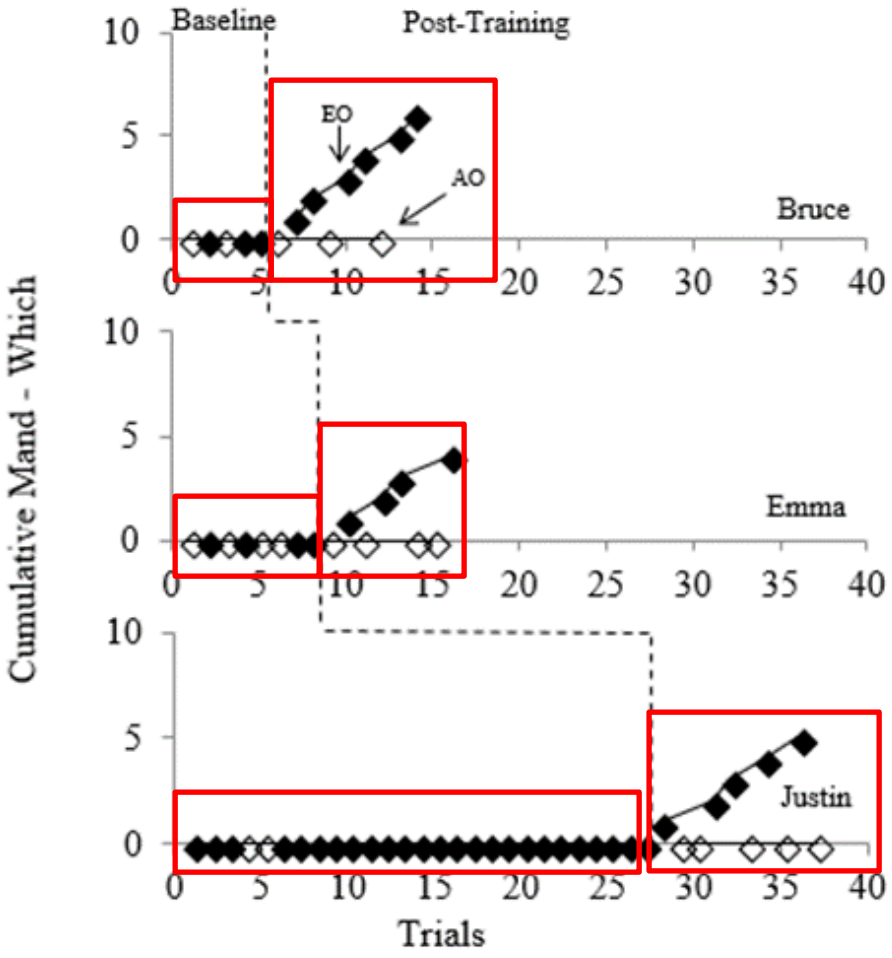
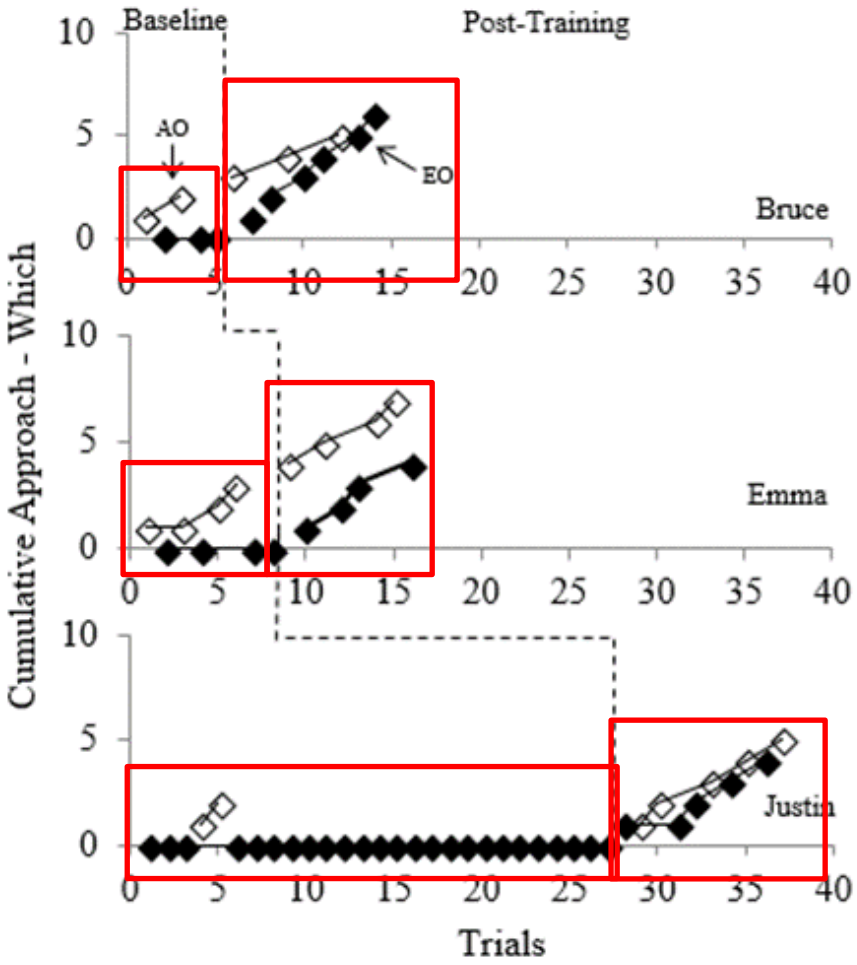
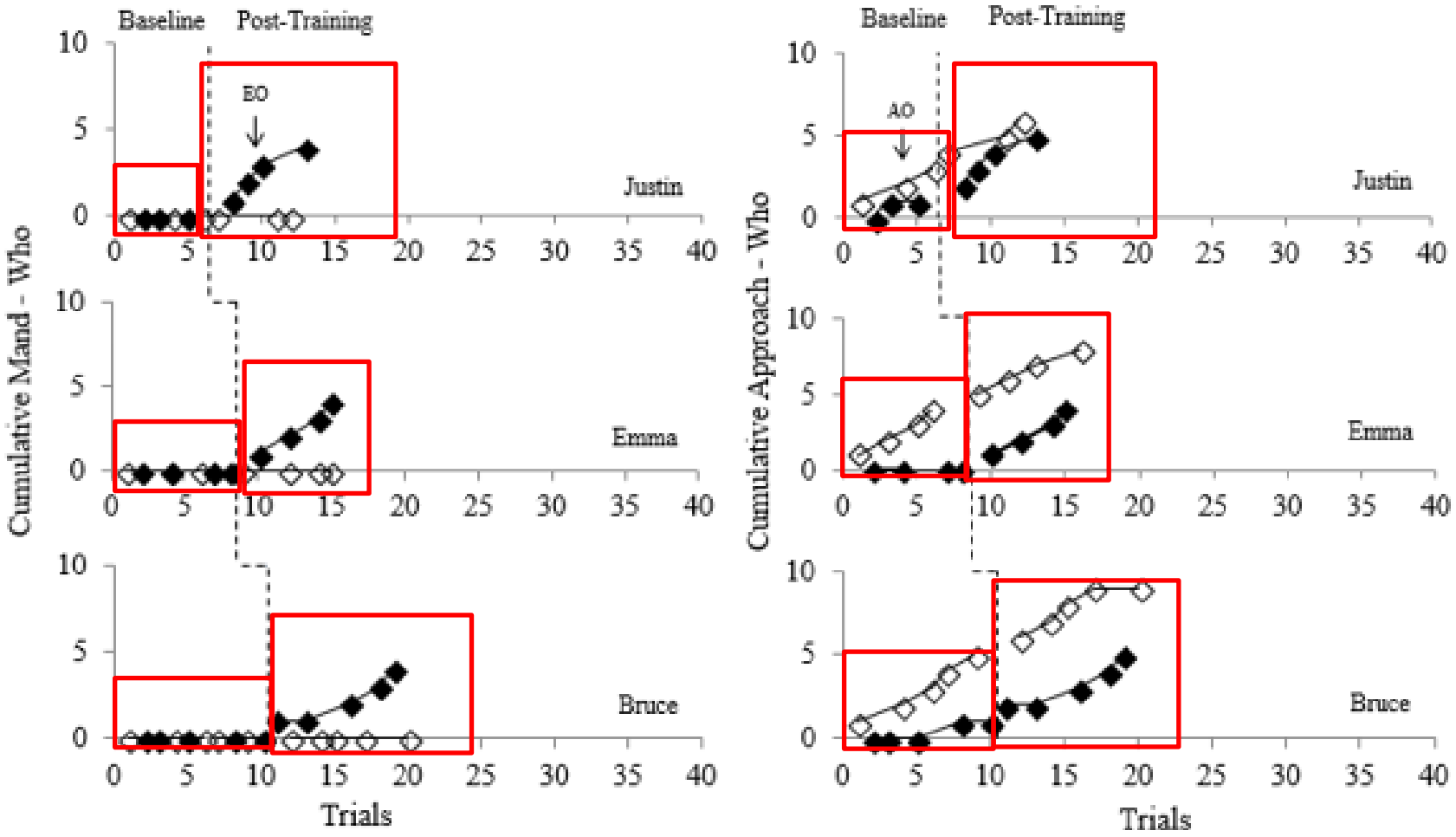
One Participant-Typing

Shillingsburg, Marya, Bartlett & Thompson (2019)
JABA

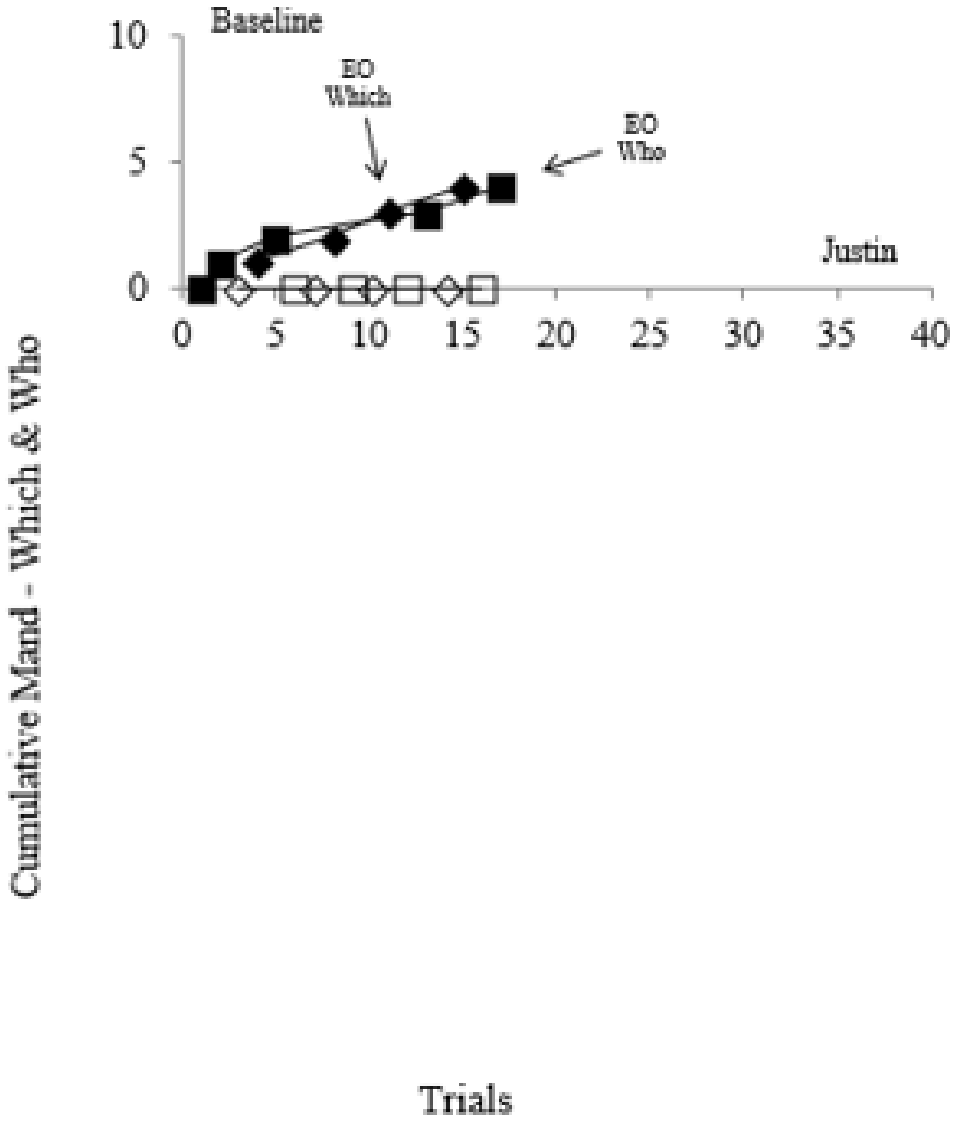




Shillingsburg, Marya, Bartlett & Thompson (2019)
JABA



Shillingsburg, Marya, Bartlett & Thompson (2019) *JABA*



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Conclusions

- All three participants engaged in discriminated manding
  - Manded for information when information was needed
  - Refrained from manding when information was not needed
  - Emitted the appropriate mand frame (i.e., “who” or “which”) under the correct conditions
    - Only one required teaching

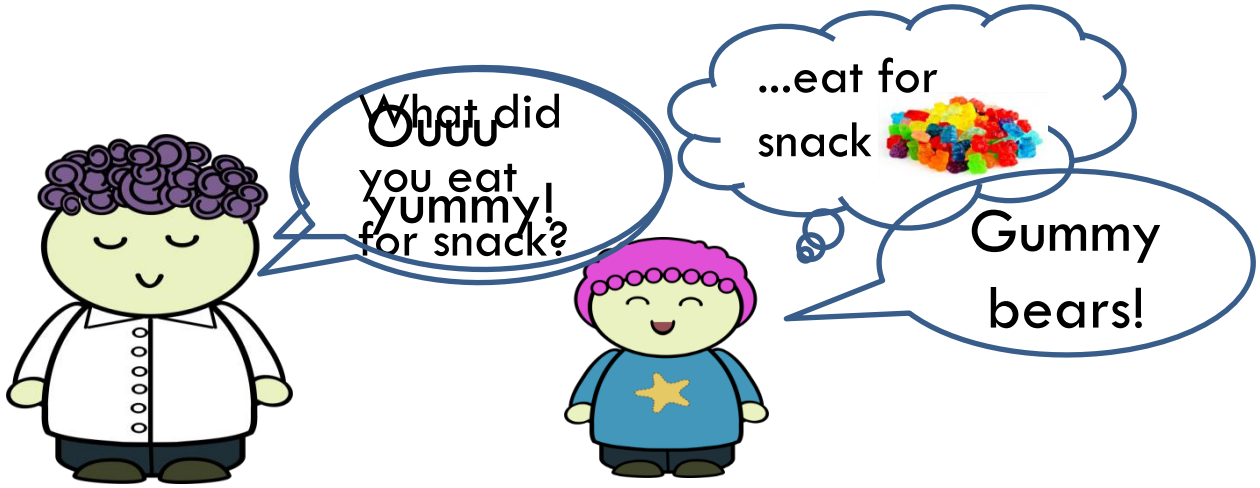
Answering Questions to Report Past Behavior

Reporting Past Behavior

- Children are expected to report past behavior
  - Did you finish your homework?
  - Who did you see at school today?
- Common caregiver concern
  - How did you get this bruise?

Development of Reporting Past Behavior

- Self-tacting
  - "…current stimuli, including events within the speaker himself **generated by the question**, in combination with a history of earlier conditioning" (Skinner, 1957, pg. 143)
- Intraverbal control (Palmer, 2016)



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Development of Reporting Past Behavior

- Verbal community arranges reinforcement contingencies and provides clarifying information
  - Who did you see at school today?
  - Was Jessica there?

- This is how reporting past behavior is shaped in typical development

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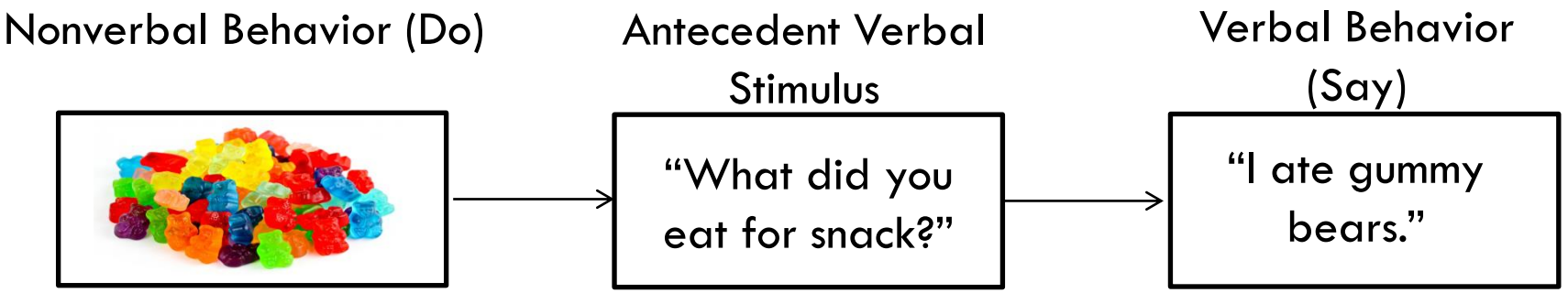
Reporting Past Behavior

- Deficits in accurate reporting
  - Errors in stimulus control (Skinner, 1957; White, 1985)
    - Failure of relevant stimuli to evoke response or insufficient reinforcement history
  - Social interaction may not function as a reinforcer for children with ASD (Call et al., 2013)

Correspondence

- Nonverbal and verbal behavior

Do/say correspondence = accurately reporting past behavior



Analysis Verbal Behav (2017) 33:275–282
DOI 10.1007/s40616-017-0085-7

BRIEF REPORT

A Preliminary Analysis of Procedures to Teach Children with Autism to Report Past Behavior

M. Alice Shillingsburg[1,2] · Tom Cariveau[1,2] · Bethany Talmadge[1] · Sarah Frampton[1]

The Analysis of Verbal Behavior
https://doi.org/10.1007/s40616-019-00112-2

BRIEF REPORT

Teaching Children With Autism Spectrum Disorder to Report Past Behavior With the Use of a Speech-Generating Device

Alice Shillingsburg[1,2,3] · Videsha Marya[1] · Brittany Bartlett[1] · Taylor Thompson[1] · Dianna Walters[1]

Participants

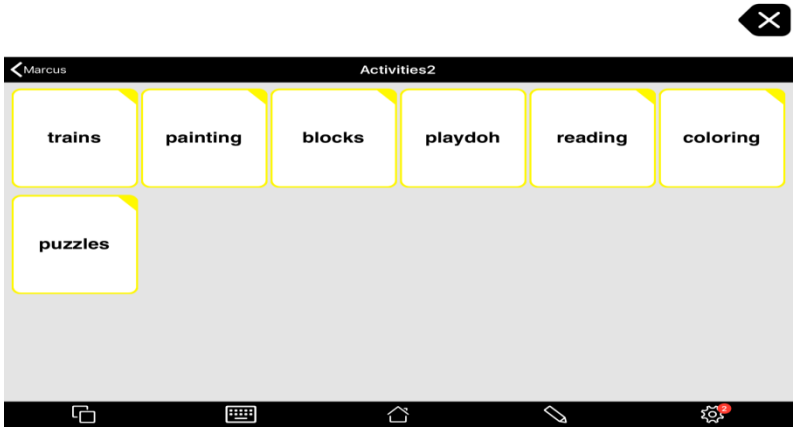
- Three non-vocal children with ASD
- All used device to mand, tact, and intraverbally respond

Response Measurement

- Correct response: providing the name of activity when asked what was done in a specific location via picture selection, text selection, or typing on his or her device

Response Selection

- Navigation
- Typing



Procedures

- Pre-teaching
  - Taught tacts/labels for activities and locations
- Order of locations and activity completed at each location varied quasi-randomly

Procedures

- Pre-teaching
  - Taught tacts/labels for activities and locations
- Order of locations and activity completed at each location varied quasi-randomly

Baseline



1.5 hour delay

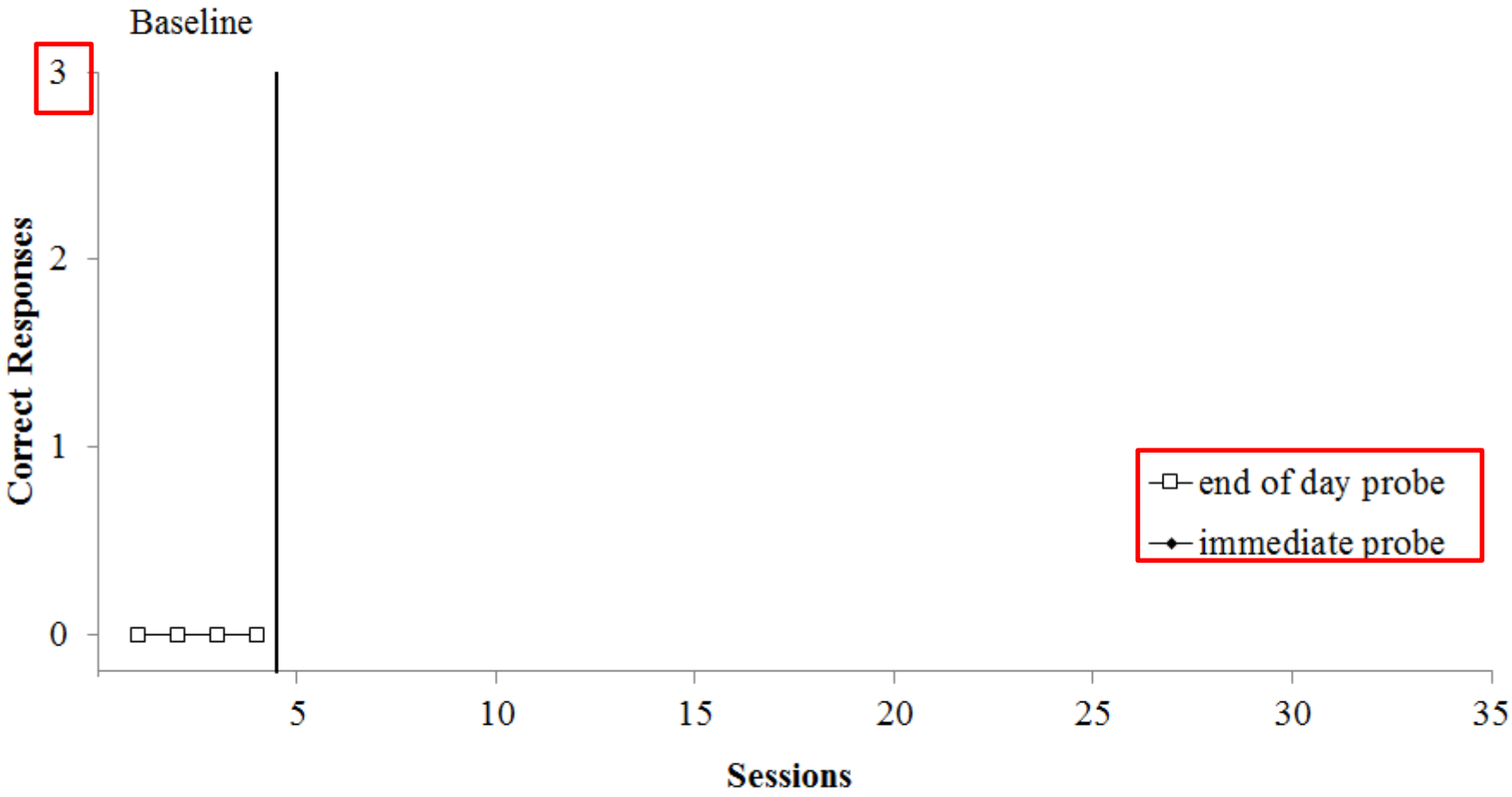
time

"What did you do in _____?"

"What did you do in _____?"

"What did you do in _____?"

Emma


Baseline
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Correct Responses
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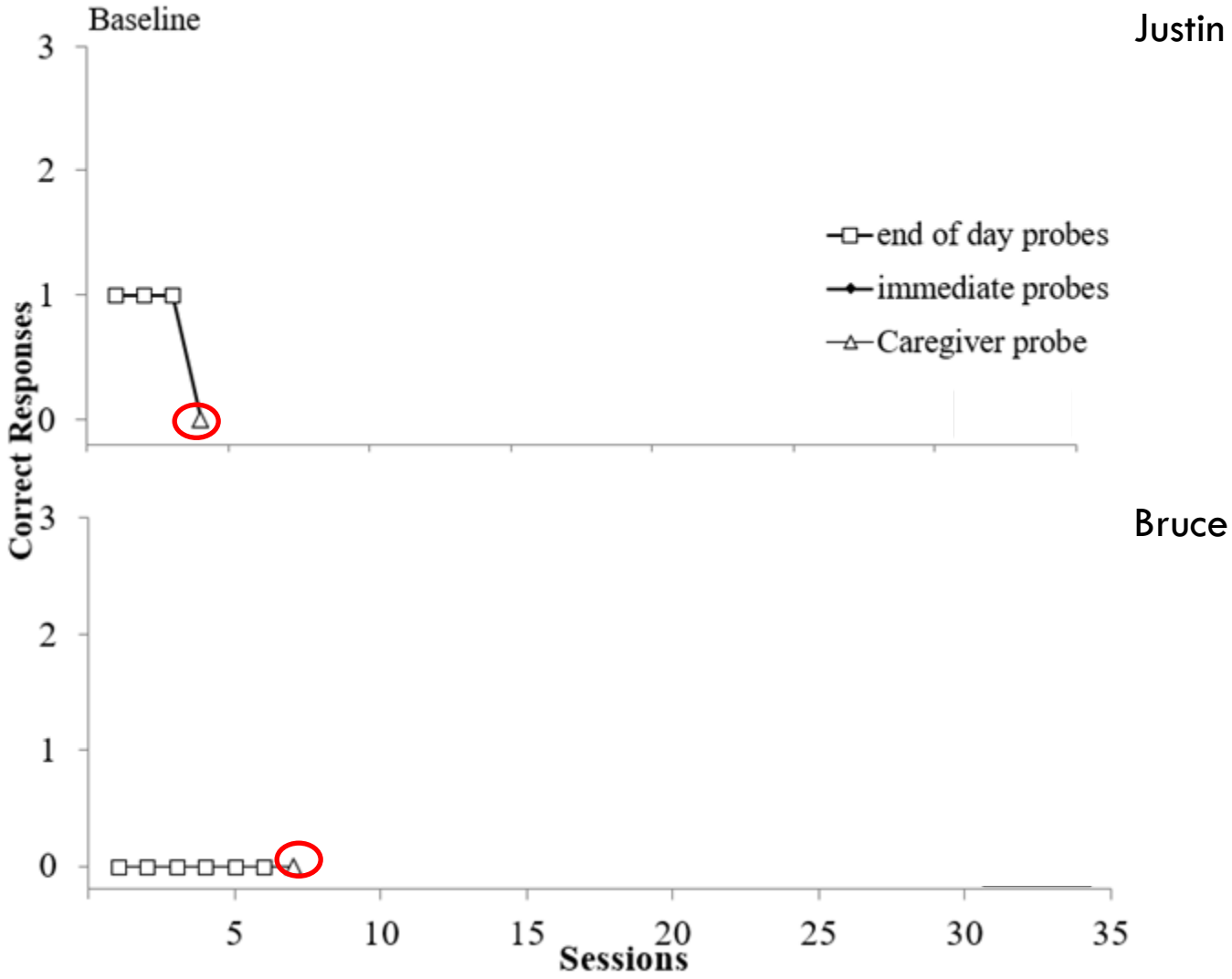
35
Sessions
end of day probe
immediate probe


Baseline
Justin
Bruce
Correct Responses
Sessions
end of day probes
immediate probes
Caregiver probe
0
1
2
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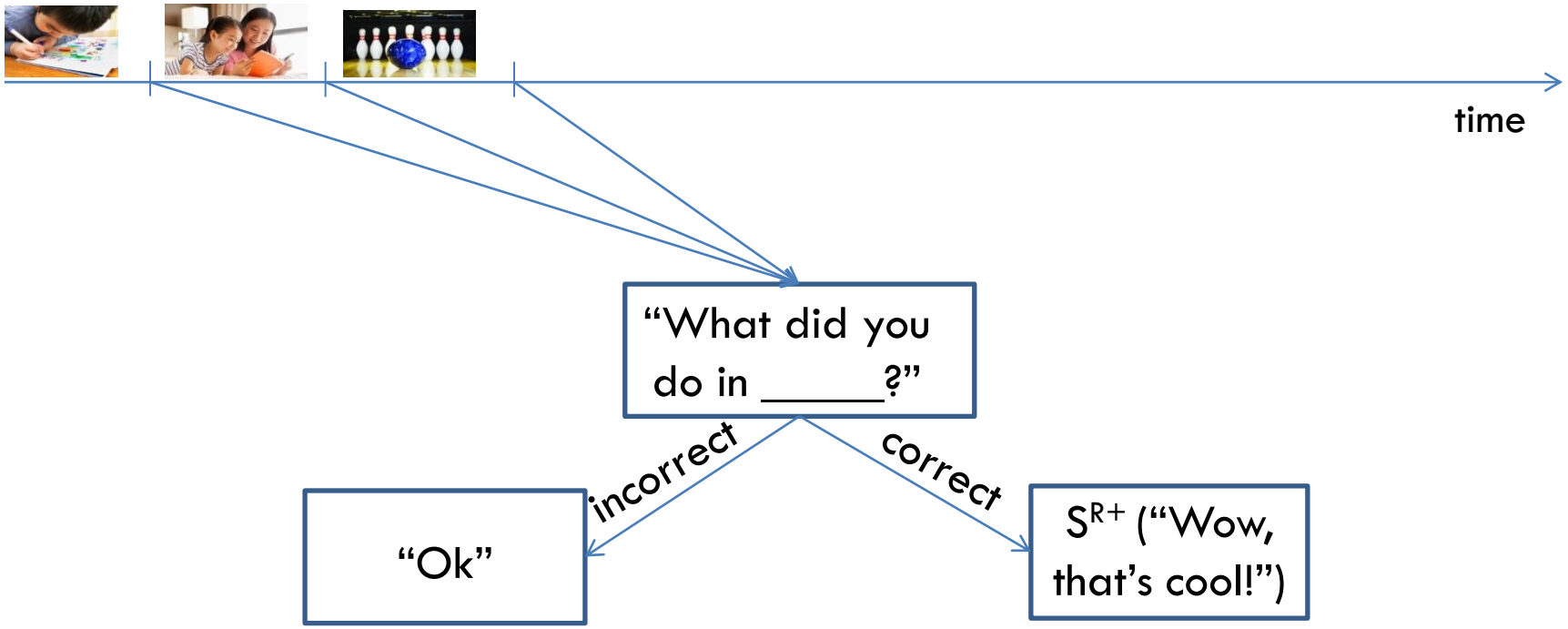
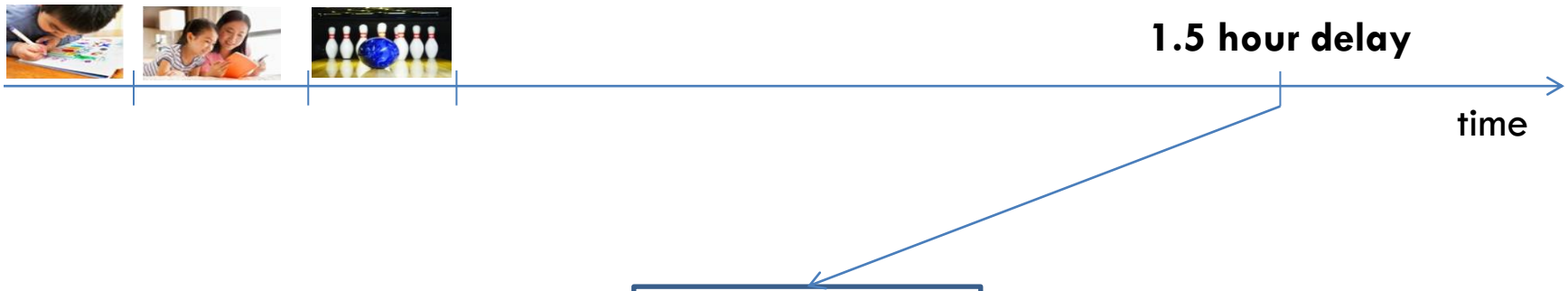
35

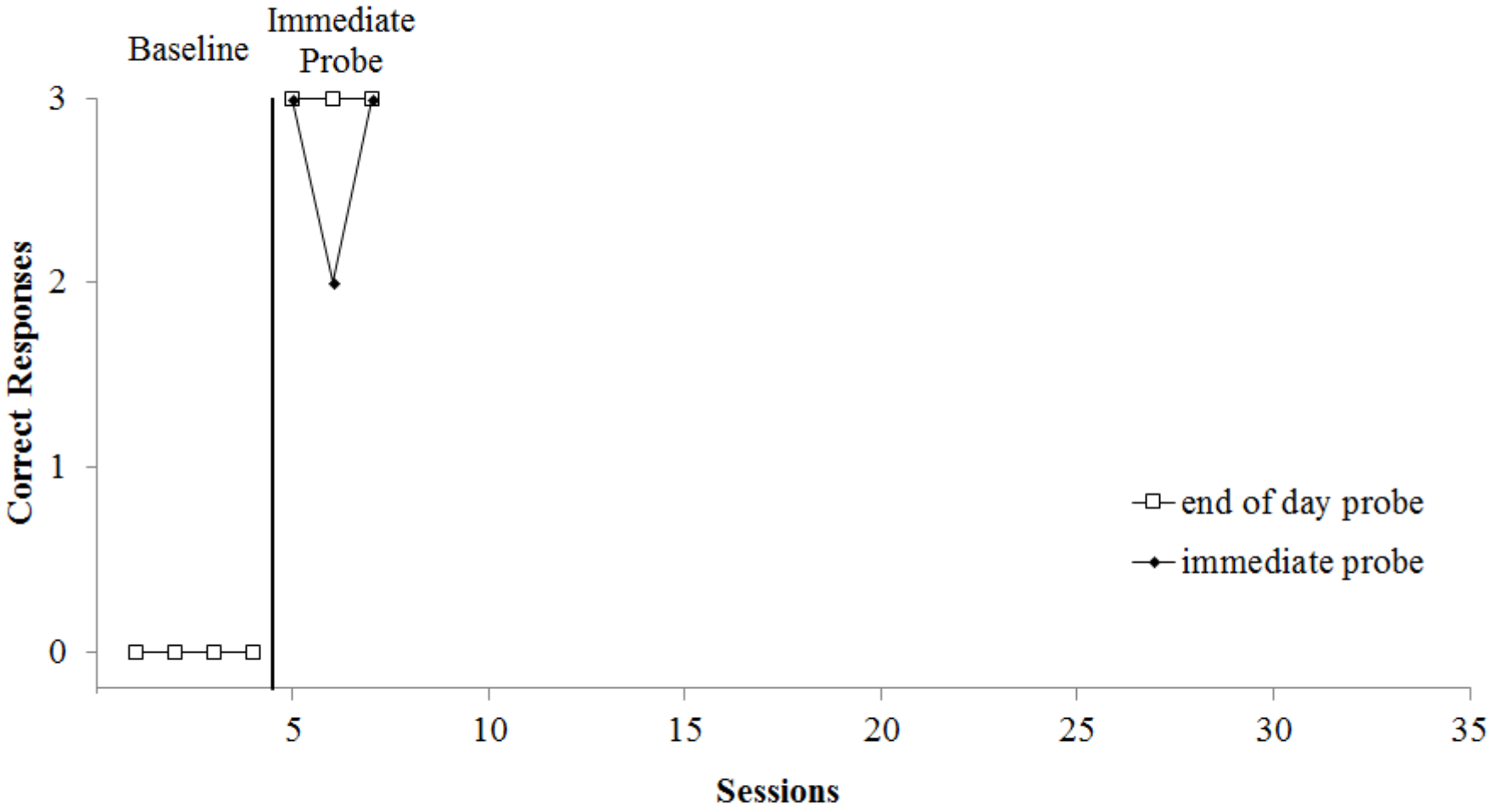
Immediate Probe



Immediate Probe



Emma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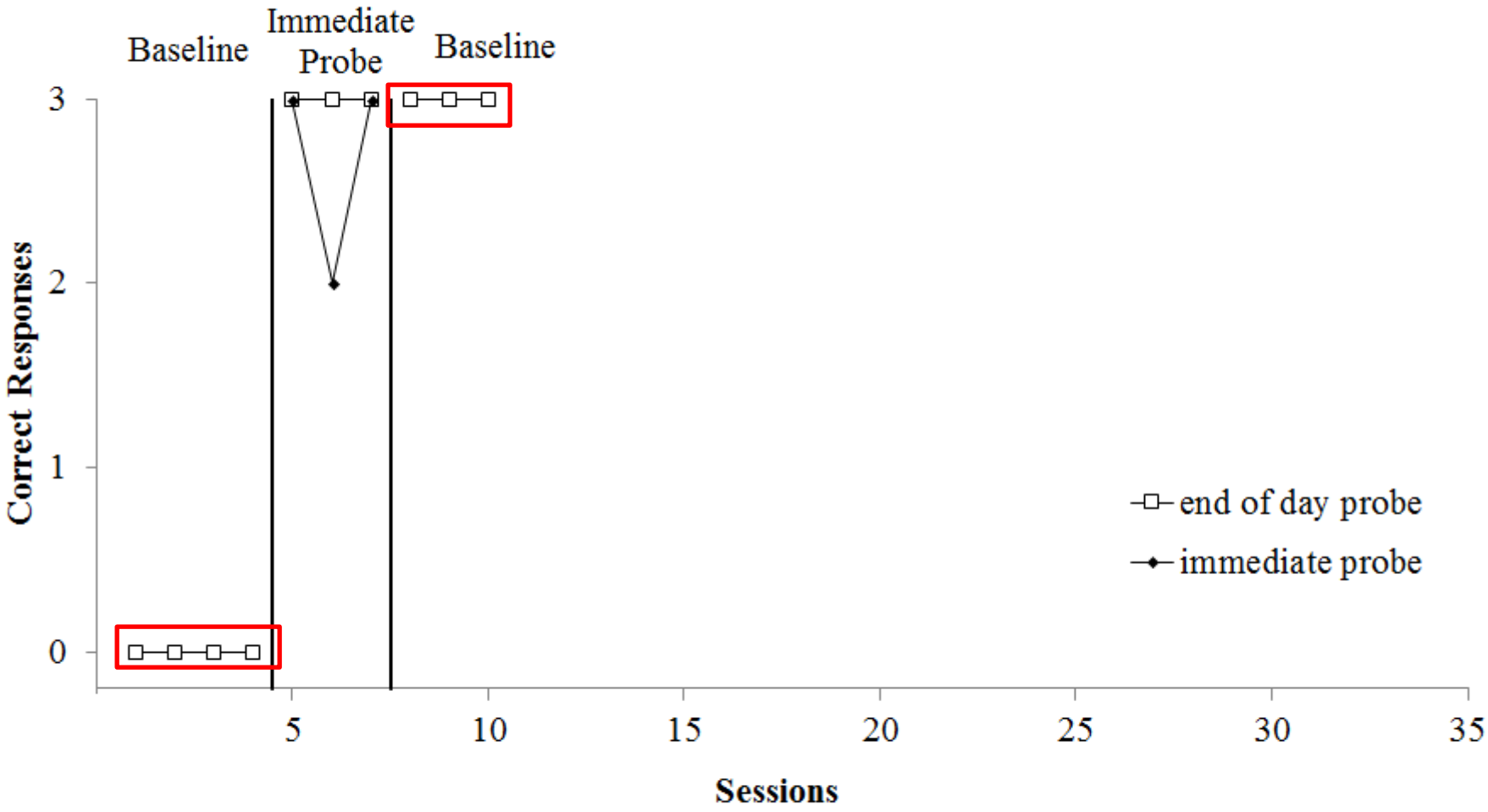
Emma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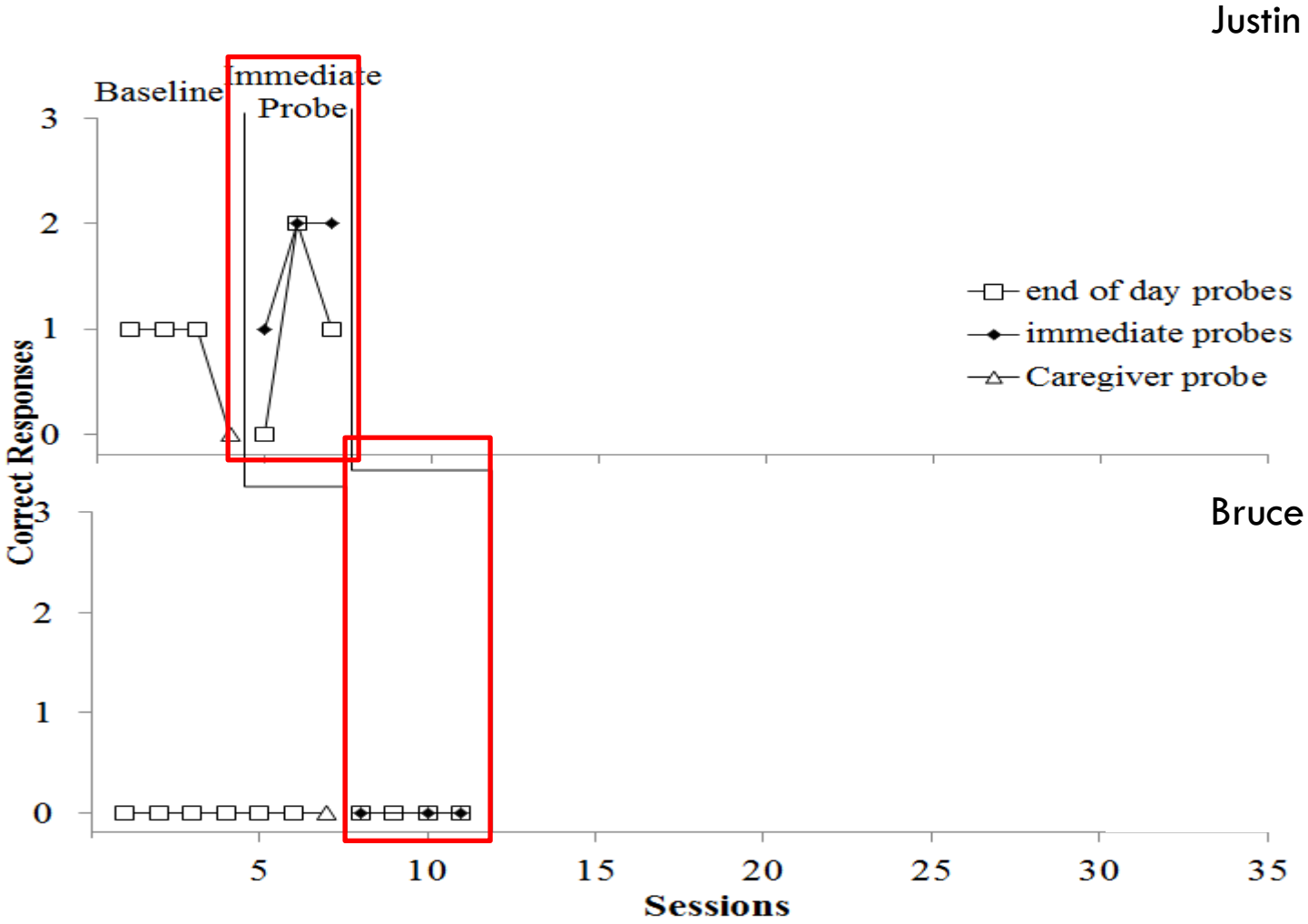
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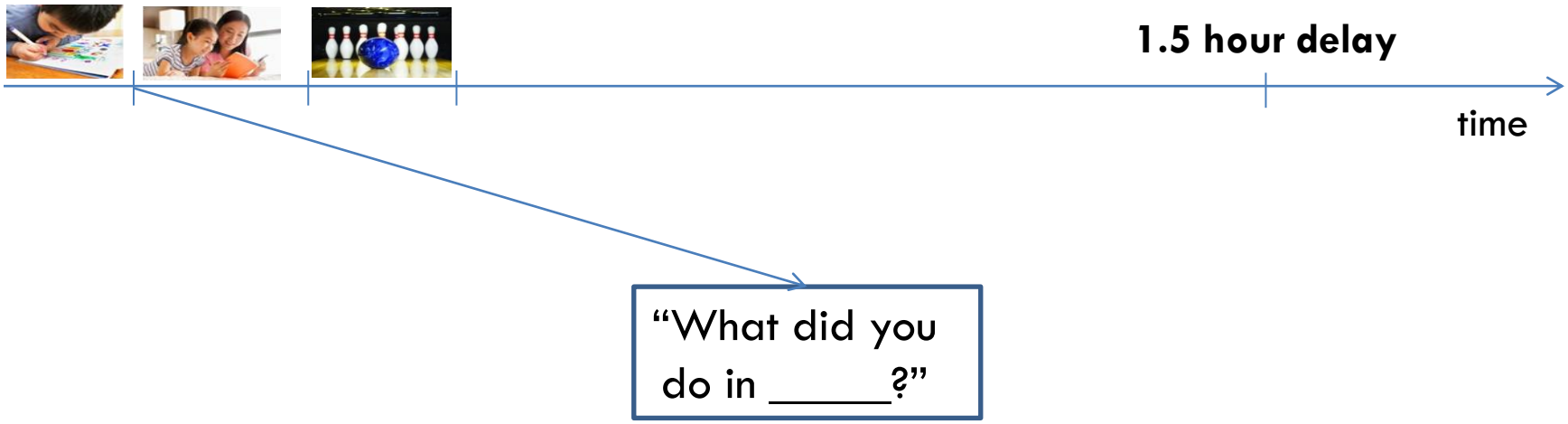
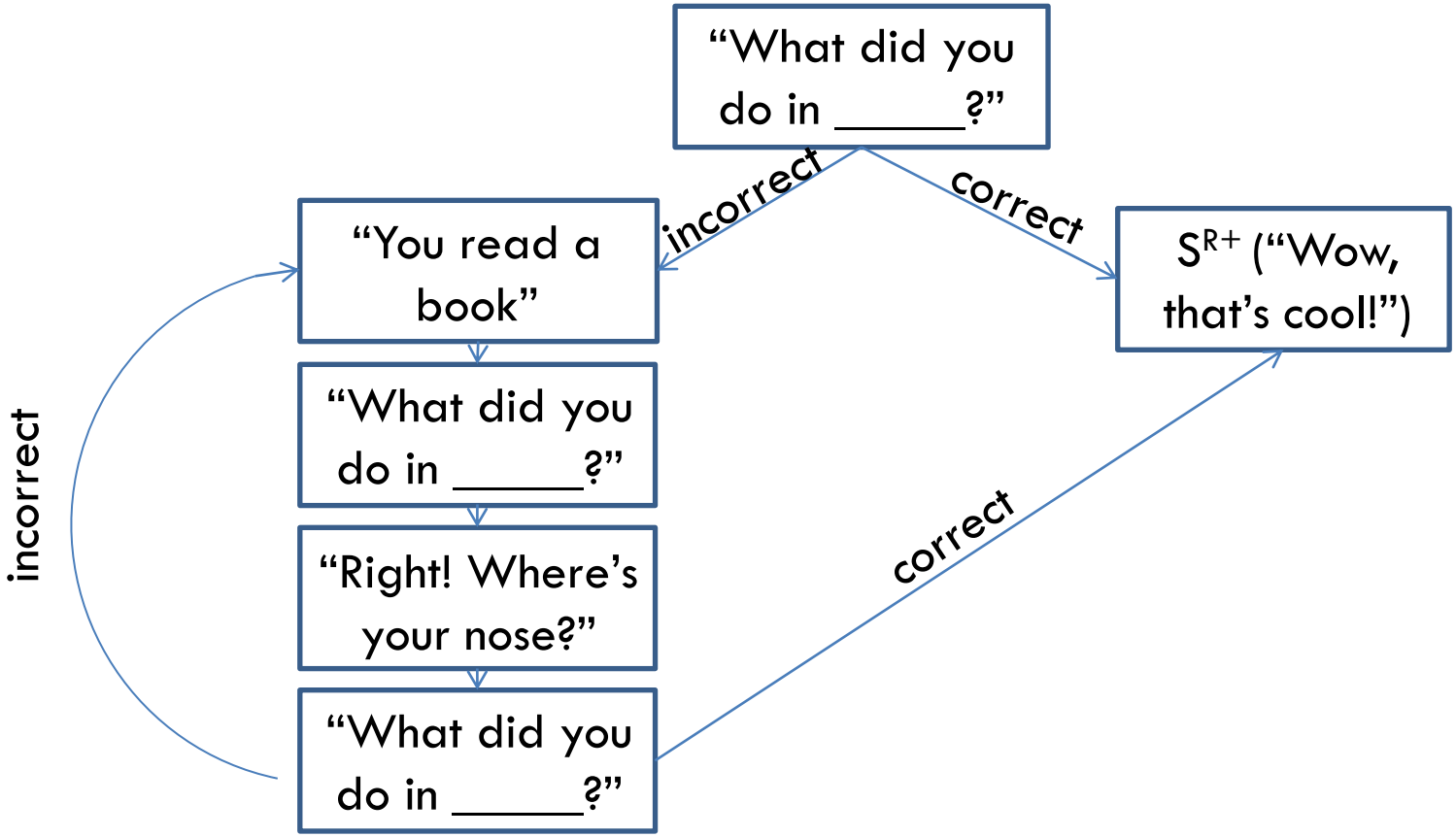
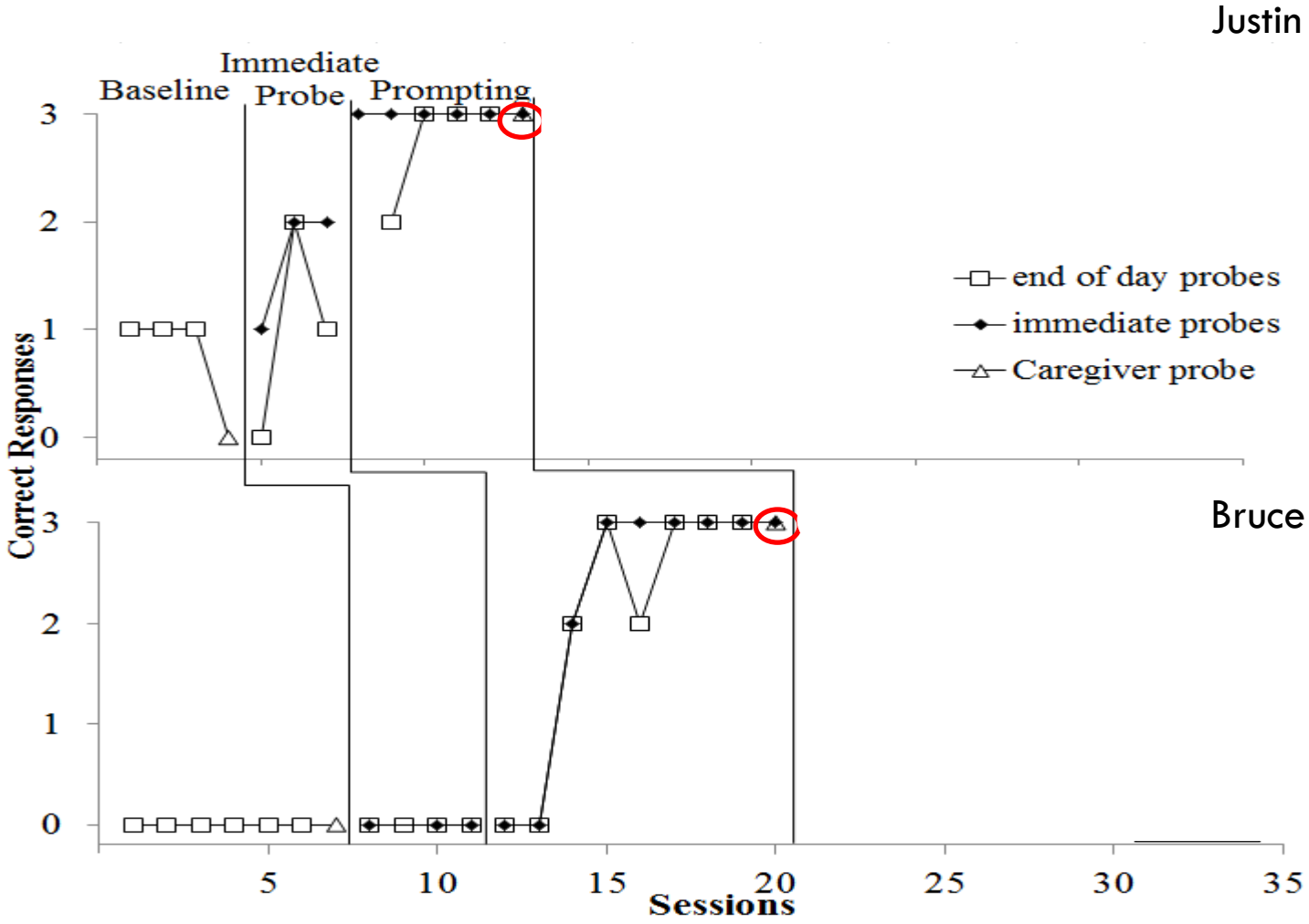
Sessions

Prompting



Prompting


"What did you do in _____?"
incorrect
correct
"You read a book"
S^{R+} ("Wow, that's cool!")
"What did you do in _____?"
"Right! Where's your nose?"
"What did you do in _____?"
incorrect
correct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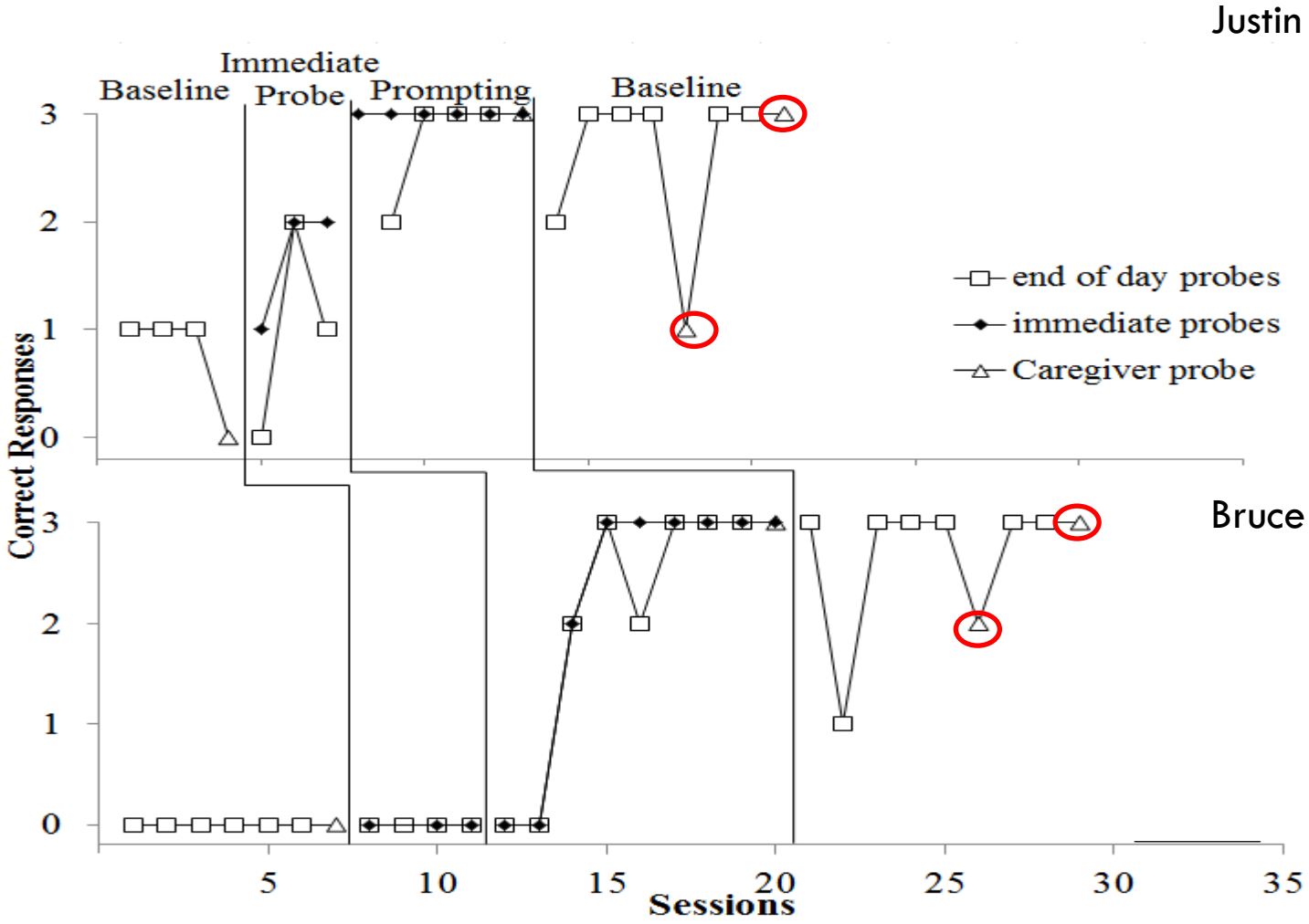
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Sessions

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Results

- All participants improved the accuracy of reporting past behavior at the end-of-day
  - One participant (Emma) reported accurately following only introduction of immediate probe
  - Two participants, needed prompts to report immediately
  - Once reporting immediately, 100% at end-of-day
- Correct reporting generalized to caregivers
- Future research into reporting novel activities in novel locations

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Word Combinations/Generative Responding

- Do not combine words into multi-word utterances when typically developing children do (Paul, Chawarska, Klin, & Volkmar, 2007)
- Despite having similar number of single words in repertoire
- Engage in rote, inflexible responding
- Much language is directly taught

- Interventions to promote word combinations in flexible, novel ways are needed

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Tact Noun-Verb Word Combinations

Journal of Applied Behavior Analysis

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2016, 49, 1–15 NUMBER 4 (WINTER)

THE USE OF MATRIX TRAINING TO PROMOTE GENERATIVE LANGUAGE WITH CHILDREN WITH AUTISM

SARAH E. FRAMPTON, SARAH C. WYMER, AND BETHANY HANSEN

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AND

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MARCUS AUTISM CENTER AND EMORY UNIVERSITY SCHOOL OF MEDICINE

Matrix training consists of planning instruction by arranging components of desired skills across 2 axes. After training with diagonal targets that each combine 2 unique skill components, responses to nondiagonal targets, consisting of novel combinations of the components, may emerge. A multiple-probe design across participants was used to evaluate matrix training with known nouns (e.g., *cat*) and verbs (e.g., *jumping*) with 5 children with autism spectrum disorders (ASD). Following baseline of Matrix 1 and a generalization matrix, diagonal targets within Matrix 1 were trained as noun–verb combinations (e.g., *cat jumping*). Posttests showed recombinative generalization within Matrix 1 and the generalization matrix for 4 participants. For 1 participant, diagonal training across multiple matrices was provided until correct responding was observed in the generalization matrix. Results support the use of matrix training to promote untrained responses for learners with ASD and offer a systematic way to evaluate the extent of generalization within and across matrices.

Key words: autism, matrix training, recombinative generalization, tact

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Teaching tacts on SGD

- Tacts of pictures (Kagohara et al., 2012; Lorah & Parnell, 2017; van der Meer et al., 2015)
- Tacts of objects (Lorah et al., 2014)

- Use of prompts and reinforcement
  - Effective in establishing trained skills

Need to find strategies specifically aimed at developing generativity

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Tact Noun-Verb Word Combinations

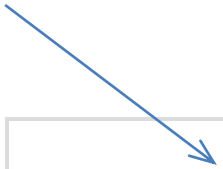
- Three Goals
  - Directly teach noun-verb combinations when tacting
    - "What's happening?" "What do you see?"
  - Assess Recombinative Generalization
  - Assess tacts novel noun-verb combinations (generalization)
- Recombinative Generalization
  - Process in which individuals come to produce and respond to novel combinations of known components (Goldstein & Mousetis, 1989)
  - Involves teaching with overlapping stimuli
- Matrix Training
  - Systematic method to organize overlapping stimuli within a matrix

	Verb 1	Verb 2	Verb 3
Noun 1	Train	Probe	Probe
Noun 2	Probe	Train	Probe
Noun 3	Probe	Probe	Train

	Jumping	Sleeping	Drinking
Sheep	Train	Probe	Probe
Bear	Probe	Train	Probe
Dog	Probe	Probe	Train

	Jumping	Sleeping	Drinking
Sheep	Sheep jumping	Probe	Probe
Bear	Probe	Bear Sleeping	Probe
Dog	Probe	Probe	Dog Drinking

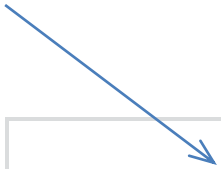
Diagonal Targets are
Directly Taught



	Jumping	Sleeping	Drinking
Sheep	Sheep jumping	Probe	Probe
Bear	Probe	Bear Sleeping	Probe
Dog	Probe	Probe	Dog Drinking

Non-Diagonal Targets are
Probed for Recombinative
Generalization

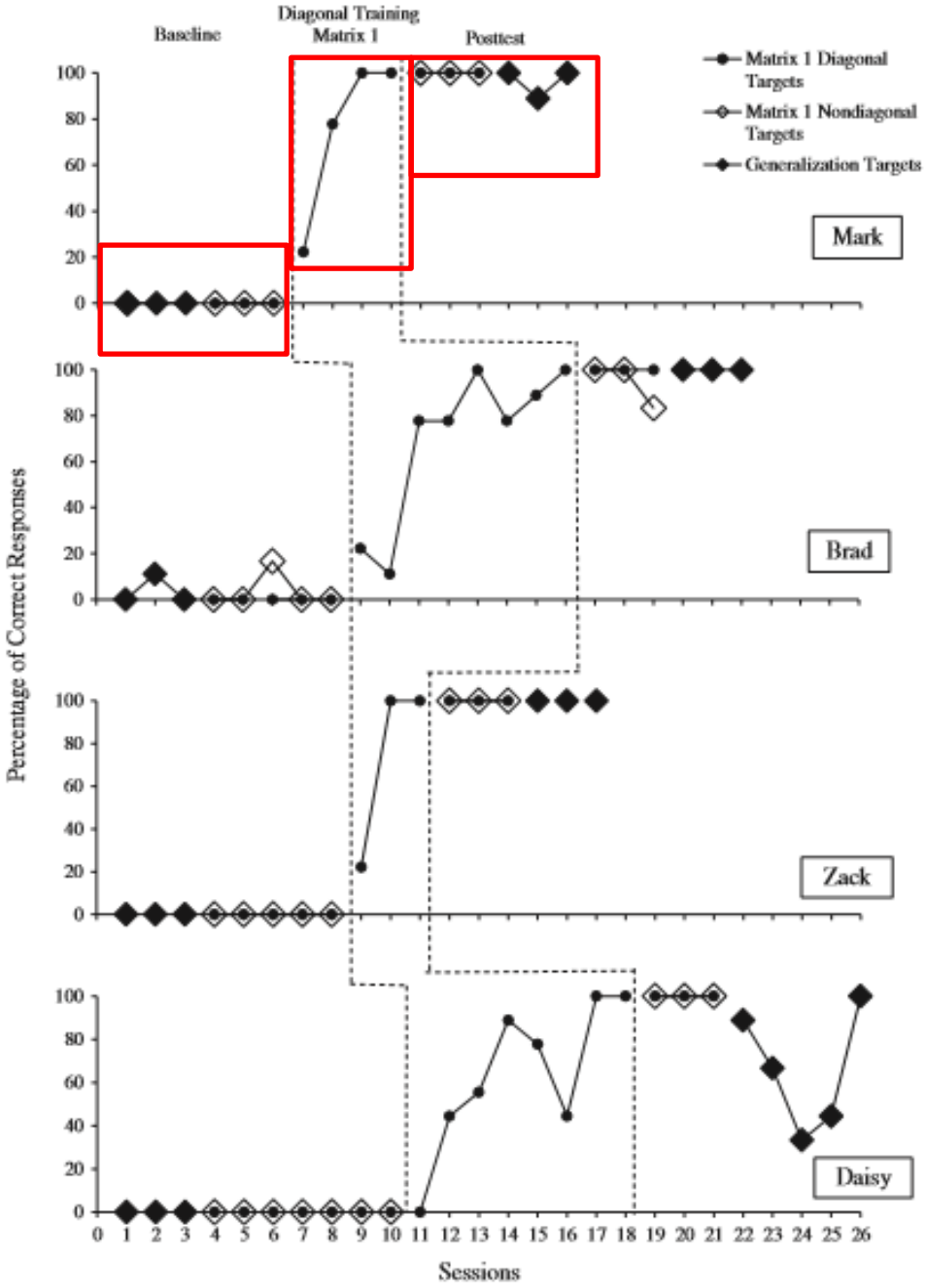
Diagonal Targets are Directly Taught



	Jumping	Sleeping	Drinking
Sheep	Sheep jumping	Sheep sleeping	Sheep drinking
Bear	Bear jumping	Bear Sleeping	Bear drinking
Dog	Dog jumping	Dog sleeping	Dog Drinking

Non-Diagonal Targets are Probed for Recombinative Generalization

Probe Novel Matrix with known components



Frampton et al. (2016)

Journal of
Applied Behavior Analysis

Replication

Matrix training to teach tacts using speech generating devices: Replication and extension

Videsha Marya, Sarah Frampton, Alice Shillingsburg

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Participants

- 3 participants
  - Bruce: 4-year-old male
  - Mason: 7-year-old male
  - Robin: 16-year-old male
- Diagnosis of ASD
- Received language intervention
  - 3-5 days per week, 2-3 hours a day
- Limited vocalizations

Participants

- Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) assessment
  - Significantly impaired echoic and articulation
  - Communicated using a SGD
    - IPad with digitized speech output
  - Fluent in device navigation (iconic and typed responses)

50 two-component verb-noun or noun-verb tacts/ instructions

Name	VB-MAPP admission	Tact Milestone 9
Bruce	42	0
Mason	55	0
Robin	55.5	0

Settings and Materials

- All sessions conducted in a classroom within a language clinic
- Animals/toy figurines
- Accessory items (e.g. toy trampoline, toy car)
- Targets were selected for each participant based on mastery lists and results of direct probing

What's happening?

Methods

Diagonal Targets are Directly Taught

Probe Novel Matrix with known components

Matrix 1

	Jumping	Painting	Sitting
Dog	Dog Jumping	Dog Painting	Dog Sitting
Rabbit	Rabbit Jumping	Rabbit Painting	Rabbit Sitting
Pig	Pig Jumping	Pig Painting	Pig Sitting

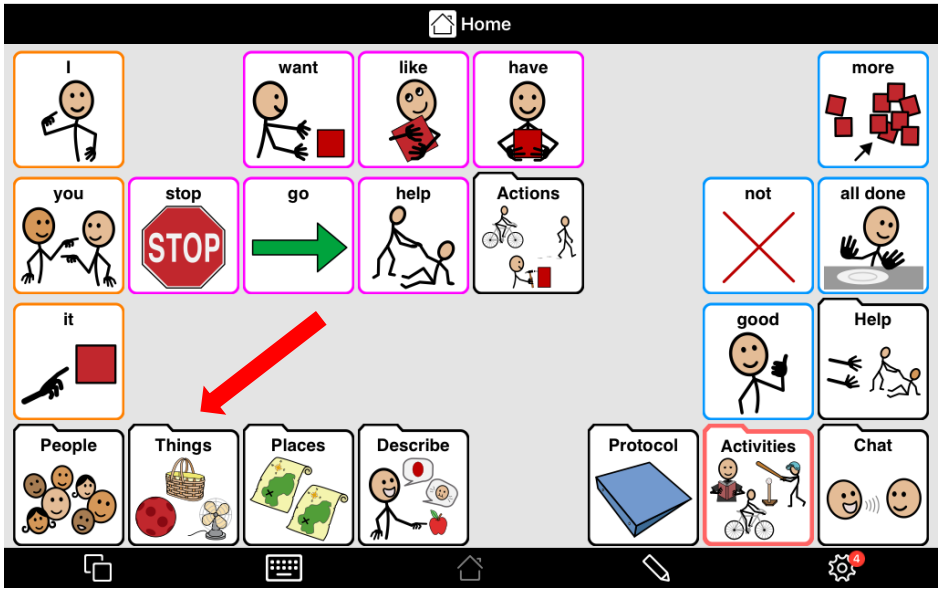
Generalization Matrix

	Drinking	Reading	Eating
Duck	Duck Drinking	Duck Reading	Duck Eating
Bear	Bear Drinking	Bear Reading	Bear Eating
Alligator	Alligator Drinking	Alligator Reading	Alligator Eating

Non-Diagonal Targets are Probed for Recombinative Generalization

Methods


What's happening?


Home
I
want
like
have
more
you
stop
STOP
go
help
Actions
not
all done
it
good
Help
People
Things
Places
Describe
Protocol
Activities
Chat

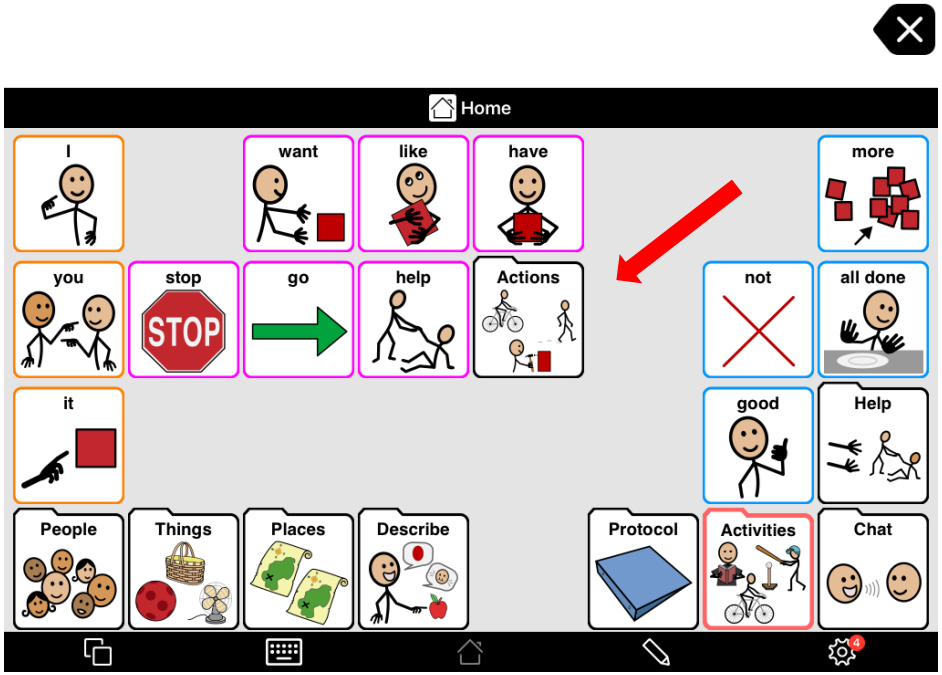
Methods


Home
Things
I
is
want
like
do
more
you
Food
not
all done
Body parts
Clothing
Personal care
Furniture
Animals
Supplies
Vehicles
Computers
Electronics
Nature
More
2

Methods


dog
Things
Animals
I
is
want
like
do
animal
who
pet
you
bear
bird
butterfly
cat
chicken
not
cow
dog
elephant
fish
fly
frog
horse
lion
monkey
mouse
pig
rabbit
snake
tiger
turtle
More
2

Methods


Home
I
want
like
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more
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STOP
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Actions
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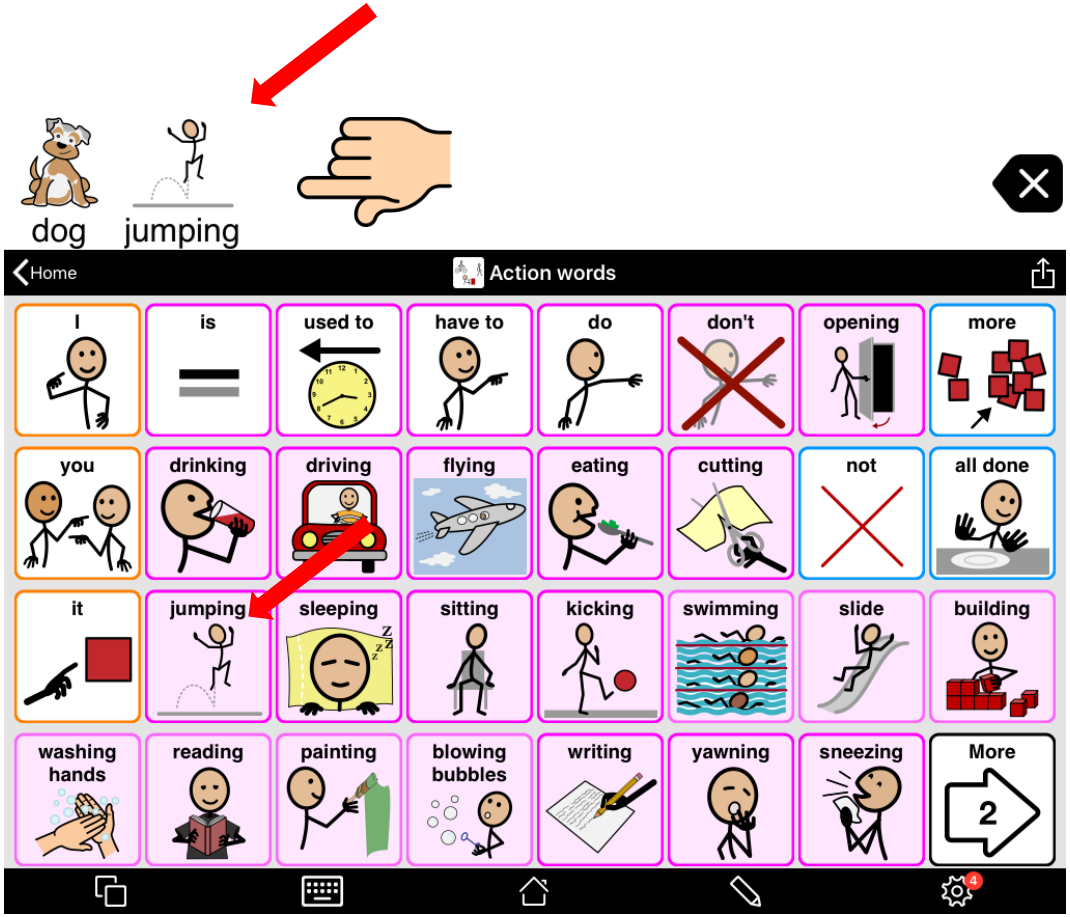
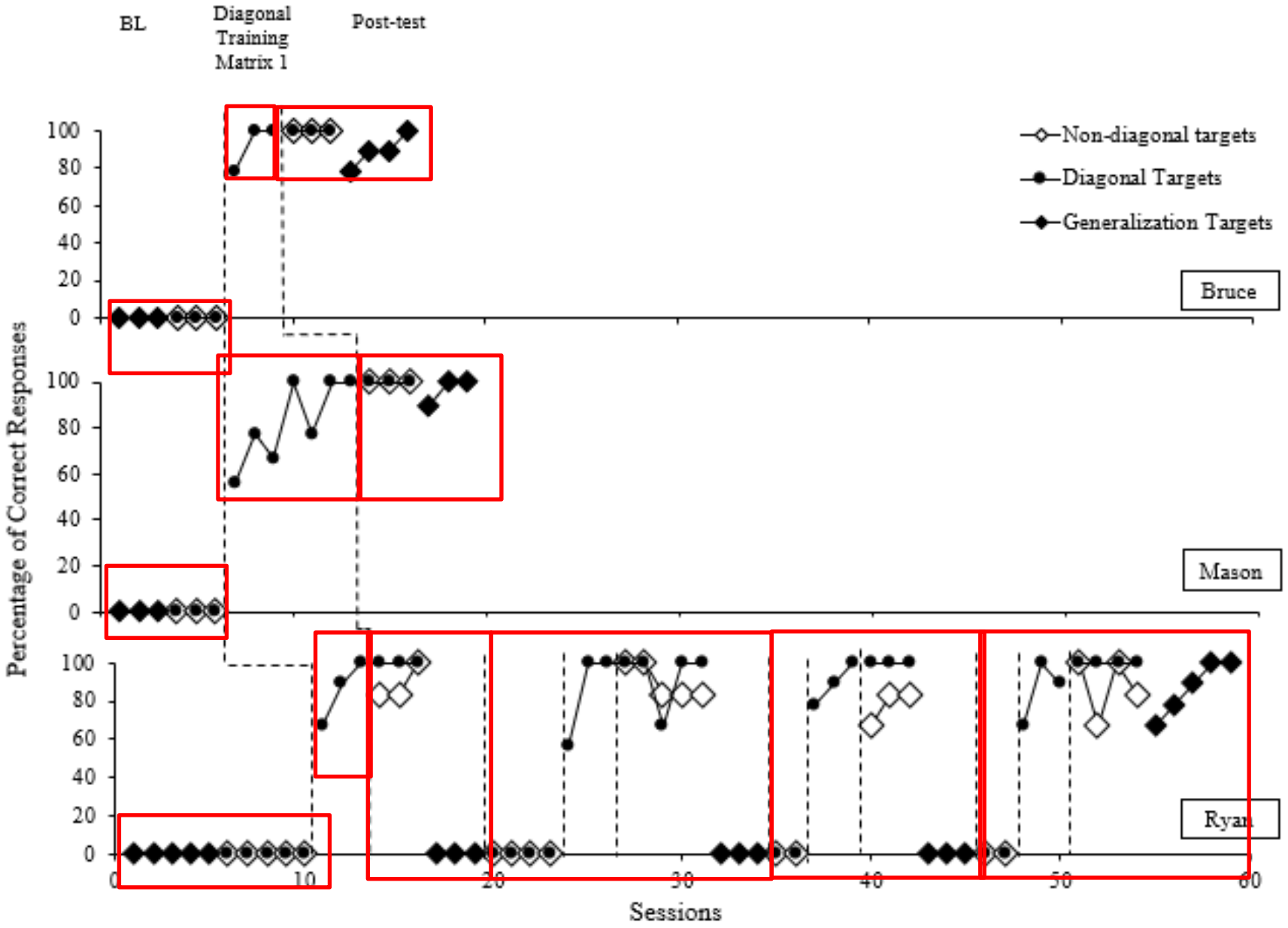
it
good
Help
People
Things
Places
Describe
Protocol
Activities
Chat

Methods


dog
jumping
Home
Action words
I
is
used to
have to
do
don't
opening
more
you
drinking
driving
flying
eating
cutting
not
all done
it
jumping
sleeping
sitting
kicking
swimming
slide
building
washing hands
reading
painting
blowing bubbles
writing
yawning
sneezing
More
2



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Results

- All 3 participants learned to emit noun-verb combinations when directly taught
- All 3 emitted recombined responses
- 2 of the 3 showed immediate generalization to novel combinations
- 1 participant required multiple exemplars

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Conclusions

- Our goals to replicate procedures that are effective with vocal children with those using SGDs
- All studies required multi-step navigation
- Children with autism presenting as level 2 and level 3 on the VB-MAPP who are non-vocal can acquire complex communication skills using SGDs
- We need more research into the development of advanced verbal behavior using high tech Speech Generating Devices

Thank You!!!!

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