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Best teaching practices in Applied Behavior Analysis

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WNE
WESTERN NEW ENGLAND
UNIVERSITY

apba

Using research to inform best practice

- Research into teaching procedures
  - What works
    - The best procedure?
- Stages of best practice
  - What do we know
  - How many things work?
  - Comparative studies!
  - Prediction of effective practice
  - Identifying crucial “pre-requisites”

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EIBI: Best Practice!

- Lovaas, 1987; McEachin, Smith, & Lovaas, 1993
- Meta-analyses

  (e.g., Eldevik, Hastings, Hughes, Jahr, Eikseth, and Cross, 2009)
- Cochrane review

  (Reichow, Barton, Boyd, & Hume, 2013)
- AAP (2001); NIMH (2007); Surgeon General (1999)

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MacDonald, Parry-Cruwys, Dupere, & Ahearn (in press; RIDD)

Table 5. Statistical comparisons across outcome measures and age groups

	RJA Point	RJA Gaze	IJA	Cognitive	Play
Main Effect (Time)	$F(1, 91)=15.14, p<.01$	$F(1, 91)=25.14, p<.01$	$F(1, 91)=4.06, p<.01$	$F(1, 91)= 24.57, p<.01$	$F(1, 91)=7.92, p<.01$
Main Effect (Age)	$F(1, 91)=23.12, p<.01$	$F(3, 91)=3.66, p>.01$	$F(3, 91)=8.50, p<.01$	$F(3, 91)=1.66, p>.01$	$F(3, 91)=4.36, p>.01$
Interaction	$F(1, 91)=12.14, p<.01$	$F(3, 91)=2.54, p>.01$	$F(3, 91)=7.50, p<.01$	$F(3,91)=12.87, p<.01$	$F(3, 91)=14.36, p<.01$
Post-hoc tests	18-23-month-olds improved more than all other age groups; no differences between other age groups	N/A (Scores increased from Time 1 to Time 2)	18-23-month-olds improved more than all other age groups; no differences between other age groups	18-23-month-olds improved more than all other age groups, 24-30-month-olds group improved more than 2.5 and 3-year-olds	18-23-month-olds improved more than all other age groups; no differences between other age groups

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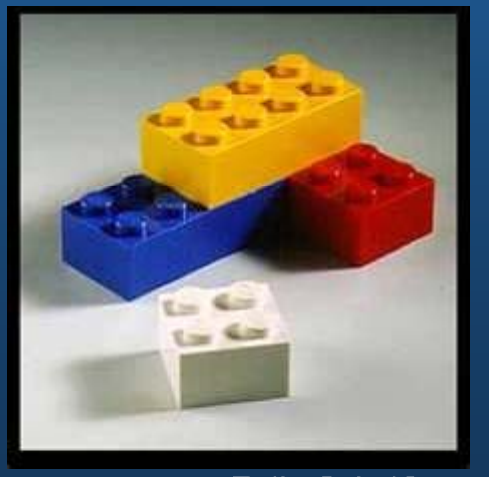
Common elements of effective programs (Dawson & Osterling, 1997)

- Curricula focus in major deficit areas
  - Becoming aware of world around them
  - Imitation
  - Communication
  - Play skills
  - Social interaction
- Establish/generalize these skills
- Functional Tx of problem behavior
  - Self-injury/Stereotypy/Aggression/Etc.

ABA: What we know now

- Behavior analysis works!
- Problem behavior
  - FA and TX is a BP!!!
- Skill building???
  - Verbal behavior (mands but)
  - Play and social skills (generalization)
  - Independent functioning (outcomes)
- But, there is so much more to learn



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Libby, Weiss, Bancroft, & Ahearn (BAP; 2009)

Least-to-Most

Independent
Light touch/shadow
Manual guidance at upper arm
Manual guidance at forearm
Hand over hand

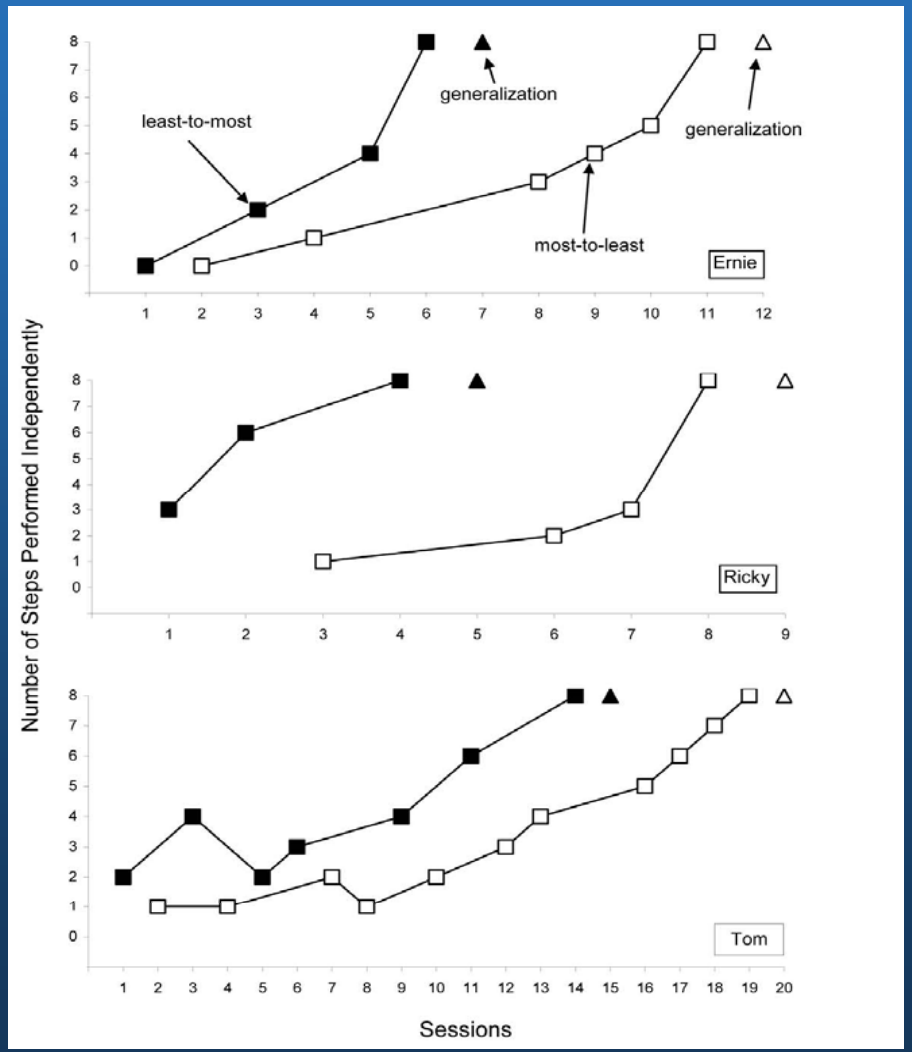
Most-to-Least

Hand over hand
Manual guidance at forearm
Manual guidance at upper arm
Light touch/shadow
Independent

Most-to-Least with 2-s Delay

Hand over hand
2-s delay, manual guidance at forearm
2-s delay, manual guidance at upper arm
2-s delay, light touch/shadow
Independent

A Comparison of Most-to-Least and Least-to-Most Prompting



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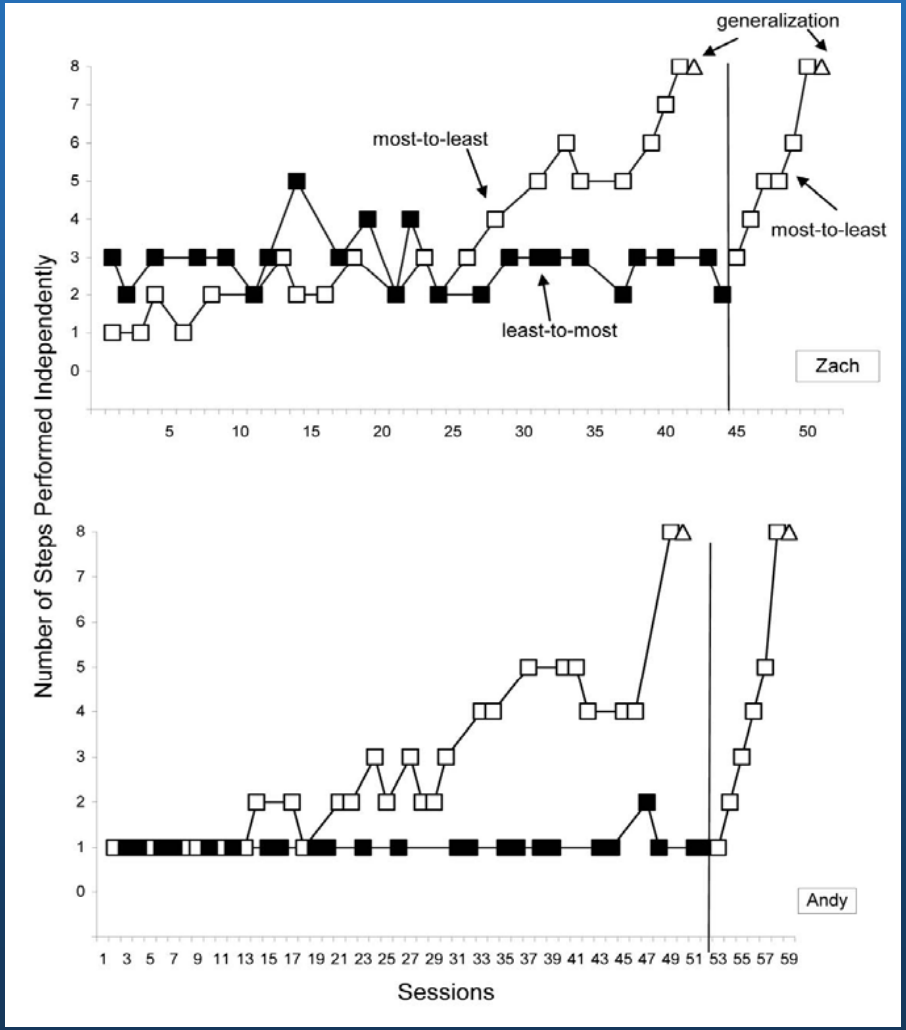
Some students need Most-to-Least Prompting



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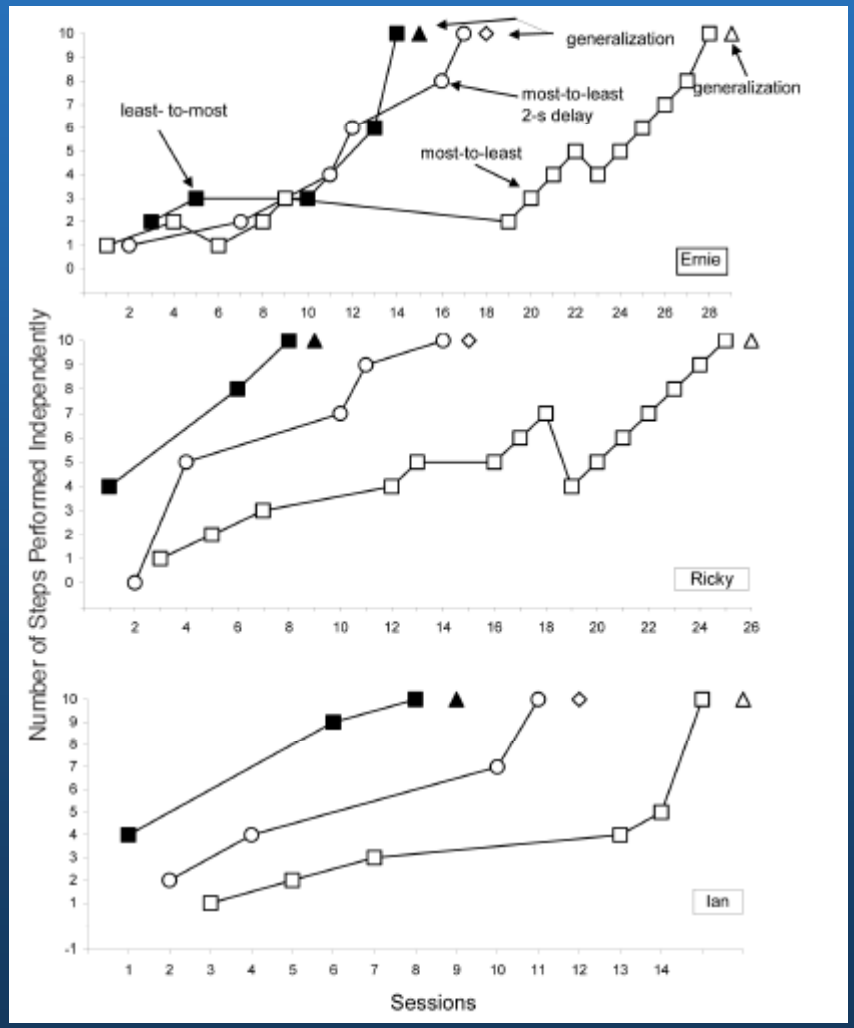
Adding 2 s delay to Most-to-Least Prompting



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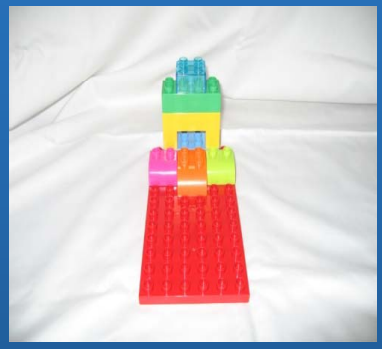
Taking research into practice for broad application

- Developing an assessment
  - Prompt Type
  - Prompt Fading
  - Generality Test

Jess Seaver & Jason Bourret

- Evaluate an assessment designed to identify a differentially effective response prompt type and prompt-fading procedure for individuals with autism-spectrum disorders

Resp. Prompt – Exp. 1



- Participants
  - 8 Males, 2 Females
- Materials
  - Novel, 8-step Lego® play constructs
    - 1 block/base = 1 step
  - Independent raters
    - Color
    - Placement
    - Shape
  - Counterbalanced across participants

Experiment 1

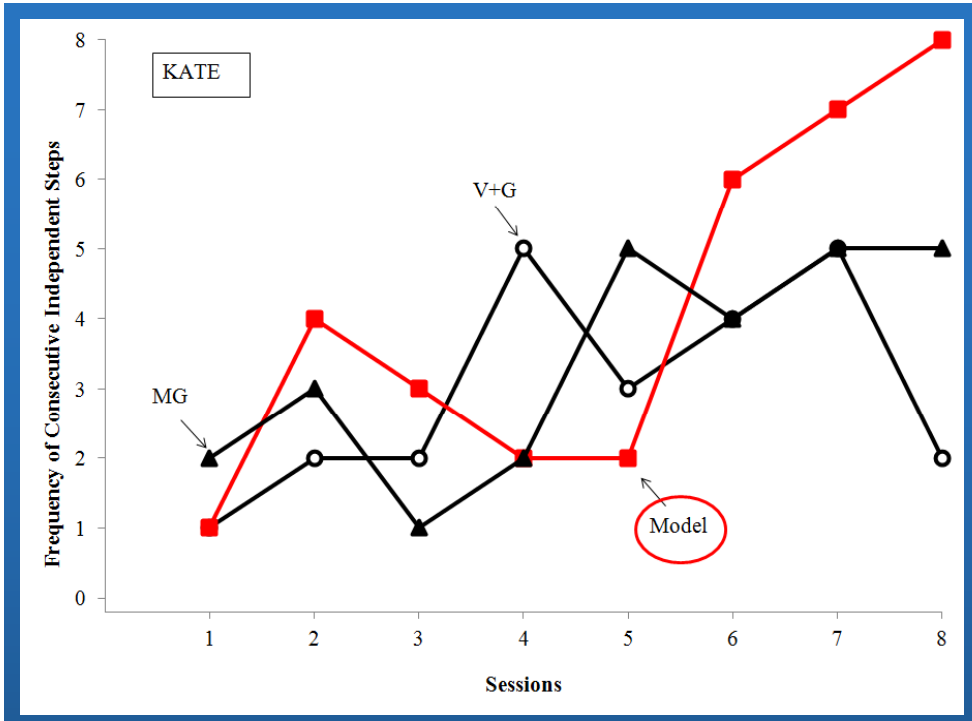
- Response-Prompt Assessment
  - Prompt type
    - Verbal+gestural
      - "Pick up *red* block and put *there*"
    - Model
      - Therapist demonstrates step
    - Manual guidance
      - Hand-over-hand
  - Prompt fading
    - 2-s progressive delay
      - Immediate prompt, 1-s delay, 2-s delay, 4-s delay, no prompt

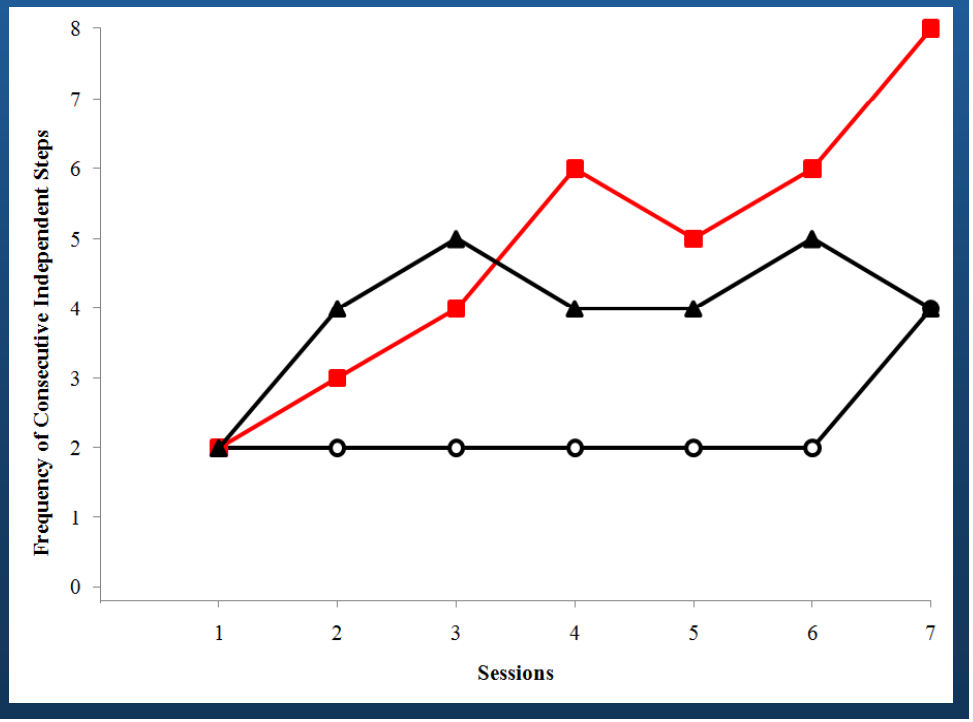
General Procedures

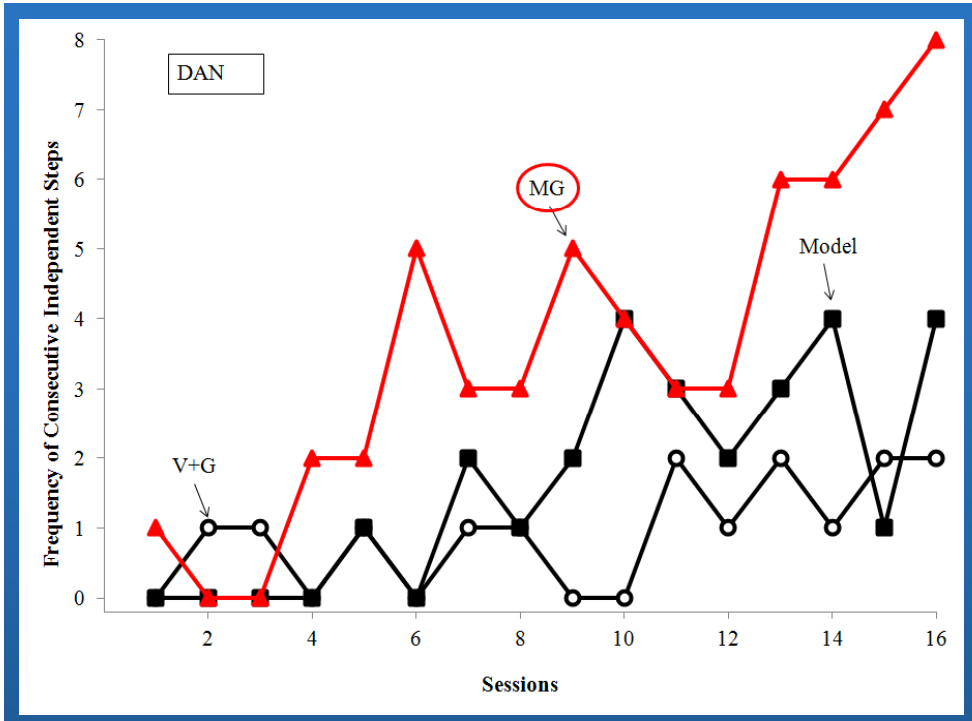
- Multielement Design
- Forward Behavior Chaining
- 10 Trials Per Session
- Untrained Steps Not Completed
- No Error Correction Procedure
- Preference Assessment
  - Reinforcement
    - Training Step

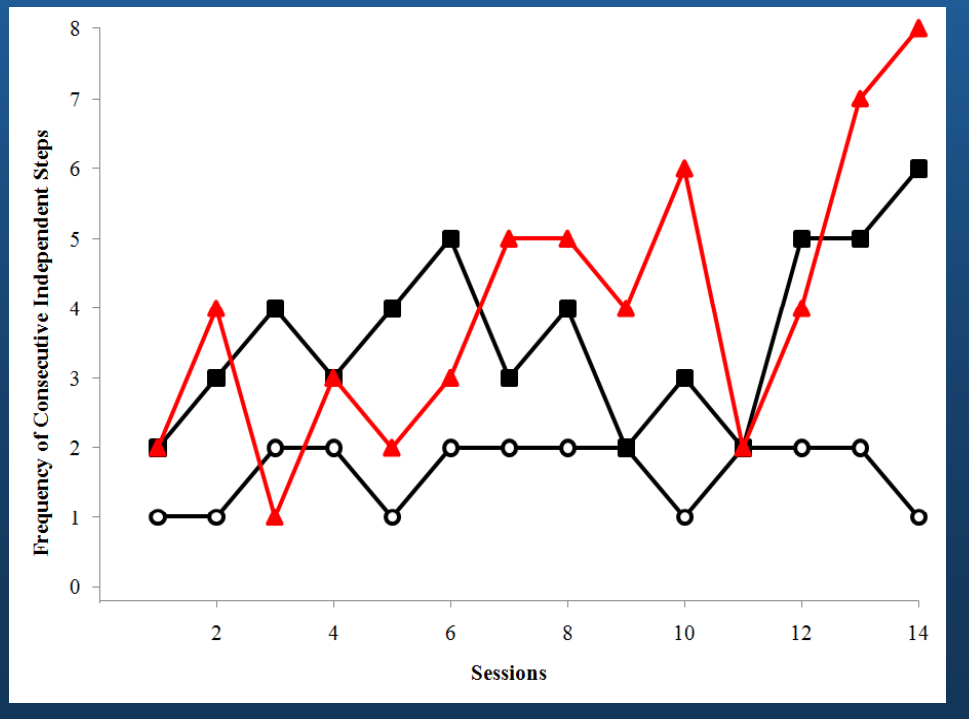
General Procedures

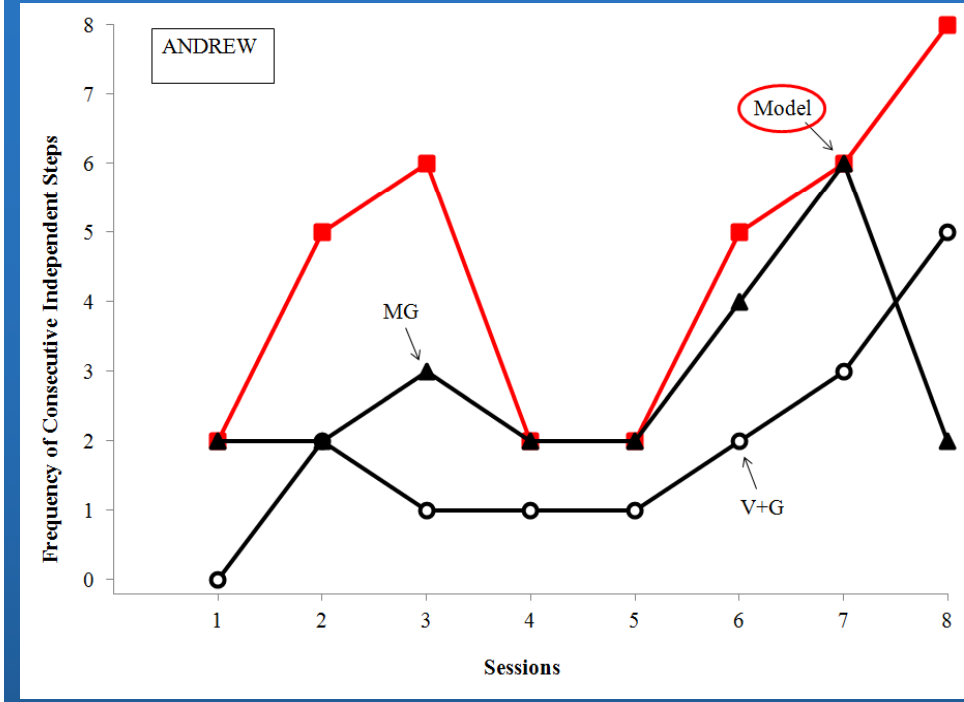
- Criterion to Fade Prompt
  - 2 consecutive, correct responses
- Criterion to Advance Step
  - 2 independent, consecutive and correct responses
- Criterion for Mastery
  - Independent completion of all 8 steps for 2 consecutive trials
- Criterion to End Experiment
  - Replication of results across 2 consecutive exposures

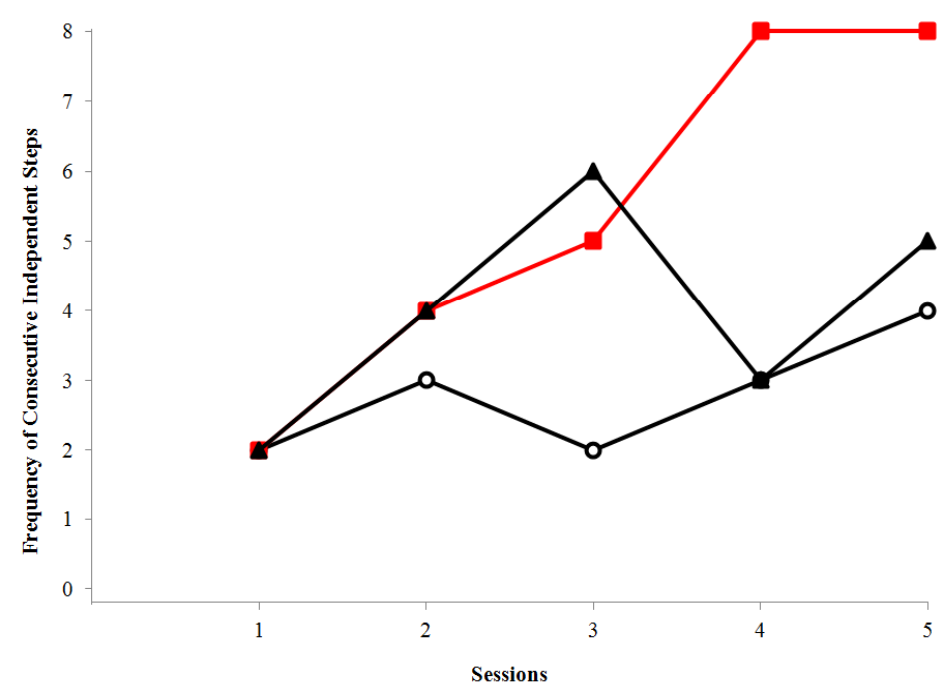

KATE
Frequency of Consecutive Independent Steps
Sessions
MG
V+G
Model
0
1
2
3
4
5
6
7
8


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8


DAN
MG
Model
V+G
Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8
2
4
6
8
10
12
14
16


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8
2
4
6
8
10
12
14


ANDREW
Model
MG
V+G
Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8

Experiment 1 Results Summary

Name	Prompt Type	Exposures	Learning Set
Kate	Model	2	No
Dan	MG	2	Yes
Andrew	Model	2	Yes
Mario	Model	2	Yes
Levi	Model	2	Yes
John	Model	2	No
Brian	MG	2	Yes
Adam	V+G	3	No
Emma	Model	4	No
Jackson	N/A	4	No

Prompt fade – Exp. 2

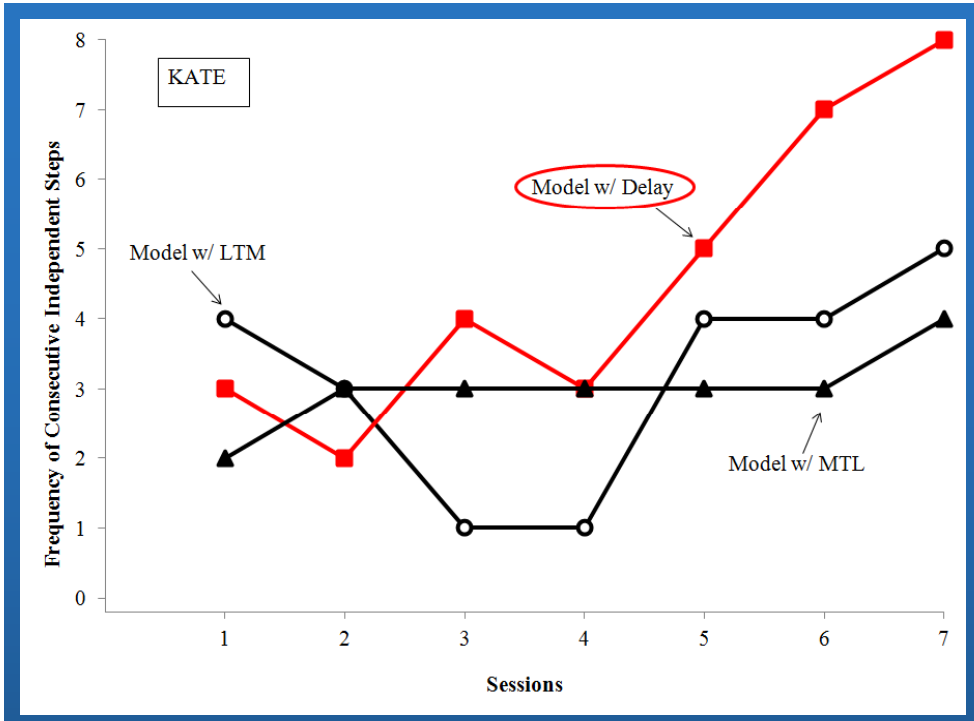
- Prompt type
  - Effective prompt type
- Prompt fading
  - LTM
  - 2-s progressive delay
  - MTL

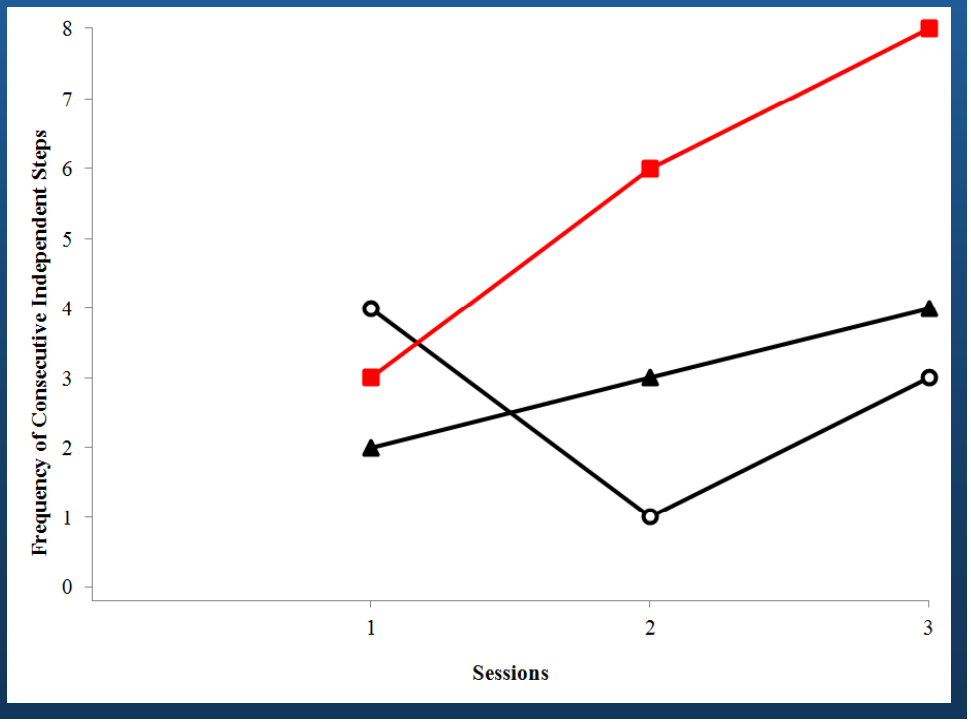
Procedures

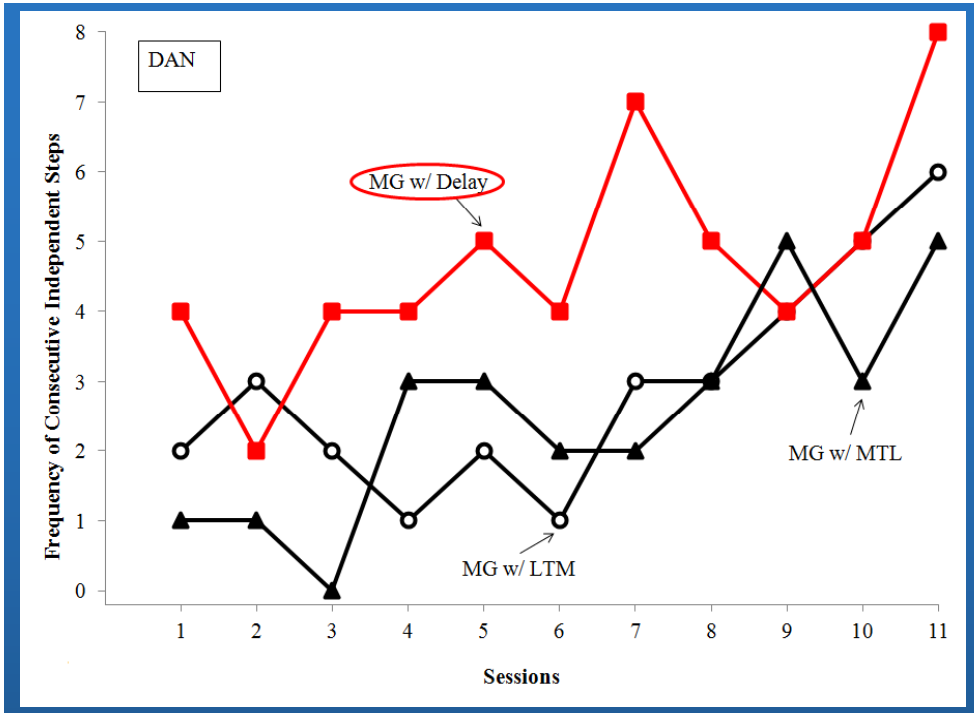
- LTM
  - Verbal and Gestural
  - Manual Guidance
  - Model
    - No prompt
    - Initial model – block 2.5 cm off of table
    - Partial model – block within 2.5 cm of base
    - Base Model – hovering block 2.5 cm over base destination
    - Full Model

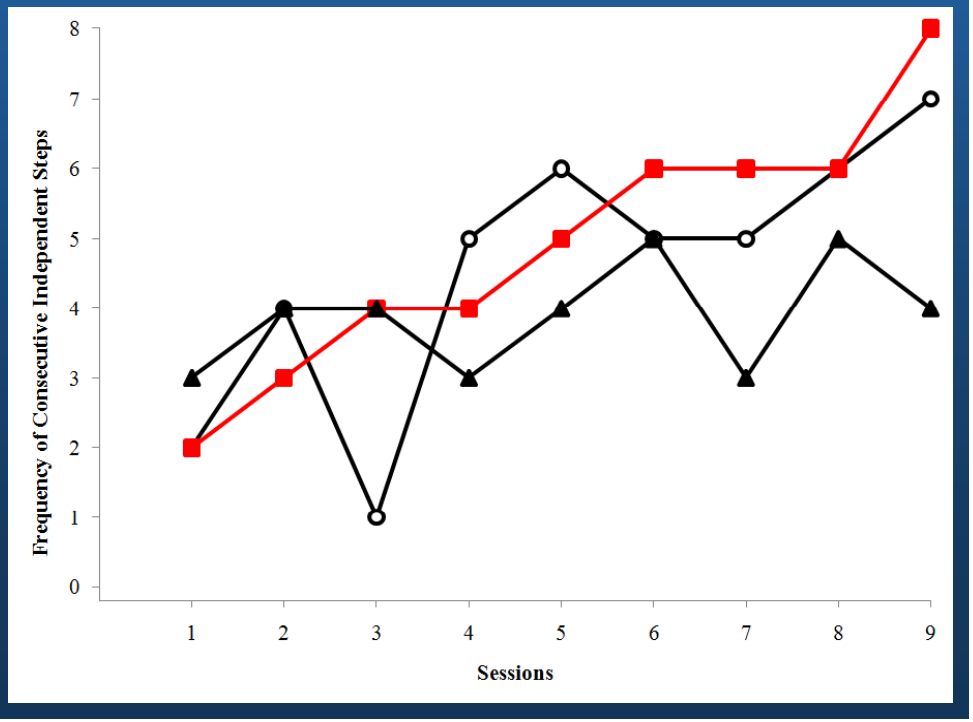
Procedures

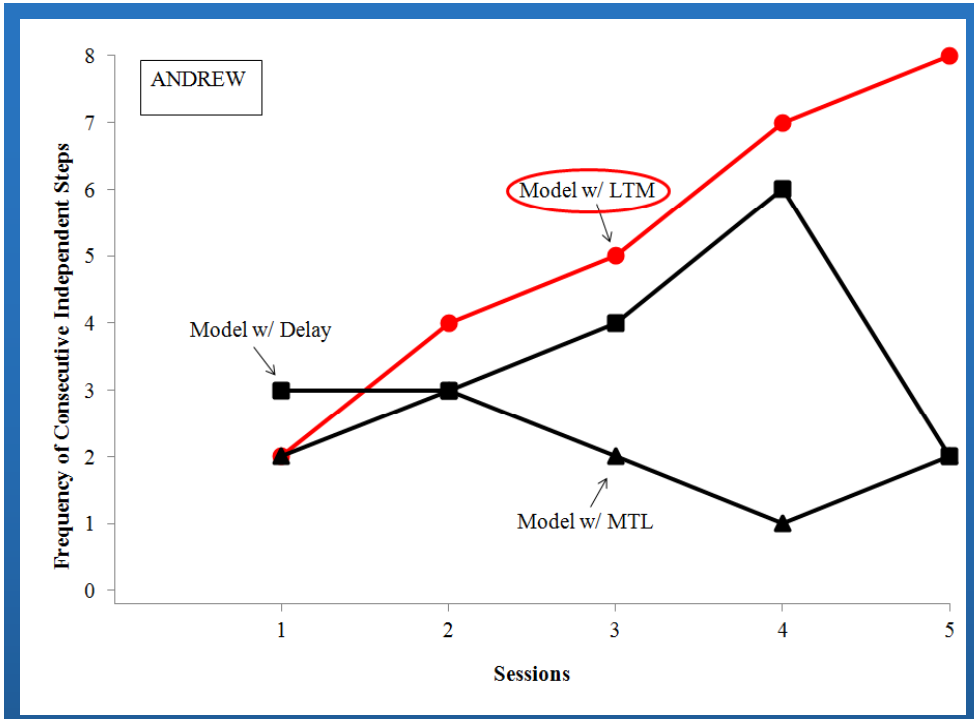
- 2 s progressive delay
- MTL
  - V+G
  - Model
  - MG
    - Hand-over-hand
    - Forearm
    - Upper arm
    - Light touch
    - No prompt

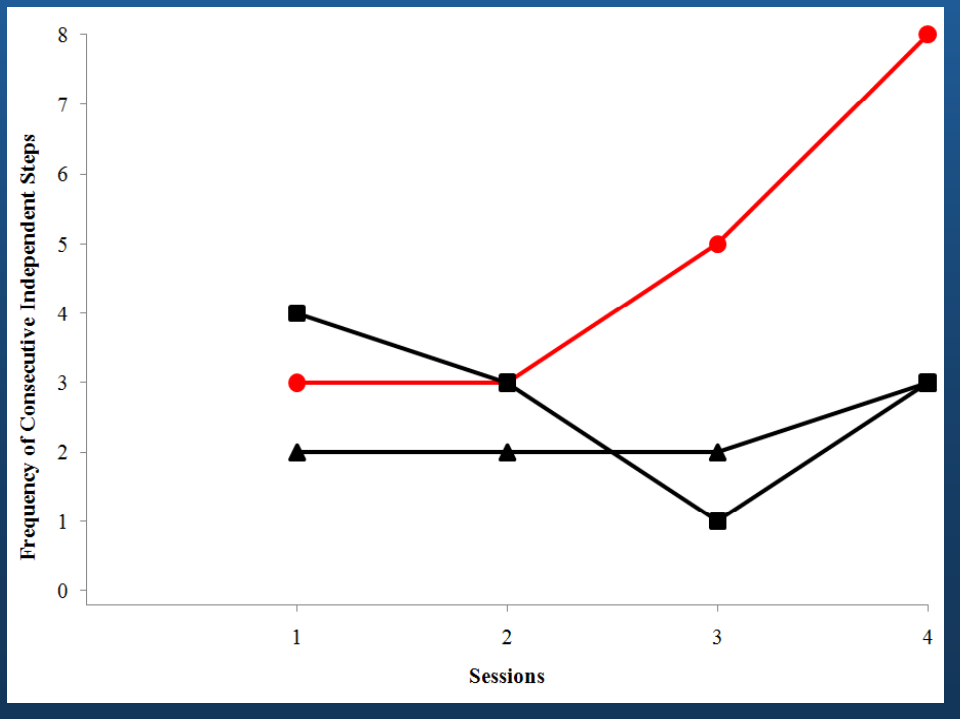

KATE
Model w/ Delay
Model w/ LTM
Model w/ MTL
Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8


DAN
MG w/ Delay
MG w/ MTL
MG w/ LTM
Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8
9
10
11


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8
9


ANDREW
Model w/ LTM
Model w/ Delay
Model w/ MTL
Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8


Frequency of Consecutive Independent Steps
Sessions
0
1
2
3
4
5
6
7
8

Experiment 2 Results Summary

Name	Prompt Fade	Exposures	Learning Set
Kate	Delay	2	Yes
Dan	Delay	2	No
Andrew	LTM	2	No
Mario	LTM	2	No
Levi	Delay	2	Yes
John	LTM	2	No
Brian	Delay	2	Yes

Generality test – Exp. 3

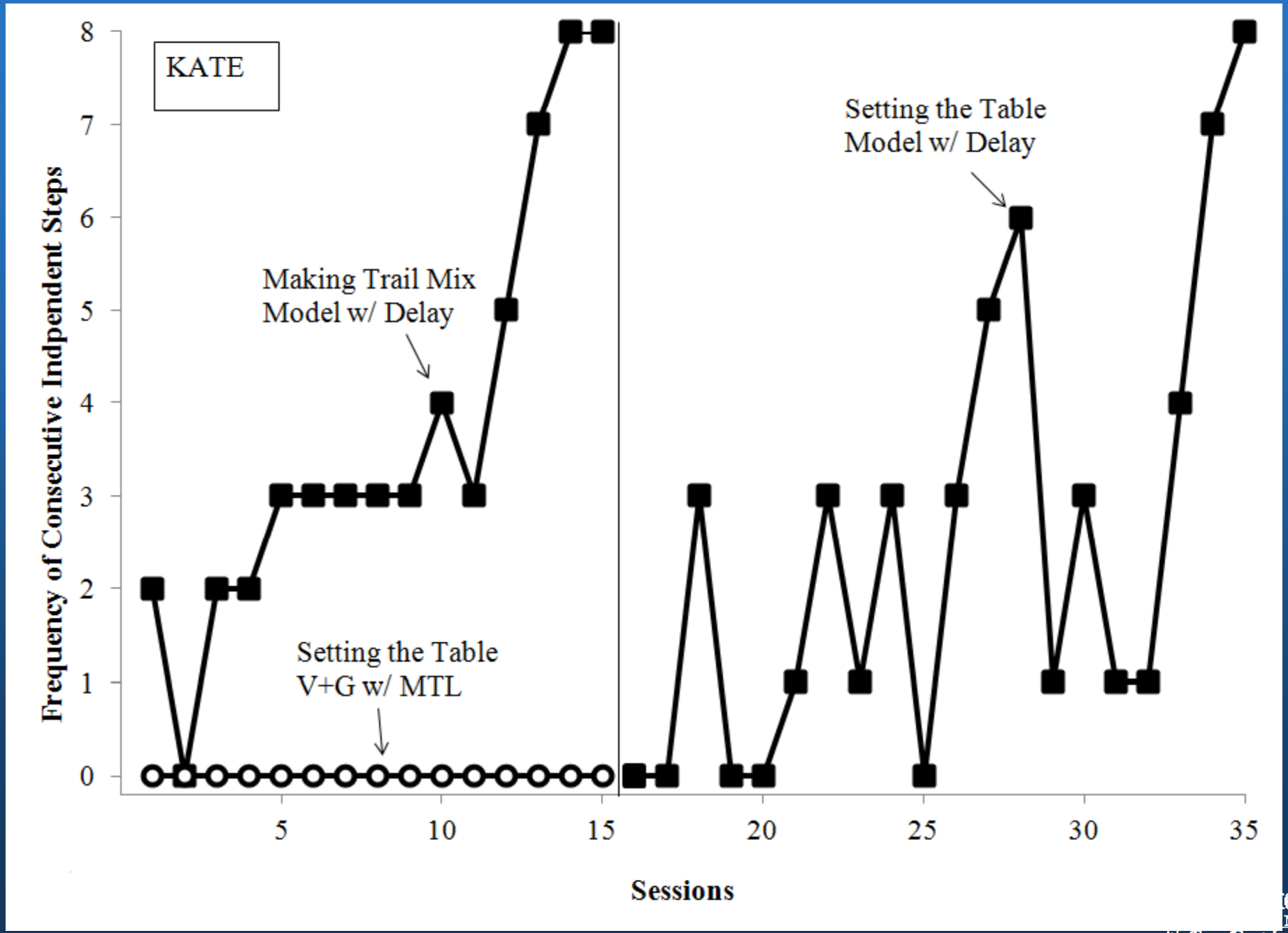
- Generality Test
- Most-effective procedure
  - Assessment informed
- Least-effective procedure
  - Lowest frequency of independent steps per trial

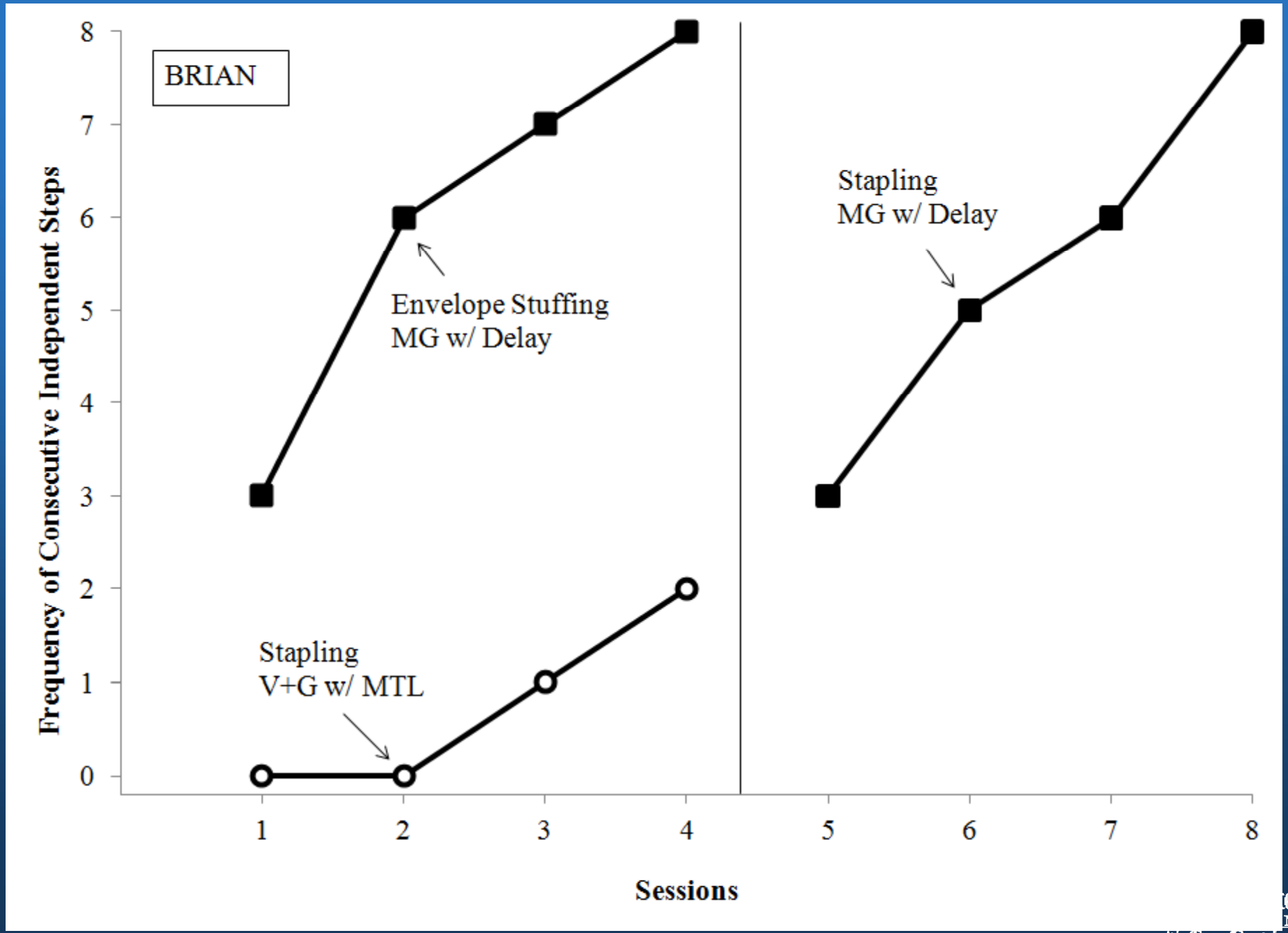
Procedures

- Participants
  - 4 Males, 1 Female
- Materials
  - Educationally-relevant skills
    - 8 steps each
    - Task difficulty
    - Folding clothes, envelope stuffing, stapling papers, hole punching, making trail mix, and setting a table
- Replication
  - Most-effective procedure used twice

Procedures

- Verbal and Gestural (cont.)
  - MTL (e.g.)
    - Point to shirt and motion as if picking something up while stating “pick up shirt”
    - Point to shirt while stating “pick up shirt”
    - Point to shirt while stating “pick up”
    - State “pick up”
    - Student responds without a prompt


KATE
Frequency of Consecutive Indpendent Steps
Sessions
Making Trail Mix
Model w/ Delay
Setting the Table
V+G w/ MTL
Setting the Table
Model w/ Delay
0
1
2
3
4
5
6
7
8
5
10
15
20
25
30
35


BRIAN
Frequency of Consecutive Independent Steps
Sessions
Envelope Stuffing
MG w/ Delay
Stapling
V+G w/ MTL
Stapling
MG w/ Delay
0
1
2
3
4
5
6
7
8

Experiment 3 Results Summary

Name	Most Effective	Least Effective	Results
Kate	Model w/ Delay	V+G w/ MTL	Replication
Andrew	Model w/ LTM	V+G w/ MTL	*Replication
Levi	Model w/ Delay	V+G w/ MTL	Replication
John	Model w/ LTM	MG w/ MTL	Replication
Brian	MG w/ Delay	V+G w/ MTL	*Replication

*Least effective procedure potentially effective

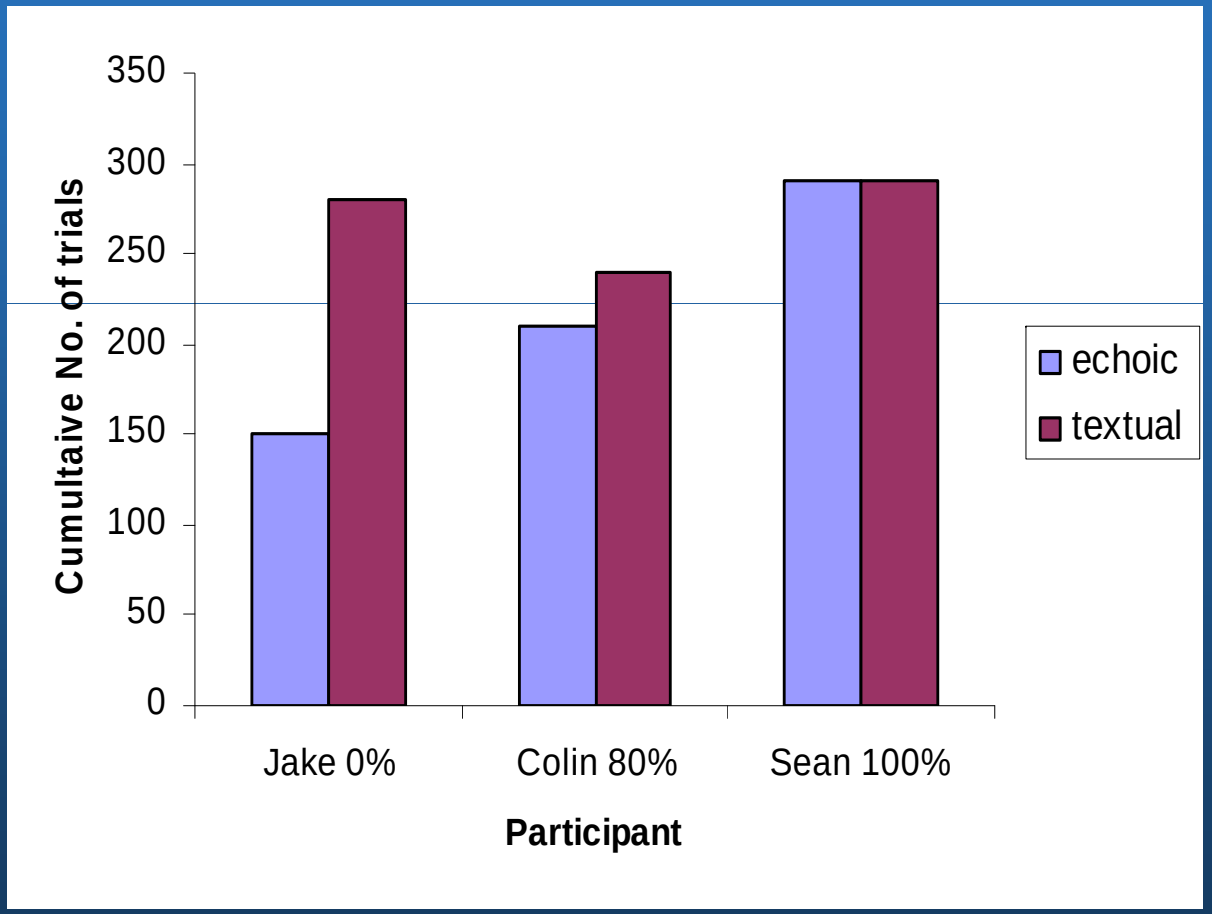
Focus on the Analysis in ABA

- Relatively Reliable Results
- Limitations
  - Verbal + gestural prompt
  - Criteria for ending assessment
  - Equating response effort
  - Generality of results
- "Best" Teaching Procedure
  - Results suggestive of learning repertoire
    - Assessment as dependent measure

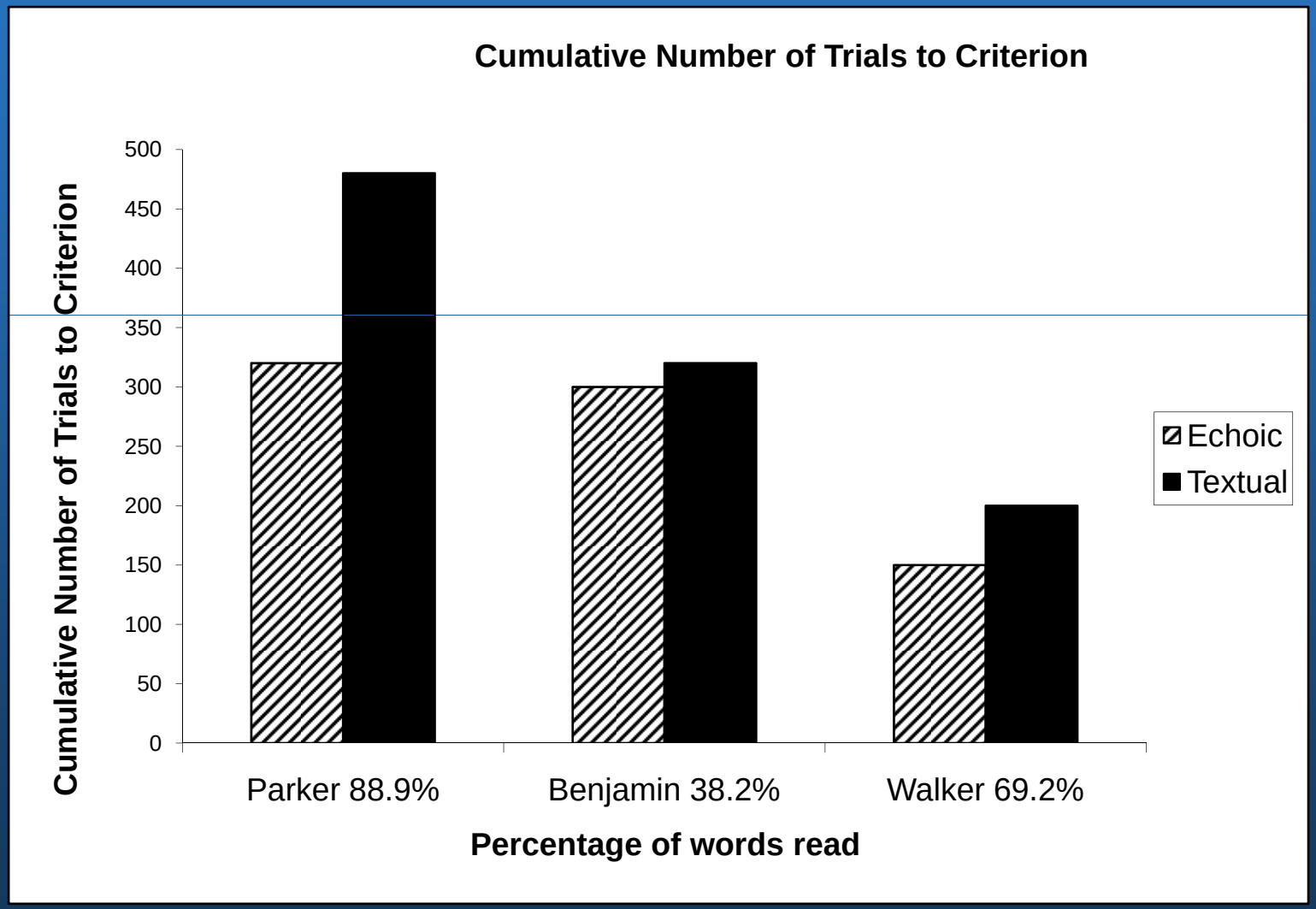
Prompt Types for QAnswering

- Echoic Prompts
  - Experimenter provides vocal model
    - Includes 1 word directives or complete sentences (Ahearn, MacDonald, Graff, & Dube, 2007)
  - Effectiveness has been demonstrated for teaching social questions (Secan, Egel, & Tilley, 1989)
- Textual Prompts (Finkel & Williams, 2001)
  - Experimenter provides textual model
    - Includes written words, lists, or instructions (Ahearn et al., 2007)
  - Used to teach children to engage in intraverbal behavior (conversations) (Krantz & McLannaghan, 1993; Sarokoff et al., 2001)

Keenan, Ahearn, & Miguel (2007)



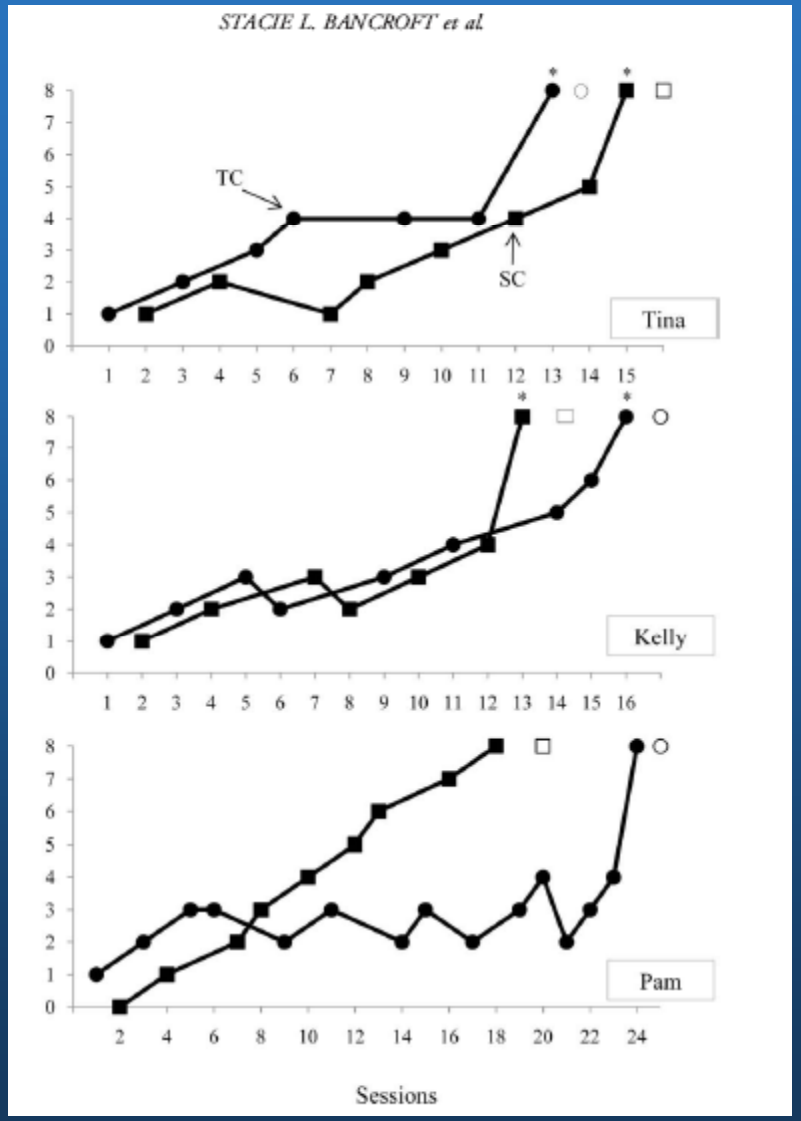
Cook, Ahearn, & Miguel (2009)



Related Matters

- "Best" Teaching Procedure (cont.)
  - Participant's "preference"
    - Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997
  - Procedural integrity
  - Lower effort
  - Learning through observation

Bancroft, Weiss, Libby, & Ahearn (JABA; 2011)



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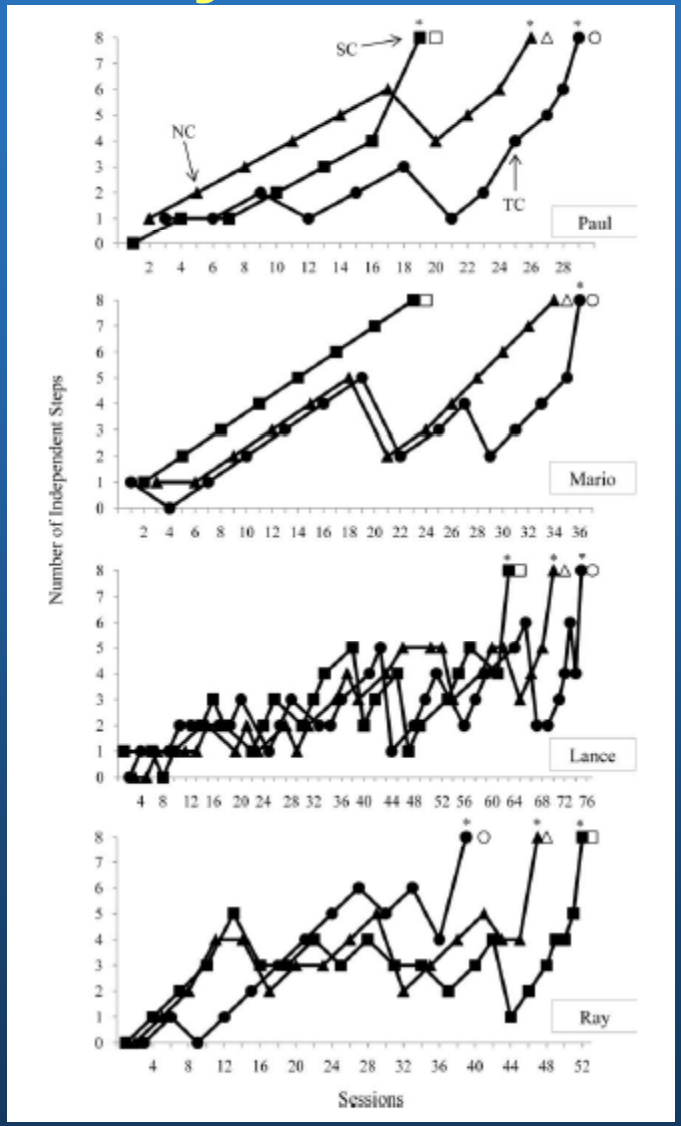
Bancroft, Weiss, Libby, & Ahearn (JABA; 2011)



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MacDonald & Ahearn (JABA; in rev.)

Running head: Observational Learning

Teaching Observational Learning to Children Diagnosed with Autism

Jacquelyn MacDonald and William H. Ahearn

Western New England University

The New England Center for Children

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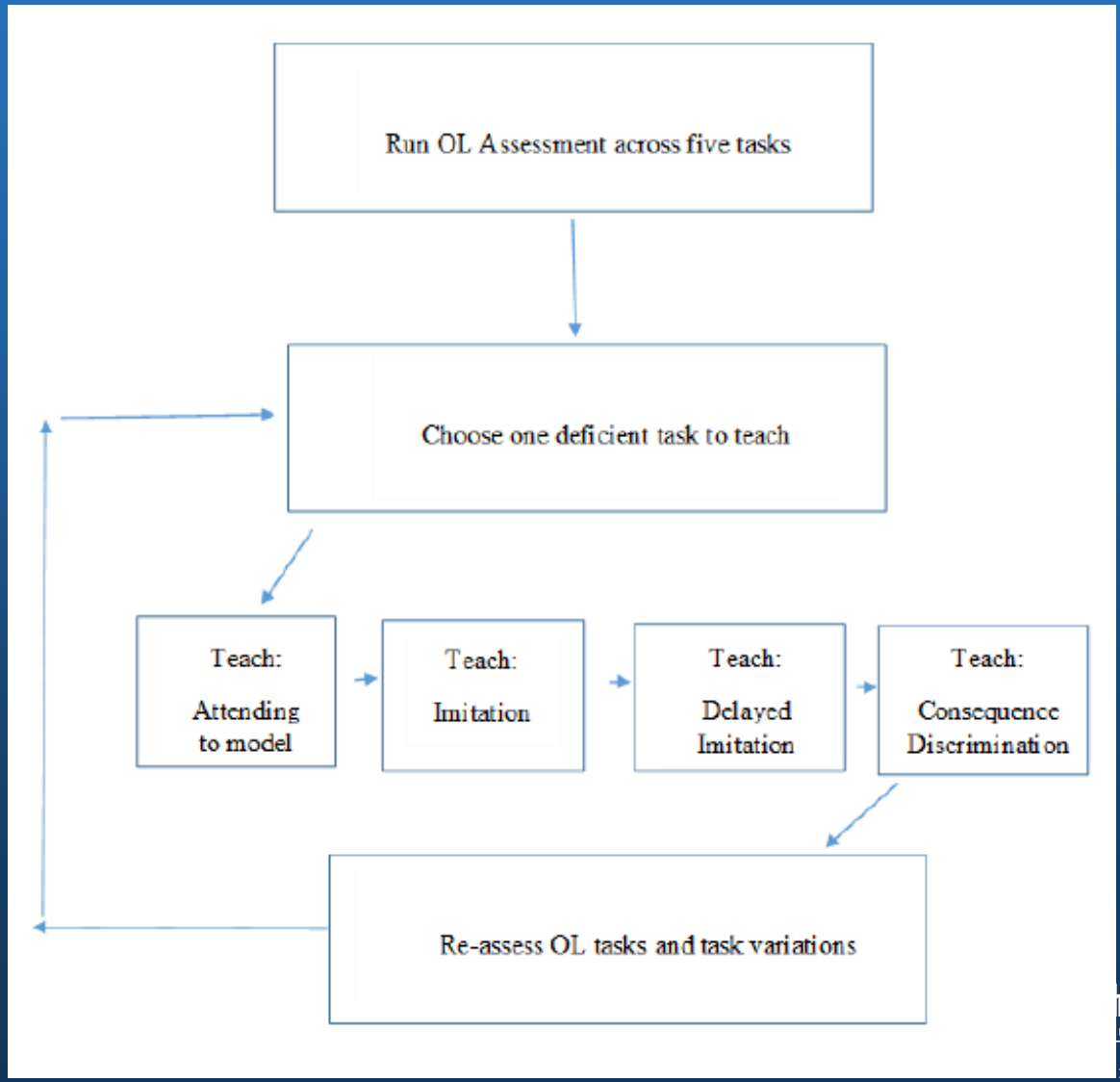
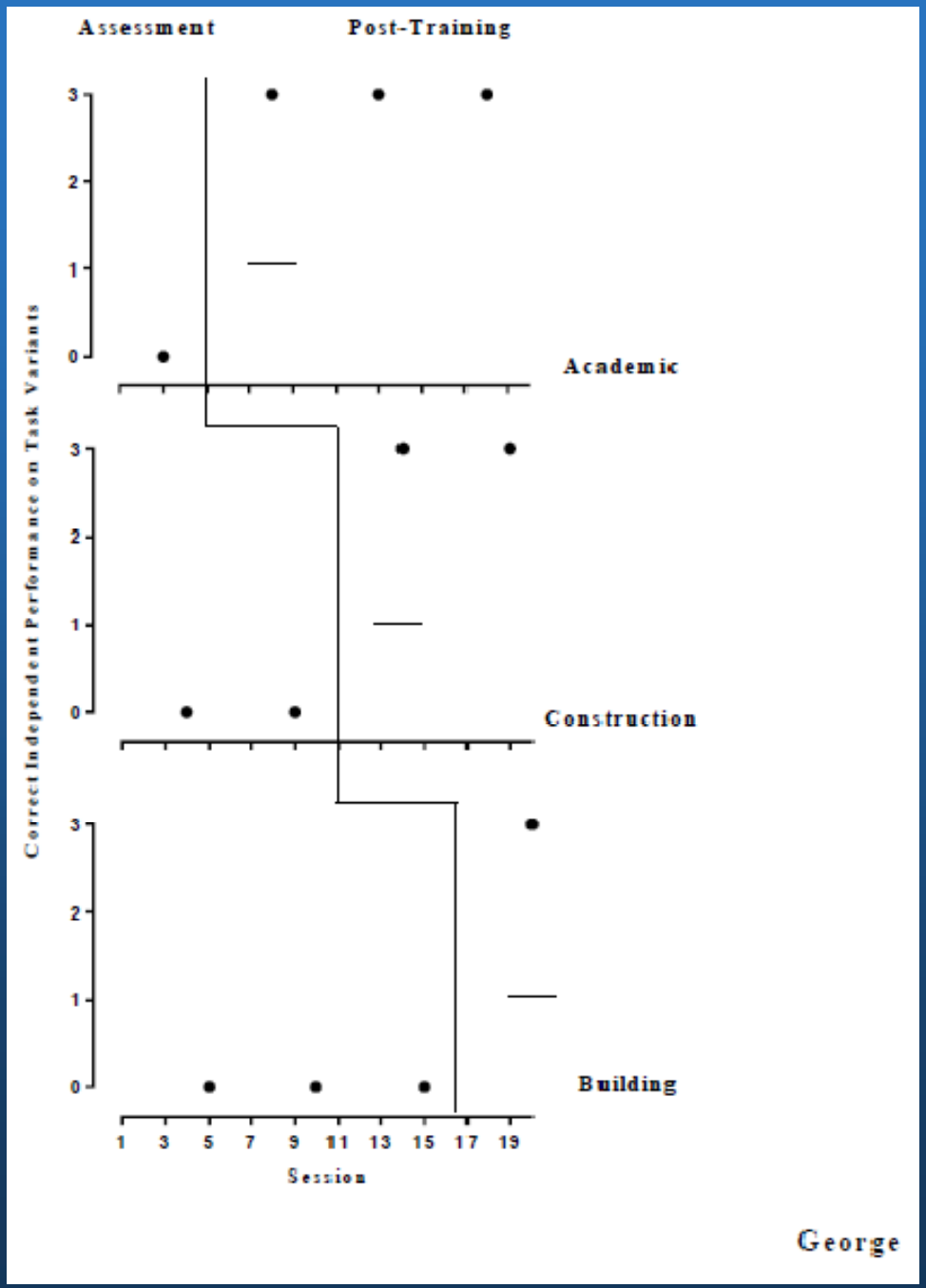
MacDonald & Ahearn (JABA; in rev.)



MacDonald & Ahearn (JABA; in rev.)

Task Variants for Observational Learning Tasks

OL Tasks	Possible Variants
Hidden Item Task	green box, blue box, plastic cups
Computer Game	right, left, or top correct position
Academic Task	various nonsense symbols/words
Construction Toy	dump truck, front loader, back hoe
Building Toy	Elmo ®, Cookie Monster ®, Lego ® toys, Thomas ® toy



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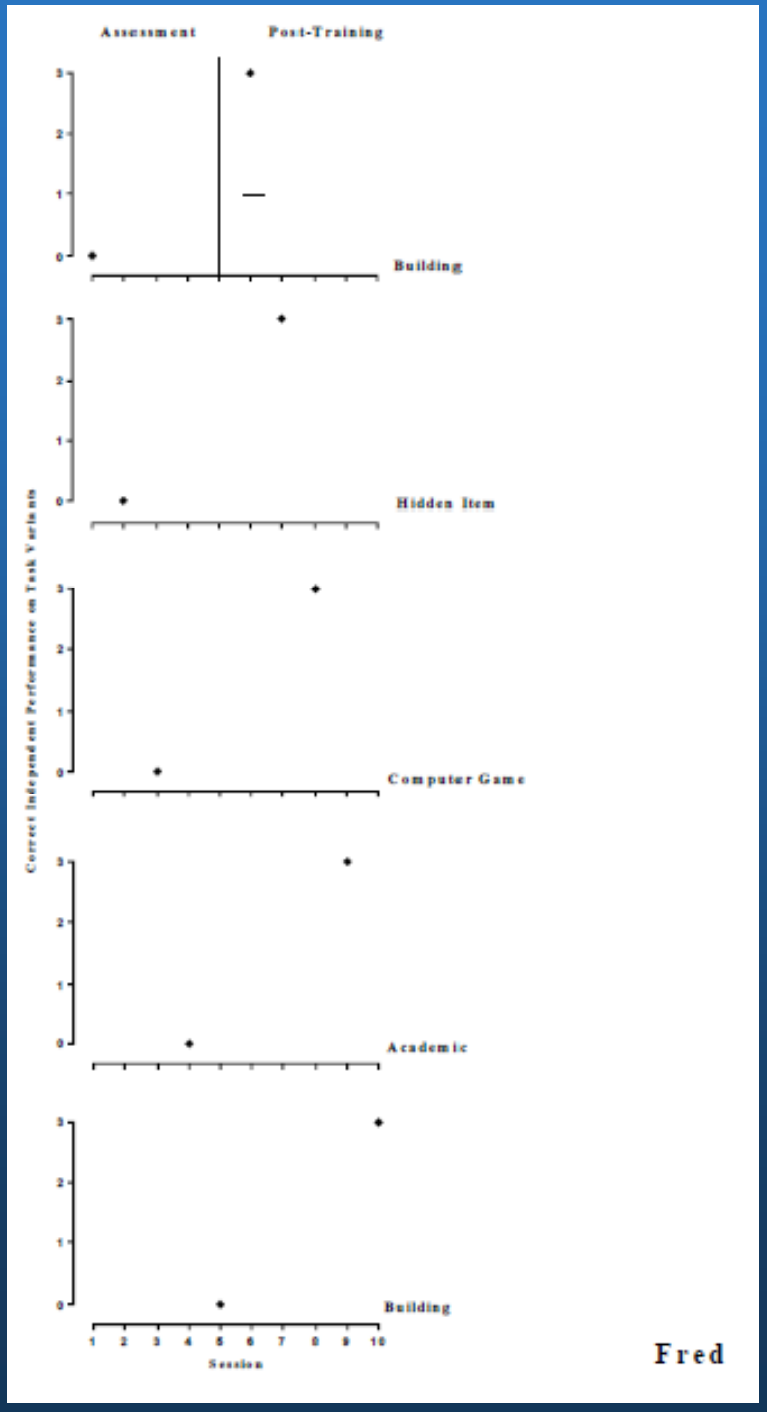

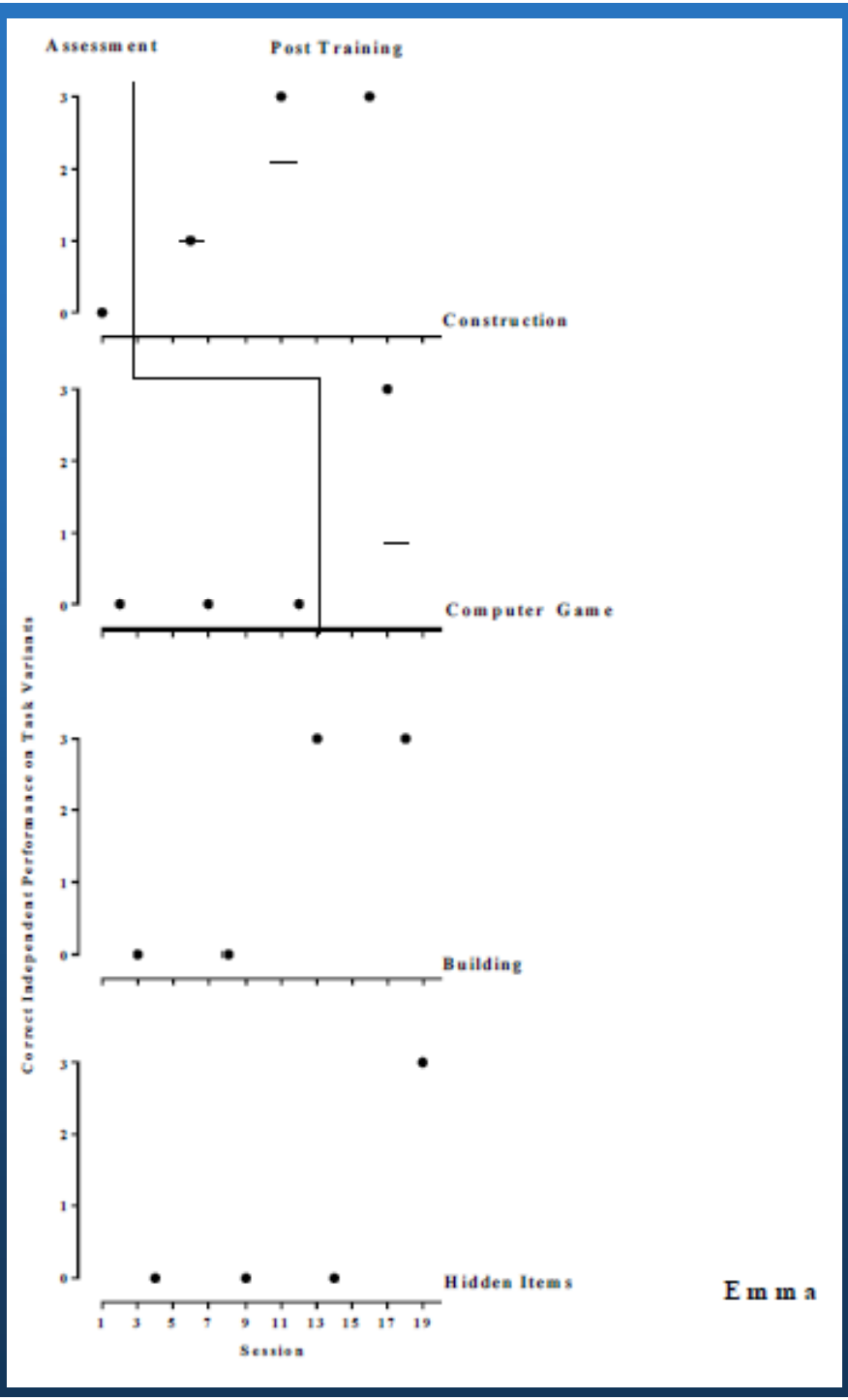

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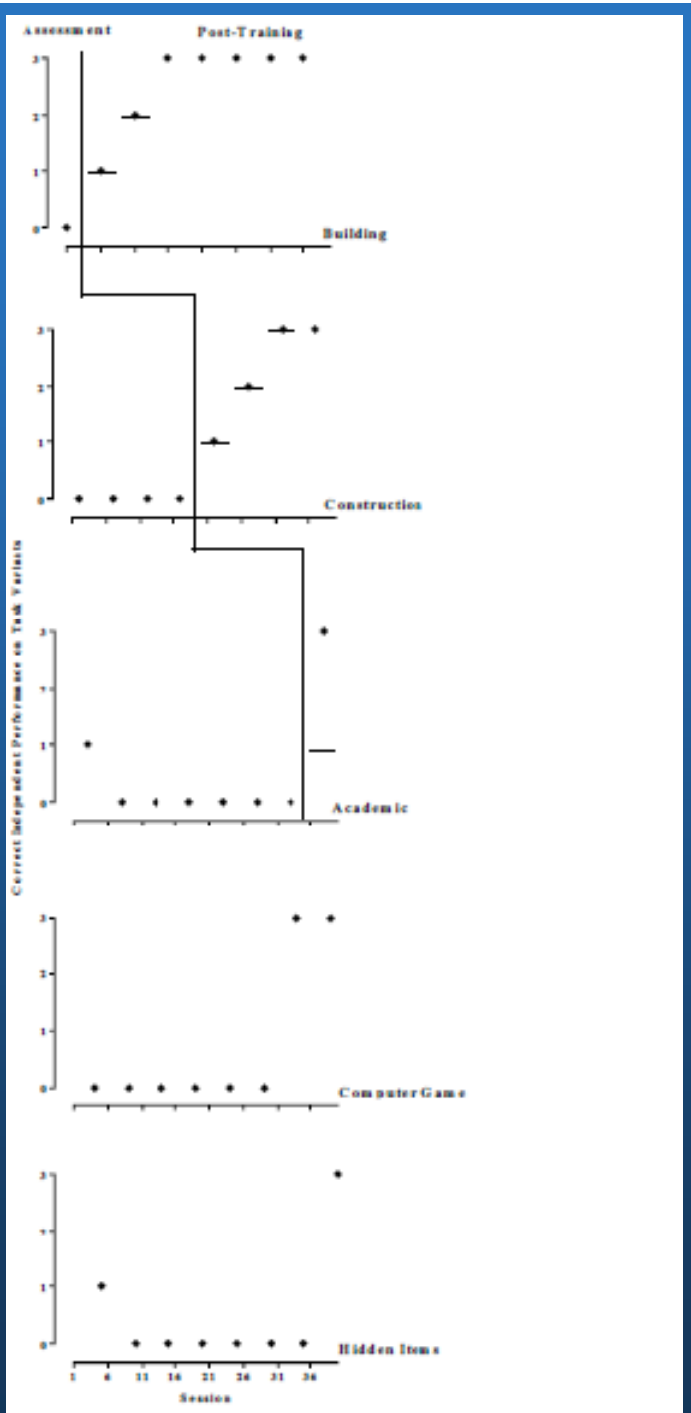

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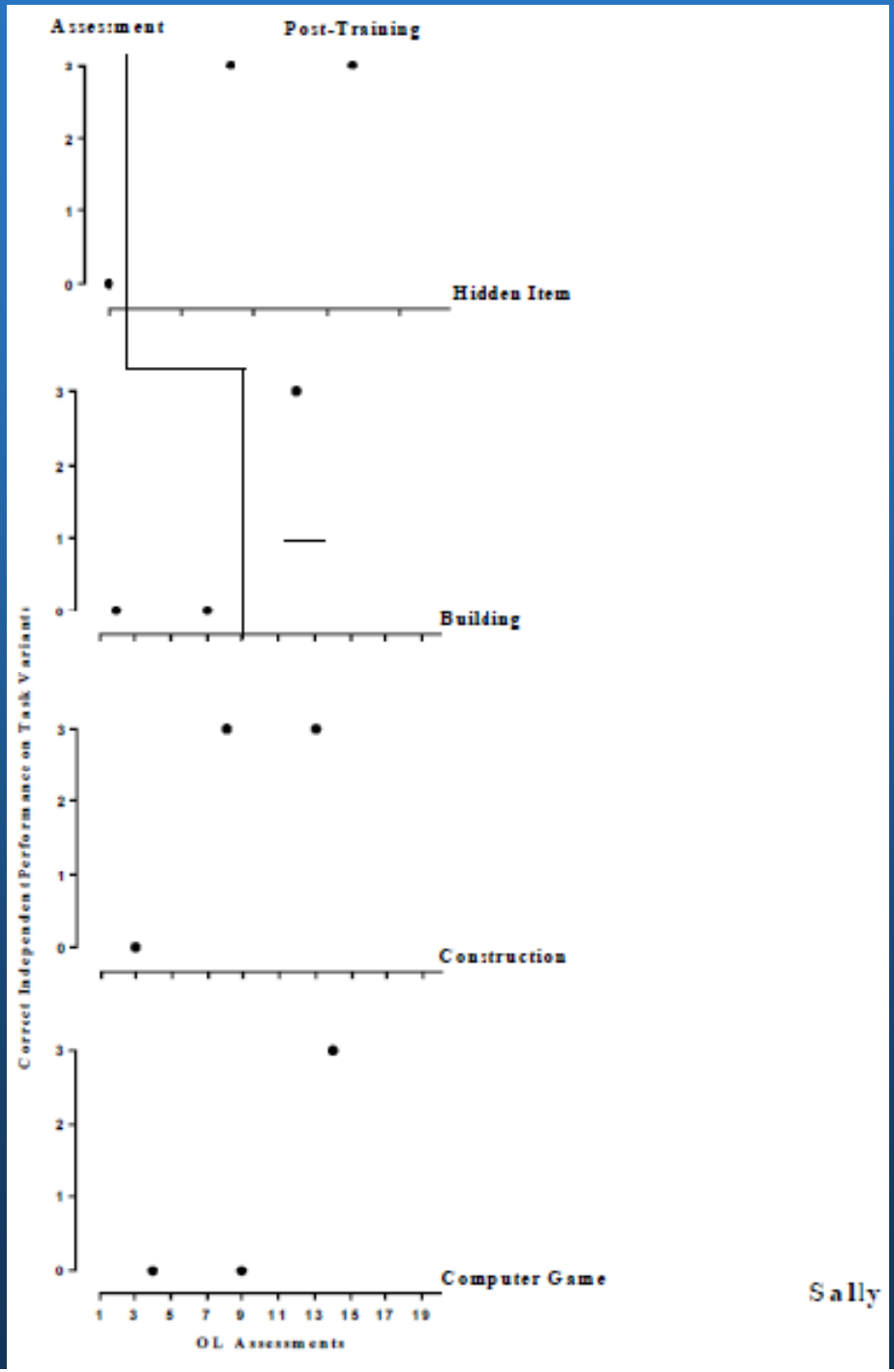

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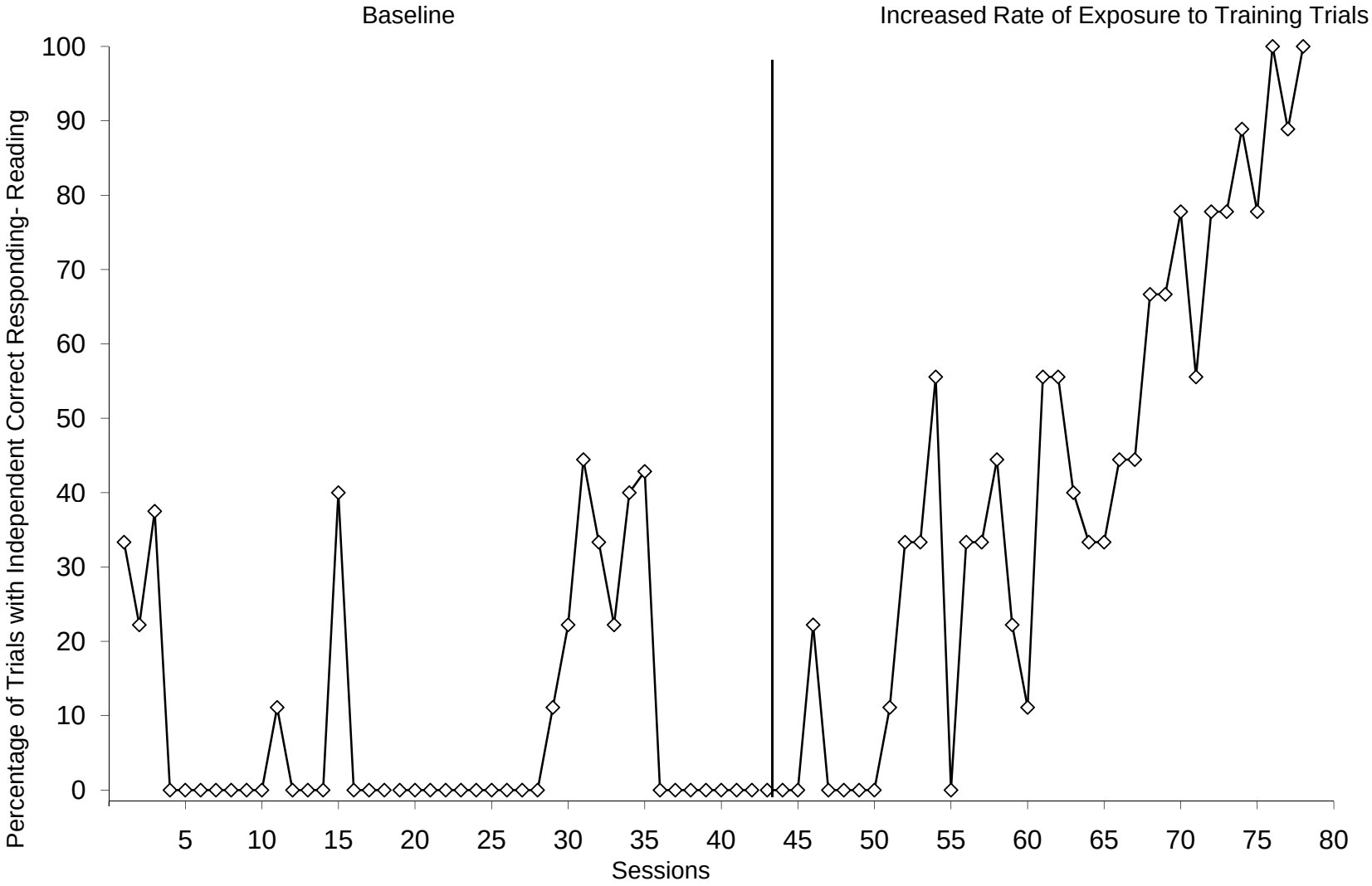
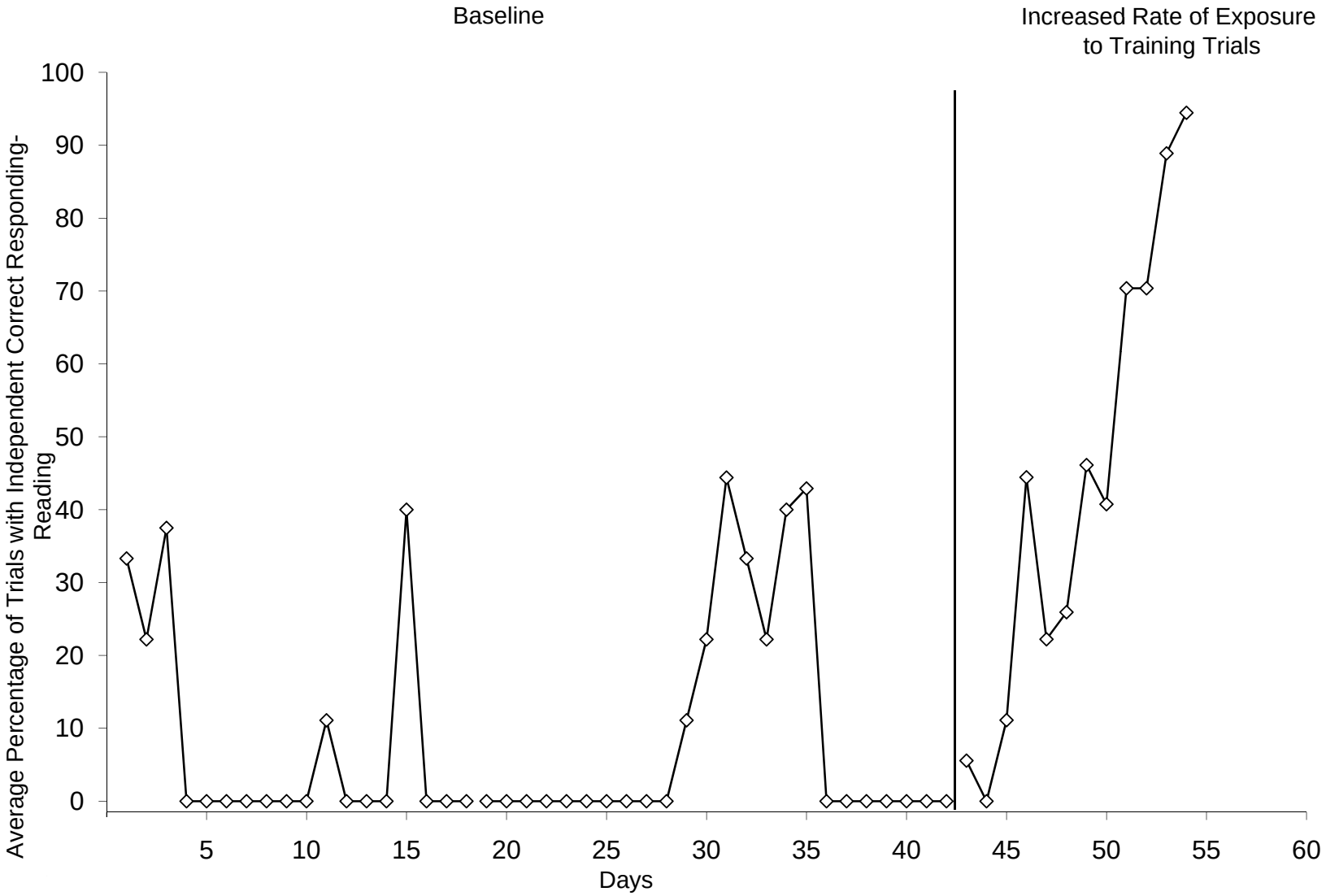
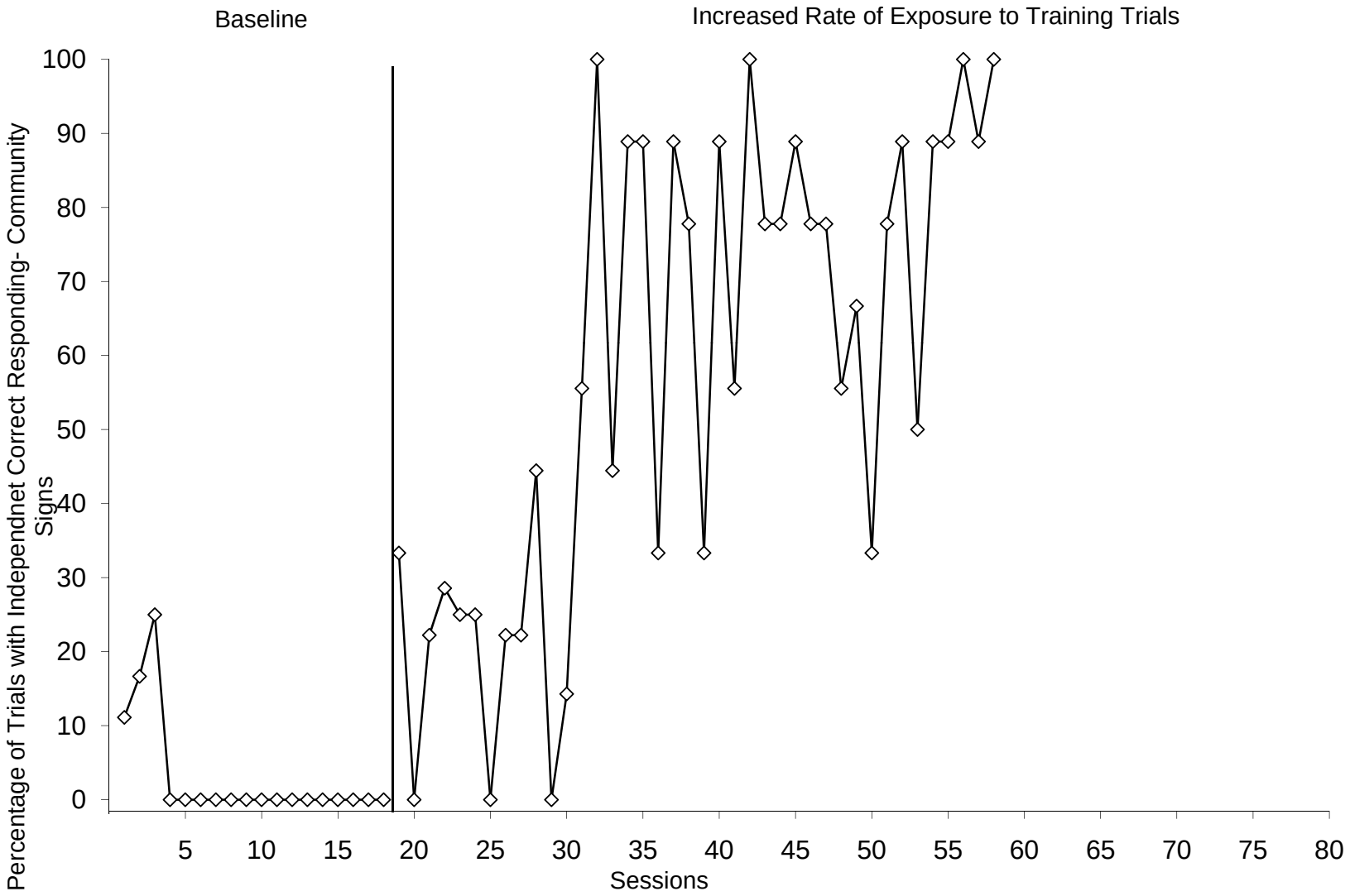
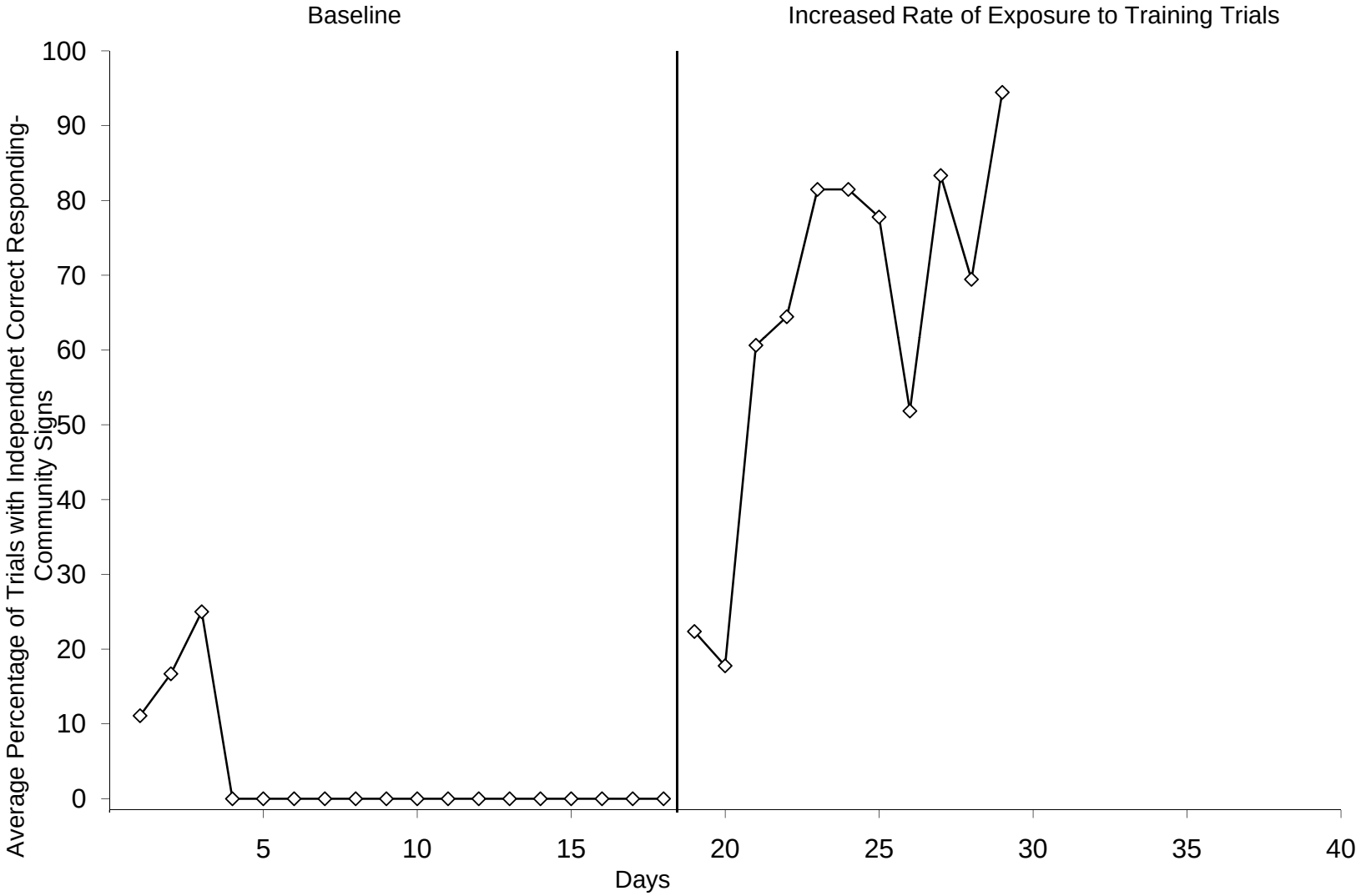
Slow to no progress in learning

- Procedural integrity
- Reinforcement
- Exposure to task – massed practice


Baseline
Increased Rate of Exposure to Training Trials
Percentage of Trials with Independent Correct Responding- Reading
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
Sessions


Baseline
Increased Rate of Exposure to Training Trials
Average Percentage of Trials with Independent Correct Responding-Reading
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
Days


Baseline
Increased Rate of Exposure to Training Trials
Percentage of Trials with Independnet Correct Responding- Community Signs
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
Sessions


Baseline
Increased Rate of Exposure to Training Trials
Average Percentage of Trials with Independnet Correct Responding-Community Signs
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
Days

Participants	Number per week during Baseline		Average number per week during Treatment	
	Trials	Sessions	Trials	Sessions
AJ				
Community Signs	45	5	255	28
Reading	45	5	255	28
Manual Signs	25	5	100	20
Bret				
Sequencing Pictures	50	10	285	57
Tooth Brushing	25	5	150	30

Another problem

- One variable that could slow learning is prompt dependency

Cividini-Motta & Ahearn (2013)

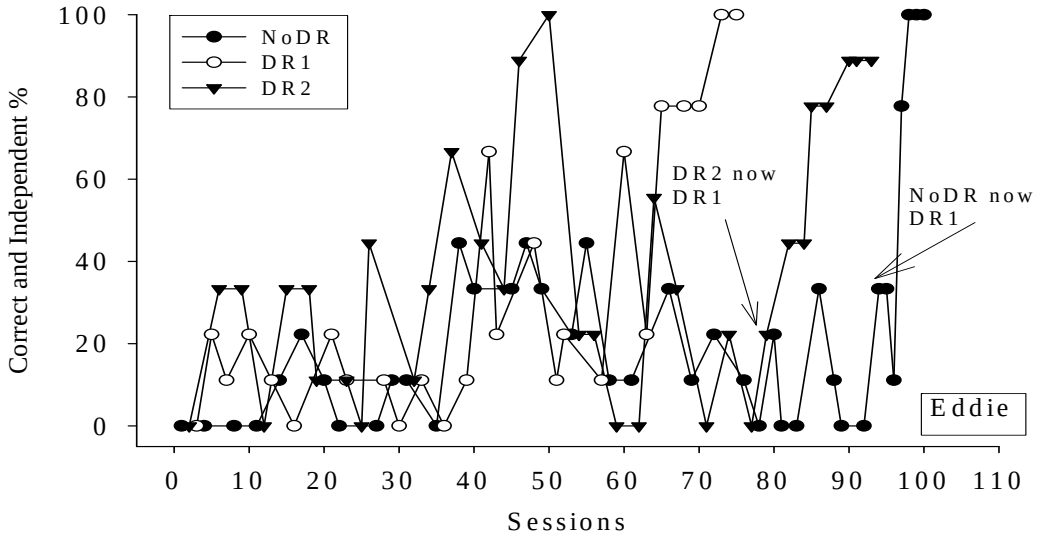
- To assess whether differential reinforcement of prompted and independent responses is effective in decreasing prompt dependency

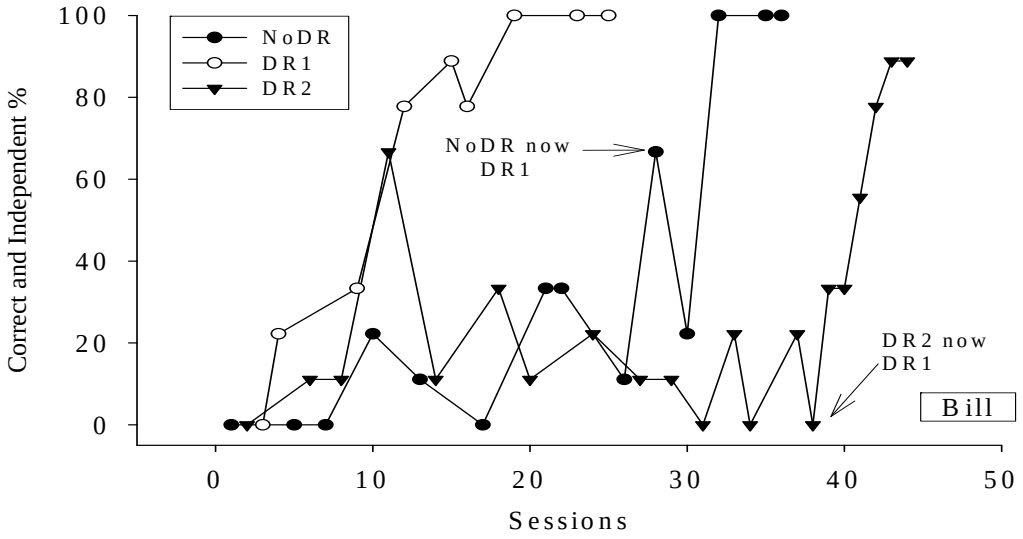
Method

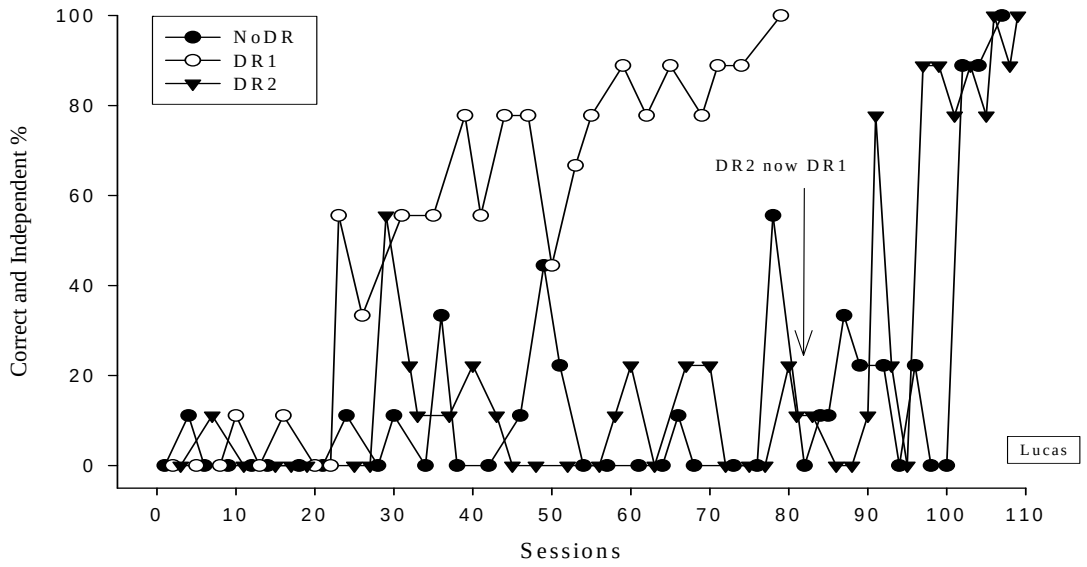
- Three reinforcement programs
  - Differential Reinforcement 1: most potent reinforcer delivered for independent responses
  - Differential Reinforcement 2: no reinforcement provided for prompted responses
  - No Differential Reinforcement: same reinforcer delivered for prompted and independent responses

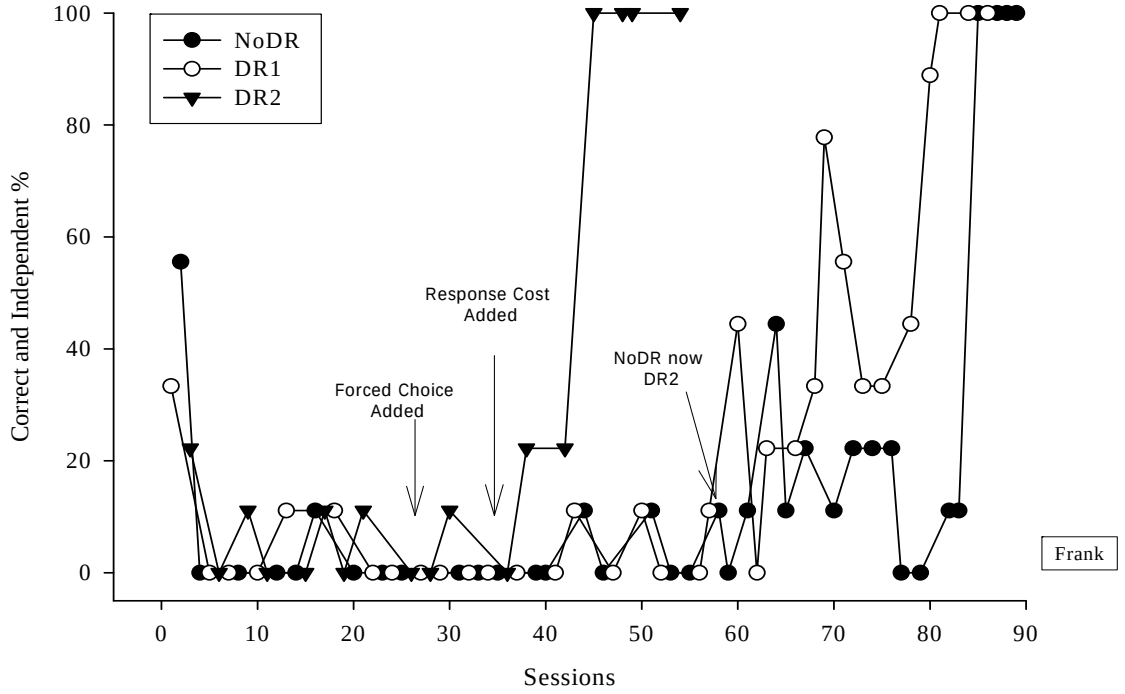
Method

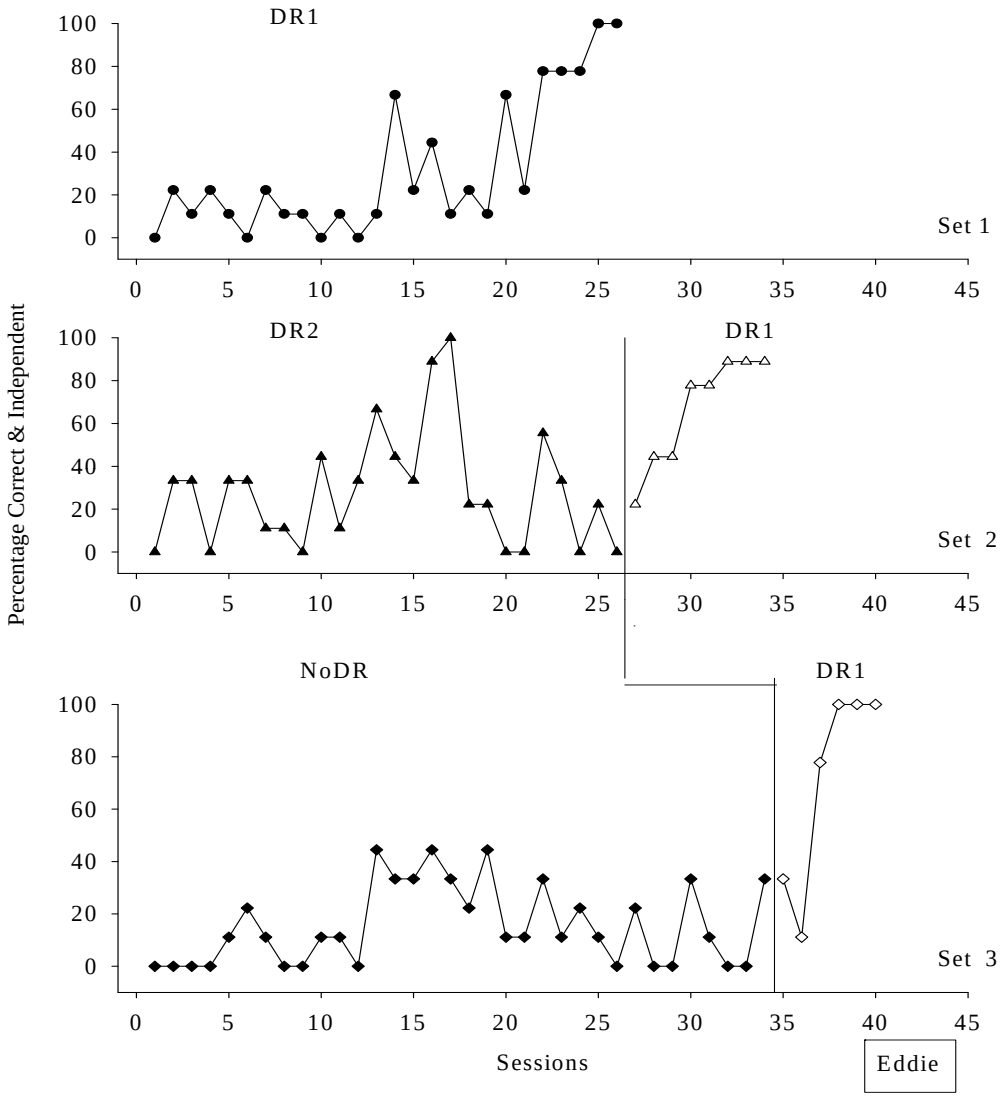
- Three sets of sight words were taught using a matching to sample (2 s c. delay/MTL)

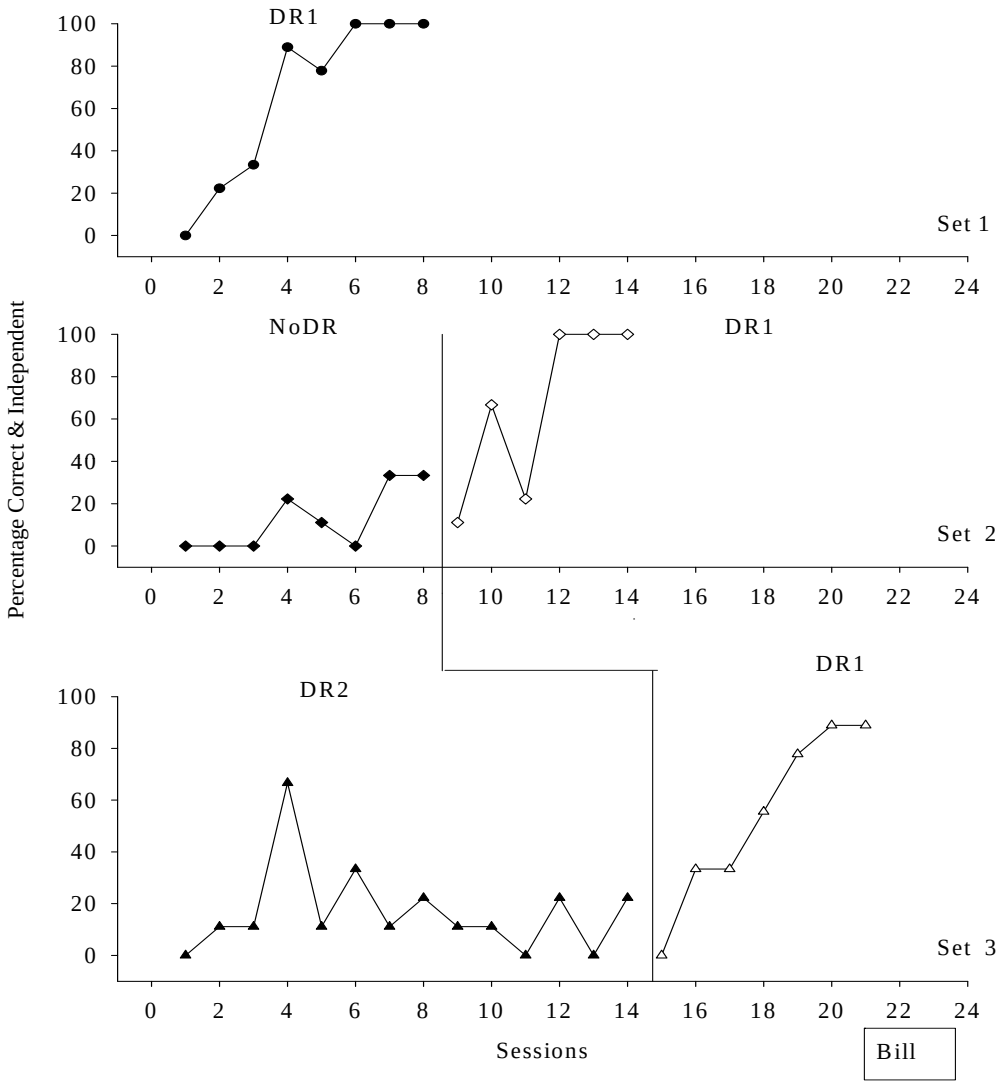

NoDR
DR1
DR2
Correct and Independent %
Sessions
DR2 now
DR1
NoDR now
DR1
Eddie
0
20
40
60
80
100
0
10
20
30
40
50
60
70
80
90
100
110

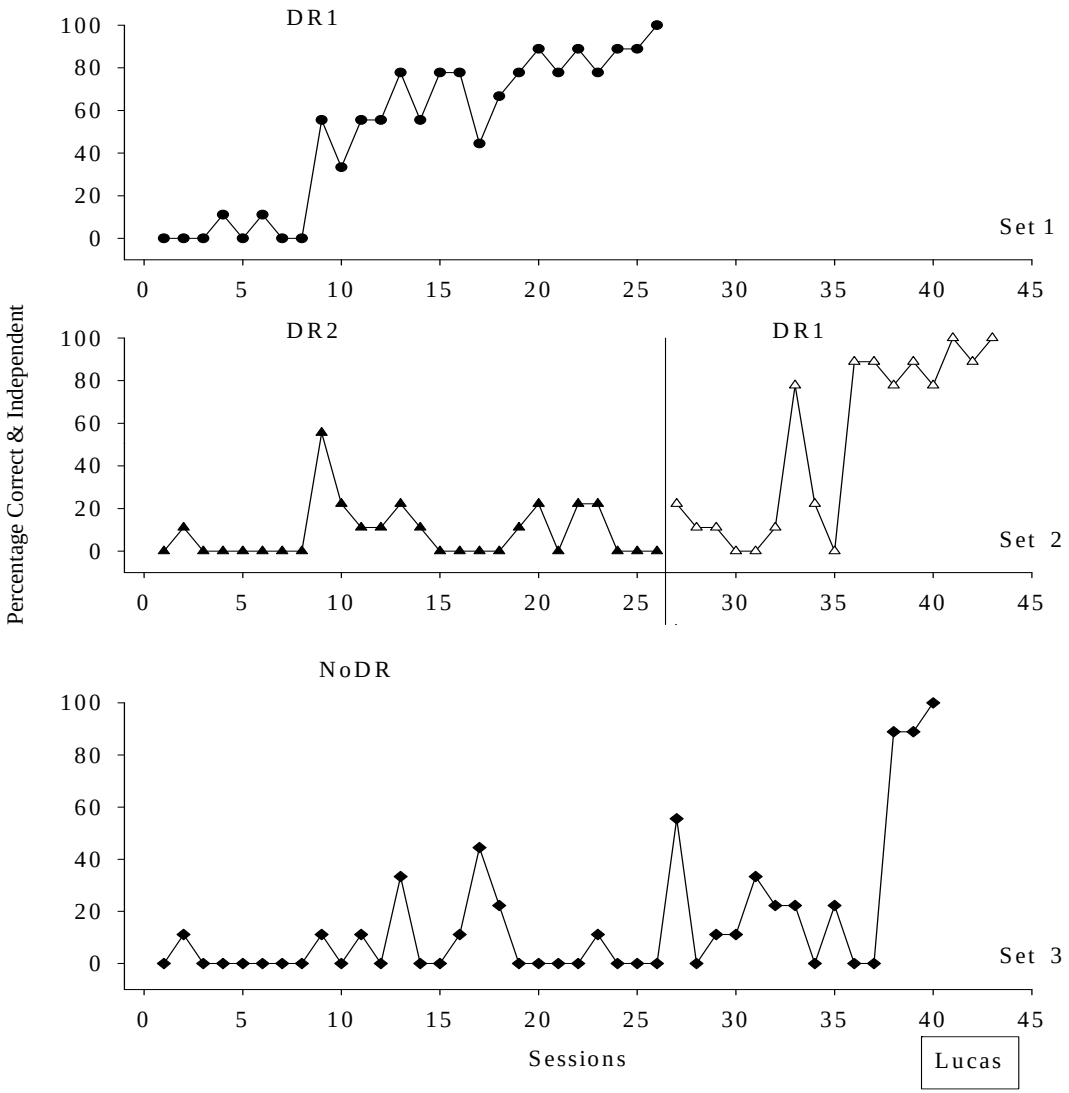

NoDR
DR1
DR2
Correct and Independent %
Sessions
NoDR now
DR1
DR2 now
DR1
Bill
0
20
40
60
80
100
0
10
20
30
40
50

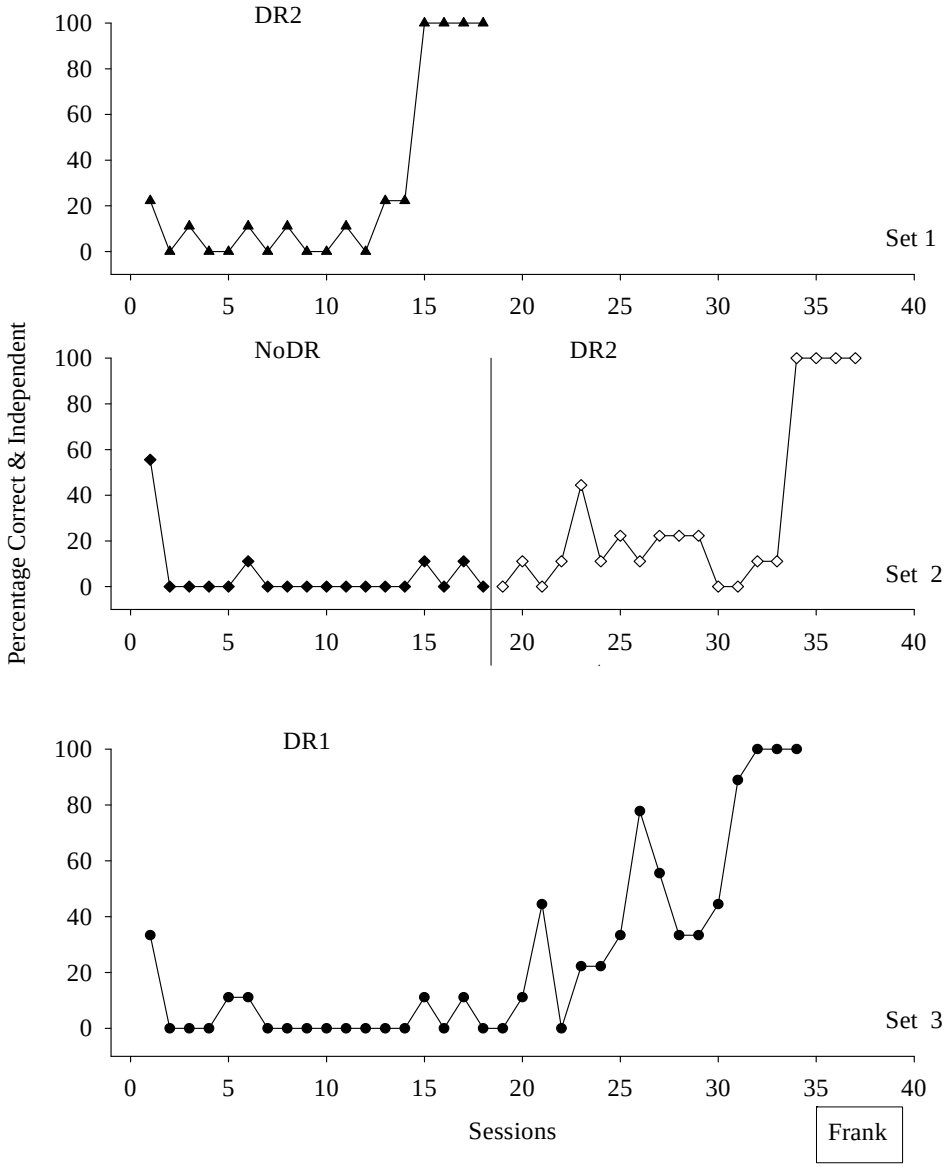

NoDR
DR1
DR2
DR2 now DR1
Correct and Independent %
Sessions
Lucas


NoDR
DR1
DR2
Response Cost Added
Forced Choice Added
NoDR now DR2
Correct and Independent %
Sessions
Frank


DR1
Set 1
DR2
DR1
Set 2
NoDR
DR1
Set 3
Percentage Correct & Independent
Sessions
Eddie
0
20
40
60
80
100
0
5
10
15
20
25
30
35
40
45


DR1
NoDR
DR1
DR2
DR1
Set 1
Set 2
Set 3
Percentage Correct & Independent
Sessions
Bill
0
20
40
60
80
100
0
2
4
6
8
10
12
14
16
18
20
22
24





Research to Practice: Practice to Research

- When setting our goals as clinicians
  - Research can help set our agenda
  - For ASDs, the goals are clear
  - But, how to get there not always clear
- Research in treatment settings
  - The best way to identify effective Tx
  - These effective teaching tools can be bettered
  - Best practices can be revealed

Focused Best Practice Research - NECC

- Established groups
- Provide resources
- Learn and distribute

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Treatment Research at NECC
Play Skills/Social Interaction

MacDonald, R.P.F., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W.H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis, 42,* 43-55.

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Treatment Research at NECC
Awareness of others

Klein, J.L., MacDonald, R.P.F., Vaillancourt, G., Ahearn, W.H., & Dube, W.V. (2009). Teaching discrimination of adult gaze direction to preschool children with autism. *Research in Autism Spectrum Disorders, 3,* 42-49.

Treatment Research at NECC
Social Preferences

Smaby, K., MacDonald, R.P.F., Ahearn, W. H., & Dube, W.V. (2007). Assessment protocol for identifying preferred social consequences. *Behavioral Interventions, 22*, 311-318.

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Treatment Research at NECC "Preventing" Severe Behavior

Herscovitch, B., Roscoe, E.M., Libby, M.E., Bourret, J.C., & Ahearn, W.H. (2009). A methodology for identifying precursors to problem behavior. *Journal of Applied Behavior Analysis, 42*, 697-703.

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Treatment Research at NECC
Tx of Stereotypic Behavior

Ahearn, W.H., Clark, K.M., MacDonald, R.P. F., & Chung, B.I. (2007). Assessing and treating vocal stereotypy in children with autism. *Journal of Applied Behavior Analysis, 40,* 263-275.

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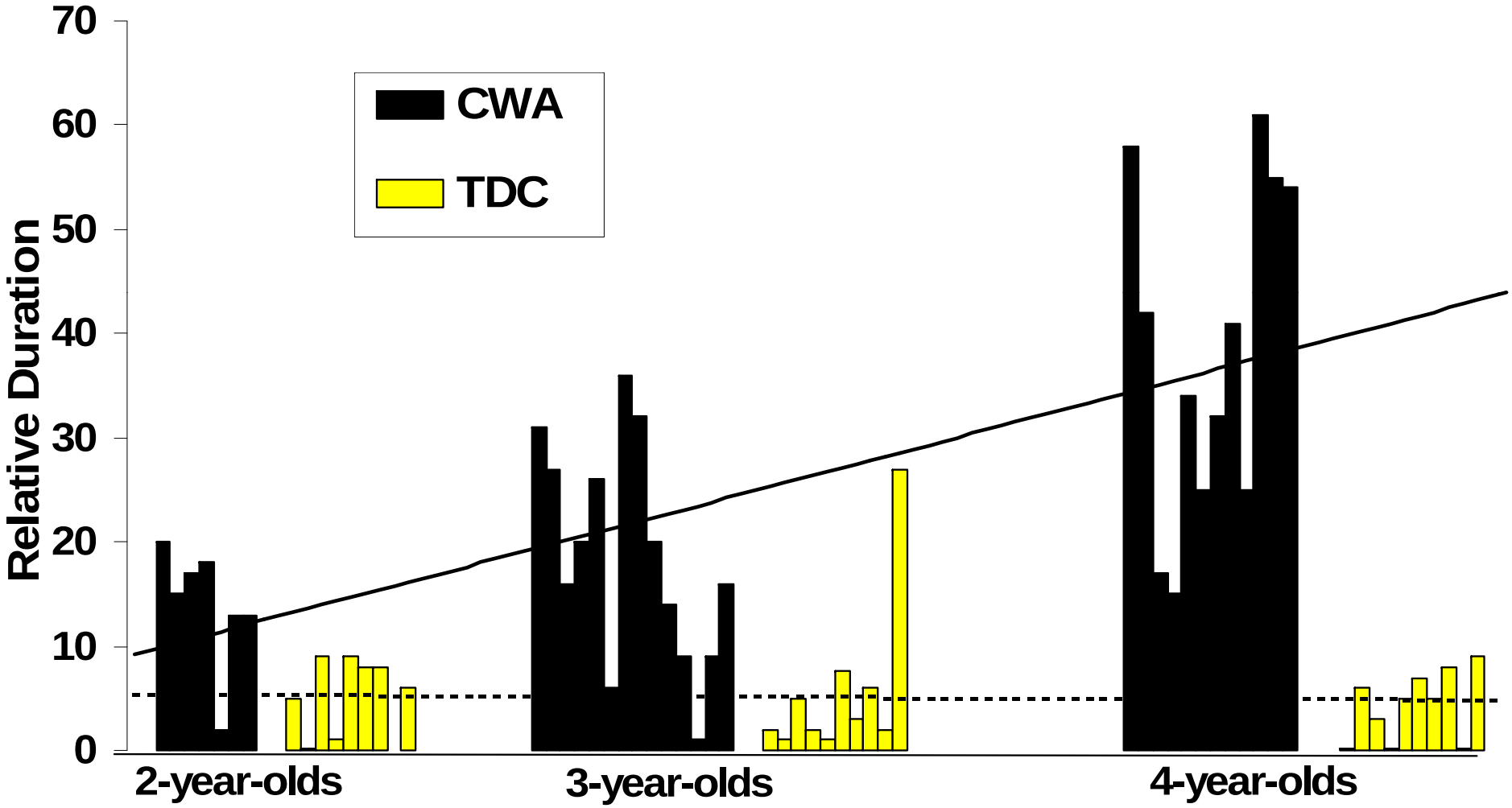
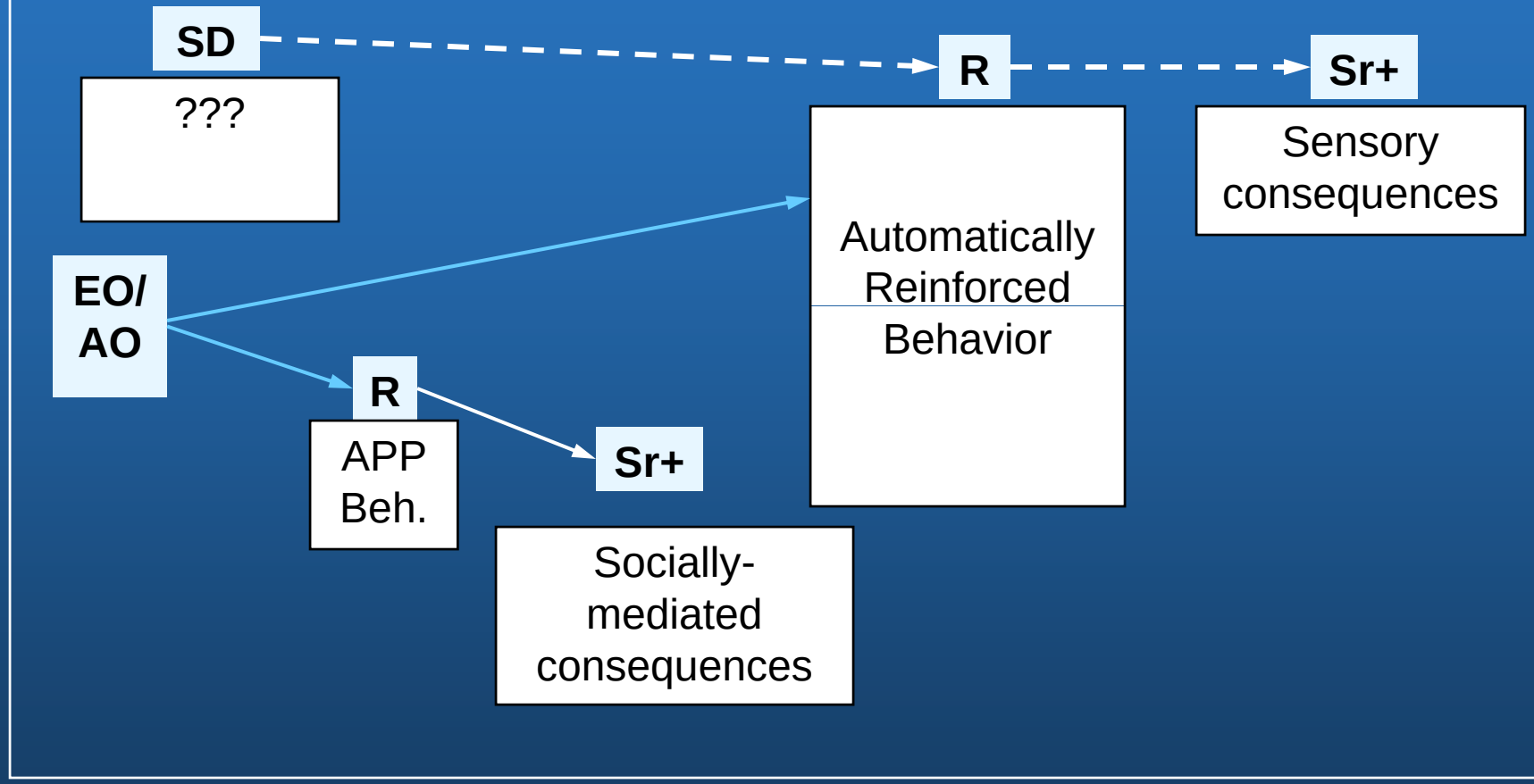
A Case History in Best Practice

- Stereotypic behavior circa 2000
  - Function-based TX?

MacDonald et al. (2007)



Context: Presence of others

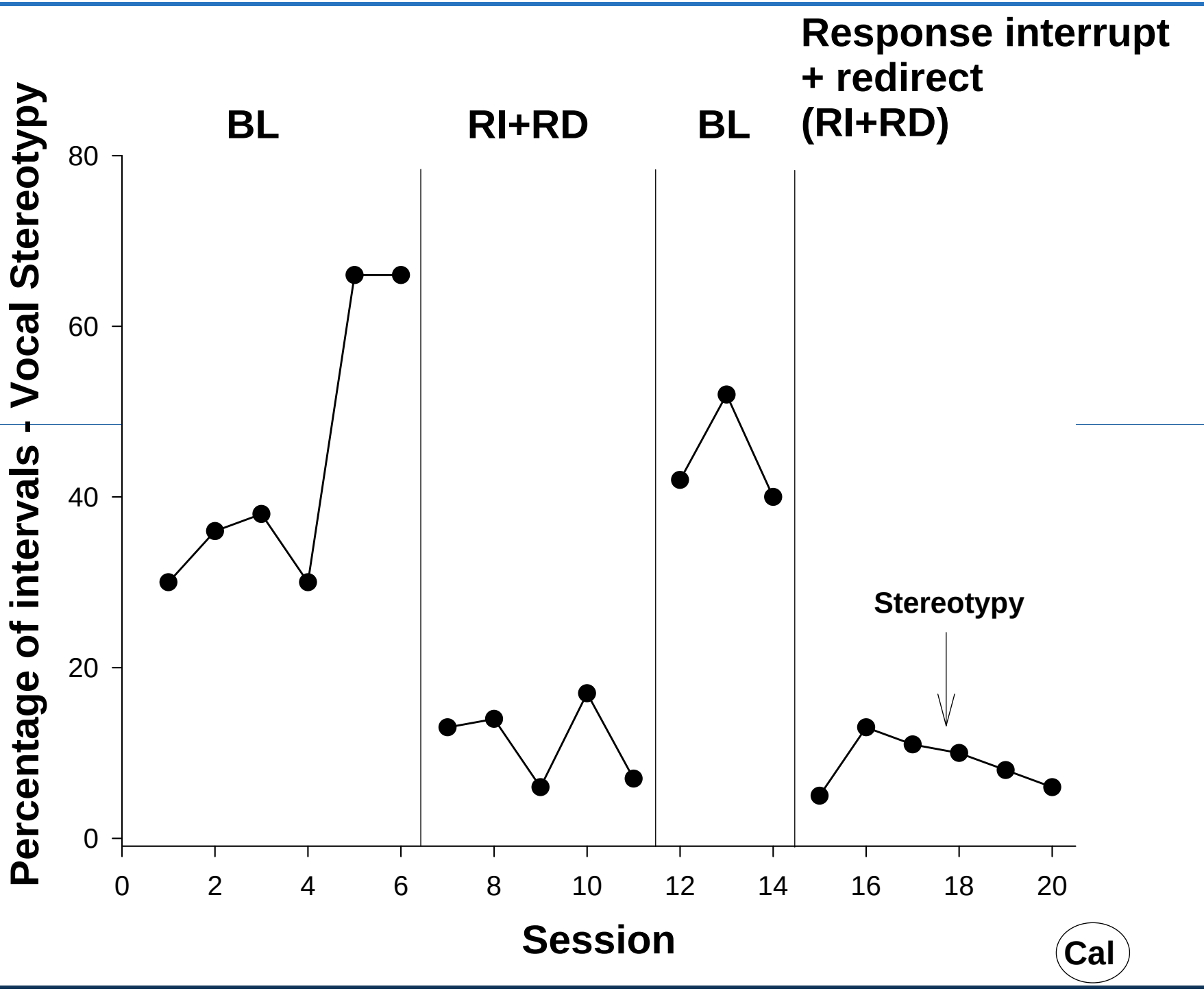


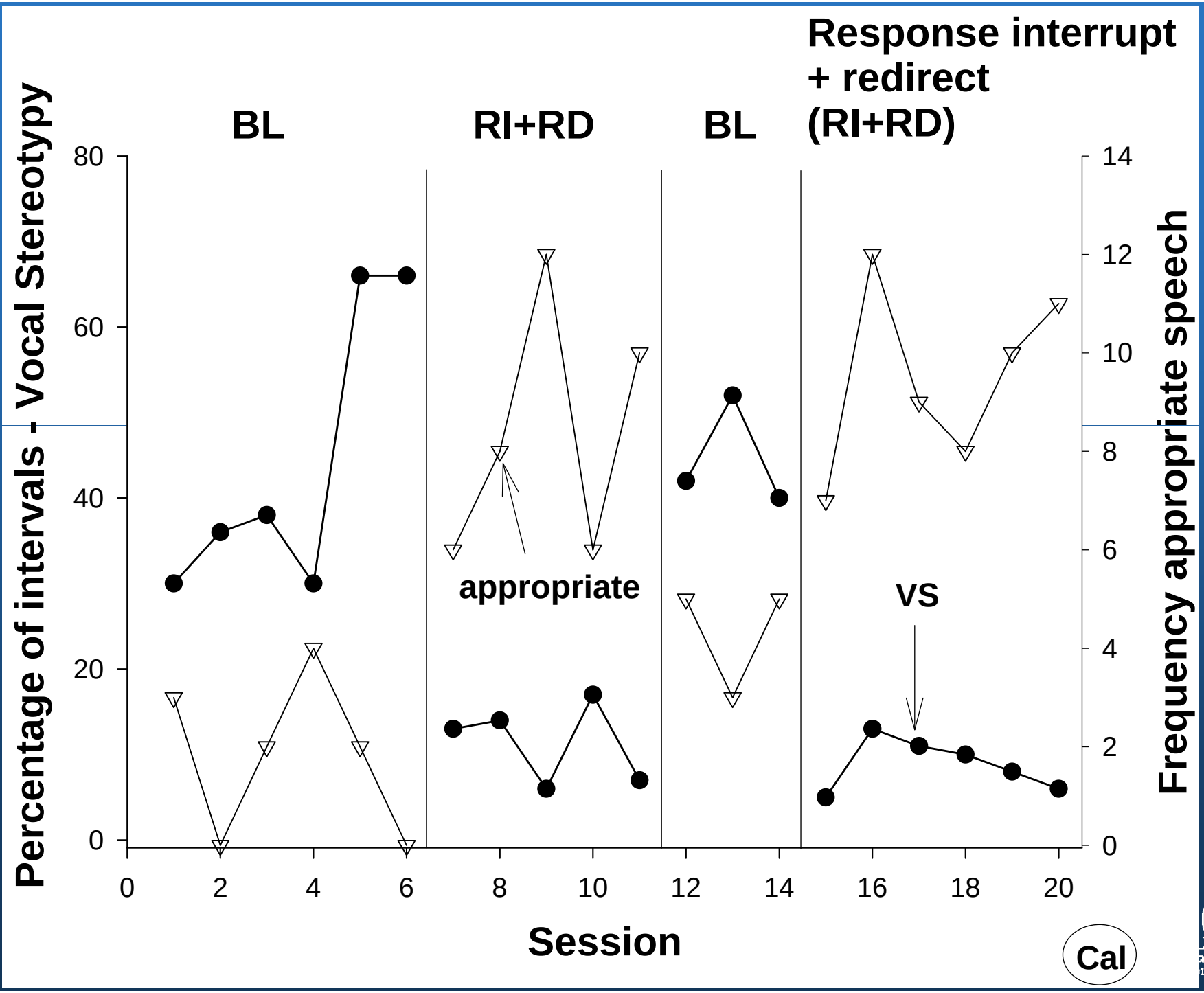
A Case History in Best Practice

- Stereotypic behavior circa 2000
  - Status as functional operant class
  - Manualized recommendations
  - Status of evidence
- Establish competing behavior! How?
- RB for Auto SIB (N=1-2)…
- NCR (Piazza et al. 1998/2000)?
  - Ahearn et al. (2003/2005)
- DRO! (but does not foster CB!)
- DRA?

Response Interruption + RD – Ahearn et al. (2007)

- **5-minute sessions**
  - **No interaction baseline**
  - **Reinforce requesting/app speech**
- **Contingent upon vocal stereotypy**
  - **Establish attention (eye contact)**
  - **Ask social questions (hi-p compliance)**
  - **Reinforce requesting/app speech**


Response interrupt + redirect (RI+RD)
BL
RI+RD
BL
Percentage of intervals - Vocal Stereotypy
80
60
40
20
0
Stereotypy
0
2
4
6
8
10
12
14
16
18
20
Session
Cal


Response interrupt + redirect (RI+RD)
BL
RI+RD
BL
(RI+RD)
Percentage of intervals - Vocal Stereotypy
Frequency appropriate speech
80
60
40
20
0
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
Session
appropriate
VS
Cal

A Best Practice Revealed

- Spurred a flurry of studies on this technique
  - Martinez & Betz (2013)
- Several variants of RIRD effective
- TX comparisons have favored RIRD (however!)
- Added components that target supporting adaptive skills likely superior to RIRD alone
  - Colon, Ahearn, et al. (2012)

- Vanderkerken et al. (2013)
  - Meta-analysis of SCE for VCB (N=74)
  - Large TX effect (e.g., RIRD – VS+)

RIRD video

Clip 4 - BL

Clip 5 – RIRD 1st session

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Moving on past RIRD

Clip 6 – Teaching social reciprocity

Clip 7 – Generalization

Establish Appropriate Behavior

- **Social interaction (via prompting)**

  (e.g., Odom & Strain, 1986; MacDonald et al., 2009)

- **Play skills (via prompting & whatever)**

  (e.g., Libby et al., 2009; Tereshko et al., 2011)

- **Collateral effects → Less stereotypy**

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