Instructive Feedback

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Overview

- Definition and types of instructive feedback (IF)
- Literature review of studies on IF
- Potential behavioral mechanisms responsible for intervention effects
- Child behavior that may impact the efficacy of instructive feedback
- Applications to clinical and classroom educational practices
- Potential extensions for IF research

Definition of Instructive Feedback

- Presenting additional information when teaching a skill
  - Can present this information before, within, or <u>after</u> a learning opportunity
- Child is not required to respond to the additional information
- The additional information may be a target of instruction in the future

Instructive Feedback- Antecedent

- Instructive feedback in antecedent portion of the learning trial
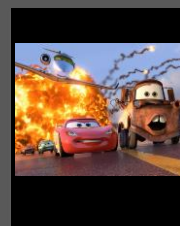

IF stimulus   Target stimulus   Student response   Reinforcement
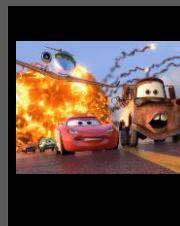
Instructive Feedback- Consequence

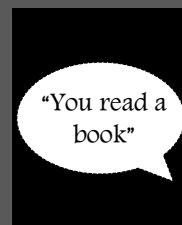- Instructive feedback in consequence portion of the learning trial

"You wash your hands with_____"

"soap"

"You read a book"

Target stimulus | Student response | Reinforcement | IF stimulus

Instructive Feedback- Within

- Instructive feedback within the learning trial

"Cherries are a red…"

"fruit"

"Way to go!"

Target stimulus w/ IF | Student response | Reinforcement

Other Names for IF

- Future learning stimuli
- Non-target information (Taylor, Collins, Schuster, 2002)
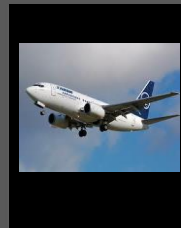- Secondary targets (Vladescu & Kodak, 2013)

Types of Instructive Feedback

1. Expansion
   - Target and IF stimuli differ but are related or are similar types of skills
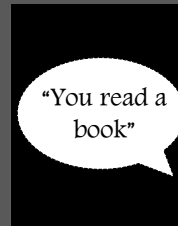
Target stimulus

IF stimulus

Types of Instructive Feedback

2. Unrelated
- Target and IF stimuli differ and are not from same skill area
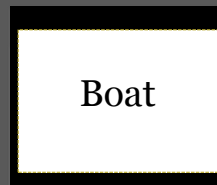
Target stimulus   IF stimulus

Types of Instructive Feedback

3. Parallel
- Target and IF stimuli differ but responses are the same

Boat

Target stimulus   IF stimulus

Usefulness of IF

- Increases efficiency of learning
  - Less time required to teach skill
    - Teaching skill requires 30 min vs. 50 min
  - More information learned during instruction
    - Learn 10 vs. 5 new skills

Research on Instructive Feedback

Research on Instructive Feedback

- At least 30 studies demonstrating efficacy of procedure
- Used to teach many different types of skills
  - Sight words (Gast et al., 1991)
  - Tacts (Tekin-Iftar et al., 2003)
  - Intraverbals (Vladescu & Kodak, 2013)
  - Categories (Loughrey et al., 2014)
  - Grocery store information (Schuster et al., 1996)
  - Play-related behavior (Colozzi et al., 2008)
  - Among others

Participants in IF studies

- Found to be effective with many populations
  - Preschool-age children (Wolery et al., 1993)
  - Elementary-age children (Stinson et al., 1991)
  - Adolescents in middle school (Doyle et al., 1990)
  - Individuals with language and hearing impairments (Wolery et al., 1993)
  - Children with moderate ID (Gast et al., 1990)
  - Adolescents with behavior disorders (Wolery et al., 1991)
- Only a few studies evaluated IF with children with an ASD

Using IF to Teach Skills to Children with an ASD

- Vladescu & Kodak (2013)
  - Taught tacts and intraverbals with antecedent IF, consequence IF, or IF only
    - IF only- did not present IF within a learning trial
  - Conducted probes to evaluate learning of IF stimuli
    - Ongoing sessions with no feedback for correct responding
- Results
  - All participants learned targeted tacts or intraverbals
  - Three participants learned IF stimuli without additional training
  - All participants learned stimuli presented in IF only

Settings for Use of Instructive Feedback

- Studies conducted across settings
  - Preschool (Wolery et al., 1993)
  - General education classroom (Gast et al., 1994)
  - Clinic (Loughrey et al., 2014)
  - Self-contained classroom (Cromer et al., 1998)
  - Transitions in school setting (Werts et al., 1996)
  - Among others

Settings for Use of Instructive Feedback

- Need more research…
  - Community settings
    - Mall, park, store, church
  - Social events
    - Football game, party, bowling
  - Types of instructors
    - Parents, siblings, peers

Instructional Arrangements for IF

- Many studies in 1:1 context
  - Easier to arrange individualized instruction, one adult dedicated to instruction
- Some studies in small-group settings
  - Usually students are working on same/similar skills

Evaluation of Observational Learning and IF

- Schuster, Morse, Griffen, & Wolery (1996)
  - Used small-group instruction to teach grocery store words to student and peer
  - IF: information about function of item or location of items in store
    - Example: "Paper towels are used to clean up spills", "Pharmacy is where you get medicine"
- Results
  - Participants learned targeted words, 83-100% of IF stimuli, varying levels of peers targeted words, and 81-100% of peer's IF stimuli

Instructional Arrangements for IF

- Few studies conducted in whole-class setting
  - May be harder to arrange opportunities for IF, students with varying skill levels

IF During Whole-Class Transitions

- Werts, Wolery, Venn, Demblowski, & Doren (1996)
  - Directly taught coins or coin combinations and used IF to teach coin values
  - Instruction occurred during transitions within the kindergarten classroom
  - Presented 4 trials per day, required whole-class choral response to directly targeted stimuli
  - Prompts and praise were based on response of child with a DD

IF During Whole-Class Transitions

- Werts, Wolery, Venn, Demblowski, & Doren (1996)
- Results
  - Five out of six typically developing children learned all stimuli
  - None of children with DD learned stimuli without modifications (adding individualized instruction)
  - Students who learned targets also learned IF stimuli

How Do We Measure Learning of IF Targets?

- Most studies conducted a baseline of IF stimuli before and after training that included IF stimuli
  - E.g., Wolery et al., 2003
- Any unmastered IF stimuli are directly trained

Measuring Acquisition of IF
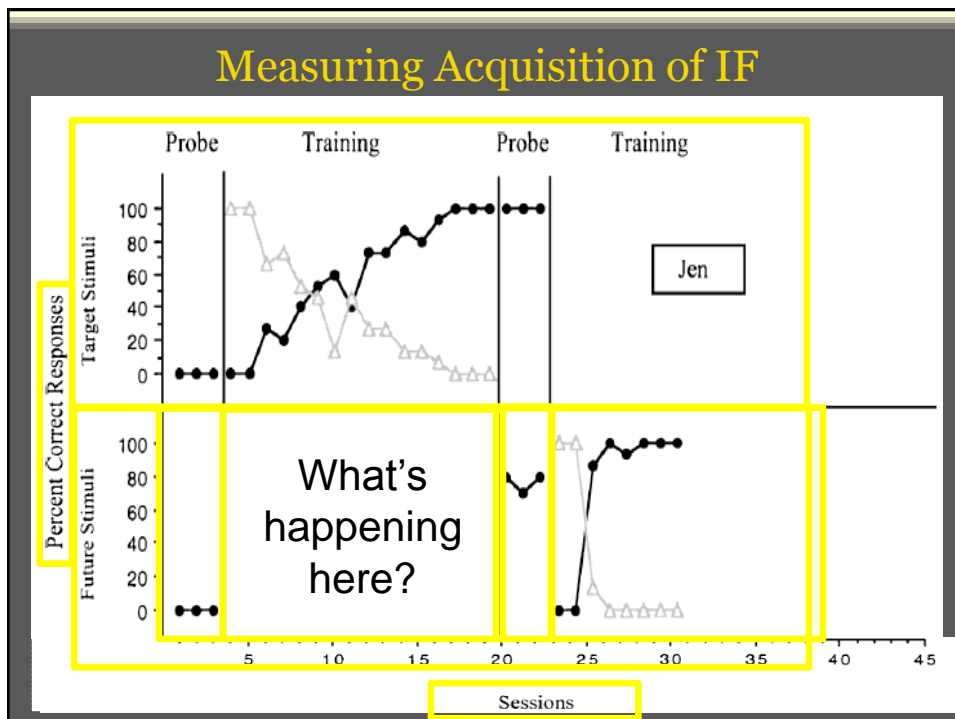
How Do We Measure Learning of IF Targets?

- Two studies conducted probes during ongoing training (Anthony et al., 1996; Vladescu & Kodak, 2013)
  - Vladescu & Kodak found that IF stimuli were acquired during training of targets

Benefits of Conducting Ongoing Probes

- Identify point at which IF stimuli are learned
  - IF may be more efficient than direct training
- Replace mastered IF stimuli with new IF stimuli to enhance efficiency even further
  - May be able to teach two sets of IF stimuli per 1 set of training stimuli

Similarity to Natural Environment

- Instructive feedback sounds like everyday practices found in the natural environment
  - Commenting on and adding to child vocalizations

Video Example

Similarity to Natural Environment

- Examples:
  - Child says "dog" in the presence of a dog at the park; adult says, "Yes. That dog is a poodle!"
  - Child is playing with an airplane; adult says, "Airplanes fly in the sky."
  - Child labels the letter "B" at circle time; teacher says, "Bird starts with B"
  - Child finds a nickel on the ground and shows parent; parent says "Yay! You found 5 cents."

It Seems so Simple

- Why don't those natural learning opportunities work?
  - If they did, children with an ASD might not have language delays
- Maybe they aren't occurring often enough each hour/day/week
- Maybe specific information isn't repeated frequently
  - Only provide information about a poodle when you happen to see one

It Seems so Simple

- Maybe presenting too much differing information
- Maybe children aren't attending to relevant stimuli/features of the stimulus during opportunities
- Maybe there are prerequisite skills that are needed*

Behavioral Mechanisms

Behavioral Mechanisms

1. Observational learning
   - Adult models behavior
   - Child observes the adult's model
   - Child imitates adult
   - No reinforcement is available for imitation
     - Reinforcement may not be necessary for observational learning

Behavioral Mechanisms

2. Demand Characteristics
   - Teacher presents many instructions
   - History of reinforcement for modeling instructor's behavior
   - Similar format to typical instruction that does contain direct reinforcement

Behavioral Mechanisms

3. Indiscriminable contingencies
   - IF occurs in close temporal proximity to reinforcement
     - Especially if presented in consequent event of learning trial
   - Might explain why some children model IF immediately after presentation, despite no requirement for responding
   - Might timing of IF in consequence influence learning?
     - IF prior to vs. during reinforcement interval

Behavioral Mechanisms

4. Generalized imitative repertoire
   - Training to strengthen imitation
   - Imitation generalizes across exemplars, people, settings
     - Although person and setting may be similar
   - Imitating is reinforced on intermittent schedule

Similarities Across Behavioral Mechanisms

- Observing behavior
- Imitating response
- Studies have included prompts to observe during training and IF
  - Example: "Look"

Similarities Across Behavioral Mechanisms

- Few studies have directly measured the occurrence of these behavior during IF
  - Exceptions
    - Vladescu & Kodak (2013) measured echoic behavior; all participants consistently echoed
    - Kodak et al. (in preparation) measured echoic and attending behavior during IF

Behavioral Repertoires that May Facilitate Learning

Evaluation of Behavior During IF

- Kodak, Haq, LeBlanc, Ruppert, & Zemantic (in preparation)
- Purpose
  - Identify behavioral repertoires that may impact efficacy of IF
    - Efficacy of IF varies somewhat across individuals
  - What behavioral repertoires are necessary to benefit from IF
    - Information could be beneficial to teachers

Participants and Setting

- Two participants
  - Charlie and Sally
- Setting
  - Private room in university-based early intervention clinic
- Target stimuli
  - Charlie
    - Common household items; Transformers™
  - Sally
    - Fill-in-the-blank statements requiring a one-word response

Operational Definitions and Design

- Dependent Variables
  - Correct responses to primary targets
  - Correct response to IF probes
  - Echoic behavior
  - Attending (Charlie only)
- Experimental design
  - Adapted alternating treatments design embedded within a multiple-probe design across stimulus sets with a constant-series control

General Procedures

- Baseline/Control
  - Interspersed maintenance tasks
  - No feedback for correct responding

General Procedures

- Instructive feedback probe (IF Probe)
  - Immediately following every treatment session
  - Measure acquisition
  - No feedback for correct or incorrect responses

General Procedures

- Treatment with instructive feedback (IF)
  - Constant prompt delay + error correction for targets
  - Instructive feedback in consequence portion of the learning trial

Charlie's Treatment Procedures

- Instructive feedback in consequence portion of learning trial (IF)
  - Set 1 and set 2

| Primary target stimulus | Student response | Reinforcement | Instructive Feedback stimulus |
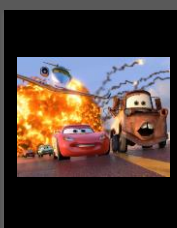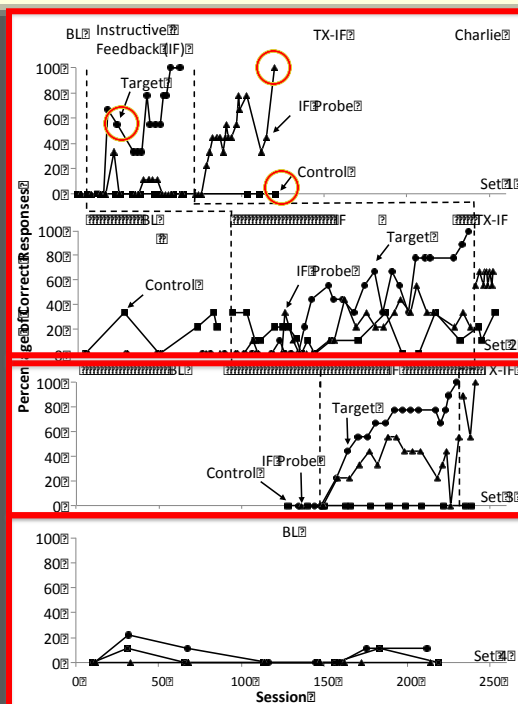
Charlie's Treatment Procedures
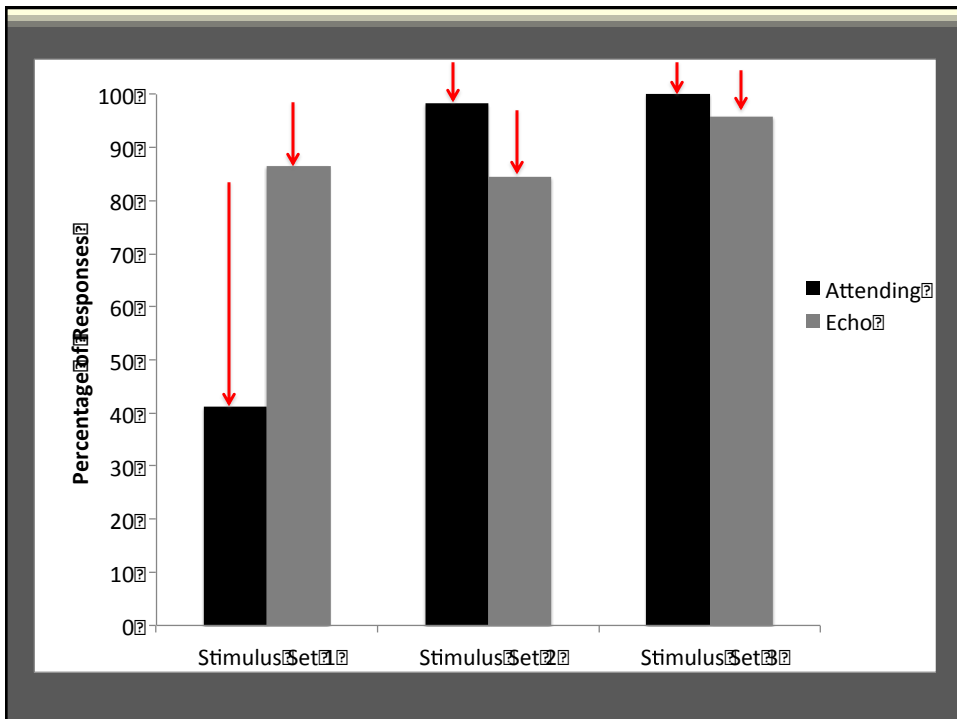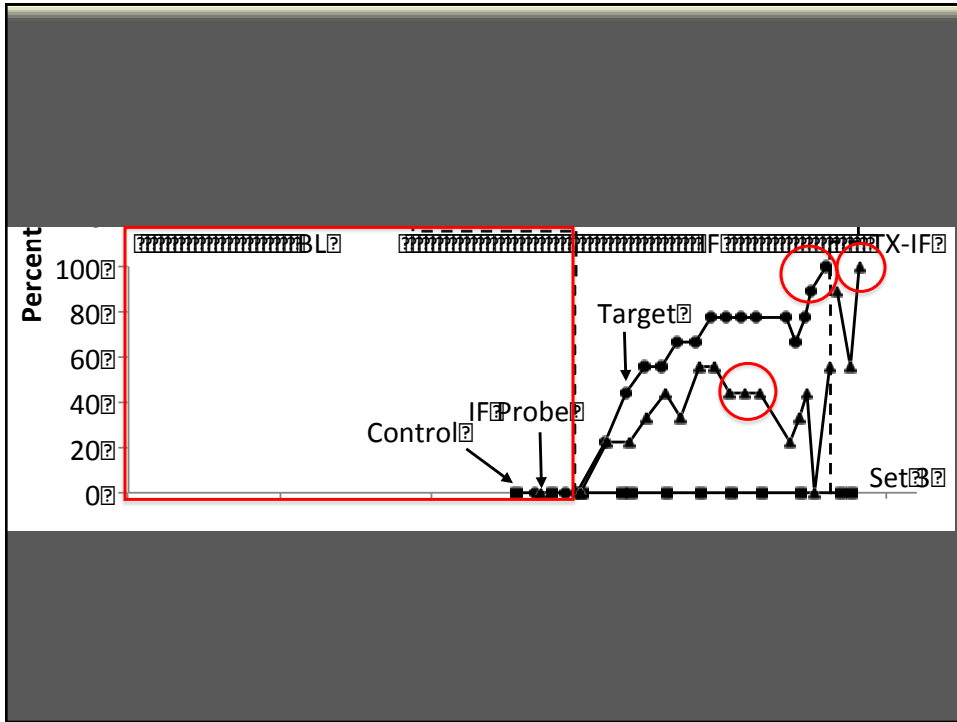
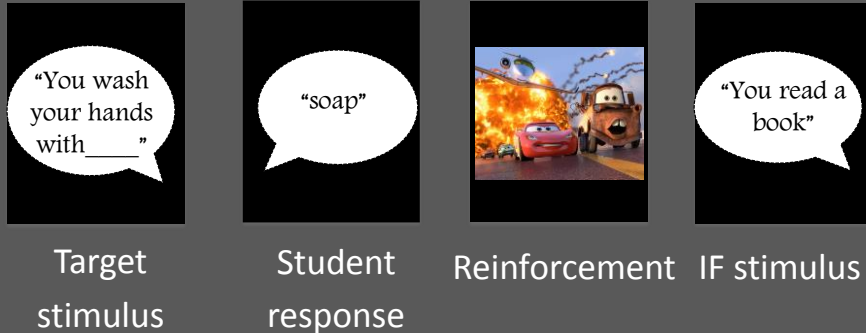- Instructive feedback in antecedent portion of learning trial (IF)
  - Set 3

Sally's Treatment Procedures

- Instructive feedback in consequence portion of the learning trial (IF)
  - Set 1

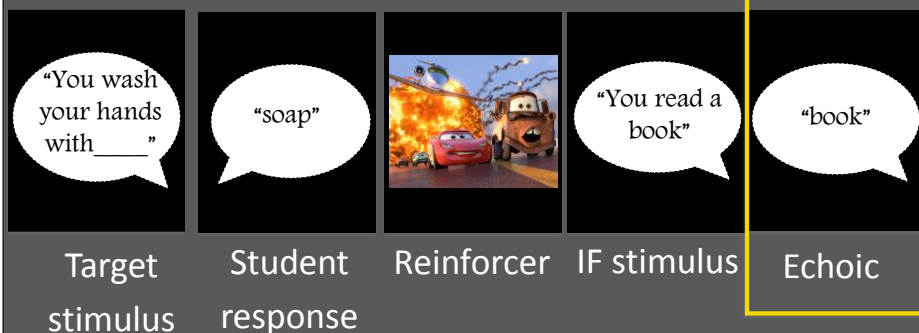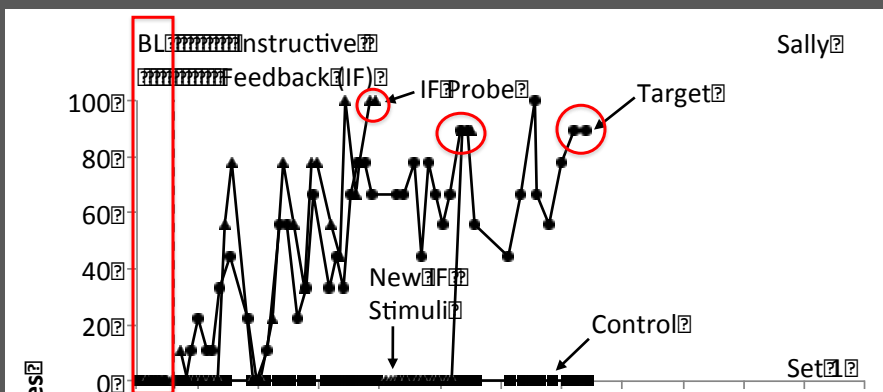| Target stimulus	Student response	Reinforcement	IF stimulus
"You wash your hands with____"	"soap"		"You read a book"

Sally's Treatment Procedures

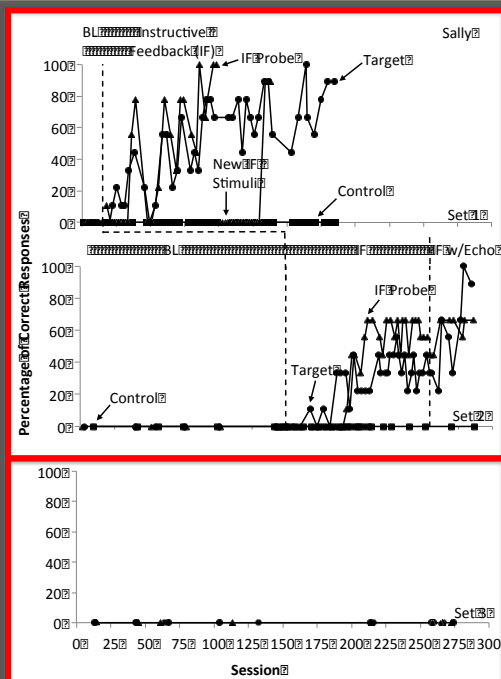- Instructive feedback in consequence portion of the learning trial (IF)
  - Set 2
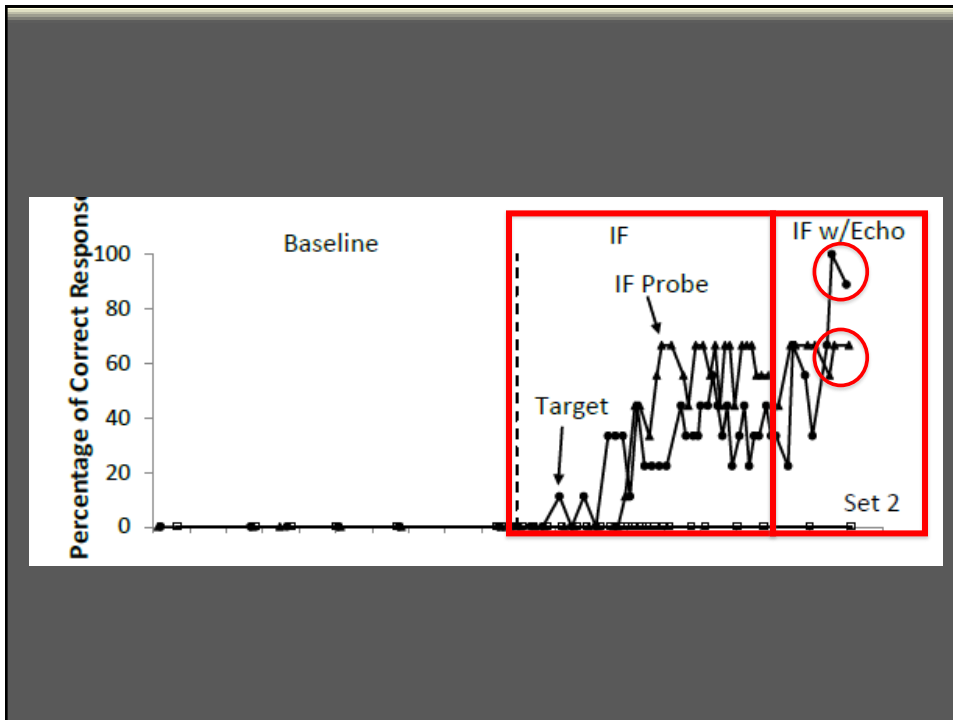
Target stimulus	Student response	Reinforcer	IF stimulus	Echoic
"You wash your hands with____"	"soap"		"You read a book"	"book"

Summary of Results and Discussion

- Charlie
  - Antecedent
    - Higher levels of attending
    - Increased efficiency of treatment of instructive feedback stimuli
- Sally
  - Consequence
    - Mastery of two stimulus sets without additional training

Discussion

- Future research on behavioral repertoires
  - How much echoic behavior and attending are sufficient to produce learning of IF stimuli?
  - Compare antecedent vs. consequence IF with other participants who display low levels of attending

Other Applications of Instructive Feedback

Other Applications of Instructive Feedback

- Peers using IF to teach skills to children with DD
  - Several studies have evaluated observational learning
  - Show that peer's IF stimuli may be learned
  - Beneficial to show that children with DD may benefit from watching instruction provided to others

Other Applications of Instructive Feedback

- Using IF to teach play-related behavior
  - More naturalistic context
  - Structured opportunities to model appropriate play behavior
  - Example: model novel and imaginative ways to play with preferred toys
- Using IF to increase response variability*

Repetitive Behavior in Children with an ASD

- Children with ASD may display repetitive language
  - During mands
    - "I want cookie", "I want water", "I want bubbles"
  - During tacts
    - "I see a book", "I see a cup", "I see a table"
  - During intraverbals
    - Answer "Good" when asked "How are you?" regardless of current private events

Treating Repetitive Vocalizations

- Use a lag schedule of reinforcement
  - Provide reinforcement if a response is different from a certain number of previous responses
    - Example: Lag 2- reinforce response if different from the last 2 responses
  - Can be hard to keep track of vocalizations at higher lag schedules
  - May produce other types of repetitive behavior
    - Example: Patterns- individual alternates between several statements, such as ABAB
- May be able to use IF to increase variability

Using IF to Increase Response Variability

- Carroll & Kodak (in preparation)
  - Previously trained intraverbals with multiple word responses for clients with an ASD
    - Example: "Tell me three animals", "Name three foods you like to eat"
  - Once responses were learned, clients provided repetitive responses to questions
- Purpose
  - Identify whether IF could be used during or following training to increase response variability

Participants and Setting

- Two participants
  - Shane and Parker
  - 4 years old
  - Both displayed high expressive and receptive language scores on standardized assessments
  - Spoke in full sentences
  - Had numerous intraverbals
- Setting
  - Private rooms at a university-based clinic

Targeted Skills

- Unmastered stimuli
  - Not yet trained intraverbals requiring three responses
  - Example: "Tell me three animals"
  - Identified four stimuli to include in training; experimenter prompted different combinations
    - Example: "Dog, Giraffe, Elephant", "Elephant, Lion, Giraffe"
- Mastered stimuli
  - Previously trained intraverbals requiring three responses
  - Also has four stimuli included in training; experimenter prompted different combinations

Dependent Variables

- Dependent Variables
  - Correct unprompted responses
  - Frequency of novel combinations
    - New sequences of 3 responses; e.g., "2, 1, 3", "3,2,1" counted as 2 novel combinations
  - Frequency of novel responses
    - New exemplars; e.g., "3,1,2" counted as 3 novel responses and "7,1,3" counted as 1 more novel response because of the 7

Experimental Design

- Experimental Design
  - Adapted alternating treatments design embedded in a multiple baseline across participants design

Intervention Conditions

1. Time delay
   - First 2 sessions conducted at 0-s delay
   - 5-s delay thereafter
   - Experimenter prompted different combinations of 3 stimuli, if needed
   - Two intraverbals randomly presented across session

Example of Time Delay

Example of Time Delay Following No Response

Intervention Conditions

2. Time delay with instructive feedback
- Same as time delay
- IF after each independent correct or prompted correct response
  - IF were 4 additional stimuli from the same category
- Following correct response, experimenter provided praise and modeled 3 additional responses from the target category
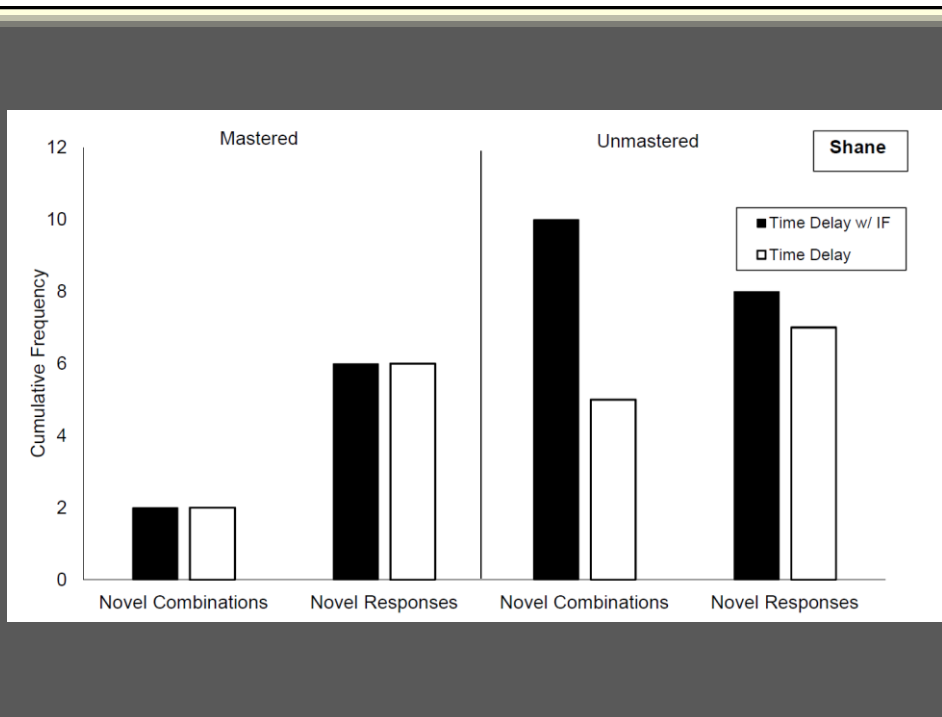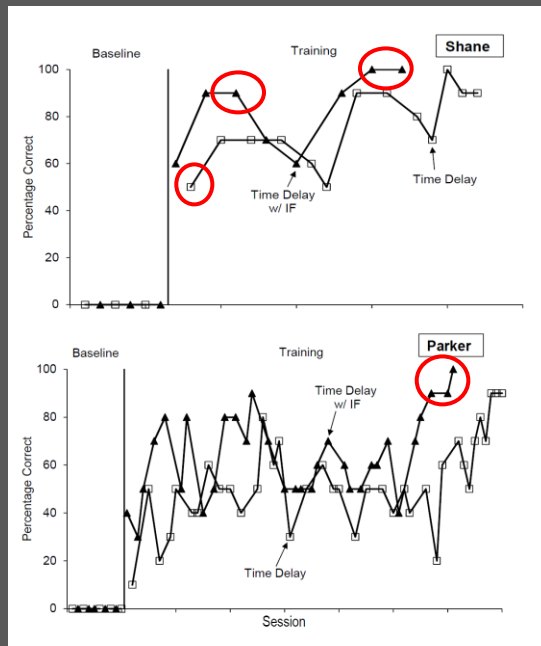- Two intraverbals randomly presented across session
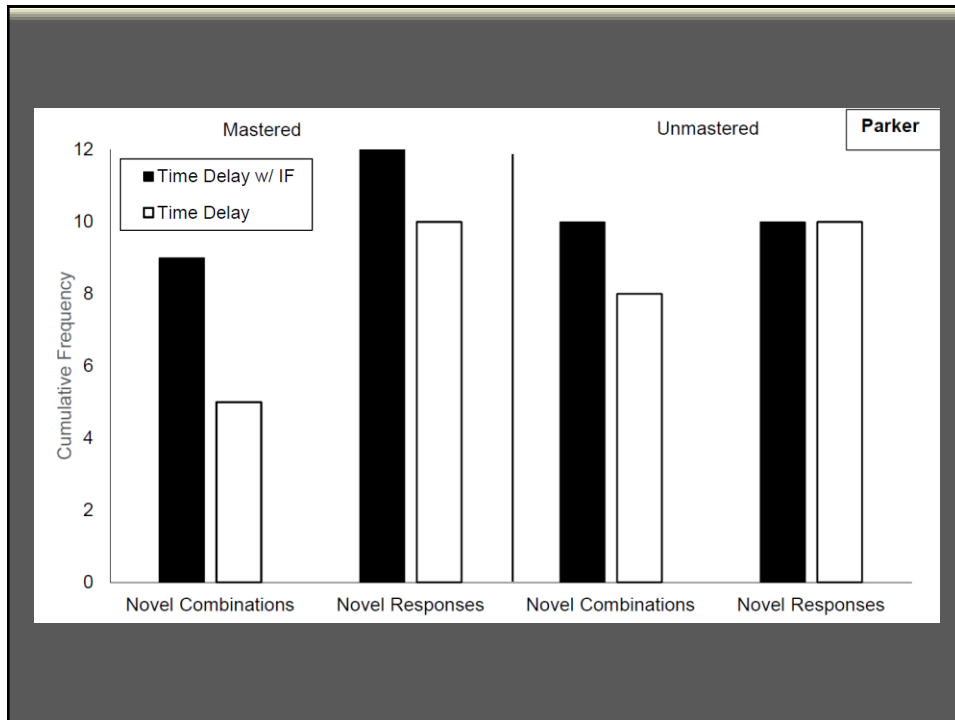
Example of Time Delay with IF

- Experimenter

  "Great job; 3, 7, and 8 are numbers, too" + token

- Child

  "1,2,4"

Summary of Results and Discussion

- Time delay with IF
  - The most efficient intervention for teaching intraverbals
  - Produced more novel responses or combinations during mastered (Parker) and unmastered (Shane) sessions
- Effective timing of IF varied across participants
  - Increased variability during training for Shane
  - Increased variability during maintenance sessions for Parker

Clinical Utility of Instructive Feedback

## Applications to Clinical and Educational Settings

- IF is effective across a variety of
  - Skill areas
  - Settings
  - Populations
- How might these findings apply to practice?
- Will we see the same outcomes when we use this intervention over an extended time period?

Clinical Utility of IF

- Purpose: Evaluate long-term efficiency of IF during clinical service delivery
  - Use IF during training of adjective-noun tacts and features of items
  - 6 sets of target stimuli and 6 sets of IF stimuli
    - Each set contained 3 stimuli
    - 6-trial sessions, each stimulus presented twice per session
  - Trained target stimuli using constant time delay
    - 0-s for 1 session, 5-s for rest of sessions

Clinical Utility of Using IF

- IF presented in antecedent portion of trial
- Measured mastery (2 consecutive sessions at or above 5/6) for targets and IF
  - Conducted probes of IF stimuli without feedback or reinforcement to measure mastery
- Move to training of next set as soon as a set was mastered
- Experimental design
  - Multiple probe across stimulus sets design
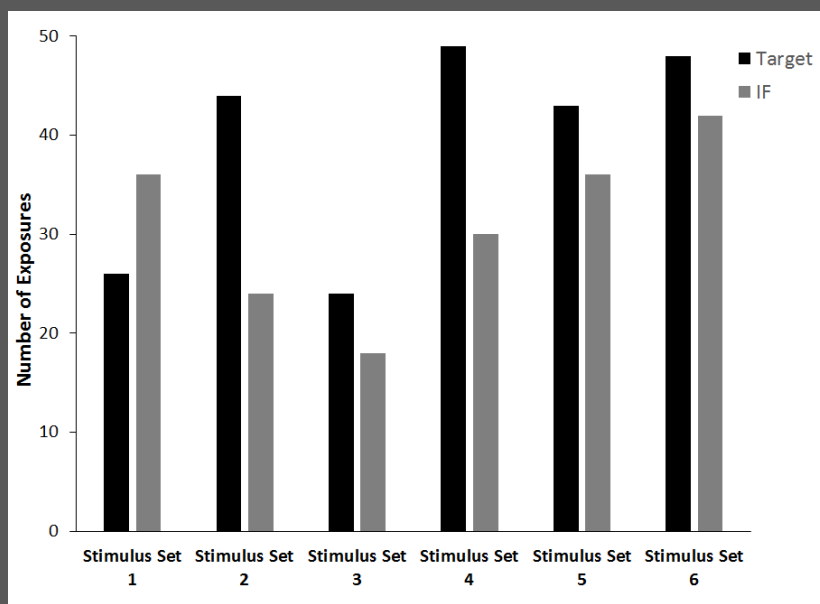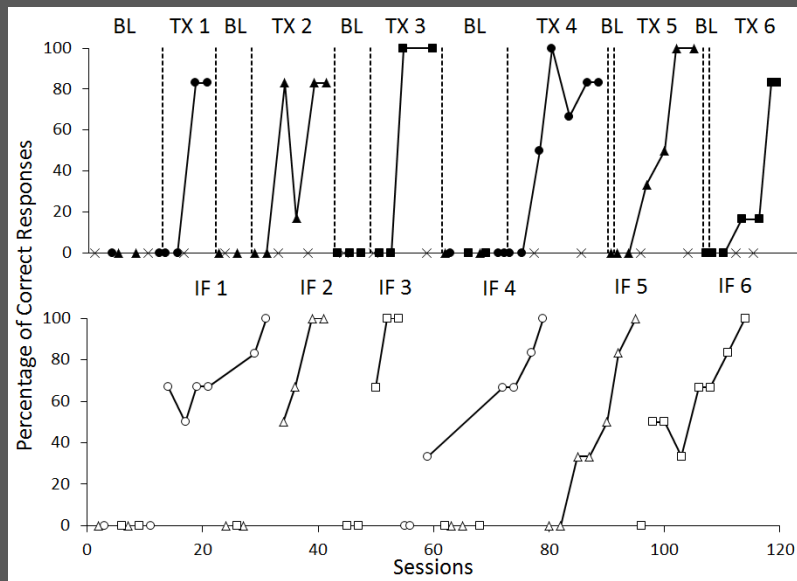
Summary of Results and Discussion

- IF required fewer exposures to mastery in 5 of 6 stimulus sets
- Echoed IF stimuli during at least 90% of trials
- IF stimuli had higher levels of maintenance following training for 3 sets or similar levels of maintenance for 3 sets

Summary of Results and Discussion

- Generalization to untrained exemplars was similar for trained and IF stimuli (about 65%)
- Mean treatment integrity remained above 95%
  - Feasible to use in clinical settings over longer time periods

Novel Uses of Instructive Feedback in Educational Settings

Novel Uses of IF

- Teach play skills during natural environmental training
  - Child mands to play with tea set; adult picks up cup and take sip and says "mmm"; adult pretends to use fork to eat food on plate
- Teach perspective taking
  - Child falls down; adult say, "Ouch. He hurt his knee"
  - Peer smiles when given preferred toy; adult says, "She feels happy to have her favorite toy."

Novel Uses of IF

- Teach functions of items in natural settings
  - Prompt child to open the door to go outside; while child is opening the door the adult says, "You turn the doorknob to open the door"
- Teach prepositions during manding
  - Child mands for item that is out of reach; adult reaches for item and says, "The car is on top of the shelf"

Considerations

- Need to identify a small set of IF stimuli that can be used in various contexts
  - Same stimuli are being modeled on numerous occasions over time
- Identify a schedule for conducting probes to evaluate whether the IF stimuli are being learned
- Takes pre-planning to conduct

Directions for Future Research

Directions for Future Research

- Evaluate how often IF can be presented in the absence of other instruction and still produce learning
  - Vladescu & Kodak, 2013- showed IF only produced learning
  - Does history of instruction in that setting influence outcomes?
- Evaluate behavioral repertoires needed to benefit from IF
  - Echoic behavior, attending, imitation, other repertoires?

Directions for Future Research

- Evaluate parents use of IF
  - During play
  - During Natural Environmental Training
- Identify how many IF stimuli can be trained at once and still produce learning
  - Previous research has examined delivery of 2 IF in same trial; effective as long as stimuli were related