Teaching Preschoolers to Produce Rule-Based Messages using an iPad App

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**Phase I: Early Sentence Productions by 5-year-olds using AAC: Effects of Augmented Output**



## Introduction: Defining the Problem

Language-learning expectations often are set too low for kids using AAC

Acquisition of generative, rule-based language is just as important for children who use AAC as for children relying on speech

Many young children with AAC needs have profiles that indicate the potential to use generative language

Even these children frequently have poor expressive language outcomes (e.g., Binger & Light, 2008)

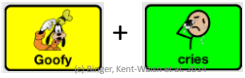


How Children Learn to use Graphic Symbols for Communication:

*TheTranslation Hypothesis*

Formulate a mentally represented spoken sentence
("Goofy cries")

Map this message onto single-meaning graphic symbols

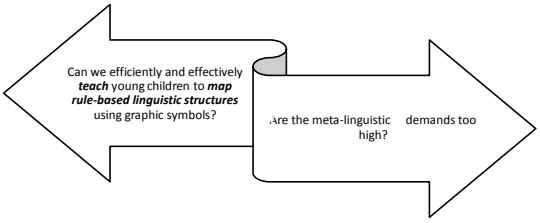





## Can We Teach Young Children to Map Messages onto Graphic Symbols?

- This task is neither intuitive nor transparent
  - Even young typically-developing children make frequent errors (e.g., Sutton et al., 2010)
- However, some young children who require AAC rapidly learn to create message combinations (e.g., Binger, Kent-Walsh, et al., 2008; 2010; Binger & Light, 2007; Kent-Walsh, Binger, et al., 2010; Kent-Walsh, Binger & Buchanan, 2014)
- And we know we can teach elementary school-age children to go beyond this and use grammatical morpheme markers (Binger, Kent-Walsh, et al., 2011)

## The Burning Question






## Aims for the Project

Evaluate Impact of an Aided AAC Modeling Intervention on:

**Aim 1**

Productive use of two-term semantic-syntactic structures *(focus of intervention)*

- MICKEY CRIES
- WET MICKEY
- MICKEY'S GRAPES

**Aim 2**

Generalized use of semantic-syntactic structures

*(focus of generalization measures)*

- CHASES MICKEY
- MICKEY CHASES MINNIE
- WET MICKEY CHASES



## Method: Research Design

Single Subject Experimental Design Study

Multiple Probe Across Targets

4 Participants (Phase I)



## Method: Participants

- Participants met the following criteria:
  - Age 5 (ages 3-5 in larger study)
  - Less than 50% comprehensible speech on "No Context" Condition of Dowden's (1997) *Index of Augmented Speech Comprehensibility in Children*
  - Not required to have prior AAC experience
    - 2 do, 2 do not

| | PPVT-IV | | TACL-3 | | Leiter-R |
|---|---|---|---|---|---|
| | AE | Percentile | AE | Percentile | SS |
| Child A (5;10) | 4;10 | 19 | 5;3 | 27 | 94 |
| Child B (5;0) | 4;10 | 47 | 5;5 | 77 | 101 |
| Child C (5;1) | 4;1 | 21 | 4;5 | 19 | 108 |
| Child D (5;9) | 6;5 | 73 | 7;7 | 77 | 117 |

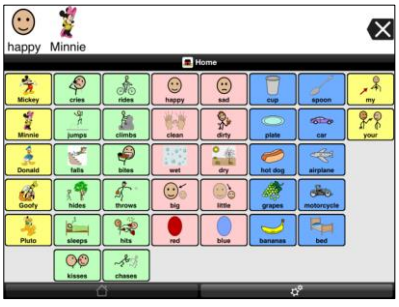


## Method: Dependent Measures

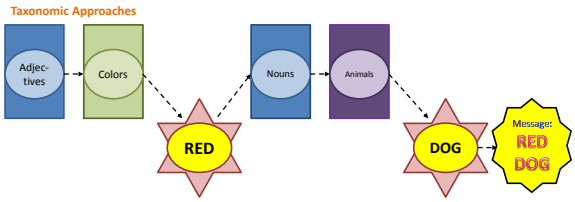
- **Probes**
  - **Productions Relating to the Focus of the Intervention**
    - Agent-action
    - Attribute-entity
    - Possessor-entity
  - **Generalization Targets**
    - Action-object
    - Agent-action-object
    - Attribute-agent-action



## Communication Board Used During Probes



Producing Multi-Symbol Graphic Symbol Messages using Three Different Approaches: Example for *RED DOG*



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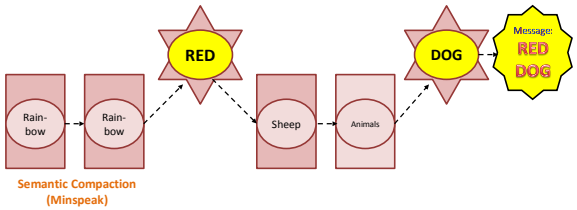




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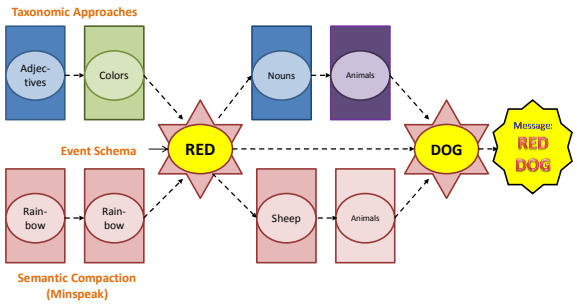





## Intervention Phase

- Concentrated models
- Play-based instruction
  - Many of the same techniques as the ImPAACT Program

→Only needed for 1 participant out of our first 4
  →And for only 1 of 3 targets
→More children currently are in intervention
  →But most continue to do well in "baseline"



## Discussion for Phase I: Why are the Participants Succeeding in Baseline?

Our hypotheses:

- Targets are highly salient
  - Very specific targets
  - Highly salient visual cues
    - Children often look back at video images while constructing messages
- Baseline condition is, in reality, an ***augmented output*** intervention (Romski et al, 2010)
  - Voice output may be playing a key role
  - We see evidence for this in the self-corrections the children make: Self-Correction
  - Lends support to our theory…although we are lacking experimental control

## What's Next?: Phase II

- Continuing with an additional 12 children
  - Examine additional ways to analyze our data
    - Various microanalysis techniques
    - Group stats
  - Revised procedures to streamline targets
    - E.g., agent-action-object without iterations
- Conducting additional analyses
  - Dynamic assessment
    - Does it predict later performance?
  - Language sampling analysis
    - Finding ways to characterize the expressive language abilities of children with highly unintelligible speech
      - E.g., Mean number of syllables per message



## What's Next?, con't

- Expanded focus
  - For children who are readily successful, we also are targeting grammatical morphemes
    - Possessive 's
      - MICKEY ***+ 'S*** + GRAPES
    - 3rd person singular
      - MICKEY CHASE ***+ S*** GOOFY
    - Non-essential terms in locative relationships
      - MICKEY ***IS*** UNDER ***THE*** TRASH



**Phase II: Early Sentence Productions by THREE & FOUR-year-olds using AAC**

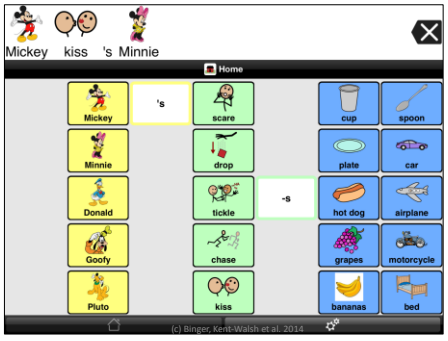


## 3- and 4-year-olds: Phase II

- Procedures very similar to first study
- Key changes
  - Only four targets total
    - Agent-action-object: *MICKEY CHASE(S) MINNIE*
    - Entity-attribute: *MICKEY IS BIG*
    - Possessive-entity: *MICKEY('S) GRAPES*
    - Entity-locative: *MICKEY (IS) IN (THE) HOUSE*
  - Taught all 4 targets to most children
    - Generalized across vocab; e.g., *TURTLE CHASE(S) ALLIGATOR*
  - Added grammatical markers
    - Taught to children who progressed rapidly
- TODAY: We'll look at the next 8 children
  - All have either finished or are in the maintenance phase



## Sample Overlay for Phase II




## Method: Participants

- Age 3-4
- Less than 50% intelligible (single word, unfamiliar listeners)
- Most had no prior AAC experience

| | PPVT-IV | | TACL-3 | | Leiter-R |
|---|---|---|---|---|---|
| | AE | Percentile | AE | Percentile | SS |
| Child F (4;10) | 3;2 | 8 | 4;0 | 35 | 79 |
| Child G (4;8) | 3;7 | 13 | 3;10 | 13 | 84 |
| Child H (4;11) | 5;2 | 53 | 4;9 | 39 | 108 |
| Child I (3;11) | 3;8 | 37 | 3;5 | 23 | 101 |
| Child J (4;2) | 5;10 | 92 | 4;9 | 84 | 113 |
| Child K (4;3) | 3;11 | 37 | 4;4 | 61 | 116 |
| Child L (4;9) | 4;4 | 30 | 3;7 | 5 | 95 |
| Child M (4;3) | 4;1 | 45 | 3;10 | 27 | 102 |

## Preliminary Results

- Patterns of performance are somewhat different than for the 5-year-old children
  - Nearly all children required at least some intervention
  - More sessions required for mastery
- But the children still accomplished this task relatively quickly
- And remember: When we started, we expected NO ONE to succeed during baseline!



## Preliminary Results, con't

- Targets mastered overall (to date)
  - 93% (26/28) mastered in either baseline or intervention
- Number of intervention sessions required for each target (to date)
  - Mean = 4.8 (range = 3-8)
  - Average time spent in intervention for each target = **2.4 hours** (30 min/session)
- Two children did not learn to accurately produce AAO
  - Agent + object + action (Mickey Minnie kiss)



## Take-Home Message (for the moment…)

- Don't underestimate what these children can do
  - May be able to make fast – even ***very*** fast – progress
- Remember to focus on language!
  - Vocab
  - Syntax
  - Morphology
- If this is a challenge, try removing the navigation piece to evaluate child's potential more "cleanly"
  - Control your variables
  - More complex devices with high navigational demands are essential for "generative" communicators
  - But making life easier (decreasing cognitive load) sometimes so the child can focus on sentence building with fewer demands is important too



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## Questions?

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