

## Effects of AAC systems with “just in time” programming for children with complex communication needs

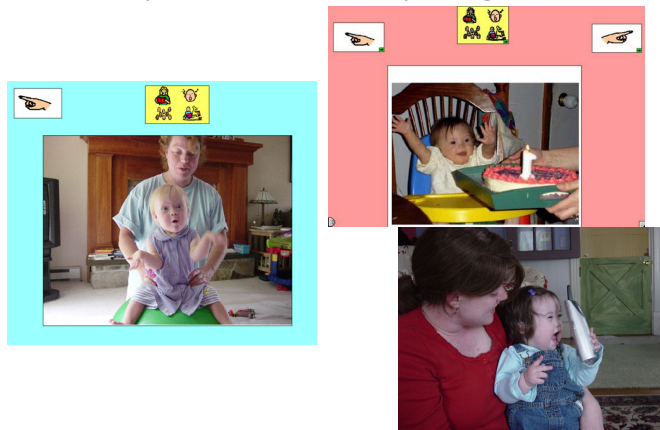
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## Maximizing communication for children with complex communication needs

- AAC technologies utilizing visual scene displays (VSDs) can significantly enhance the communication of young children with complex communication needs.
- VSDs
  - capture the daily experiences of young children with CCN
  - embed language concepts in the context of these familiar daily activities

## Examples of VSDs for young children



## The Problem

- Unfortunately, there are two major limitations to current AAC technologies and apps:
  1. It is time consuming to program new VSDs and vocabulary
    - As a result, partners do not add vocabulary frequently.
  2. It is not possible for partners to dynamically capture new experiences / vocabulary and add them to AAC technologies on the fly during interactions.
    - As a result, it is difficult for partners to respond to children's interests.
    - It is difficult to capitalize on “teachable moments”.

## Potential Solution

- One potential solution to this problem is the implementation of AAC technologies that support “just in time” (JIT) programming.
- JIT programming
  - Allows the quick & easy import of photos as VSDs
  - Allows the quick & easy programming of vocabulary as hotspots within the VSDs
  - Allows partners to respond to their children’s interests by adding new communicative contexts and vocabulary “on the fly” during daily interactions.

## Research Objectives

- To investigate the effects of AAC technology that supports JIT programming
- Specifically to compare the effects of the JIT system to a traditional AAC system (without JIT capabilities) on:
  - the number of communicative turns taken and
  - the amount of vocabulary available to preschoolers with CCN.

## Participants

- 3 children participated
  - Aged 3-5 years
  - Developmental delay
    - E.g., Down syndrome, severe developmental apraxia
  - Had complex communication needs
    - Speech inadequate to meet their communication needs
  - Used AAC to enhance their communication
    - Signs, low tech systems, schedules
    - Were not using SGDs at the time of the study

## Procedures

- Alternating treatment design with two conditions
  - 2 intervention sessions per week (counterbalanced)
    - One with JIT PlayTalk software
    - One with SD Pro software
- AAC technology preprogrammed with VSDs /hotspots
  - Identical VSDs & hotspots programmed in each condition
- AAC technology introduced during play interactions with children with CCN
  - New VSDs and hotspots added during the play interactions as required in JIT condition
  - Not possible to add new VSDs or hotspots during interaction in SDPro condition

## AAC technology with JIT programming

- Innovative JIT software called PlayTalk developed by InvoTek, Inc.
  - Allowed quick & easy import of photos as VSDs
    - Using cell phone with Bluetooth connection
  - Allowed quick & easy addition of hotspots and programming of vocabulary
    - Drawing of hotspots with finger or stylus
    - Recording of digitized speech
  - Provided drawing function to add text, numbers, or pictures to VSDs
  - Provided a simple menu easily understood by the children
    - Options always visible; represented as thumbnails of VSDs

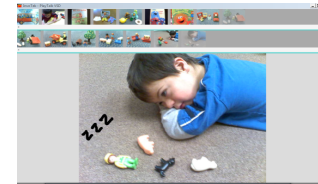


Figure . Child pretending to sleep next to his farm animals in a PlayTalk VSD.

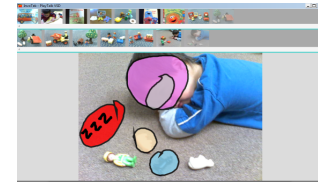


Figure . Hotspot creation on the VSD. The hotspot outlines are only visible when adding hotspots - not during normal use by the child.

## Traditional AAC Technology

- Traditional AAC technology
  - SGD with Speaking Dynamically Pro (SDPro) software
  - Allowed preprogramming of VSDs and hotspots
  - Did not support JIT programming
  - Utilized traditional menu system
    - Options represented through thumbnails of VSDs, but not always visible
    - Required navigation through main menu or forward / back arrows

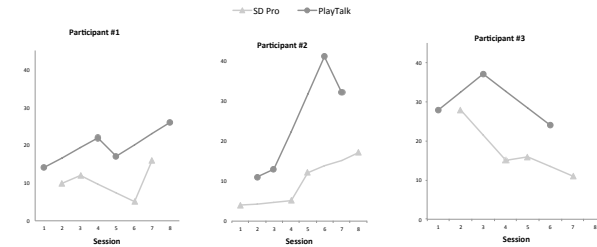
## Results

- Children with CCN
  - Took significantly more turns during 15-min play interactions using JIT PlayTalk compared to SDPro
  - Had access to significantly more vocabulary concepts using JIT PlayTalk compared to SDPro

### Comparison of JIT to SDPro Number of communicative turns

	Participant 1		Participant 2		Participant 3	
	PlayTalk	SD Pro	PlayTalk	SD Pro	PlayTalk	SD Pro
Week 1	14	10	11	4	28	28
Week 2	22	12	13	5	37	15
Week 3	17	5	41	12	24	16
Week 4	26	16	32	17		11
<b>Mean</b>	<b>19.8</b>	<b>10.8</b>	<b>24.2</b>	<b>9.5</b>	<b>29.7</b>	<b>17.5</b>

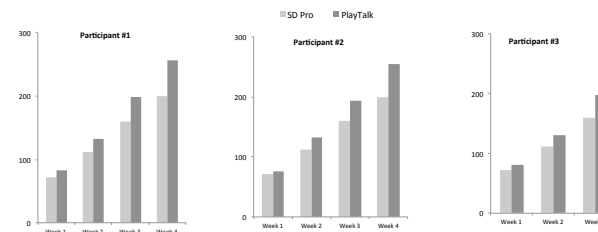
### Comparison of JIT & SDPro Number of communicative turns



### Number of concepts available

	Participant 1		Participant 2		Participant 3	
	PlayTalk	SD Pro	PlayTalk	SD Pro	PlayTalk	SD Pro
Week 1	83	72	76	72	81	72
Week 2	133	112	133	112	130	112
Week 3	199	160	194	160	198	160
Week 4	256	200	255	200	263	200

### Number of concepts available



## Discussion

- Children with CCN
  - Took more turns during 15-min play interactions using JIT PlayTalk compared to SDPro
  - Had access to more vocabulary concepts using JIT PlayTalk compared to SDPro
    - System allowed partner to be more responsive to children's interests
    - Partner could easily capture new events & vocabulary in response to children's interests
    - Relevant VSDs and vocabulary were easily added
    - Children were motivated to communicate since they had easy access to vocabulary of immediate interest to them

## Time required for JIT programming

- Programming using the JIT PlayTalk software was very efficient
  - Takes less than 1 min from the time it is decided to add a VSD & hotspots until the child is able to use the new concepts to communicate
    - Takes an average of 33 sec to take a photo & import it to the system as a VSD
    - Takes an average of 16 seconds to draw the hotspots and record the vocabulary

## Children's engagement during JIT programming

- JIT programming allowed partner to rapidly add VSDs & vocab during interactions
  - But did the children lose interest during JIT programming?
- Measures of the children's engagement during JIT programming demonstrated high levels of interest
  - 97% engagement during VSD import /creation
  - 95% engagement during hotspot creation
  - Engagement levels were higher than expected
    - Children were very engaged in the process of building AAC displays
    - They assisted with the process

## Limitations of the study Directions for future research

- Limited number of participants
  - Future research is required to investigate effects with larger number of children with CCN
    - Range of ages and disabilities
- Short term evaluation
  - Future research is required to investigate effects over a longer time period across various partners and environments

## Conclusion

- This project represents an exciting transition for the field to AAC systems that are truly dynamic
  - Capture interaction on the fly as it occurs
  - Support dynamic learning /language growth
    - Allow partners to respond to children's interests
  - Reduce programming demands on clinicians & families
    - Incredibly easy and time saving
- With access to JIT technologies, parents & clinicians will be better able to support the language & communication development of children with CCN

## Acknowledgements

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