

# Measuring Treatment Change with the Communication Complexity Scale

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A copy of this presentation is at <https://lsidata.ku.edu/ccs/news.php>

# Disclosures

- Research reported in this presentation was supported by the NIH:
  - R01 HD076903; RO1 HD003110
  - Thank you NIDCD!
- We are in the process of licensing the Communication Complexity Scale (CCS) (copyright 2015 University of Kansas. All rights reserved.)
- We have no relevant financial relationships to disclose.

# Presentation Overview

- Difficulties with measuring changes in prelinguistic communicators
- Study 1: Measuring changes in children with autism participating in an intervention aimed at increasing joint attention and symbolic play
- Study 2: Measuring changes in children with autism participating in a peer mediated intervention incorporating AAC.
- Future directions
- Questions

# How to measure changes in prelinguistic communication

- Most measures focus on speech and other forms of symbolic communication
- What scores to use?
  - Standard scores- Problem of floor effects
  - Age equivalents? Raw scores?
- Occurrences and Rates of prelinguistic communication acts
  - Time consuming and difficult to summarize and interpret

# Need for more measures

- How would you measure communication in this individual?



CCS Scores		
Number	Definition	Communication level
0	No response	
1	Alerting - a change in behavior, or stops doing a behavior	Preintentional
2	Single orientation only -- on an object, event or person; can be communicated through vision, body orientation, or other means.	Preintentional
3	Single orientation only + 1 other PCB (potentially communicative behavior)	Preintentional
4	Single orientation only + more than 1 PCB	Preintentional
5	Dual orientation - shift in focus between a person and an object, between a person and an event using vision, body orientation, etc. (without PCB)	Preintentional
6	Triadic orientation (e.g. eye gaze or touch from object to person and back)	Intentional Non-Symbolic
7	Dual orientation + 1 PCB (e.g., dual focus + gesture)	Intentional Non-Symbolic
8	Dual orientation + 2 or more PCB (e.g., dual focus + gesture + vocalization, switch closure)	Intentional Non-Symbolic
9	Triadic orientation + 1 PCB (e.g. triadic + vocalization)	Intentional Non-Symbolic
10	Triadic orientation plus more than 1 PCB (e.g. triadic plus vocalization and differential switch closure)	Intentional Non-Symbolic
11	One-word verbalization, sign or AAC symbol selection	Intentional Symbolic
12	Multi-word verbalization, sign or AAC symbol selection	Intentional Symbolic

# Validation of the CCS

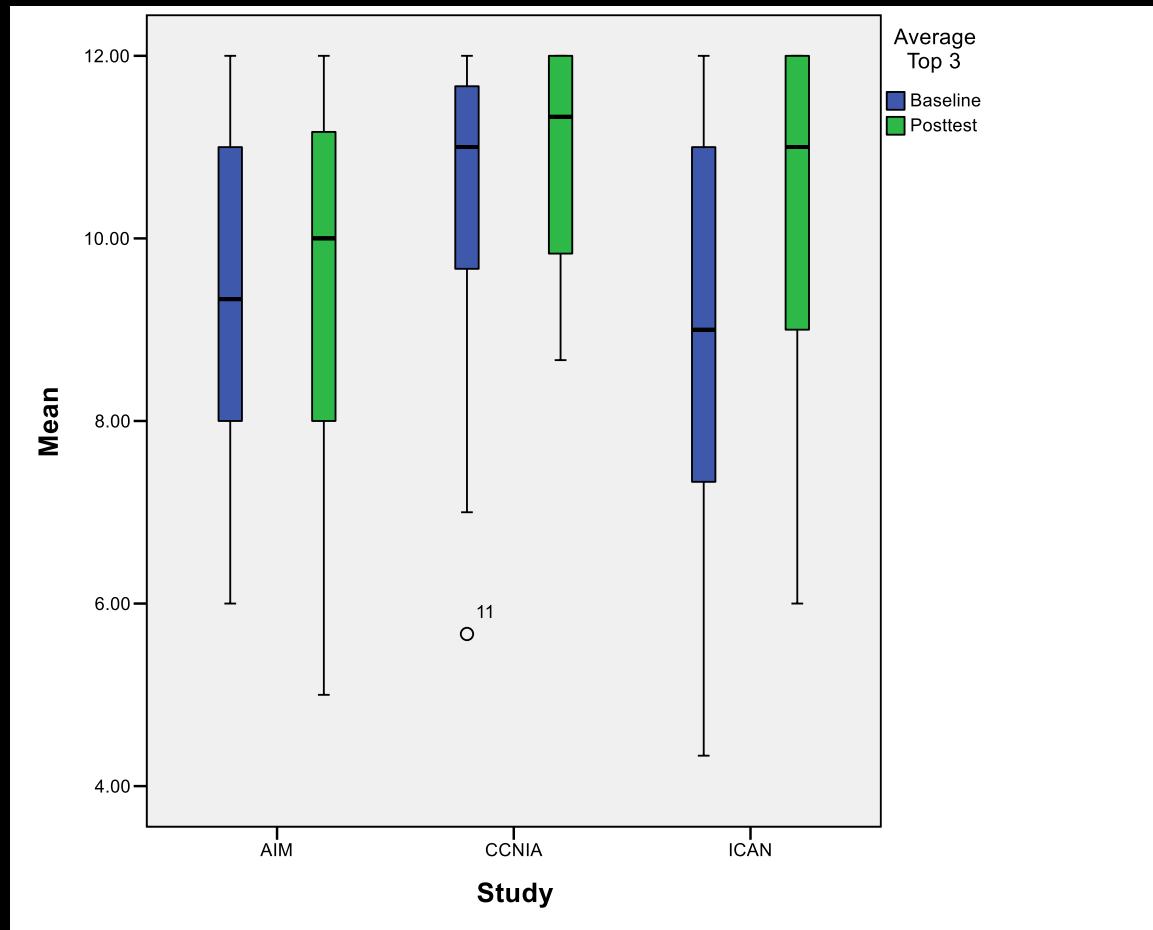
- How does it compare to other measures?
  - Communication Matrix, Vineland II
- How does it predict changes in response to treatment?



# Analyses of data from UCLA interventions

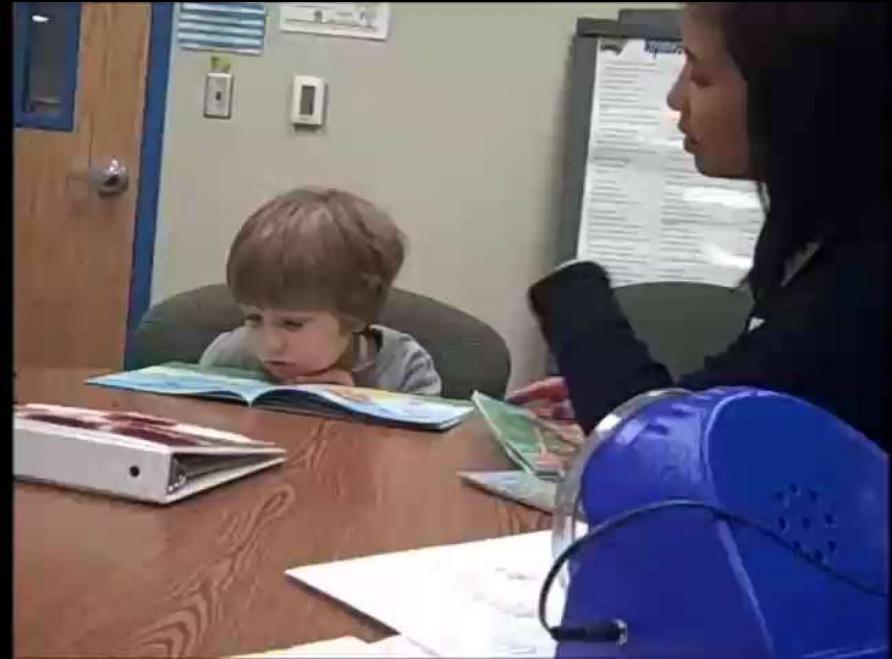
- 3 studies of differing lengths and ages
  - 6 mo. Intervention; 3-4 yr olds
  - 12 week intervention; 5-8 yr olds
  - 6 week intervention; 5-8 yr olds
- All focused on increasing communication and language

# Sensitivity to intervention effects



- AIM- n= 29 5-8 years old; 6 week intervention
- CCNIA- n= 21 5-8 years old; 12 week intervention
- ICAN- n= 60 3-4 years old; 6 mo. intervention

communication changes over time





Overall score 5.33  
5.0 for JA; 5.33 BR



Overall score = 11  
10 for JA and 11 for BR

# Measuring change with the CCS

- These scores were comparable to changes in rates of communication (Behavior regulation and Joint attention)
- Changes in the CCS are interpretable from a developmental framework



# COMMUNICATION INTERVENTION FOR PRESCHOOLERS LEARNING TO USE AAC (CIPAAC)

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JUNIPER GARDENS CHILDREN'S PROJECT

NIH R01DC012530-03

2013 TO 2017



# CIPAAC STUDY

- 12 minimally verbal/nonverbal preschoolers with autism recruited each year for 4 years; n = 48 by end of study
  - Cohorts 1, 2, and 3 complete (n = 35 with autism; and 75 peer partners); currently implementing with Cohort 4
- RA each year: 6 children to Group 1 (Control/iPad Only) and 6 children to Group 2 (Treatment/PM-AAC)
  - Group 1 - iPad and instruction provided on programming using voice output app (Touch Chat); weekly observations
  - Group 2 – iPad instruction and peer-mediated AAC intervention; 2-3 times per week coaching and observations

# 'STAY-PLAY-TALK': BUDDY TRAINING WITH SGD

Three 30-min sessions with all peers only: 90 minutes total

## Session 1:

- ❑ Sensitization Training (10-min): Video examples of ways some children communicate (sign language, PECS, SGD)
- ❑ Introduction of **STAY** Steps : 1. Sit close 2. If buddy moves, you move

## Session 2:

- ❑ Review and recall of **STAY** Steps
- ❑ Introduce **PLAY** Steps 1. Share 2. Take turns

## Session 3:

- ❑ Review and recall of **STAY** and **PLAY** Buddy Steps
- ❑ Introduce **TALK** 1. Look and listen 2. Push and talk
- ❑ Introduce **OTHER WAYS TO BE A BUDDY**
  1. Get buddy's attention
  2. Hold and Wait



# INTERVENTION COMPONENTS

- Adult instructs and models each step and substep
  - Adult-adult role play (if 2 adults)
  - Adult-child role play
  - Child-child role play
  - Feedback and reinforcement – SPECIFIC to steps
- Each peer given Buddy Book with steps to take home
- Peer joins focus child in dyad – 10-min table top activity
- Brief 3-5 min review of steps with peer prior to activity
- Intervention from November to April (18 to 26 sns)

# OUTCOMES

## Aim 1:

- (a) Examine the effects of a PM-AAC intervention on communication and social reciprocity between preschoolers with autism and peers without disabilities
- (b) Examine generalization and maintenance of social gains following PM-AAC intervention.

## Aim 2:

Determine if implementation of the PM-AAC intervention leads to collateral increases in complexity of prelinguistic and early linguistic adult- and peer-directed communication behaviors, and improvements in play skills.

# CHANGES IN PRELINGUISTIC AND LINGUISTIC COMPLEXITY: STRUCTURED COMMUNICATION SAMPLES AND THE CCS

## Structured Communication Sample: Scored with CCS

- 12 communication opportunities: 6 JA and 6 BR
- 30-min; administered pre- and post-intervention (6 months pre to post)
- 1:1 with adult (research staff)
- 1:2 child and peer communication partner with adult support
- Peer coached to be 'helper' and participate in gentle sabotage
- Adult avoids eye contact, redirects to peer, asks peer to say, "I can help"



# COACHING/SUPPORTING THE PEER



# INTENTIONAL PEER-DIRECTED COMMUNICATION

## WIND UP TOY - PRE

BUBBLES PRE



SNACK PRE

CARROT/MARKER BOX - PRE  
SCORE OF 3: SINGLE ORIENTATION + 1 PCB



CARROT/MARKER BOX - POST  
SCORE OF 12: MULTI-WORD

BUBBLES PRE  
ENOUGH TO SCORE A 5, DUAL ORIENTATION?

BUBBLES POST

SCORE OF 10 – TRIADIC + MORE THAN 1 PCB

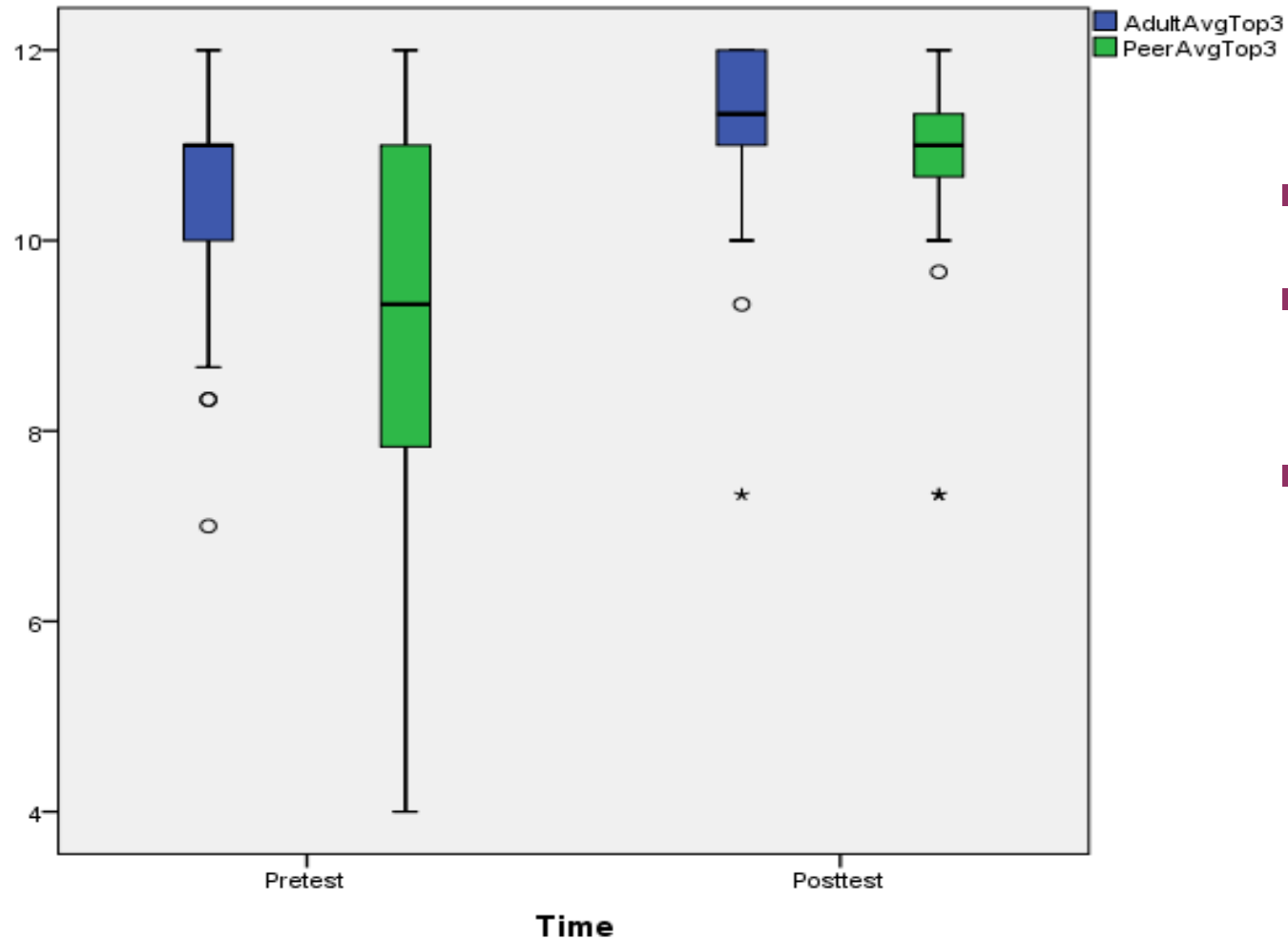


ONE MORE...

## CCS RESULTS FOR ADULT AND PEER PARTNERS: AVERAGE OF TOP 3 SCORES

- Adult Partner:
  - If ignore group assignment: Children in both groups demonstrated **significantly** higher average scores at post
  - Effect size for interaction based on standardized mean differences within groups = .2 (small)
- Peer Partner:
  - If ignore group assignment: Children in both groups demonstrated significantly higher average scores at post
    - PMAAC change = 8.9 to 11.2; vs. Control change = 9.1 to 10.5
  - Effect size for PMAAC children = .4 (moderate)

# AVERAGE OF TOP 3 FOR N = 35 CHILDREN (BOTH GROUPS)



- 9 months between pre- and post-
- Large variability at PRE with peers compared to with adults
- Increase in median scores with peer partners at POST

## CCS: AVERAGE TOP 3 SCORE - CHANGES IN LEVELS WITH PEER

- PMAAC Group (n = 17)
  - 100% (1 of 1) moved from pre-intentional to intentional non-symbolic
  - 90% (9 of 10) moved from non-symbolic to intentional symbolic
  - 100% (6 of 6) remained at intentional symbolic
- Control/iPad Only Group (n = 17)
  - 100% (2 of 2) moved from pre-intentional to intentional non-symbolic
  - 75% (6 of 8) moved from intentional non-symbolic to intentional symbolic
  - 86% (6 of 7) remained at intentional symbolic

## WHY IS IT IMPORTANT TO MEASURE JOINT ATTENTION?

- Core deficits for this population; strong predictor of later social, language, and communication skills
- Early intervention research documents children can learn JA skills with adult partners (JASPER; Kasari et al, 2008; 2012).
- Observed collateral improvements in communication and social outcomes
- The ability to engage and communicate with typically developing peers is related to these early core skills
- JA interventions have yet to be applied with typically developing peer partners



## JOINT ATTENTION MEASURES FROM THE CCS

- Total # of JA used in all 12 scripts - all JA acts tallied, regardless if task designed to elicit JA or BR
- Mean Complexity of JA Scripts – average score on CCS based on child demonstrating JA during intentional non-symbolic or intentional symbolic communication (score of 6 – 12)

## JA RESULTS WITH ADULT PARTNER

# of JA all 12 scripts: (no significant differences between groups)

- PMAAC group mean: PRE = 2.5 POST = 2.9
- iPad only group mean: PRE = 2.5 POST = 2.2

Mean complexity of JA scripts: (significant differences for both\*)

- PM-AAC group mean: PRE = 9.6 POST = 10.3 (\* $p=.05$ )
- iPad only group mean: PRE = 9.2 POST = 10.3 (\* $p=.009$ )

## JA RESULTS WITH PEER PARTNER

# of JA across all 12 scripts: (not significant between groups)

- iPad only group mean: PRE = 2.3 POST = 2.1
- PMAAC group mean: PRE = 1.7 POST = 2.8\*

Mean complexity of JA scripts: (not significant between groups)

- iPad only group mean: PRE = 8.4 POST = 9.4
- PM-AAC group mean: PRE = 8.9 POST = 9.3

\*Significant change within PMAAC group ( $p = .04$ )

## CONCLUSIONS

- The CCS was sensitive to changes in complexity of communication with preschoolers with autism with both adult and peer partners over one year
- Within group receiving PMAAC intervention - effect size was moderate
- Low rates of JA with both adult and peer partners – range of 1.7 to 2.5
- Within group receiving PMAAC intervention – CCS sensitive to significant increase in total number of JA with peers; preliminary data (n = 18)
- Increases in CCS complexity score with JA acts was significant for both groups with adults but NOT with peer partners

# Future Directions

- Live coding of CCS!
- Dissemination of web-based training materials
- Continued investigation of teaching JA with peer partners – and what would the expectations be?
- Further examination of the sensitivity and validity of using CCS as assessment tool to document changes in peer communication