Adaptive Interventions for Minimally Verbal Children with Autism

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Today’s Talk

• Why do children remain minimally verbal?
• Communication Interventions for Minimally Verbal Children with Autism— an RCT
• Adapting Communication Interventions
  • Some promising strategies
  • What do we need to know?
  • What can we recommend?
What Does It Mean To Be ‘Minimally Verbal’

- Exact percentage of children with ASD that remain minimally verbal is unclear
  - Somewhere between 25% and 50% (definitions vary)
  - Important difference between preverbal (will develop language later) and minimally verbal: age, extent of intervention.
- Most minimally verbal children are not ‘nonverbal’
  - They have some words, often for requesting, and sometimes scripted phrases
  - They may not use language functionally or socially in standard ways
  - They may be quiet or be very low rate communicators, however, many can talk
- Some children physically seem unable to make sounds, words
  - This is a small percentage of children who are minimally verbal (maybe 20%)
- Nonverbal IQ ranges from below 30 to gifted
  - IQ alone is not the determining cause
Video 2:
Minimally verbal- low rate
Video 1:
Minimally verbal - no words
Video 2:
Minimally verbal- low rate
Some factors predicting minimally verbal status at age 5 are apparent early

- Age 2 non-verbal cognitive ability
- Socialization (from Vineland)
- Age 2 expressive & receptive communication
- Imitating sounds and simple movements
- Responding to joint attention (receptive)
- Initiating joint attention (expressive)

From C. Lord, C. Kasari, A Kaiser & L Hampton, APA 2013: Understanding and Improving Social Communication in Minimally Verbal Children with ASD
Does intervention contribute to remaining minimally verbal?

- *Ineffective or insufficient dosage of early intervention*
  - Lack of progress may be related to type or amount of intervention
    - May learn form based prerequisites to spoken language, but not social prerequisites for communication
    - May not have learned sufficient receptive skills
    - May not have learned to imitate sounds or to produce sounds fluently
    - ELL may have specific additional challenges because of two languages
  
- *Access to an AAC may not result in social communication*
  - A few children are fluent in AAC and remain minimally verbal
  - Many children may not master AAC mode for *social communication*
  - Instruction in use of AAC may be insufficient for learning
  - Limited opportunities to learn and use *mode as social communication*
  - Partners who respond to mode, model mode, and manage mode may be lacking
Bottom line?

- Given low motivation for social communication, early intervention may be insufficient to initiate the social process of communication
  - DTT may teach prerequisites, but not social use of language
  - PECS may provide tool for requesting, but not commenting; may not facilitate spoken language
  - Naturalistic teaching may provide too few opportunities for learning

New approaches are needed that address critical deficits. Given this very heterogeneous population of children, one size is unlikely to fit all.
What Children Bring to Communication Intervention

- Imitation
- Auditory memory
- Efficiency of learning (associative, concept formation, fastmapping)
- Person
- Object
- Activity
- Coordination

- Rate
- Forms (Verbal, Nonverbal)
- Functions
- Receptive Understanding
- Fluent use of mode
- Intelligibility/ Transparency to partners
- Access to input for learning

Mode
Engagement Strategies
Baseline Communication
Learning Strategies
Communication Interventions for Minimally Verbal Children with Autism


Clinical Trials Number: NCT01013545.
This study was funded by Autism Speaks #5666, Characterizing Cognition in Nonverbal Individuals with Autism (CCNIA).
Can Intervention improve outcomes for minimally verbal children with ASD?

- The majority of children who began speaking after age 5 did so as a result of behavioral intervention targeting spoken language
  - Pickett et al. (2009)  N = 167
  - 70% used single words; no data on social use
  - Best outcomes for children with higher IQ (>50), socially motivated, ages 5-7

- Augmentative communication systems may be beneficial for this population
  - **Picture Exchange System (PECS)**
    - Howlin et al, 2007 RCT classroom based intervention  N = 84
    - Increases in requesting with PECS, but not in spoken language
  
  - **Speech Generating Device (SGD)**
    - Van Der Meer (2010) Review of 23 SCD studies  N = 51
    - Most taught single skill or requesting
    - Some evidence of increases in spoken language, primarily requesting

No randomized trials of communication intervention using SGD or naturalistic communication interventions with this population
Objective of the Study

• To construct and systematically test an adaptive intervention that utilized a naturalistic intervention to address joint attention, symbolic play and language (JAE/EMT) with and without AAC

• SMART Design
  • Sequential multiple assignment randomized trial
    • (Murphy 2005)
  • Goal to test a ‘sequence of interventions’ to determine best sequence for different children
Specific Aims of the Study

• Goal: To construct an adaptive intervention that utilized a naturalistic behavioral communication intervention (JASPER + EMT) with the added variation of an SGD with minimally verbal school-aged children with ASD

• Aim 1: To examine the effect of the adaptive intervention beginning with JASP+EMT+SGD versus the adaptive interventions beginning with JASP+EMT verbal only

• Aim 2: To compare the outcomes of three adaptive interventions
SMART DESIGN

= randomization;
JASP = joint attention/engagement and social play
EMT = enhanced milieu teaching treatment
SGD = speech generating device (an AAC)
Comparisons

• **Primary** [12, 24, 36 Weeks]
  • JASP + EMT (spoken) vs. JASP + EMT + SGD at 12, 24, 36 weeks

• **Secondary** [24, 36 weeks]
  • JASP + EMT followed by Intensified JASP + EMT
  • JASP + EMT followed by JASP + EMT + SGD
  • JASP + EMT + SGD followed by Intensified JASP + EMT + SGD
Study Participants

• 61 minimally verbal children diagnosed with autism
  • 60 met ADOS critieria for autism
  • Mn ADOS score 19.55 (SD 4.27)
  • 51 males; 10 females
  • 48% white, 23% African American, 19% Asian American, 5% Hispanic, 5% other
  • Mn age 6.31 years (SD 1.16)
  • Mn unique words at Pre 16.62 (14.65)
  • Mn PPVT-4 2.72 years (SD. 68)
  • Mn Nonverbal Cognitive (Leiter)
    • 4.00 yrs (SD 1.12)
    • BIQ: 68.18 (SD 18.68)
Intervention

- **Blended JASP+ EMT**
  - Joint Attention, Symbolic Play and Emotion Regulation (JASP; Kasari et al 2006)
  - Naturalistic, interactive, play based
  - Model and prompt joint attention, symbolic play, and verbal and nonverbal communication contingent on child’s interests and responses
  - Goals: increase engagement, social initiations, symbolic play and social communication, especially commenting

- **JASP+ EMT Spoken Language Only**
- **JASP +EMT + SGD**
  - Speech Generating Device - Dynavox or iPad
  - Model using spoken language and SGD
    - At least 50% of utterances, 70% of expansions
  - Child could speak or use SGD to respond and communicate
JASP-EMT
Intervention Implementation

• Phase 1
  • 24 40-minute sessions in clinic play room
  • Parents watched most sessions
  • 4-6 toys sets preferred by child
  • Primary comparison JASP +EMT (spoken) vs. JASP + EMT + SGD

• Phase 2
  • 24 40-minute sessions in clinic play room
  • Parents trained in sessions (Teach, model, coach, review)
    • Parents taught JASP + EMT
    • Parents taught use of SGD
  • 4-6 toys sets preferred by child
  • Treatment variations:
    • JASP +EMT (spoken)
    • JASP + EMT + SGD
    • Intensified JASP + EMT
    • JASP + EMT + SGD
    • Intensified JASP + EMT + SGD

Non-responders were reassigned to one of these
Use of SGD

- SGD available to the child
- Programmed pages for toys sets
- Used communicatively with the child
  - 50% of adult utterance
  - 70% of adult expansions
- Child could respond to prompts with either SGD or spoken language
- Embedded in JASPER-EMT interactions
Definition of Early Responder

≥25% improvement on ≥50% of the following variables:

- **Session Data (Average of Sessions 1 & 2 as compared to Average of 23 & 24)**
  1. Total Social Communicative Utterances (Total SCU)
  2. Percentage Communicative Utterances (% SCU)
  3. Number Different Word Roots (NDWR)
  4. MLUw
  5. # Comments
  6. Words per Minute (WPM)
  7. Unique Word Combinations *(only include if the child’s target talk is 2+ words)*

- **Language Sample (Screening compared to 12 weeks)**
  8. Total Social Communicative Utterances (Total SCU)
  9. Percentage Communicative Utterances (% SCU)
  10. Number Different Word Roots (NDWR)
  11. MLUw
  12. # Comments
  13. Words per Minute (WPM)
  14. Unique Word Combinations *(only include if the child’s target talk is 2+ words)*
Analysis

- Longitudinal regression models for each outcome variable
  - Total Social Communicative utterances (TSCU)
  - Total Number of Different Words (TNDW)
  - Total Comments (TCOM)
- Included baseline covariates
  - Age, gender, ethnicity
  - ADOS score
  - Site
Results

• 70% of whole group met criterion for response to treatment at week 12
• Greater percentage of participants in the JASP + EMT+ SGD group (77%) were early treatment responders than in the JASP +SGD group (62%)

• Participants in the JASP + EMT +SGD group had:
  • more Social Communicative Utterances (SCU),
  • greater Number of Different Word Roots (NDW),
  • more comments (COM) than participants in JASP+ EMT group

• Both groups shows gains over time in SCU and NDW; only the JASP+EMT+SGD group showed gains in COM
## Results At 12 Weeks

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Social communicative utterances (TSCU), Number of different word roots (TNDW) and number of comments (TCOM) were derived from a naturalistic language sample with a blinded clinician.
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Social communicative utterances (TSCU), Number of different word roots (TNDW) and number of comments (TCOM) were derived from a naturalistic language sample with a blinded clinician.
Primary aim results for the primary outcome (TSCU).

Open plotting characters denote observed means; closed denote model-estimated means. Error bars denote 95% confidence intervals for the model-estimated means.
Outcomes 12, 24 & 36 weeks

JASP+EMT (spoken only)

JASP + EMT + SGD

- TSCU
- TDW
- TCOM
Secondary results

- Outcomes at Weeks 24 and 36
- Adaptive interventions beginning with JASP + EMT + SGD resulted in more social communicative utterances than those beginning with JASP + EMT (spoken).
- The adaptive intervention following JASP + EMT (spoken) which added SGD (JASP + EMT + SGD) was more effective than intensified JASP + EMT (spoken).
- Overall, primary and adaptive interventions that included SGD were more effective
- However, 92% of the SCU were spoken, and the addition of SGD utterances did not account for the differences between conditions
  - Suggesting that SCD facilitated spoken language use, rather than replaced it
Discussion

• Minimally verbal children can make significant progress in socially communicative utterances after age 5 a relative brief intervention (effects at 12 weeks, 24 hours; and at 24 weeks 48-56 hours)

• Progress is noted in *social communication*, which have not been examined in previous RTC with this population

• Children benefit significantly more when they begin treatment with an SGD and may benefit when SGD is added later

• SGD in this study was effective when used within the context of a naturalistic intervention teaching foundations of communication with others

• Several limitations to the current analysis: sample size, LS is only measure of generalization, challenges in determining criterion for early response to treatment, random assignment regardless of need for SGD, limited access to SGD
Some thoughts about SGDs

• The manner in which the SGD impacts children’s social communication is not completely clear
  • Increased modeling in a consistent phonetic pattern may support receptive language
  • This intervention was social and symbolic, the SGD was imbedded in increasing social engagement, play, joint attention
  • Some children did learn to use the SGD to communicate
    • Modeling communication is important
    • Use maybe transitional or more consistent
    • A small percentage of children were motivated to use the SGD for communication other than request
Some thoughts about SGDs

• Access to SGD, partner use and response, partner programming to match environments are essential
  • Lack of continued growth at 36 weeks for SGD group

• Not every child who had access to the SGD became a fluent user
  • Only about 20% of children in SGD condition were social communicators with the SGD, more children used for requesting
  • Some children used SGD transitionally then replaced with words

• About 20% of children entered the study with an SGD, but none were fluent users-- suggesting access to SGD alone may not be sufficient for promoting social communication

• Skills for using the SGD were not formally instructed, just modeled (possible to do better)
Adapting Communication Interventions for Minimally Verbal Children with ASD

- Heterogeneous, need for individualized intervention
- Creating a context for increasing social motivation
- Baseline characterizations (beyond standardized assessments)
- Teaching skills children lack across context and mode
  - Teaching pre-requisites: imitation, joint attention, receptive language to facilitate initial learning
  - Using blended direct teaching for form and naturalistic teaching to promote social use and function
  - Actively teaching AAC and modeling use as a communication mode (social use beyond requesting)
- Using response to treatment as guide to principled modifications
Current and Future Research

• Ongoing ACE study extends current study to replicate effects of JASP+ EMT +SGD
  • Compares naturalistic approach to teaching SGD to discrete trial training (DTT) using SGD
  • The ACE study includes a “rescue” protocol for nonresponders
    • Individualizing and potentially blending a naturalistic and direct teaching intervention to find the treatment model that best supports learning and use of social communication.
  •

• Much more intervention research is needed to determine the potential for developing spoken language in minimally verbal children
  • Replication is essential
  • More in depth study of generalization and maintenance
Future Research – How can we advance adaptive interventions?

• Time to move beyond RCT for communication interventions for children with ASD who are minimally verbal?
• Determining the intersect between child extant communication skills and “active ingredients”
• Developing comprehensive assessments that translate to treatment differentiation
• Developing progress monitoring measures for assessing ongoing treatment effects
• Developing bench marks for progress
• Determining the best adaptive sequences: logical or developmental?
• SMART issues: sample size, number of adaptations,
Dynamic Intervention:
Modifications to Fit Minimally Verbal Children with ASD

- Teach imitation
  - Add discrete trials
  - Increase dosage

- Teach coordinated joint attention

- Teach play
  - Increase person engagement

- Provide alternative mode
- Signs
- SGD
- Teach partners mode

- Teach joint attention strategies
- Teach receptive language
- Teach commenting

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Bottom lines

• Some promising results, need replication
• Adaptive treatment designs are appealing
• The critical clinical challenge is adapting treatment for minimally verbal children, based on principled guidelines for treatment components, child response to treatment, and benchmarks for progress
• There is a lot to do before we have an effective treatment for school age children with ASD who are minimally verbal
Acknowledgements

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• For more information
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