It’s Good to Be 2/Two

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Acknowledgements

Families and children who have made this research possible and from whom we have learned everything we know

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• Rebecca Landa, PhD Kennedy Kreiger
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Vanderbilt KidTalk Research Team
• Institute for Educational Sciences, National Institutes of Health (NICHD, NIDCD), Office of Special Education Projects, John Merck Foundation
What we do

• Language intervention for children at the early stages of language learning
  • Average ages 15-42 months; Mn age approximately 30 mos
  • Typically fewer than 20 words, approximately 10th percentile on the MCDI
  • Not yet generatively combining words
  • Range of populations: DLD (English and Spanish), ASD, DS, Cleft Palate

• Caregiver Plus Therapist implemented naturalistic interventions
  • Systematic parent training (Teach-Model-Coach-Review)
  • Varied dosages of Therapist intervention
  • Varied lengths of treatment
  • Combinations with other interventions
## Intervention Studies with two year olds (+/-)

<table>
<thead>
<tr>
<th>Population</th>
<th>Age at Entry</th>
<th>Intervention</th>
<th>Implementers</th>
<th>Setting</th>
<th>Design</th>
</tr>
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<tbody>
<tr>
<td>ASD</td>
<td>24-36 mos</td>
<td>JASPER-EMT</td>
<td>Parent + Therapist</td>
<td>Home</td>
<td>RCT IES Goal 3 (NCE)</td>
</tr>
<tr>
<td>DLD English A</td>
<td>24-42 mos</td>
<td>EMT</td>
<td>Parent + Therapist</td>
<td>Home and Clinic</td>
<td>RCT IES Goal 3</td>
</tr>
<tr>
<td>DLD English B</td>
<td>30 mos</td>
<td>EMT- Sentence focused</td>
<td>Parent+Therapist</td>
<td>Home</td>
<td>RCT NIDCD U01 Ongoing</td>
</tr>
<tr>
<td>DLD Spanish</td>
<td>24-36 mos</td>
<td>EMT</td>
<td>Parent +Therapist</td>
<td>Home</td>
<td>RCT NIDCD R21, RCT IES Goal 3 Ongoing</td>
</tr>
<tr>
<td>Cleft Lip +/or Palate</td>
<td>15-24 mos</td>
<td>EMT-Phonological Emphasis</td>
<td>Therapist</td>
<td>Clinic</td>
<td>RCT NIDCD R21</td>
</tr>
</tbody>
</table>
Why two year olds?

• By 30 months language assessments are generally stable and predictive of K and grade 3 language outcomes
  • Receptive/Expressive Delays (Fischer, 2017; Rudolph & Leonard, 2016)
  • Cleft (Eshghi, Adatorwovor, Preisser, Crais & Zaiac, 2019; Lancaster et al, in press)

• All children had cognitive scores in typical range
• Cognition and receptive language are consistent predictors
Developmental premises for early language acquisition

1. The pathway to language begins well before the first word
2. Pathways contain a variety of challenges to language learning
3. Different pathways to language lead to important differences in outcome
4. The environment is a multi-layered system that influences the child’s language development
5. Parents play a crucial role in establishing the contexts that introduce a child to language
6. The developing child actively contributes to language-facilitating interactions
7. A parent contributes to language-facilitating interactions using finely tuned acts that are responsive to the child’s on-going actions and developmental course
8. Language-facilitating interactions are collaborative, transactional processes composed of more than just the child and parent

The child and caregiver develop together

Fig. 1. Developmental landscape for language acquisition and intervention. Image adapted from Waddington (1957, p. 29).
Implications of developmental premises for parent-focused language intervention

1. Intervention that support the emergence of language should begin well before a child speaks
2. Interventions should be tailored to the specific challenges learners face at different points along the pathway to language
3. Interventions should address the child’s current skills and offer support for subsequent development
4. Interventions will likely be most effective when they target more than one layer of the child’s environment
5. Parents make important indirect contributions to interventions when they make decide about when and what interventions their child should receive
6. The developing child actively contributes to interventions in ways that influence both the intervention process and its outcome
7. Intervention may help parents enhance their contributions to language-facilitating interactions, teaching them specific ways to be more responsive to the child’s on-going actions and developmental course
8. Language-facilitating interventions are nested in the collaborative, transactional processes that extend beyond the individual child and parent

Why two year olds?

• Naturalistic interventions are optimal when child has some productive language and prelinguistic communication skills

• Naturalistic interventions can be adapted to fit the needs of a range of populations and to teach prelinguistic, play and behavior skills

• Natural environment (home) includes an accessible, invested adult who can engage with the child across multiple contexts
THE LONGITUDINAL EFFECTS OF EARLY LANGUAGE INTERVENTION FOR TODDLERS WITH LANGUAGE DELAYS


Enhanced Milieu Teaching (EMT) (Child Intervention)

- EMT is a widely studied intervention with consistently positive effects on various language forms and structures (Kaiser & Hampton, 2016).
- Gains in language have been observed in children with intellectual disabilities:
  - Classes of language structures (Goldstein & Mousetis, 1989; Warren, Gazdag, Bambara, & Jones, 1994),
EMT Principles and Strategies

1. **Promote adult-child communication now**
   - Notice and respond
   - Follow the child’s lead

2. **Increase child engagement with objects and activities**
   - Child preferred activities
   - Join the child in play and activity
   - Teach play and participation
   - Teach across play and routines

3. **Expand the social basis of communicative interactions**
   - Arrange environment to increase engagement
   - Teach joint attention strategies
   - Balance turns (mirror and map)
   - Increase person engagement

4. **Teach child communication target forms to advance language**
   - Respond
   - Model
   - Expand
   - Prompt
Design

• Randomized controlled trial (NCT01975922)
  • Treatment n=45
  • Control n=53

• Children were assessed:
  • At the start of the study
  • At the end of intervention
  • 6 months after intervention
  • 12 months after intervention
  • Spring of Kindergarten
Participants

• Age
  • 24-42 months
  • mean age of 30 months
  • 83% boys

• Race
  • 80% White
  • 18% African American
  • 2% Other

• Mother Education
  • High school only: 40%
  • Undergraduate degree: 30%
  • Graduate degree: 26%

• Cognitive Skills (Bayley Scales of Infant Development)
  • 90 (SD 8)

  • Expressive language: 75 (SD 8)
  • Receptive language: 75 (SD 16)
Intervention

• 28 Intervention Sessions (2x per week for 14 weeks)
  • 4 Workshops
  • 11 Home sessions
  • 13 Clinic sessions

• Structure of sessions
  • Clinic Sessions
    • 10 minutes of review of strategies
    • 15 minutes of watching the therapist play with the child and use the strategies
    • 15 minutes practicing the strategies with the child
    • 10 minutes of discussion
  • Home Sessions
    • 10 minutes of review of strategies
    • 15 minutes of watching the therapist use the strategies with the child
    • 30 minutes practicing the strategies with the child during play
      • Play: 15 minutes
      • Book: 5 minutes
      • Snack: 5 minutes
      • Routine of their choice: 5 minutes
    • 10 minutes of discussion
The gap between children with language delays and typical children

- Intervention
- Control
- Typical
Longer View Of Vocabulary:
NDW from Pre- 12 mos Followup

![Graph showing NDW from 20 min Language Sample]

- **Typical sample**
- 105 Words

Graph: Comparison of NDW from 20 min Language Sample for Treatment and Control groups across different time points:
- Pre
- Post *
- 3 mos *
- 6 mos *
- 12 mos
Children who received treatment maintained their status relative to their peers; however, their expressive syntax remained severely delayed. (*Mean z = -2.88, 12-month follow-up*).

In contrast, children in the control group lost ground relative to age expectations. (*Mean z = -5.04, 12-month follow-up*).
Growth Trajectories for IPSyn

- Children who received treatment were 8 times \((p = .035)\) more likely to have good outcomes than poor outcomes.

- Children with Receptive and Expressive delays were 13 times \((p=.039)\) more likely to have poor outcomes than improved outcomes and 38 times \((p=.023)\) more likely to have poor outcomes than good outcomes.

- 84\% of children with poor SYN outcomes had slow early vocabulary growth in number of different words.

Figure 2. Three-class Model: Growth Curve Trajectory for IPSyn Raw Scores
Predicting Language and Literacy at Kindergarten

- T00 Leiter (Nonverbal IQ)
- T00 PLS (global language standardized assessment)
- Account for 53% of variance

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<thead>
<tr>
<th>Kindergarten (Mn age 74 mos)</th>
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<tbody>
<tr>
<td></td>
<td>B</td>
<td>Standard Error</td>
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<tr>
<td>Constant</td>
<td>-7.701</td>
<td>1.42</td>
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<tr>
<td>Leiter</td>
<td>0.48*</td>
<td>0.14*</td>
</tr>
<tr>
<td>PLS-4 (T00)</td>
<td>0.41*</td>
<td>0.12*</td>
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<tr>
<td>Study Group</td>
<td>0.64</td>
<td>.253</td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.526*</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td></td>
<td>0.48*</td>
</tr>
</tbody>
</table>

Table 3. Summary of regression analysis for study group predicting the language and literacy factor score

Note. The language and literacy factor score is a four variable factor including participant scores on the TOLD:P-4, PPVT-4, EOWPVT-4, GRADE:P. $p <0.05$. 
Effects on behavior at 12 month follow up

• The intervention group had significantly fewer:
  • total problem behaviors $-6.589$, 95% CI [-11.804, -1.385])
  • externalizing behaviors $-2.231$, 95% CI [-4.355, -0.108]),
  • internalizing behaviors $-2.091$, 95% CI [-3.791, -0.391]).

• Effects sizes for treatment vs control differences
  • total problem behavior, $d = -0.434$
  • externalizing behavior, $d = -0.346$
  • Internalizing behavior, $d = -0.440$

Curtis, Kaiser, Estabrooks, & Roberts, 2017 Child Development
Simple Mediation Model

Relationship between EMT and total problem behavior and internalizing behavior was fully mediated by changes in rate of communication; relationship with externalizing behavior was partially mediated.
Summary

Yes...

• Effects on vocabulary observed over time from parent-implemented short term intervention

• Language and Cognition appear to predict from age 2

• Improvements in rate of talking may mediate reduction of behavior problems

• Modest linkage between treatment less decrement in Syntax relative to control

But...

• Effects are modest

• Did not close the gap with typical development

• Effects significant for vocabulary, language sample (unsupported, distal) and positive but variable on standardized measures
Developmental Premises and Implications for Intervention

*Premis*:
Parents play a crucial role in establishing the contexts that introduce a child to language

*Implications*:
Interventions should be tailored to the specific challenges learners face at different points along the pathway to language. Interventions should address the child’s current skills *and* offer support for subsequent development:
- Intervention improves vocabulary relative to control and there are some sustained effects
- Improvements in vocabulary may not result in robust cascading effects on grammar, reading
  - Low but stable syntax relative to typical with some treatment effects
  - Modest evidence of linkages to a language/literacy composite at Kindergarten
Implications for Practice

• Parent plus therapist model provide efficient and effective early intervention for vocabulary
  • 28 sessions; less than 30 hours of intervention/training, about $5000/child
• High quality parent training had positive impact children’s language
  • Parents learned strategies to fidelity
  • Used the strategies across the day, taught others
• Early vocabulary intervention may not be sufficient to resolve language delays; continuous intervention to support later stages of development may be needed
Implications for Policy

• Screening children at age 2 to identify children for whom language impairment (developmental language disorder) is likely to persist
  • 65% of control group had persistent language impairment
  • Bayley cognitive score and receptive language (PLS-AC) predicted child language outcomes
  • (66% of variance)
  • Magnitude of difference at 48-53 months is 3+ SD lower than typical children as a total group

• “Wait and See” may not be the best global policy
  • Children with receptive and expressive delays at 24-30 months
  • Family History
  • Children with significant delays in social communication (ASD)

• Improve access to early intervention for children with receptive and expressive language delays who may not qualify for Part C services

• Prepare professionals to teach parents
Will longer intervention that includes the transition to syntax improve long term outcomes?

• Stay tuned.....
Maximizing outcomes for preschoolers with developmental language disorders
Kaiser, Roberts & Hadley NIDCD U01 ongoing

- **Enhanced Milieu Teaching-Sentence Focus (EMT-SF)**
  - Compare overall language ability at 48 months of age.
  - Compare growth in vocabulary skills during intervention from 30 to 48 months of age.
  - Compare growth in grammar skills during intervention from 30 to 48 months of age.

- **Randomized Control Trial**
  - 104 30 month-old children
    - Receptive/expressive delay
    - Typical cognition
  - 18 mos of intervention in 4 phases
    - Parent training
    - Vocabulary and early sentences
    - Sentences
    - Decontextualized language
It’s good to be 2/two! Thank you for coming!
For more information:

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This talk will be posted at

http://kc.vanderbilt.edu/kidtalk/