Adapting Enhanced Milieu Teaching for Young Children With Communication Impairment

Ann P. Kaiser
Vanderbilt University
Today’s Talk

• Building a new generation of communication interventions
• Enhanced Milieu Teaching (EMT)
  • Brief overview
  • Summary of research evidence
• EMT active ingredients
  • What children bring to EMT
  • Additions to core EMT
• Adapting EMT to fit learner characteristics
  • Profiles of four populations
  • Adaptations to maximize social communication outcomes
  • Research on adaptations
• The Intervention Tool Box: Tools for Adapting EMT
• Summary and Conclusions
What is Enhanced Milieu Teaching?

• EMT is a naturalistic, conversation-based intervention that uses child interests and initiations as opportunities to model and prompt language in everyday contexts.

• EMT can be used throughout the day as part of the everyday interactions.

• EMT is an evidence-based intervention with 20 years of research.

• EMT is an effective intervention.
EMT is effective

• **Increases child use of language targets**
  • Early syntactic forms (Kaiser & Hester, 1994)
  • Moderately complex syntax (Warren & Kaiser, 1986)
• **Increases child frequency of communication** (Warren et al, 1994; Kaiser et al, 1993)
• **Generalization** across settings, people, and language concepts (Warren & Bambara, 1989; Goldstein & Mousetis, 1989; Kaiser & Roberts, 2012)
• **Maintenance of newly learned targets** (Warren & Kaiser, 1986; Kaiser & Roberts, 2012)
EMT Active Ingredients

- Environmental arrangement to promote communication
- Play and engage
- Follow child’s lead in play and activity
- Respond to child communication
- Model target language in context
- Expand child communication**
- Use Time Delays to prompt requests or initiations
- Use Milieu Teaching Prompts to promote practice
- Teach across settings, activities and partners

** In 2 randomized trials, expansion has been the ingredient most highly correlated with child outcomes (Kaiser & Roberts, 2012; Roberts & Kaiser, under review)
EMT Example
What Children Bring to EMT

- Access to Input
- Intelligibility
- Fluency

- Person
- Object
- Activity

- Rate
- Form
- Functions
- Transparency to partners

- Imitation
- Auditory memory
- Efficiency

Mode

Baseline Communication

Engagement Strategies

Learning Strategies

CEC 2015
EMT Modifications to Fit What Children Bring

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

- Teach play
- Increase person engagement
- Teach coordinated joint attention

- Teach joint attention skills
- Support partner comprehension

- Teach imitation
  - Add discrete trials
  - Increase dosage
Modifications of EMT

- JASPER + EMT [J-EMT]
  - Teaches joint attention, symbolic play, regulation

- JASPER + EMT + AAC [J-EMT+ SGD ; Words + Signs]
  - Teaches joint attention, symbolic play, regulation
  - Includes speech generating device or signs for input and output

- Phonological Emphasis + EMT [PE-EMT]
  - Models speech targets
  - Recasts for speech

- + Discrete trial training [Rescue protocol; preteaching protocol]

- - Reduce prompt complexity, number of prompts [Simplify]
  - + Increase Dosage [Dosage]
  - + Support Partners to use mode and EMT [Partner]
# Population Specific Modifications

<table>
<thead>
<tr>
<th>Population</th>
<th>Mode</th>
<th>Engagement</th>
<th>Learning Strategy</th>
<th>Baseline Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toddlers with Rec/Express Delay</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Support partner as teacher</td>
</tr>
<tr>
<td>Down syndrome</td>
<td>+ Sign or SGD</td>
<td>Teach play, object engagement, sustained attention</td>
<td>+Dosage</td>
<td>Support partner comprehension and as teacher</td>
</tr>
<tr>
<td>Cleft</td>
<td>+ Speech targets</td>
<td>None</td>
<td>+Recast + Speech practice</td>
<td></td>
</tr>
<tr>
<td>Minimally Verbal ASD</td>
<td>+ SGD</td>
<td>Teach play, engagement</td>
<td>+Dosage +Rescue or Pre-teach Protocol: imitation, receptive language</td>
<td>Teach joint attention skills Support partner as teacher</td>
</tr>
</tbody>
</table>
The Effects of a Parent-Implemented Language Intervention for Children With Language Impairment

Megan Y. Roberts, PhD, CCC-SLP
Ann P. Kaiser, PhD
## Toddlers with Receptive/Expressive Delays

<table>
<thead>
<tr>
<th>Communication Challenges</th>
<th>Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem behaviors</td>
<td>Increase attention to positive behavior, plan routines, teach communicative alternatives</td>
</tr>
<tr>
<td>Low rates of talking</td>
<td>Use responsiveness strategies to increase rate</td>
</tr>
<tr>
<td>Low lexical diversity</td>
<td>Model expanded vocabulary before and during early syntax targets</td>
</tr>
</tbody>
</table>
## Toddlers with Receptive/Expressive Delays

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Design**      | Randomized Clinical Trial  
45 Intervention, 43 Control |
| **Intervention**| EMT with Play Skills  
28 sessions (4 workshops, 14 clinic, 10 home across routines)  
Parent + Therapist |
| **Measures**    | Pre, 6 wks, 12 wks, 18 wks (end of intervention)  
Standardized, observational, parent report |
| **Participants**| Average age: 31 months  
Average Bayley Cognitive Score: 85  
Gender: 83% male  
PLS-4: 70 |

Kaiser, Camarata, & Roberts (2011) IES R324A090181; Roberts & Kaiser, 2015
Parent + Therapist EMT

Enhanced Milieu Teaching with a Toddler
Outcomes Intervention vs. Control

<table>
<thead>
<tr>
<th>Test</th>
<th>Intervention</th>
<th>Control</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressive language (PLS-4)</td>
<td>84</td>
<td>80</td>
<td>0.3</td>
</tr>
<tr>
<td>Receptive language (PLS-4)</td>
<td>86</td>
<td>77</td>
<td>0.3</td>
</tr>
<tr>
<td>Expressive vocabulary (EOWPVT-3)</td>
<td>76</td>
<td>70</td>
<td>0.3</td>
</tr>
<tr>
<td>Receptive Vocabulary (PPVT-4)</td>
<td>94</td>
<td>86</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Standard Score

- Expressive language (PLS-4): 84 vs. 80
- Receptive language (PLS-4): 86 vs. 77
- Expressive vocabulary (EOWPVT-3): 76 vs. 70
- Receptive Vocabulary (PPVT-4): 94 vs. 86

CEC 2015
### Outcomes Intervention vs Control: Number of Different Words

<table>
<thead>
<tr>
<th>Start</th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>26</td>
<td>32</td>
<td>47</td>
</tr>
<tr>
<td>19</td>
<td>32</td>
<td>47</td>
<td>55</td>
</tr>
</tbody>
</table>

#### Analysis
- **Treatment** (d = 0.5)
- **Control** (d = 0.2)

**MCDI**
- T: 264
- C: 215
- **D = 0.4**
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).
## Children with Autism

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td>Randomized Clinical Trial; Multiple Baseline AAC, Verbal only</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>EMT + Joint Attention and Symbolic Play 48 sessions in the clinic (24 therapist only, 24 parent + therapist)</td>
</tr>
<tr>
<td><strong>Measures</strong></td>
<td>Pre, Post, 6 months Standardized, observational, parent report</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Average age: 6 years, 6 months Average Leiter: 61 Gender: 74% male PPVT: 32</td>
</tr>
</tbody>
</table>

Kasari, Kaiser, Landa et al, 2011   Autism Speaks 5566
## Children with Autism

<table>
<thead>
<tr>
<th>Communication Challenges</th>
<th>Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty with joint engagement</td>
<td>Model and teach joint engagement behavior</td>
</tr>
<tr>
<td>Few play skills and brief duration of play</td>
<td>Model and teach play skills</td>
</tr>
<tr>
<td>Requesting rather than commenting</td>
<td>Model commenting, limit requesting</td>
</tr>
<tr>
<td>Interfering behavior</td>
<td>Determine which behaviors are communicative; respond differentially</td>
</tr>
<tr>
<td>Very low rate spoken language</td>
<td>Add SGD</td>
</tr>
</tbody>
</table>
## Children with Autism

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td>Randomized Clinical Trial</td>
</tr>
</tbody>
</table>
| **Intervention**| EMT + Joint Attention and Symbolic Play (J-EMT)  
48 sessions in the clinic (24 therapist only, 24 parent + therapist) with/ without SGD |
| **Measures**    | Pre, Post, 6 months  
Standardized, observational, parent report |
| **Participants**| 61 children with ASD  
Average age: 6 years, 6 months  
Average Leiter: 68.16  
Gender: 74% male  
PPVT: 32  
Mn words at pre: 16.6 |

Kasari, Kaiser, Landa et al, 2014  Autism Speaks 5566
Intervention Variations

- J-EMT Spoken Language Only
- J-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
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
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

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>12 weeks</th>
<th>Treatment Responders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TSCU</td>
<td>TNDW</td>
<td>TCOM</td>
</tr>
<tr>
<td>JASP+ EMT</td>
<td>28.4</td>
<td>16.8</td>
<td>7.0</td>
</tr>
<tr>
<td>JASP + EMT + SGD</td>
<td>30.5</td>
<td>17.6</td>
<td>5.1</td>
</tr>
<tr>
<td>(difference)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P value</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

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.
Ongoing Studies

ACE: Minimally Verbal Children with Autism

- 192 5-8 year old children with ASD
- Fewer than 20 words
- RCT SMART design
  - Discrete Trial Training (DTT)
  - JASPER-EMT
- Adaptive treatment
  - Slow responders to either intervention received tailored combination of DTT + JASPER-EMT
  - Both with iPads

Minimally Verbal Preschoolers with Autism

- 120 3-4 year old children with ASD
- Fewer than 20 words
- RCT Treatment vs Control
- JASPER-EMT with DDT pre-teaching core skills
  - Individualized based on baseline imitation and receptive skills
  - With iPads
  - Parent training

Kasari, Kaiser, Smith, & Lord in progress; NIH Autism Center of Excellence C. Kasari, PI

Kaiser & Hampton, in progress HRSA
EFFECTS OF NATURALISTIC SIGN INTERVENTION ON EXPRESSIVE LANGUAGE OF TODDLERS WITH DOWN SYNDROME.

Children with Down Syndrome

<table>
<thead>
<tr>
<th>Communication Challenges</th>
<th>Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low rate of symbol infused joint attention</td>
<td>Model communication in joint engagement episodes</td>
</tr>
<tr>
<td>Poor articulation skills</td>
<td>Teach sign + word as mode</td>
</tr>
<tr>
<td>Poor auditory memory/ strong visual skills</td>
<td>Model words + sign</td>
</tr>
<tr>
<td>Poor generalization across partners, settings</td>
<td>Teach with multiple partners, settings, activities</td>
</tr>
</tbody>
</table>
## Study Component

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Multiple Baseline Single Subject</td>
</tr>
</tbody>
</table>
| Intervention    | EMT Words + Signs  
24 sessions at home  
Therapist + Parent |
| Measures        | Pre, Post, ever 3 months  
Standardized, observational, parent report  
Use of signs |
| Participants    | Gender: 1 male, 2 female  
Average age: 25 months (2.83)  
Average Mullen: 69 (8.04)  
Average PLS-Total Standard Score: 67.25 (5.32) |
Intervention Variation

- EMT Words + Signs
- Simplify and reduce prompting
- Parent training after responding to prompts was established with therapist
EMT Words + Signs for Young Children with DS

3 Toddlers with DS 18-22 mos
- Multiple Baseline Design
- Taught by SLP in Clinic
- Generalization to home activities with parents
- Phase 2, teaching parents
  - Wright et al, under review

<table>
<thead>
<tr>
<th></th>
<th>Parent Outcomes</th>
<th>Child Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Matched Turns</td>
<td>% Targets</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Ryan</td>
<td>41%</td>
<td>90%</td>
</tr>
<tr>
<td>Erin</td>
<td>36%</td>
<td>82%</td>
</tr>
<tr>
<td>Jay</td>
<td>34%</td>
<td>95%</td>
</tr>
</tbody>
</table>
J-EMT  Words + iPads

- 3-4.5 year olds with DS
- Parent + Therapist
- JASPER-EMT
- 48 sessions; 4 days/week
- Childcare/preschool + Home
- iPads
- RCT treatment vs control

Kaiser, Kasari & Wright in progress, John Merck Foundation
EFFECTS OF EMT+PE ON THE LANGUAGE SKILLS OF YOUNG CHILDREN WITH CLEFT PALATE

Kaiser, Scherer, Frey & Roberts (submitted)

NIDCD 1R21DC009654
# Children with Repaired Cleft

<table>
<thead>
<tr>
<th>Communication Challenges</th>
<th>Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low intelligibility</td>
<td>Recast unintelligible utterances, model phonological targets</td>
</tr>
<tr>
<td>Low rate of communication</td>
<td>Use responsiveness strategies to increase rate of communicating</td>
</tr>
<tr>
<td>Often shy, nonresponsive to prompting</td>
<td>Increase prompting after 12-24 sessions</td>
</tr>
</tbody>
</table>
## Children with Repaired Cleft

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Design**      | Pilot Randomized Clinical Trial  
                 7 Intervention, 9 Control |
| **Intervention**| PE-EMT  
                 48 sessions in the clinic  
                 Therapist only |
| **Measures**    | Pre, Mid, Post, 3 months, 6 months  
                 Standardized, observational, parent report |
| **Participants**| Average age: 25 months  
                 Average Bayley Cognitive Score: 101  
                 Gender: 69% male  
                 PLS-4: 100  
                 Scherer & Kaiser, 2010  
                 NIDCD 1R21DC009654-01A1 |
Intervention Variation

- Phonological Emphasis PE-EMT
- Choose word targets with target sounds
- EMT for words
- Recast for phonological correctness
- Simplify prompt sequence
### Children with Repaired Cleft

#### Number of Different Words

<table>
<thead>
<tr>
<th>Time</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>T1</td>
<td>34</td>
<td>43</td>
</tr>
<tr>
<td>T2</td>
<td>52</td>
<td>50</td>
</tr>
</tbody>
</table>

**Effect Size:** ES: $d = 0.72$

**P-value:** $p = 0.02$
Children with Repaired Cleft

Percentage of Consonants Correct

- Intervention
- Control

T0: 52% (Intervention) vs. 34% (Control)
T1: 58% (Intervention) vs. 57% (Control)
T2: 71% (Intervention) vs. 78% (Control)
Tools for Practice

Skills Needed for Effective Intervention

• Fluent in the use of EMT*
• Skills for training parents and partners*
• Skilled in the additional components added to EMT
  • JASPER http://www.interactingwithautism.com/section/treating/jasper
  • Sign
  • Speech generating device: use, management, assessment, instruction
  • Speech recasting
  • Discrete trial training (Smith, 2010)

* Information available at http://kc.vanderbilt.edu/kidtalk/
Tools for Practice
Assessment & Progress Monitoring

- Structured Play Assessment *
- Language Sample*
  - Transcribed
  - Coded for gesture
  - Words, MLU, rate of initiations, rate of communication, consonant production
- Speech assessments
  - Arizona, PEEPS or language sample with consonants transcribed
- Baseline EMT session*
  - Responsiveness to comments, TD, Prompts;
  - Prompted and spontaneous verbal imitation
  - Use of targets
- Imitation probe *
- Receptive language probe : receptive object and picture labeling
- Toy preference assessment (ongoing)

* Information available at http://kc.vanderbilt.edu/kidtalk/
Tools for Practice

Progress Monitoring is Essential

• Every child presents unique challenges in implementing EMT
• How child is responding to the intervention is the test of whether the fit is right
• Adaptive treatments are the 4th generation of language intervention
  Choose the best treatment based on assessment, baseline
  Monitor progress against benchmarks
  If needed, make adaptations
• Quick tools for monitoring:
  • IGDI http://www.igdi.ku.edu/
  • Trackers for session data for therapist and child *
Tools for Practice
Fidelity and Dosage Matter

• Is the intervention being delivered at fidelity?
• Is the dosage of components within in the intervention sessions sufficient?
  • Models, expansions, prompts
  • Is child responding to the active ingredients?
• Are sessions frequent enough, long enough?
• Do other partners need to be trained to increase dosage?

<table>
<thead>
<tr>
<th>Fidelity Measure</th>
<th>% Criterion</th>
<th>% Intervention Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched turns</td>
<td>&gt;75</td>
<td>98 (2.8)</td>
</tr>
<tr>
<td>Talk at child’s level</td>
<td>&gt;50</td>
<td>83 (12.5)</td>
</tr>
<tr>
<td>Recasted Incorrect child utterances</td>
<td>&gt;40</td>
<td>76 (16.7)</td>
</tr>
<tr>
<td>Expanded child utterances</td>
<td>&gt;40</td>
<td>55 (16.0)</td>
</tr>
<tr>
<td>Time delay strategies</td>
<td>&gt;80</td>
<td>98 (8.0)</td>
</tr>
<tr>
<td>Prompting strategies</td>
<td>&gt;80</td>
<td>98 (12.4)</td>
</tr>
<tr>
<td>Words containing speech targets</td>
<td>&gt;25%</td>
<td>34 (17.3)</td>
</tr>
</tbody>
</table>
Last words

- EMT is evolving with new individualized adaptations
- The core of the intervention is always the social communicative connection between the child and partner
- The most important immediate outcome is increased communication
- Fine tuning intervention to fit child characteristics can improve outcomes when combined with the core EMT and components are delivered at fidelity
References

Appreciation!

• KidTalk Research Team at Vanderbilt
  • Jennifer Nietfeld, Stephanie Jordan, Suzanne Thrower, Courtney Wright, Lauren Hampton, Kelly Windsor, Julie Bryant, Lizzy Fuller, Jodi Heidlage, Kim McCulla, Morgan Lueck

• Families and children who participated in our studies

• Our collaborators
  • Connie Kasari (UCLA)
  • Danny Almirall (Univ of Michigan),
  • Rebecca Landa (Kennedy Kreiger, Johns Hopkins Univ)
  • Tristam Smith (Univ of Rochester)
  • Nancy Scherer (ASU)
  • Jennifer Frey (GWU)
  • Megan Roberts (Northwestern Univ)
  • Juliann Woods (FSU)

• Our funding agencies: IES, OSEP, NICHD, NINDS, John Merck Foundation, HRSA

• For more information
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  This talk will be posted at
  http://kc.vanderbilt.edu/kidtalk/
  Follow us on Facebook: Vanderbilt Kidtalk