Phenotypic Adaptions of Naturalistic Teaching

Ann P. Kaiser
Vanderbilt University
Today’s Talk

• Building a new generation of communication interventions
• Enhanced Milieu Teaching (EMT)
  • Brief overview
  • Research evidence
• EMT active ingredients
  • Underlying model of communication development
  • Core procedures
  • Additions to core EMT
• Adapting EMT To Fit Learner Characteristics
  • Profiles of four populations
  • Adaptations to maximize social communication outcomes
• 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 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

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
EMT Child Communication Goals

1. Increase duration of engagement
   • Social (joint engagement)
   • Objects (play)

2. Increase rate of communication
   • Emphasize spontaneous social initiations

3. Increase diversity of communication
   • Same level forms
   • More words and phrases
   • More functions (requests, comments, questions)
   • Across more contexts

4. Increase complexity of communication
   • Higher level forms
   • Prelinguistic to linguistic,
   • Mean length of utterances
   • Complexity of utterance types

5. Increase independence
   • Initiated social communication
   • Generalization across contexts, people
EMT Example
Part II
Adapting EMT
Review: EMT Active Ingredients

- Environmental arrangement to promote communication
- Play and engage
- Follow child’s lead in play and activity
- Respond to child communication
- Model language in context
- Expand child communication**
- Use time delay 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)
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

Strategies
EMT Modifications to Fit What Children Bring

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

- Teach imitation
- Add discrete trials
- Increase dosage

- Teach joint attention skills
- Support partner comprehension

- Support partner comprehension
- Increase person engagement
- Teach coordinated joint attention

- Teaching play
- Increase dosage
<table>
<thead>
<tr>
<th>EMT Active Ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play and engage</td>
</tr>
<tr>
<td>Follow child’s lead in play and activity</td>
</tr>
<tr>
<td>Respond to child communication</td>
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<tr>
<td>Model language in context</td>
</tr>
<tr>
<td>Expand child communication</td>
</tr>
<tr>
<td>Use time delay to prompt requests or initiations</td>
</tr>
<tr>
<td>Use Milieu teaching prompts to promote practice</td>
</tr>
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<td>EMT Active Ingredient</td>
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<tr>
<td>Expand child communication</td>
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<tr>
<td>EMT Active Ingredient</td>
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<td>Play and engage</td>
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<tr>
<td>Use time delay to prompt requests or initiations</td>
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<tr>
<td>Use Milieu teaching prompts to promote practice</td>
</tr>
</tbody>
</table>
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]
• - Reduce prompt complexity, number of prompts [Simplify]
• + Increase Dosage [Dosage]
• + Support Partners to use mode and EMT [Partner]
## Phenotypic Specific Modifications

<table>
<thead>
<tr>
<th>Population</th>
<th>Modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode</td>
</tr>
<tr>
<td>Toddlers with Receptive/Express Delay</td>
<td>No</td>
</tr>
<tr>
<td>Down syndrome</td>
<td>+ Sign or SGD</td>
</tr>
<tr>
<td>Cleft Lip +/-or Palate</td>
<td>+ Speech targets</td>
</tr>
<tr>
<td>Minimally Verbal ASD</td>
<td>+ SGD</td>
</tr>
<tr>
<td>EMT Active Ingredient</td>
<td>Modification</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Play and engage</td>
<td>Teach play, Use person engaged activity to reinforce social engagement</td>
</tr>
<tr>
<td>Follow child’s lead in play and activity</td>
<td>Teach play Provide more motivating materials, choices</td>
</tr>
<tr>
<td>Respond to child communication</td>
<td>Modify mode Train partners to recognize communication Target simple rate increases first</td>
</tr>
<tr>
<td>Model language in context</td>
<td>Teach imitation skills Modify modeling to fit speech or mode characteristics Rescue protocol PE-EMT Words + Signs J-EMT +SGD</td>
</tr>
<tr>
<td>Expand child communication</td>
<td>Teach prelinguistic skills (point, show, give) Increase intelligibility Make mode more transparent to partner</td>
</tr>
<tr>
<td>Use time delay to prompt requests or initiations</td>
<td>Modify time delay (lessen production demand) until child regularly responds Choose highly preferred objects</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 |

Parent + Therapist EMT

Enhanced Milieu
Teaching with a Toddler
Intervention Group: Pre-Post Gains

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressive language (PLS-4)</td>
<td>75</td>
<td>84</td>
</tr>
<tr>
<td>Receptive language (PLS-4)</td>
<td>77</td>
<td>86</td>
</tr>
<tr>
<td>Expressive vocabulary (EOWPVT-3)</td>
<td>61</td>
<td>76</td>
</tr>
</tbody>
</table>
Outcomes Intervention vs. Control

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

Effect sizes: $d = 0.3$
Outcomes Intervention vs Control: Number of Different Words

- **Number of Different Words**
  - **Treatment**
    - Month 1: 32
    - Month 2: 47
    - Month 3: 55
  - **Control**
    - Month 1: 32
    - Month 2: 32
    - Month 3: 38

- **MCDI**
  - Treatment: 264
  - Control: 215
  - Effect Size: d = 0.4

- Effect Size (Cohen's d): d = 0.2 for Month 1, d = 0.5 for Month 2.
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>
## 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 |

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 show 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></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>TSCU</td>
<td>TND W</td>
<td>TCOM</td>
</tr>
<tr>
<td><strong>JASP+ EMT</strong></td>
<td>28.4</td>
<td>16.8</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>JASP + EMT + SGD</strong></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.
Results for the primary outcome (Total Social Communicative Utterances).

Open plotting characters denote observed means; closed denote model-estimated means. Error bars denote 95% confidence intervals for the model-estimated means.
Further adaptations for children with ASD

• Blending direct instruction with naturalistic teaching
  • Population: Minimally Verbal 3-4 year olds with ASD

• Teaching behavior and social support as a basis for naturalistic teaching
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>
## Children with Down Syndrome

<table>
<thead>
<tr>
<th>Study Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></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>
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</thead>
<tbody>
<tr>
<td></td>
<td>% Matched Turns</td>
<td>% Targets</td>
</tr>
<tr>
<td></td>
<td>Pre  Post  Pre  Post  Pre  Post  Pre  Post  Pre  Post  Pre  Post</td>
<td></td>
</tr>
<tr>
<td>Ryan</td>
<td>41%  90% 1%  74% 0% 48% 0% 83% 0% 94% 0% 82%</td>
<td>3</td>
</tr>
<tr>
<td>Erin</td>
<td>36%  82% 7%  64% 3% 57% 0% 100% 0% 100% 0% 66%</td>
<td>18.5</td>
</tr>
<tr>
<td>Jay</td>
<td>34%  95% 2%  75% 0% 60% 0% 100% 0% 100% 0% 80%</td>
<td>11</td>
</tr>
</tbody>
</table>
Further Adaptations for Children with DS

- Use SGD as an alternative to signs
- Strengthen therapist component
  - 2 sessions per week with child only (45 minutes each)
  - Based on previous outcomes for DS children (Yoder et al, 2016)
- Train parents across social and activity routines at home as well as in play
- Pre-teach skills and strategies using direct instruction (Heidlage, in progress)
  - Teach persistence, responding, prompt sequence
  - Teach multiple responses to single stimuli (label, action)
  - Teach label/action in matrix training format
EFFECTS OF EMT+PE ON THE LANGUAGE SKILLS OF YOUNG CHILDREN WITH CLEFT PALATE

Kaiser, Scherer, Frey & Roberts (in preparation)

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>
## Study Component

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

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

Number of Different Words

<table>
<thead>
<tr>
<th>T0</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention: 17</td>
<td>52</td>
<td>58</td>
</tr>
<tr>
<td>Control: 25</td>
<td>34</td>
<td>50</td>
</tr>
</tbody>
</table>

ES: $d = .72$, $p = .02$
Children with Repaired Cleft

Percentage of Consonants Correct

T0  T1  T2

52%  58%  78%
34%  57%  71%
0%   10%  20%

Intervention  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
  • JASPER
    http://www.interactingwithautism.com/section/treating/jasper
  • AAC (sign or SGD)
  • Speech recasting
  • Discrete trial training

* 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
• Quick tools for monitoring:
  • IGDI [http://www.igdi.ku.edu/](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 a complex intervention
- The core of the intervention is always the social communicative connection between the child and the therapist
- The most important immediate outcome is communication
- Fine tuning interventions to child needs and characteristics can improve outcomes, but only when the core of the intervention is working.
References


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