Exploring the Early Communication Key Skills for Intervention Decision-making
With Infants and Toddlers

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Introduction

The Early Communication Indicator (ECI) is one of a growing class of outcome measures emerging in early education and early childhood special education designed to identify infants and toddlers (6 to 36 mos) who are not making expected progress learning to communicate, promote levels of more intensive intervention to address children’s delays, and monitor children’s progress to ensure that they are benefiting from services received (Carta, Greenwood, Walker & Buzhardt, 2010). Benchmarks for intervention decision-making with the ECI are currently based on the Total Communication Score, normed on children entering Early Head Start (Greenwood, et al., 2008). How- ever, the ECI Total Communication Score is comprised of four key skill elements of early communication, each with a dynamic pattern of growth and change over time. A line

Table 1. Squared Multiple Correlation Coefficients $R^2$ for Univariate Longitudinal Panel Models

<table>
<thead>
<tr>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>21 mos</th>
<th>24 mos</th>
<th>30 mos</th>
<th>36 mos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestures</td>
<td>0.68</td>
<td>0.72</td>
<td>0.73</td>
<td>0.69</td>
<td>0.67</td>
<td>0.64</td>
<td>0.61</td>
<td>0.58</td>
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<td>Utterances</td>
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<td>0.61</td>
<td>0.58</td>
<td>0.55</td>
<td>0.52</td>
<td>0.49</td>
<td>0.46</td>
</tr>
<tr>
<td>Vocalizations</td>
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<td>0.50</td>
<td>0.47</td>
<td>0.44</td>
<td>0.40</td>
<td>0.37</td>
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</tr>
<tr>
<td>Words</td>
<td>0.37</td>
<td>0.41</td>
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Note: The increment in $R^2$ for observations that are more that 4 measurement occasions removed is negligible. Autoregressive relationships are not reported.

Research Questions

1. What are the predictive relations within and between ECI key skill elements across time?

2. What is the divergent validity of the ECI key skills based on a breakdown by known risk groups?

Methods

Participants were infants and toddlers recruited from Early Head Start (EHS) programs representing urban, suburban, and rural communities across Kansas and Missouri. Of 3,177 infants and toddlers, 2,229 enrolled in 13 Kansas EHS programs (n = 1,450, 62.20%) and 13 Missouri EHS programs (n = 769, 37.80%) with the primary language of English. Children having three or more repeated Early Communication Indicator (ECI) observations were included. 52.5% (n = 1208) of participants were male. English was the primary language reported in the home for 88.9% (n = 2062) of participants. 9.5% (n = 215) of participants were eligible to receive IDEA Part C early intervention services (indicated by an IFSP).

The first research question was addressed using Structural Equation Modeling (SEM) to estimate latent longitudinal panel and growth curve models describing predictive relations within and between ECI key skill elements across time. Logistic regression analyses were conducted to determine predictive values of infants’ and toddlers’ observed frequencies per minute of gestures, vocalizations, and single word utterances at 12, 18, 24, and 30 months to future success or failure in demonstrating 36 month multiple word fluency. The second research question was addressed using Hierarchical Linear Modeling (HLM) to estimate growth parameters for children 6 to 42 months of age. Communication risk (IFSP vs. No IFSP status) was treated as a fixed effect.

Results

The squared multiple correlation coefficients estimated within each of the four key skill elements suggested that observations one year removed significantly predicted communication rates at subsequent measurement occasions. Latent growth modeling (Figure 1) confirmed that simpler elements of communication preceded more complex. Specifically, growth in gestures between 6 and 15 months significantly predicted the frequency of vocalizations at 18 months; children demonstrating rapid growth in gestures achieved higher vocalization rates at 18 months, which in turn predicted single-word utterance rate at 36 months. The observed negative slope of vocalizations after 18 months predicted single-word communication at 36 months such that children who slowed to use words and multiple words in their communication achieved lower single-word rates at 36 months. Finally, growth in single-words beginning at 12 months significantly predicted multiple-word fluency (rate per minute) at 36 months.

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Discussion

The predictive validity of the earlier key skills (gestures, vocalizations) to later single word and multiple word skills at 6 months was established using latent growth modeling, replicating and extending these relationships. Findings support the potential value of using the Key Skills for further research on predictive utility and the divergent validity of the Key Skills was shown that children at risk due to their IFSP status and receipt of early intervention services compared to Early Head Start children, generally started growth in isolated single word skills first, and grew slower in skills over time (with the exception of gestures). Together, these findings support continuing work developing the ECI for screening, identifying risk, and monitoring. Future research on the sensitivity and specificity of the key skills is in progress (e.g., Wilson & Lonigan, 2010). Planned are several analyses of the key skills’ predictive utility in relationship to a communication outcome criterion variable for children 36 to 48 months of age (e.g., the Peabody Language Scale, Preschool Picture Naming IGDI, TOPEL).

Acknowledgements

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