Individual Growth and Development Indicators for Infants and Toddlers (IGDI's): *Extending DIBELS to Children Younger than Kindergarten*

Charles R. Greenwood, Judith J. Carta, & Dale Walker

*Juniper Gardens Children’s Project*

University of Kansas

http://www.lsi.ku.edu/jgprojects/igdi
An Effort of the Early Childhood Research Institute on Measuring Growth and Development

- Ruth Kaminski, Roland Good, and Others University of Oregon
  - Kg-3rd Grade
- Scott McConnell, Mary McEvoy, and Others University of Minnesota: Preschoolers
  - 3-5 Years Old
- Judith Carta, Charles Greenwood, Dale Walker, and Others University of Kansas: Infants and Toddlers
  - Birth to 3 Years Old
What Does the Literacy Connection Look Like?

- Kg-3 DIBELS
- Oral Reading
- Nonsense Word
- Phoneme Segmentation
- Initial Sound
- Letter Naming

- Preschool IGDIs
- Letter Naming
- Alliteration
- Rhyming
- Picture Naming

- Infant/Toddler IGDIs
- Toy Play Follows Function
- Multiple Word Utterance
- Single Word Utterance
- Vocalization
- Gesture
Here is the Website!

www.lsi.ku.edu/jgprojects/igdi
The Official IGDI Home Page
Individual Growth and Development Indicators for Infants and Toddlers

General Information

What is an IGDI?

- How might one use an IGDI to monitor individual child progress?
- How might one use an IGDI to monitor program progress?
- Using IGDI's to make decisions about progress

Getting started

- How do I get started?
- What are the costs?

Frequently asked questions

- What services are provided by this web site?
Expressive Communication (ECI)

- General Information
  - Introduction to the ECI
  - The Key Skill Elements of the ECI
  - Technical Soundness
  - Administration
  - The ECI Recording Form / Scoring Total Communication
  - Checking Quality: Interobserver Agreement of ECI Recording
  - ECI Reports and Results
  - Bibliography
  - Instruments

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Jumper Gardens
Children's Project
ECI Downloads

ECI Administration Instructions
ECI Scoring Definitions
ECI Administration Checklist
ECI Video Tape ($25.00)

contact: Betty Smith
bettys@ku.edu

ECI Recording Sheets

• ECI recording sheet 1 - original
• ECI recording sheet 2 - example - filled out

Observer Agreement Calculation

• Recording sheet 1 (ECI recording sheet original)
• Recording sheet 2 (ECI example - filled out)

Click below to download Free Acrobat Reader
Early Communications Indicator

Login

User ID: [blank]
Password: [blank]

Login

For Assistance

Contact us by email: darwin@ku.edu. You also may contact us by telephone at 785 864-0560
Weighted Total Early Communication

Slope: 1.50

Expected Slope (Norm): .41

Program: Juniper Gardens Test
Id: Valient, Prince
Graph 3 Version Date: 11/9/2003
Early Communication Key Skill Elements

Rate per Minute

Age at Test (Months)

Key Skill Elements
- Gestures
- Vocalizations
- Single Words
- Multiple Words
Weighted Total Early Communication

Rate per Minute

Age at Test (Months)

+1.5 SD
Norm
-1.5 SD
Weighted Total Early Communication

Slope = 2.8 Coms/Month
Why Needed Birth to 5?

- Early interventionists in Child Care, Early Head Start, Part C IDEA) need tools to:
  - Identify children who may need early intervention
    - too many children are identified too late
  - Monitor a child’s progress over time
    - use info to guide intervention decisions
  - Evaluate the effectiveness of early intervention
    - Welcome to the new era of Accountability for Results!
But, they lack appropriate tools - Because existing measures:

- Are too often based on conceptual frameworks that do not account for context and early intervention
- Require highly specialized expertise, not designed for Early Interventionists
- Take too much time and cost too much
- Are not repeatable often enough
- Are not sensitive to short-term growth over time
- Are not sensitive to EI effects
- Are difficult to understand by early interventionists and parents
Why Needed Now?

- Increased expectations for accountability (e.g., young children’s “readiness for school”, Head Start, New Part C and Part B-619 reporting requirements).
- Few measures are designed for use by early childhood interventionists:
  - Identify individual children needing intervention
  - Track progress over time
- This is true for children younger than 5 years of age, even more so for children younger than 3.
Research Challenges

- How to best measure children 0 to 3?
  - You can’t ask them questions and expect a response!

- What to measure for children 0 - 3?
  - There is often no curriculum nor unified program!
  - What developmental or functional skills are important to measure and monitor over time?
  - Which skills predict “school readiness” skills?

- How to make measurement meaningful to caregivers and parents so as to improve communication?
  - Professionals are often untrained and low unskilled!
  - Parents are Parents!

- How to make the tools available?
  - Websites!
For our purpose, Pediatric Growth Charts provided a beacon:

- Quick and easy to administer
- Reliable, valid measurement
- Repeatable info guiding treatment
- Identify children in need
- Monitor intervention results
- Excellent communication with parents
Use within an Intervention Decision-Making Model

General Outcome Indicator

Monitor

Identify/Validate Need

Evaluate Intervention

Monitor

Generate Options

Implement Intervention

Families

Exploring Solutions
The General Outcome Measurement (GOM) Approach

- Start by identifying “social valid” general outcomes for young children this age.
- Develop a few “sensitive” indicators of progress towards attaining the general outcome.
- Measure the indicators repeatedly to gauge rate of growth over time.
- Use a rate of growth metric (Growth Chart).
- Make intervention decisions based on progress or lack of progress as measured by change in the indicator.
Social Validation Survey Results

(Priest, McConnell, et al., *Journal of Early Intervention, 24(3)*, 163-180)

- **General Outcome Statements Validated**
  - **Early Communication**
    - “The child uses gestures, sounds, words, or sentences to convey wants and needs or to express meaning to others.”
  - **Movement**
    - “The child moves in a fluent and coordinated manner to play and participate in home, school, and community settings.”
  - **Social Competence**
    - “Child interacts with peers and adults, maintaining social interactions and participating socially in home, school, and community.”
  - **Problem Solving**
    - “Child solves problems that require reasoning about objects, concepts, situations, and people.”
  - **Adaptive Skills (in development)**
General Outcome
Indicators for Children 0 - 3

- Early Communication Indicator (ECI)
- Early Movement Indicator (EMI)
- Early Social Competence Indicator (ESI)
- Early Problem Solving Indicator (EPSI)
- Early Adaptive Skills Indicator (EASI)
General Administration

- **Administration Procedures**
  - Toy-play setting with familiar adult
  - 6-10 minute testing sessions
  - Adult’s role is to facilitate play and follow child’s lead
  - Set-up/clean-up/put away

- **Alternate Toy Forms**

- **Observational Recording Procedures**
### NOS CODING SHEET

**Child ID:** 502  
**Wave:** 8

**Test Date:**  
**Assessor:** Annessa

**Coder:** Gabriel  
**Circle one:** Barn / House

**Location:** Testing Room  
**Reliability Y N** Primary Coder Name: 

Four key skill elements (Gestures, Vocalizations, Single and Multiple Words) are tallied (columns) over 6 one-min periods (rows)

<table>
<thead>
<tr>
<th></th>
<th>Gestures</th>
<th>Vocalizations</th>
<th>Single Word Utterances</th>
<th>Multi-Word Utterances</th>
<th>Total</th>
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<td>M</td>
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</table>

Revised 9/27/99
Early Communication Indicator

General Outcome: “The child uses gestures, sounds, words, or sentences to convey wants and needs or to express meaning to others”

Constructs: Prelinguistic Communication → Spoken Language

Indicators:
- Gesture
- Vocalization
- Single Words
- Multiple Words

Time to Bench Mark:
- 0--6--12--18--24--30--36 Months of Age
Early Communication Indicator for Infants and Toddlers

- Key Skill Elements
  - Gestures
  - Vocalization
  - Single Words/Signs
  - Multiple Words/Signs
- Combine to form Total Communication Indicator
Early Communication Indicator

- Is the ECI sensitivity to growth over time?
Early Communication Indicator

- Does the ECI measure early communication? - Criterion Validity
  - Total Communication Rate vs.
    - Preschool Language Scale, $r = .62$
    - Caregiver Communication Scale, $r = .51$
Early Communication Indicator

- Is the ECI reliable?
  - Interobserver agreement = 90% overall
  - Spit half (odd vs. even) =
    - .89 for mean level;
    - .62 for slope for Total Communication
  - Alternate forms (House vs. Barn) = .72 for mean level for Total Communication
Can the ECI be Used Large Scale?

- Kansas Early Head Start
- 1,246 Children
- 126 Assessors
- 13 Head Start Programs
- Missouri Early Head Start is starting up!
Kansas EHS 2004 (N = 1246)

Children Enrolled
0 to 5,  76  72.4%
5 to 10,  14  13.3%
10 to 20,  5  4.8%
20 to 30,  4  3.8%
30 to 56,  6  5.7%
**All EHS Children**

Benchmark Mean at 36 Months = 15.4 Communications
Growth (Slope) = .41 per month

KS Mean at 36 Months = 20.7 Communications
Growth (Slope) = .63 per month
### Individual Programs’ mean growth rates

<table>
<thead>
<tr>
<th>Program</th>
<th>N</th>
<th>Upper Bound</th>
<th>Lower Bound</th>
<th>Rate of Communications per Month</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
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<td>.6878</td>
<td>12.67</td>
<td>-8.34</td>
<td>9.44</td>
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By IFSP Status

Benchmark Mean at 36 Months = 15.4 Communications
Growth (Slope) = .41 per month

Children without vs. with Individual Family Service Plans

<table>
<thead>
<tr>
<th>Age at Test</th>
<th>Weighted Total Communication Rate</th>
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<tbody>
<tr>
<td>5</td>
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<td>9</td>
<td>10</td>
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<td>21</td>
<td>25</td>
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<td>25</td>
<td>30</td>
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</table>

- ECI Benchmark
- No IFSP
- IFSP
By Home Language

Benchmark Mean at 36 Months = 15.4 Communications
Growth (Slope) = .41 per month
The Other IGDI’s for Infants and Toddlers

- Movement
- Problem Solving
- Social
- Adaptive
Early Movement Indicator

General Outcome: The child moves in a fluent and coordinated manner to play and participate in home, school, and community settings.

Constructs: Postural Movement → Locomotion → Object Control

Indicators: Transition in Position, Grounded Vertical, Roll, Throw, Catch, Trap
Early Movement Indicator for Infants and Toddlers

- Key Skill Elements
  - Transition in Position
  - Grounded Locomotion
  - Vertical Locomotion
  - Roll/Trap
  - Throw/Catch

- Total Movement Indicator
Early Movement Indicator

- Alternate Forms
  - Blocks/Balls  Shopping Cart  Window House
Early Movement Indicator

Is the EMI **Sensitive** to growth?
Early Movement Indicator

- Does the EMI measure movement? - Criterion Validity
  - Total Movement Rate (mean level) vs.
      - Locomotion scale, $r = .86$ to $.90$
      - Stationary scale, $r = .77$ to $.80$
    - *Caregiver Assessment of Movement Skills-Gross Motor* (CAMS-GM: Kuntz, 2001), $r = .85$ to $.87$
Early Movement Indicator

Is the EMI reliable?

- Interobserver agreement = 93%
- Split half (odd vs. even observations),
  - $r = .88$
- Alternate forms
  - $r = .85$ (BB versus WH)
  - $r = 0.84$ (WH versus SC), and
  - $r = 0.91$ (BB versus SC)

Note. BB = Block/Balls, SC = Shopping Cart, WH = Window House
Early Problem Solving Indicator

General Outcome: Child solves problems that require reasoning about objects, concepts, situations, and people.

Construct: Visual Exploration $\rightarrow$ Object Exploration $\rightarrow$ Problem Solving

Indicators: Looking $\rightarrow$ Touch Manipulate $\rightarrow$ Toy Function $\rightarrow$ Persistence/ Sustained Engagement

Time: 0--------6--------12--------18--------24--------30--------36 Months of Age
Early Problem Solving Indicator

- Key Skill Elements
  - Look
  - Explore (touch, mouth, manipulate)
  - Function (toy use follows function)
  - Solutions (produces solution)
  - Engagement (seconds participating)

- Problem Solving Indicator = (Toy Use Function)
Early Problem Solving Indicator

Alternate Forms (2 min each/Total 10 min per occasion)

<table>
<thead>
<tr>
<th>Toy Type</th>
<th>Form A</th>
<th>Form B</th>
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<tbody>
<tr>
<td>Pop-up</td>
<td>Dinos</td>
<td>Pets</td>
</tr>
<tr>
<td>Stack</td>
<td>Cups-Round</td>
<td>Cups-Square</td>
</tr>
<tr>
<td>Dome</td>
<td>DropNCatch</td>
<td>PullNPop</td>
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<tr>
<td>Gazebo</td>
<td>6 items</td>
<td>6 other items</td>
</tr>
<tr>
<td>Sound Puzzles</td>
<td>Animals</td>
<td>Bears</td>
</tr>
</tbody>
</table>
Form A Toy Set

- Pop-up
- Stack Cups
- Lever Pull
- Shape-Sorter
- Puzzle
Is the EPSI Sensitive to Growth over Time?

Intercept at 36 Months Old = 81.4
Slope = 3.2 responses per month

Functions

Age at Test (Months)

Frequency

Mean

Intercept at 36 Months Old = 81.4
Slope = 3.2 responses per month
Is the EPSI Sensitive to Age Differences?

Cohort 1 = 0-12
Cohort 2 = 13-24
Cohort 3 = 25-36
Early Problem Solving Indicator

- Criterion Validity
  - EPSI Functions (mean level) vs. Bayley Scales
    - MDI, $r = .48$, $p = .011$
Early Problem Solving Indicator

- Reliability
  - Interobserver agreement =
  - Alternate forms
    - $r = .90$ (A versus B)
Early Social Indicator

**General Outcome:** “Child interacts with peers and adults, maintaining social interactions and participating socially in home, school, and community.”

**Constructs:**
- Positive
  - Nonverbal Behaviors
  - Verbal Behaviors

**Key Skill:**

**Elements:**
- Adult
- Peer
- NonDirected

**Time to Bench**

**Mark:**
- 0
- 6
- 12
- 18
- 24
- 30

**Months of Age**
Early Social Indicator

- Key Skill Elements
  - Positive Nonverbal
    - To Adult
    - To Peer
    - To Nondirected
  - Positive Verbal
    - To Adult
    - To Peer
    - To Nondirected
- Total Positive Verbal Social Indicator
Early Social Indicator

- Alternate Forms
  - Tub of toys (TT)
  - Kitchen with dishes (KD)
  - Window house (WH)
Early Social Indicator

Does the ESI measure social competence? - Criterion Validity

ESI Verbal Social vs.

- Vineland Social-Emotional Early Childhood Scales (Sparrow et al., 1998), is a parent report measure:
  - Interpersonal scale, $r = 65$
  - Play/leisure scale, $r = .62$

- Howes Peer Play Scale (Howes, 1980), is an observational measure of play
  - Simple social play scale, $r = .47$
  - Overall composite scale, $r = .34$
Early Social Indicator

- Is the ESI reliable?
  - Interobserver agreement = 91.5% overall
  - Split half (Odd-even), $r = 0.85$
  - Alternate forms
    - 0.71 (TT versus WH),
    - 0.70 (WH versus KD), and
    - 0.57 (TT versus KD).
Early Social Indicator

- Is the ESI sensitivity to growth over time?

![Graph showing age at measurement against responses in 6 minutes for individuals -2SD on Vineland with ESI data points and lines for -1 SD and +1 SD.](image-url)
General Outcome: Child engages in a range of basic self-help skills including dressing, eating, toileting/hygiene, and safety/identification

Construct: Dependence/Independence (Self Help)

Indicators:
- Eating
- Toileting
- Undress/Dressing
- Amount/
- Guided vs. Guided vs.
- Fuss
- Indepen Independent
- Cooperating, Complying, Expected Behaviors

Time: 0-------6-------12-------18-------24-------30-------36 Months of Age
Discussion

- Progress to date – feasibility demonstrated
- Implications – replication needed, need bridging research to practice using the website
- Next steps – seek out programs interesting in use IGDI’s to monitor progress
Sources


For More Information

- carta@ku.edu
- greenwood@ku.edu
- walkerd@ku.edu
- http://www.jgcpcp.ku.edu/