

RUNNING HEAD: Best Practices in Measuring Growth and Development

**Best Practices in Measuring Growth and Development for Preschool Children**

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**AUTHORS' NOTE:** This research was funded by the U.S. Department of Education, Office of Special Education Programs, as part of the Early Childhood Research Institute on Measuring Growth and Development (Grant H024S600010). The authors thank the co-investigators of this project (Drs. Ruth Kaminski, Roland Good, Karen Rush, Judy Carta, Charles Greenwood, Gayle Luze, and Dale Walker) and our colleagues at the University of Minnesota site who have worked on the research reported here, including Kristen Davis, Julie Good, Stephanie McNeill, Chrisa Nitsiou, Maytali Novack, Allison Shiu, Jongho Shin, Ben Silberglitt, Marie Stadler, Michelle Suedbeck, and Sara Weisser. Correspondence regarding this manuscript should be sent to: Scott R. McConnell, Ph.D., 215 Pattee Hall, University of Minnesota, Minneapolis MN 55455; 612-624-6365. E-mail may be sent to [smcconne@tc.umn.edu](mailto:smcconne@tc.umn.edu).

***Manuscript Version: 9/12/00 10:28 AM***

## Overview

This chapter describes *Individual Growth and Development Indicators for preschool-aged children*. Preschool Individual Growth and Development Indicators (or IGDIs) are quick, efficient, and repeatable measures of correlates or components of developmental performance designed for use with children 30 to 66 months of age. Preschool IGDIs sample child performance in each major developmental domain (i.e., language, social, cognitive, motor, and adaptive), with a special emphasis on assessment related to long-term developmental outcomes that are common across the early childhood years, are functional, and are related to later competence in home, school, and community settings (Priest et al., in press). Preschool IGDIs are one of a growing class of general outcome measures (like curriculum-based measurement) for monitoring child development and achievement and for producing data that support an ongoing and comprehensive decision-making or problem-solving model of assessment and intervention (c.f., Deno, 1997).

### Purpose Of This Chapter

The purpose of this chapter is to provide a broad overview of Preschool IGDIs, including foundational information on their development and evaluation and practical information on their application both individually and as part of a decision-making model of assessment and intervention. Preschool IGDIs are still in a fairly early stage of research, development, and evaluation; readers interested in monitoring recent work on these tools may want to consult <http://ici2.umn.edu/ecri>.

In the first section of this chapter, we will describe how IGDIs can be seen as one part of a comprehensive early childhood education program, the ways in which they contribute to a decision-making approach to assessment and intervention, and the background information and skill needed to use them. In the section on “Best Practices” we will describe Preschool IGDIs already developed and those currently under development, and provide some examples of application for

these measures. Finally, in an annotated bibliography at the end of this chapter, we provide a few additional references for more information on general outcome measurement and Preschool IGDIs.

### Overview of IGDIs

As their name suggests, Preschool IGDIs are indicators of child status in different developmental domains. As indicators, these measures are not considered comprehensive, all-inclusive samples of child performance in a particular domain or area of functioning; rather, these measures are intended to be simpler components or correlates of more comprehensive measures or samples of child performance on the terminal skill in a particular domain.

Preschool IGDIs are specifically designed to help teachers and parents monitor growth of individual children over time. This focus on growth is intended to identify children needing early intervention, and to monitor the effects of such intervention so that long-term outcomes can be improved. Additionally, we expect Preschool IGDIs to be used for screening children in potential need for intervention, evaluating programs, and other applications (c.f., Shinn, 1998).

A summary of essential characteristics for individual growth and development indicators can be found in Table 1. Two basic principles underlie these essential characteristics. First and foremost, IGDIs must represent performance in the presumed developmental domain and general outcome. Technically, this means Preschool IGDIs must demonstrate criterion or construct validity, treatment validity (or sensitivity to the effects of interventions targeting a particular developmental outcome) and social validity (evidence that information helps teachers and parents make decisions in a particular developmental domain or with respect to a specific developmental outcome).

Second, Preschool IGDIs must also provide an index of the rate of development or growth over time. Growth or change is a powerful metaphor for all educational programs, and is especially appropriate for evaluation in early childhood education. Through frequent and repeated assessment, and by using common measurement procedures and metrics, Preschool IGDIs (like other general outcome measures) produce empirical “movies” of the rate of change in a particular domain over

time. With this information, parents and educational professionals can evaluate the extent to which a child is on a developmental path to achieve desired outcomes at later ages (for instance, whether a child is on trajectory to be an independent reader by the end of third grade).

As depicted in Figure 1, the growth trajectory produced by repeated administration of Preschool IGDIs can be used to answer a number of different questions, such as: (a) What is the child's current level of performance, compared to a normative group of similar age?; (b) What is the child's projected rate of growth and development, and based on this information does it appear likely the child will reach a desired long-term goal by the desired age or date?; (c) What is the effect of intervention on the child's rate of growth and development, and does this particular intervention improve projected long-term outcomes *vis a vis* the desired long-term goal?

#### Guidelines for Use

Preschool IGDIs should be used in instances where psychologists, teachers, and other program staff want to measure, record, and act on information about young children's rate of growth and development toward long-term, developmentally important goals. This assessment may be completed to monitor children not receiving specialized intervention, to identify children who might benefit from such intervention, and to monitor the effects of such intervention. Preschool IGDIs can be employed in regular early childhood programs with a stable cadre of enrolled students, or in community-based programs where children are seen more periodically by educational or other child service professionals. Further, given the standardized and easy-to-use features of these measures, data collection and management can be conducted by psychologists or others with advanced training in child assessment, teachers, paraprofessionals, volunteers or others. (When paraprofessionals or volunteers conduct large portions of assessment, an overall plan and ongoing monitoring of assessment results and utilization should be monitored by a professional with more in-depth knowledge and experience.)

To date, Preschool IGDIs have been used in limited ways in child-serving programs. We expect, however, that application will include a variety of purposes:

1. Screening and other normative comparisons of children in the general population, or those served in a program or classroom;
2. Identification of need for intervention (or change in intervention), and/or selection of individual children for intervention;
3. Evaluation of effects of intervention; and
4. Program evaluation efforts.

In spite of their relative youth, IGDIs build on a strong conceptual and empirical foundation in the design, evaluation, and application of general outcome measures. As a result, by hewing closely to the models provided by earlier research and development (Deno, 1998; Shinn, 1998), we can offer in this chapter a measured view of using these measures with preschool-aged children.

### **Basic Considerations**

#### **Background Information**

##### **Assessment In Early Childhood Education**

Assessment in early childhood education has a shorter history, and more diversity of opinion (and controversy) regarding its scope and appropriateness, than assessment for children in K-12 education. Nonetheless, there is a strong tradition of assessment in early childhood education, particularly for children with special needs (Fewell, 2000; McLean, Bailey, & Wolery, 1996).

Akin to practices for older children, assessment in early childhood education covers a number of different functions. Perhaps most common in early childhood education is assessment for screening, to identify children who may need additional evaluation or early intervention. Universal preschool screening programs are common in many states, and a variety of checklists, tests, and systems have been developed to support these efforts. Additionally, in the past few decades increased attention has been paid to assessment for determining eligibility, especially for

special education and related services. Again, a number of checklists, interviews, tests, and systems have been developed to support eligibility evaluations, often in direct response to State and Federal laws governing special education.

Other assessment tools for young children have also emerged. Recently, a variety of systems have been developed for planning intervention programs (e.g., Bricker & Pretti-Frontczak, 1996). Generally, these assessment systems relate either to formal or informal developmental sequences, or to explicit curricula (Bricker & Waddell, 1996) for early childhood education.

Closely related, a small number of systems for monitoring progress and evaluating effects of intervention have been offered in recent years. In select instances, these monitoring systems are tied directly to program planning and curriculum (as with Bricker's Assessment and Evaluation Performance System). In other instances, these systems are free-standing tools based on standard or generic developmental sequences (Meisels, Liaw, Dorfman, & Nelson, 1995). To date, however, most progress monitoring systems for young children represent critical skills mastery approaches, with some inherent weaknesses for monitoring progress and evaluating change (McConnell, 2000). In particular, these "critical skills mastery" approaches are often cumbersome to administer, provide little information for making comparative evaluations of individual children, and provide no information about rate of growth over time nor rate of progress toward long-term, desired outcomes.

As we continue to refine assessment practices for young children and their families, several specific conceptual and social-political issues must be confronted. These issues include:

1. Lack of clarity and agreement regarding the developmental goals, or "outcomes," for early childhood education. Early childhood education has long been saddled with internal debates over the scope and direction of intervention (e.g., "readiness" versus "skills" goals, "child-directed" versus "adult-directed" intervention; cf. Carta, Schwartz, Atwater, & McConnell, 1991). At the same time, there is little

conceptual clarity or empirical support for developmental outcomes that prepare children to meet the academic and behavioral standards of early elementary school. Without a clear sense of important functional and developmental outcomes for early childhood education, it will be difficult to develop a monitoring system that is widely accepted and implemented.

2. Associated ambiguity about “curriculum” in early childhood education, and thus ambiguity about standards against which children should be evaluated. Without general agreement and empirical support for specific developmental outcomes, it is impossible to identify specific experiences and opportunities that promote young children’s long-term success. And without this information, professionals in early childhood education have little external guidance about what services to provide at any stage of evaluation.
3. Preschool children do not have universal access to educational services, thus reducing the number of children served in publicly funded programs. While the United States may be moving toward some version of universal access to educational services for preschool-aged children, at the turn of the 21<sup>st</sup> century publicly funded programs are available primarily for children with developmental or other disabilities (served through special education), children living in poverty (served through Head Start and related programs), and children with other perceived special needs or risk factors. There has been tremendous growth in the numbers of children served in congregate care situations like day care, but there is very little explicit, common, and systematic organization of these services in ways that would support expanded assessment activities.

As a result, any assessment system in early childhood education must address several challenges. First, these assessment systems must be based upon explicit definitions of the outcomes

of interest, and provide evidence of the construct and social validity of these outcomes (e.g. Priest et al., in press). Second, early education assessment systems must articulate the relation of items or constructs assessed to both earlier development and to later functioning and expectations, especially in academic domains considered important for early school success (e.g., reading). Last, assessment systems in early childhood education must be developed, evaluated, and applied across a broad spectrum of children, including those with disabilities, those at risk for learning and behavior problems (including children whose primary language is not English) and children who are developing typically.

#### General Outcome Measurement Approach

Two different approaches to assessment for monitoring progress are emerging in early childhood education, akin to what has occurred in elementary and secondary education (McConnell, 2000). These two approaches have been characterized as critical skill mastery approaches and general outcome measurement approaches (Deno, 1997; Fuchs & Deno, 1991).

Critical skills mastery has been the dominant approach to assessment in early childhood education to this point (McConnell, 2000). This approach is characterized by assessment of separate, discrete skills that are assumed to be developmentally linked skills and ordered in a sequence or hierarchy. Critical skills mastery approaches can identify specific developmental status of individual children, and can be a strong foundation for program planning assessments. However, these approaches are poorly suited to monitoring the rate of development over time, assessing a child's progress toward long-term goals, or assessing child performance in an integrated, comprehensive and authentic way.

Conversely, general outcome measurement lends itself to direct assessment of growth and development over time. Instead of breaking skills down into pieces and gathering incomparable measures, general outcome measurement allows the practitioner to continually measure a student's progress over time and make changes as they are needed. General outcome measurement is

characterized by the use of standardized, prescriptive measures and long-term measurement that remains constant over time (Fuchs & Deno, 1991). Performance in a particular domain is measured with repeated, direct observations of performance, using common metrics and comparable stimulus materials. Slope of progress over time is used as an indicator of progress in the entire domain or curriculum. Increases or decreases in the slope over time indicate that skills are or are not being learned and used successfully (Fuchs & Deno, 1991). Because general outcome measurement samples a broad domain, growth (or no growth) indicates that the student is or is not making progress towards a specified outcome. This approach to assessment does not indicate which skills a student may or may not have mastered. General outcome measurement lends itself to treatment or intervention monitoring because of the broad sampling across domains and the measurement of progress over time using slope.

As a result, general outcome measures provide direct assessment of child progress toward a long-term goal. Further, because common metrics are used across time, general outcome measures yield data that index both current level of development and (if administered repeatedly) rate of development. Also, because common measures are employed and tools are explicitly designed for repeated and frequent assessment, general outcome measures are a good match to the task of evaluating the effects of intervention over short periods of time.

While a variety of critical skills mastery measurement systems have been available in early childhood education for some time (e.g., Bricker & Waddell, 1996; Meisels et al., 1995), general outcome measurement approaches are just beginning to appear (McConnell, 2000). Preschool IGDIs, along with similar measures for infants and toddlers and for early elementary students, and Dibels (Good & Gruba, this volume), are examples of these recently-developed general outcome measures.

### Decision-Making Model

Preschool IGDIs are part of a more comprehensive decision-making model for monitoring development and providing intervention to children birth to age 8 (Early Childhood Research Institute on Measuring Growth and Development, 1998). This decision-making model, which is conceptually very similar to other problem-solving models in school psychology and special education (see Tilly, this volume), is designed to identify children in need of intervention, to plan that intervention explicitly, and to monitor the effects of intervention services over time. Figure 2 presents a simplified version of this decision-making model.

This model, like other versions, is recursive; that is, individual children typically cycle through different stages or portions of this model. Preschool IGDIs are used to monitor development over time. When performance on one or repeated assessments indicates that children are not making desired rates of progress toward a long-term goal, intervention is designed and implemented (the variation presented here anticipates future refinement of a new class of assessment tools, “exploring solutions assessments,” to provide empirical support for, and reduce the uncertainty in, developing interventions for individual children). As intervention begins, IGDI assessment continues to document the effects of that change in service in the child’s development towards the long-term goal. If intervention is successful, monitoring continues. If intervention does not produce desired results, the model recycles back to design, implementation, and evaluation of intervention.

### Background Knowledge and Skills

#### Test Administration

Because Preschool IGDIs use specific and precise measures to indicate progress, an understanding of basic test administration is needed. In particular, administrators of IGDIs must use constant, standardized procedures across children and test occasions. Specific skills include administering procedures in standardized ways, familiarity with administration and scoring

procedures, following testing protocols, engaging the child, and following standard rules for interpreting and reporting results.

### Data Management

While single administration of IGDIs may, in some instances, be useful, the full power of continuous progress monitoring comes through repeated administration of IGDIs for individual children over extended periods of time. To obtain the full benefit from this effort, teachers and school psychologists must have efficient and effective tools for storing, managing, and displaying their assessment data to support intervention decision-making. Basic management of data consists of recording and graphing the number of correct responses over time (see Figure 1 for example). Time in days or weeks is recorded on the horizontal axis and correct number of responses is recorded on the vertical axis. Individual performance over time can be summarized, typically by calculating and graphing a trend line and relating this line to some prespecified long-term goal.

While these tasks can be accomplished with pencil and graph paper or a computer program such as Excel<sup>®</sup>, a number of resources describe applications to continuous-progress monitoring specifically (e.g., Shinn, 1989; Howell, Fox, and Morehead, 1993; and various locally-produced training modules such as those produced for the Curriculum-Based Measurement and Problem-Solving Assessment Summer Institute at the University of Oregon.)

### Interpretation and Treatment Planning

IGDI data collected over time and graphed can then be used to answer questions about intervention need (e.g., “Is this child’s development on path to meet our long-term goal?”) and effectiveness (e.g., “Is my new intervention producing higher rates of growth for this child?”). To answer questions like these, IGDI users must be able to interpret current status and plan changes in treatment when needed.

Interpretation skills for general outcome measures have been described elsewhere (Deno, 1985; Shinn, 1989, 1998). In general, interpretation IGDIs or other general outcome measures

requires comparing one child's current rate of development to either their predicted long-term status (a "long-term goal") or to a desired rate of growth over time (an "aim line"). Often, teachers or others compare levels or trends in child performance in two adjacent phases or periods of contrasting intervention.

While IGDIs are well-suited to monitoring and evaluating developmental status and treatment effectiveness, they provide little information for planning changes in treatment. Rather, interventionists and support professionals must turn to other data sources, including interviews and observations or curriculum-based assessment to achieve this aim (Barnett, Erhardt, Stollar & Bauer, 1994).

### **Best Practices: Individual Growth and Development Indicators for Preschool Children**

As part of the Early Childhood Research Institute on Measuring Growth and Development, we have been developing and evaluating a set of preschool IGDIs related directly to specific developmental and educational outcomes. In this section, we describe specific procedures and evaluation results for IGDIs developed to date, as well as our plans for future development. We also provide an example of how IGDIs can be used in an early childhood education setting.

#### Expressive Language

Indicators of individual preschooler's growth of expressive language skills have been developed with the following outcome statement as a guide: Child uses gestures, sounds, words, or sentences (including sign language and augmentative or alternative communication) to convey wants and needs or to express meaning to others. Two indicators appear promising: (a) Picture Naming Fluency, and (b) Semi-Structured Play.

Picture Naming. This Preschool IGDI is completed by presentation of photographs and detailed, color line drawings of objects commonly found in preschoolers' natural environments (i.e., home, classroom, community), one at a time for one minute. Categories of objects used in this

format include animals, food, people, household objects, games and sports materials, vehicles, tools, and clothing. Each photograph and line drawing is printed on a 8 x 5- inch index card. The examiner demonstrates the task with a set of four cards, looking at each card, naming the object as quickly as possible, and moving to the next card. The child practices the task with the same set of sample cards named by the examiner, ensuring the child understands the importance of speed in naming the pictures. The examiner then shuffles the entire deck of cards, presents the card at the top of the deck, and starts a stopwatch. Acceptable names for each object are printed on the back of each card to help the examiner determine the correctness of the child's labels. Incorrectly named pictures include errors and omissions. If the child does not respond to a picture within three seconds of its presentation, the examiner asks the child, "Do you know what that is?" or "What's that?" If the child does not respond within an additional two seconds, the examiner shows the next card. After exactly one minute has expired, the examiner stops the activity and counts the total number of pictures named correctly.

Studies of the psychometric properties of this measure – total number of pictures named correctly in one minute – have generated strong evidence for its use as an indicator of growth of preschoolers' expressive language skills. Results have shown strong concurrent relationships between this Picture Naming measure and norm-referenced measures of preschoolers' language skills, including the Peabody Picture Vocabulary Test – Third Edition (Dunn & Dunn, 1997) and the Preschool Language Scale – 3 (Zimmerman, Steiner, & Pond, 1992), with correlation coefficients ranging from  $r = .47$  to  $.69$  (Priest, Davis, McConnell, McEvoy, & Shin, 1999). Picture Naming also appears sensitive to growth of preschoolers' expressive language skills over time, with significant correlations between children's scores and chronological age ( $r = .41$  in a longitudinal study, and  $r = .60$  in a cross-sectional study), including typically developing children ( $r = .63$ ), children enrolled in Head Start ( $r = .32$ ), and children with disabilities receiving services in early childhood special education classrooms ( $r = .48$ ). Additionally, Picture Naming is sensitive to

growth across time ( $r_{12} = .34, p < .01$ ) and has one-month alternate form reliability coefficients from  $r = .44$  to  $.78$ . Finally, Picture Naming easily evokes expressive language from preschoolers, and it appears easy for examiners to learn and administer repeatedly across time.

Field testing Picture Naming is currently underway in a large district in central Iowa and an urban district in Minnesota. These efforts have been undertaken to substantiate continued use of this indicator to track preschoolers' growth of their expressive language skills, as well as expand the normative pool of children to which the measure applies. Eventually this information will help create benchmarks for school psychologists and others to use to make decisions about individual children's growth trajectories, based on comparisons to norm groups.

Semi-Structured Play. In this format, two peers (typically the same age and sex) play in a setting away from others. Each pair is provided with a pre-selected set of materials, that can be used in multiple, imaginative ways (e.g., Legos, Duplos, blocks, toy house, toy people). The examiner tells the children to work together to make something with the materials, walks away from the immediate area, and then starts a stopwatch. The examiner does not interact with children during the activity unless one child (or both children) leaves the area or adult intervention is needed to resolve a conflict. After exactly 10 minutes, the examiner stops the activity.

During the activity, the examiner observes one child's verbal behavior using a 10-second, partial-interval observational tool. This tool measures two child-produced behaviors per interval: an intelligible utterance of three or fewer words and an intelligible utterance of four or more words. Once the observer completes the 10-minute observation, s/he calculates two scores: the total number of intervals in which the child produced an utterance of three or fewer words, and the total number of intervals in which the child produced an utterance of four or more words.

Research to date suggests that one of these measures – the total number of intervals in which the child produces an utterance of four or more words – is the best measure from this format for use as an indicator of preschoolers' growth in expressive language skills. Concurrent

relationships between this measure of four or more word utterances and norm-referenced measures of preschoolers' language skills – the PPVT-III and PLS-3 – appear moderate, with correlation coefficients ranging from  $r = .33$  to  $.43$  (Priest et al., 1999). However, this measure may not be sufficiently sensitive to growth over time, since correlations between the measure and chronological age range from  $r = .25$  for children receiving early childhood special education services to  $r = .29$  for typically developing children. One-month alternate form reliability coefficients for the observational measure range from  $r = .25$  to  $.79$ . Learning to score this measure appears straightforward for most observers, based on strong results from tests of inter-observer reliability.

In summary, at least two measures – Picture Naming and an observational measure of four or more word utterances – show promise for assessing growth and development of expressive language for preschool-aged children. In particular, the Picture Naming measure shows promise as a logistically simple measure with strong psychometric properties.

### Early Literacy

We have begun development of a small set of Preschool IGDI's specifically designed to assess preschool children's progress in early literacy development. While a broader set of measures will emerge in coming years, three formats have already been developed and evaluated that assess phonemic awareness and analysis of preschool-aged children. Phonemic awareness and analysis is widely seen as a critical element of early reading success (Adams, 1990; Snow et al., 1998), and there is clear evidence that development of these skills begins during the preschool years (Lonigan, Burgess, Anthony, & Barker, 1998; Whitehurst & Lonigan, 1998). These three formats assess, in turn, alliteration, rhyming, and phonemic blending.

Alliteration. Our measure of alliteration was adapted from the work of Lonigan and colleagues (1998). We identified a set of words commonly known to preschool children, then assembled stimulus cards to present a color line drawing of the stimulus word (e.g., *boat*), and, under that, a row of three randomly ordered line-drawn pictures depicting the correct response (e.g.,

*butterfly*) and two incorrect responses (e.g., *lamp* and *chair*). During testing, the administrator tells the child she or he will be asked to “look at some pictures and find the ones that start with the same sound.” The administrator provides a series of sample items, both demonstrating the task and leading the child through it until the child understands the requirements.

Data collection continues for two minutes. For each card, the examiner labels the stimulus picture and the three possible responses, then asks the child to “point to the one that starts with the same sound as [the stimulus word].” To assess alliteration, we count the number of correct responses in two minutes.

While research continues on this measure, early analyses of psychometric characteristics are quite promising. Our first pilot test, with 38 preschool-aged children, yielded strong correlations to measures of language (with PPVT-3,  $r = .57$ ) and early literacy, including Clay’s *Concepts About Print* ( $r = .55$ ), letter identification ( $r = .74$ ), and the Test of Phonological Awareness ( $r = .75$ ). Early results also suggest this alliteration measure is sensitive to growth over time, with correlation to chronological age of .61. These analyses are being replicated and extended in a larger longitudinal study.

Rhyming. The Rhyming IGDI, like the Alliteration measure, was adapted from work by Lonigan and colleagues (1998) and uses cards and arrangements of pictures. Again, we identified a set of words commonly known to preschool children, but then identified rhymes for each of these words. We then selected rhyming pairs where both words were likely to be known to preschool children, and assembled cards presenting a color line drawing of the stimulus word (e.g., *hat*) above a line of three randomly ordered pictures depicting the correct response (e.g., *cat*) and two incorrect responses (e.g., *house* and *shoe*).

During testing, the examiner teaches the child what “rhyme” means (“Listen to these words: *bat*, *mat*, *hat*, *cat*. They all rhyme. *Cat* and *Sam* don’t rhyme. Listen: *boy* and *toy* rhyme. Do *boy* and *car* rhyme? (no) Do *car* and *bar* rhyme? (yes)”) then tells the child he or she will be

asked to “look at some pictures and find the ones that sound alike. They rhyme.” The examiner then presents series of demonstration and practice items, continuing until the child understands the task requirements. Data collection continues for two minutes. For each card, the examiner labels the stimulus picture and the three possible responses, then asks the child to “point to the one that sounds the same as [stimulus picture].” To assess rhyming, we count the number of correct responses in two minutes.

Our early research produced promising, but not quite as strong, evidence of the psychometric properties for this rhyming measure. The Rhyming measure showed strong correlation to the PPVT-3 ( $r = .56$ ) and measures of early literacy, including Clay’s Concepts about Print ( $r = .54$ ), letter identification ( $r = .59$ ), and the Test of Phonological Awareness ( $r = .62$ ). Pilot testing also suggested a significant, but lower, relation to chronological age ( $r = .44$ ), suggesting this measure might be somewhat sensitive to growth over time. Our current research is extending these analyses.

Phoneme blending. Phoneme blending is assessed via oral presentation of stimulus words. A shuffled deck of stimulus cards is used to present a list of typically known words. Approximately one third of the items in this list require segmenting at the level of compound words (e.g., *cow – boy*), one third require segmenting at the level of syllables (e.g., *ta – ble*), and one third require segmenting at the level of phonemes (e.g., *r – a – m*). Order of presentation is randomized by shuffling the deck prior to each administration, so that each examination includes items of all three types, in roughly equal proportions.

The examiner reads previously-specified segments, with one-half second pause between segments. The child is told “I’m going to say a word in a funny way and I want you to listen closely and tell me what word I said.” Again, the child receives a series of demonstration and training items, and then administration begins. This measure of early literacy is expressed as the number of correct responses in two minutes.

Early results for Phoneme Blending, while promising, are not as strong or consistent as those for Alliteration or Rhyming measures. Phoneme Blending is related to performance on the PPVT-3 ( $r = .49$ ) and the early literacy measures (Concepts about Print  $r = .35$ , letter identification  $r = .28$ , and Test of Phonological Awareness  $r = .47$ ), and significantly but weakly correlated with chronological age ( $r = .30$ ). It is possible that this measure is too difficult for younger and less-skilled children, and as a result we have obtained floor effects. These issues, and replication of initial findings, are being examined in current research.

### Social Interaction

Our work to date has also focused on measures of the development of social interaction skills. Specifically, we have developed indicators for the following outcome: Child interacts with peers and adults, maintaining social interactions and participating socially in home, school, and community settings. We are interested in assessing children's success in initiating social interaction with peers, responding to others' interactions, engaging in cooperative play, and knowing how to solve social problems. These *key elements* of social interaction were selected based on a comprehensive review of the literature, as well as interviews with practitioners and researchers who had experience working with young children in play settings.

We have developed two IGDI formats – Play Ideas and Joint Play – to serve as indicators of child-child interaction, with two versions of Play Ideas. For the first, Play Ideas Picture Prompts, the experimenter presents the child with a photo of his or her own playground or classroom. The picture includes areas of the classroom or playground that were typically used for freeplay. The experimenter asks the child to “pretend that he or she was going here with a friend”. The child is then asked to name all of the things that s/he and a friend could do “together” in the area. For the second, Play Ideas Verbal Prompts, the experimenter tells the child that “a friend and I are going into your classroom (or playground) to play together.” Again the child is asked to name as many things as they can that could be done together. With both the verbal and picture prompts, we count

the total number of Play Ideas (number of novel activity ideas and number of novel interactive activity ideas) that a child generates during a three-minute time period.

Joint Play is measured during a semi-structured play activity. This format includes the target child and one other child, typically the same sex and comparable age. We developed two different versions of this format. First, we present the children with “silly face” pieces (eyes, ears, nose, mouth, mustache, etc) and a card with a blank face on it. We ask the children to “work together to make the blank face a silly face.” In a second version, we present the children with a puzzle form, and each child is given one-half of the puzzle pieces. We ask the children to play together so that they finish the puzzle. In each of the versions, children play for five minutes. We record the duration of joint play (defined as a child actively engaging in the same activity as a peer) during this five-minute period.

Early results of our evaluations of these social interaction measures are somewhat promising. Duration of Joint Play for one format, making silly faces, showed moderate correlations with observer ratings of social competence ( $r = .40$ ) and teacher ranking of social interaction ( $r = .43$ ). Additionally, duration of Joint Play in this one format was strongly related to child age ( $r = .58$ ), suggesting its sensitivity to growth over time. Correlations for the second Joint Play format, building puzzles, were generally lower and nonsignificant with all criterion measures ( $r$  from  $.09$  to  $.34$ ), suggesting that the settings in which these data are collected may influence the meaningfulness of scores.

Future research will evaluate the feasibility of using the social interaction IGDI to assess social interaction trajectories for young children who have identified social interaction deficits, as well as those who may be at-risk for interaction delays. It is anticipated that these indicators will help teachers and families target children who may need additional assessment and possible intervention.

### IGDIs Under Development

Future efforts to develop new growth indicators will focus on preschoolers' skills in two domains: motor and adaptive. In the motor domain, the underlying outcome guiding development of a growth indicator (or indicators) states: Child moves in a fluent and coordinated manner and manipulates toys, materials, and objects in a fluent and coordinated manner to play and participate in home, school, and community settings. Important elements of this outcome for preschoolers include development of locomotion skills, such as walking, running, and jumping, as well as object control skills, such as throwing, catching, and kicking (Burton & Miller, 1998). These elements will be used to formulate potential formats within which preschoolers' movement skills may be observed directly.

In the adaptive domain, the guiding outcome states: Child engages in a range of basic self-help skills, including but not limited to skills in dressing, eating, toileting/hygiene, and safety/identification. Factor analyses indicate this outcome represents one component of practical intelligence, which in turn embodies just one of perhaps five dimensions of adaptive skills (Thompson, McGrew, & Bruininks, 1999). For preschoolers, however, these self-care skills may play an even more important role in overall development of personal competence compared to older children, since the construct of adaptive behavior in early childhood appears less differentiated than it is for children beyond preschool (McGrew & Bruininks, 1990). Thus, these self-help skills will serve as essential elements of an indicator of preschoolers' growth in adaptive behavior.

### Application Example: Monitoring Progress

Although Preschool IGDIs are relatively new, our work to date has given us opportunities to use these measures in several community-based preschool programs. In one example, a school psychologist and two classroom teachers implemented a continuous assessment program to monitor progress for children in three early childhood special education classrooms, with eventual focus on three particular children.

“Wadsworth Community School” is an elementary school with a large Early Childhood Special Education site in a large urban school district. Wadsworth serves 39 preschool children with disabilities in eight classroom sessions. Three classrooms, serving 15 children with developmental delays, participated in baseline data collection using Picture Naming IGDI. Data were collected in the classrooms twice a week for five weeks.

These data were then used to identify individual children who might benefit from some change in their program of intervention. To select participants, the teachers and school psychologist identified children who had flat or decreasing slopes in Picture Naming scores across the five-week period. Teachers also considered whether students demonstrated potential for growth in expressive communication through a combination of existing preskills, participation in intervention, and absence of competing behaviors.

From this process, the team identified three boys, ages 4-11 to 5-1, for more frequent monitoring and intervention evaluation. All three children were receiving services under the category of “Developmental Delay” and were receiving speech and language services.

The school psychologist collected additional information to plan interventions. This included language samples, information on classroom variables known to contribute to language development, and information on interactions between the boys and their teachers, peers, and classroom materials. Based on assessment of classroom activities, child behaviors, and staff resources, the team designed a peer-mediated language intervention. The three target students were paired with a typically developing peer in a structured play setting. Target students and peers participated in 20-minute play groups three times per week. IGDI data were collected twice a week during the two-month intervention phase to monitor changes in child growth and development. Weekly meetings were held with the two teachers to share data and discuss progress and/or changes.

The results of the progress monitoring can be seen in Figure 3. In all three cases, the students responded positively to the change in intervention and few modifications were needed.

### Future Directions

In coming years, we expect continued development of Preschool IGDIs, as well as increased numbers of research studies and practical applications using Preschool IGDIs to improve assessment and intervention outcomes for young children with disabilities and other risk factors. After initial development of IGDIs in all developmental domains, we project continued improvement and refinement of existing measures – indeed, we expect the measures (and results) reported here to be only an initial “baseline” for the expected quality of these measures. We also hope that others will develop new measures for preschool children, meeting the criteria for general outcome measures outlined by Fuch and Deno (1991) and summarized in Table 1. Also, we expect applications of Preschool IGDIs to follow and replicate the path seen in the use of other General Outcome Measures, including curriculum-based measurement (c.f., Shinn, 1998).

Two elaborations of Preschool IGDIs are already underway. First, our research team is developing *Get it, Got it, Go!*, a web-based application for helping teachers obtain assessment materials, manage resulting data, and collaborate with others on the design and evaluation of intervention programs. Second, we are actively exploring links between Preschool IGDIs and general outcome measures in similar domains for infants and toddlers and for early elementary students.

### Get it, Got it, Go!

Our work, and that of our colleagues who have developed other General Outcome Measures, consistently points to the need for a technological infrastructure to support teachers’ selection and implementation of these tools. To begin addressing this need, we are developing a multi-component web site for teachers, administrators, researchers, and parents.

The first part of this site, *Get it*, will provide information on the characteristics of general outcome measures, as well as detailed information on implementation in classrooms and programs. This portion of the site will also provide files for downloading and printing that provide both detailed administration instructions and stimulus materials (where needed) for individual Preschool IGDIs.

The second portion of this web site, *Got it*, will help teachers who have already begun using Preschool IGDIs. The site will provide password-controlled access to a secure site where teachers can enter individual student data, produce reports of child status and/or growth over time, and compare individual results to groups in the teacher's classroom, district, or a national database.

The third portion of this web site, *Go!*, will support teachers interested in using Preschool IGDIs to plan and evaluate changes in intervention. Teachers will "invite" others – including parents, colleagues, building and district consultants, or others – to a separate password-protected site where they will view data for a particular individual, and participate in a threaded discussion via email regarding interpretation, planning, and evaluating changes in intervention.

#### Links to I-IGDIs, E-IGDIs, Dibels

Preschool IGDIs are one part of an emerging portfolio of general outcome measures, linking outcomes and assessments from birth (see Greenwood et al., this volume) to kindergarten and early elementary school (see Good et al., this volume) and later grades (see Shinn et al., Fuchs et al., and others, this volume). To realize the potential of these measures as a set, our research is starting to examine relations between measures for different age groups (say, infants and toddlers compared to preschoolers), relations between rates of growth in one set and status on a second (say, relation between rates of growth in Early Literacy IGDIs and later reading), and relations between family and classroom variables and rate of growth within and across IGDIs and age periods. We expect results from this research to extend our understanding of assessment of developmental

progress, and to advance our knowledge of the critical dimensions and outcomes of early intervention.

### Summary

School psychology researchers and practitioners are developing an expanding portfolio of *general outcome measures* for monitoring the growth and development of children from birth through secondary school. These measures are distinguished by administrative efficiency (they are cheap and easy to collect), psychometric quality (they possess high levels of interobserver, alternate-forms, and test-retest reliability, as well as high levels of criterion, social, and treatment validity), and enhanced utility in school and community programs. In particular, these measures contribute to empirical evaluation of individual children's growth over time and the effects of different interventions. As such, general outcome measures are an essential component of many data-based decision-making (or "problem-solving") models of education and school psychology.

In this chapter, we have described one part of this emerging portfolio of general outcome measures, individual growth and development indicators for preschool children. These Preschool IGDIs sample child achievement and growth in developmentally and academically relevant domains, and hold particular promise for linking to similar general outcome measures for infants and toddlers and for elementary-aged students. To date, Preschool IGDIs have been developed for expressive communication, early literacy, and social interaction. In the near future, similar measures will be available for adaptive behavior and gross motor functioning.

Based on our current knowledge of essential features and application opportunities for other general outcome measures (particularly curriculum-based measurement), we expect these Preschool IGDIs to contribute to: (a) improving procedures for identifying children with developmental delay, (b) monitoring development over time for individual preschoolers and groups of children, (c) implementing data-based decision-making models of intervention and evaluation for early childhood education programs, and (d) expanding research on developmental continuity in

academic achievement, as well as the effects of different child, family, community, and service variables.

### **Annotated Bibliography**

- ❖ Early Childhood Research Institute on Measuring Growth and Development. (1998). Research and development of individual growth and development indicators for children between birth and age eight (Tech. Rep. No. 4). Minneapolis, MN: Center for Early Education and Development, University of Minnesota (available at <http://ici2.umn.edu/ecri>).

This report presents the rationale and research and development process for creation of individual growth and development indicators for young children. It is especially for practitioners interested in more detailed evaluation of the quality and utility of IGDIs, and for researchers interested in developing measures of this type.

- ❖ Early Childhood Research Institute on Measuring Growth and Development (1998). Theoretical foundations of the Early Childhood Research Institute on Measuring Growth and Development: An early childhood problem-solving model (Tech. Rep. No. 6). Minneapolis, MN: Center for Early Education and Development, University of Minnesota (available at <http://ici2.umn.edu/ecri>)

This report describes an early childhood problem-solving model for delivering services to children with disabilities or at-risk. Phases of this model include identifying the need for additional assessment based on a child's lack of growth toward developmental outcomes, validating need for early intervention, exploring possible solutions, evaluating implemented solutions, and monitoring child progress over time.

- ❖ Fuchs, L. S., & Deno, S. L. (1991). Paradigmatic distinctions between instructionally relevant measurement models. Exceptional Children, 57, 488-500.

This article provides a critical conceptual distinction between “critical subskill mastery” and “general outcome measurement” approaches to monitoring progress in academic achievement,

and outlines the paradigmatic distinctions associated with these two approaches. General outcome measurement is proposed as an approach to monitoring progress toward a single long-term goal, with periodic assessment using common metrics as a means of assessing an individual's progression toward mastery of this long-term goal.

- ❖ Kaminski, R. A., & Good, R. H. (1996). Toward a technology for assessing basic early literacy skills. School Psychology Review, 25, 215-227.

This article describes a study investigating the validity, reliability, and sensitivity of three measures designed to assess three important aspects of early literacy: vocabulary, phonological awareness, and letter naming. The authors describe these measures as “Dynamic Indicators of Basic Early Literacy Skills,” or DIBELS. DIBELS are designed to identify kindergarten and first grade students who have not acquired important prerequisites for reading.

Table 1

## Essential Characteristics of Individual Growth and Development Indicators

| Characteristic  | Rationale  |
|---|--|
| Assess behaviors related to important outcomes for children       | Construct and social validity; likelihood of implementation in range of settings |
| Efficient and economical administration and scoring               | For ease of use, particularly with large samples in repeated fashion             |
| Standardized and replicable procedures                            | Minimize error due to administration variations                                  |
| Repeatable over time  | Frequent, repeated assessment for monitoring rate of growth                      |
| Reliable across occasions, administrators, and stimulus materials | Reliability of assessment information  |
| Sensitive to growth over time                                     | Essential for assessment of developmental progress                               |
| Sensitive to the effects of intervention                          | Essential for monitoring effect of intervention                                  |

Figure 1: Sample Preschool IGDI

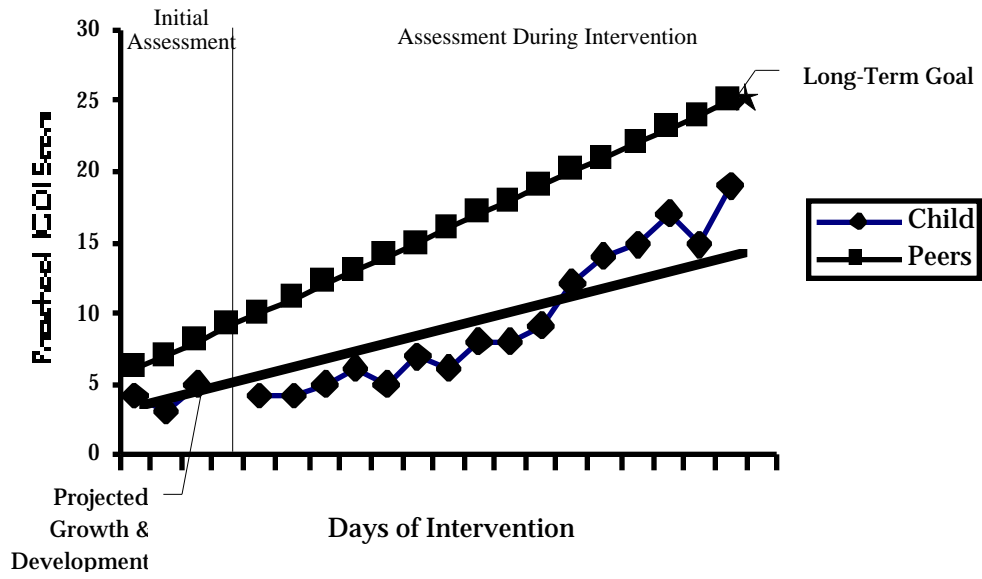
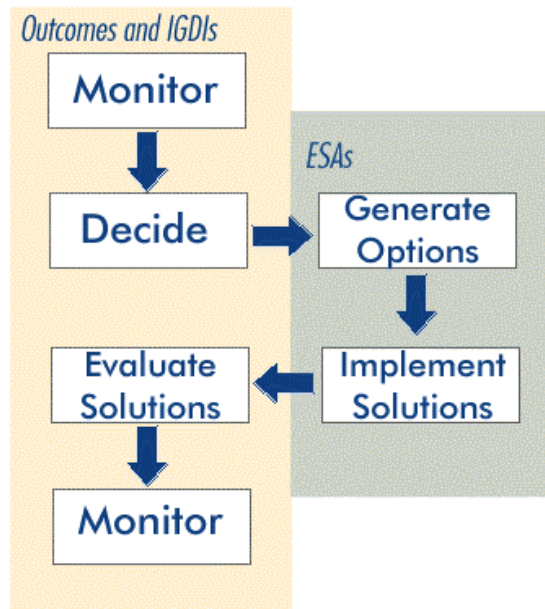


Figure 2





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